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TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

VOL. VI.

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Twenty-Seventh Annual Meeting,

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Annu. Ed. Railwaymen's Soc.,
Nov. 20, 1894.

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1891-92.

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<tr>
<td>Dr. Charles E. Rider</td>
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<tr>
<td>Dr. C. Schweigger</td>
<td></td>
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**Whole Number.** 111
MINUTES OF THE PROCEEDINGS.

TWENTY-SEVENTH ANNUAL MEETING.

Arlington Hotel, Washington, Sept. 23, 1891.

The Twenty-seventh Annual meeting of the Society held in connection with the Second Congress of American Physicians and Surgeons at Washington, D. C., was called to order by the President, Dr. Hasket Derby, at 9.15 A.M., and immediately went into Executive Session. The President announced the following committees:

Committee on Bulletin — Drs. J. J. B. Vermyne and C. A. Oliver.


Auditing Committee — Dr. Swan M. Burnett.

On motion it was ordered that the session extend from 10 till 2 on the first day, and that an Executive Session be held at 9 A.M. on the second day, to be immediately followed by the reading of papers. It was also ordered, that in discussion no speaker should occupy more than 3 minutes, nor speak more than once on the same topic.

The Committee on Membership reported the names of the following gentlemen for election, and they were all unanimously elected:
Twenty-Seventh Annual Meeting.

Dr. W. E. Lambert, Dr. D. W. Hunter, Dr. F. G. Marlow.

Voted, That the assessment for 1891-1892 be $10.

Voted, That the stenographer may furnish a copy of his notes for any medical journal applying for them, that is approved by the Secretary; and that Drs. Jackson and Stevens be given permission to report for the Ophthalmic Review and the Annales d'Oculistique.

The Treasurer's Report was read and referred to the Auditing Committee.

Voted, That the members of the Congress of American Physicians and Surgeons now in session, and their guests who are interested in ophthalmology, be invited to sit with us and take part in the discussion.

A number of names were proposed for membership and referred to the Committee on Membership.

The Committee on Bulletin reported and the following papers were read:


2. "The Occurrence, Prevention, and Management of Prolapse of the Iris in Extraction of Cataract," by Dr. H. Knapp.

3. "Routine Syringing out of Cortical Matter in Cataract Extractions, as illustrated by 100 cases," by Dr. J. A. Lippincott. These three papers were discussed by Drs. Gruening, Bull, H. D. Noyes, Theobald, Reeve, Marmion, and Knapp.

4. "A Case of Acute Glaucoma occurring in an Eye with Coloboma of the Iris and Supernumerary Pupils (illustrated by micro-photographs and microscopic slides)," by Dr. George E de Schweinitz.


7. "History of a Case of Brain Tumor with Autopsy," by
Twenty-Seventh Annual Meeting.

Dr. C. S. Bull. These papers were discussed by Drs. Heyl, Sutphen, Webster, Bull, and Jones.


11. "Divergent Squint and its Operative Treatment," by Dr. E. Gruening. Discussed by Drs. Webster, McKay, and Gruening.


Adjourned to 9 A. M. of 24th.

Sept. 24th.

Meeting called to order at 9 A. M.

The Auditing Committee reported the Treasurer’s Report correct, and the report was received and ordered placed on file.

The following named gentlemen were recommended for admission by the Committee on Membership, and were all unanimously elected: Drs. Wheelock Rider, Harlan P. Allen, J. M. Ray, C. F. Clark, and B. J. Baldwin.

A number of names were proposed for membership and referred to the Committee on Membership.

The Committee on Membership reported the following nominations for officers for the ensuing year:

For President — Dr. Hasket Derby.
For Vice-President — Dr. George C. Harlan.
For Corresponding Secretary — Dr. J. S. Prout.
Twenty-Seventh Annual Meeting.

For Recording Secretary — Dr. S. B. St. John.
For Publishing Committee — Drs. C. S. Bull, W. S. Dennett, and the Secretary (ex officio).

The above officers were unanimously elected.

Voted, That the next annual meeting be held at New London.

The deaths of Dr. Abram DuBois, one of the oldest members of the Society, and of Dr. Geo. R. Cutter being announced, Dr. H. D. Noyes was appointed a committee to prepare an obituary notice for our transactions.

The reading of papers was then resumed.

15. "Neuroma of Right Upper Eyelid and Temporal Region," by Dr. George E. de Schweinitz.
18. "Extraction of Foreign Bodies from the Vitreous," by Dr. E. E. Holt.
20. "Case of Brain Tumor with a High Grade of 'Choked Disk,'" by Dr. L. H. Taylor.


24. "Clinical Study of the Ocular Symptoms in the so-called Mongolian Type of Idiocy," by Dr. C. A. Oliver.


27. "Note on Hyosciamine," by Dr. S. D. Risley. Discussed by Dr. Harlan.


The Society then adjourned at 12.30 to accept Dr. S. M. Burnett's invitation to luncheon, and to re-assemble at 3.30.

Session resumed at 3.30 p. m.


32. "Rotary Prism and Fixed Apparatus for its Use," by Dr. S. D. Risley.

33. "Glaucoma after Extraction of Cataract," by Dr. F. Buller. Discussed by Dr. Buller.

Adjourned.
Present at the Twenty-seventh Annual Meeting:

Dr. W. H. Carmalt, Dr. C. A. Oliver,
Dr. John Green, Dr. F. Buller,
Dr. Haskett Derby, Dr. A. G. Heyl,
Dr. H. Knapp, Dr. S. B. St. John,
Dr. Wm. Thomson, Dr. M. V. Marmion,
Dr. C. S. Bull, Dr. L. H. Taylor,
Dr. D. Webster, Dr. S. D. Risley,
Dr. H. S. Oppenheimer, Dr. L. S. Dixon,
Dr. H. F. Hansell, Dr. J. D. Rushmore,
Dr. F. W. Ring, Dr. E. Gruening,
Dr. F. M. Wilson, Dr. S. J. Jones,
Dr. G. E. de Schweinitz, Dr. P. A. Callan,
Dr. F. B. Loring, Dr. T. Y. Sutphen,
Dr. Geo. C. Harlan, Dr. H. D. Noyes,
Dr. S. Theobald, Dr. C. E. Rider,
Dr. B. L. Millikin, Dr. Edw. Jackson,
Dr. D. Harrower, Dr. A. Mathewson,
Dr. R. A. Reeve, Dr. J. J. B. Vermyne,
Dr. C. M. Culver, Dr. J. A. Lippincott,
Dr. S. O. Richey, Dr. Myles Standish,
Dr. E. E. Holt, Dr. R. J. McKay,
Dr. B. A. Randall, Dr. S. M. Burnett.

S. B. St. John,

Secretary.
IN MEMORIAM.

DR. ABRAM DUBOIS.

BY H. D. NOYES, M.D.,

NEW YORK.

Dr. Abram Dubois of New York City died at the age of eighty-one years, August 29, 1891. He was one of those who united to found the American Ophthalmological Society in 1864. His interest in ophthalmic surgery began with his pupillage under Dr. J. Kearney Rodgers of New York, with whom he became an associate as Surgeon of the New York Eye Infirmary in 1843. With that institution he was actively connected in the various positions of surgeon, consulting surgeon, director, and second vice-president for a period of forty-eight years.

In his early professional life he followed the teachings of Tyrrell and Mackenzie, who were the authorities of their time and enjoyed the high opportunity of personal intercourse with the elder Sichel at Paris. He lived to see the dawn and marvellous development of modern ophthalmology. In this new movement he took a deep interest. When it first made itself felt in this country he had a large reputation as an oculist, although he was chiefly engrossed in the practice of general medicine. He early recognized the inevitable separation of ophthalmology into a specialty; and while circumstances forbade his entering into the new paths of investigation which were being opened, he was glad to encourage other and younger men who were zealous in their pursuit. He remained in active service as a surgeon of the New York Eye and Ear Infirmary until 1869, when he became one of its consulting surgeons, and continued in this position until his death. To this institution he was deeply devoted; and to it he gave not only his many years of service but large financial aid from his own purse, and induced many others to become its friends and
patrons. He was not an author, but his lively interest in medical science and art was evinced in a noble gift to the library of the New York Academy of Medicine, and in generous contributions of books to its enlargement during many years. He used his fortune liberally in the advancement of the interests of the medical profession, and his name will be cherished as one of its best benefactors. He was fully devoted to his profession and pursued it with noble aims and in a worthy spirit. He scorned artifice, and despised those who practiced it. A strong character, he made a deep impression by his personal influence; and within the circle in which he moved he will be long remembered.

GEORGE R. CUTTER, M.D.

Dr. George R. Cutter died at his home in Brooklyn, N. Y., February 12, 1891. He became a member of the American Ophthalmological Society in 1887. He began his studies in ophthalmology as resident surgeon of the New York Eye and Ear Infirmary, and was afterwards placed upon the staff in 1877. He was connected with the institution for a period of twenty-one years. He was a diligent student and faithful worker. His reading was extensive, and he possessed a notable aptitude for acquiring languages. French, German, Italian, and Scandinavian tongues were at his command, both as accomplishments and as means of knowledge. Among the fruits of this gift was a dictionary of the German terms used in medicine, 1879, and a translation of Frey's Compendium of Histology, 1876. He made few contributions to ophthalmic literature, and was not often heard in the discussions of our Society. A modest man, he hesitated to put forward his own observations, but those who saw his work recognized its admirable quality. Quick in speech and action, versatile and laborious, he is to be remembered for many genial and noble qualities.
MACULAR CHANGES AS INFLUENCING THE PROGNOSIS IN ADVANCING MYOPIA.

BY HASKET DERBY, M.D.,
BOSTON, MASS.

The highly myopic eye is beset with two dangers, most likely to occur as the patient approaches middle age: the one leading to absolute blindness, the other to serious impairment of vision. I refer of course to separation of the retina and to changes in the region of the macula lutea. The latter are the more frequent, and it is a well-established fact that but few very myopic patients reach an advanced age without the occurrence of something of the kind.

A frequent macular change is familiar to all, and is ordinarily preceded by symptoms of metamorphopsia. Straight lines appear to the patient crooked at the point of fixation. A central scotoma follows and the ophthalmoscope discovers a pathological collection of pigment at or near the macula. The scotoma however does not correspond in size to any visible change, being generally more extensive. About this pigment patch evidences of local congestion are often at first apparent, and small retinal apoplexies may occur in the earlier stages of the disease. The pigment patch is round or oval, at first of a dense blackness, but as time goes on it may clear up in the center, and even its defined edge may ultimately disappear, the whole giving place to a bluish-gray spot about which small patches of choroidal atrophy may or may not group themselves. But the central defect in the visual field never disappears and the patient is compelled to rely on excentric vision, if dependent on this eye. Treatment at any stage is without effect.

The foregoing statement contains no new facts, and is but a brief résumé of our knowledge on this subject. Retinal separation in sclerotico-choroiditis needs no description; we have all unhappy experience of its disastrous effect.

I have carefully followed many of these cases and have been
led to a belief concerning them that I have not seen elsewhere stated. If correct it has an important practical bearing as affecting the prognosis. Before stating it, however, I will give some extracts from the notes of a single case which has been under my care for the past twenty-nine years, and is quite representative of its class. It is of interest as being that of a gentleman of marked intelligence, conversant with the subject and carefully observing his own symptoms.

Mr. R., aged 45, had been excessively near-sighted as long as he remembered. As an active business man he had had much to do with the accounts of his firm, and had moreover been a hard student, employing his eyes under all circumstances and in all kinds of light to an immoderate extent, committing in his early years such imprudences as reading fine print by fire-light, and the like. I saw him first in 1862, when he was sent me by the late Dr. Agnew of New York, whom he had consulted. Having been always in the habit of chiefly relying on his left eye for work on near objects, he had observed, thirteen months before, a cloudiness before it. This alarmed him and caused him to seek advice in various quarters. He had been in the habit of using — 5.5 D. for distant objects and — 4 D. for reading. In the right eye there was a myopia of 11 D. with a vision of 0.5. There were numerous small floating opacities in the vitreous and a defined posterior staphyloma of medium size extending over an area half as large as that of the disc. No macular change. In the left eye the myopia was the same. On account of a central scotoma direct vision could not be measured. There were more floating bodies in the vitreous, while the posterior staphyloma was considerably larger than in the other eye and evidently advancing. Directly over the macula was a small coal-black patch of pigment with sharply defined edge, and resting against its lower edge a crimson spot a little less in size, evidently a recent hemorrhage.

Treatment of the kind then in vogue and actively applied had, as may well be supposed, not the slightest effect. Two months later the black patch had begun to grow perceptibly lighter in its center, while several fresh hemorrhages had grouped themselves at its periphery. Later on these in their
Prognosis of Advancing Myopia.

turn disappeared and were replaced by others, at a greater distance away. All these hemorrhages ceased within the year and have never occurred since. Gradually the dense hue of the pigment gave way to a grayish marbled appearance. Where the hemorrhagic spots had been the fundus remained perceptibly lighter than elsewhere. Excentric vision was found to be 0.2, and continued unchanged.

In February, 1871, having used his eyes to an unusual extent in looking over accounts, retinal separation in the other eye came on and ultimately became nearly total. A cataract formed, the iris bulged, the eye became sensitive and was removed by Sir Wm. Bowman in August of that year, the patient happening to be in London at the time. Shortly afterwards I lost sight of him for ten years. He had meanwhile used his remaining eye as much as possible, and, when he again visited me in December, 1886, the myopia had increased from 11 D. to 12 D. and the vision fallen off from 0.2 to 0.1. The posterior staphyloma had increased, a white patch formed about the macular spot, and there were more floating opacities in the vitreous.

The last thorough examination was made a year ago. Myopia and vision as before. The sclerotico-choroiditis had notably increased, there was a large patch of atrophy surrounding the nerve and an equally large white patch over the macular region, a slender bridge connecting the two. In the center of the second patch was the old macular spot. No signs of retinal separation.

The patient is now nearly seventy-four years of age, and in January next will have been thirty years under observation. He wrote me a month ago that he could still tell the time on his watch, recognize handwriting and occasionally make out written words. In bright daylight he could go about unattended, go up and down stairs, and cross streets with perfect freedom. He could write without much difficulty, but the effort of following the letters caused a sensible strain.

A very good picture of these macular changes may be found in the frontispiece to the first volume of Loring’s Textbook of Ophthalmoscopy, being a drawing made under my own direction and from a patient who was under my care at about the
same time. The case above quoted is typical and I have observed a number of similar ones in the course of my practice, although no single one has been as persistently or as carefully studied. And in eyes where this pigment deposit in the macular region has been noted I have never as yet found retinal separation to occur, and I do not believe that it often takes place. It is even possible that it may thereby be prevented, and I feel assured that it is rendered far less probable. In the pigment spots of choroiditis areolaris Aubert found in the choroidal stroma rounded clumps, "showing on their surfaces occasional small depressions into which the thinned and atrophied retina had been drawn."* It seems reasonable to suppose that the single pigment deposit may anatomically resemble the multiple one, and that the closer union of the retina with the subjacent tissue may tend to prevent its subsequent detachment.

I am not aware that attention has previously been directed to this point. Its practical bearing on the prognosis is evident. If it be true that a pigment deposit in the region of the macula, in a case of advancing myopia, means that the eye is unlikely to be ever wholly lost, and that the permanent retention of a certain amount of useful vision is probable, it is easy to see the immense importance of such a fact to the patient. I trust that the experience of others may be drawn upon for the purpose of either confirming or refuting such a theory.

DISCUSSION.

Dr. Henry D. Noves of New York.—I would like to say one word upon this subject. We see this condition often in eyes that are not myopic. It is by no means an uncommon experience with me; to have persons of advancing age, as they approach sixty for example, exhibit just such changes at the macula as are so commonly seen in cases of myopia; and this in most instances appears to depend upon general failure in nutritive power; it occurs most frequently in emaciated individuals, though I have seen it occur in persons who were quite corpulent. These cases seem like simple erosion, and absorption of the tissues at the center of the eye, and they have in my observation been just as hopeless as are the cases which occur

* Schmidt-Rimpler. Augenhilkunde und Ophthalmoskopie, S. 289.
in myopia. The prognosis is usually that they will go on to a gradual deterioration of sight, but I have never seen them lose all sight. The scotoma becomes more and more marked and I have rarely seen an arrest of the progress of the disease take place. The usual thing is that they go on to a gradual deterioration, without absolute loss of vision at this part. But the prognosis is bad, and the treatment is of no avail.

Dr. ALBERT G. HEYL of Philadelphia.—I would like to say a few words with reference to the genesis of appearances of the kind described. They are usually ascribed to a form of choroiditis, but I wish to call the attention of members to the effect of simple pressure as a cause. We all know there must be a certain amount of vitreous pressure in every eye, and the appearances from the effect of blows upon the eye—rupture of the choroid etc.—show that the force bears upon the pigmenteary layer of the retina, and thence we draw the conclusion that the vitreous pressure bears upon the pigmentary layer.*

Now it is impossible in three minutes to fully develop this, but in intra-uterine life I believe that the vitreous pressure bears upon the primordial retina and as a result the macula is formed by the splitting of the retina; but in extra-uterine life it bears specially upon the pigmentary layer of the retina, and if the vitreous tension be great you may have a local injury or you may have a distributed injury disintegrating the pigment to a large degree. I believe this; in myopia you may see the same sort of pigmentary changes, and instead of being a true inflammatory condition, I believe that it is one of pressure. And you may have one of two forms; either localized, affecting the macula itself, or distributed over a large section of the pigmentary area with a large destruction of pigment.

Dr. SAMUEL D. RISLEY.—My observation of these macular changes in eyes with defects of refraction, particularly astigmatic eyes, has led me to regard them as but a part of the pathological history of the distending or stretching eye, and may be present before the eye has reached the stage of myopia. My experience in their treatment, however, does not fully accord with the very grave opinion expressed by Dr. Noyes. Under the prolonged use of a mydriatic, rest, and smoked glasses, to be followed by a carefully selected correcting glass, I have repeatedly seen these eyes get well. I believe not only that such treatment is fruitful of good results, but very important in the early history of macular inflammation of this class, and that such treatment will do much to avoid the serious macular disease so frequently seen in eyes with progressive myopia.

Dr. Emil Gruening of New York.—My experience agrees with that of Dr. Derby. Detachment of the retina in cases of this kind must be very rare. I think that we have here an inflammatory and adhesive process by which the retina and choroid are glued. At one time I saw a patient who had such changes at several points in the eye, and between two points the retina had become detached. Dr. Knapp also saw this patient, and treated him finally. Dr. Knapp made a favorable prognosis in that case and the retina actually became re-attached. The points of adhesion prevented the further extension of the detachment.

Dr. Edward Jackson of Philadelphia.—As bearing upon the subject of the paper, I may say that I have two cases in mind, cases that I see or hear from occasionally which I hope may prove the truth of Dr. Derby's observation. In one of these cases there has been extensive loss of attachments of the retina of one eye; one is moderate myopia, the other hyperopia, but in either eye there are these choroidal changes going on. I have regarded them as probably the precursors of detachment, but I hope that that is incorrect. I cannot recall any case in which decided choroidal pigmentary changes have been followed by detachment.

In both of these cases that I refer to, the changes are perhaps a little different from the ordinary mass of changes of choroiditis in this: that the amount of pigment deposit is relatively large, the changes are decidedly greatest in the macula, and the amount of atrophy of the choroid is small; in one I think there is no atrophy at all.

Dr. B. Alexander Randall of Philadelphia.—There are of course many types of this central choroiditis which we have often seen and treated, beside the form spoken of by Dr. Risley, which has been described as "ametropic," and which is certainly in some cases curable. We have, of course, all seen the severe types of this disease, and some such cases as have been described are evidently beyond any help, and we have also seen those cases which have been termed central senile choroiditis, which become more and more marked as time goes on and which are in like manner irremediable. I would like to call attention to a point which is usually overlooked, and a form which is probably as rare in the experience of others as in my own, where we have a flask-shaped detachment of the retina such as Jaeger has pictured. Of these I have seen but one or two cases. Jaeger shows one that is central at the macula and the flask-shaped prominence of the retina is surrounded by an area of choroiditis; but he does not picture nor
describe what I have observed, the later stage of the condition where only a lesion of the choroid or pigmentary layer remains. It is possible that we may have the retinal detachments in such cases oftener than is known, yet not tending to progress but going back to a normal position, they leave only the choroidal patch to mark the diseased area.

ADDITIONAL EXPERIMENTS TO DETERMINE THE LESION IN QUININE BLINDNESS.

BY G. E. DE SCHWEINITZ, M.D.,
OF PHILADELPHIA.

With Photo micrographic studies by WILLIAM M. GRAY, M.D.

A communication presented to the College of Physicians of Philadelphia, November, 1890,* contained the results of some experiments which I had made in the endeavor to determine the lesion in quinine blindness. A brief summary of this research is the following: Quinine given hypodermically to dogs in quantities varying from one grain to four grains to the pound, produces blindness in from three to fourteen hours, the earliest appearance of the amaurosis after the injection being three hours. The blindness remained practically complete in one animal for twenty-nine days after a single injection of 3$\frac{1}{2}$ grains to the pound; in one there was a slight return of vision after thirty-six hours of blindness. The effects of the drug were obtained more quickly and more surely with quin, bimur, carbamidot, than when the bisulphate was used. A dose exceeding 3$\frac{1}{2}$ grains to the pound produced death; one animal perished from a dose of three grains to the pound; and one dog resisted 1$\frac{1}{2}$ grains of quinine to the pound given on two successive days, but succumbed when a third similarly proportioned dose was administered. With two exceptions the animals suffered from other symptoms in addition to the blindness, viz: vomiting,

*Transactions of College of Physicians of Phila., 1890; also Ophthalmic Review, February, 1891.
or staggering gait, or paraplegia, or convulsions. The two exceptions became blind without any general symptoms, and in one of these the most noted microscopical changes were found.

The ophthalmoscopic picture in these animals was in all instances similar to that which has been noted in human beings, suffering from quinine amaurosis. In one there was complete obliteration of the vessels in the disc; in another, blurring of the edges of the papilla. In all the pupils were immovably dilated. The microscope did not discover any very coarse lesions except in one dog, in which the central vein was plugged with a clot, and in the transverse cuts of the smaller veins white thrombi were visible. In other nerve entrances there was some dilatation of the vessels. In the transverse cuts of the optic nerve there was some increase of the connective tissue, and a curious appearance was the spreading apart of the individual nerve-fibrils as if the tissue was oedematous. There was no true atrophy demonstrable by Weigert's method, even in the nerve of a dog blind for twenty-nine days. Chiasms, retinas, and choroids were normal. In sections from the cuneus there was remarkable dilatation of the pericellular lymph spaces, with degeneration of the protoplasm of the cells. From these results it became evident that toxic doses of quinine could produce thrombosis in the central vein, and that, as negative evidence, neither neuritis, nor atrophy in the true sense of the word, was present in an animal blind for nearly a month (although the disc was quite white and the vessels threads), but that there appeared to be a species of oedema between the optic nerve and chiasm.

Certain additional evidence is desirable, viz.:

(1) Can the same results be produced with salts of quinine other than with those composed of the bimuriate of quinine combined with the carbamide of urea, and will all of these results be apparent in animals so poisoned that blindness, unaccompanied by general symptoms, is the sole effect?

(2) Will the prolongation of the quinine blindness produce true atrophy?

(3) Is the production of thrombosis or embolism to be expected in severe cases?

(4) Is the apparent degeneration of the brain cells the result of the hardening process, or due to a lesion from the drug?
Determine the Lesion in Quinine Blindness.

I. In the first research, the effect of the quin. bimur. carbamidat. was found to be more pronounced than the ordinary bisulphate of quinine, although it was shown that the latter was active. Since then in a number of instances I have produced blindness by using quinine dissolved with the aid of tartaric acid or dilute hydrochloric acid, and have used quinine from several different sources. It is needless to detail these experiments. The results were the same as those already published. In regard to the second portion of the first query, an affirmative answer may be given, as the detailed research presently to be given will show, as it will also answer the other questions. One experiment is detailed.

Experiment. Black dog, weight 15 pounds, was given 30 grains of bisulphate of quinine at 4.15 P. M., October 28, 1890, previous examination having shown normal fundus oculi, pupil reactions, and cornea.

October 29. Partially blind. Runs with nose stretched out and apparently finding his way by the sense of smell; frequently butts his head against objects, as one whose field of vision is deficient. Ophthalmoscope. Pupils widely dilated. Cornea not anaesthetic. No evident change in the color of the disc or caliber of the veins; arteries smaller than on previous day. Thirty additional grains of quinine injected.


November 17. Daily record of animal’s condition omitted, which may be summarized as gradual shrinking of the arteries, loss in color of disc, and contraction of veins. No general symptoms occurred, and on this date (November 17, 1890) discs entirely white; arteries not distinguishable. Only faint traces of the lower veins in each eye.

December 25. There has been practically no change in the animal. During the last day or two, however, there appears to be some return of sight, as he now avoids certain objects in the room and fails to promptly respond to the ordinary tests. The ophthalmoscope shows no new changes in the fundus.

December 26. Fifteen additional grains of quinine administered.
December 29. Dog apparently completely blind. Ophthalmoscope. In each eye the discs entirely white, only the lower temporal veins being visible. The position of the arteries is marked by faint white threads. The animal was killed, and the eyeballs, optic nerves, chiasms, and entire brain were placed in Mueller's fluid and prepared with the utmost care for section. Some days later a normal dog was similarly killed and the same organs removed and placed in Mueller's fluid for comparison.

The specimens, which were removed for microscopic examination, were sectioned for the microscope by Dr. William M. Gray, and from the sections thus obtained the accompanying photo-micrographs prepared. The following are the results of the microscopic examination: (Fig. 1, Pl. I, is the normal optic entrance.)

At the point of entrance of the central vessels—the vessel infundibulum—a cup has been formed somewhat similar to the excavation seen in glaucoma. This cup is partly filled by a fine granular substance, a portion of which is arranged in threads holding in its meshes a few blood corpuscles. A little below the cupped entrance is a dense plug of this granular substance. Below this plug the central vessel is seen, the walls of which are somewhat thickened, and its lumen almost entirely filled by a connective tissue growth composed of fine reticular fibrous connective tissue, small spindle cells with long processes, and small round cells. (Fig. 2, Pl. I). Scattered through this structure and in relation to the cells is a small quantity of pigment. Running through the center of this mass of tissue which fills the vessel there is a small capillary arteriole, narrow at its upper extremity, but at its lower fourth suddenly expanding to at least double the size of the upper portion (Fig. 3, Pl. II, high power). To one side of the upper extremity of this capillary vessel is an irregularly-shaped space, formed in the connective tissue filling the large vessels. This space contains a few blood corpuscles and seemingly is lined by endothelium, a few nuclei being seen around the edge (Fig. 3, Pl. II). At its upper extremity this space leads off into a series of branching capillary vessels, which run into and are lost in the surrounding nerve tissue. At the lower portion of the large occluded central vessel there is a blood sinus which also leads
Figure 1. Optic nerve entrance of the normal dog. [X 75.]

Figure 2. Quinine-dog nerve entrance, showing cupping and occluded vessel. [X 100.]
**Figure 3.** Same section as figure 1, showing the tissue filling the vessel, capillary arteriole running through the centre of the tissue, and the large cavity formed in it. \( \times 250. \)

**Figure 4.** Ciliary ganglion from quinine-dog, showing above part of the oculo-motor nerve, and springing from the ganglion short ciliary nerves. \( \text{[Weigert's stain.]} \)
Figure 5. Normal optic nerve of a dog. [× 125, Weigert's stain.]

Figure 6. Optic nerve of a dog, blind from the effects of quinine for two months, showing atrophy and degeneration. [× 125, Weigert's stain.]
off into the surrounding nerve tissue (Fig. 2, Pl. I). There are other, but smaller, sinuses or vessels passing from the main vessel along its entire course. In a number of the sections, both in the first series of quinine dogs and from the one which is under consideration in the present paper, the cup at the central vessel entrance is seen, and, protruding from the cup, masses of material, partly homogeneous and partly granular, containing a few nuclei. In one section the lower portion of this cupped entrance is constricted, and below the point of constriction the vessel rapidly expands, its lumen being filled by a finely-reticular fibrous connective tissue, holding in its meshes a mass of small round cells. Here and there in this mass of tissue there are blood sinuses which contain a few blood cells. To one side of the central cup, where Mueller's fibres enter the nerve from the retina, there is an expanded blood vessel filled with a blood clot. In one dog, of the original series of quinine experiments, the cupping is well marked, and protruding from the cupped entrance is a mass of the granular and homogeneous material such as has been described. The entrance to the vessel is greatly constricted immediately after passing into the upper opening, and it is partly filled by the granular material. In one section is shown a small vessel formed of this granular homogeneous material which extends through the constricted entrance to the central vessel. Below the entrance and constriction the central vessel is lost in a mass of dense fibrous tissue. This tissue contains numerous small blood vessels or channels, some of which lead off into the surrounding nerve tissue.

Transverse sections of the optic nerve and chiasm of the dog blind for two months, stained by Weigert's process, show marked degenerative changes. Fig. 5, Pl. III, represents a transverse cut of a normal dog's optic nerve stained by this process, while Fig. 6, Pl. III, has been prepared from a similar cut taken from the dog blind from the effects of quinine for two months. The contrast in these two sections is well shown. In the quinine dog there is complete destruction of the nerve fibres, some increase of connective tissue, and a small amount of fatty infiltration. In one specimen the section has passed through the lenticular
ganglion, showing the development of the ciliary nerves and some slight degenerative changes in the ganglion itself (Fig. 4, Pl. II). A section of a normal ganglion stained by Weigert's process compared with the ganglion from the quinine specimen, prepared by exactly the same process, illustrates the degeneration in the fibres. The transverse sections of the chiasm may be compared with similar sections taken from the normal dog, from whence it is evident that the degenerative process and complete atrophy exist in all of the fibres up to the chiasm, in the chiasm itself, as far backward as it has been possible to trace the optic tracts. The dilatation of the pericellular lymph-spaces through the brain in the first series, especially in the cuneus, have been shown by a number of experiments to be unconnected with any action of quinine, being easily produced by any slight fault in the technique.

From what has been said, it will be seen that the answer to the second question is that the prolongation of quinine blindness produces true atrophy. The answer to the third question is also affirmative, namely, that thrombosis of the central vessels may be expected in severe cases of the toxic action of this drug; while the answer to the fourth question, as has just been stated, is negative, as the degeneration of the brain cells is the result of the hardening process, and not due to a lesion from the drug.

In résumé we may say in regard to the microscopical points, that we have thickening and changes in the walls of the central vessel (endo-vasculitis); organization of a clot, the result of thrombosis, an organization which has been carried on even to the extent of its being channeled by new vessels; widening of the infundibulum of the vessels as the result of the constriction of the surrounding nerve fibres, presenting appearances not unlike a glaucomatous excavation; and finally, practically complete atrophy of the visual path, including the optic nerves, optic chiasm, and optic tracts, as far as they could be traced. It seems, then, very likely that the original effect of quinine is upon the vaso-motor centers, producing constriction of the vessels; that finally changes in the vessels themselves are set up, owing, perhaps, to an endo-vasculitis; that thrombosis may
occur, and that the result of all of these is an extensive atrophy of the visual tract. Not the least remarkable is the selective influence of quinine on the optic nerves and the optic tract. In the sections and the micro-photographs herewith presented, it will be seen that the ciliary and oculo-motor nerves, side by side with the optic nerve, are perfectly normal, and that even in the lenticular ganglion many of the fibres are perfectly intact, although others appear to have undergone a slight degeneration. The same, no doubt, is true of the other cranial nerves. The selective action of drugs is, of course, well known, the characteristic action of digitalis upon the heart being, perhaps, the most typical example. This, however, in addition to the well-known physiological action of drugs, appears to be a histological demonstration of such affinities. Why quinine should produce these lesions upon the nerves of special sense which supply the eye and the ear, it is difficult to understand; that it has such action is unquestioned, and here meets with a positive microscopic demonstration. While, no doubt, the original effect is in some sense due to the influence of this drug upon the vaso-motor centers, this cannot be the entire explanation, or we should have similar actions under the action of well-known vaso-motor stimulants, like ergot.

DISCUSSION.

DR. SAMUEL THEOBALD of Baltimore. — Were the experiments confined to dogs?

DR. DE SCHWEINITZ. — No. I have experimented to some extent with rabbits. Cats are rather difficult to handle in physiological experiments.

DR. HENRY D. NOYES of New York. — I should like to inquire if Dr. de Schweinitz has turned his attention to nicotine and alcoholic poisoning.

DR. DE SCHWEINITZ. — I am trying some experiments with tobacco and some with lead, but am not in a position to report now.
THE OPERATIVE TREATMENT OF DETACHMENT OF THE RETINA BY SCHOELER'S METHOD, WITH A REPORT OF FIVE CASES.

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The views of Schoeler (Zur operativen Behandlung und Heilung der Netzhautabloesung, Berlin, 1889), are based upon the modern theory of the causation or origin of detachment of the retina, which was first clearly and anatomically demonstrated by Leber and Nordenson in 1887. Heinrich Mueller in 1856 proved that the vitreous could only be detached from the retina, and the retina from the choroid, by shrinking or contraction in the connective tissue portion of the vitreous. In 1867 Iwanoff demonstrated on pathological specimens that disease of the vitreous led to detachment of the vitreous, and that the latter preceded the detachment of the retina as an independent disease. In 1863, Von Graefe first called attention to the significance of perforation or laceration of the retina in its relation to detachment of the retina. In 1870 Von Wecker stated that detachment of the retina was generally, if not always, preceded by both detachment of the vitreous and laceration of the retina. Finally Nordenson in his elaborate work clearly demonstrated the process known as shrinking or contraction of the vitreous, followed this out to its natural conclusion, and proved that as the process of detachment of the vitreous extended to the equatorial region, the retina being here more intimately united with the vitreous, became torn, and through this rent the fluid which collected between the detached vitreous and the retina percolated and thus gave rise to detachment of the retina itself. This view of the origin of detachment of the retina is now generally accepted.

It is not known who first suggested the injection of an irritating fluid into the sac of the detached retina, though Fano refers to it in his "Traité des pratiques des Maladies des Yeux,
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p. 417, 1886."" Galezowski tried it in 1871, but without any success.

In order that a detachment of the retina may be cured, Schoeler lays down the following propositions:

1st. It is necessary to produce such an adhesive retinitis as will antagonize the effects of a contracting or shrinking vitreous.

2d. This irritative inflammation must be of moderate intensity, in order that the functions of the retina may not be injured.

3d. If by this inflammation an absorption of the fluid between retina and choroid is promoted, it is desirable that the means (fluid) employed to develop it should be to a certain extent hygroscopic in character.

4th. The means (fluid) employed should not injure the already diseased and degenerated vitreous, but should rather tend to act favorably also on the original choroidal disease.

5th. The fluid employed must be antiseptic, and must be injected into the vitreous, in front of the space between the latter and the retina, where it should tend to tear the shrinking or contracting bands in the vitreous, without causing any further detachment. In recent cases, by its hygroscopic properties, it should act on the fluid between the retina and the choroid, through the laceration of the retina itself.

In the course of his investigations, Schoeler made experiments on animals with tincture of iodine, biniodide of mercury, Lugol's solution, sublimate solutions, and glycerole of iodine solutions. Some of these were too weak, causing changes in the retina indeed, but which were transient and inconstant. Some of them were too strong, like the glycerole of iodine. The tincture of iodine gave constant results. After an injection of six drops of the latter, changes appeared during the next six or eight days, such as chorio-retinitis with diffuse cloudiness of the pre-retinal layer of the vitreous, which subsequently subsided. Schoeler first used the tincture of iodine in the human eye on Nov. 22, 1888, in a woman, in whose eye the detachment occupied about two-thirds of the retina. In eight days there was a marked improvement, and the patient
was able to read. In fourteen days there was a relapse, with two concentric annular detachments. A second injection was made into the vitreous, which was followed by pain, conjunctival congestion, retinitis and cloudiness of the vitreous. A recession of the chorio-retinitis took place slowly, but eventually the retina became re-attached.

Schoeler states that the tincture of iodine injected into a space filled with serum and albumen, is diluted and extends for some distance over the retina and between it and the vitreous. The possible bad effects of the injection of the tincture of iodine into the vitreous depend —

1st, on the toxic properties of the drug; 2d, on the possible formation of thrombi in the veins; and 3d, on the direct extension of the drug through the lymph-spaces of the eye into the cerebro-spinal fluid. The first danger Schoeler considers is met by the well-known fact that large quantities of the drug are frequently injected into the thyroid gland in goitre, without producing any bad results. The danger of the formation of thrombi is offset by the fact that in aneurisms the aim is to form a thrombus by the injection. The danger of the entrance of the drug into the cerebro-spinal fluid is probably offset by the fact that in “Spina bifida,” large quantities of the drug are frequently injected into the spinal canal without dangerous results.

The views of the profession as to the value of Schoeler’s method vary greatly. Schweigger is opposed to it except in cases from which nothing more can ever be expected (Centralbl. fuer prakt. Augenheilk, p. 181, Aug., 1889). Becker quotes Kühne’s statement that in frogs the retinal function returns as soon as the cone is again in contact with the pigmentary layer, and suggests that the same should occur in recent detachments in man, if we can bring the cones in place. In old detachments the rods and cones are destroyed, and, of course, there is then no hope of restoration of vision by any means. Abadie believes in the efficacy of the method and thinks it should be tried (Arch. d’-Ophtal., 1889, p. 461). He reports nine cases, with success in some of them. He never injects more than three drops of the tincture of iodine. If the dose is too large, the reaction is very
great, and is followed by rapid disorganization of the media of the
eye. He has a knife made for the purpose, shaped like a Graefe
cataract knife, but with a stronger blade, and with the back
hollowed into a shallow gutter, and the shank and handle are
a Pravaz syringe. The injection is thus made without with-
drawal of the knife. The amount to be injected is regulated by
the extent of the detachment. If the detachment is extensive,
he makes two injections on opposite sides of the eye, and the
second injection, he claims, almost always brings success.

Panas reports good results, but is in doubt whether they
are due to the injection or to the simple puncture. (Archiv d’
Ophtal., 1890, p. 257.)

Gelpke reports a case which terminated fatally. The patient
was a man, aged sixty-six, who had a detachment of unknown
origin, and involving about three-fourths of the retina. He had
perception of light and the tension was —3. The antiseptic
precautions taken at the operation were painfully minute.
Three drops of tincture of iodine were injected into the vitre-
ous, which set up infectious purulent choroiditis, which in its
turn induced acute meningitis, ending in death on the sixth

For the performance of his operation, Schoeler had a special
instrument constructed, which he describes as follows: Upon
the end of a Pravaz syringe is fastened a gold-plated platinum
tube, shaped like a strabismus hook, which ends in a small
knife, curved like a hook. The length of the gold-plated plat-
num tube is 4 cm., and its thickness 2 mm. The length of the
little knife is 2½ mm., and its width 1½ mm. At the junction of
the knife with the tube there are two small openings, 0.3 to
0.5 mm. in diameter, which are prolonged on each side of the
blade into a short, shallow gutter, to conduct the fluid from the
syringe into the eye.

All Schoeler’s experiments on animals and man tend to
prove that there are substances, of differing medical properties,
which may be injected into the vitreous with safety for the pur-
pose of bringing about a cure of detachment of the retina. As
a rule, the earlier the fluid is injected after the detachment is
recognized, the better; for the less contraction has taken place
in the vitreous, the better is the prognosis. The most favorable place for the injection to be made is the point at which the retinal detachment began, in order to establish as near as possible to the point of traction of the contracting vitreous bands the mechanical antagonizing factor set up in the retina by the irritative inflammatory process and its consequences.

Schoeler considers that the two most favorable factors for the success of the operation are: 1st. A slight sagging of the detached retina, showing the presence of a small amount of fluid; and, 2d. The recent occurrence of detachment. On the contrary, the unfavorable factors are: 1st. Simultaneous disease of the vitreous with flocculent opacity and fluidity. 2d. The existence of excessive myopia. 3d. A wide extension of the detached part of the retina. 4th. Co-existence of more or less advanced disease of the choroid.

After the operation, a bandage is applied merely for the purpose of aiding in closure of the external wound. The patient should remain on his back in bed for at least a week and sometimes for two weeks.

Schoeler draws the following conclusions:

1st. He considers that his experiments give the first demonstration of the fact that different medicated fluids may be injected free into the vitreous, in front of the retina, without necessarily endangering the eye, and may induce the development of a healing process.

2d. The injection of tincture of iodine into the vitreous through the retina may induce the rupture of abnormal adhesions between the vitreous and the retina, and may set up a plastic retinitis, which, together with the hygroscopic, absorbent, and disinfecting properties of the iodine, may bring about a cure of the detachment.

3d. The process of development of the cure, and the clinical progress of the case, with a slowly increasing visual acuity, widening of the visual field, and diminution of the night blindness, justify the assumption that these curative processes must be based upon the lapse of time, that is, the duration of the improvement.

The following five cases have been under the writer's observ-
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ation and treatment for some months each, and their histories are presented in detail to enable us to judge of the value of the operation, if there be any, and of the propriety of employing such severe surgical procedures in desperate cases:

CASE I. Thomas B., aged 28, first seen Sept. 23, 1889. In March, 1888, he had received a violent blow on the right eye which caused total blindness for a few minutes and great pain. The vision then slowly returned, and in the course of about ten days, all signs of visual disturbance had disappeared. Three months before I saw him, while ill in bed, he read for hours at a time while lying on his back, by insufficient light. After some weeks he began to have symptoms of asthenopia, and woke one morning with a defect of vision in the right eye, which annoyed and startled him, because he could not see the upper portion of any object. An examination revealed the following conditions:


The patient was immediately placed on his back in bed, and was not allowed to rise except to answer the calls of nature. The eye was kept under the influence of atropia, and pilocarpine was administered hypodermically. He did not bear the pilocarpine well, though its physiological effects manifested themselves promptly, and it was discontinued on the following day. In its place small doses of potass. iodd., largely diluted, were administered. This treatment was continued for four weeks, and an ophthalmoscopic examination was made nearly every day. During this period the vitreous became clearer and the floating opacities diminished, but there was no visible change in the detachment of the retina, and none in the visual field. Schoeler's operation was then suggested to him and he was informed of the possible dangers of the step, as well as of the advantage claimed for it, and he decided to have it done. Five weeks from the date of his first visit, the injection was made, the instrument used being similar to that devised by Schoeler. The
eye was anaesthetized by cocaine, having previously been rendered thoroughly aseptic, and the puncture was made between the inferior and internal recti, and well in front of the equatorial region. The operation was done under ophthalmoscopic examination, and without fixation of the eyeball, and as soon as the point of the knife needle was seen in the vitreous, three drops of tincture of iodine were injected very slowly. The vitreous became cloudy very rapidly, and the intra-ocular tension rose at once. A bandage was then applied, and the patient at once put to bed. In the course of a few minutes the patient complained of a boring pain, which, during the next hour increased in severity, but was never unbearable, and disappeared during the night. The bandage was removed the next morning, and slight conjunctival injection was found. The wound through the conjunctiva had already healed. The vitreous was still cloudy, with several reddish brown flocculent opacities floating about. Whether these were fresh blood clots, the result of the operation, or merely flocculi colored by the iodine, could not be settled. The condition of the detachment could not be determined. On the second day the vitreous was much clearer, and the detachment could be made out, apparently smaller and withdrawn towards the periphery. No pain and no signs of any serious intra-ocular inflammation. On the third day the vitreous was still clearer and a distinct yellowish white band could be made out running from a point at the extreme periphery of the infero-nasal quadrant towards the center of the vitreous. Only one brownish-red floating opacity could be discovered. The patient was kept in bed for another day as a precautionary measure. On the fourth day the patient was allowed to rise and a test of the vision and of the visual field was made. Vision was reduced to 10/200 and the visual field was practically unchanged, perhaps a trifle widened. The signs of chorio-retinitis subsided, and as there had been no material improvement in the field, and as the vision was slightly worse than before the operation, the patient was discharged with directions to report in a week. In this case the signs of inflammatory reaction were surprisingly slight and very transient in duration. The patient did not report until nearly two weeks had elapsed, but he had not at-
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tempted to use his eyes for any purpose, and the operated eye had
given him no trouble, and he claimed that the vision had improved.
An examination showed a decided change in the fundus. The
vitreous was very much clearer and there were no floating
opacities. The yellowish white band of tissue running from
the point of puncture towards the center, was much smaller
and more condensed and more sharply outlined. The detach-
ment was decidedly less in extent, and there was quite an exten-
sive patch of plastic chorio-retinitis at the extreme periphery
of the fundus around the region originally occupied by the de-
tachment. Vision had risen to 15/200 and there was a slight
widening of the visual field.

The reaction following the first injection had been so slight,
and the vision had so soon returned to the degree existing at
the time of the operation, that I suggested to the patient that
he have a second injection made, but this he declined, and I
was not enthusiastic enough in the matter to urge it. The
point that impressed me most in the progress of this case was
the exceedingly slight reaction following the injection. The
existence of the band of fibrous tissue running from the point
of puncture into the vitreous must be regarded as of grave sig-
nificance. As the contracting process goes on in the eye, the
presence of this band of tissue will tend inevitably to detach the
vitreous from the retina, or the latter from the choroid, at a
point opposite to the site of the original detachment, and the
case may thus end in total detachment of the retina. It seems,
therefore, a fair statement to say that the condition of the
eye of this patient has not only not been improved by the op-
eration, but has, in all probability, been made worse. This is,
of course, making a forecast of the future, and thus far no such
unfortunate change has occurred. The patient has been
repeatedly examined at intervals of a few months, and the vis-
on and field of vision have remained practically unchanged.

Case II. Miss Margaret M., aged 31, first seen April 24,
1890. Had always had very strong eyes, and had used them
constantly for all kinds of fine embroidery. Never noticed any-
thing to complain of until about two months before I saw her,
when she observed a steadily-increasing cloudiness of the vision
of the right eye. This grew worse until now she can only see the lower part of objects with the right eye. An examination revealed the following condition of affairs:

Right eye \( \frac{1}{200} \) unimproved. Cornea, aqueous and lens clear. Hyalitis with delicate cobweb membrane running across the vitreous, and attached to the opposite disc. Numerous floating opacities. Retina detached downwards and outwards.

Left eye. \( \frac{4}{8} \) Hm+D1. Media and fundus normal.

Owing to the presence of this delicate cobweb membrane, I decided to divide it before taking any steps to treat the detachment of the retina, and this was done in the way before described in two articles previously published on the subject, with the narrow double-edged needle. The eye was then bandaged and the patient put to bed, atropine having been previously instilled. The next morning the bandage was removed and the cobweb membrane had retracted in both directions. The patient was kept in bed for three weeks, and an injection of pilocarpine hydrochlorate was given hypodermically every other day. She bore the drug very well, and the diaphoresis was complete, but at the end of the third week her health, never very good, began to fail, and this treatment was discontinued and the patient allowed to rise. No change had taken place in the vision for near objects, though distant vision had risen to \( \frac{4}{8} \), but the defect in the visual field remained the same. She then decided to have Schoeler's operation done, though I did not urge it. Eight days later the right eye was cocaineized, and under the strictest antiseptic precautions and by ophthalmoscopic examination, a puncture was made in the infero-temporal quadrant, between the inferior and external recti muscles, the point of the needle being carried well into the center of the vitreous and four drops of tincture of iodine slowly injected. Sharp pain was complained of at once, and a solution of cocaine and atropine was dropped in. Before the bandage was applied, an ophthalmoscopic examination showed a general brownish haze through the vitreous. The pain subsided after a few hours in spite of the increased tension, and the patient passed a good night. The next morning there was considerable conjunctival injection, and the tension was still above normal. The vitreous
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was so cloudy that only a very faint red reflex could be obtained with the ophthalmoscope. The atropia was discontinued and cocaine used in its place, and the bandage was left off permanently. On the second day there was a well-marked ciliary injection, some chemosis of the conjunctiva and an invisible fundus. Hot applications were applied constantly, and as the patient complained of continuous pain, two leeches to the temple. On the third day the symptoms of intra-ocular inflammation were decidedly less marked, and the pain had almost disappeared, but it was not until the fifth or sixth day that the infiltration of the vitreous began to clear up. From this time on the symptoms rapidly subsided, and on the twelfth day all ciliary and conjunctival injection had disappeared, the chemosis was gone, there was no pain, and a tolerably clear vitreous. There was no trace of the previous cobweb, but there was a broad, dense band of tissue running across the vitreous from a point downwards and outwards, the site of the two punctures, in a direction upwards and inwards, and decidedly backwards, partially concealing the optic disc from view. With a widely-dilated pupil, only a small detachment of the retina could be discovered at the extreme periphery. A test of the vision showed a decided diminution to \( \frac{2}{3} \) eccentrically. Examination of the field of vision showed a decided improvement peripherically, but there was an irregular, broad defect extending nearly across the center of the field.

The condition of this patient has, therefore, been made decidedly worse by the operation, and at one time there was a fear that a destructive panophthalmitis had been set up.

One week later the vitreous was very much clearer, and the fibrous band across the vitreous seemed narrower.

A somewhat extensive exudative or plastic chorio-retinitis was seen downwards and outwards, and the detachment of the retina had changed its position and its shape, and was now more directly downwards. It, however, was apparently of about the same extent as before, and the defect in the visual field was relatively of the same size.

Case III. Mr. W. A., aged 60, first seen May 11, 1890. Has been myopic all his life, and has worn glasses for 35 years. He persistently abused his eyes for many years. In March,
1890, he suddenly noticed a small black spot downwards and inwards in front of the right eye, which has steadily increased in size until now it covers nearly half of the field of vision. Vision is now eccentric with this eye, and there is a constant dull pain in the eye and great photophobia. An examination showed the following:

Right Eye. $V = \frac{48}{100}$ eccentrically and unimproved. Cornea and aqueous clear. Iris fluttering. Peripheral opacities in both lenses. Floating opacities in vitreous. Patches of diffuse chorio-retinal degeneration. Detachment of nearly the upper half of the retina, and the remaining portion blunted as to the perception of form and color.

Left Eye. $V = \frac{12}{10} : \text{with sph.} - D 2 \circ \text{cyl.} - D 2.50 \text{ax.} 180^\circ = \frac{18}{8};$ floating opacities in the vitreous, and patches of diffuse chorio-retinal degeneration. Field for form unrestricted. No detachment. This patient was a severe sufferer from chronic rheumatism, and could not be subjected to the long confinement in bed. He was therefore put on a tonic treatment together with small daily doses of pilocarpine hypodermically. The physiological properties of the drug appeared very promptly, and he bore it very well, but at the end of the second week he began to lose his appetite and became very restless, and it was stopped. An examination then made showed a slight improvement of the vision in the right eye with a sph. $- D 2 \text{to} \frac{18}{8} +$, but there was no change in the defect of the visual field, and none apparently in the detachment of the retina. He was then told that all had been done for him except an operation, which was described to him in detail. He was told that his case was a bad one, that the left eye was in an unsatisfactory condition, and that the operation might not only destroy what sight he had in the right eye, but might also endanger the left eye. On the other hand, he was told that the retina in the right eye would almost certainly become entirely detached in time, and that the operation might prevent this. After deliberation he decided to have the operation performed. This was done while in the sitting posture, with the usual antiseptic precautions, and under ophthalmoscopic examination. The puncture was made in the supero-temporal quadrant of the eyeball, just back of the ciliary region, between the superior and external recti muscles, and three
drops of tincture of iodine were slowly injected. The vitreous became of a brownish color at once, and before the bandage was applied was so cloudy that the fundus could not be seen. Little or no pain followed, but the tension increased. There was some pain during the night and the next morning, but nothing of a severe character. When the bandage was removed chemo-
sis of the conjunctiva had already taken place, and a deep in-
jection was rapidly developing. The pain became intense, the lids became swollen, and before the end of the day panophthal-
mitis was in full blast. This was combatted by atropine, leeches to the temple, and hot bichloride fomentations, but the inflammatory process lasted more than a week before the symp-
toms began to subside. The disease ran the usual course and at the end of the fourth week the eye was in a quiescent condition, and could be carefully examined. The iris was decidedly atrophic and adherent to the lens-capsule. The opacities of the lens had increased and encroached on the field of the pupil. The vitreous was filled with bands of exudation that were so dense that no view of any details of the fundus could be made out. The tension was decidedly below normal, and vision was reduced to recognizing the movement of the hand eccentrically. Fortunately, the severe inflammation through which the right eye had passed, had not as yet caused any positive defect in the left eye. There was no sympathetic irritation developed, and no ophthalmoscopic complication appeared in the left eye. But in the operated eye the vision had sunk from \( \frac{1}{700} \) to distinguishing the movements of the hand eccentrically. The vitreous was filled with bands of fibrous tissue, which concealed all view of the fundus, and the natural inference is, that so far from the detach-
ment of the retina having been diminished, it was probably increased by the results of the operation. It is certain that the condition of the patient was certainly made worse by the opera-
tion.

Case IV. Mr. M. H., aged 73, first seen September 30, 1890. Patient has always been myopic, and has worn glasses for many years, but has never consciously abused his eyes, and does not wear glasses in reading. He began to notice a failure of the vision of both eyes about a year ago; about eight months
ago it grew suddenly very much worse in the left eye. This was recognized at the time as due to a detachment of the retina, for which he went through the usual rest cure, but without any benefit. When I examined him the conditions were as follows:

Right Eye. $V = 2^1_0^8$, and with sph. $-D_3 1^8_0$. Reads Jaeger 3 with sph. $+D_2$. Peripheral opacities in the lens and floating opacities in the vitreous. Usual atrophic myopic fundus.


In view of the patient's advanced age, the degree of myopia present, and the fact that the patient had been subjected to the rest treatment on his back in bed for a period of nearly six weeks, together with the use of atropia and the internal administration of potassium iodide, without any benefit whatever, the case was regarded as a desperate one. Schoeler's operation was proposed to him, together with its accompanying dangers, and he decided to have the attempt made. On October 2d the left eye was cocainized, and the puncture was made in the infero-temporal quadrant, just back of the ciliary region, and between the inferior and external recti muscles. Four drops of tincture of iodine were slowly thrown into the vitreous, which almost immediately caused a brownish turbity and rendered everything in the fundus invisible with the ophthalmoscope. Quite a sharp pain was almost immediately complained of, which radiated from the eye back upon the temple and over the forehead. This increased until it soon became so violent that it was necessary to administer a hypodermic injection of morphine. The sharp pain soon passed away, leaving behind it a dull ache, both in the eye and head. The next morning the bandage was removed and the eye examined. There was a very marked and general chemosis of the ocular conjunctiva, but not much injection. The tension was increased to $+2$, and the fundus was entirely invisible. The objective signs of intra-ocular inflammation were more marked than is usual in an ordinary acute chorio-retinitis, but the application of leeches, atropia, and hot fomentations caused a gradual subsidence of the inflammation, and on the
eleventh day I was enabled to obtain a view of the fundus. There was no change in the appearance of the lens, but the detachment of the retina had receded over more than half its extent, and seemed to be confined to the infero-nasal quadrant. There were some brownish flocculi floating in the vitreous, but no bands of new tissue were visible; vision had improved to counting figures at a distance of eight inches, and the field had widened. This patient, in spite of his years, made an excellent recovery, and was enabled four months later to read $\frac{10}{200}$ with the left eye. A portion of the retina in the infero-nasal quadrant still remained detached, but downward and outward it had become reattached, and the signs of a plastic chorio-retinitis were extremely well-marked. The widening of the field which was noticed on the eleventh day still remained, and had even gained somewhat in extent. Unfortunately, this improved condition of the fundus did not last. About the middle of December the vision became again more obscured, and an ophthalmoscopic examination showed that the detachment had again taken place, and was as extensive as at first. The chorio-retinitis had extended, and the degeneration had evidently advanced in part to the atrophic stage. The opacities of the lens had increased, and extended well into the nucleus, and vision was reduced to recognizing the movements of the hand. The lens has since become entirely opaque, and the patient has the merest quantitative perception of light.

Case V. Mr. B. W., aged 36, first seen December 28, 1890. He always had good eyes, and has used them steadily day and night. Several months ago he began to have foggy vision in the right eye, and a dull ache after long-continued reading. He has had a refractive error, which turns out to be compound hypermetropic astigmatism. Soon after this he began to complain of the left eye also. Was examined by an oculist who told him that he had disease of the retina of both eyes, and that he must stop all work. When I examined his eyes I found the following condition:

Right Eye. $\frac{18}{100}$: with sph. + D 1.75 $\sigma$ cyl. + D 1 ax. 75° = $\frac{18}{48}$. Cornea, aqueous, and lens clear. Organized membrane in the vitreous. Patches of old chorio-retinitis, and one or two of

Left Eye. \( \frac{4}{5} \) with cyl. + D 2.50 ax 105 \( \leq \) sph. + D t = \( \frac{6}{8} \). Reads Jaeger 3 with same combination. Cornea, aqueous, and lens clear. Quite extensive patches of chorio-retinitis, but no demonstrable detachment.

This patient was very anxious about his condition, and was willing to submit to any treatment that offered a chance of success. He was put on his back in a dark room, with atropia in his eyes, and a bandage over the right eye for six hours daily. In addition, pilocarpine was administered hypodermically daily for eight days. The physiological effects of the drug manifested themselves promptly, but without any bad result until the eighth day, when he had an attack of heart failure which nearly carried him off, and from which he did not entirely rally for nearly twenty-four hours. The administration of the drug was of course permanently stopped, but the rest of the treatment was persisted in for nearly two months. Not the slightest benefit resulted from these weary weeks in bed, and after he had somewhat recuperated, Schoeler’s operation was suggested to him and immediately accepted. His vision in the right eye was still \( \frac{4}{5} \) with the compound cylinder, but he could no longer read Jaeger No. 2. On February 26th I punctured the eyeball on the nasal side just below the inferior margin of the internal rectus muscle, and just back of the ciliary region, and injected slowly into the vitreous four drops of tincture of iodine. The vitreous became immediately very cloudy and the tension rose to +2, and he complained of some pain, not severe but very persistent in character, and located entirely in the eyeball. The next morning the bandage was removed, and considerable conjunctival and ciliary injection was found. The tension was somewhat less than the day before, but the fundus was still invisible. There was no chemosis and no sign of any severe infra-ocular inflammation. The vitreous remained persistently cloudy for nearly three weeks. At the end of that time an opthalmoscopic examination showed some flocculi in the vitreous, an increase in the density of the membrane which previously extended across the vitreous, and a decided increase in the
Detachment of the Retina by Schoeler's Method.

detachment. His vision had sunk to $\frac{1}{3}$, and the field of vision was perceptibly narrower than before the operation. This patient was kept under observation for several months, and a gradual change was observed in the fundus. The nasal portion of the retina became slowly reattached, as if due directly to a contracting process going on in the plastic chorio-retinitis set up at the point of injection, but it seemed as if the detachment simply shifted its location from the inner to the inferior quadrant of the retina, as the defect in the visual field was upwards. The membrane in the vitreous grew somewhat thinner, and the floating flocculi entirely disappeared. The most unfavorable symptom was a decided increase in the number and extent of the patches of chorio-retinitis, without doubt set up by the operation. At the last examination made the patient's vision was $\frac{2}{3}$, unimproved by any glasses, and the defect of the visual field occupied fully a quarter of its extent and directly upwards. This patient had not been seen since the latter part of February, but in a letter received from him in April, and dictated, he stated that his vision had decidedly failed, as he could only recognize the large letter of the test-types when held close to his eye, and then only in the lower part of the field of vision.

A brief résumé of the histories of these five cases may assist in drawing some conclusion.

The first case was a young man, with previous history of injury to one eye, in whom the detachment occupied about one-third of the fundus. The injection caused very little reaction, but the primary effect was a diminution of the existing visual acuity. Subsequently the vision improved and the field widened. Plastic chorio-retinitis, causing adhesion of the retina to the choroid, was undoubtedly the cause of this, but the formation of additional fibrous bands in the vitreous will probably lead to a further increase of the detachment, and probably to permanent loss of vision.

The second case was a young woman, with hypermetropia and a perfectly normal fundus in one eye, but with a cobweb membrane and a detachment of the retina in the other, occupying about one-third of the fundus. . . . The injection caused a somewhat more violent reaction than in the first case, but soon
subsided under active treatment. The effect of the operation was to make the vision decidedly worse, and caused no diminution of the detachment, but simply shifted it from one quadrant of the eye to another quadrant. Rather extensive plastic chorio-retinitis and the formation of fibrous bands in the vitreous were decidedly bad results.

The third case was a gentleman, aged 60, who had compound myopic astigmatism and a diseased choroid in both eyes, with detachment of the retina in one eye. The injection caused acute infectious panophthalmitis, which ended in nearly total destruction of vision in this eye, and an apparent increase in the extent of the detachment, though this could not with certainty be made out.

The fourth case was a gentleman, aged 73, who had myopia and diffuse choroidal disease in both eyes, and a very extensive detachment in one eye. The injection caused an acute panophthalmitis of moderately severe type, which yielded to treatment in about two weeks. The primary effect was an improvement in the vision and a decided lessening in the extent of the detachment, more than half of the detached portion becoming reattached. But the ultimate effect was a recurrence of the detachment and a reduction of the vision to what it was before the operation was done, and subsequently an opacity of the lens.

The fifth case was a gentleman of 36, with compound hypermetropic astigmatism and a diseased fundus in both eyes, and a small detachment of the retina in one eye. The injection caused only moderate reaction. The primary effect was an increase in the detachment and a further loss of vision, but subsequently the retina became reattached at the inner quadrant and detached below, and vision rose to $\frac{10}{60}$. Two months later his vision had again sunk to $\frac{8}{60}$, and the detachment of the retina had become more extensive.

DISCUSSION.

Dr. Heyl, Philadelphia.—Mr. President: With reference to this Schoeler operation of course it is a matter which interests us very much because it deals with a very dreadful disease. I have gone over Schoeler’s monograph on the subject, and have come to the conclusion that the remedy is about as dreadful as the disease, and the experience of Dr. Bull will go far to confirm
me in this conclusion. So that for myself I am utterly disinclined to attempt it at all. I am not sure that the pathological principles upon which the operation is based are correct. I do not deny the existence in retinal separation of the tear through the retina or of the vitreous bands, but I am rather inclined to think that that is not the whole of the process, and I believe that we shall never get at the true rationale until we understand the principles underlying the tension of the ball. Meanwhile I believe that this procedure had better be done away with.

Dr. T. Y. Sutphen of Newark, N. J.—Mr. President: May I ask Dr. Bull if there was a suppression of the intracranial fluid?

Dr. Bull.—There was not.

Dr. T. Y. Sutphen of Newark, N. J.—Mr. President: I recall three operations in cases of this kind, which I reported to this society in 1888, one of which was eminently successful, the operation being a simple puncture. That case has good vision to this day. He is slightly myopic with vision 20/30.

Dr. David Webster of New York.—Mr. President: I want to thank Dr. Bull for making these experiments for us. One thing I would like to make an inquiry about. He reports that in two cases panophthalmitis occurred, and yet the resulting vision was very considerable. Now he must put a different meaning to the term panophthalmitis from that which I have learned. I have always thought that a case of panophthalmitis left nothing beyond a mere perception of light.

Dr. C. S. Bull of New York.—Mr. President: These were cases of intra-ocular inflammation starting in the vitreous or choroid, and so far as it was possible to judge, free from external manifestations involving all the tissues of the eyeball. There was enormous chemosis, enormous swelling of the eyelids, protrusion of the eyeball, excessive pain, and increase of temperature.

Dr. Samuel Theobald, Baltimore, Md.—Mr. President: I think that all of us have seen cases at least of traumatic panophthalmitis where, taken early enough, by rapid and persistent efforts we have reduced the inflammation so that the trouble lasted only a few days, and left a certain amount of vision.

Dr. S. J. Jones of Chicago.—May there not be other explanation of the fact that suppuration, the usual accompaniment of acute panophthalmitis, was absent in this case? May not such explanation lie in the fact of the use of iodine which may have had sufficient antiseptic effect to have prevented formation of pus, while, at the same time, it may have contributed by its irritating effect to the simple diffuse inflammation which occurred in the eye?
NEUROMA OF THE RIGHT UPPER EYELID AND
ADJACENT TEMPORAL REGION.

BY G. E. DE SCHWEINITZ, M.D.,
OF PHILADELPHIA.

Strictly speaking, the term neuroma should be limited to
tumors composed of new-formed nerve fibres, and, while in cer-
tain instances true new formation of nerve tissue does occur,
the majority of these growths are false neuromata, i.e., fibro-
mata and myxomata of the connective tissue of the nerve, un-
accompanied by multiplication of its nerve fibres. Indeed, the
latter usually are compressed and atrophied by the surrounding
tissue. Vernueil* gave the name “plexiform neuroma,” and Paul
Bruns† “Rankenanneum,” or “Neuroma Cirsoideum” to a morbid
process of this character when it appears in the form of a more
or less convoluted mass, somewhat corded beneath the skin, and
affecting an entire nerve territory. In a few instances this va-
riety of the growth has been situated in the eyelid and surround-
ing region, notably the temporal area. The researches of Von
Recklinghausen have shown that multiple fibrous tumors of the
skin often contain nerve fibres, or, to speak more accurately, are
developed from the fibrous sheath of small cutaneous nerves,
and thence involve the connective tissue structure of the ves-
sels, sweat glands, and hair follicles, and are, in fact, neuro-
fibromata. Tumors of this nature may invade the fibrous
sheaths of the different tubular structures contained in the skin
and sometimes reach a great size, until finally the appearance
of elephantiasis is developed, which, to distinguish it from the
acquired variety of this type of hypertrophy, is designated by
some authors as “congenital elephantiasis.” Under such cir-
cumstances the tumors may not be circumscribed, but an
overgrowth of the skin takes place, giving rise to an extensive
hypertrophy.

* Archives Générales de Medicine, 1886, Vol. II., V serie, T 18.
† Virchow’s Archiv., Vol. L, 1870, p. 80.
To the cases of so-called plexiform neuroma of the eyelid already upon record I desire to add another case of congenital tumor of this region, which presented itself in the form of considerable thickening of the eyelid, causing an extensive ptosis and a morbid growth in the temporal region, clinically giving rise to the appearance of a fibro-fatty tumor, or to that condition which has received the name elephantiasis, and which in rare instances has appeared as a congenital affection in the upper lid. Examination of the slides and of the photo-micrographs will, however, demonstrate that in addition to hypertrophy of the glandular structures in the skin and of the connective tissue, the most marked pathological lesions are large masses, which in cross section appear as concentric whorls of soft fibrous tissue, containing in their center more or less degenerated nerve fibres.

The history of the case is as follows: Edward Hawkins, aged 20, was admitted to the Philadelphia Hospital September 2, 1890, and came under the care of my colleague, Dr. G. M. Gould, on account of the condition which is represented in the accompanying photograph, namely, a large, irregular tumor of the right temporal region, ptosis, and thickening of the upper lid and the tissue between it and the margin of the brow. When I took charge of the wards I obtained the following history: The tumor was present at birth, and, indeed, had not materially changed in its appearances except by its expansion with the corresponding growth of the tissues in which it was situated. The distance from the edge of the brow to the lower margin of the swollen eyelid was 7.5 cm.; the longest transverse diameter, i.e., from commissure to commissure, 9 cm., and the thickness varied from 1 to 1.5 cm. The temple tumor extended from the outer commissure to the ear, and from the margin of the hair to the zygoma. The skin over the area of the growth was slightly brown in color, a pigmentation which had developed since the birth of the patient. To the palpitating fingers the underlying mass gave the impression of a somewhat lobulated, slightly cored growth. There was no pain and no inconvenience, save that caused by the ptosis. Both eyes were normal in structure and vision, and there were no congenital faults.
or tumors elsewhere in the body, neither had a similar growth been present in any member of the patient's family or ancestors. The palpebral conjunctiva of the affected lid presented the appearances of a chronic blennorrhoea, and across the lid, on its conjunctival surface, there were three furrows, bounded by corresponding ridges, and several transverse divisions, so that the whole presented a somewhat lobulated appearance. There was

![Image](image_url)

**FIG. 1.**
**NEURO-FIBROMA OF THE RIGHT UPPER EYE-LID AND ADJACENT TEMPORAL REGION.**

moderately free secretion of muco-pus. Some attempts to reduce the size of the tumor by local blood-letting had met with indifferent success. The first operation was done January 6, 1891, and consisted in removing a semi-lunar flap from the lid, dissecting out all of the affected tissue which it was possible, and afterwards approximating the edges by means of sutures. After the operation the long transverse diameter of the lid measured 5 cm. The second operation was made January 20, 1891, and consisted in an attempt to overcome the ectropion which had resulted from the first operation. The outer commissure
was slit for a distance of 5.5 cm., and from the end of the incision a second one was carried forward and backward for 5 cm., a parallelogram of skin and subcutaneous tissue, together with the underlying tumorous mass, was dissected away from the temple, and the edges were approximated. Twenty millimeters of the thickened outer edge of the upper lid were cut off, the lower lid pared correspondingly, and the two united with sutures as in the operation for tarsorrhaphy. This operation relieved the ectropion, and when the patient looked directly forwards the lid fissure was separated about one centimetre. A third operation was done in April, 1890, which consisted in Panas's operation for ptosis slightly modified, owing to the thickened tissues. This yielded a fair result, elevated the lid, and gave the boy a reasonable palpebral opening.

The tumorous masses which had been dissected from the lid, and to a less degree from the temple (the mother positively declined to allow the whole mass from the temple to be removed)
were placed in Mueller's fluid, carefully hardened, and sectioned for the microscope, as were also the pieces of skin which had been removed from the temple and from the eyelid. The following are the most important microscopic lesions:

**Integument of the Eyelid.** The horny layer of the epidermis is thickened, uneven, its flat cells being somewhat discolored; both the granular layer and the rete mucosum are thicker and more prominent than is normal in the skin of the eyelid. As is natural to the part, the papillae of the pars papillaris are not well marked in this layer, and the pars reticularis of the corium is not readily separated; the entire corium appears to be composed of a loose fibrous connective tissue containing numerous wavy bundles, free corpuscles, and elastic fibres. Prominent features in this portion of the microscopic field are the hypertrophy of the sebiparous glands and the wide dilatation of the lymphatic spaces which sometimes assume large areas lined by distinct, flat, endothelial cells, in close relation to wide-mouthed, thin-walled veins (Fig. 2, Pl. I). Here and there in some sections racemose and tubular glands with hypertrophied walls are present. In the deeper portion of a section made directly through the integument, the first portions of the true tumor appear in the form of the strands presently to be described, which are the characteristic feature of the growth.

**Main Body of the Growth.** This is composed of strands which pass through a framework of loose connective tissue containing fat cells and large blood-vessels, lymphatics, and muscle fibres. The strands themselves, when seen in cross section, are composed of concentric whorls of loose fibrous connective tissue containing many nuclei and in their center medullated nerve fibres, sometimes intact and sometimes partially destroyed by fatty degeneration. Figure 1, Pl. I represents the general outline of a cross section of several of the strands seen under a low magnifying power, while these other sections exhibit various appearances of the center of the whorls under a higher magnifying power. In order to positively demonstrate the presence of medullated nerve fibres, which, however, are readily seen in many of the sections stained by a carmine nuclear dye, the method of Weigert was employed, and Figures 3 and 4, Pl. II
Figure 1. Section of the tumor, showing the concentric whorls.
[X 195.]

Figure 2. Vertical section of the skin of the eyelid, showing hypertrophied gland and dilated lymph spaces.
Figure 3. An oval whorl, showing a band of medullated nerve fibres passing through its centre. [× 250, Weigert's stain.]

Figure 4. Small, oval whorl, showing in its centre a patch of medullated nerve fibres. [× 125, Weigert's stain.]
represent the various appearances elicited by this method of staining. In Figure 3 the oval whorl is seen to contain directly in its center a band of medullated nerve fibres, while on either side the remains of the loose connective tissue, nuclei, and here and there some myxomatous change are visible. Additional sections represent, on the one hand, an oval whorl, and on the other an irregular-shaped whorl with nerve fibres in their centers, while in Figure 4 a small round whorl is depicted with the nerve fibres cut transversely and placed somewhat laterally. All of the photo-micrographs were taken with apochromatic objectives, 16 mm., 8 mm., and 4 mm. of Zeiss, on orthochromatic gelatine dry plates, by sunlight illumination rendered monochromatic. The photo-micrographic illustrations and the microscopic slides were prepared by Dr. William M. Gray of the Army Medical Museum.

The literature of plexiform neuroma is not an extensive one. Marchand* has collected twelve cases, and Cartaz† six cases, and in five, perhaps six, of these eighteen cases the growth has been situated in the region of the upper eyelid and temporal area. Since the paper of Marchand and Cartaz no very elaborate work on the subject has been done, although here and there scattered reports appear, not, however, with reference to a situation in the eyelid. Interesting observations will be found in the papers of Cristol,‡ Garel,§ and especially in the research of Lacroix and Bonnauq,|| the latter observers having made a careful histological examination of a plexiform neuroma situated in the back in the neighborhood of the scapula, and presenting the rare characteristic of being largely composed of amyelinic nerve fibres. The development of plexiform neuroma belongs in the majority of instances to foetal life. Some hereditary tendency has been shown, but not with great definiteness. When this has existed it seems to have concerned that form of the tumor which partakes more of the nature of an elephantiasis than of a neuroma. When these tumors occur in the region with which we are at present interested, they appear in the form of a some-

* Virchow's Archiv., Bd. LXX, page 36.
† Archives Générales de Medicine, August, 1876.
‡ Gaz. Hebdomadaire, 1870.
§ Lyon Médical, 1887.
|| Archives de Medicine Expérimentale et d'Anatomie Pathologique, II., 1890, p. 411.
what lobulated tumor, which gives the impression to the palpating finger that the tumor is composed of fat and connective tissue, with perhaps occasionally an ill-defined sense of fluctuation. It may and has been mistaken for congenital lipoma, encephalocele, hydromeningocele, cystic tumor, and cavernous angioma. In fact, it would be practically impossible in any of the cases to have stated with certainty that the tumor was composed either in part or entirely of nerve fibres. Pain, as is usual with neuromata, was not a marked feature in any case, although tender spots have sometimes been found. As Lacroix and Bonnaud very properly insist, the diagnosis of a growth of this character can rest alone upon a careful histological study. In a number of such careful examinations it has been shown that the interstitial tissue between the cords or strands which form the characteristic gross appearance of the tumor, is composed of a fasciculated connective tissue of loose construction. The fasciculi often arrange themselves in the neighborhood of the cords in a concentric manner, and around these, and separated from the cords themselves, are well-defined lymph spaces in which an endothelial lining could be detected. In one case the tissue of the tumor had a myxomatous character, and one observer has seen in the tumor a new connective tissue. Often in the interstitial substance well-formed sections of fat cells are found. Vessels are frequent. The cords, which are the essential part of the tumor, for the most part exhibit a clear peripheral zone which is composed of concentrically-arranged fibrillar connective tissue. Inward from this follow loose connective tissue strands accompanied by many nuclei. Usually in the center, but sometimes irregularly-placed, medullated nerve fibres may be found in all stages of degeneration, but sometimes well preserved. Non-medullated nerve fibres have also been demonstrated, and, as has just been quoted, in one instance the growth was largely composed of them. Through the cords more or less rich vessel formation is present, and in the largest cords the nerve fibres may be poorly developed, or fail altogether. The skin which covers the tumor generally is in a condition of distinct hypertrophy, which especially concerns the connective tissue of the cutis. In some cases hair follicles and sweat glands are hypertrophied, and the epidermis often shows pigmentation in the deeper layers
of the rete Malpighii. Various opinions in regard to other fine details have been recorded by different authors. Czerny and Winiwarter picture an increase of the cells of the vessel walls and the capillaries, arteries, and veins, which is also present in the subcutaneous tissue and the skin, and according to the latter observer, help in the new formation of the connective tissue. A similar development has been supposed to be present in the vessels of the muscles. Cell proliferation of the sheath of the nerve fibres and of the sarcolemma of the muscle fibres is present, and also contributes to the connective tissue formation. Czerny and Winiwarter promulgate the hypothesis that the whole affection is a disease of the trophic nerves. Whether there is really a development of new-formed nerve fibres is a question.

This résumé of the microscopic lesions found in so-called plexiform neuroma has been quoted in large part from Marchand's monograph, and it will be seen that it accords with the histological characters of the tumor to which I call your attention to-day, and which hence must be recognized as belonging to this group of cases. The association of the disease with fibroma and elephantiasis congenita has been referred to, and Bruns calls attention to the commingling of circumscribed elephantiasis mollis congenita and neuroma, in their relation to an elephantiasis proper, which consists of an alteration of the subcutaneous connective tissue, or one in which there is enormous development of the vessels (elephantiasis teleangiectodes). Therefore, a congenital elephantiasis with excessive development of the nerve tissues may be classified as an elephantiasis neuromatodes; and Bruns further recites from an observation of two clinical cases, that almost imperceptible transitions occur from simple elephantiasis to elephantiasis neuromatodes, or neuroma elephantiasticum. A brief description of the most important cases of so-called plexiform neuroma of the eyelid and adjacent temporal region which have been recorded is here appended:

Case I. Boy, aged 6; tumor of the right upper eyelid reaching to the temple, composed of cords in the center of which was a nerve which had partly undergone fatty degeneration. (Billroth, Archiv. f. klin. Chirurg., 1863, IV., s. 547.)
CASE II. Boy, aged 18; plexiform tumor of the upper eyelid and the neighboring temporal region. When freed from fat it was seen to be composed of grayish-white, smooth cords, of plexiform arrangement sometimes ending in fine nerves. The center of the cords was composed of atrophic and fatty degenerated nerves. (Billroth, Archiv. f. klin. Chirurg., Bd. XI., 169, s. 232.)

CASE III. Man, aged 28; part of the tumor, which occurred in the temporal region, reaching to and affecting the outer palpebral commissure. (Bruns, loc. cit.)

CASE IV. Man, aged 33; tumor of the left upper eyelid and temporal region, and at the same time general neuromatosis and multiple neuromas of both vagi. (Bruns, loc. cit.)

CASE V. A brother of the preceding case; neuroma of the left upper eyelid and corresponding temporal region. (Bruns, loc. cit.)

CASE VI. Boy, aged 13; tumor of the left upper eyelid and corresponding temporal region. (Marchand, loc. cit.)

REPORT OF A CASE OF TUMOR OF THE BRAIN WITH AUTOPSY.

BY CHARLES STEDMAN BULL, M.D.,
OF NEW YORK.

In April, 1890, I was consulted by a gentleman aged 45, on account of the difference in the size of the two pupils, which had then existed for nearly a year without any change, and which interfered somewhat with his comfort in reading. I had known the gentleman for many years, but had never examined him professionally. He was a man of very active mind, by profession a civil engineer, and of somewhat irregular habits. He had always been myopic and astigmatic, and had worn glasses for twenty-five years. He had contracted a chancre fourteen years before, and had had numerous lesions of constitutional syphilis since then, but none of them severe. For five
years he had had no demonstrable constitutional lesion until about two years before I saw him. He then began to have some curious, ill-defined brain or nerve symptoms, of which he could give no very clear description, but he stated that he was sure they arose in his brain. From the general ill-defined description furnished, I concluded that they were probably attacks of "petit-mal," which were at times accompanied by transient loss of consciousness, which was never of long duration, but the attacks increased in frequency. There was no regularity in these attacks. There were at times lapses of memory of very varying duration. At no time was there any headache until a few hours before his death. When I saw him in April, there was a marked though not complete ptosis of the right upper lid and paresis of both internal recti. In the left eye the iris was moderately dilated and immovable, the pupil on this side being more than twice the diameter of the right pupil. With the right upper lid raised and the refractive error corrected, there was crossed diplopia, the right image being lower, and the two images were brought to a level by a prism of 2°. The internal recti were not completely paralyzed, but paretic. There was no paresis of any of the other ocular muscles. The difference in the size of the pupils had existed unchanged for nearly a year:

R. E. 3/200; with sph.—D 8 □ cyl + D 2.50 axis 90° = 20/30
L. E. 5/200; with sph.—D 4 □ cyl + D 0.50 axis 90° = 20/20

There were small irregular central opacities in both lenses. In the right eye there was a moderate case of neuro-retinitis with not much swelling of the disc, but with two or three small hemorrhages in the retina near the margins of the disc. The fundus of the left eye showed merely the ordinary changes of a myopic eye. The field of vision was apparently normal in each eye, and there was no interference with the color sense. He was then under treatment by mercury and potassium iodide, and the dose of the latter was increased to thirty grains four times a day. Under this treatment, the neuro-retinitis and the muscular pareses slowly subsided, and finally entirely disappeared. During the summer he began to have attacks of ver-
tigo, and in the early autumn these vertiginous attacks increased in intensity, and there appeared a hemianæsthesia of the left side which gradually became well marked. During the autumn there were a number of regular well-marked epileptiform convulsions, and the lapses of memory became more marked. On November 14, 1890, I made another careful examination, and found that not a trace remained of the neuro-retinitis, or of the ptosis, or of the paresis of the internal recti muscles. The vision remained the same. A test of the dynamics of the muscles showed for 18 inches a convergence of 12° and a divergence of 5°. For twenty feet there was no convergence at all, and a divergence of 5°. There was no diplopia at any distance. His intelligence was apparently unaffected, except for the lapses of memory. The condition of the left pupil had remained unchanged. There was no loss of power in any of the extremities, but the hemianæsthesia was very marked. I had previously made a diagnosis of pachymeningitis, and a prominent and very careful neurologist had made a diagnosis of multiple sclerosis of the brain. The patient remained in about the same condition until the night of January 28, 1891. He had gone to bed feeling as well as usual, and woke suddenly about two o'clock in the morning, shrieking with severe pain in the occipital region. Be it marked that this was the first attack of pain in the head which had occurred. He became rapidly delirious, then sank into coma, and died comatose about 11 A.M., Jan. 29, 1891.

The autopsy was made at 4.30 p.m. the same day. The frame was large, the muscular condition good, and the adipose layer considerable. The dura mater was rather thicker than the average, and more adherent to the skull, but there was no trace of pachymeningitis anywhere within the skull. The sinuses were normal. The convolutions were flattened, especially over the anterior lobes. The anterior half of the left hemisphere was larger than that of the right hemisphere. A section made through the middle of the left frontal lobe, passed through a tumor two inches in longitudinal diameter, and one and three-quarter inches in a transverse diameter, with a broken-down center. The anterior portion of this growth was firmer than the brain substance, and was grayish pink in color,
with a few small hemorrhagic spots. This mass reached to within two inches of the anterior extremity of the hemisphere.

A vertical incision made from the lower extremity of the fissure of Rolando and cutting the longitudinal fissure two and a half inches in front of the fissure of Rolando, passed behind the tumor.

The tumor involved the corpus callosum and protruded downward from the roof of the left lateral ventricle. The heart was normal. The right lung was normal. The left lung contained a few fibrous nodules in the lower lobe. In the right iliac region there were several old peritoneal adhesions between the omentum, caecum, vermiform appendix, and the abdominal wall. The spleen was normal. The liver was normal. The capsule of the left kidney was adherent, and its surface a little roughened by fine irregular scars.

A careful microscopic examination of the tumor proved it to be a glio-sarcoma. Careful microscopic examination of many sections taken from different parts of the brain, showed no trace of sclerosis of nerve tissue.

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COLOBOMA OF THE IRIS, POLYCORIA, AND PRIMARY GLAUCOMA.

BY G. E. DE SCHWEINITZ, M.D.,

OF PHILADELPHIA.

The occasional association of primary glaucoma with complete or partial congenital absence of the iris, has been noted in several instances. The most recent paper on the subject is one by E. Treacher Collins (Ophthalmic Review, April, 1891), in which he reports a case of primary glaucoma with apparently complete aniridia, and refers to the case of congenital coloboma of the iris and primary glaucoma recorded by Mr. Lang (Trans. Ophth. Soc., U. K., Vol. X, page 106), the instance of double microphthalmos and glaucoma, with partial absence of the iris, reported by Brailey (Ibid., page 139), and an example of glau-
coma secondary to dislocation of the lens in a patient with nearly complete aniridia, described by Armaignac (Mémoires et Observations d' Ophtalmologie pratique, page 239). To this list I will add a case of coloboma of the iris, polycoria, and primary glaucoma. The history is as follows:

Mrs. M. M., aged 52, an American by birth, presented herself for treatment January 26, 1891, with the following statement: For several years she had noted with her left eye iridescent circles surrounding lights, most marked, according to her statement, when looking at the moon, but had experienced no pain. In the spring of 1890, the vision in the left eye became very poor, with intermittent pain in the peri-orbital and temporal regions. Two weeks before her visit for treatment, she suffered violent pain in the left eye and almost complete suppression of sight, the attack lasting about forty-eight hours. Since then she has had a number of similar attacks of less severity, and characterized chiefly by temporary obscurations in vision. The patient is a well-preserved woman, in good general health, and with a clean family history. Her previous illnesses have been rheumatism and malaria, neither of violent type. Her children are healthy, and have normal eyes and natural vision. There is no instance of blindness or congenital ocular defect in her ancestors. The following is the record of the examination of the eyes:

O. D. \( \frac{20}{20} \) with \( -1.25\circ \) axis \( 15\circ \frac{20}{20} \); \( +2.50\circ \). D = 0.50 p. p. 22 cm.

O. S. \( \frac{20}{20} \) unimproved by glasses; with \( +2.50 \circ \) spells D = 1 with difficulty.

*O. D.* Oval disc, gray red; small central excavation; several spots of disseminated choroiditis.

*O. S.* Oval disc, excavated to the scleral border, the center of the excavation measuring \(-2\) D; strong arterial pulse; below the disc a large irregular patch of retino-choroiditis, at first yellowish-white in appearance and farther towards the periphery presenting pigment dots. A smaller similar patch in the macular region. Coarse injection of the episcleral vessels; steaminess of cornea; shallow anterior chamber; \( T + 3 \). The
iris of this eye presented a congenital coloboma down and in its axis at 75 degrees. Up and out from the coloboma were three supernumerary pupils, the upper being crossed by two fibres. In addition to these defects of the iris there were considerable patches of atrophy, the largest being adjacent to the uppermost supernumerary pupil, lying to its inner side. (See colored drawing.) In the center of the pupil lying on the capsule there was a small, irregular, brownish, faintly granular tag. Figure 1 represents the field of vision. The outer boundary marks the limits of the normal field; the transverse shading where vision was lost. It will be noticed that the greater portion of the nasal field is wanting, together with a small strip on the temporal side. Iridectomy was declined; eserine was ordered. The next day the vision of the affected eye had risen to 2/5. In the fields of vision for white, blue, and red, in addition to the loss of the greater portion of the nasal field, there was slight increase in the shrinking of the field below. Both the blue and red fields were contracted, the greater proportional contraction being present in the red field. Two days later, in spite of eserine, the vision was 2/6, and the day succeeding this, 2/6, fingers being poorly counted at one foot; T + 2. The patient was not seen after this until the 13th of February, having used the eserine continuously, and also having taken iodide of potash. She then reported one attack of general head pain, with some redness of the eye. The vision was barely 2/6, the
iris of this eye presented a congenital coloboma down and in its axis at 75 degrees. Up and out from the coloboma were three supernumerary pupils, the upper being crossed by two fibres. In addition to these defects of the iris there were considerable patches of atrophy, the largest being adjacent to the uppermost supernumerary pupil, lying to its inner side. (See colored drawing.) In the center of the pupil lying on the capsule there was a small, irregular, brownish, faintly granular tag. Figure 1 represents the field of vision. The outer boundary marks the limits of the normal field; the transverse shading where vision was lost. It will be noticed that the greater portion of the nasal field is wanting, together with a small strip on the temporal side. Iridectomy was advised: eserine was ordered. The next day the vision of the affected eye had risen to 20/20. In the fields of vision for white, blue and red, in accordance to the loss of the greater portion of the nasal field there was slight increase in the shadow of the field below. Both the blue and red fields were larger; the greater part of normal contraction being present in the red field. Two days later, in spite of eserine, the vision is not distinct or well marked; 20/100. The patient was not seen after this. I have used the eserine
present. It seems probable, at least in human eyes, that no true instance of doubling of a normal pupil has been observed, and that the term of polycoria describes the existence of several openings in one iris.* In the majority of cases, in addition to the central pupil, one or more apertures are placed eccentrically which do not represent malformations due to arrested development, but either are defects in the iris tissue arising from an incomplete evolution of the choroid, or are dialyses, i. e., separations of the attachment of the iris. The patches of atrophy in the present case appear to be imperfect apertures, the defects not having gone on to complete absorption of the structure. The small granular tag lying in the pupillary space (not shown in the colored drawing), undoubtedly represented the remains of the capsulo-pupillary membrane. The association of capsulo-pupillary membrane and coloboma of the iris, and the etiological questions which this raises are interesting points which have received considerable attention in the papers of O. Plauge (Archiv. f. Augenheilk, Bd. xxi, page 194) and Seggel (Klin. Monatsbl. f. Augenheilk, August, 1890, page 299), the former observer concluding that in laterally placed iris colobomas, in contradistinction from those which are situated below, anomalies of the pupillary membrane of the embryonal eye should be regarded as the most important etiological factor. The patches of retino-choroiditis present in both eyes deserve notice. In the left, or glaucomatous eye, the large area below the disc at the first glance suggested the possibility of coloboma of the choroid, an anomaly reasonably to be expected owing to its frequent association with a similar defect in the iris. The lesion, however, was an ordinary area of exudative retino-choroiditis, and not a developmental deficiency. In this connection it is interesting to recall the theory that many cases of arrested development are due to intra-uterine sclero-chorido-retinitis (Deutschmann), and the fact that cases of polycoria have been placed upon record (Seeley), the subjects of which have become blind from choroiditis. Finally, the choroiditis may have been the primary cause of the glaucoma. In one of Mr. Collins’s cases, this was attributed to a hemorrhage into the lymph space between the choroid and sclerotic.

EXTRACTION OF FOREIGN BODIES FROM THE VITREOUS.

BY E. E. HOLT, M.D.,
PORTLAND, ME.

When Mackeown first effectively employed the magnet for the removal of iron or steel from the vitreous in 1874, he introduced an operation of great value in ophthalmic surgery. Hirschberg, recognizing the value of the method, devised an electro-magnet in 1877. Gruening employed a cluster of permanently magnetized rods in 1880, while Bradford, after many careful experiments, brought out an electro-magnet in 1881. For convenience the dry-cell batteries are to be preferred to the bichromate of potash, and the writer has found two cells sufficient with Bradford's magnet. For the removal of iron or steel about the cornea or anterior chamber, Gruening's magnetized steel rods have been of service, but for the removal of iron or steel from the vitreous an instrument like Bradford's magnet is to be preferred. Since the electro-magnet has been used but a few years, and since these operations upon the vitreous are comparatively rare with a low per cent. of success, the writer has ventured to present the following cases, all of which occurred within a year:

CASE I (6741).—J. S. A., aged 24, came to my office June 13, 1890, at about six o'clock, stating that at about ten o'clock that morning while chiseling stone he felt something strike his right eye. Considerable blood came from the wound and he fainted. On recovering he sought his fellow workman who was in the habit of removing pieces of steel and stone from the eyes of those who sustained accidents. This man recognized at once that the foreign body had penetrated the eye and also that it was a serious wound. He therefore recommended him to consult me at once. They procured a boat, rowed a long distance and there taking a team drove at a rapid rate an equal distance in order to catch the train that would bring them to Portland at six o'clock. Upon examining the eye I found a T-shaped wound

OPH.—5
on the nasal side of the right eye. The vertical part of the
wound was about 3 mm. (1/8 in.) in length and about that dis-
tance from the cornea, while the horizontal part extended into
the cornea and very nearly corresponded to its horizontal diame-
ter, giving the appearance of a T tipped over horizontally to the
right. Careful examination did not reveal any injury to the
lens. Upon looking at the fundus of the eye, a piece of steel
could be seen just outside of the macula lutea attached to the
retina. Early on the following morning ether was administered,
Drs. Moulton, Small, Sullivan, Foster, and King being present.
An incision was made between the external and inferior rectus
muscles and the tissues dissected from the globe beyond its
equator. A suture was passed under the external rectus and
by it the eye was rotated upward and inward. A horizontal in-
cision was made in the sclerotic as nearly over the piece of steel
as could be estimated and as it was passed through the sclerotic
into the eye it touched the steel. This incision caused con-
siderable hemorrhage from the cut choroidal vessels. After
this had ceased I passed the straight point of Bradford's electro-
magnet into the eye. No metal was brought out and after
several attempts with the electro-magnet, I introduced Gruen-
ing's magnet but failed to touch or bring out any steel. I now
enlarged the incision from about 8 mm. to 12 mm. in length and
after several prolonged attempts the steel was brought out on
the point of the magnet. The wound was carefully cleaned and
sprayed with bi-chloride, 1:5000. There was no loss of vitreous.
The incision in the sclerotic was not sutured, but the conjuncti-
val incision was brought together with one suture. The eyes
were carefully padded with cotton which was held in place by
silk isinglass plaster and the patient was put to bed. Before
dressing the wound the fundus was examined and I was sur-
prised to find no blood in the vitreous. I could distinctly see
the whole outline of the incision through the sclerotic and retina.
Recovery was uninterrupted and he was discharged cured in
ten days with vision as good as ever, and equal to 0.5.

Case II.—B. B. J., aged 34, consulted me August 9, 1890,
with the following history and condition: Two days ago while
drilling he felt something strike his right eye. There was a
slight wound on the temporal side of the cornea corresponding nearly to its horizontal diameter about 3mm. in length and opposite this there was a rent in the iris of about the same size. It was thought by those who saw the eye that this wound was made and then the foreign body rebounded, a thing that seldom occurs and never in my experience. The vision was good and this favored the opinion of those who thought the foreign body had rebounded. Upon examining the eye with the ophthalmoscope a piece of steel could be seen on the temporal side of the fundus anterior to the equator. Since it had been over two days I thought it best to lose no time and therefore with the assistance of Drs. Small and Sullivan operated that evening. Dissecting the conjunctiva and connective tissue away from the eye-ball between the external and inferior rectus and estimating the location of the steel I made an incision through the sclerotic and retina into the vitreous, and as my knife passed through I felt it strike the metal. I introduced the straight point of Bradford’s magnet and after some manipulation I was pleased to find the steel on its point upon withdrawing it. The conjunctival wound was closed with a suture. He made an uninterrupted recovery and was discharged in a week with vision as good as ever and equal to 0.7. The patient came back six weeks after this time on account of two floating specks in the eye. Vision remained the same and there was no detachment of the retina.

Case III.—Blank, while splitting wood with a steel wedge and iron mallet, felt something strike and penetrate his left eye which produced quite a shock and seriously affected the sight. He was on the town farm and the chairman of the selectmen desired him to go to the Infirmary at once, but the other members of the board did not concur in this opinion and he was not seen until two weeks after the accident. The eye then presented a linear scar in the cornea, traumatic cataract and circumcorneal congestion. There was irritation of the fellow eye. To satisfy the chairman of the selectmen and the desire of the patient rather than with any expectation of removing the steel or saving the eye, an estimation was made of its location and under ether an incision was made near the equator of the eye, between the superior and external recti muscles, directly over the steel
Inflammation had produced a fluid vitreous and the eye collapsed. Subsequent examination of the globe showed that had he been seen immediately after the accident the steel could have been as easily extracted with the electro-magnet as in the other cases, and the eye saved.

Case IV.—P. H. G. came to the clinic of the Maine Eye and Ear Infirmary, stating that on the previous day while chiseling he felt something strike his right eye. Examination showed that he had sustained a wound of the eye on the nasal side just outside of the cornea in a line with its horizontal axis. Since the steel could not be seen in any part of the eye, it was thought to have passed just inside of the sclerotic and therefore might be removed without taking ether. But upon applying cocaine and making several attempts to remove it, it was decided to give ether. Under ether the wound was enlarged towards the equator of the eye and the straight point of Bradford's magnet introduced. Several attempts were unsuccessful, but upon causing the wound to gap by retractors while the magnet was introduced by Dr. Moulton the steel came out on the magnet. He made a rapid and uninterrupted recovery. In answer to questions of recent date he says the eye has never troubled him in any way whatever and the sight is as good as ever.

Case V.—M. L. H., aged 41, came to me with his physician, Dr. Jackson of Jefferson, stating that on the preceding day, while standing in a blacksmith shop, he was struck in the left eye with a piece of steel. Dr. Jackson took from his eye a triangular piece of steel which weighed nearly one-fourth of an ounce. Upon examination I found a wound extending across the cornea nearly horizontally and reaching back into the sclerotic on both sides. The lens was broken up and had begun to swell. I removed the lens and treated him as I would a case after the extraction of cataract. His recovery was slow but highly satisfactory, since he writes me May 28th, "My eye has cleared so it looks nearly as well as the other. The sight has changed so I can see nearly as much again as when I came home."

Case VI.—S. S., aged 17, came in the evening of January 28, 1891. About an hour before this time he took a dynamite cap and put a piece of fuse into it. He lit the fuse and was holding
the cap ready to throw when it exploded in his hand, shattering his fingers and wound ing his left eye. He consulted Dr. Thombs, who, finding the sight destroyed, sent him to me. Upon examination I found a large wound in the sclerotic on the nasal side. There was loss of vitreous and the eye was collapsed. There was of course no perception of light. It was evident that a piece of the cap had passed into the eye and was still there, unless it had passed through into the orbit. If it was in the eye and could be removed the eye might be saved. If time was allowed for the media to clear up so it might be located inflammation might set in and an operation for its removal would not be justifiable. Hence it was decided that the only way to save the eye was by the removal of the piece of cap, and if this could not be accomplished the eye should be enucleated. With this understanding and agreement, he was sent to the Maine Eye and Ear Infirmary and on the following morning ether was administered, Drs. Moulton, Small, Marshall, Sullivan, and Mr. Clough being present. The vitreous was explored through the wound first by a bulbous probe in the direction the piece of cap was supposed to have gone, but without finding it. Then Mathieu's forceps were introduced, closed and opened and closed again in different directions, but after several attempts nothing was brought out but shreds of vitreous and retina until finally when the search was about to be given up my forceps closed on something hard and brought out a piece of the cap. The wound was united with catgut sutures and the eye bandaged as in cataract operations. On removing the bandage the second day I was surprised to find that he could see with that eye. His recovery was uninterrupted and he has a perfect eye in its outward appearance, but of course the sight is defective.

In reviewing these cases it will be seen that the first, second, and fourth only were suitable for the electro-magnet, and that all of these were successful in preserving the eye-ball with sight as good as ever. The fifth shows how seriously the eye may be wounded and yet under careful treatment retain its form with sight. The sixth is rather a unique case, inasmuch as there is no record of a successful attempt to remove a foreign body from the vitreous when it could not be located or attracted by the
70 St. John: Extraction of Foreign Bodies from Eyeball.

magnet. There is no reason why we should not attempt the removal of a foreign body from the vitreous when it cannot be located or attracted by the magnet provided the wound is extensive and the sight destroyed, necessitating the removal of the eye or the foreign body. Excluding the third case which, coming in close connection with the other cases, was introduced into this series to show the folly of delay, all may be classed under the following from the excellent work of Dr. Noyes, in which he says that “one of the greatest triumphs of the oculist is when he discriminates correctly the dangers of an injured eye and by skilful treatment and wise forbearance preserves to the patient his precious possession of sight or eye-ball.”

EXTRACTION OF FOREIGN BODIES FROM EYE-BALL.

By S. B. St. John, M.D.,
Hartford, Conn.

The extraction of foreign bodies from the interior of the eyeball equals if not exceeds in interest and difficulty any of the problems ever presented to the ophthalmologist.

I bring forward the subject with no intention of posing as an authority or of proposing any new method of procedure, unless, perhaps, in one class of cases. I shall simply adduce three cases which I have seen recently and which illustrate respectively,—foreign bodies entangled in the iris, foreign bodies partly in the anterior chamber and partly in the vitreous body, and finally foreign bodies wholly in the vitreous.

The first case is of a woman of 20, with a chip of iron (from the head of a hammer the day before) lying upon the iris near the pupillary margin. Reaction moderate. Ether was administered and a section made as usual at the corneal margin. A magnet point was first introduced, but failed to withdraw the iron from its entanglement. The piece was too small and too much embedded in iris tissue to permit of grasping it with the iris forceps without including the iris, and when the forceps
were used I withdrew a small sector of the iris, which I prepared to excise according to the rule usually followed in these cases. It occurred to me, however, that I might disentangle the iron from the iris fibers outside of the eyeball where I could work with two instruments, and this proved very easy to do. Replacing the iris, which was very slightly wounded, and using eserine I had the satisfaction of seeing the patient recover with a nearly circular pupil and undisturbed vision.

I was not, at the time, aware that this method of dealing with foreign bodies entangled in the iris had been advocated, but have since learned that one case at least has been published. I think, however, that it may do good to call attention to the method as it is one which may in all cases be tried before excising the iris, inasmuch as it does not in any way interfere with the subsequent iridectomy if found necessary.

The second case is one that, in some respects, is the most remarkable it has ever been my fortune to encounter. The patient, a child two years old, had pain in one eye four weeks previous to my seeing her. The history and symptoms were so much like those from a small foreign particle upon the conjunctiva that the family physician who was called the next day considered that the irritation must have been due to such cause and that the foreign body had worked out, and in this view he was confirmed by the speedy subsidence of pain, lachrymation, etc., which had been present. He saw the child on the following day and considered her sufficiently recovered not to need his attention. In a letter to me subsequently he says he remembers, when first called, that in attempting to open the lids to inspect the eye his finger felt something hard and that afterward he had come to believe it must have been a cinder which was washed out by the discharge from the eye before his second visit. The family physician had retired from attendance and the child was free from pain or complaint. The father, however, noted that the eye did not open freely, there was a slight droop to the lid, and she did not like to face the light at the window. The ordinary light of the room did not annoy her. After four weeks the father's uneasiness led him to call the physician again, who discovered something abnormal and
referred her to me. Inspection revealed a foreign body projecting into the anterior chamber. Etherizing and examining more closely, a rift in the iris was seen below the pupillary margin, through which projected from behind an object like the point of a small rusty pin. The anterior end of this body did not quite reach the cornea, and the long axis was inclined slightly toward the temporal side as it came through the anterior chamber. I made an incision at the corneal margin below as being the nearest point of approach, and upon introducing iris forceps and grasping the object I was surprised at the resistance it afforded, which was so decided that I did not dare to try to extract it by traction in that direction. Noticing that the long axis inclined outwardly, it occurred to me that if I could pull more outwardly it might be removed and I accordingly extended my corneal incision with scissors nearly to the outer end of the horizontal meridian of the cornea, and introducing the forceps at the outer end of the incision. I easily withdrew a piece of wire 12mm. in length slightly bent at several points. About one-third only of this wire had been anterior to the plane of the iris, the posterior two-thirds passing through the edge of the lens and into the vitreous. The child made an uninterrupted recovery from the operation, and two months afterwards showed a slightly distorted pupil from a posterior synechia at the lower margin of the pupil and a sharply defined opacity of the edge of the lens, at the infero-nasal quadrant, and was able to distinguish small articles at twenty feet, the age of course preventing an accurate measurement of vision.

The question, how the wire got into the eye, was shrouded in mystery till the second visit of the parents when they brought a horsewhip covered with braided wire (instead of silk or linen) the wire being continued at the top into a kind of lash with a tassel of loose ends. It appeared evident that some one had snapped this wire lash against the child's face and that a single strand had punctured the eyeball and broken off short at its point of entrance. Perhaps the sharp sensation communicated to the family physician's finger was from the end of this wire, at that time just projecting sufficiently to scratch the lid and give rise to the symptoms of conjunctival irritation which were then
prominent. To my mind it is very remarkable that a foreign body of this size should have remained transfixing the iris and lens and projecting back into the vitreous with such slight subjective symptoms for four weeks, and also that the case should have recovered with such a comparatively small amount of injury to the tissues or of impairment of vision.

The third case of foreign body wholly in the vitreous is one of the more usual kind but is interesting as showing what may be done with the electro-magnet under favoring conditions. The patient, a man of 30, machinist, had been struck in the eye by a sliver of steel, scraped from the edge of a die when the press was in motion. A linear incision in the sclera, as if made with a sharp knife, about 1 mm. long and situated exactly in the horizontal meridian, beginning about 2 mm. from the edge of the cornea, showed where the steel had gained entrance, and a small bead of vitreous exuded from the wound. The ophthalmoscope showed several small hemorrhages and small wrinkles in the retina at a spot on the temporal side of the macula and about one disk diameter distant therefrom, together with a rift in the retina about 1 mm. long, and at the end of the rift was attached a needle-like metallic fragment which projected inwards towards the center of the vitreous body. The vision was <sup>20/60</sup>. Cocaine was used, the wound enlarged to 4 mm. in length, and the point of a strong electro-magnet introduced and withdrawn three times, each time in a slightly altered direction. Upon the third withdrawal the fragment was withdrawn, its escape being facilitated by holding the lips of the wound apart with forceps-blades, introduced, closed, and allowed to separate slightly. It is 8 mm. in length but scarcely 1 mm. in its thickest part. Recovery followed with scarcely any reaction, and on July 12th the V. was <sup>20/60+</sup>.

**DISCUSSION.**

**Dr. H. Knapp** of New York.—I hesitate to open this discussion because I know all the members present have had large experience with these matters and the remarks upon them might be prolonged indefinitely. I would beg, however, to make two remarks only.

Dr. St. John certainly did very well in this one case where
he got the foreign body out of the iris. A few years ago I exhibited such a case at the Academy of Medicine. I made a curved corneal incision, exposed and removed the foreign body, reduced the iris, and the healing was perfect and complete without any interruption of any kind. I have had a similar case since. Foreign bodies in the iris can be removed by simply making a flap section, exposing the iris, pick up the foreign body and put the iris back, as in simple extraction of cataract.

With regard to Dr. Holt’s case, I had such a case lately in which a piece of steel had penetrated through the cornea and the periphery of the lens, and with the ophthalmoscope was seen sticking in the sclerotic about three millimetres below the macula lutea. It was surrounded by a white ring, evidently the cicatrizising edges of a rupture in the retina. I did not venture to go in with a magnet and make the attempt to draw the foreign body out. There was evidently a beginning of capsulation, and I thought it safer to allow the chip of iron to stay. I took the patient to the hospital, kept him in bed two weeks watching the process, capsulation by which the foreign body was surrounded by a white substance (connective tissue). There was no inflammatory reaction, but some retinal congestion, which gradually disappeared, and the sight was very good.

Dr. E. E. Holt of Portland, Me.—Dr. Knapp’s case reminds me of one seen two or three years ago. The patient, while hammering steel, felt something strike his eye. His family physician could find no wound and the functions of the eye appeared to be normal. Several weeks after the accident the eye became painful and when seen he had suffered excruciating pain and the eye presented the appearance of a soft cataract. On removing the eye a piece of steel the size of the point of a cambric needle was found near the macula lutea on the retina, surrounded by pus the size of a pea. I can’t say that this foreign body had ever been encapsulated but certainly it would have been a good one to have left for it, so it can be said of Dr. Knapp’s case as he said of those reported, “the last of it has not been told.”
REPORT OF ONE HUNDRED AND THIRTY-SIX CASES OF CATARACT EXTRACTION, WITH REMARKS.

BY DAVID WEBSTER, M.D.,
OF NEW YORK.

I reported thirty-five cases of cataract extraction to this Society at its Nineteenth Annual Meeting, and again, in July, 1886, I reported an additional fifty cases. Since that time I have operated upon one hundred and thirty-six eyes, with uncomplicated cataract, in private and in hospital practice. Twenty of these eyes were operated upon by the method then most common, von Graefe's Method Modified; the remaining one hundred and sixteen by the Simple Method.

In performing the simple extraction, I have commonly used a speculum and fixation forceps. In most cases, the speculum was not removed until the operation was finished; in some cases it was removed as soon as the cut was made, and in a few cases no speculum was used at all, the lids being held open by an assistant. At present my feeling is in favor of removing the speculum on finishing the section. It seems to me that by so doing, we may sometimes avoid the loss of vitreous that comes from sudden spasmodic squeezing of the eye with the speculum in it. I make my cut upward, with the Graefe's knife, large enough to include a little less than half of the circumference of the cornea, all the way in the limbus or semi-transparent cornea, and completing it so as to make a slight conjunctival flap, if possible. In some cases, I have had to turn the edge of my knife forward so as to avoid wounding the iris, and so brought the apex of the cut out in the clear cornea. I dislike such a complication, as it is very likely to be followed by grooving of the wound and delayed healing, with a good deal of irritation of the eye. But it seems preferable to mutilation of the iris.

In lacerating the capsule, I have tried to avoid injuring the
iris. I have endeavored to make the opening in the capsule at the lower border of the pupil, thinking that in this way a secondary operation might sometimes be avoided.

I have usually expelled the lens by pressure on the lower border of the cornea with a tortoise-shell spoon, though sometimes I have used only pressure with my thumb upon the lower eyelid. I have in no case attempted to syringe out the remaining cortical matter. What I have failed to remove by manipulation has remained in the eye, and I am not sure that it has, in any case, given rise to bad results. It simply delays the restoration of good vision. In cases in which the iris remained in the wound after the removal of the lens was accomplished, I have endeavored to replace it by gently rubbing the upper lid of the closed eye. Where that would not restore it to its normal position, I have pushed it back with a rubber spatula. I have endeavored, in all cases, to leave the pupil clear, central, and circular.

All, or nearly all, the operations were done under cocaine, and of this a sterilized 4% solution was dropped into the eye three or four times. I like to have the cocaine dropped into the eye long enough beforehand, so that the pupil may be slightly dilated when the operation is commenced. Fifteen or twenty minutes will be sufficient.

Immediately before operating, I have washed the eyelids, inside and out, with Panas's fluid, using it very freely. All the instruments used are carefully cleansed in boiling water before and after the operation. The hands of the operator and of his assistants are washed with soap and water, and the finger nails scrupulously cleansed.

Before dressing the eye, immediately after the extraction, I first instill a drop of solution of eserine 1 gr. ad 3i. I then apply a little white vaseline to the edges of the lids to keep them from sticking together. I then apply a prepared wad of absorbent cotton over both eyes, and over that a roller bandage of the thinnest flannel. Over the flannel bandage, I apply a parallelogram of black silk lined with cotton, and with a tape at each corner, so as to make a four-tailed bandage, tied so that the knots will be at the side of the head. I let my patient sit
WEBSTER: *Cataract Extraction.*

up from the first if he desires to. Unless the patient complains of pain in the eye, or that the bandage is too tight, or in other respects uncomfortable, I do not remove it until about forty hours after the operation. If the eye is doing well, and the wound has healed, after washing both eyes, I apply clean cotton compresses, and again tie on the black silk dressing, leaving off the roller bandage. If the anterior chamber is still empty, I reapply the whole dressing as at first. In favorable cases, both eyes are kept tied up for from five to ten days. Then the cotton is left off and the lower strings of the black silk dressing cut off, so that it becomes simply a shade hanging down over the eyes. I think it important that both eyes should be kept tied up until the wound has become thoroughly healed, for if one is left uncovered, it will roll about, and the wounded eye will roll about with it, and the healing will thus be delayed.

On about the fifteenth day, or as soon as the eyes seem strong enough, the shade is removed and medium smoke coquille glasses substituted. I like to defer fitting the patient with glasses until all redness has passed off from the eye.

**VISUAL RESULTS.**

Of my twenty cases of extraction by von Graefe's method, the resulting vision was as follows:

In one eye, vision was 20/20; in two eyes, 20/40; in one eye, 20/50; in one eye, 20/70; in one eye, 20/100; in nine eyes, 20/200; in one eye, 15/200; in one eye, 10/200; in one eye, counting fingers; in one eye, perception of light; in one eye, 0.

According to the commonly accepted standard, this would give: *Successes* 15 = 75 per cent.; partial successes, 3 = 15 per cent.; failures, 2 = 10 per cent. Upon twelve of these eyes no secondary operation was performed. Five of them had one Keratonyxis each. Two of them had two needlings each. One of them had two needlings, and an Agnew's hook operation.

The patient whose final vision was ability to count fingers, had vision = 20/50 following a Keratonyxis done thirty days after the extraction. A second needling was done about three and a half months later, and was followed by increased tension.
WEBSTER: Cataract Extraction.

Under the use of eserine the vision came up to 18/200. Three weeks later a membrane was removed from the pupillary area by means of a sharp hook. The immediate result seems not to have been noted, but my recollection is, that the sight of that eye was good until nine months later, when an attack of acute glaucoma was developed during recovery from an extraction of the cataract from the other eye, and vision was reduced to counting fingers.

The case resulting in perception of light only, lost the eye by plastic iritis, or irido-cyclitis, resulting in closure of the pupil and anterior atrophy.

The patient whose vision was nil was an unruly man who tore off his bandages as often as they were replaced, and who finally died of meningitis, the result of panophthalmitis, 18 days after the operation.

Of my 116 cases of simple extraction, the resulting vision was as follows:

In eleven eyes, vision was 20/15; in fifteen eyes, vision was 20/20; in twenty-three eyes, vision was 20/30; in twenty-four eyes, vision was 20/40; in thirteen eyes, vision was 20/50; in eleven eyes, vision was 20/70; in four eyes, vision was 20/100; in five eyes, vision was 20/200; in one eye, vision was 18/200; in one eye, vision was 15/200; in two eyes, vision was 10/200; in one eye, vision was 5/200; in one eye, vision was, "sees objects"; in one eye, vision was, "perception of light"; in one eye, vision was 0; in two eyes, vision was not noted.

There were, then, 106 eyes that had vision of 20/200 and better, or successes 91%; 6 eyes that had vision from 18/200 to seeing objects, or partial successes, 5%; and 4 eyes that had vision "perception of light," or 0, or 3% failures.

The case noted as resulting in "perception of light," was one in which suppurative iritis set in, beginning at the wound, which was cauterized without arresting the disease. Closure of the pupil and a soft eyeball resulted so that any further operation seemed out of the question.

The case in which vision is noted as nil had one eye operated upon previously with excellent result. The eye that was lost did well up to the fifth day, when the wound was entirely
healed, the pupil central, circular and black, and the eye looking so well that the dressing was left off and only the black shade applied. The next day there was a good deal of redness of the eye with secretion, and on the following day well-marked purulent ophthalmia had set in, which resulted in total loss of vision.

In one of the cases in which the vision was not noted, we find a history of violent insanity setting in on the day after the operation, and the patient had to be sent away from the hospital on the third day. For aught that I know she may have recovered with a good eye, but on the whole I thought it best to class her case with the failures. In the other case, there was prolapse of the iris. This was excised, and the hospital history says she steadily improved, and she went home on the 16th day, and there are no further notes of her case; so I put her also with the failures.*

*Prolapse of iris occurred and had to be excised in five cases out of the one hundred and sixteen, or in 4%.

The actual cautery was applied in two cases, in one of prolapsed iris where excision proved to be insufficient, and in one case where suppuration of the wound occurred.

Needling of secondary membranes in the pupil was performed in fifty cases, or in 43% of all the cases.

Agniesz's hook operation was resorted to in three cases in which needling had failed.

Paracentesis was done in one case in which increased tension had developed itself. The eye recovered with good vision.

As to accidents during the operation, in two cases the iris fell before the knife and was wounded in cutting out.

In six cases there was loss of vitreous. In two of these cases the lens became dislocated, and on making pressure in the usual way the vitreous presented at the wound instead of the lens. The wire spoon was then introduced and the lens withdrawn with loss of vitreous. In one case the patient squeezed his eye and expelled the lens in its capsule, with vitreous, per saltum.

In the other three cases, the vitreous followed the lens.

* Nov. 19, 1891. This patient has had an iridectomy done since, and has recovered sufficient vision to place her among the partial successes.
while it was being pressed out in the usual way, the patient losing control and contracting his orbicularis spasmodically.

I usually instill a drop of a one per cent. solution of atropine on the third or fourth day after the extraction, experience having shown that even in cases where there is no apparent iritis, sufficient bruising of the iris may have occurred to produce adhesions to the capsule.

As to the management of prolapse of the iris occurring during recovery from the simple extraction, my experience strongly biases me in favor of early excision. I have watched the prolapse in several cases and have seen it increase day after day, the eye at the same time becoming more and more irritable until the prolapsed iris was excised, and in such cases, I have regretted that I had not cut it off when it first appeared. I once replaced it with the spatula, but it had reappeared as large as ever, when the eye was next opened, and had to be excised in the end.

It is safer to give ether for excision of prolapsed iris, as cocaine generally proves insufficient to make the operation painless, and the patient is apt to move the eye suddenly as soon as the iris is seized by the forceps, and before the scissors can be used. When cut off with the scissors without traction with the iris forceps, some iris is commonly left in the wound, and the eye heals with synechiae anterior.

ON THE OCCURRENCE, PREVENTION, AND MANAGEMENT OF PROLAPSE OF THE IRIS IN SIMPLE EXTRACTION OF CATARACT.

BY H. KNAPP, M.D.,
NEW YORK.

Iris prolapse has been the dark side of simple extraction from the time of Daviel to the present day. If, like prolapse of vitreous or suppuration, it were an accident which skill and care could reduce to a minimum, it would, though bad enough, be bearable; but it may occur in any eye, after a faultless opera-
tion, under the most careful after-treatment. It is the weak point, I may say the inherent viciousness, of the method. The Germans, von Graefe at their head, being, like all others, unable to untie this Gordian knot, solved the problem in the brutal manner of Alexander the Great, they cut the iris off. What was cut away could, of course, not fall out any more, but neighboring portions of the iris did, and what was worse, shreds of capsule and remnants of lens would, frequently enough, occupy the breach, not as a defending garrison, but as traitors facilitating the invasion of infectious micro-organisms, as is exemplified by many a case of severe irido-cyclitis, deleterious not only to the eye operated on, but also to its fellow. Those surgeons who, like the present writer, consider the simple extraction superior to the combined not only in the point of sight, but also of safety, will certainly not disregard its dark side, the liability to prolapse of the iris, but study it in all its features, in order to reduce, by prevention and treatment, its consequences to the lowest obtainable degree.

**Occurrence.**

The *frequency* of iris prolapse is stated very differently by different operations. C. S. Bull of New York and Galezowski of Paris, have reported series of operations in which they had no hernia of the iris, but quite a number of incarcerations. Other operators who report on larger statistics, give from 4% to 7% as their most favorable series. The present writer, who reported on three series of 100 simple extractions, has had 6%, 8%, and 12% severally in the different series. Unpublished are 209 successive cases of simple extraction, in which there were 7.8% of prolapse. The problem has to be studied by considering the total number of extractions which an operator has performed in a given time, the number being large enough to omit chance as an important factor. My statistics are as follows: From June 10, 1886, to Sept. 18, 1891, I have made 564 extractions of cataract, 53, *i.e.* 9.5%, with iridectomy. Of these 564 extractions 42, *i.e.* 7.4%, have been followed by prolapse of the iris. If I deduct the 53 cases in which iridectomy was made, the percentage of prolapses rises from 7.4% to 8.2%. This consideration is quite essential, for an operator who performs a large
number of extractions with iridectomy, and only the most promising cases without it, will score a brilliant prolapse record.

**Prevention.**

In answer to the question what are the means, ways, and precautions to prevent prolapse of the iris, I would, for brevity's sake, express my views in a number of rules:

1. **Make an iridectomy, when, in the particular case, all points considered, the combined method offers better chances for the restoration of sight than the simple.**

2. **Cocainize thoroughly.** Cocaine, apart from its anaesthetic effect, by reducing the tension of the eye, favors the spontaneous and artificial reduction of the iris, and counteracts one of the chief causes of prolapse, the intraocular pressure. **Make an exception in old and emaciated people,** for in them the softness of the eyeball is so much increased by the cocaine that the cornea sinks in to such a depth as to interfere with the proper coaptation and healing of the wound. During the cocainization do not forget to keep the eye closed, lest the exsiccation and blistering of the cornea dim your field of operation.

3. **Make the corneal section in the classical way of the old operators, Beer, Richter and others,** puncture and counterpuncture just above (respectively beneath) the horizontal meridian, remaining, without in the least turning the knife, in the periphery of the transparent cornea, touching, never trespassing upon, the limbus, except, perhaps, at the very apex where, by slightly turning the edge of the knife backward (Snellen), you may form a small conjunctival flap. **After long trials and watching many of the most experienced operators, I am satisfied that this section obviates prolapse more than any other and gives in general the best results.** Whenever, out of my guard, I slide back into the accustomed Græfe section, the prolapses showed themselves in greater number. A more central position of the section, on the other hand, often leads to an insufficient opening and incarceration of portions of the iris.

4. **Cleanse the pupil and anterior chamber carefully,** for remnants may produce irritation, over-secretion, and prolapse.

5. **Open the capsule by one long, horizontal incision in the upper part under the iris.** This opening admits of an easy exit
of the lens and, by preventing iritic irritation, takes away one of the causes of prolapse of the iris.

6. Avoid prolapse of vitreous and everything that ruptures the transverse (zonulo-capsular) septum of the globe, which is a protection of the wound from vitreous pressure. Removal of the capsule together with or after the exit of the lens favors prolapse of iris, and so does a rupture of the upper part of the zonula without actual escape of vitreous.

7. Carefully reduce the iris. The pupil should be round and central. Frequently the peripheric portion crowds in the sulcus of the anterior chamber, the so-called iris-angle, and is not easily stroked out. In these cases an olive-tipped repositor should be passed from the side under the opaque border of the anterior chamber, to the head of the ciliary body, and the iris stroked out toward the center of the pupil. This movement should be repeated until all crumpling of the iris has disappeared.

If it is not possible perfectly, or almost perfectly, to reduce the iris, and if the reduced iris shows a tendency to fall into the wound, the best thing to do is to make a small iridectomy, after which the carefully reduced limbs of the coloboma will no longer manifest a tendency to protrude. When the operation is completed, neither the opening and shutting of the eye, nor the movements of the globe should disturb the normal position of the iris.

8. You may use myotics, eserine or pilocarpine. I think they are useful, for frequently on opening the eye the fourth day, I still find the pupil contracted. They may have less power than was formerly ascribed to them in keeping the iris back, but neither eserine (1%) nor pilocarpine (2%) produce iritis, as far as my experience goes.

9. During the first day or two, keep the patient as quiet as is compatible with the maintenance of his general health and a reasonable allowance of comfort. Stiff plasters ought to be avoided, and, during the hot season, and with restless patients at all seasons, also the binoculus, for it loosens and displaces itself readily. The best dressing seems to be a double layer of antiseptic gauze, placed moist on the closed lids, over it absorbent cotton dipped in a corrosive sublimate solution (1-5000), the whole fastened by two or three strips of court plaster.
10. Watch the patient or tie his hands in the night, during the first five or six days. This rule is not a useless torture, for a considerable number of prolapses are of traumatic origin. Hyphæma and partial or total emptying of the anterior chamber without prolapse from touching or hurting the eye against the pillow is of frequent occurrence. Darkening of the room has no advantage.

Treatment.

During the first years of my experience with simple extraction, I left prolapses of the iris alone. The majority, the small ones, either disappeared or were skinned over and did no harm. A few of the largest damaged sight considerably by changing the curvature of the cornea. During the last year I gave the early excision of the prolapse a fair trial. The experiment has not been successful. If, on the second day, a sudden pain, lasting one-fourth or one-half hour, is reported by the patient, the eye may be opened and the prolapse removed. We then can perform a clean iridectomy and reduce the crura of the coloboma. Such cases I have seen progress without irritation. Not so when I absceded the prolapse on the third, fourth, or fifth day. In one case a large (traumatic) prolapse in an unruly patient, was removed; no reaction. The angular portion which had been left, swelled and was absceded. This was followed by purulent iritis and loss of the eye. The patient suffered from chronic conjunctivitis. A second case is still worse. A man, whose eye was found perfect on the fourth day, was mentally disturbed the next night. He wandered through the house. The next day prolapse, which was cut at once. Healing kind, clean coloboma. Three days later, patient struck his eye in the night. Incarceration of iris. Slow irido-cyclitis and in third month sympathetic iritis. Patient suffers from chronic rheumatism. A third case, a man with fluidity of the vitreous and marked scintillating synchisis whose cataract I removed with the capsule, had a small prolapse which I cut. Sight remained fair, yet in a month some iritis was noticeable in the other eye. He would not stay in the hospital during my absence, and I have not been able to see him again.*

* He returned three months later; both eyes blind by irido-cyclitis.
LIPPINCOTT: Syringing in Cataract Extraction. 85

From these experiences I conclude that it is safer to leave the prolapse alone for several weeks. If it show a tendency towards diminution, I would not interfere, if it increase or become troublesome, especially if a cystic enlargement set in, I would abscise. All the cases of abscission, except the above three, have done well, and those three are certainly not enough to condemn simple extraction. Suppuration and sympathetic ophthalmia have been observed after every method of extraction, sympathetic ophthalmia mostly after von Graefe's peripheric linear.

Simple extraction in its execution, cosmetic, and visual results, is a glorious operation even as it is now; but if, by continued efforts, we succeed in divesting it of its one weak point, the tendency to prolapse of the iris, our time and labor will indeed be well rewarded.

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ROUTINE SYRINGING OUT OF CORTICAL MATTER IN CATARACT EXTRACTION, AS ILLUSTRATED BY ONE HUNDRED CASES.

BY J. A. LIPPINCOTT, M.D.,
PITTSBURGH, PA.

In the cases reported in this paper, the syringe was employed for the removal of cortical matter, not in every instance, but as a routine measure. As a matter of fact, lavage was practised in all but the seven cases (Nos. 29, 34, 49, 56, 58, 70, and 96), in which either escape or exposure of vitreous occurred either before or immediately after the expulsion of the lens.

The first fifty-three of the series were reported in a paper read at the annual meeting of the Pennsylvania State Medical Society last year. They are included in this report partly to make it more complete, and partly because the opportunity is thus afforded of putting on record such changes in vision for the worse or better as I have had occasion to observe since the former paper was published. The remaining forty-seven cases embrace all of the extractions made in thirteen months following the preparation of the paper just alluded to.
It may be remarked that the cases which form the basis of this report were not "selected" in the usual acceptation of the term. In many of them it was evident before operation, that on account of serious changes in the fundus, the sight could be but slightly improved. In point of fact the only cases rejected were those in which there was no light perception, or in which an essentially destructive process of an inflammatory type, such as irido-choroiditis or irido-cyclitis, was present, or in which there was limitation of the visual field manifestly due to some intraocular growth or to detachment of the retina. Marked changes of an atrophic character in the optic nerve, choroid, or retina do not, in my judgment, constitute a sufficient reason for denying to our patients the chances of an operation; and recent experience tends to show that persistent transparency of the cortical layers of the lens does not seriously militate against a successful result.

In reference to the mode of operating, a preliminary iridectomy, generally downward, had been made in every case. The portion excised from the iris involved little more than the width of the sphincter pupillae except in those cases which responded sluggishly or imperfectly to a mydriatic. In these an amplecoloboma had been secured.

In proceeding to the extraction, after careful cleansing of the instruments and of the eye and its neighborhood, an incision was made embracing from two-fifths to one-half of the corneal periphery, but lying wholly in clear corneal tissue. Laceration of the capsule was effected in a majority of the cases with the ordinary cystotome. In a number of instances, owing to the ease with which the lens is sometimes dislocated in this step of the operation, especially when the capsule is tough or the zonule weak, I used a cystotome made in the form of a minute razor. This instrument, although not open to the objection just alluded to, I have now discarded because it is difficult with it to make the laceration as complete as desirable, and I am persuaded that a free capsulotomy ranks in importance only next to a generous corneal incision. At present, I employ a cystotome which, while not exercising traction on the lens, as does the ordinary instrument, projects at the point sufficiently
to counterbalance the curvature of the lens, and so will cut from one edge of the latter to the other.

The nucleus was expelled by pressure exerted by means of the thumb applied to the edge of the upper lid (the incision being in general downward). Cortical debris was removed by lavage, no manipulation of the cornea being resorted to for this purpose. The fluid used was a boric acid solution, from 2 to 4 grains to the ounce, made with distilled water, and carefully boiled and filtered. Of this solution a quantity varying from two drachms to two or three ounces was allowed to run into the anterior chamber and out again, the nozzle being meanwhile moved gently from one end of the incision to the other. "In general," I take the liberty of quoting from the former paper, "the anterior chamber was thus rapidly cleared; but in some cases, in which small masses clung tenaciously to the margin of the pupil, the point of the nozzle was pushed on until actual contact, aided by the continuous flow, dislodged the mass which now rapidly escaped. . . . After having examined the wound to make sure that no portion of iris or remnant of capsule had insinuated itself between the lips, the whole eye was finally flushed with the solution, a drop of atropine was instilled, and a cheese-cloth pressure bandage applied.

Detailed reports of the cases, including all information in regard to them accessible up to this writing, are presented in the following table:

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<tbody>
<tr>
<td>Miss C. F., 55; good.</td>
<td>Hard, mature, normal.</td>
<td>Oct. 23. Irrigation by means of pipette used in Case No. 1; smooth; 12 days.</td>
<td>February 12, 1889. + 12 = 1 cy. hor. S. = - XL February 13, 1890. + 12 = 330 March 19, 1891. 20 Capsule wrinkled.</td>
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### TABLE I.—CONTINUED.

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<td>3</td>
<td>Mrs. R. U., 57; good.</td>
<td>Hard, mature, normal.</td>
<td>Oct. 25. Smooth; 11 days.</td>
<td>January 11, 1889. + 5.5 + 2.5 cy. 18° S. = 20 xxx</td>
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<td>March 4, 1889. + 13 D. S. = -- xx</td>
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<td>4</td>
<td>A. McC, 72; good. Family history of mental derangement.</td>
<td>Hard, mature, normal.</td>
<td>Nov. 15. Anterior chamber irritated with specially devised syringing; 28 hours after operation patient was discovered walking about the hospital with bandages off; delirious for 24 hours; smooth; 12 days.</td>
<td>January 24, 1888. + 9 D. S. = 20 LXXX Media clear. Optic nerve atrophic.</td>
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<td>5</td>
<td>Mrs. C. J., 66; feeble.</td>
<td>Hard, mature, projection not very good.</td>
<td>Dec. 12. Cornea flabby and wrinkled after incision; smooth; 10 days.</td>
<td>March 3, 1889. + 11 + 1.5 cy. hor. S. = 20 xxx</td>
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<td>7</td>
<td>Mrs. A. C., 64; feeble. Decided mental hebetude.</td>
<td>Hard, mature, apparently normal.</td>
<td>Feb. 15, 1889. After irrigation found posterior capsule quite opaque; removed opaque capsule through a small corneal incision on April 24; 19 days.</td>
<td>March 26, 1889. + 12.5 S. = 20 LXXX September 2, 1891. S. = 20 LXXX Capsule opaque.</td>
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<td>8</td>
<td>P. D., 58; good.</td>
<td>Hard, mature, normal.</td>
<td>March 1. Smooth; 10 days.</td>
<td>May 11, 1890. First appearance since operation. He says he could see to read the &quot;newspaper through even by lamplight&quot; without glasses for 8 months after the operation. In Nov., 1889, he received a violent blow on the eye, and has not seen well since, though he is able to work. To-day 20 S. = -. No glass helps. Large posterior staphyoma; media clear.</td>
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<td>9</td>
<td>F. B., 55; good.</td>
<td>Complicated; partly transparent; always near-sighted; normal.</td>
<td>March 1. Syringe brought out considerable quantity of soft cortex; smooth; 10 days.</td>
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<td>No.</td>
<td>Name, Age, General Health</td>
<td>Quality of Cataract, Functional Examination</td>
<td>Operation, Incidents, Course of Healing Process, Duration of Treatment</td>
<td>Resulting Vision</td>
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<td>10</td>
<td>Mrs. W. M., 62; feeble.</td>
<td>Hard, hypermature, projection poor.</td>
<td>March 15. Smooth; 12 days.</td>
<td>May 25, 1889, 8</td>
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<td>+ 10 S. = −</td>
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<td>Media perfectly clear; pronounced atrophy of disk. Sept. 3, 1889,</td>
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<td>S. = 15 c</td>
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<td>Feb. 25, 1891. −</td>
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<td>Capsule wrinkled.</td>
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<tr>
<td>13</td>
<td>Mrs. J. L., 64; good.</td>
<td>Hard, mature, normal.</td>
<td>April 2. Considerable cortical remains; small masses persistently adhered to pupil margin, and detached by touching with syringe nozzle; smooth; 14 days.</td>
<td>May 23, 1889.</td>
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<td>With + 1.0 + 1.5 cy. 50</td>
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<td>+ 20 S. = −</td>
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<td>Mch. 6, 1890. Cannot see so well; has been very ill for several weeks. S. = −</td>
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<td>Capsule slightly wrinkled; discussion, May 14, 1890. + 10 + 1.5 cy. hor.</td>
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<td>+ 20 S. = −</td>
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<td>Slight opacity of capsule remains.</td>
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<td>+ 9 + 3 cy. 80</td>
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<td>+ 20 S. = −</td>
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<td>15</td>
<td>S. I., 70; good.</td>
<td>Hard, mature, normal.</td>
<td>May 9. Smooth; patient became delirious 12 hours after operation, and remained so about 24 hours; 16 days.</td>
<td>July 7, 1889.</td>
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<td>+ 10.5 S. = −</td>
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<td>Jan. 14, 1891. −</td>
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<td>Capsule opaque.</td>
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<td>Sept. 21, 1891. Discussion.</td>
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<td>16</td>
<td>S. W., 38.</td>
<td>Soft, traumatic; extensive anterior synchiae.</td>
<td>May 10. Iritisomy with De Wecker's scissors; soft lens tissue removed with syringe.</td>
<td>July 1, 1889.</td>
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<td>+ 11 S. = −</td>
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<td>Some opacity of capsule.</td>
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<td>16</td>
<td>Mrs. S. B., 65; fair.</td>
<td>Hard, mature, normal. (Other eye enucleated after cataract operation by another surgeon.)</td>
<td>July 9. Smooth; 12 days.</td>
<td>January 9, 1890.</td>
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<td>+ 11 D. S. = 40</td>
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<td>XXX.</td>
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<td>+ 10 D. S. = 40</td>
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<td>XXX.</td>
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<tr>
<td>18</td>
<td>Mrs. S., 74; good.</td>
<td>Cat. lactea good.</td>
<td>Oct. 6. Cornea collapsed after incision. Lens matter like whey; small nucleus; smooth; 16 days.</td>
<td>November 12, 1889.</td>
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<td>+ 10 D. S. = 40</td>
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<td>+ 11 Ù + 2 cy. 170</td>
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<td>S. = 40</td>
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<td>20</td>
<td>M. V., 60; good.</td>
<td>Fundus reflex good through periphery 2</td>
<td>Oct. 12. After expulsion lens remarkably transparent at margins, clear lens matter easily syringed out; smooth; 10 days.</td>
<td>November 16, 1889.</td>
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<td>S. = 40</td>
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<td>+ 11 Ù + 2.5 cy. hor.</td>
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<td>oc projection normal.</td>
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<td>Sept. 30, 1890.</td>
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<td>Horizontal wrinkle in capsule across center of pupil.</td>
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<td>21</td>
<td>W. B., 49; good.</td>
<td>Right eye. Soft, mature, normal.</td>
<td>Dec. 3. Cortical abundant; syringed more than 2 ounces boric solution into chamber; smooth; 11 days.</td>
<td>December 30, 1889.</td>
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<td>+ 5 Ù + 3 cy. hor.</td>
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<td>22</td>
<td>J. A. D., 56; feeble.</td>
<td>Hard, mature, normal. (Other eye removed for irido-cyclitis after cat. extraction by another operator.)</td>
<td>Dec. 6. Operation clean and satisfactory. Night of eighth day struck his eye during sleep; mild attack of iritis, which yielded to treatment in a few days; 15 days.</td>
<td>January 9, 1890.</td>
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<td>+ 6 Ù + 3 cy. hor.</td>
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<td>April 17, 1890.</td>
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<td>+ 7 Ù + 5 cy. vert.</td>
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<td>July 7, 1891.</td>
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<td>+ 11 + 2.5 cy. hor.</td>
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<td>April 8, 1890. Discision of capsule.</td>
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<td>May 26, 1890.</td>
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<td>+ 11 + 2 cy. hor. S.</td>
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<td>Sept. 11, 1891.</td>
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<td>+ 11 + 2 cy. hor.</td>
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<td>+ 11 + 2 cy. 1380</td>
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<td>25</td>
<td>Mrs. F. G., 54; good.</td>
<td>Soft, hyper-mature, normal.</td>
<td>Dec. 16. Capsule very opaque, except small point below; smooth; 17 days.</td>
<td>April 23, 1890.</td>
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<td>+ 8 S. = —</td>
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<td>Media absolutely clear; nothing abnormal in fundus. Says he “can see as well as ever he did in his life.”</td>
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<td>+ 9 + 2 cy. 1760</td>
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<td>Oct. 30, 1890.</td>
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<td>Atrophy of disc.</td>
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<td>29</td>
<td>P. V. J., 53; good.</td>
<td>Completely fluid; good.</td>
<td>Jan. 1, 1890. On using cystotome liquid lens matter gushed out, followed by vitreous, which was also fluid; syringing not used; healing slow; 23 days.</td>
<td>March 14, 1890.</td>
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<td>+ 8.5 + 2 cy. 860</td>
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<td>30</td>
<td>E. D., 56; good.</td>
<td>Soft, mature, not tested.</td>
<td>Jan. 1. Operation satisfactory; irritation ninth day from exposure to a cold draught; recovery in 12 days. Jan. 35th another attack from same cause; recovery in two weeks. For safety retained in hospital till 54th day. No synechia.</td>
<td>March 18, 1890.</td>
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<td>+ 9 + 1.75 cy. hor.</td>
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<td>Media clear; nerve decidedly atrophic; pupil free.</td>
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<td>S. = 20.</td>
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<td>32</td>
<td>G. W. L., 48; good.</td>
<td>Soft, mature.</td>
<td>Jan. 4. Operation satisfactory. Jan. 5, 24 hours after operation, found patient with bandage off; eyes re-bandaged. Two hours later patient again removed bandage, stole out of hospital and went to his home four miles away, walking much of the distance; 1 day.</td>
<td>April 23, 1890. +11 + 1 cy. vert.</td>
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<td>S. = 20.</td>
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<td>33</td>
<td>Miss M. S., 40; good.</td>
<td>Soft, hyper-mature.</td>
<td>Feb. 11. Nucleus 5 mm. in diameter; cortex liquid; smooth; 9 days.</td>
<td>February 24, 1890. +8 D. S. = 20</td>
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<td>Capsule clear.</td>
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<td>Floating opacities in vitreous.</td>
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<td>34</td>
<td>T. R., 76; good.</td>
<td>Hard, hyper-mature (7 years old), normal.</td>
<td>Feb. 22. Vitreous escaped with lens; syringes not used; smooth; 11 days.</td>
<td>April 24, 1890. +11 + 1 cy. hor.</td>
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<td>S. = 20.</td>
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<td>35</td>
<td>Mrs. A. J., 74.</td>
<td>Right eye. Hard, mature, normal.</td>
<td>Feb. 22. Operation satisfactory, though patient was very restless and almost unmanageable; smooth; 16 days.</td>
<td>March 31, 1890. +11 S. = 20</td>
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<td>Capsule transparent.</td>
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<td>Oct. 20, 1890. S. = xx</td>
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<td>S. = LXX</td>
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<td>36</td>
<td>P. G., 54; good.</td>
<td>Soft, mature, normal. (Stricture nasal duct treated before operating on cataract.)</td>
<td>Feb. 28. Smooth; 13 days.</td>
<td>April 15, 1890. +9 + 1 cy. hor.</td>
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<td>S. = 20.</td>
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<td>37</td>
<td>A. K., 68; fair.</td>
<td>Hard, hyper-mature, projection poor. Other eye, light perception extremely feeble.</td>
<td>March 4. Patient nearly completely deaf and of feeble intelligence; eyeball rolled incessantly, still operation was completed pretty satisfactorily; but before the bandage was applied patient suddenly and violently snapped his eyelids together, rupturing capsule or zonule, and forcing fluid vitreous from the wound. Healing process smooth; 16 days.</td>
<td>March 20, 1890. S. = light perception; vitreous muddied; very small retinal detachment below and outward.</td>
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<td>38</td>
<td>Mrs. M. E. W., 35; good.</td>
<td>Right eye. Soft, hyper-mature (6 years), normal.</td>
<td>March 11. Much cortical syringed out; 11 days.</td>
<td>April 26, 1850. + 7.5 + 3.5 cy. 80</td>
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<td>39</td>
<td>W. B., 49; good.</td>
<td>Left eye. Soft, mature, normal.</td>
<td>March 26. Abundant cortical syringed out; smooth; 11 days.</td>
<td>May 9, 1850. + 6 + 2.25 cy. 172</td>
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<td>40</td>
<td>E. G., 61; good.</td>
<td>Complicated, hyper-mature, corneal opacities from old ulcers.</td>
<td>March 27. Healing rather slow; 13 days.</td>
<td>April 18, 1850. + 11 + 3.5 cy. hor.</td>
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<td>41</td>
<td>Mrs. L. L.</td>
<td>Hard, mature, normal.</td>
<td>April 4. Opaque capsule left. Apl. 9, mild attack of iritis, with no pain, and but slight congestion; pupil good size, but small synchia at upper part.</td>
<td>April 24, 1850. + 10 + 1.5 cy. hor.</td>
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<td>May 12, 1850. + 9.5 + .5 cy. hor.</td>
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<td>Sept. 14, 1851.</td>
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<td>O. D. + 10. S. = — — — — — —</td>
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<td>42</td>
<td>J. V., 38; feeble.</td>
<td>Left eye. Opaque in center, but translucent in periphery. Duration many years. Right eye in 1856 showed incipient cataract and marked signs of old choroiditis.</td>
<td>April 6. Left eye. Nucleus small; syringed out large quantity of transparent cortical; smooth; 9 days.</td>
<td>June 7, 1850. + 13 + 1 cy. hor.</td>
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<td>43</td>
<td>W. H., 52; good.</td>
<td>Soft, mature, normal.</td>
<td>April 6. In using cystotome this instrument, acting as a hook, tore off anterior capsule, leaving it attached just inside of wound; nucleus small; large quantity of cortical syringed out; finally, reflected anterior capsule removed with iris foresep; smooth; 9 days.</td>
<td>May 13, 1850. + 9 + 1.25 cy. hor.</td>
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<td>June 20, 1850. + 11 = — — — — — —</td>
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<td>44</td>
<td>J. G., 70; good.</td>
<td>Hard, partly transparent; no change for several months; normal.</td>
<td>April 8. Smooth; 9 days.</td>
<td>April 26, 1890. + 10 + 1.25 cy. hor. 20 S. = --- XL Capsule perfectly clear; several small brownish patches on retina in macular region. July 1, 1890. + 10.5. S. = --- XXX Jan. 5, 1891. S. = 20 LX Sept. 2, 1891. Discussion. Sept. 8, 1891. S. = 20 XL</td>
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<tr>
<td>45</td>
<td>Mrs. A. M., 65; good.</td>
<td>Hard, mature; projection poor; patient greatly addicted to alcohol.</td>
<td>April 8; smooth; 11 days.</td>
<td>April 25, 1890. + 10 S. = --- LX Media perfectly clear; decided bluish atrophy of disk. Sept. 3, 1891. + 10. S. = --- C Capsule opaque.</td>
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<td>46</td>
<td>A. K. E., 64; good.</td>
<td>Cat. lactea; duration at least 10 years; normal</td>
<td>April 11. The instant cystotome touched capsule, most of lens spurted out in shape of thin whey-like fluid; nucleus 3 mm. in diameter, retreated into upper part of chamber, but was slowly caused down by manipulating upper lid; pupil made jet black instantaneously by use of syringe; smooth; 9 days.</td>
<td>May 6, 1890. + 9 S. = --- XX</td>
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<td>47</td>
<td>J. C., 60; feeble.</td>
<td>Hard, mature, normal.</td>
<td>April 14. Eye well in a week; patient attacked with bronchitis on eighth day. Discharged cured ten days later.</td>
<td>May 12, 1890. + 10 + 1 cy hor. 20 S. = --- + XL</td>
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<tr>
<td>48</td>
<td>Mrs. M. C., 82; very feeble in body and mind.</td>
<td>Hard, mature, doubtful. Other eye, no light perception.</td>
<td>April 16. Operation satisfactory, and everything favorable till twelfth day, when slight congestion appeared with a burning sensation, but no pain. Eight days later eye clear and pupil large, but a slight adhesion at upper papillary margin; 20 days.</td>
<td>May 31, 1890. 10 D. S. = --- Media perfectly clear; nerve markedly atrophic.</td>
</tr>
<tr>
<td>No.</td>
<td>Name, Age, General Health</td>
<td>Quality of Cataract, Functional Examination</td>
<td>Operation, Incidents, Course of Healing Process, Duration of Treatment</td>
<td>Resulting Vision</td>
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<td>49</td>
<td>Mrs. L. M., 61; not good</td>
<td>Hard, hypermature, normal</td>
<td>April 19. Incision completed with more than usual care, and without dragging; lens came well forward. On gently introducing cystotome, lens retreated upward. A little tentative expulsive movement caused vitreous to appear in wound. With wire scoop delivered cataract, which was large and very hard and dark; small bead of vitreous escaped; syringe not used; 15 days.</td>
<td>May 14, 1890. + 11 + 1 ey. hor. S. = — xx Dec. 15, 1890. 20 S. = — XL Capsule slightly wrinkled. Health very feeble.</td>
</tr>
<tr>
<td>50</td>
<td>Mrs. M. C., 62; fair</td>
<td>Nucleus and posterior capsule opaque; other parts of lens translucent; condition stationary for years; very poor projection; eye never good.</td>
<td>April 21. Sockets remarkably deep. Patient greatly agitated; eyes rolling constantly. Lens on being expelled was quite large and quite translucent, except in center and at posterior pole. Syringe not used with usual freedom on account of nervousness of patient. Slight catarhal conjunctivitis in both eyes; 8 days.</td>
<td>May 11, 1890 + 8. S. = — Lower half of capsule clear. Part just above center opaque; floating opacities in vitreous. Large patch of atrophy of choroid below and to outer side of macular region. June 8, 1891. + 5. S. = — Sept. 21, 1891. 20 S. = — (estimated.)</td>
</tr>
<tr>
<td>51</td>
<td>H. B. S., 75; good</td>
<td>Hard, partly translucent; stationary; good.</td>
<td>April 28. Lens on expulsion amber colored, but transparent in periphery. Some cortex left in chamber, easily and quickly expelled by syringing; 8 days.</td>
<td>May 26, 1890. + 8 + 3.5 ey. hor. S. = — xx</td>
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## TABLE I. — Continued.

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<td>54</td>
<td>Mrs. M. C., 52; fair.</td>
<td>Lens very transparent, except in the posterior layers in the center. Projection not good.</td>
<td>May 26, 1890. Smooth; 8 days.</td>
<td>Sept. 30, 1890.</td>
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<td>O. D. — 2 cy. vert. =</td>
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<td>Some floating opacities in vitreous. Large patches of atrophy of choroid.</td>
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<tr>
<td>55</td>
<td>A. R., 71; very poor.</td>
<td>R. E. Soft. Normal.</td>
<td>May 26, 1890. Nucleus very small. Very large amount of cortical left in eye, which was quickly washed out with syringe; smooth; 8 days.</td>
<td>June 15, 1890.</td>
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<td>+ 6 + 7 cy. hor.</td>
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<td>S. = xxx</td>
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<td>July 7, 1890.</td>
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<td>+ 9 + 3 cy. hor.</td>
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<td>S. = -- xx</td>
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<tr>
<td>56</td>
<td>G. T., 64; very poor.</td>
<td>R. E. Lens transparent in periphery.</td>
<td>May 26, 1890. On endeavoring to expel lens, vitreous presented in wound; removed with wire scoop; did not use syringe; 9 days.</td>
<td>June 26, 1890.</td>
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<td></td>
<td></td>
<td>Projection doubtful.</td>
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<td>+ 10 + 1 cy. hor.</td>
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<td>S. = -- lx</td>
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<td>Lids catarhal, and marked piosis. L. E.</td>
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<td>+ 11 + 1 c. hor.</td>
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<td>perished from irido-cycitis, after operation by another surgeon.</td>
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<td>S. = -- xx</td>
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<td>Slight opacity of capsule.</td>
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<td>58</td>
<td>J. C., 61; very poor; general eczema.</td>
<td>L. E. Soft. Projection poor.</td>
<td>June 12, 1890. On attempting to expel lens some soft cortical came out. In continuing pressure nucleus became rotated and vitreous presented. Lenses delivered with wire scoop, followed by three or four drops of semi-fluid vitreous. Syringe not used; 14 days.</td>
<td>Oct. 7, 1890.</td>
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<td>S. with + 7 = —</td>
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<td>Media almost quite clear. Very marked atrophy of optic nerve.</td>
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<td>59</td>
<td>D. R., 65; good.</td>
<td>L. E. Hard, mature; fair.</td>
<td>June 13, 1890. Some difficulty in dislodging the lens; smooth; 11 days.</td>
<td>Sept. 16, 1890.</td>
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<td>+ 9. S. = --</td>
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<td>XL Slight opacity of capsule.</td>
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<tr>
<td>60</td>
<td>J. R. S., 55; fair.</td>
<td>R. E. Soft; good.</td>
<td>June 12, 1890. Some little cortical came out before the lens. Nucleus about 7 mm. in diam.; 12 days.</td>
<td>July 8, 1890.</td>
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<td>+ 11 + 5 cy. hor.</td>
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<td>S. = -- xx</td>
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<tr>
<td>61</td>
<td>Mrs. A. H., (colored) 77; good.</td>
<td>L. E. Hard, ripe. Doubtful.</td>
<td>June 12, 1890. Patient excessively restless, eyes rolling incessantly, cornea small, incision therefore made larger than usual. Considerable hard cortical matter left after expulsion of the nucleus. On endeavoring to remove the corneal matter, some thin vitreous escaped; syringes not used; 18 days.</td>
<td>Vision = 1 1/2</td>
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<td>Pupil occluded. Light perception good, eye perfectly quiet. To make an iridectomy and hope for good result.</td>
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<tr>
<td>62</td>
<td>T. G. C., 82; good.</td>
<td>L. E. Hard, ripe. Normal.</td>
<td>Sept. 25, 1890. Very satisfactory. On the 29th iritis, which lasted three weeks. Three weeks after operation glaucoma developed in right eye. Operation on that eye not deemed advisable on account of the age of the patient and his feeble condition, and because this eye was naturally poor. The trouble yielded pretty promptly to eserine; 5 weeks.</td>
<td>Nov. 12, 1890.</td>
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<td>+ 10 —?</td>
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<td>Sept. 14, 1891.</td>
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<td>+ 10. S. = —</td>
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<td>Capsule slightly opaque. States in a note that he reads a good deal.</td>
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<td>+ 11 + 1 c. vert.</td>
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<td>+ 10. S. = —</td>
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<td>+ 12. S. = —</td>
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<tr>
<td>66</td>
<td>J. W. H., 49; good.</td>
<td>R. E. Soft, ripe, good. Left eye-ball flattened, and cornea entirely opaque, as result of cataract operation by another surgeon. Has been a very hard drinker.</td>
<td>Oct. 4, 1890. Smooth; 12 days.</td>
<td>Nov. 29, 1890.</td>
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<td>+ 11 = —</td>
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<td>July 25, 1891. With his glasses + 11.5.</td>
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<td>20</td>
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<td>S. = —</td>
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<td>With + 14, readily reads 0.37 at sixteen inches, and also from that to nine inches, so that he has an accommodation corresponding to seven inches.</td>
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Oph.—7
### TABLE I.—Continued.

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<tr>
<td>67</td>
<td>J. S., 81; good.</td>
<td>R. E. Hard. Hyper-mature. Good. Left eye traumatic cataract 10 years duration, and probably foreign body in eye.</td>
<td>Oct. 6, 1890. Lens came out, leaving very little cortical, but could not count fingers, owing to complete collapse of cornea. After syringing could see well; smooth; 10 days.</td>
<td>Nov. 12, 1890. S. = + 11. = xxx July 20, 1891. + 11. = LXX Capsule slightly opaque. July 21, 1891. Discussion. Sept. 4, 1891. + 11. = LX</td>
</tr>
<tr>
<td>68</td>
<td>Mrs. W. H., 67; good.</td>
<td>R. E. Morgagnian; duration 7 years. Projection good.</td>
<td>Oct. 8, 1890. Lens entirely liquid, except an amber-colored nucleus 4 mm. in diameter, after removal of which pupil appeared black, but could not count fingers. After syringing, sight good; 9 days.</td>
<td>Nov. 13, 1890. + 8. + 1 c. hor. S. = XXX</td>
</tr>
<tr>
<td>69</td>
<td>W. H., 79; good.</td>
<td>R. E. Hard, ripe; normal.</td>
<td>Oct. 23, 1890. Smooth; 8 days.</td>
<td>Nov. 20, 1890. + 11. S. = XXX</td>
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<td>73</td>
<td>Mrs. J. B., 69; good.</td>
<td>L. E. Hard. Hyper-mature, normal.</td>
<td>Dec. 13, 1890. After incision some blood appeared in ant. chamber, which was syringed out before the cystotomy; smooth; 12 days.</td>
<td>April 2, 1891. + 7.5 + 2 c. hor. 20 S. = XL</td>
</tr>
<tr>
<td>75</td>
<td>Mrs. M. R., 71; very poor.</td>
<td>R. E. Hard. Ripe. Not good.</td>
<td>Jan. 13, 1891. Ether administered because patient was so restless during the preliminary iridectomy; smooth; 13 days.</td>
<td>March 30, 1891. 20 + 10. = LXX Media entirely clear, except a small flock of capsule in upper part which was out of line of vision. Atrophy of optic nerve.</td>
</tr>
<tr>
<td>80</td>
<td>Mrs. J. G., 71; very poor, especially since an attack of La Grippé.</td>
<td>L. E. Hard. Ripe. Normal.</td>
<td>Feb 11, 1891. After corneal section anterior chamber filled with blood, which was thoroughly removed with syringe. When lens was half way out bleeding recurred, filling up ant. chamber again. Syringe again used, removing all of the blood but a slight film. A portion of this film was removed with smooth forceps. On re-introducing forceps to grasp the rest, the posterior capsule ruptured and 1 dram fluid vitreous escaped. Healing slow; 20 days.</td>
<td>April 24, 1891. 20 + 11.5 = = XX Sept. 8, 1891. + 9. + 3. c. hor. 20 S. = + XXX With + 13. + 2.5 cy. hor. reads '37 at 12 inches.</td>
</tr>
<tr>
<td>No.</td>
<td>Name, Age, General Health</td>
<td>Quality of Cataract, Functional Examination</td>
<td>Operation, Incidents, Course of Healing Process, Duration of Treatment</td>
<td>Resulting Vision</td>
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<td>84</td>
<td>P. D., 61; not good. Is a very hard drinker.</td>
<td>R. E. Hard. Ripe; normal.</td>
<td>April 4, 1891. Smooth; 10 days.</td>
<td>Sept. 2, 1891. + 11. S. = — XXX</td>
</tr>
<tr>
<td>No.</td>
<td>Name, Age, General Health</td>
<td>Quality of Cataract, Functional Examination</td>
<td>Operation, Incidents, Course of Healing Process, Duration of Treatment</td>
<td>Resulting Vision</td>
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<td>+ 7. = 1. 170°</td>
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<td>S. = LXX</td>
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<td>Sept. 2, 1891.</td>
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<td>S. = c</td>
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<td>A month ago fell out of a bogy striking on his forehead, and losing consciousness for a little while. Since that &quot;has seen black spots&quot; before left eye, and sight not so good. Media absolutely clear. Disc presents a grayish-white color, and capillary circulation poor.</td>
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<td>+ 3. = 4. + c. 20</td>
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<td>S. = LX</td>
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<td>Media quite clear. Large conus down and out. Disc whitish. Retinal vessels below normal size.</td>
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<td>91</td>
<td>J. H., 40; good</td>
<td>Traumatic. A foreign body had been removed from anterior chamber. Apr. 3, '90.</td>
<td>April 13, 1891. After corneal incision patient violently shut the eye, expelling the lens, but leaving behind some cortical, which was removed with the syringe.</td>
<td>May 16, 1891.</td>
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<td>+ 6. = LX</td>
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<td>Slight capsular opacity.</td>
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<td>+ 10. = 1.5. 20</td>
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<td>S. = LX</td>
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<td>July 24, 1891.</td>
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<td>+ 9. S. = LXX</td>
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<td></td>
<td>Oblique linear opacity in capsule.</td>
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<tr>
<td>94</td>
<td>Mrs. M. R., 94; good</td>
<td>Hard. Ripe. Normal.</td>
<td>June 30, 1891. Satisfactory. Mild attack of iritis began on 4th day, due to getting up on 3d day and making a general inspection of her house,—walking over uncarpeted floors in her bare feet. Recovery in 12 days.</td>
<td>Sept. 9, 1891.</td>
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<td>+ 11. S. = 20</td>
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<td>Slight central opacity of capsule. Two small post. synechiae above. Pupil large.</td>
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### TABLE I.—CONTINUED.

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<tr>
<th>No</th>
<th>Name, Age, General Health</th>
<th>Quality of Cataract, Functional Examination</th>
<th>Operation, Incidents, Course of Healing Process, Duration of Treatment</th>
<th>Resulting Vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>C. S., 65; good.</td>
<td>L. E. Opaque in center, but pretty clear in periphery. Duration 3 or 4 years. Vision 15 = inches. cc Normal.</td>
<td>June 30, 1891. Satisfactory; 8 days.</td>
<td>Sept. 1, 1891. + 11. xxx</td>
</tr>
<tr>
<td>96</td>
<td>Mrs. T. J., 70; good.</td>
<td>R. E. Morgagnion. Pupil small. Both direct and indirect reflexes sluggish. Poor.</td>
<td>July 3, 1891. On attempting clysotomy capsule proved very tough, and lens was slightly dilacerated; came out in capsule, followed by a drop of fluid vitreous; syringes not used. Healing slow; 10 days.</td>
<td>July 16, 1891. + 9 + 2 c. cy. hor. LXXX Sept. 15, 1891. + 10. + 2, c. cy. hor. S. = 20 xxx</td>
</tr>
<tr>
<td>97</td>
<td>S. P., 68; poor; drinks hard.</td>
<td></td>
<td>July 6, 1891. Smooth; 10 days.</td>
<td>Sept. 5, 1891. + 10. + 1, c. hor. S. = 20 xxx</td>
</tr>
<tr>
<td>100</td>
<td>W. S., 60; poor.</td>
<td>L. E. Hard. Ripe. Only moderately good. Right eye media perfectly clear, but vision limited to light perception, owing to extreme atrophy of optic nerve.</td>
<td>July 10, 1891. Smooth Iritis developed on sixth day, leaving broad adhesions to capsule, but pupil of good size.</td>
<td>Sept. 15, 1891. + 10. + 2, c. vert. S. = 20 LXX Nerves in both eyes atrophic, and both fields decidedly limited.</td>
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TABLE II.—SUMMARY OF VISUAL RESULTS.

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<td>20</td>
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<td>20</td>
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<tr>
<td>XII</td>
<td>1 case.</td>
<td>14 cases.</td>
<td>3 cases.</td>
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<tr>
<td>XV</td>
<td>3 cases.</td>
<td>15 &quot;</td>
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<tr>
<td>XX</td>
<td>9 &quot;</td>
<td>6 &quot;</td>
<td>10</td>
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<td>XX-</td>
<td>7 &quot;</td>
<td>4 &quot;</td>
<td>2 cases.</td>
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<tr>
<td>XXX</td>
<td>25 &quot;</td>
<td>8 &quot;</td>
<td>Occluded pupil 1 case.</td>
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<td>Total, 100 cases.</td>
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<td>0 1 case.</td>
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To the cases showing an unfortunate termination must be added a case of *suppurative panophthalmitis* which followed a preliminary iridectomy, and which shall be referred to again. So that if the case stated as resulting in occlusion of the pupil be considered a failure, as it may turn out to be, the losses occurring during the period of the performance of the 100 cases reported amount to 3 per cent.

The mere statement of visual results is not specially instructive without some attempt at an explanation of the conditions under which, in each case falling below a certain standard, those results were reached. An explanation, it is true, is not always possible. In the routine of office practice we sometimes observe cases of subnormal acuity of sight which cannot be accounted for by any abnormality in the refracting media or in the fundus; and aphakial eyes do not in this respect differ from eyes with perfect crystalline lenses. But such inexplicable cases are exceptional, and they do not materially detract from the value of the statistics. In reference to the standard adopted, it may be assumed that vision amounting to $\frac{20}{X^L}$ which permits of the reading of ordinary print, is sufficiently good to pass without explanation; whereas it seems equally clear that if the sight is only $\frac{20}{LX}$ or less, statistical completeness demands some effort to explain the visual imperfection. The following table is the result of such an effort applied to the less completely suc-
cessful cases of cataract extraction now reported. "Escape of vitreous" is given in the table as one of the causes, not because it is a satisfactory explanation, but because there seemed to be no other.

**TABLE III.—SUMMARY OF CASES OF S. = \( \frac{20}{LX} \) AND UNDER, WITH CAUSES.**

<table>
<thead>
<tr>
<th>VISION</th>
<th>Capsule Clear</th>
<th>Capsule Opaque</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 LX</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>20 LXX</td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>20 LXXX</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20 c</td>
<td>2</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>20 c</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>15 cc</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10 cc</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

**Secondary Operations.** — From the above table it will be seen that in 18 cases capsular opacity sufficient to reduce the vision below \( \frac{20}{xL} \) was found at the last examination made. These include 4 cases which underwent a more or less unsuccessful secondary operation. In all, discission for wrinkling or opacity of the capsule was performed in 11 cases with the results stated below.
**Lippincott**: *Syringing in Cataract Extraction*. 105

**Table IV.—Discisions for Opaque Capsule.**

<table>
<thead>
<tr>
<th>No.</th>
<th>No. of Case</th>
<th>Primary Vision</th>
<th>Time after Extn.</th>
<th>Time of disc'n after Extn.</th>
<th>Final vision and time after discission</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>20 3 weeks. CC</td>
<td>20 11 mos.</td>
<td>20 14 days. XL</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>20 9 weeks. XX</td>
<td>20 13 mos.</td>
<td>20 8 days. XL</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>20 4 mos. XX</td>
<td>20 28 mos.</td>
<td>20 11 days. LK</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>22</td>
<td>20 5 mos. LX</td>
<td>20 19 mos.</td>
<td>20 4 days. XXX</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>23</td>
<td>20 3 mos. XXX</td>
<td>20 5 mos.</td>
<td>20 10 days. LX</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>32</td>
<td>20 5 mos. LX</td>
<td>20 17 mos.</td>
<td>20 6 days. XL</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>44</td>
<td>20 9 weeks. XXX</td>
<td>20 19 mos.</td>
<td>20 7 days. LK</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>67</td>
<td>20 10 mos. LX</td>
<td>20 9 mos.</td>
<td>20 8 days. XL</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>71</td>
<td>20 9 mos. XX</td>
<td>20 10 days.</td>
<td>20 5 days. XXX</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>72</td>
<td>20 3 mos. CC</td>
<td>20 10 mos.</td>
<td>20 5 days. XXX</td>
<td></td>
</tr>
</tbody>
</table>

*Since this paper was prepared the sight in this case has been found to be* 20.

Besides these eleven discisions, there was one case (No. 25) in which a moderate-sized corneal incision was made with the design of using De Wecker's forceps-scissors to split, or excise a portion of the capsule which was very dense in the line of vision, though clear below. The completion of the incision being followed by the escape of very thin vitreous, I concluded not to make any attempt on the capsule at that time. If we add these eleven cases to those not operated upon, we have in the whole series, twenty-six cases, *i.e.*, 26% of more or less pronounced
capsular opacity, which either remained after the extraction or developed subsequently.

In noting the vision obtained after extraction of cataract, much depends upon two elements: first, the time, and secondly, the completeness of the examination. Richard Greef, in reporting the work done at Prof. Schweigger’s University Eye Clinic (Arch. of Ophthalmology, July '91), says: “There was not a single case of 6/6 at the time of discharge owing to the greater or less amount of astigmatism which is present at an early stage, but gradually decreases or disappears. I am of the opinion, that, in order to get S = 1 in the statistics, one needs a little indulgence on the part of the physician, or even the use of various test types, and perhaps of hook letters.” It is easy to account for the rather pessimistic view held by this writer. In the first place the sight was tested about the twentieth day after the operation. Every one knows that vision frequently improves very greatly after that period. My own results, except in the cases in which the capsule subsequently became opaque, represent the vision obtained when the patient returned to be fitted with glasses, viz., from four to eight weeks after the operation. In the second place it appears that Greef took no account of the astigmatism present, though why he should ignore this element, is by no means clear. The astigmatism produced by the operation is, indeed, as a rule, subsequently lessened in a great measure, but it is only rarely that it wholly disappears. In the great majority of cases there remains permanently enough of this anomaly to depress the visual acuity to a notable degree. In my own experience the persistent astigmatism left after extraction, as a rule, varies from one-half to two dioptrics. I can conceive of no reason why we should be less scrupulously careful in correcting aphakia than in correcting any other refractive aberration; and if the addition of a cylinder of one or two dioptrics to the correcting lens changes the vision from 20/LX or 20/XL to 20/XX or better, it would appear to be very indifferent practice to withhold it. Recent contributions to the literature of cataract, especially Dr. Risley’s valuable paper on “Incipient Cataract” (Univ. Med. Mag., March, 1889), have made it probable that in many cases, if not in all, cataract
is not a physiological but a pathological phenomenon, and results from antecedent morbid changes in structures on which the lenticular nutrition depends; but, admitting this to be a fact, it may be safely affirmed that in a very considerable proportion of cases, the morbid conditions giving rise to opacity of the lens do not appreciably involve the integrity of the structures most vitally concerned in vision, viz., the retina, choroid, and optic nerve. There is, therefore, no reason in the nature of things for concluding that a cataractous eye can in no case be made to see as sharply after a successful extraction, as before the development of the cataract. On the contrary, without taking into account myopic cases, the sight after operation is sometimes better than ever, a fact which is not surprising in view of the frequency of imperfections in the crystalline in cases showing no disposition, for the time at least, to the development of cataract. I recall the case of a man, who, after having been operated upon in 1880 by Pagenstecher's method, was able to decipher for the first time some very minute characters on the face of a watch which he had carried for upwards of forty years. Several of the cases reported in this paper possess unusually good vision. One of them (No. 66), who with a lens of +1 D, can read test letters No. XV at a distance of twenty feet in a clear light, is noteworthy as possessing a decided range of accommodation, being able to read with apparent ease 37 test type from nine to sixteen inches.

In looking over the report just presented, a few moments may not unprofitably be devoted to the consideration of:

A. Conditions and incidents noted before or during operation.

1. The lens was almost completely liquid in five cases (Nos. 18, 33, 46, 68, and 96), and completely so in one (No. 29). Results in all good.

2. Cataract more or less translucent in eleven cases (Nos. 20, 42, 44, 50, 51, 54, 56, 65, 83, 90, and 95). Results in one only moderate, No. 83 = 10/CC (opaque capsule). Results in the rest good.

3. Cataract diabetic in one case (No. 55) and traumatic in one case (No. 91). Results in both good.

4. Air entered anterior chamber in one case (No. 1);
removed by continuing the syringing. This accident was owing to the imperfection of the instrument—an ordinary compte-gouttes—and could not happen with the syringe which I now employ, and which, on the contrary, serves admirably for the expulsion of air bubbles that may spontaneously gain an entrance. This use of the instrument was happily illustrated in a case of iridectomy.

5. Collapse of cornea happened in four cases (Nos. 5, 18, 67, and 88). Results in all good. In these cases the prompt restoration of the corneal curvature by means of the syringe made an immediate and satisfactory testing of the vision, by the usual method of counting fingers, possible.

6. Vitreous exposed without escaping in two cases (Nos. 56, and 70). In these, gentle pressure made with the object of tilting the lens, caused vitreous to present in the wound. Delivery with wire scoop. Visual result in the first was 20/1X, in the second, 20/c (atrophy of optic nerve).

7. Vitreous escaped in eight cases (Nos. 29, 34, 37, 49, 58, 61, 80, 96). In case 29, the lens being entirely liquid, gushed out on being touched with the cystotome, which was not removed quickly enough to prevent the posterior capsule coming in contact with it and being ruptured, thus permitting some vitreous to escape. Vn. = 20/1X. In case 34 a moderate quantity of vitreous followed the lens. Vn. 20/1X+. In case 37, the accident occurred just before applying the bandage, and was caused by a violent spasm of the lids. Result, failure. Vn. light perception. Vitreous muddy and retina detached. In case 49 the zonule ruptured during the corneal incision, although the latter was made with more than ordinary deliberation. Vn. = 20/XL. In case 58, on attempting to expel lens, some soft cortical came out; on continuing the pressure, the nucleus became rotated, and vitreous presented. Lens removed with wire scoop and followed by three or four drops of semi-fluid vitreous. Vn. = 20/cc (marked atrophy of disc). In case 61, the patient, an aged colored woman, was excessively restless, rolling her eyes upwards incessantly and with convulsive violence, in spite of all efforts made to control her. After escape of the nucleus some cortical masses were left, the attempt to
remove which caused some thin vitreous to escape. Result, closure of pupil. Prospects of sight after another operation seemed fair. In case 80, the posterior capsule was ruptured in the attempt to remove with smooth iris forceps a filmy clot of blood which remained after the anterior chamber had been thoroughly cleared of cortical remains, and twice emptied of blood by means of the syringe. Vn. = 20/xx—. In case 96 the capsule proved very tough, and the attempt at cystotomy slightly dislocated the lens, which was therefore expelled in its capsule. A drop of fluid vitreous followed. Vn., ten weeks after operation, 20/xxx.

8. Seven patients were almost or actually uncontrollable during the operation (Nos. 35, 37, 52, 61, 72, 91, and 92), and one case (No. 75) would probably have given much trouble had she not been etherized. This woman was intensely nervous during the preliminary iridectomy, and for this reason an anaesthetic was administered for the extraction. The result was good. There are some persons, especially among women, in whom a paralysis of the will or an abandonment of fear renders them insensible alike to entreaty, argument, or threats. In such cases, anaesthesia may enable us to make a smooth and satisfactory operation, where, without it, the work would be more or less bungled; for it is next to impossible to execute gracefully the various delicate steps of a cataract extraction while the eyeball is in incessant motion; and there is no safe means of fixing the globe under these circumstances after the incision has been completed.

B.—Complications arising after operation.

1. Delirium in two cases (Nos. 4 and 14); one of them (No. 4) had a family history of insanity. In the other case, there was no discoverable explanation. Results 20/xx—, and 20/Lx. 2 Slow healing of corneal wound in six cases (Nos. 29, 40, 70, 80, 81, and 96), in four of which (Nos. 29, 70, 80, and 96), there had been escape or exposure of vitreous. In case No. 40, there was nothing to account for the deferred union, unless it might have been due to the corneal nutrition having been interfered with by old ulceration, which had left opacities. No. 81 was a man broken in health by repeated misfortunes.
3. Iritis in ten cases (Nos. 22, 30, 41, 48, 57, 61, 62, 83, 94, and 100). In one case (No. 22), the trouble was caused by a blow. In one case (No. 61), the inflammation was manifestly due to the bad performance of the operation, due to the restlessness of the patient. In three cases the iritis was directly attributable to exposure to cold. One of these three cases, on the second day after the operation, left her bed and walked about her house treading on cold carpetless floors in her bare feet. The other two owed this complication to cold draughts from open windows. In the remaining five cases the cause of the iritis was not discovered. Of the ten cases, one (No. 61) was very severe, resulting in closure of the pupil and Vn. quantitative; three (Nos. 62, 83, and 94) were moderately severe; while the remaining six presented very light cases of the disease. The results, mechanical and visual, in the ten cases of iritis are as follows:

No. 22. No adhesions, Vn. = 20/xxx.
No. 30. No adhesions, Vn. = 20/xl+
No. 41. One small post. synechia above, pupil large, Vn. = 20/xxx.
No. 48. One small post. synechia above, pupil large, Vn. = 20/cc (marked nerve atrophy).
No. 57. Two small synechiae above, pupil large, Vn. = 20/lxx (slight opacity of capsule).
No. 61. Closure of pupil, Vn. Light perception.
No. 62. Upper third of pupil adherent to capsule, Vn. = 20/lxx.
No. 83. No adhesions. Vn. = 10/cc, pronounced opacity of capsule.
No. 94. Two small synechiae above, pupil large, Vn. = 20/xl (slight central opacity of capsule).
No. 100. Broad synechia above. Vn. = 20/lxx (optic atrophy).

4. Suppurative inflammation. Reference has already been made to a case of destructive suppurative inflammation after iridectomy. Besides this case there was another case of infection of the corneal incision with the formation of a minute hypopyon, which also followed a preliminary iridectomy, but
which was successfully combatted. It may be remarked parenthetically, in regard to this latter case, that although the cautery was employed, the happy outcome, in my opinion, is to be attributed in great part to the repeated instillation of water at a temperature of about 150 degrees F., applied drop by drop directly to the wound. The water was heated to 160 degrees in a large test tube in which a sterilized thermometer had been placed. The dropper used for the application was also kept immersed in the hot water. In transferring the dropper from the test tube and making the application, it is probable that from five to ten degrees of heat were lost. The instillation was made night and morning for three days. It may be added that I have found this method of treatment brilliantly successful in two cases of rebellious ulcer of the cornea which placed the affected eyes in jeopardy. The rationale of the favorable action is probably to be found in the fact that we can by this method distribute the heat over a wider area, we can more thoroughly heat the infected corneal zone which is always to be found surrounding the originally infected spot—than is possible by means of the necessarily brief application of the cautery needle; and the milder heat thus induced may approximate in effectiveness, through prolongation and repetition, the fiercer heat of the cautery. The latter should, of course, not be neglected in case of infection of the corneal wound; but I regard the use of very hot water in the way suggested as valuable supplemental treatment. In cases of obstinate corneal ulcer, the hot water may substitute the cautery; and, so far as my experience enables me to judge, is less likely to leave a scar.

After this therapeutic digression, I return to the consideration of the two cases of suppurative inflammation following iridectomy with special reference to their etiology. As to asepsis of operation, the instruments are thoroughly cleansed with abundance of water and afterwards remain in alcohol during cocainization of the eye. In addition, they are of late also subjected to the influence of boiling water in an apparatus devised for the purpose. They are entrusted only to the hands of one trained and conscientious assistant. Both cases were operated upon in the men's eye ward (of the Allegheny General Hospital)
which is in direct communication, through large folding doors, with the male surgical ward; but this circumstance does not account for the trouble unless on the improbable hypothesis of aerial contamination. In neither case was there any epiphora, but both had a slight degree of the conjunctival catarrh, so common in the Ohio valley, and both also presented mild cases of nasal catarrh. Moreover, on splitting up the canaliculus on the other side in the panophthalmitis case with the purpose of preparing the second eye for operation, I found a constriction of the nasal duct which was so slight that it had not obviously interfered with the passage of the tears.

The causes of suppuration following cataract operation are frequently difficult to discover. Greef, for example, in the article referred to above, mentions six eyes lost from suppurative keratitis or hyalitis, the source of which in four cases was unknown. My own experience of this complication embraces six cases including the two mentioned above. In all of these cases except one, the corneal infection occurred after the performance of preliminary iridectomy, which procedure I have habitually employed for a number of years. In the single case excepted, iridectomy and extraction were made at the same time. Suppuration therefore occurred in all of these cases at the initial operation, no instance of infection having happened in any eye which had been previously operated upon. These facts seem to point strongly to the conclusion that in many instances the morbid process is due to auto-infection. I am inclined to believe that in a considerable proportion, if not the majority of these cases of obscure causation, the fons et origo mali is in the nasal chambers, from the intricacies of which, as from an almost inaccessible stronghold, armies of micro-organisms, scenting out with fell sagacity the operative breach in the cornea, crowd through the lachrymal passages into the conjunctival sac. Hence, though much has been and much can be done to minimize suppuration following operations on the eyeball, we can scarcely expect to wholly eliminate it; for although we can sterilize our hands, our instruments, and the parts surrounding the eye, we can never be sure that the conjunctival sac is, or will remain, free from germs, unless we
seal up the puncta, a procedure likely to be resorted to only in exceptional cases. We may, however (and it would probably be good surgery), carefully examine the nasal cavities in all cases before operating, and where disease of the region is observed or suspected, apply a more or less prolonged preparatory treatment. Indeed, no harm can, and much good may, result from spraying the nostrils with an antiseptic solution before the operation in every case. In opposition to the view here expressed, it might be urged that nasal catarrh is a very common affection, while corneal suppuration after operation is rare. The explanation may lie in the facts that nasal catarrh usually exhibits no purulent tendency, that if there are pus germs in the nasal cavities, they need not necessarily reach the eye, and that even if they do, the invaders may be routed by those not yet well understood agencies which fight for the integrity of the tissues. In this connection it may be added that in the panophthalmitis case the subject was in feeble health and suffered from paralysis agitans.

It is unnecessary to allude here to so obvious a source of danger as dacryocysto-blennorrhæa. The necessity of correcting such a condition speaks for itself, although I once saw a distinguished surgeon on the other side of the Atlantic invite disaster by proceeding to a very dexterous cataract extraction after pressing out the purulent contents of the lachrymal sac and then spraying the inner canthus with a solution of carbolic acid.

As already stated, the syringe was used in all of the cases except those in which the vitreous either was exposed or escaped during or immediately after the expulsion of the lens. The purpose of this proceeding was solely to cleanse, and not at all to disinfect, the anterior chamber. Consequently, the fluid mostly employed was a weak solution of boric acid which can hardly lay claim to the title of antiseptic. In the great majority of instances, considerable cortical substance remained after delivery of the nucleus, and in most of these the superiority of lavage over massage was signally illustrated. Even in the instances in which the lens came out whole and clean, the syringe was nevertheless used in order to free the lips of the wound from shreds of capsule; and it proved to be a gentle
and effective means of replacing the iris when the latter showed a tendency to become imprisoned at the angles of the incision. Irrigation was found of great service in the few cases in which blood entered the anterior chamber during the operation. One eye (No. 80), already referred to as a case of escape of vitreous, was, I believe, saved by it. The patient, a woman long in delicate health, was still further debilitated as the result of a severe attack of la grippe nine months before. After the corneal section the anterior chamber rapidly filled with blood which was thoroughly washed out. Capsulotomy was satisfactorily accomplished, and the lens was emerging slowly and smoothly, when, just as its equator became engaged in the incision, the bleeding recurred, rapidly filling the chamber for the second time. After delivery of the lens, the blood was again driven out by means of the syringe, all except a very thin clot. It was in the attempt to remove this clot with forceps that the posterior capsule gave way and escape of vitreous occurred. The vision seven months after the operation was 20/xx —. It is exceedingly problematical whether, without irrigation, the blood could have been so satisfactorily expelled and such a result attained.

The anterior chamber syringe in cataract extraction has incontestable advantages. Has it any serious disadvantages? Is there any danger of conveying infection by means of it? Does its use tend to produce iritis?

In regard to conveying infection there is no more danger of this with a syringe properly constructed and cared for than with a cataract knife under the same conditions.

The second question, as to iritis, I think can equally be answered in the negative if a few simple precautions are taken. For example, the fluid used should not be irritating. It should be at about the temperature of the blood as it emerges from the nozzle (slightly warmer in the reservoir to allow for cooling in the rubber tube). It should not be distilled water nor should it be too strong a solution. The best results in my hands have followed the use of a 1 to 240 solution of boric acid made with distilled water and carefully boiled and filtered. It should be prepared by a person who is thoroughly imbued with the importance of his task. The fluid should not enter the eye with too
much force. A sufficiently effective stream will be secured by holding the reservoir at a height of from 8 to 10 or 12 inches above the nozzle.

The instrument now presented, and which was used in the cases (with the exception of the first three) reported in this paper is the same, slightly modified, as that which I had the honor of presenting at the meeting of this society held two years ago. The correctness of the statements then made as to the ease of keeping it aseptic, the uniform smoothness with which it works, the security with which it is handled, the impossibility of inject-
ing air bubbles with it, the absolute accuracy with which the force of the stream can be regulated, etc., has since been amply confirmed.

DISCUSSION.

Dr. Emil Gruening of New York.—Dr. Knapp said in his paper that the old operators cut the Gordian knot. They had no cocaine. Those who operated in the days when cocaine was not used, will remember that the iris always prolapsed when they opened the anterior chamber, and this was a welcome sight, because they wished it to prolapse, and they then cut it off. Now it does not come out, but remains in the anterior chamber; therefore, I cannot see that we are in the position of the old operators. We are not obliged to cut it. The iris remains in the eye because there is hypotony of the eye induced by cocaine. The gentleman who read the first paper on cataract says that the cocaine should be instilled until the dilatation of the pupil comes on. Now it is known that if we use a four per cent. solution of cocaine in order to produce dilatation, we shall have to wait at times fifteen minutes, at times even longer. If we instill a four per cent. solution of cocaine every fifteen minutes, we shall often have such hypotony that the lens may not come out in spite of well-directed pressure upon the eye. Those who have had this experience will know how important it is to understand thoroughly how to cocainize. Dr. Knapp says "cocainize thoroughly." That is not sufficient. How thoroughly? What is a thorough cocainization when we wish to operate? We wish to produce sufficient hypotony to retain the iris in the eye, and still not cause a hindrance to the exit of the lens. I have found that a four per cent. solution instilled fifteen minutes before the operation, caused excessive hypotony in most cases; that instillation, even for ten minutes before the operation, causes too much hypotony, and I have reduced it to six minutes, and during these six minutes cocaine is instilled three times; then I get exactly what I want. Should eserine be instilled after the operation? I think eserine should be instilled after every simple operation for cataract. One per cent. produces iritis in every case. A one-fourth per cent. solution answered best in my cases. Even then a slight iritis could be observed, but a few slender adhesions are not only harmless, but really useful in retaining the iris in its position until the corneal wound is sufficiently firmly closed.

Dr. C. S. Bull of New York.—I think, and all who have done this operation will, I believe, agree with me, that prolapse of the iris is the one vicious factor in simple extraction, and
that our labors in the future should tend to lessening the frequency of its occurrence. I agree with Dr. Knapp absolutely as to the necessity of locating the corneal incision entirely within clear cornea, just touching the limbus, the baseline of the flap being just above or just below the horizontal meridian. I do not agree with him in the turning of the knife backward in order to form a small conjunctival flap, because I believe a conjunctival flap is a vicious thing to make. I do not agree with Dr. Knapp in his belief as to the effects of eserine, nor am I as positive as Dr. Gruening is in regard to the danger of a one per cent. solution of eserine always causing iritis. I have known very severe iritis in very many cases to be induced by a one-half grain solution. I never use a stronger solution than a one-half grain, and usually employ a solution of one-tenth of a grain. This does not produce iritis and it does produce what we want. I use eserine in every case after the operation.

As regards the dressing of the eye, I agree with the reader of the paper that the plaster should be avoided. In almost all cases in my practice, I use a double-roller bandage in all operations for extraction of cataract, making the bandage of very thin material, particularly in very warm weather, and leaving it on one or two days. I still think that one of the strongest means we have for avoiding the occurrence of prolapse is to do the operation while the patient is in the bed in which he is to remain during his convalescence. That is the strongest means that I know of to avoid the occurrence of a prolapse. And one point in addition: when the prolapse occurs, I believe in as early and as complete an excision of that prolapse of the iris after your operation as is possible.

Dr. Henry D. Noyes of New York.—I have studied very carefully this subject of prolapse of the iris, and I think that one point deserves a more explicit mention than has been given to it in our discussion, in fact, it has been entirely omitted. Prolapse of the iris is not an accident exclusively belonging to the simple operation. Cases of operation with iridectomy are accompanied by the same accident, only in them prolapse cannot affect the iris in the middle of the wound, but presents itself at its angles, and everybody who has been accustomed to von Graefe's operation knows that incarceration of the iris is one of the ominous and serious occurrences belonging to that method of procedure, as it gives rise to cystoid cicatrix, and to other complications. A recent writer in the last number of Knapp's Archives of Ophthalmology reported two hundred cases, and puts the rates at four or five per cent. I think if we should go over our old cases, we should find that at least as much as five
per cent. of them were accompanied by incarceration of the iris at the angle of the wound.

But to come to this matter in simple extraction, I have summed up a number of cases as they have occurred to me, of this accident, from which I make the following statement: That a condition of plus tension at the time of operation is the first and most serious consideration, and that this plus tension, like a tendency to simple glaucoma, inevitably invites prolapse. It may or may not be overcome by cocaine, but if at the time of the operation there be plus tension, you will get prolapse. The second condition which gives rise to it is the uncontrollable squeezing of the patient. A recent experience of that kind came to me in two negroes at the New York Eye and Ear Infirmary, and who made powerful compression of the eyes by the eyelids. I operated on one eye at a time in each and both had a very large and copious prolapse of the iris. The operations were normal, but the squeezing was persistent and uncontrollable.

The third thing which seems to me to render this prolapse of the iris extremely liable is a rude operation; that is an operation accompanied by a certain amount of violence, thereby producing more or less reaction in the healing process, and I am sure that this favors the unhappy occurrence.

Then last is traumatism. I am certain, as Dr. Knapp has said, that traumatisms to which we pay little attention are responsible for a great many of these occurrences, and not only within the first two days does it make its appearance, but at the expiration of six or nine days may it appear, by reason of the secondary opening of the wound. I have seen that take place several times.

Dr. Samuel Theobald of Baltimore.—I wish to say just one word with regard to the production of iritis by the use of eserine. I am very glad to hear that Dr. Knapp, from his later experience, believes that iritis is not apt to be produced by even the one per cent. solution of eserine. If I remember correctly, both Dr. Knapp and Dr. Bull agreed at the last meeting of the Ophthalmological Society, that from their experience up to that time iritis was frequently produced by eserine, and that very weak solutions of eserine must be used if we wished to avoid iritis. At that time I made the remark that my experience had been quite different; that I had usually employed solution of the strength of four grains to the ounce, and that iritis had been an extremely rare occurrence.

If I am right in my recollection of what Dr. Knapp's earlier experience was, I congratulate myself that this later experience of his so closely coincides with my own.
Dr. Reeve of Toronto.—At the discussion before the Society last year, I expressed the opinion that iritis was frequently produced by a bruising of the iris during evacuation rather than by eserine.

Dr. W. V. Marmion of Washington, D. C.—In the first years of my professional career, I practiced the flap extraction without iridectomy, using the Beer knife to make the section. The various accidents attendant upon this form of operation, particularly suppuration of the cornea, led me, as it did, I may say, every one, to adopt Graefe's modified linear procedure, and it is this method that I follow to-day, with one modification; I always make a small upward iridectomy, from three to six weeks in advance of the extraction of the lens (as originally suggested, I think, by Mooren of Dusseldorf) taking care that the iris is not caught, to the slightest extent, in the angles of the wound; and my results are so very satisfactory, that I can see no reason for changing to the method under discussion, which is simply a revival of the flap operation, the narrow Graefe knife being used instead of the Beer. I practiced this method five times two years ago, and had prolapse of the iris in two of the cases on the third day. Abscission was done in one case, and was followed by intense reaction and impairment of vision; in the other I did an iridectomy, the prolapse reforming after a few days. I enlarged the coloboma, and the hernia being reduced, I passed a flat needle into the fistulous opening and gently scraped its edges, securing complete union in a few days. It seems to me that one cause of prolapse of the iris is the concaving of the corneal lip of the flap when making the section, in part at least, down to the membrane of Descemet, thus preventing perfect coaptation of the edges of the wound. Cocaine in a 4 per cent. solution frequently toughens the cornea to such an extent that it is almost impossible to puncture it. I find a 2 per cent. solution answers much better.

Of eserine in the treatment of cataract, I have had no experience, but I have seen destructive iritis follow its use, in the treatment of glaucoma, the solution being one grain to the ounce.

Dr. H. Knapp of New York.—With regard to eserine, I believe with Dr. Reeve that iritis is frequently due to the bruising of the iris during the operation. I believe with Dr. Bull and Dr. Gruening that eserine favors the occurrence of iritis, but when there are no anatomical conditions to cause iritis, a one per cent. solution of eserine may be instilled without fear. The mode of preventing iritis is to avoid bringing two raw surfaces together, the lacerated capsule and the lacerated pupil-
lary edge of the iris. Those who operate within the capsule never get iritis. Those who make peripheral capsulotomy will notice synechiae only at the place where the capsule is opened.

During the passage of the lens through the pupil, the free edge of the iris is stretched and lacerated in several places which can easily be seen. These lacerations become invisible when the iris is reduced and give rise to posterior synechiae only when the lens capsule is opened in the center. When the lens capsule is incised at the periphery only, the instillation of a one per cent. solution of eserine produces no iritis, a fact which I can demonstrate any day at the hospital.

GLAUCOMA AFTER EXTRACTION OF CATARACT.

BY DR. F. BULLER.

MONTREAL, CAN.

The precise conditions which lead to glaucoma after the successful removal of cataract are not yet so well established as to render a further study of these cases unnecessary. The three cases I propose bringing before you present some features, I think, which are worthy of consideration, and in the matter of treatment I must confess myself still in doubt as to the proper course to be pursued. It is in this direction especially that I shall be glad to hear the views of other ophthalmic surgeons who may have had a wider experience than has fallen to my lot. I shall, without further comment, proceed to give the salient features of three cases.

CASE No. 1. — J. M., a rugged Scotchman, aged 73. Left eye uncomplicated, mature cataract, removed early in September, 1883. Ether used as an anaesthetic. The extraction was with iridectomy and peripheral capsulotomy, perfectly smooth, puncture and counter-puncture being about 1 mm. behind clear cornea. In healing the inner angle of wound contained just a small portion of entangled iris, not a prolapse, but just enough to show as a small dark spot beneath the conjunctiva. A slight iritis appeared at the end of the first week, but no adhesions resulted. Sixty days after extraction the eye was quiet,
and V. = 20/50, with + 4½ sph., capsule rather dense. Discussion done with two needles, moderate reaction, irregular central aperture obtained not quite as large as desired. On the 14th April following a note was made of vision with + 4½ ≥ 28 cyl. ax. 90, V. = 20/30, and + 3 sp. ≥ 28 cyl. ax. 90, reads J. 1 at 10″ fluently. The condition of the eye appeared entirely satisfactory. For several years the eye was used freely especially in reading, the patient being rather a book-worm. His habits of life were regular and temperate, except that he was unduly addicted to snuff-taking.

About the beginning of the year 1888 he found the vision of the left eye deteriorating. Shortly afterwards I examined the eye, and discovered rather deep cupping and an atrophic appearance of the optic nerve, just as in ordinary chronic glaucoma. Tension decidedly increased, and with the usual limitation of the visual field vision was reduced to 20/70. In March, 1888, vision was reduced to 20/200. I then made a free sclerotomy downwards without benefit. In January, 1889, vision was reduced to qual. perception of light, and the eye had now a distinctly glaucomous appearance, with symptoms of considerable irritation and still greater tension. The cornea was cloudy, iris and capsule pushed forwards, and the lower lid in a condition of entropion.

The right eye was now blind from complete cataract, but was otherwise healthy. On the 29th January, 1889, I removed the cataract from the right, under cocaine. Recovery from the operation was perfectly normal, and the eye is as good to-day as could be desired. The capsule is not opaque, and scarcely interferes with vision. The patient, now 81, somewhat ostentatiously declares he can see as well as ever he could in his life. The left eye has ceased to trouble him, although the lower lid still turns in, and the eye has the typical appearance of glaucoma consummatus. There is practically no anterior chamber, the iris and capsule dimly seen through the cloudy cornea are pushed forwards to its posterior surface.

In addition to a general cloudiness of the cornea, there are many circumscribed, dense, interstitial, and vascularized opacities; inversion of the lid, and consequent mechanical irritation
of the cornea, will doubtless account, to some extent, for the unusual development of blood vessels in its substance. Another peculiarity is in the scar of the original wound, which now appears as a dense vascularized yellowish white streak across the upper margin of the cornea. That the entropion had nothing to do with the development of the glaucoma is obvious, since the lid only became inverted when the eye was already practically blind.

As far as I could ascertain, there were three factors likely to have been instrumental in lighting up the glaucomatous process. They were: 1st, the small portion of entangled iris at the inner end of the wound; 2d, the patient's bookish propensity; 3d, the thick capsule which after discussion formed a dense band above, which, to all appearances, lay along that portion of the canal of Schlemm which corresponds to the coloboma. With the band of capsule in this position and the entangled iris, in all probability excessive use of the eye in reading created sufficient irritation to obstruct the circulation of fluids in a considerable extent of Schlemm's canal, thus initiating the glaucomatous process. Should I again meet with a similar chain of circumstances, I would feel inclined to perform the sclerotomy upwards, with the hope of establishing a filtration scar through the line of obstruction.

Case No. 2. — October 12, 1887. A. D., age 73, Scotch by birth. Is a tall, robust-looking man for his age, and in good general health. Vision has been failing for some months, and there is a mature uncomplicated cataract in right eye. Left eye cataract immature: fundus seen fairly well, appears normal, except that the optic nerve is somewhat pale; V. 6/60. Right eye extraction with iridectomy and peripheral capsulotomy done under cocaine 4%. By an error, cocaine was used three or four times several hours before the operation; only one drop was instilled five minutes prior to operation. When the cataract was removed, the cornea and eye generally was very flaccid, causing some difficulty in removing the lens completely; on account of this difficulty some lens substance was allowed to remain in the eye. Healing progressed favorably until the fourth day, when he managed to strike the covering of the eye
with the hand and open the wound; a moderate reaction followed this injury.

Seventeen days after the operation the eye was quiet, and with +12 D., V. = 6/60, being greatly obstructed by a thick and wrinkled capsule containing some cortical substance. Capsulotomy done with one needle. Six days later all reaction had subsided, but there was only a very small opening in the capsule, and very little improvement of vision. By the middle of December — that is, six weeks after discission — with 20° + 2.00+11.00, V. 6/12. For about one year he continued to enjoy pretty good vision, but in May, 1889, this was reduced to 6/30 by a diminution of the capsular aperture. On the 6th May, 1889, capsulotomy was again performed, this time with two needles, resulting in a good-sized and nearly central aperture. This was followed by a sharp reaction for a few days. In June, 1889, vision was again 6/12 with his compound glasses. A few months later he noticed a gradual diminution in the acuteness of vision, and on October 30, 6/18 was the best he could do. At this time I could discover no positive cause for the failing vision; certainly it was not due to any fault in the capsular operation; the fundus was distinctly visible in detail, and showed no coarse changes; only a doubtful increase of tension was noticed, without cupping of the nerve or limitation of the visual field; the latter, however, was not then tested with as much care as the doubtful tension demanded.

There was nothing in the appearance of the eye suggestive of glaucoma. No iris in the wound, and no adhesion of iris to the dense capsule under the edges of the pupil; the capsule was thick and white, no doubt the result of an antecedent capsulitis, together with unabsorbed cortical remnants. For fifteen months longer he continued to follow his employment (store-room inspector in a large railway company) without much difficulty, but on the 26th of January of this year — or four years and three months after the original operation — he came, on account of a recent and rather rapid failure of vision, which was now reduced to fingers at 6'. There has been no pain; "only a blur or smoke has come over the sight."
sclerotic presents a slightly glaucomatous appearance. The
cornea is faintly clouded, T + 2, and field contracted on nasal
side nearly to the center. Has not seen halos. The most, in
fact, the only conspicuous abnormality about the eye, is the con-
dition of the capsule, which, in addition to the thickened ap-
pearance already mentioned, now bulges forward as a sail-like
prominence in its upper part. The central aperture is clear
and well-defined as ever, and the vitreous is free from opacity,
so that a perfect view of the optic nerve is easily obtained.
The nerve is pale, and presents a moderately deep shelving
cup; arterial pulsation is doubtful. The choroid is normal.
On the same day I performed a large sclerotomy in a downward
direction. No benefit came of the operation. Vision steadily
diminished, and on March 3d there remained only qual. p. 1.

Case No. 3. — March 6, 1891. The left eye now presented
a mature uncomplicated cataract, which I extracted with
iridectomy, using Knapp's capsule forceps instead of the
cystotome for opening the capsule. The wound united kindly,
and everything was entirely satisfactory until the fourth day;
he then managed to strike this eye also through the bandage
and reopen the wound, which remained open three or four
days, but healed perfectly at last without entangled iris or
other visible complication. Three weeks after operation vision
was tested, and with 180° + 3.00 + 9.00, V. = 6/20, a delicate
looking shining capsule is stretched across the pupil, but with-
out adhesion of the iris to any part of it.

At the end of four weeks he was out and at work as usual,
although advised that the eye, though apparently quite well,
was not in a fit condition to be used. Before the end of April
he was reading the evening papers at night, but outraged
nature brought swift retribution. On the 2d May he came
with the statement that four days previously the sight sud-
denly became dim and the eye very painful. Fingers at 8 feet
was all he could contrive to see. There was in addition
T + 2, cornea steamy and pupil sluggish, capsule thicker than
when last seen, somewhat pushed forwards, and beset with
minute dots, which appeared ark when seen through a + 20 D.
len. Fundus seen very dimly, no details, no floating opacities
in vitreous. He was ordered to remain quiet in a dim light, and solution of eserine \(\frac{1}{4}\%), to be instilled three times daily. On following day V. 6/27. "The first drop took the pain away."

May 9th, V. 6/20, with correcting glass.

June 2d. Has used the eserine once or twice daily until yesterday. Can read and write with facility, and has resumed work. Eye still a little hard, but there are no other signs of glaucoma, \(180° + 1.25 + 12.00-6/18\). Advised to continue the eserine once every other day.

September 20, 1891. Has had no further trouble with the last eye since June. The eye looks and feels perfectly well, tension is normal, and in ordinary daylight V. field is complete. He has used one drop of the eserine solution every other day, and has worked comfortably all summer.

The capsule is thin and mostly clear. It has the appearance of being stretched straight across, and not bulged. With a + 20 D. lens, it presents a series of bright folds pleated up to an irregular bright band at the upper part. The pupil is active and nowhere adherent. The optic nerve, though pale, is not cupped. The pallor of the nerve, still observable, is of no special significance, since it was present several years previously before the cataract had obscured the fundus. The right eye continues unaltered, blind but harmless, though its tension remains distinctly increased.

In both patients the age, nationality, and physique were similar. In cases one and two a long interval of useful vision occurred between the operation of extraction and the glaucomatous trouble. In both a dense capsule had been divided, and the upper portion evidently rested in contact with the corresponding filtration region. This clinical observation, recorded in my note-book some years ago, has been sustained by pathological investigation, as may be gathered from Mr. Collins's valuable paper read before the Ophthalmological Society of Great Britain in 1890, in which he describes that condition as an almost constant pathological state in eyes which have perished from glaucoma after extraction of cataract. In none
of my cases were there adhesions between the capsule and iris.

In all three excessive use of the eyes seems to have been an important factor in the development of glaucoma. It is somewhat remarkable that both eyes of one patient became glaucomatous, although not the slightest tendency to glaucoma existed prior to the removal of the cataract.

In the last case eserine has evidently had a curative effect, but in this instance the glaucoma was more acute, and in all probability depended on an early and injudicious use of the eye. The mechanical features here were totally different from the other two, and I am inclined to look upon the outbreak of glaucoma in this instance as an irritative condition brought on by over-exertion of the visual apparatus before the filtration region of the eye had recovered from the disturbance which a wound in the immediate vicinity, but not to any extent through the canal of Schlemm, might readily create. The operation was, so far as I can judge, a typically perfect one; nor is there the least trace of injury or ill effect from the wound having been reopened a few days after its first closure. The capsule is, I think, certainly not in contact with the extraction scar, but then it is to be observed the eye has recovered without further operative interference, showing that the cause of the glaucoma, whatever it may have been, was of a transient nature.
SUBNORMAL ACCOMMODATIVE POWER IN YOUNG PERSONS A NOT INFREQUENT CAUSE OF ASTHENOPIA.

BY SAMUEL THEOBALD, M.D.,
BALTIMORE.

While the investigations of Donders and Von Graefe, by giving us a clearer conception of the refractive and muscular anomalies of the eyes, very properly led to an abandonment of the older teaching that the complex of symptoms which we know as asthenopia is usually dependent upon imperfect accommodative power, it is open to question whether in this instance, as in so many others, the pendulum did not swing too far in the opposite direction, or, in other words, whether in ascribing to refractive errors or deficiencies of the extrinsic eye muscles practically all cases of asthenopia occurring in early life, while ignoring wholly the condition of the ciliary muscles, we have not committed an error similar in kind, if not in degree, to that which our fathers committed in clinging to exactly the opposite opinion. For one, I am strongly disposed to think that such is the case, for my experience has convinced me that, beside the failure of accommodative power due to age and that which follows exhausting illness, there is a condition which might, perhaps, be termed insufficiency of the ciliary muscles, which is of not very infrequent occurrence, and which is as capable of producing asthenopic symptoms as are the insufficiencies of the extrinsic eye muscles which have rightly received so much of our consideration. Like the latter it may occur independently of refractive errors or in connection with them, as a complicating factor; it may also exist apart from, or be associated with, other muscular anomalies. It is met with not infrequently in different members of the same family, and is in many instances, no doubt, an inherited or congenital defect. Though in some respects it is so closely related to presbyopia, the symptoms which attend it are by no means the same, but resemble more nearly those which are characteristic of hypermetropia—
asthenopia, and very often headache, not defective vision, being the chief complaints. I have recognized it as a distinct condition only in the young; after middle life it would be difficult to distinguish it from presbyopia. Its existence in connection with presbyopia, however, affords a sufficient explanation of the frequently observed fact that, independently of differences in refraction, persons of the same age often require reading glasses of very unequal strength. Finally, its presence is not to be detected by the tests which are usually employed to determine the existence of presbyopia. The smallest of Jaeger's types are usually read with facility, and the nearest point at which the words can be distinguished, at least momentarily, may or may not be appreciably different from what the age of the patient would lead us to expect. Indeed, paradoxical as the statement must appear to be, the subjects of this anomaly not infrequently elect, habitually, to hold the printed page or other small object upon which their gaze is fixed unusually close to the eyes, thereby seeming to lessen their discomfort for reasons which will presently be referred to.

In view of what has been stated the question will naturally arise, How is the condition under consideration to be recognized? Before answering this question it will be necessary to make something of a digression, and direct our attention for a few moments to that important fact in the physiology of binocular vision, the correlation of the functions of the internal recti and of the ciliary muscles.

It has been usual to speak of the parallelism which exists in emmetropic eyes between the accommodative movement and the convergence of the optic axes. This parallelism, however, is not as absolute as, *a priori*, one would expect it to be. It is, of course, true that in binocular vision for near objects a given tension of accommodation is ordinarily accompanied by a corresponding movement of convergence, so that when we accommodate for ten, twelve, or fifteen inches we converge for a like distance; but, on the other hand, if by means of a prism vertical diplopia be induced, we shall find that *in accommodation for near objects* this parallelism is not, as a rule, maintained. Under such circumstances a given tension of accommodation is not
accompanied by the degree of convergence of the visual lines which attends it under ordinary conditions. A relative divergence of the visual lines occurs, so that the eyes accommodate for a nearer point than they converge for. The extent of this relative divergence varies somewhat, even in emmetropes with normal muscular balance; but, judging from my own experience, I should say that in emmetropic persons, below the presbyopic age, and with normal muscular balance, it seldom falls below 3°, and is not apt to exceed 5° or 6°. It will be observed that this relative divergence which, in common with other observers, I regard as entirely normal, * occurs only in near vision. In distant vision, under like conditions, no such deviation of the visual lines takes place.

It is, in my judgment, of the utmost importance, in dealing with refractive and muscular anomalies, that the normal character of this relative divergence of the eyes in near vision, with induced vertical diplopia, should be clearly recognized, and that it should not be mistaken, as I strongly suspect it often is, for insufficiency of the internal recti muscles.

Expressed in the convenient terminology proposed by Dr. Stevens, the fact which I wish to lay especial stress upon is, that in the eyes which are in every respect normal the modified vertical diplopia test of von Græfe should show orthophoria, when the test object is at 20° and exophoria of from 3° to 6°, when it is at the usual reading distance, which I assume to be about 13". The corollary of this is that when, with orthophoria at 20°, the test shows more than 6° or less than 3° of exophoria at the reading distance, there is ground for suspecting some abnormality in the muscular or refractive condition of the eyes.

Let us first take the case in which, with distant orthophoria, there is an excess of exophoria shown by the near test, and consider what conditions would be likely to produce it. Insufficiency of the internal recti muscles of low grade, hypersthenia of the ciliary muscles, and myopia are the conditions which at

* Upon this point Dr. Noyes remarks, "It is most common to find that the images do not stand vertically above each other, but that there is a deviation in the sense of abduction of about 5°; this cannot be called abnormal, more than this must be noted. A deviation in the sense of convergence is always abnormal and directs suspicion upon the external." Noyes' Diseases of the Eyes, p. 193.
once suggest themselves. In myopia the relative divergence is excessive because there is little or no tension of accommodation, for this means, of course, that, owing to the correlation of the two functions, the internal recti are but feebly stimulated to contraction. When the ciliary muscles are abnormally strong or the internal recti weak the same result happens because, in the first instance, the exceptionally strong ciliary muscles require but a feeble nervous stimulus to enable them to perform their work, and this is accompanied by a correspondingly feeble stimulation of the interni, and, in the second instance, the weak interni receive only the stimulus which attends the ordinary accommodative effort, whereas something more than this is required, because of their feebleness, to enable them to perform the work done by the normal muscles.

If, now, we turn to the opposite condition in which, at the reading distance, there is less than the normal amount of exophoria (orthophoria, be it remembered, being assumed in distant vision) and ask ourselves what it may be caused by, we shall have to conclude, so it seems to me, that there is but one anomaly competent to produce it, and that is insufficiency of the ciliary muscles or subnormal accommodative power. The explanation of the way in which this happens is, of course, easily deduced from what has already been said as to the influence of abnormally strong ciliary muscles upon the action of the internal recti: the weak ciliary muscles require excessive stimulation to enable them to accomplish their task, and this involves necessarily a corresponding stimulation and consequent over-action of the normal interni.

At first glance it might seem that hypermetropia and insufficiency of the external recti muscles should have been classed with weakness of the ciliary muscles, as anomalies competent to produce the condition under consideration. But each of these anomalies, if it existed in sufficient degree to modify the exophoria in the near test, should influence to even a greater degree the result of the distant test, so that we should not have the distant orthophoria assumed to be present.

It must not be inferred, however, from what has been said that insufficiency of the ciliary muscles exists only, or that its
presence can be demonstrated only, when there is orthophoria in distant vision. As has been remarked, it may exist in connection with, and may complicate, any of the refractive or any of the other muscular anomalies. What general rule, then, can be laid down for its detection? In the assumed case of a non-presbyopic individual, with orthophoria in distant vision, the discovery of orthophoria at the reading distance or of exophoria of but 1° or 2°, should be regarded, in accordance with the foregoing reasoning, as conclusive proof of the existence of subnormal accommodative power. But, how shall we proceed when the distant test reveals the presence of lateral heterophoria? The rule which I have formulated, and which I have followed for several years with satisfactory results, is this: Whatever the muscular balance may be in the distance, the vertical diplopia test at 20' ought to show a difference in favor of the internal recti muscles, as compared with the test at 13", of at least 3°, often of as much as 4° or 5°. When this is not the case, there is subnormal accommodative power.

For example, let us suppose a young asthenope with esophoria at 20' of 2°. If he has normal accommodative power, I should expect to find exophoria at 13" of at least 1°, and probably would find as much as 2° or 3°. Again, if the distance test revealed exophoria of, say, 3°, I should anticipate that the near test would show exophoria of from 6° to 9°. If, however, in the first mentioned example there were found as much esophoria at 13" as at 20' (and a fortiori, if more were found), or if in the second there were as little (or less) exophoria at 13" as at 20', I should conclude that there was subnormal accommodative power. A few typical cases which I shall presently give in brief will illustrate the application of this rule, as well as the satisfactory results which have ensued from following its indications.

Allusion has been made to the fact that in some cases of asthenopia from subnormal accommodative power the subjects of the defect elect to read at an exceptionally near point. I do not for a moment believe that we have here a repetition of what occurs in some cases of hypermetropia of high grade—a disposition to increase the size of the retinal image even at the cost
of greater indistinctness. The explanation which seems to me most satisfactory is that the weak ciliary muscles, when supported by a strong convergent effort, are better able to perform their task, though the task be a heavier one, than they are when, with the type held further off, the tension upon the internal recti is much lessened. However this may be, it is an observation worthy of remark, that when appropriate convex glasses are prescribed the habit disappears, the disposition to hold the type at a more usual distance manifesting itself, in some instances, the moment the glasses are put before the eyes.

That we have in convex glasses the means of getting rid of the unpleasant consequences which the existence of subnormal accommodative power frequently entails, cannot but be evident. It may not be so evident at first glance, however, just how the strength of the glass to be prescribed should be determined. The rule which I have adopted, with very satisfactory results, is this: *Ascertain by trial the weakest convex spherical glass which will give, at 13", the minimum amount of normal exophoria (say from 2° to 3°), and prescribe this for systematic use in near vision.* Should the strength of this glass be so considerable as to bring the binocular far point inconveniently close to the eyes, reduce it, and endeavor to accomplish the end in view by decentering the lenses outward as much as practicable. In this way, by permitting some over-action on the part of the interni, at the same time that we lessen the work of the weak ciliary muscles, we shall almost always succeed in accomplishing all that we desire. I may add that I do not recall any case in which a greater prismatic effect than could be obtained in this way was called for.

The co-existence of subnormal accommodative power with hypermetropia or with true insufficiency of the external recti muscles, produces a condition likely to give rise to especially troublesome consequences, and when all three exist together we have a "triple alliance" which requires radical remedial measures. Its association with hypermetropia, as my experience has not infrequently shown, may make it necessary, even in quite young subjects, to prescribe glasses of different strengths for distant and for near vision, while its presence in connection
with insufficiency of the external recti muscles would make us more disposed to resort to tenotomy of the interni, should the amount of external insufficiency be considerable enough to warrant it. On the other hand, for reasons which are obvious, when subnormal accommodative power is associated with myopia or with insufficiency of the internal recti muscles, the likelihood of its causing much annoyance is decidedly lessened.

The first illustrative case that I shall give a brief synopsis of is one of subnormal accommodative power, uncomplicated by appreciable refractive or other muscular error.

**Case I.**—Miss C., about 20 years of age, was compelled to use her eyes a great deal, doing fine needle-work, and complained greatly of asthenopia and headache. She was found to have orthophoria at 20' and exophoria at 13'' of only 1/4°, at least 2/4° less than should have been present. Examined under a mydriatic (a two-grain solution of duboisia), scarcely .25 of hypermetropia was discovered; there was also a slight amount of irregular (probably lenticular) astigmatism. A diagnosis of subnormal accommodative power was made,* and +3 1/8's glasses were prescribed for near work. As with this correction the exophoria at 13'' was only increased to 2°, each lens was ordered to be decentered outwards 5 mm. The glasses gave immediate and complete relief, and during the past year have enabled the patient, who afterwards was appointed to a position as copyist in the census bureau at Washington, to perform her duties without discomfort. It may be mentioned, as of interest, that a first cousin of this patient also exhibits subnormal accommodative power. She has astigmatism against the rule and, although much below the presbyopic age, derives great satisfaction from having a glass especially adapted for near vision by the addition of a convex spherical to her full distance correction.

**Case II.**—Master W. C., about twelve years of age, affords an example of subnormal accommodative power associated with hypermetropia. This patient first came under observation in August, 1889. He was then complaining of asthenopia and headaches. With accommodation paralyzed by the liberal use

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* Tested by her ability to read J. No. 1, her range of accommodation (\(\frac{1}{A} = \frac{1}{44} \)) was not below what might have been expected at her time of life.
of a four-grain solution of atropia, a total hypermetropia of $\frac{1}{3}$ was found in each eye, with an insignificant amount of astigmatism according to the rule. The vertical diplopia test showed esophoria of $1^\circ$ at 20' and of $2^\circ$ at 13". Glasses, + $\frac{1}{3}s$, were prescribed, to be tried, at first, only in near vision. Marked relief followed the use of these (which he soon preferred to wear in distant as well as in near vision), but was not of very long duration, as he returned six months afterwards with a recurrence of asthenopia and headaches and with blepharitis marginalis. His muscular balance was again tested, and there was found less than $\frac{1}{3}$ of esophoria at 20', with $\frac{1}{3}$ at 13". With his glasses (+ $\frac{1}{3}s$) there was neither exophoria nor esophoria at 13". His asthenopia was judged to be due to subnormal accommodative power, and in accordance with this view stronger glasses, adapted only for near vision, were given him, while the previously prescribed glasses were to be worn for distance. It was found that with +2.s there was about 2° of exophoria at 13" (the degree being variable, sometimes dropping to 0°) and this was the strength decided upon, the lenses being decentered outwards 4mm. The relief which followed the use of these glasses was complete and has lasted up to the present time.

**Case III.**—Master H. C., 11 years of age, is a brother of the patient whose case has just been described. In his case subnormal accommodative power and insufficiency of the external recti are associated. When first seen in February, 1890, with less than .25 manifest hypermetropia, there was esophoria at 20' of $2^\circ$, at 13" of $4^\circ$. Temporary relief followed the use in near vision of +1.25s, with outward decentering; but, in April, 1891, the asthenopic symptoms returned in spite of the glasses. The tests then showed esophoria of $4^\circ$ at 20' and of $7^\circ$ at 13", and even with +2.s the esophoria at 13" was still 5°. Progressive gymnastic prisms were prescribed at this time, and they were used systematically for some weeks, the same reading glasses being worn as before. After this treatment had been kept up for six weeks the asthenopic symptoms disappeared (although the tests showed but little improvement in the muscular balance) and have not, I believe, returned up to this time. A sister of these two lads has also been under my care recently and she, too, shows marked insufficiency of accommodative power.
I might cite many other cases in which I have felt warranted in diagnosticing subnormal accommodative power, and in which the remedial measures adopted in accordance with this diagnosis have yielded good results, but those which I have described are sufficient for the purpose in view, and I will not occupy your time with a recital of others.

Before concluding, it may not be amiss to add a word in reference to the manner in which I employ the vertical diplopia test, since this has a most important bearing upon the points which have been brought forward in this paper.

In the first place, I employ as weak a prism as possible to induce the vertical diplopia, since this lessens the likelihood of error from slight deviations in the position of the prism. In the distance test I find one of 4° usually strong enough, and in the test at 13" one of 7°. The test object which I generally employ in the distance is a white dot, 2cm. in diameter, upon a blackboard twenty feet from the patient. I find it more convenient to use this than to employ a candle flame, and I believe that it affords a rather more accurate test. When the vision is very poor from any cause, I use the candle flame, since the white dot is not seen under such circumstances with sufficient distinctness. In the near test I use a fine star (a small printed asterisk is the best) upon a white card, attached to the end of a rod 13" long, and I consider it of the first importance that the subject under examination should be induced to accommodate accurately for this object while the test is in progress. As to the prisms, they are taken from my trial case, and I usually hold them in my hands, being satisfied that with the weak prisms which I employ to produce vertical diplopia, I can make the test in this way with a degree of accuracy sufficient to avoid appreciable error.

DISCUSSION.

DR. R. J. McKAY of Wilmington, Del. — I have been very much interested in Dr. Theobald’s paper and I largely agree with his views about this trouble. I would like to state how I test in these cases. Before I use any prisms I find what the refraction is. I put a dark red glass in front of one eye and let the patient look at the gaslight in the shape of a candle-flame at twenty feet, and see whether there is diplopia, hyper-
phoria, esophoria, or exophoria as the case may be; then I go on with prisms, using ten degrees first, five on each side, bases in, then I rotate these and find confirmation often of what I found with the red glass. Usually I make a mental note of that—as I am able to carry things well in my mind—and then I exercise the eyes with square prisms of the kind I first saw some twenty years ago in Dr. Noyes's office to find the muscular power that is present, which I record; then I again put them through, looking at the light twenty feet off with the red light and with the prisms. I then know something about the strength of muscles and record the "phoria" or "heterophoria" found. I rarely use a prism base down in exercising the muscles. By this procedure I think I have gotten rid of the spasm, which Dr. Noyes mentioned so pointedly, and feel I know something about the case. And if these patients have exophoria or esophoria in accommodation I pay no attention to it provided they have orthophoria for a distance, and fairly good muscular power. I think Dr. Theobald has brought out a good point, that when there is slight exophoria in reading, and none at a distance, there may exist what he describes as subnormal accommodative power.

**Dr. Edward Jackson of Philadelphia.**—I think Dr. Theobald has done well in calling attention to the swing of the pendulum in this class of cases. I do not think, however, that I can quite agree with him as to what he designates by the term subnormal accommodative power. It seems to me that if the amount of accommodative power is really up to the normal, if the eyes have the near point of normal eyes, and exert the normal amount of accommodation, to speak of them in this way will introduce confusion. It may be right to speak of subnormal accommodative endurance. The phenomena, however, is very closely allied, almost identical with that of insufficiency of the muscles. It is a faulty co-ordination of ciliary contraction with contraction of the internal recti, if I understood the class of cases Dr. Theobald had chiefly in mind, where with a certain amount of convergence there was a relatively small amount of ciliary contraction. These are closely allied to heterophorias rather than cases of simple weakness of the ciliary muscles. Now there are a very large number of cases, I think, that come to us with accommodative power actually below the normal. I find quite a large proportion of cases with decided eye strain, hyperopes, as well as myopes, presenting actually low power of accommodation. It seems to me these better deserve to be spoken of as cases of subnormal accommodative power, than the other class to which, as I understood, Dr. Theobald principally referred.
DR. J. A. LIPINCOTT of Pittsburgh.—Dr. Theobald is
doubtless correct in stating that exophoria at the reading dis-
tance is very common; but I do not agree with him that any
considerable degree of this condition ought to be regarded as
normal. Most, probably 90 per cent. of my cases showing
exophoria for the near point amounting to six or eight degrees,
derive positive comfort from the addition of a prismatic element
to their reading glasses. The strength of the prism which I
usually find of service is about one-half of the insufficiency for
the reading distance.

In regard to the treatment of these cases of accommodative
asthenopia there is one method that has not been alluded to,
and that is the gymnastic method introduced by the late Dr.
Dyer. The patient is directed to read for four or five minutes
times three twice a day, and gradually to increase the time of each
reading until an hour and a half is reached, i.e., four and a half
hours of reading during the day. It is true very few men can
be induced to carry out such a programme, but many women
can, and women it is, preëminently, that suffer from this form
of asthenopia. Dr. Dyer's method has been followed in hun-
dreds of cases with excellent results, and I regard it as a most
valuable contribution to ocular therapeutics.

DR. B. ALEXANDER RANDALL of Philadelphia.—This sub-
normal accommodative power—or better, insufficiency of
accommodation—like insufficiency of the convergence, has
always been especially interesting to me. It is largely a matter
of terms; but I like better these latter names—for it strikes
me as a bad phrase to call insufficient muscles which may be
abundantly strong, yet do not act sufficiently. As I have
stated on previous occasions, insufficiency of convergence for
the near I have found rather the rule than the exception; but I
cannot agree with Dr. Theobald in regarding it as normal, any
more than I accept as normal the hypermetropia which is
present in the majority of eyes. However great we may for
the moment make the region of relative accommodation and
convergence, these two functions are really closely linked, and
deviations from the typical balance are usually cases of distorted
coordination. Some of these cases are best met by optically
making up the difference with lenses or prisms, and following
Dr. Risley I have always given about one-half of the correction
for lateral deviations, as Dr. Lippincott advises: some are due
to actual weakness and are greatly helped by weak eserine
collyria or administration of nux vomica; but in many cases
efforts to mechanically restore the lacking balance are largely
abortive and relief is gained by tonics acting centrally in restor-
ing the disturbed co-ordination.
Theobald: A Cause of Asthenopia.

Dr. Gradle of Chicago.—The want of co-ordination of the convergence with the accommodation that the speaker has referred to I have met with very often by examining patients by the method described by me before the Society yesterday, by means of the apparatus which separates the field of one eye from that of the other without the use of prisms. One-half of all persons I have ever examined show exophoria at a range of eleven inches, and it is very common to find from three to six degrees, yes, even eight degrees where no complaint exists, or where asthenopia is due to other causes. Moreover I would state that exophoria at short range is not necessarily a morbid occurrence. I would assert this definitely on the strength of tests I have made with Landolt's ophthalmodynamometer as persons who may show an insufficiency of convergence of six or seven degrees at reading distance, when binocular vision is suppressed will still converge up to two inches without diplopia in Landolt's test, and therefore have twenty metric angles at their disposal, an amount of convergence fully equal to the normal limit. Accommodative troubles which do not come under the classical heads, where we cannot distinctly assign a typical cause for the asthenopia, have been very common in my practice. Quite a number of these I have been unable to benefit by the use of prism or weak spherical or cylindrical glasses or remedies, as eserine, intended to strengthen the ciliary muscle. I have for the past few years been able to relieve some of these, however, by attention to the nose, and it has been my good fortune in a fair number of instances to succeed in removing all asthenopia by means of an operation intended to relieve nasal obstruction. I must emphasize, however, that these remarks apply only to that class of asthenopic complaints not due to typical errors of refraction or accommodation.

Dr. John Green of St. Louis.—I have long felt that, in dealing with asthenopic patients, too little thought has been given to possible accommodative insufficiency with resultant accommodative fatigue, and this whether in the presence or in the absence of noteworthy errors of refraction or of demonstrably disordered muscular balance. Some of the members present may recall a communication made by me to this Society in 1881, in which I advocated the systematic use of very small instillations of a weak pilocarpin solution, in conjunction with graduated daily exercise of the accommodation as taught us by our late colleague, Dr. Ezra Dyer, in a paper printed in 1865 in the first number of our Transactions. I can now only reiterate what I stated here ten years ago, namely, that I regard many asthenopic cases as essentially cases of strained accommodation,
and believe that I have derived great advantage, in their treatment, from the instillation, say twice a day, of a solution of hydrochlorate of pilocarpin of the strength of one or two grains to the ounce. The quantity to be instilled is carefully measured in the tip of a fine-pointed glass pipette, and should ordinarily not exceed perhaps one-tenth of a minim. The intention is to instill a quantity a little less than would be required to produce noticeable contraction of the pupil or tension of accommodation.

In this connection it may be permissible to refer to the fact that our colleague, Dr. D. B. St. John Roosa, has recently given expression to views substantially in agreement with those which I have long held.

Dr. Samuel Theobald of Baltimore, Md.—In regard to Dr. Jackson’s objection to the use of the term sub-normal accommodative power, I would say that I gave the matter of nomenclature considerable thought. Two names occurred to me; one was the term used—sub-normal accommodative power, the other, insufficiency of the ciliary muscles. I did not feel quite justified in using the latter term because I had no way of determining whether the weakness was in the ciliary muscles, or whether the condition of the lens was such as to make it difficult for the ciliary muscle to produce the usual change in its curvature. Therefore I thought the former term was the better one to employ.

That there is an actual sub-normal accommodative power in these cases I feel convinced. This results either from weakness of the ciliary muscles or from some unusual condition of the lens.

As to Dr. Jackson’s reference to insufficiency of the external recti muscles, I am a thorough believer in the fact that we have at times true insufficiency of the internal and external muscles. I think that the muscles are actually poorly developed in many cases, and that they are not capable of performing their work. I do not think there is simply a want of nervous energy. I have very often observed, in making tenotomies, and I am sure that others have noticed the same thing, how greatly the size of a given muscle varies in different subjects. In one case we have twice as large a muscle as in another. In some cases there will be found merely a slender band, making us disposed to doubt whether we have cut the whole muscle through.

As to divergence in the near vision being anything like exceptional, or being present, as Dr. Gradle has claimed, in only fifty per cent. of cases, I am very sure from my own experience that that percentage would not begin to represent the actual
figures. I believe that nearly ninety per cent. of all the refraction cases I examine show some exophoria at the reading distance. In emmetropic eyes the normal condition in fully ninety per cent. is exophoria at the reading distance, and this exophoria will vary; it will rarely be as low as two degrees and will go from that to five or even six degrees.

In regard to Dyerizing or exercising the ciliary muscles by systematic practice. It seems to me that with a school girl who comes to me and who has been exercising her ciliary muscles in the most thorough manner it is very doubtful whether anything of this kind will be beneficial.

It is like telling a man who spends his days in breaking stone on a road that he had better use dumb bells to develop his muscles. He does not need such exercise. He is using his muscles every day. Certainly the cases that I have seen were cases in which the muscles were habitually used; they were exercised daily. I doubt very much, then, whether any good could come from telling these patients to read systematically, and to gradually increase the length of time of reading.

A CLINICAL STUDY OF THE OCULAR SYMPTOMS FOUND IN THE SO-CALLED MONGOLIAN TYPE OF IDIOCY.

BY CHARLES A. OLIVER, M.D.,
PHILADELPHIA.

This paper, which is the outcome of clinical work, extending over a period of nearly three years at the Pennsylvania Institution for Feeble-minded Children, and which embraces to a greater or less degree many of the peculiar ocular groupings found in this so-called class of cases, is here given in the hopes of not only adding a few of the more easily seen ophthalmic symptoms to the main characteristics of the disorder, but that some additional proof may be furnished as to the true pathology. Reserving the details of the latter examination for another paper, the subject will here be confined to a series of short

* The author desires to express his thanks to Drs. J. N. Kerlin and A. W. Wilmarth, for their kindness in allowing him access to the proper class of subjects, and to Drs. J. S. Stewart, L. F. Love, H. W. Cattell, F. P. Norbury, and M. W. Barr, for assistance given.
clinical observations in association with a definite number of deductions upon the eye conditions alone.

Although classed by most alienists and neurologists as a genetous form of idiocy, in which the physiognomy is distinctly mongolian in type, a form of ethnic naming, however, which with equal force might be given to those cases presenting other racial facial characteristics, yet in this brief clinical demonstration of some of the ocular groupings found, the ophthalmic conditions have been so constant and are so different from those that are seen in the mentally and physically healthy of our race, that they deserve to be specially studied from this standpoint. The paper, therefore, resolves itself into a study of the eye symptoms of that peculiar form of congenital idiocy which presents a marked brachycephalic deformity as one of its most prominent features.

Governed by the same rules of selection of cases as in all of the previous work* in this direction by the writer, and care having been taken that all of the conditions were studied under similar circumstances, the observations have been combined into a series of short captions, from which a definite number of conclusions will be formulated.

**OBSERVATIONS.**

*First.* Direct vision for form in the couple of cases in which it could be studied, slightly below normal.

*Second.* Direct vision for color slightly subnormal in one instance in which it could be properly obtained.

*Third.* Accommodative action: impossible to obtain any reliable answers by any subjective or objective methods.

*Fourth.* Visual fields: nothing could be properly gotten.

*Fifth.* Circumference of orbital cavities, probably somewhat larger than normal, the bony rim in many cases being unusually thin.

*Sixth.* Bony bases of orbital cavities, somewhat squared, asymmetrical, and situated farther apart than normal.

*Seventh.* Greatest vertical diameter of the circumference

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*Vide* these Transactions for 1887, 1889, and 1890.
or base of the bony orbit in a number of cases, directed slightly down and out, and away from the median line.

**Eighth.** Greatest lateral diameter of the circumference or base of the bony orbit in a number of cases, directed in and down towards the median line.

**Ninth.** Superciliary margin of orbit slanting upwards and outwards, causing in many instances a distinct lessening of the usual downward inclination of the outer third of the supercilia.

**Tenth.** Palpebral fissures in every instance, obliquely placed toward one another, deviating downward and inward toward the median line, and at angles varying from five to twenty degrees with the horizontal meridian.

**Eleventh.** Palpebral fissures generally placed at different angles in relation to one another; that of the right eye usually showing the greater inclination.

**Twelfth.** Palpebral fissures, as a rule, corresponding in direction with that of the greatest lateral diameter of the orbital base.

**Thirteenth.** Palpebral fissures in every instance quite short, averaging but twenty-three to twenty-four millimetres in length.

**Fourteenth.** Palpebral fissures in a number of cases differing about a millimetre in length in the same subject.*

**Fifteenth.** Horizontal plane at position of right inner canthus somewhat more frequently lower than that at the left inner canthus.

**Sixteenth.** Lid substance in a few instances tumescent and soft to the touch, the inferior orbital and the orbito-malar sulci being not very clearly defined.

**Seventeenth.** Ciliary borders of lids thickened and broad in quite a number of cases.

**Eighteenth.** Conjunctivae very vascular, swollen, and excreting; the orbital portions of the membranes being very frequently succulent; these conditions increased by handling.

**Nineteenth.** Follicles in the lower cul de sacs very much enlarged.

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*It is curious, though it may be a coincidence, the left palpebral fissure was almost always the longer.*
Twentieth. Plica Semilunaris thicker than ordinary in several instances.

Twenty-first. Epithelial layer of cornea thickened, filled with rugae, and in some instances dotted with minute blebs.

Twenty-second. Horizontal diameter of cornæ in a number of cases, at different angles from that of the palpebral fissures.

Twenty-third. Pupillary openings three millimetres in average size.

Twenty-fourth. Interpupillary distance as a rule about fifty millimetres in length.*

Twenty-fifth. Iridæ, as a rule, freely and equally responsive to light stimulus.

Twenty-sixth. Iridæ, in the few instances in which the experiments could be tried, not very prompt to efforts for accommodation and convergence.

Twenty-seventh. Iridæ utterly devoid of any peculiarity in comparative tints.

Twenty-eighth. Pupils dilated almost ad maximum by the instillation of three drops of an eight-grain solution of hydrobromate of homatropine.

Twenty-ninth. Extraocular motion intact in all directions in the two instances in which it could be properly studied.

Thirtieth. Slight insufficiency of the interni manifest in the one case (a low grade with six diopters of hypermetropia) in which it could be satisfactorily searched for.

Thirty-first. Horizontal nystagmus-ataxic in variety in several cases in which the deeper temporal layers of the optic nerve tissue appeared very gray and degenerate, and the choroid and retina much disturbed.†

Thirty-second. Intraocular tension normal.

Thirty-third. Intraocular media in all instances clear and transparent.

* It must be remembered that all of these subjects were quite dwarfish in stature for age.

† This nystagmic action, which in three instances was horizontal and becoming vertical at times, was best noticed during ophthalmoscopic examination made through an artificially dilated pupil. It could be momentarily quickened by directing the attention of the subject to some brilliant object.
Thirty-fourth. *Optic discs in a number of cases unequally grayed, especially in the deeper layers and to the temporal sides; this being more marked where the outlying choroid and retina seemed the most disturbed.

Thirty-fifth. Substance of disc in the great majority of instances, especially where the retinal and the choroidal disturbance was not pronounced, apparently oedematous and superficially over capillary.

Thirty-sixth. Edges of disc, except to the temporal side, almost completely hidden at first view, but dimly seen by careful and concentrated focusing upon the successive parts.

Thirty-seventh. Scleral ring quite narrow, and as a rule only seen to the outer side of the disc.

Thirty-eighth. Crescents and broken areas of blackish pigment, generally limited to the temporal edge of disc.

Thirty-ninth. Physiological excavation in most instances seemingly filled in with almost transparent yellowish gelatinous-like masses.

Fortieth. Retinal striation but very slightly marked, it always being more pronounced just beyond the superior and the inferior borders of the disc.

Forty-first. Retina surrounding the optic-nerve head, oedematous and swollen in quite a number of cases.

Forty-second. Retinal vessel walls where they could be seen — especially on the disk — extremely thin and apparently somewhat yellowish and translucent, appearing as though they had been soaked.

Forty-third. Retinal blood currents excessively pallid.

Forty-fourth. Light-streak along the retinal vessels in a number of cases, quite broad, uniform, and clearly defined, while in some others, especially in those where there were many evidences of inflammatory or exudative products, it was probably narrower, more irregular, and less visible.

Forty-fifth. Retinal veins in the majority of cases, tortuous in appearance.

Forty-sixth. Macular twigs of the retinal circulation in a

* All of the intraocular structures below described, were most carefully studied after enlarging the pupillary area, thus giving a broad and extensive ophthalmoscopic field.
few cases, apparently larger than ordinary and more plainly visible than usual.

_Forty-seventh._ A fine network of minute branching vessels having no apparent communication with any other retinal vessel grouping in the macular region in two cases where the retinal swelling was quite dense and extensive.

_Forty-eighth._ "Shot silk" opacities so ordinarily seen in children, not very pronounced and not numerous.

_Forty-ninth._ Small clusters of pin-point spots apparently like the remains of minute capillary haemorrhages seated superficially in the retina in many instances, these more generally following the course of the smaller inferior retinal stems.

_Fiftieth._ Isolated and aggregated cholesterol crystals in some instances, generally situated in positions bearing no relation to the larger retinal vessels.

_Fifty-first._ Whitish and yellowish massings from the size of pins' heads to two or even three millimetres in area, irregularly distributed throughout the retina in a number of cases.

_Fifty-second._ Rim of macular lutea itself quite large, irregular, and apparently stretched laterally in a few cases where there was not much intraocular disturbance; especially where there were low degrees of hypermetropic and myopic refraction, with and without noticeable astigmatism.

_Fifty-third._ Border of yellow spot in a few instances, densely white in appearance.

_Fifty-fourth._ Pigment layer of the retina reduced in thickness and density, allowing the larger choroidal vessels to be plainly seen in the periphery of the eye-ground.

_Fifty-fifth._ Choroid in a great number of cases, disturbed, granular, and irritated.

_Fifty-sixth._ Choroid in some instances, seemingly in a low grade inflammatory state, the greatest amount of disturbance being in the macular region and vicinity of the disc.

_Fifty-seventh._ Refraction in the macular region generally hypermetropic with some astigmatism.

In more than fifty per cent. of the cases examined in this grouping, post mortem examinations showed a decided lessening in both the number and the size of the ganglion cells in the
hemispheres, especially in the frontal regions, widely scattered sequelae of cerebral vasculitis, and marked deficiency of the pons and the medulla.* These are of extreme interest in illustrating the more pronounced conditions of the intracranial contents which may be either parts and parcels of the general systemic involvement, or merely anatomical and pathological peculiarities due to defective development of the nutritive centers in the lower brain.

Here, where gathered from every phase of social condition, we have a definite and easily recognized class of subjects, dwarfed, stunted, and peculiarly shaped, markedly brachycephalic or even plagiocephalic, and universally almond-eyed;+ a type of patients with cold, club-shaped extremities that must be wrapped during the moderate winter of our latitude to prevent them from being frost-bitten, it must be conceded that there is a something which is peculiarly common in their physical formation. Moreover, here where there is a grouping of cases in whom mere scratches become ulcerous, sores fail to heal until warm weather appears, and ecchymoses are so prevalent during sickness (a type of patients, who, without any history of ancestral ties of consanguinity in marriage, most always succumb during one of the colder months of the year to some gross hæmorrhagic or exudative lesion in the mucous tract), it must be agreed that there is some particular form of dyscrasia which is alike in all: and if this class of individuals present the above ocular conditions so pronounced, so indicative of the general symptoms, and so unlike those seen in any other form of idiocy, it can be justly claimed that in them there has been some common etiological factor which has been quite actively at work during the very early history of their antenatal existence.

So, regarding these cases then, the following deductions may with some show of certainty be tentatively made: conclusions that if at all certain and sure, assume an interest not only to the ophthalmologist, but a direct value to the alienist, the neurologist, and the pathologist: a series of results — correct or incorrect — that at least may be of service in the

+ Not strictly so, as the fissures are short.
inducement for further study in this and other directions of the many types of cases which apparently present similar groupings of coarse and at most times recognized peripheral lesions.

CONCLUSIONS.

I. In the so-called Mongolian type of idiocy, the malpositions, irregularity of contour, and inequality in comparative size of the bony orbits, with the obliquity of the attached ligamental and tarsal tissues, giving the palpebral fissures their peculiarity of direction, the lids their shortness, and the eyes their apparent relative faulty situations, are merely the rough ocular expressions of the results of the osseous and ligamental malformations so characteristic of the disorder: in fact, it is these conditions which have, more than any other, contributed to the naming of the type.

II. In the so-called Mongolian type of idiocy, the ocular bulb in nearly every instance presents peculiarities of structural change characterized by the appearances of the results of low and chronic forms of neuro-retinitis and choroiditis indicative of local inflammation of these parts before and after birth of the individual.

III. In the so-called Mongolian type of idiocy, the substance of the intraocular ending of the optic nerve and the circumjacent retinal and choroidal membranes, seem, in those instances where there are no marked evidences of coarse intraocular change, to share in the soft jelly-like edema so universally recognized in the external portions of the organs.

IV. In the so-called Mongolian type of idiocy, the mucous lining of the ocular appendages and of the anterior part of the globe in every instance seems to exhibit the many gross pathological peculiarities seen in the chronic and constantly provoked inflammation of other similar surfaces found throughout the same subject, and which in the great majority of instances leads to lethal result.

V. In the so-called Mongolian type of idiocy, the peculiar vascular changes not only discoverable even ophthalmoscopically in the vessels of the retina, where the visible portions of the walls appear thin and so peculiarly tinted, and the sequelae
of fine capillary and even larger haemorrhagic extravasation into the retinal substance, with probable evidences of graver complications are most common, but as almost universally recognized in identical imperfections and disease of intracranial vessel * structure serves, with the general clinical features of imperfect circulation, to show, both objectively and subjectively, the prominent characteristic lesions and probably the etiological condition of the disorder: imperfect development, with consequent disease of the entire vascular system.

DEMONSTRATION OF A ROLLER-FORCEPS CONSTRUCTED ACCORDING TO THE MANGLE PRINCIPLE FOR PRESSING OUT TRACHOMA GRANULATIONS, WITH REMARKS.

BY HERMAN KNAPP, M.D.,
NEW YORK.

The surgical, or rather mechanical, treatment of granulated lids, though very old in all its forms, has been revived during the last years. Its different modes, arranged in historical order, are very well described in a brochure which Prof. Sattler of Prague, now of Leipzig, published a year ago, under the title, "Die Behandlung des Trachoms, sont u. jetzt."

Several years ago, Dr. Prince of Jacksonville, Ill., on a visit to New York, made me a present of a ring forceps with which he pressed out trachoma granules. I will pass the instrument

* For comparison with the faulty conditions of the retinal structures, a careful comparison of the condition of the related cortex cells in the occipital region would be most interesting and instructive; in fact, all of the structures, both neural and vascular, might be studied to advantage.

It may be interesting to note that the average age was twelve years; but one case gave any evidence of organic cardiac disease, though the heart in several instances examined, post mortem, was found to be quite small; in all but two cases, both of whom were paralytics, the patellar-tendon reflexes were either absent or greatly diminished; and as a rule, the grandparents, more particularly upon the maternal side, gave a history of paralysis.
around. Early in March of this year I had the privilege of witnessing Dr. Henry D. Noyes treat a marked case of follicular trachoma with a pair of his forceps in the manner described in his text-book. I determined to give this mode of treatment a thorough trial, and began with it systematically March 21, 1891. Since that time to the present day, I have treated by the pressing method 58 cases, of which I have kept careful notes.

I used Dr. Noyes's forceps once only. I had greater difficulty in pressing the granules out with them than with the ring forceps of Prince, which I used in a few cases. Both instruments answered their purpose, but they lacerated the conjunctiva considerably. I therefore had a pair of forceps constructed with which I could press the trachomatous substance out completely and without laceration of the mucous membrane by the instrument. The principle on which the instrument is constructed is used in several machines. A similar example is the mangle with which the laundress wrings out the washing without tearing it in the least; the linen is passed between two rolling cylinders, the liquid comes out and no fibre is torn. In order to apply such an instrument to the conjunctiva, I had two steel cylinders so inserted into the forked ends of the branches of a pair of small but strong forceps that they rolled on each other when they were drawn over a body held between them. The retrotarsal fold of the lower or upper lid is grasped as far back as possible between the cylinders, compressed and stripped out. In follicular trachoma the granules come out as such; in diffuse trachoma pseudoplastic infiltration escapes like a transparent oily substance. In robust persons good cocainization will suffice to perform the operation, but I prefer to etherize the patients, for the operation, if thoroughly done, is somewhat tedious. The forceps have to be passed repeatedly over all the por-

tions of infiltrated conjunctiva. In the first traction the conjunctiva offers a good deal of resistance, the nodules impede the advance of the instrument, but when the forceps are passed a second or third time over the same portion of the conjunctival fold, the cylinders roll smoothly over the tissue between them, and the lack of resistance indicates that all infiltrated material has been squeezed out.

The mode of operating is as follows:

When the local, or better, the general anaesthesia is complete, the lower lid is everted and the infiltrated portion of the lid superficially scarificated, very conveniently with Dr. G. Lindsay Johnson's scarifier ("sillionneur," as he calls it). Any knife, however, will answer, and I may mention that scarification is by no means indispensible. Then one roller is pushed between lid and globe deep into the conjunctival fornix, while the other roller is applied to the anterior portion of the everted lid. The forceps are then compressed with the fingers, drawn forward so that the tissue between the cylinders is milked out. The instrument is re-inserted and the neighboring portion treated in the same way. This manipulation is repeated until the cylinders roll easily and evenly over the evacuated conjunctival fold. The upper lid is dealt with in the same way. It is convenient to bring the fornix portion of the conjunctiva to view by drawing the upper edge of the tarsus away from the globe by means of a fixing forceps or a sharp hook. Both lids of both eyes can be treated at the same setting, and the evacuation of the infiltrated substance should be so complete that another operation is not required. Particular care should be taken to reach the part of the conjunctiva which is hidden under the commissures. If the tarsal portions are infiltrated, one cylinder may be applied to the outer surface of the lid, and the instrument so drawn across the lid that the other cylinder presses the granules out of the tarsal conjunctiva. When the instrument is not properly made, the cylinders do not roll well, and the conjunctiva is pressed out by traction, as with the ring forceps. It is also necessary that during the operation the branches of the forceps should be kept clean. Coagulated blood is apt to stick to the joints of the rollers and prevent their
rotation. The forceps therefore should, in the progress of the operation, be dipped into an antiseptic fluid and wiped with a sterilized sponge or linen.

I had a number of instruments made in order to find out which form and size would work best. The smooth cylinders did not turn so well as the creased ones. I had the rollers and tips of the branches made of platinum, in order to sterilize the instrument by glowing. The expense is doubled, the advantage probably imaginary. It is easy to cleanse the steel forceps with a brush and soap, and sterilize it with boiling water. At first, as long as I was feeling my way, I operated one lid only at a sitting, then two lids, and soon after all four. At first I kept the patients in the hospital, but soon I found that they could safely go home. In no case have I seen a serious reaction. There is more or less bleeding during the operation. I think the more the better, for, in my opinion, the extravasation of blood and transudation of tissue juice, during and after the operation, act as the best antiseptic, carrying along with them germs which are in the region of the wound. I have brushed a lotion of 5% corrosive sublimate over the stripped and swollen parts of the conjunctiva, but do not think it essential. It is, perhaps, best to bathe the bruised conjunctiva with slightly warmed water, avoiding everything that, by coagulating the blood, prevents the oozing out of the tissue juice. It is remarkable how soon the patients feel well even after the most extensive crushing of tissue.

I have treated in the manner described follicular and diffusely infiltrated trachoma. The method triumphs in the cases of densely packed spawn-like granulations, before the cornea is affected and scars have formed. These cases, I dare say, are completely and permanently cured in one sitting, however dense and extensive the deposition of granules may be. The other forms of trachoma, when there is more or less inflammatory secretion of the conjunctiva, or distinctly hyaline infiltration between cicatricial tissues are also greatly benefited by the squeezing, but in these cases it is advisable to let the operation be followed by the application of nitrate of silver solutions or the sulphate of copper crystal. Corneal ulcers are
no contraindication to the squeezing, but in the after treatment the secretion ought carefully to be removed, and by cold application and mild astringents kept in check. Cases of follicular catarrh where the miliary granulations are not much developed, but in some cases obstinately resist, lotions, salves, and touchings, are benefited by the squeezing, but the horny excrescences of infiltrations of the lids in summer catarrh are not benefited by it, if I may judge from one case.

In the non-inflammatory follicular trachoma the conjunctiva assumes a normal aspect in a month or two; the patients are entirely comfortable; in cases of some inflammatory complication a condition of so-called papillary swelling lasts for a month or two longer, the same as we notice in the gradual restoration of the healthy condition of the conjunctiva after blennorhagic inflammation. Six months is not a long enough time to judge of the final results, i.e., the value of this mode of treatment; but so much I feel entitled to assert, that the thorough pressing out of the trachoma granules in the manner described is the most valuable aid in the cure of this important disease that I have become acquainted with.

DISCUSSION.

DR. DAVID WEBSTER of New York.—I have used this method of treatment of follicular trachoma and granular lids in quite a number of cases. I have not counted them up, but within a year or two I have been operating in suitable cases and have always had the best results. I have always used Noyes's forceps for that purpose. It requires two pairs, one to fix the lid, the other to do the squeezing and scraping. After I had operated on quite a number of cases, I learned that it was a rule with a number of my most eminent colleagues in New York city to apply the sulphate of copper freely after the operation, first wiping away the blood, then applying the sulphate. So I tried that in one eye, and didn't do it in the other eye of the same patient. I thought I would compare the result. The result was that the eye that had the sulphate of copper applied to it became very much more inflamed; there was a good deal of inflammatory reaction, and it was much longer in recovering than the other eye. The result was absolutely the same. I find that by this method of treatment we can cure cases of bad follicular trachoma in a couple of weeks, or nearly
cure them in that time, where it would take perhaps two years
to cure them by any other method. I think it is one of the
greatest discoveries of modern ophthalmology.

**DR. MYLES STANDISH** of Boston.—Since Prince showed
me these forceps, I have used them in my clinics frequently,
and with the most satisfactory and surprising results. A
patient comes in not able to open the eyes, you squeeze out
the contents of almost all the granulations, and the next
day he comes down stairs with his eyes wide open and says he
feels well. The results have been very satisfactory to my
mind. It is true that with Prince's forceps there is a good
deal of bleeding and apparent tearing of the conjunctiva. I
think, however, this is more apparent than real, as the next
day the conjunctiva looks quite entire. It would seem as if
each follicle was readily broken by Prince's forceps and evacua-
ted of its contents. I have always done it under cocaine, how-
ever. If Dr. Knapp's roller forceps will do the same work
with less laceration, it seems to me they are to be preferred, but
that the treatment is correct, and that it shortens the length
of stay in the hospital of all cases of acute granular lids by at
least three months, I am fully certain.

**DR. HENRY D. NOYES** of New York — I have made use of
these forceps as a good mechanical arrangement for performing
the work, and I am willing to grant that a certain amount of
laceration and reaction takes place which is unpleasant. In
some cases I have had to resort to the use of ice water con-
tinually for two days; but in most cases the œdematous con-
dition subsides before that time. Having all the squeezing
power at one side of the handle, you are able to get into the
outer and inner angle better than you can by any other in-
strument, and you can pick up small portions of tissue and
handle it with the forceps I have made use of better than by
any other method. I think the rollers Dr. Knapp has de-
scribed would do best in those cases where you want to squeeze
out the follicles on the tarsus. There you may be able to exert
an amount of pressure greater than you could secure with other
instruments.

You must always have two pairs of forceps, one to fix the
tissue and the other to squeeze out the granulations.

Now, as regards the cases to which this treatment is ap-
pllicable, let me say first: The cases to which this practice
eminently applies are those of follicular trachoma in which
there is no opacity or vascularity of the cornea. There is a
slight amount of secretion and discomfort; the patient is not
apparently aware of it; he simply knows there is a purulent
discharge. Galezowsky has also done excision of the cul de sac in this class of cases, upon which I have operated in this manner for many years. I have removed the cul de sac of the upper and lower lid, and no shrinking has taken place, owing to the prudence with which it is done. I have got rid of the disease by this method, in cases which would otherwise have occupied from six months to two years for cure. This is not a dangerous disease; it never produces vascularity of the cornea.

But take the mixed cases of trachoma, and this method is not so successful. It helps the cases, but you have still to go on with the ordinary methods of treatment, with the nitrate of silver, astringents, and whatever else should be applied.

I wish to add but one word more. I have done this operation to a very large extent during many years. I have not kept any statistics, and have not recorded my cases, and have only been giving you impressions derived from the growth of experience. The thing can recur. Dr. Knapp has not seen it recur. I know at least two cases where, after six months, I have been obliged to resort to the squeezing again. Furthermore, if you have treated your case with some severity in the process of squeezing, you will get a grayish film of plastic exudation of the conjunctiva that may last for a day or two; but you will find this disappears. This never results in cicatrization. This process has never given rise to any shrinking of the lids afterwards, and it greatly shortens the period of treatment.

But for papillary hypertrophy which may be consecutive, or if primary, the squeezing does much less good. That has to be treated with sulphate of copper and nitrate of silver for a certain number of weeks. But I can assure you that extrusion of the follicles is a great boon.

DR. EMIL GRUENING of New York.—I have made use of another kind of forceps for the same purpose of squeezing out granulations. The forceps is somewhat similar to that of Dr. Noyes, but differs from his in this, that but one is required.

I find that relapses occur when disinfection of the lids is not resorted to. After expressing the granulations I use sulphate of copper in substance. In a case of follicular trachoma in a child, where the lower lids only were affected, I used this forceps without disinfesting the lid, and two days later I found that in both eyes the upper and lower lids were studded with granulations. There was an acute infection of the conjunctiva of the upper and lower lids and of the transition folds. This goes to show that the ordinary form of follicular conjunctivitis is really a granular conjunctivitis. I expressed
two days later the upper and lower lids and used copper. The reaction resulting from this treatment was considerable, but with cold applications the reaction subsided, and within a few days the child was well.

Dr. H. Knapp of New York.—As this question of contagiousness and antisepsis has been brought up by Dr. Gruening, I want to say that ordinarily I do no more than cleanse the conjunctiva before the squeezing, but when the squeezing is over and after the bleeding has been going on for a time, which I encourage, I brush the whole cul de sac out carefully with a \( \frac{1}{500} \) solution of bichloride of mercury. Even this I have often omitted without noticing any difference in the recovery.

With regard to the rationale, the action of the squeezing, I have given that subject considerable thought. It can scarcely be imagined that one squeezing removes all the germs that are in the conjunctiva sac, which is often studded with granules from one end to the other, there being scarcely a square millimeter free. When the squeezing is thoroughly done the granulations disappear as by enchantment, and it seems permanently. In a number of cases which I have followed for three or four months, there has been no return after the operation, and the conjunctiva was as white and smooth as an ordinary conjunctiva. I think the organism rids itself of bacteria by congestion, transudation, and extravasation. I may be allowed to cite the old observation that a cataract section that bleeds does not suppurate.

Purulent sloughing of the cornea is arrested and the cornea clears up when perforation takes place and the oozing of aqueous through it drains and purifies the ulcer. In like manner it seems to me, that, when the squeezing is done carefully, the bleeding and the oozing out of the tissue juice carry off the infective material which may still happen to remain. We must bear in mind that there is in the living tissue a sufficient force to destroy or at least render innocuous a number of germs. If larger colonies remain, I should not be surprised to see the disease reappear.
THE BLIND OF NEW YORK CITY.

BY HENRY S. OPPENHEIMER, M.D.

The city of New York makes an annual appropriation from its excise fund to be divided among such of the blind adult poor of the city as try to maintain themselves without becoming inmates of public institutions. The conditions upon which an applicant becomes entitled to participate in the benefits of this fund are: That he, or she, shall be of age, shall have lived in the city for at least two years, shall be poor enough to be considered in need of it, and shall be blind. The definition of blindness is not the scientific one,—"Incurable, total loss of sight," but rather the popular one: The loss of vision to so serious a degree as to prevent earning a livelihood at any vocation requiring eyesight. Visual disturbances which may be remedied by operation, such as cataract, for instance, are included in this definition of blindness. The medical examiner is simply required to certify that the applicant is unable to make his living by sight, or to refuse to sign this application. It is only of recent years that it has been found advisable, for various reasons, to employ an oculist in this capacity. Formerly any legally registered physician could sign the certificates of applicants. In consequence many abuses had crept in, of which it is not my purpose to speak here.

The number of applicants which passed my examinations (as the official examiner for the city) successfully, are, so far, 572.

They are of 15 different nationalities, and present many points which I thought might be of interest to this Society.

There were 304 males and 268 females.

The explanation of this difference I will endeavor to point out later on.

It should be observed that the material I have thus brought together is made up of the poorest of the poor, the poor blind. The vast mass of it is made up of ignorant people of the lower, or lowest classes. Only rarely I found one who, through
blindness, had been brought down to this level from a higher plane of education and refinement. Their statements, as a rule, were unreliable, when they thought it to their interest to vary from the truth. Therefore, so far as this was possible, I relied upon objective signs in diagnosis, when these contradicted statements as to etiology, etc.

NATIVITY.

Of all these applicants there were born in

<table>
<thead>
<tr>
<th>Country</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>213</td>
</tr>
<tr>
<td>New York</td>
<td>189</td>
</tr>
<tr>
<td>Germany</td>
<td>72</td>
</tr>
<tr>
<td>United States (outside of New York)</td>
<td>37</td>
</tr>
<tr>
<td>England</td>
<td>25</td>
</tr>
<tr>
<td>Russia</td>
<td>8</td>
</tr>
<tr>
<td>Italy</td>
<td>6</td>
</tr>
<tr>
<td>Austro-Hungary</td>
<td>5</td>
</tr>
<tr>
<td>France</td>
<td>5</td>
</tr>
<tr>
<td>Scotland</td>
<td>5</td>
</tr>
<tr>
<td>Canada</td>
<td>2</td>
</tr>
<tr>
<td>Denmark</td>
<td>1</td>
</tr>
<tr>
<td>Norway</td>
<td>1</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1</td>
</tr>
<tr>
<td>West Indies</td>
<td>1</td>
</tr>
<tr>
<td>Egypt</td>
<td>1</td>
</tr>
</tbody>
</table>

Natives of United States: 226 = 39.58 per cent.
Foreign-born: 346 = 60.42 per cent.

Total, 572

Of Foreigners

29 persons were blind when they arrived here.

One of these was one year old on arrival.

Twelve were between 10 and 20.

Six " 20 " 30.
Six " 30 " 40.
Four " 40 " 60 years of age.

at the time of their landing here.

It is worthy of remark that 51 lost their eyesight, according to their own statement, within the first five years after arriving here. This would show that of the 346 blind of foreign birth, 8.40 per cent. arrived here blind, and that 14.78 per cent. of their number have grown blind within the five years following their arrival.
The difficulty of arriving at the exact truth of these statements is apparent.

Of this number of 51, it is most probable that quite a proportion should belong to the former of 29, and thus swell the number of blind arrivals on our shores. The lesson this should teach to the guardians of our ports is of great importance, and, in view of these startling figures, I venture to suggest to this Society to consider the advisability of recommending the systematic examination of the eyes of all immigrants who land at our ports with the intention of settling here.

As to the causes of blindness, I have adopted the classification of Magnus and Roth, and put them under four heads, namely:

*Congenital Blindness,*

*Blindness due to idiopathic diseases of the eye,*

*Traumatic Blindness,* and

*Blindness due to general diseases.*

Of *congenital* blindness I have found 22 cases:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retinitis pigmentosa,</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Atrophy of the optic nerve</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Buphthalmos</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Congenital cataract,</td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>&quot; syphilis,</td>
<td></td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

Of the eight cases of congenital cataract, seven had been operated for the removal of the lenses. In three of these the operation was successful, so far as the removal of the lens and the kindly healing of the eye were concerned; but the six eyes showed each an atrophic nerve. In the other four operated cases, the nerves could not be seen on account of occluded pupils. But there was no light perception.

From *idiopathic diseases of the eyes,* I have found of

<table>
<thead>
<tr>
<th>Condition</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrophy of both optic nerves</td>
<td>10</td>
<td>16</td>
<td>26</td>
</tr>
<tr>
<td>&quot; one &quot;</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Blennorrhea neonatorum,</td>
<td>17</td>
<td>18</td>
<td>35</td>
</tr>
<tr>
<td>&quot; virulent, both eyes,</td>
<td>47</td>
<td>40</td>
<td>87</td>
</tr>
<tr>
<td>&quot; one eye,</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>&quot; gonorrhoeica,</td>
<td></td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
The atrophy of the optic nerves, in the 26 cases put down as idiopathic, were those in which neither history nor careful examination could elicit any other cause or disease upon which it might depend.

It will be noticed that 16 of the patients were male and only 10 female.

There were 35 cases of blennorrhea neonatorum, of which the history was usually unmistakable.

Blennorrhoea virulenta, as I call it, was the cause of blindness in both eyes in 87 patients, and in one eye each in six more.

Whether many of these cases were specifically gonorrhoeal or not, could not be told, either by the history or examination, and I have no means of knowing the number; but I do not doubt that quite a proportion were specific. Gonorrhoea, as a cause, was admitted by five men and by no women. When we add these three forms of blennorrhoea, as casual factors of blindness, we have 130 cases of communicable, and therefore preventable, disease. This gives us nearly 23 per cent. of the whole number, without adding Trachoma, of which there were 23 cases, 17 women and six men.

Such a showing as this ought to spur us on to aid the laudable efforts made by several of our public-spirited members, to check this great evil.

In this list are 43 persons with cataracts in both eyes, and seven with cataract in one eye, who refuse to have an operation performed.
It is a startling assertion to make that there are 50 persons, about equally divided between the sexes, who will not grasp at any remedy offered to be released from blindness; but it is a solemn fact.

The advanced age of the patients, the absence of any positive promise of success, and the loss of this stipend from the city, combined, determine them to bear the ills they have. I may add also that the notion is very prevalent amongst the ignorant poor, that the hospitals are simply traps to catch operating material for the surgeons, and that the latter are wholly reckless as to the results of operations.

It is worthy of note that amongst the six patients with detached retinac, there was only one woman; while, on the other hand, the five people blinded by myopic choroiditis and atrophy were all women.

Of the choroiditis with iritis (21 cases), two-thirds were in women.

Glaucoma was the cause of blindness in 62 eyes. Twenty-four of these eyes had had one or more operations performed upon them, while 38 eyes had not been operated upon at all. Of the 24 operated eyes, 23 belonged to men, and only one to a woman. Of the 38 unoperated eyes, there were 24 belonging to men and 14 to women. Combined, they furnish a percentage of glaucomatous eyes in women, 24, or 19 per cent. " " " " " " men, 75, or 81 per cent. or, in round numbers, about three times as many men as women.

Retinitis pigmentosa furnished eight victims, one woman and seven men. In none of them was there any history of consanguinity of parents. Three of them were congenital. The other five grew blind at the ages of 19, 29, 33, 33, and 52 respectively. In one case there were distinct signs of congenital syphilis. This patient became blind at 19. There was no trace of syphilis to be found in the other seven cases, and no history of it.

Blindness from Injuries.

In this table I have included eyes lost after cataract operations and sympathetic ophthalmia. I have left out losses from operations for Glaucoma, for obvious reasons.
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There were lost from

**Burns**, 14 eyes, 1 vitiol, 1 creosote, 1 lightning stroke, 3 lime. In each of these accidents both eyes were destroyed. All victims were men.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract operations</td>
<td>24</td>
<td>41</td>
<td>65</td>
</tr>
<tr>
<td>Dislocated lens</td>
<td>2</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Explosions (blasts, etc.)</td>
<td>46</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>Foreign bodies</td>
<td>7</td>
<td>—</td>
<td>7</td>
</tr>
<tr>
<td>Injuries (to eyes direct)</td>
<td>44</td>
<td>18</td>
<td>62</td>
</tr>
<tr>
<td>Injuries (to head)</td>
<td>16</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Jequirity</td>
<td>2</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Poison Ivy</td>
<td>2</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Sunstroke</td>
<td>2</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Sympathetic Ophthalmia</td>
<td>27</td>
<td>19</td>
<td>46</td>
</tr>
</tbody>
</table>

In those blinded by burns, sunstroke, jequirity, and poison ivy, both eyes were destroyed in each case.

It will have been noticed that in this table most of the victims were men. Leaving out the cataract operations and the cases of sympathetic ophthalmia, we have a percentage of males to females of 78.48 per cent. to 21.52 per cent. If we include the two classes just mentioned and compare them with the total blindness, we have 20 per cent. of all eyes lost destroyed by injuries. Of these 20 per cent., the men furnish 12.50 per cent., the women 7.50 per cent.

*pSympathetic* ophthalmia destroyed 46 eyes; or, to give what is the practical effect, it caused the permanent blindness of 46 people. We know that, as a rule, the eye which causes the sympathetic inflammation in its fellow is blind before it. I am cognizant of several exceptions to this rule, but they are extremely rare, I believe. The count, therefore, charging 8.05 per cent. of the 572 blind noticed in this paper, to sympathetic ophthalmia as the determining cause, must stand as a fair one. If we consider the number of eyes lost alone, the percentage would, of course, be only half that, or 4 per cent.

In explanation of this astonishing record of ignorance and negligence, I would like to say that New York city is, in a very large measure, a place of last resort for people who are suffering from blindness, and whose homes are away from the city. In the hope of cure they come from all parts of this continent. Very often they are obliged to make a supreme effort

Oph.—11
to raise money enough to bring them to the city, and they trust to luck and their hoped-for eyesight to return them to their homes. As an instance, I remember several miners from the Lake Superior copper mines, whose eyes had suffered in an explosion, and whose expenses to the city, which they reached penniless, had been made up by subscription among their comrades. These men were in my charge at the New York Eye Infirmary. Their eyes were hopelessly destroyed before they came East, and two of them are, to my certain knowledge, amongst these cases. I have no doubt that many cases come to the city under similar circumstances, optically and financially, and remain there, stranded and blind.

The dense ignorance of the great majority of these patients, and their inherent distrust of the surgeon who proposes to remove an eye which, at the time, may be no longer painful or troublesome to them, is another prolific source of recruits to the list of victims to sympathetic ophthalmia.

**SYMPATHETIC OPHTHALMIA**

Followed the fellow eye in

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cases</th>
<th>Aged</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Keratitis (with perforating ulcer)</td>
<td>1</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Explosion</td>
<td>2</td>
<td>24 and 45</td>
<td></td>
</tr>
<tr>
<td>Shot (penetrating)</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Foreign bodies (in globe)</td>
<td>3</td>
<td>41, 58, 65</td>
<td></td>
</tr>
<tr>
<td>Operation (dislocated lens)</td>
<td>1</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Blennorrhoea (with perforation)</td>
<td>6</td>
<td>from 1 to 47</td>
<td></td>
</tr>
<tr>
<td>Injury</td>
<td>31</td>
<td>3 to 63</td>
<td></td>
</tr>
</tbody>
</table>

Two of these injuries were said to have been perforations of the globe by pins. All the others were either lacerated, incised, or stab wounds of the globe, excepting two, which are said to have been contusions by the fist. There may have been, in these two, ruptures of the globe in the posterior segment, but this was impossible to determine.

Of these 46 patients,

- Six were blind in the first decade of life,
- Six " " second " "
- Five " " third " "
- Four " " fourth " "
- One " " fifth " "
- Five " " sixth " "
- Four " " seventh " "
One old woman of 63 had the first injury with a pin.

If we consider that children are more exposed to accidents than adults, and if we further bear in mind that children are less intelligent and less likely to complain of a slight annoyance in the eye, which may be in the first stage of sympathetic inflammation, also that they are much less apt to realize the necessity for mentioning it, nor the danger arising from the neglect to do so, we must conclude that the very slight preponderance of numbers of eyes lost in the first two decades of life, as given here, cannot be considered evidence that children are more liable to sympathetic inflammation than adults.

*Blindness from General Diseases*

<table>
<thead>
<tr>
<th>Disease</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
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<tr>
<td>Erysipelas</td>
<td>2</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Interrupted menses</td>
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<td>1</td>
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<tr>
<td>Malaria</td>
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<tr>
<td>Measles</td>
<td>10</td>
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<td>19</td>
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<tr>
<td>Meningitis (cerebral)</td>
<td>15</td>
<td>11</td>
<td>26</td>
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<tr>
<td>&quot; (cerebro-spinal)</td>
<td>2</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Pertussis</td>
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<td>Pneumonia</td>
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<td>Pregnancy</td>
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<tr>
<td>Rheumatism</td>
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<td>1</td>
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<tr>
<td>Scarlatina</td>
<td>5</td>
<td>7</td>
<td>12</td>
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<tr>
<td>Sclerosis (multiple)</td>
<td>2</td>
<td>—</td>
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<tr>
<td>Syphilis</td>
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<tr>
<td>Tobacco poisoning</td>
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<td>Tabes</td>
<td>4</td>
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<tr>
<td>Typhoid</td>
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<tr>
<td>Typhus</td>
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<td>3</td>
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<tr>
<td>Tumor of brain</td>
<td>1</td>
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<tr>
<td>Variola</td>
<td>7</td>
<td>8</td>
<td>15</td>
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</table>

It will be noticed that the sexes are represented about equally in all these diseases, excepting in Typhus 3, Tabes 4, and multiple Sclerosis 2, in which the patients are all males, and in Meningitis, in which males predominate, 17 to 12.

*Tobacco amblyopia* has no female victims here.

In atrophy of the optic nerves the cases in male subjects are almost triple those in females.
I have made up a table of these cases, with their causes, as near as I could arrive at them. The histories very often were as unreliable as they were meagre, and it was very necessary to sift and make use of such as seemed probable. Above all, I preferred to decide by objective signs, where these could be obtained. In spite of all precautions, however, I feel that, where I have had to use the statements of the applicants as a basis, these statistics are not as reliable as I should desire them to be. There is no doubt in my mind that syphilis and gonorrhoea, for instance, should play a much greater rôle as causes here than appears. But, without objective signs or history to point them out, I could do nothing to prove it.

*Causes of Atrophy of the Optic Nerves*

In 101 patients, 72 males and 29 females.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Cases</th>
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<tbody>
<tr>
<td>Meningitis (cerebral and spinal),</td>
<td>26</td>
</tr>
<tr>
<td><em>Genuine atrophy,</em></td>
<td>24</td>
</tr>
<tr>
<td>Injuries (to head),</td>
<td>13</td>
</tr>
<tr>
<td>Congenital,</td>
<td>7</td>
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<tr>
<td>Scarlatina,</td>
<td>4</td>
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<tr>
<td>Syphilis (acquired),</td>
<td>4</td>
</tr>
<tr>
<td>Typhus,</td>
<td>3</td>
</tr>
<tr>
<td><em>Tabes,</em></td>
<td>4</td>
</tr>
<tr>
<td>Syphilis (congenital),</td>
<td>2</td>
</tr>
<tr>
<td>Sclerosis (multiple),</td>
<td>2</td>
</tr>
<tr>
<td>Rheumatism,</td>
<td>2</td>
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<tr>
<td>Erysipelas,</td>
<td>2</td>
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<tr>
<td>Measles,</td>
<td>1</td>
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<tr>
<td>Myopia and choroiditis,</td>
<td>1</td>
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<tr>
<td>Pertussis,</td>
<td>1</td>
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<tr>
<td>Sun and fire (in a cook),</td>
<td>1</td>
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<tr>
<td>Sunstroke,</td>
<td>1</td>
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<tr>
<td>Tobacco poisoning,</td>
<td>1</td>
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<tr>
<td>Tumor of brain,</td>
<td>1</td>
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<tr>
<td>Variola,</td>
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</tbody>
</table>

In conclusion, I should like to say that I made an attempt to arrive at the difference between the longevity of the blind and those who can see. Of the 572 persons considered here, there were between

*So called in absence of any other apparent cause.*
I compared this with the table of the Institute of Actuaries (H. M.), 1869, which was accessible to me. It involved a series of long and tedious calculations, which I will spare you the details of, and which showed a tremendous advantage in favor of the H. M. (healthy male), who can see and afford to insure. This is so easily understood as hardly to need comment. The blind, in spite of the fact that many of them reach an advanced age, are, with the exception of those blind from injuries and blennorrhoea, never thoroughly healthy subjects.

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**ON THE OPERATIVE TREATMENT OF DIVERGENT STRABISMUS.**

BY EMIL GRUENING, M.D.,

NEW YORK.

Absolute divergent strabismus is so often associated with high degrees of myopia, with anisometropia, or with monolateral amblyopia that these conditions are regarded as causative in the development of the muscular anomaly in question. Not infrequently, however, this very form of squint is observed in persons whose two eyes are emmetropic and equal in vision. In divergent strabismus the range of motility is normal; both in the squinting eye and its fellow the inner edge of the cornea touches the caruncle upon extreme adduction, and the outer edge of the cornea the outer canthus upon extreme abduction. The power of accommodative convergence is lost. In some cases the degree of divergence changes with the position of the object, the deviation being more pronounced in distant than in
near vision. There is no tendency to use both retinæ for the
binocular act of vision for any position of the object.

These characteristic features are pointed out here because,
for the purpose of this paper, it is necessary to exclude, on the
one hand, the various forms of periodic divergence, and, on the
other hand, all forms of divergence known as secondary,
paretic, and paralytic.

The latter go to make up separate classes of deviation, are
recognizable by limitation of motility inwards, and require for
their correction the operation of advancement. The ordinary
divergent squint, on the contrary, shows no limitation of
motility, and can be corrected by simple tenotomy of both
recti externi muscles. In many of our recent text-books of
ophthalmology the various forms of divergent squint and
the operative methods applicable to their relief are somewhat
commingled. As a consequence of this intermixture of classes
and measures, the following proposition is induced: "Tenotomy
of the recti externi muscles generally proves insufficient for the
correction of absolute divergent strabismus."

Yet the reverse is true. If by absolute divergent strabismus
the so-called concomitant divergent strabismus is understood,
the proposition should read: Tenotomy of the recti externi
muscles, with the addition of an adducting suture, generally
proves sufficient for the correction of divergent strabismus.

In the past ten years I have practiced this operation with
the greatest satisfaction in all my cases of absolute divergent
squint, and of many I possess a detailed record. Some of them
remained under observation a number of years, a sufficiently
long time to permit me to say that the favorable results were
not only immediate, but also permanent. It is now almost
forty years since Albrecht von Graefe wrote that the pre-
cautionary measures so essential in tenotomy of the rectus
internus, do not apply to the rectus externus, inasmuch as
a free division of the conjunctiva over the externus, and of the
muscle itself, could neither cause an unsightly recession of the
caruncle nor a vexatious limitation of motility. These consid-
erations guide me, and in my operations the conjunctiva is
freely incised and the whole extent of the tendon and its inser-
tion exposed. Both recti externi are operated upon at one sitting. In cases of divergence of not more than two millimetres the tendons are divided at their points of insertion. Whenever the deviation measures more than two millimetres the tendons are divided at a distance from their insertions, the distance corresponding to the degree of squint.

Thus in a case of divergence where the measurement by corneal reflex, according to Hirschberg, showed a deviation of five millimeters, both tendons were divided at that distance from their points of insertion. The tendinous stumps are not removed. The conjunctival wounds are closed by a few interrupted sutures placed horizontally. A silk thread is passed through the conjunctiva over both interni muscles in a line with the horizontal meridian of the cornea, and tied over a pledget of cotton on the bridge of the nose. The eyes are thus coupled in a position of strong convergence, which is maintained twenty-four hours. A binocular bandage may be applied; it relieves the discomfort caused by the suture.

Conclusions.

(a) The operation here described yields better results in cases of absolute divergent strabismus than advancement.
(b) It is a simpler operation.
(c) In advancement the graduation of the effect is impossible.
(d) In tenotomy of the externi, the shortening of the muscles in accordance with the degree of squint, though practiced empirically at present, suggests the possibility of attaining mathematical exactitude in the graduation of the effect.

Discussion.

Dr. David Webster of New York.—Does the treatment shorten the muscles on both sides?

Dr. Gruening.—Yes, sir.

Dr. R. J. McKay of Wilmington, Del.—I wish to thank Dr. Gruening very much for this paper. I operated two years ago on a case of monocular amblyopia, the result of an operation in early childhood in England, in which there had ensued an ulceration and destruction of more or less of the sclerotic
coat over the site of the operation for the convergent squint, and you could see through the conjunctiva the bluish choroid very plainly. I did a complete section of the externus of the eye. I measured it the best I could. It was about 58 degrees with prisms. The patient occasionally had diplopia that annoyed her somewhat. I stitched the eye after the section to the nose, and kept it so for from twenty-four to thirty-six hours. I apparently gained one-third, but subsequently it diverged again and I did not gain quite so much. She went to Moorfields last year for further treatment, but she was not operated upon.

Dr. Gruening.—The operation I mentioned is not applicable to this case. It is one of secondary divergence. Here the motility of the eye inwards is reduced. In cases of ordinary divergent squint the inner edge of the cornea can be moved to the caruncle and the outer edge to the outer canthus.

Dr. David Webster of New York.—I merely wanted to say that I have done Dr. Gruening’s operation for divergent squint three or four times—I think four times—and in all cases with satisfactory results. I divided both externi and tied the eyes together across the nose and left them in a slightly convergent position. I think it is always necessary to bear in mind the convergent position. Moreover I think if you leave them too much so you get a hyper-correction. I have not yet in any case had to exsect any portion of the muscles. I wanted to give this experience because I suppose that very few members of the Society besides Dr. Gruening have had much experience with this operation.

Dr. Gruening.—I rise only to say that the operation suggested by me is not one for periodic divergence. It is for absolute and constant divergence. For a divergence produced by an excessive tenotomy of the internus, advancement of the internus is necessary.
CASE OF PARTIALLY BONY TUMOR OF ORBIT.
REMOVAL; RECOVERY.

BY B. L. MILIKIN, M.D.,
CLEVELAND, OHIO.

Hard tumors of the orbit are so unusual, whatever may be their nature, that one of any variety is worthy of record. The following case has been entirely unique in my own experience, and in looking up the matter in the literature at my disposal, I have found little definite information regarding it. Numerous cases of osteomata, hydatids, cysts, etc., more or less connected with the frontal sinus, occur in the literature of ophthalmology, but I find very few or no cases similar to this.

Miss Jennie E. D., age 16, American, came to me on the 13th of June, 1890, and gave me the following history: At the age of 6 years there was first noticed a small tumor located on the upper inner border of the left orbit. This was very hard, and the increase in size was very slow. There was no marked pain in the growth, occasionally a sharp shooting sensation in the region of it. Three years after this, or at the age of 9, an operation was performed upon it, but from the history of this and the cicatrix, I am not able to understand how extensive the operation was, only the wound continued to discharge from the time of the operation in April until the following September. Whatever it may have been, the growth has continued to increase ever since, and also has become quite painful at times.

Condition at time of examination: The patient was a well-formed, good sized, healthy-looking girl, fair complexion, and had never been much ill. Her father died at 48 years of age, of "quick consumption," fifteen years ago, and her mother a year later, at 38 years of age, of what disease she does not know. She has five brothers, all healthy.

On examination, I found the vision of right eye 6/6, left eye 3/30, T = n both eyes. Located in the left orbital region was a large growth of bony hardness, arising from the upper, inner portion of the orbit, and extending from the inner angle of orbit
outward, along the orbital border to the junction of the middle and outer thirds, and downward on a line with the inner canthus, so that the lower border of the tumor was almost an inch below the line of the eyebrow, and projected forward full on a line with the superciliary ridge, which was itself somewhat thickened. As a result of this, the eye itself was protruded far forward, downward and outward, and the movements of the eyeball were greatly restricted in all directions. There was diplopia in nearly all portions of the field, and some drooping of the upper lid. Vision in this eye was very defective, and the ophthalmoscope showed a small, somewhat atrophic disc, with small thread-like arteries of very much less caliber than the corresponding vessels of the opposite eye-ground. The tumor was uniformly smooth, with rounded outlines, hard as bone, with only skin covering. That the tumor was of a bony nature, and was connected with the frontal sinus, was very evident—but an exact diagnosis of the difficulty was to me rather puzzling. My impression and expectation were that we had to deal with an osteoma of large size, and so intimately connected with the vault of the orbit that its removal might be attended with grave risk of injury to the membranes of the base of the brain. However, I advised operation as the only procedure offering any relief, and fully acquainted the friends with the possible serious nature of the undertaking. I confess I was not at all certain what would be found, and was greatly relieved when I discovered the real nature of the trouble, so far as the operation was concerned. On the 17th of June, in the presence, and with the assistance of Dr. H. S. Upson, and the House Staff of Charity Hospital, the following operation was performed:

The patient being etherized, an incision was made extending from a point directly above the external angle of the orbit, on a line just above the eyebrow, to a point above the root of the nose, about 5 cm. long. From the inner extremity of this incision a second incision was made down the center of the nose to a point on a level with the internal canthus. These incisions were made to the bone, the flap with its subjacent periosteum was removed over the entire area of the tumor, when it was found that the tumor extended far back into the bottom of the
orbit. In separating the periosteum from the bone in the most prominent part of the tumor, the bone was found very thin, but hard, and broke down quite readily, disclosing a very large cavity filled with soft fibrous material, dark in color, well organized, no purulency. With the rongeur, chisels, bone forceps, burr, etc., the entire bony walls of the tumor below were removed, leaving a very large cavity. The floor wall of this cavity extended deep into the orbital cavity, and this was removed, so that it was left on a level with the surrounding orbital vault. Care was taken not to injure the roof of the cavity, which I should judge was thin, and perhaps pushed a little higher than normal. The whole cavity was rough, like cancellated bone tissue. This was all smoothed out with the ordinary surgeon's burr, as well as could be, and thoroughly washed out with a 1-2000 solution of bichloride of mercury, the entire operation being done with strict antiseptic precautions. With the exception of the hemorrhage from the skin flap, the bleeding was almost nil. The arch of the orbit was much thickened, and this thickening was all torn and cut away with the rongeur and bone forceps. The eyeball, with the orbital contents, which had been previously separated from the tumor walls, were placed back in the cavity, and with a sponge, pressure was made by the hand of an assistant until the sutures could be placed, silk being used for this purpose. I suspected, from a cavity of such dimensions and of such structure, that there would be a considerable amount of serous oozing, so I was led to insert a small drainage tube, allowing it to project from the most dependent portion of the incision upon the nose. The whole was then dressed by placing masses of bichloride gauze over the eyeball, care being taken that the eyelids were closed, over this pledges of absorbent cotton, and the whole retained in place by flannel rollers put on rather tightly. There was much retching and vomiting from the effects of the ether, and a small quantity of blood was thus ejected,—the only indication of any connection of the tumor with the nasal cavity. I might say at this time there was no history or indication at any time in the progress of the case, indicating a possible nasal origin of the difficulty, so that I have no doubt the growth originated de novo, in the frontal
sinus or possibly in the periosteum of this cavity. To keep the
eyes as quiet as possible, both of them were closed after the
operation.

June 19th. Since the operation, two days ago, the patient
has done very well, the temperature at no time rising much over
100° F. To-day the dressings were removed for the first time,
when it was found that the wound had entirely healed by primary
union in every part, except where the drainage tube was inserted.
Amount of discharge, very little. The drainage tube was re-
moved and the wound redressed with iodoform and bichloride
gauze, the sound eye being left open.

June 21st. All the stitches were removed, and the wound
was almost healed, and looks well.

June 25th. Everything doing well. There is complete
ptosis of the upper lid, but when this is raised, the vision seems
about the same as before the operation, and the movements of
the eyeball are of course limited.

June 30th. Thirteen days after the operation everything was
healed solid. The patient was recovering rapidly from the
effects of the operation in a general way, and was permitted to
go home. The amount of the scarring was not great, only a
linear cicatrix along the border of the eyebrow, the most scar
being on the root of the nose where the drainage tube had been
placed. Since then I have occasionally seen the patient, and thus
far, now nearly a year and a half, there has been no indication
of any return of the growth, nor has there been any special dis-
comfort about it, except the cosmetic disadvantage. As time
has gone on, the ability to raise the upper lid has increased, so
that it now can be elevated nearly half, disclosing a portion of
the eyeball. However, this I think, is no special disadvantage
as the lid covers the eye, so as to shut off the annoyance of di-
plopia, which is very evident whenever the eyelid is raised. The
movements of the eyeball in all directions are somewhat re-
stricted, as I previously thought would be the case, owing to the
long and very great stretching of the muscles by the large size
of the growth, and the consequent pressure upon them. The
vision has remained in statu quo. A recent more careful ex-
amination of the refraction of the eye shows a high degree of
astigmatism, about 5° D. cy. ax. 90°, and with this glass, V = 6/24, and the ophthalmoscope shows less of the atrophic condition than before the operation, the color of disc better, and the vessels larger. Now the eyeball moves pretty freely in all directions, but diplopia occurs in all portions of the field, the image of the eye seeming to be placed farther away than that of the sound eye. A photograph taken a few days ago shows the present appearance of the eye better than any description, and I am only sorry we have no good photograph taken previous to the operation, for comparison.

With reference to the operation and methods of performing it, I think there is little to be said. The removal by piecemeal is the only practical method, and was easily and quickly accomplished. The rongeur I found a most admirable instrument, it enabling me to cut away the bone very readily.

In another operation of the kind I should omit the use of the drainage tube entirely, for in this case there is no doubt the union would have been prompt and complete without it, whereas with it, union was delayed. In fact, I believe that I should not again use a drainage tube in any operation about the orbit, unless there was some indication of suppurative trouble.

I have given the tumor to Dr. W. H. Nevison of Cleveland, who has been kind enough to make sections from various portions of the growth, for microscopical examination, and pronounces it to be "a sarcoma of the small spindle-celled variety. Many points have undergone fatty degeneration, with the formation of small cyst-like cavities." Of course from the extent of the growth, it is impossible to say what was the exact origin of it, nor do I know how a more exact diagnosis could have been made without an exploratory incision.
TWO CASES OF ORBITAL TRAUMATISM RESULTING IN IMMEDIATE MONOCULAR BLINDNESS THROUGH FRACTURE INTO FORAMEN OPTICUM.

BY PETER A. CALLAN, M.D.,
NEW YORK.

In one of these the blow was over the left orbit, causing blindness of the right eye. The ancients as far back as Hippocrates were aware that blows on the eyebrow or skull were followed at times by immediate blindness. Hippocrates wrote that amaurosis follows wounds inflicted on eyebrows. During the past hundred years, medical writers alluded to the possibility of sudden blindness following a blow on the head. Various were the theories advanced in explanation, that of Beers being most in vogue, viz.: that the injury to the supra-orbital nerve was the cause, to which later writers added the infra-orbital nerve.

Lawrence, in his work on diseases of the eye, gives in detail four cases, and remarked that although the fact appeared to be well established, no one furnished the details of any cases, referring especially to Beer and Wardrop. Since Lawrence's time there has been no lack of recorded cases, but it remained for R. Berlin to establish on a sound basis the true pathology. At the twelfth meeting of the German ophthalmologists at Heidelberg, in 1879, Berlin, besides reporting three of his own cases, gave an analysis of Von Hölder's very careful autopsies of 126 fractures of the skull. Von Hölder for many years filled a position corresponding to a medical coroner. For 33 years of such medical work, Von Hölder made careful autopsies of 126 persons who died from fracture of the skull. In 88 of these 126 autopsies the lesion involved the base, and in 80 of the 88 the orbital roof was likewise fractured, or 90 per cent. In 54 cases, or 60 per cent., the fracture involved the optic foramen. Unfortunately, these cases have no clinical data, but at the same time they
established beyond doubt the frequency with which the optic canal was involved.

In 42 of the cases the injury was a gunshot wound through the mouth or temples; in 11 the lesion was caused by falling on the head, and only one case where the head was run over.

In the cases where death does not result from the injury to the head, the patient is stunned or dizzy by the blow or fall on the head, suffers from shock, bleeds from the mouth or nose, and discovers that one eye is blind as a result of the injury.

The explanation of fracture involving the foramen is as follows, as it appears to me:

The frontal bone unites with the nasal, superior maxillary, lachrymal, and ethmoid bones by a continuous line of sutures, until the lesser wing of the sphenoid is reached, and at this point the suture line bifurcates, forming an obtuse angle, and quite near the apex of this angle is the foramen. The movement or jar made by the blow would find its weak point along this line of sutures and the first resisting point would be at the point of bifurcation at the obtuse angle near the foramen opticum, and as a consequence, the greater movement following one of the bifurcations, the bone would give way under the unequal strain.

G. F. S., 23, artist, was brought to me March 3, 1890, while suffering from shock. From his companions I learned that, while fencing with a friend, a thrust of the opponent’s foil had broken Mr. S.’s mask and entered the orbit between the nose and eyeball. I saw the patient forty minutes after the accident, and then the right eyeball was somewhat protruded and displaced down and outward. Chemosis and ecchymosis of lower ocular conjunctiva, with a slight irregular tear of conjunctiva over the body of internal rectus muscle. Eyeball immobile, pupil dilated almost ad maximum and not responsive to direct rays of light, but only consensually with fellow eye. Total loss of all light perception. Ophthalmoscope showed a slight haze of fundus, which did not prevent a good view of optic nerve. Veins were enlarged and tortuous, while the arteries appeared somewhat reduced in size compared with the other eye. At the end of the first week the protrusion and displacement had disap-
peared. The eye, however, diverged, and patient had control of the ocular muscles, except the rectus internus. Chemosis still remaineck. Ophthalmoscope showed arteries and veins normal in size, with disappearance of haziness of the fundus. On the tenth day for first time had some light perception on nasal side, pupil being moderately dilated and somewhat responsive to direct rays of light. At the end of the third week there was well-marked beginning atrophy of the optic nerve. I have had the patient ever since under observation. The atrophy is marked, but he still retains a small sector of the nasal field when there is light perception. The pupil is moderately dilated, responds to direct rays in a feeble manner. There still remains a slight divergence.

Ludwig M., 24, German, was admitted to my service at the New York Eye and Ear Infirmary, April 1, 1891. He came on account of an injury which the left eye had sustained, and the inability to see with the right eye, which immediately followed the injury.

At 1 a. m. of the day of his admission to the Infirmary he was struck over the left eye. The assailant was a rival, and whether he used anything beside his fist patient does not know. For a moment he was stunned and dizzy but did not fall, and was led home by the young woman who was the cause of his trouble. From the time he was struck over the left eye patient is positive that the right eye became blind. Patient vomited blood, which he must have swallowed, bled from the nose, and suffered from shock. I saw him fifteen hours after the injury. There was a slight abrasion of the skin of the left upper lid towards the nose, with some oedema of both eyelids and some redness of the ocular conjunctiva. Movements of globe and pupil normal. Ophthalmoscope showed some hyperopic astigmatism. Vision 2/6 + 1.00 90 2/6. Right eye totally blind to all light perception. Movements of eyeball normal in extent, no protrusion, some conjunctival injection. Pupil widely dilated and only consensually responsive to light, direct rays having no effect. Ophthalmoscope showed nothing abnormal in the fundus. Seventy-two hours after injury, ptosis marked, and 96 hours after ophthalmoplegia externa.

One week after admission the optic nerve of right eye began
to pale, and in three weeks the atrophy was pronounced. April 15th, or two weeks after injury to left eye, he began to have some light perception in right eye in upper nasal field, can move the eyeball somewhat, the ptosis not so marked. May 11, 1891, six weeks since injury, movement of lid and eyeball greatly improved, slight divergence which he cannot overcome, pupil not so dilated, can guess at fingers when held at 18 inches in the upper nasal field, light perception in that sector quite good. The atrophy has increased, disappearance of all the capillaries, with total pallor of optic disc.

Since then I have lost track of the patient, and my efforts to find him have proved futile.

DISCUSSION.

DR. ST. JOHN of Hartford, Conn. — In connection with this paper of Dr. Callan's I should like to report a case of orbital traumatism unconnected with fracture of the orbit, which was followed immediately by monocular blindness on the same side, for the reason that similar cases may happen in the experience of any of us — cases coming under our charge from a general surgeon.

In this case an operation had been done by a most excellent surgeon for the relief of tri-facial neuralgia; excision of the supra-orbital and infra-orbital nerves had been practiced, and this was performed by a modification of the usual procedure, which was described at the International Congress in Berlin, last year.

The patient was an elderly lady, some seventy-five years of age, and in fair health. The operating surgeon found that there was more hemorrhage than was usual. He operated at the same time upon the infra-orbital and upon the supra-orbital nerves.

Although the hemorrhage was extensive, as I have said, it was not sufficient to cause him any alarm or anxiety. He closed the wounds, and there was no special reaction. On the following morning the patient said she could not see. He noted that the pupil was dilated, and sent for me. I found the pupil, on examination, dilated almost ad maximum and absolutely irresponsive to light. She had no perception of light whatever, and no mobility of the eyeball in any direction. The immobility was as complete as in any case of ophthalmoplegia. There was no plus tension, no glaucomatous condition. The ophthalmoscope showed congestion of the choroid and retina.

In the course of a few days the mobility of the eyeball
began to return, but perception of light did not return, and has not to this day. This operation was performed four months ago. Mobility came back gradually and the pupil contracted to perhaps two-thirds of its former dimensions, although remaining very sluggish to light.

My explanation — the only one I have to offer — was that this free bleeding had led to a clot collecting at the apex of the orbit, and involving the nerves running to the different muscles as well as the optic nerve, and that the contraction of the clot had caused the paralytic symptoms which followed. The case went on to atrophy of the optic nerve, which is now complete. I advised the gentleman who did the operation to re-open the wound, which he did, and syringed the orbit with a long, slender-pointed syringe, hoping to break up the clot which involved this mesh of nerves at that point, and, if possible, free it from the contraction.

Whether the explanation I offered was the true one or not, I do not know. Perhaps, as these operations are being done more frequently in these days, it would be well to bear in mind and to mention to our surgical confrères that they must be very careful to relieve the orbit from the blood which collects there, in cases in which there is free bleeding.

Dr. Myles Standish of Boston. — I have had two cases in my experience which are recalled by the paper just read by Dr. Callan, which I would like to mention, as they may serve to prevent some member giving a false opinion some day. Each of these were medico-legal cases, one a young woman, the other a young man, who received an accidental blow on the head, and who declared that they were blind in one eye, and could see nothing by it immediately following the blow. In each of these cases there was reaction of the pupil to light, and there was absolutely nothing to see in the fundus. I saw them both immediately after the injury, at the instance of parties who were supposed to be responsible in each case. I said I believed that the patients were malingering. To my confusion and regret, in each case, three or four months after the injury, atrophy complete and perfect ensued, and the patients were absolutely blind. Of course, later on there came on a dilatation of the pupil. But the thing that I wish to call attention to is that there may be a truthful statement from a patient after he has received an injury that he cannot see, though he may still have reaction to light, and that that injury may subsequently produce complete atrophy in the eye.

I remember also the case of a captain of an English steamer who fell into the hold of his vessel, striking on the
back of his head, and who, immediately following, had no vision in the right eye. I saw him within three days after the accident, but in his case there was the paling condition of the nerve, and following the accident there had been a sub-conjunctival hemorrhage. In this case there could be no mistake. As to the other cases, I do not undertake to explain their nature.

Dr. David Webster of New York.—The cases cited by Dr. Standish recall to my mind a somewhat similar case in which I was called in consultation about a year ago. A young married man had insured in an accident insurance company, and the loss of his eyesight was equivalent to the loss of his life,—that is, he would receive ten thousand dollars if it could be proved that the loss of sight extended over sixty days.

The accident happened in this way: He was going rapidly through the door of a barn, jumping through, and struck the top of his head against the upper part of the door and was severely stunned. He had certain nervous symptoms; went home and vomited, and within a day or two lost his sight entirely. He was seen by a friend of mine from time to time, who thought he was malingering, and after several weeks had passed, I was called to see the case and asked to give an opinion. I found the pupils perfectly responsive to light and of normal size. I found no lesion of the fundus whatever. I found nothing whatever to account for this blindness. Yet he certainly gave every outside evidence of blindness, certainly acted as a blind man would act, and there was every reason to believe he was blind. I accordingly gave that opinion. I happen to know that the man got his ten thousand dollars, but I have not heard whether he recovered his sight after receiving it or not.

Dr. Samuel Theobald of Baltimore.—In connection with the case reported by Dr. St. John, of ophthalmoplegia following section of the supra-orbital nerve, I think it worth while to mention that I have seen one very marked case of right hyperphoria following and persisting after a resection of the infra-orbital nerve on the right side. It was done by a very careful surgeon in Baltimore, and there followed diplopia and very marked hyperphoria. When I last saw the case the hyperphoria was diminishing. By correcting the marked refractive error which was present, and by centering the lenses vertically, the diplopia was done away with. If my memory serves me, there was, when I first saw the case, seven degrees of hyperphoria.

Dr. R. J. McKay of Wilmington, Del.—I would like to ask
Dr. Callan if there were any symptoms of orbital cellulitis in his case.

**Dr. Callan.** — As far as I could see there was no indication of it.

**Dr. George C. Harlan of Philadelphia.** — With regard to these cases which have just been cited, of blindness coming on as the result of a blow and malingering blindness, you may remember that two years ago I reported a case to this Society of monocular hysterical blindness, which had lasted ten years, following immediately upon a blow which the patient thought had completely destroyed vision. There was no reason to doubt that the patient was entirely honest in his belief that the eye had been blind for ten years, and he was greatly delighted when the mistake was demonstrated to him. There has been no return of the blindness since.

**Dr. Samuel D. Risley.** — I have observed four cases of monocular atrophy of the optic nerve following blows, — three received on the orbital ridge and one on the top of the head. In the last case the patient, a man in middle life, was walking through a building in course of construction, when a scantling fell upon his head. He did not consider that he was seriously injured, but in a few weeks sought advice for failing vision in one eye, which proved to be due to commencing atrophy of the optic nerve, which subsequently became complete. Of the other cases, one was a boy aged 12, who came to the University Hospital, having fallen, while running, upon the end of a stick he was carrying in his hand. The blow was received on the infra-orbital ridge. In a few weeks there was failing sight and obvious paling of the optic nerve, which went on to complete atrophy and blindness. Another case was that of an Irish carter, quite an old man, who was thrown from his cart, striking the outer end of the left supra-orbital ridge against the curbstone. The injury was severe and was followed by great swelling and oedema of the soft parts. When this had subsided he came to the University Hospital because of his failing vision in the left eye. He had commencing atrophy of the optic nerve, which also became complete, ending in total loss of sight. The fourth case I saw in consultation with Dr. Elmer of Davenport, Iowa, in July last. A few weeks before, a farmer had been thrown from a machine for loading hay in the field, and one of the prongs or fingers, sharpened into a long cone, had struck the outer angle of the left orbital ridge, glancing backward. How deeply it had penetrated could not be determined, but he had complete secondary atrophy of the optic
nerve, and there were the remains of extensive hemorrhages in
the retina. In this case the iron finger probably either pen-
etrated to the orbit or splintered the orbital walls, leading to
extensive post-ocular hemorrhage, or possibly direct injury to
the optic nerve.

A MODIFICATION OF DIEFFENBACH'S OPERA-
TION FOR RESTORATION OF THE
LOWER EYELID.

BY GEORGE C. HARLAN, M.D.,
PHILADELPHIA.

For the removal of cicatrices or small growths from the
lower eyelid, or for the cure of ectropion, less extensive opera-
tive procedures may often be preferable, but when it is neces-
sary to remove the whole lid its place can be better supplied by
the sliding flap recommended by Dieffenbach than in any other
way. The broad base of the flap reduces the danger of slough-
ing to a minimum, while the abundant new material supplied
affords a good margin for subsequent contraction. The trans-
planting, however, of so large a piece of skin necessitates the
leaving of a considerable bare space to be filled by granulation,
and the cicatization of this space, in its usual position, tends
to stretch the flap horizontally and at the same time to produce
deformity by drawing the external canthus downwards. This
is well shown in the photograph of a patient in whom the
operation was done for extensive epitheliomatous disease, and
in whose case the result was otherwise entirely satisfactory. It
was taken nine months after the operation.

In the case of another patient, also the subject of an
epitheliomatous growth which involved the whole lid and
measured an inch in its horizontal and three-fourths of an
inch in its vertical diameter, I modified the operation by
filling the space from which the flap was taken by another flap
formed from the skin of the temple; and the result, as will be
seen by her photograph, taken more than three years after the
operation, is unusually good. The deformity is really very slight and, at a distance of a few feet, is scarcely noticeable. Dr. Norris recently operated in the same way upon an extremely discouraging subject. The patient was very old, badly nourished, and unmanageable, and his case seemed almost desperate, but the present condition is excellent, and if any subsequent contraction takes place it is not likely to draw down the canthus, as the granulating surface was above it. His photograph, taken two months after the operation, shows that while there is some depression of the margin of the lid, resulting from considerable sloughing of the flap, the external canthus is very nearly in its normal position. The triangular spaces left by removal of the flaps can be much diminished by freely undermining the skin at their margins and stretching it.

This operation involves a rather formidable dissection of the skin of the face, but the region is so vascular and the bases of the flaps are so broad that, if the operation and the after-treatment are conducted with strict antiseptic precautions, there is usually not much danger of sloughing. It is, however, recommended only when the disease is so extensive as to necessitate a considerable operation, and the new lid is less likely to slough if both of its edges are stitched to sound skin than if one is left to form the margin of a rather extensive granulating surface.

Figure 1 represents the lines of the incisions; Fig. 2, the position of the uncovered space in Dieffenbach's operation, and Fig. 3, its position in the modified operation.
TWO CASES OF SUCCESSFUL SKIN-GRAFTING UPON THE EYELID, BY THIERSCH'S METHOD.

BY SAMUEL THEOBALD, M.D.,

BALTIMORE.

Having had the opportunity of observing in the surgical wards of the Johns Hopkins Hospital the very happy results which have been obtained there from the adoption of the method of skin-grafting proposed by Thiersch, I was prepared to resort to it with confidence should a suitable case occur in my ophthalmic practice. Two such cases have occurred during the past year, and the result in each has shown that my confidence was not misplaced. The successful outcome of these cases is the more noteworthy in view of the fact that they were both treated as out-patients—one at my office and the other at the dispensary of the Baltimore Eye, Ear, and Throat Charity Hospital—and that the antiseptic precautions employed in each were far from perfect. In both the grafts were removed, with a small, slender scalpel, from the inside of the forearm, the skin from which they were taken having been washed, first with soap and water, then with sublimate solution, and lastly with a solution of common salt. While the wound was being prepared for their reception, the grafts were placed in a warm, unsterilized solution of salt, the strength of which was not accurately gauged. They were somewhat less than half an inch in width and of varying lengths, some of the longer strips having been cut in pieces in order to make them fit more accurately the spaces upon which they were grafted. No antiseptic was applied to the wounds upon which the grafts were placed. Their granulating surfaces were in part shaved off (as recommended by Dr. Halstead) and in part scraped, and the bleeding surface which was thus produced was wiped off with non-sterilized absorbent cotton, dipped in the warm salt solution. After the grafts were in position they were covered with "rubber protective," which, except in one instance, had not been sterilized, and over this was placed lint or absorbent cotton and a retaining bandage.
In one of the cases, that of a man about 25 years of age, the wound which made the grafting necessary, and which involved, besides other portions of the face, nearly the whole of the upper lid, the brow, and the temple upon the right side, was the result of a burn by sulphuric acid, which had been purposely thrown into the individual's face. The first grafts, three in number, were made sixteen days after the receipt of the injury. Three days afterwards three more were made, and two days later five more. All of the grafts "took" well with one exception, and a portion even of this one lived and grew. They were applied over nearly the whole of the upper lid, upon and above the brow, and upon the temple in the neighborhood of the outer canthus. One week after the last grafts were applied the notes of the case state "there is no surface on or near the lid which is not covered by epidermis." Five months have now elapsed since the injury occurred, and the outcome of the treatment is, that while the lid is considerably shortened, and near the outer canthus does not lie in complete contact with the eyeball, it is not everted at any point and closes well over the cornea. Massage is being practiced upon the lid, and I have not been able to detect any increase in the shortening or in the tendency to eversion during the last three months. Had the skin-grafting not been resorted to in this case, there is, I think, little doubt that a marked ectropion would have developed before this time.

In the other case the wound which called for the application of the grafts was due to the removal of an epithelioma from the lower eyelid. The patient was a railroad watchman and about fifty years of age. The growth was removed with a sharp curette supplemented by the application of the thermo-cautery. Five days later the charred tissue was removed, the granulations were scraped and three small grafts were applied. The "protective" used in this instance had been thoroughly sterilized. Two days later the protective was removed, and it was found that two of the grafts and a part of the third one were living. The death of a part of one of the grafts appeared to be due to the fact that the charred tissue had not been thoroughly removed from the whole of the surface upon which it was placed. Fresh protective was applied, and worn for three days longer, when,
as the grafts had united firmly, it was left off permanently. The patient was seen but once after this, and the ultimate effect of the treatment is not known. I have recently tried to communicate with him, but, I regret to say, without success.

DISCUSSION.

Dr. Henry D. Noyes of New York.—I will not take up the attention of the Society for more than a moment. I only want to say, in reference to Dr. Harlan's proceeding, that it is an extremely ingenious and satisfactory method of treating certain very difficult cases, and I would call attention to the fact that the same proceeding has been performed by myself, when I have been obliged to slide a large flap into a lid, and have left a secondary vacancy, I have used a portion of hairy scalp to slide into position. This does not become objectionable in such cases, and it answers precisely the same purpose as Dr. Harlan's method.

In regard to the second paper which was read by Dr. Theobald, I merely want to give my experience in a similar class of cases. I have had under my notice for the last two years a man whose face was shockingly burned and whose tissues were cicatrizied to a terrible extent, and for that man I first performed Wolfe's operation and as there was no tissue in the vicinity, took the structure from the front of the abdomen. That flap introduced into the lid shrunk so much that the deformity was reproduced in comparatively a short time, and it practically did almost no good. Then after the lapse of several months I did Thiersch's operation, being encouraged in this by what I saw at the Johns Hopkins Hospital last year, and believing that the introduction of a flap including only the epidermis would be less inclined to shrinkage. This has done better than Wolfe's operation. But even that has undergone shrinkage, which was so considerable that it continued to leave ectropion. A third operation was performed in which I had to use the adjacent cicatrical skin, and that skin in the lapse of one and one-half years had acquired so much thickness that I could turn the flap from the forehead down, and by this operation I have succeeded in restoring considerable breadth to the upper lid. This was supplemented by the uniting together of the outer halves of both upper and lower lids, leaving the eye covered during this period.

The Wolfe operation was a failure; the Thiersch operation a partial success. It was supplemented afterwards by a flap of cicatrical skin.
A CASE OF BRAIN TUMOR WITH HIGH GRADE OF CHOKED DISK.—AUTOPSY.

BY LEWIS H. TAYLOR, M.D.,
WILKESBARRE, PA.

Cases of brain tumor are not so exceedingly rare as to excite our special wonder, yet it falls to the lot of the average oculist to deal with comparatively few in the course of his professional career. The size of the tumor in the case, the history of which I am about to relate, and some of the symptoms presented were, to me, of considerable interest, and I have thought it worth while to offer the same for your consideration.

On October 8, 1889, I was requested by my friend, Dr. Mayer, to examine the eyes of Milton M., aged 17, to see if I could discover any refraction error as the cause of the severe headaches for which he had been treating him for some weeks.

The patient was confined to his house, could not walk alone comfortably, but was quite dizzy and staggered when he attempted it. He was, however, able to come to my office in a carriage for examination. I found vision 20/xxx in each eye, no astigmatism, slight insufficiency of the externi, but no marked strabismus. The external condition of the eyes was normal; no conjunctival injection and no exophthalmus.

The ophthalmoscope showed choked disc in a marked degree; borders of the nerve could not be seen at all; œdema and infiltration very great; vessels but partially and dimly seen, and none could be traced in course, being obscured in greater part by the inflammatory process going on in the eye; neuroretinitis in high degree.

I at once wrote to the attending physician and told him that I suspected a tumor of the brain to be the cause of the suffering. This diagnosis was based upon the high degree of papillitis of about equal grade in each, the intense headache, the staggering, uncertain gate, and the exclusion of kidney trouble as shown by examination of the urine.

I made a second ophthalmoscopic examination almost a year
later and found the patient totally blind, with all the acute symptoms of choked disk subsided and, instead, marked atrophy of each nerve.

I subsequently learned from his sister, a trained nurse, that he had severe headaches in the fall of 1889, and on September 28th, he fell to the ground while playing lawn tennis. He could not rise by himself, and on being helped to his feet complained of dizziness and could not stand alone. After resting a time he walked to his home, nearly a mile away, went to bed, and from that time on to his death, January 25, 1891, he was confined to the house, though not all of the time to his room.

His constant complaint was of severe headache, which was very persistent, and at times excruciating. Exophthalmus was marked about the third month, worse in the right eye than in the left, but subsequently it disappeared from both. From the fifth or sixth month on he was totally blind. At first there was slight paresis, but no permanent paralysis. He complained a great deal of numbness in the face. The headaches were worse in the right side. He also, had severe pain in the right side of the face and back of the neck.

He had slight tremors occasionally, and twitching of the muscles, which never developed into true convulsions. He always recovered immediately from these. He was never affected mentally, — his mind being clear even to the last.

His treatment at first was by bromides and later, iodides, to test the existence of a possible syphilitic taint. These were of but little avail. For the last six months he took nineteen drops of a mixture of Norwood's tincture of veratum viride and concentrated tincture of gelsemium three times a day. He received more benefit from the use of veratum than from any other medicine.

He expired suddenly and unexpectedly, January 25, 1891. He had been unusually well the evening before his death; had chatted cheerfully with members of the family, and seemed brighter than for weeks. About 110 A.M. he uttered a piercing cry, and before his sister could reach his bedside he was unconscious, and in a very short time expired.

The autopsy was held the same day. Upon removing the
scalp, the bone of the skull was found necrotic on the right side, and apparently thinned. About a half-inch to the right of the sagittal suture and one inch posterior to the coronal suture the skull was entirely eroded through, showing a hole one-quarter of an inch in diameter. Upon removal of the skull, the dura mater was found adherent at this point, and the brain quite prominent, as if pushed upward,—the appearance suggesting that the erosion of the skull had been caused by long pressure of the brain.

Upon gently lifting the posterior portion of the cerebrum, there was exposed a large yellowish soft tumor, lying above the cerebellum. From the notes of my friend, Dr. A. G. Fell, who performed the autopsy and subsequently carefully examined the brain microscopically, I copy the following: "The tumor is situated in the posterior portion of the brain, between the cerebrum and cerebellum. It is soft and gelatinous in nature, ovoidal in shape. Its size, 2½ inches in line parallel with commissure of the longitudinal sinus, and two inches broad at right angles to the same. It is fully an inch and a half in depth. It arises from the corpora quadrigemini and roof of the fourth ventricle, extending to and involving the roof of the third ventricle. It is of such size as to elevate the crura cerebri and to press upon the optic thalami, more particularly at the left side. The identity of the corpora quadrigemini, pineal gland, testes, and valve of Vieuussens was destroyed."

A microscopical examination of the tumor proved it to be glioma.

The case was of peculiar interest in several points:—

First. The sudden onset of the symptoms; although he had complained of headache for a few weeks, yet, previous to the attack while playing lawn tennis, he had been in fairly good health, and subsequently to this attack he was not able to leave the house alone, nor to take care of himself at all.

Second. The absence of convulsions or of any psychic changes indicating softening of the brain.

Third. The size of the tumor, which was certainly above the average, and the influence exerted upon the bones of the skull by its excessive pressure.
Fourth. The high grade of papillitis in the early stage of the attack. It was the most marked case of choked disk I have ever seen. Subsequently this entirely disappeared, leaving the usual condition of optic atrophy. Cases of brain tumor are frequently reported in which choked disk is absent. Is it not possible that in such the condition has been overlooked, owing to lateness of the first ophthalmoscopic examination?

Fifth. The influence of veratum viride in controlling the headache was marked. After bromides and iodides, phenacetin, antipyrene, morphia, and other drugs had been tried, and without avail, the free use of veratum and gelsemium rendered the patient reasonably comfortable.

The exact location of the tumor was not diagnosed during lifetime, though the double choked disk of equal degree, the later complete blindness, the intense cephalalgia should have suggested the corpora quadrigemina as the probable point of origin.

DISCUSSION.

DR. R. J. Mckay of Wilmington, Del. — I was very much interested in Dr. Taylor’s case, having seen a somewhat similar one some two years ago, having been called in consultation by one of our best physicians. This gentleman was a man of some prominence in the profession; he had translated Cazeaux’s Midwifery, and you would suppose him to be a well-equipped man. I was called in to see the patient, who was said to be suffering from trouble with the ear. I found she had a double optic neuritis with a good deal of esophoria, and that she suffered excruciating pain. The attending physician regarded this as due to the ear trouble. I made a diagnosis of brain trouble. The pain was relieved by letting her have one eye covered for a long time, sometimes with a dark glass and sometimes with a patch. Subsequently a great variety of remedies were given to relieve her, but in vain, until by cutting one of the interni and then the other, and then putting on weak prisms, I finally succeeded. She lived some months afterwards, and remained comfortable until within a few days of her death.
THE CALIBRE OF THE RETINAL VESSELS AFTER
TRAUMATIC INJURY TO THE CONVEXITY OF
THE BRAIN.

BY ALBERT G. HEYL, M.D.,
PHILADELPHIA.

It is a matter of common observation that the retinal
arteries and veins vary in calibre under different conditions.
It is also known that the cross section of the retinal veins
varies. Sometimes it may be a pronounced ellipse, and then
to the eye of the observer the vessel will appear flattened, or
the cross-section may be circular, or nearly so, and then the
vessel will appear rounded in contour and standing out in relief
from the fundus oculi. The study of conditions of this kind
may be called diametroscopy, or the estimating by the eye of
the diameter of the retinal vessels, and this paper is a summary
of some diametrosopic observations in cases of injury to the
vault of the cranium, and in which, so far as discoverable,
no fracture of the basis cranii had taken place. The cases are
twelve in number, and for most part have been under the care
of my colleagues at the Episcopal Hospital. To Dr. T. R.
Neilson I have been indebted for the majority of them, as well
as for the protocol of the case of William Warfield (No. VI).

Case I.—Charles ——, age 39. Struck with a poker, causing
a long scalp wound. So far as perceivable, no fracture of the
skull. Ophthalmoscopic examination 48 hours after injury,
—both pupils 2mm. in diameter in a somewhat darkened room.
Main arterial and venous retinal vessels diminished in calibre
about one-fourth the normal amount. Patient is conscious.
Temperature yesterday, 100°; to-day, normal.

Case II.—A Frenchman, age 36. Struck on the head
two weeks previous to ophthalmoscopic examination by a
falling pulley. According to his statement, was not uncon-
scious after the injury. He complains now of pain on the
left side of the head. There is a healed scar on the scalp, about
an inch in length, over the left parietal bone, sensitive to
pressure, as is also the left supra-orbital nerve at the supra-orbital notch. There is slight tendency to tonic blepharospasm. Left pupil reacts sluggishly to light. At times is less dilated than the right pupil. Light thrown centrally on the right pupil causes it to contract normally, but if thrown on eccentric portions of the retina the contraction is sluggish. In the left eye this destruction does not exist. So far as can be observed, there is no fracture. In this case the retinal arteries were contracted.

Case III. — Kate O., admitted December 5, 1889. Injury over right temporal bone, with some symptoms of depressed fracture. It was deemed best not to trephine. Symptoms of compression largely subsided, but patient remained for weeks in a condition of mild delirium, at times lying quiet as if in reverie, and then giving vent to incoherent talk in an unexcited tone and apt to be characterized by obscene allusions. She finally recovered sufficiently to be discharged. Ophthalmoscopic examination 11 days after injury: right pupil widely dilated, left normal. Retinal vessels show no tortuosity, retinal veins normal, arteries diminished in calibre one-half. Color of fundus seemed abnormally pale, optic disk normal. Pulse is 72, temperature normal. January 29, 1890, 24 days since the injury: mental condition same as at last examination, possibly a trifle more delirious. Temperature is normal. Condition of fundus unchanged, except that a slight turgidity of the retinal veins is noted. A subsequent examination, after an interval of perhaps a week, showed the retinal vessel calibre to be same as at the first examination.

Case IV. — Henry ——, admitted December 14, 1891, with injury over left parietal bone and probable stellate fracture. Ophthalmoscopic examination two days after the accident. Right pupil normal, left dilated. Retinal vessels the same as in the last case. No further change in fundus. Patient has not been operated on. His mind is clear. Pulse 108, respiration 30.

Case V. — Andrew S., age 40. Fracture of right parietal bone, depressed. A day or two after trephining, an ophthalmoscopic examination showed a contraction of the main arterial trunks.
CASE VI.—William Warfield, age 28. Admitted to the accident ward of the Episcopal Hospital, June 10, 1891, having fallen from the top of a freight car and struck his head on the left parietal bone, close to the sagittal suture and 1⁄4 inches from the coronal suture. No evidence of fracture. Patient comatose for two days. Then he became restless, lifting himself in bed, biting at those endeavoring to restrain him. On the sixth day he became more conscious, extended his tongue on demand, etc. On the ninth day he lapsed again into unconsciousness, and remained so until the thirteenth day after the injury, when he died. The temperature record showed that on the night of admission the temperature rose to 101°; it oscillated between this and 102° until the fifth day, when it rose to 103°. It continued at this point until the seventh day, when it fell to 102°. On the ninth day it was 101°. Then it fell to 99°, and on the twelfth day it was 101°. Corresponding to this was the pulse, which was about 100, and respirations, 28 to 30, the only instance of special note being the fifth day, when with a temperature of 103°, the pulse 104, but the respirations 44.

The autopsy made by Dr. J. P. Tunis showed calvarium unusually thick, no signs of fracture, no signs of meningitis, nor abnormal amount of cerebro-spinal fluid. There was not an unusual amount of vascular injection of the brain substance. On the surface of left hemisphere, about the middle of the temporal lobe, an ecchymotic spot was found, not elevated above the surface, and extending through the cortex into the medullary substance. It was about the size of a hickory-nut.

Ophthalmoscopic examination June 14, 1891, four days after the injury. Temperature 101°, pulse 116, respiration 24, pupils 24 mm. in diameter. Patient restless, has to be tied, does not scream, but endeavors at times to bite those approaching him. Examination of left eye showed both retinal artery and vein slightly increased in calibre, say one-eighth of the normal amount; the vessels stood out in relief, and their cross-sections would have been a circle.

June 16, 1891. Two days ago the temperature rose to 103°, now it is 101.5°, pulse 104, respiration 28. Patient very much
more restless, occasionally screams loudly. The main upper vein has increased in calibre slightly over that at last examination. The artery is about normal calibre, having shrunken from that of the last examination.

June 22, 1891. Temperature 102⅛, pulse 140, respiration 48. Patient lying quietly on his back. Hippocratic face. The retinal vein has shrunken to normal calibre, but it is turgid, standing boldly in relief, but it has a blurred look, as if seen through a slightly turbid medium,—perhaps the vessel wall is not normally transparent. The artery is one-half the size of the vein, and therefore abnormally contracted. Death 22 hours later.

Comments.—This case is the typical one of the series. It is one of pure brain contusion. The ophthalmoscopic examinations not only show the changes already described in the other cases; they give insight into the character of these changes. 1. A slight enlargement of both arteries and veins, with circular cross-section of each. 2. Following this, a slight increase in the retinal vein diameter. The retinal artery had decreased in calibre. 3. Following this, the retinal veins had become normal in diameter, while the artery had still further decreased. In all of these stages the cross-section was circular. In other words, the condition observed in the third examination was essentially that noted in the preceding cases. It may be proper to state here that, in making these investigations, it is not feasible always to examine both eyes, and often only to fix the main retinal vessel and to observe it; thus, in case of William Warfield, the observations were made on the left eye, and the vessels studied were the main upper vein and its corresponding artery.

The result of the ophthalmoscopic examination may thus be summarized: The retinal veins were rounded in contour, the cross-section circular, very little tendency to tortuosity, and the diameter varied little from the normal amount. The arteries showed a constant tendency to diminished calibre. In the most typical case of the series (No. VI), there was at first a slight dilatation, but this was succeeded by contraction, which steadily increased.

Oph.—13
I shall now give the record of a case in which the same vascular phenomena were observed nearly thirty years after injury, and in which atrophia nervi optici existed.

Case VII.—D. F., in 1863, while on a gunboat, was wounded by a musket-ball, which cut a groove through the outer table of the right parietal bone near its posterior edge. It is not known whether the internal table was injured, but presumably not. He did not enter the hospital for the wound, which healed readily, but for several years suffered severe headaches, violent pain centered in or about the right eye, and in about a year its vision was almost totally gone. Subsequently, but less rapidly, the sight of the left eye likewise vanished. Status praesens, August 20, 1891: Patient barely able to grope his way about. Ocular media clear, blue atrophy of both optic disks, retinal veins a trifle under size, but full and rounded, arteries not only contracted but show a tendency to shrink to mere thread-like structures. The veins are of a rose-red, vessels are not tortuous, pupils normal, anterior chambers shallow. There were no indications of neuritis optici. Note.—The appearances of the retinal veins were essentially those seen after acute contusion of the brain substance. The arteries were not only contracted, but were undergoing a contracting process which will ultimately result in their entire disappearance from the eye of the observer, or their conversion into thread-like vessels scarcely visible.

This case is important for several reasons. (a) The calibre of the retinal vessels is closely allied, probably identical with those observed in the acute cases, showing that, in this case at least, the process once being set up in the retinal vessels, it may remain, and never return to the normal condition. (b) The mental condition of case was perfectly good, and this goes to show that, while the delirium and the calibre changes in the retinal vessels coexist, yet that they do not stand in causal relation to each other.

I shall now give the records of two cases which belong to the series now under discussion, and yet have features peculiar to themselves.

Case VIII.—Lewis S., admitted January 23, 1891, with
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fractured skull from a falling derrick. The fracture commenced in the anterior part of the left parietal bone, extending down toward the ear. Patient was trephined, and it was found that a spicule of bone had wounded the middle meningeal artery, necessitating its ligation. I examined him eleven days after the operation. There was homonymous diplopia, although no deficiency in the external rectus could be detected. Patient is thoroughly conscious, but cannot tell at whose shipyard he was hurt, although he knows it was in a blacksmith's shop. (There evidently is defect in the ability to concatenate facts.) The retinal arteries are of full calibre, the veins, if anything, under size, approximating in calibre the arteries. Note.—The ophthalmoscopic appearances differ from those observed in the preceding cases. Possibly the ligation of the middle meningeal artery and the considerable hemorrhage which rendered it necessary, may have had something to do with this.

Case IX.—A stout, well-built man was struck over the left temporal ridge by a flying fragment of an exploded emery wheel. He walked to the Hospital, and the ophthalmoscopic examination was made immediately after he was placed in bed. There was a long scalp wound extending across the left temporal ridge, from which blood oozed. There was a depressed fracture. The right pupil 2mm., left 3mm. in diameter. The left eye is beginning to protrude from the socket. Patient was semi-comatose, but resisted somewhat the attempt to use the ophthalmoscope. Examination of left eye was not feasible, but of the right eye showed extreme pallor of the fundus. The retinal arteries of normal calibre, but very pallid, while the veins were somewhat reduced in size (one-sixth larger than the arteries), of rounded cross-section, and black in color. Radial pulse 52, forcible in beat. Patient became quiet, although no stertor. Subsequent trephining showed that the brain substance had been lacerated by a spicula of bone. Note.—The retinal vessels in calibre resembled those in Case VIII, and I remember that a slight pressure over the seat of fracture caused by the struggles of the patient, made the blood to well forth as if a considerable quantity had collected there. It may have been that this hemorrhage, as suggested in Case IX, had so
affected the intercranial circulation as to induce the condition of the retinal vessels described.

I wish now to direct attention to a second series of cases, characterized by a psychical phenomenon to which the name of *sopor alternans* may be given. This condition is one in which a patient, after a severe head injury, goes into a condition of unconsciousness resembling ordinary sleep, then will become conscious, and in turn again thus unconscious, a series of sleeping and waking stages succeeding each other.

**Case X.**—A boy, age 11. Struck on the left frontal region, opening the skull and lacerating the brain substance. Ophthalmoscopic examination three hours after the accident. Pupils somewhat dilated but not responsive to light. After a short interval it was noted that they contracted without apparent cause, and subsequently dilated. The retinal veins of full size, possibly a little larger in calibre than normal. Arteries contracted one-half the normal diameter. Optic disc pallid. Pulse was 60. Patient at times conscious and answers questions, then relapses into an unconscious state without stertor, to become after a little while conscious again. During the examination a violent fit of vomiting occurred, without affecting the calibre of the vessel as already described.

**Case XI.**—A woman was struck six hours previous to the ophthalmoscopic examination, over the right parietal bone, causing a linear scalp wound nearly two inches long, ending near the occipito-parietal suture. She had been unconscious, but at the time of examination had become conscious and was vomiting.

Right eye, retinal arteries and veins contracted to about one-fifth their normal diameter. Left eye, retinal arteries and veins slightly dilated, are over-full. Patient was conscious during this examination, but suddenly sank back in the nurse’s arms, unconscious. This was not a swoon; the face was not pale and pulse was good. This comatose condition lasted twenty minutes; during it I was not able to detect any alteration in the vessels of the right eye. Those of the left do not appear to have been examined. A few hours later patient was trephined. A spicule of bone an inch long, with several smaller pieces, was removed.
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In this case the sopor alternans existed, although the phenomenon did not present itself to me so characteristically as in other cases. But the unconscious condition before I saw her, and the recurrence of it during the examination were the indications of this condition. During it the vessels of right eye did not change, i.e., both retinal artery and vein were contracted as in the waking interval. The vessels of the left eye, dilated during the waking interval, were not examined in the sleeping interval.

Case XII.—Fred W., age 17, admitted March 5, 1890. Injury from a fall down an elevator shaft from the fourth story to the stone floor of the basement. Had a convulsion while being conveyed in an ambulance to the hospital. On admission completely unconscious; widely dilated pupils; stertor. A violent clonic convulsion occurred, followed by tonic spasm of the whole muscular system and partial asphyxia. The latter was relieved by a hypodermic injection of atropia and artificial respiration. Examination then showed a compound comminuted depressed fracture, involving the frontal and parietal bones. The area of depression was about two inches square. Just as Dr. Neilson commenced to trephine, another convulsion set in. The trephining was accomplished as rapidly as possible, and the moment the fragments of bone were raised, instantly the pupils contracted and the patient came to consciousness. "He told his name, where he lived, realized that he was in a hospital, but had no recollection of the accident." Further examination showed that the dura was torn and brain substance lacerated. The further progress of the case was toward complete recovery from the head injury.

The ophthalmoscopic examination in this case was made 24 hours after admission. Patient lying quietly in bed, apparently asleep, but rouses at times, and once sat upright in bed, but he seemed to be dazed and unable to converse. When awake, his pupils would dilate to 4.4 mm. Then, sinking into a quiet sleep, without stertor, the pupils would contract to 2 mm. I examined the retinal vessels with the following result: When the pupils were small and the patient asleep, the main arteries were diminished about one-fourth the normal amount, while the veins
were normal; but when the pupils dilated and the patient became awake, both veins and arteries contracted, i. e., the artery now became about one-half the normal diameter, and the vein was diminished one-half its previous calibre. Pulse 125, temperature 99°.

Note. — This case goes to show that the waking interval is one characterized by a contraction of both retinal artery and vein, while in the sleeping interval a dilatation occurred, the vein regaining its normal calibre, the artery still being diminished about one-fourth. In other words, the waking and sleeping phenomena are characterized by a simultaneous change in the calibre of retinal artery and vein; and in this they seem to differ from the phenomena observed in the first group of cases, in which, with considerable instability in the calibre of the artery, the vein keeps nearly of normal calibre, although of rounded cross-section. It is further to be noted that the pupils dilated and contracted coincidently with the waking and sleeping intervals, probably being connected with the same cause which gave rise to the changes in the vessel calibre. These three cases are too few to deduce a final conclusion from them, but one cannot fail to note both the variableness in the condition observed in the different cases as well as the tendency to rapid change in vessel calibre, as in passing from the waking to the sleeping stage. Possibly the latter furnishes the key to the differences observed. The real state of the vessels to be expected in any contusion of the brain may be that observed in Case X: Retinal veins slightly increased in calibre, artery diminished one-half. You have then a condition essentially the same as in the first series; when, however, you have superadded, as in the second series, the condition of sopor alternans, then a tendency to rapid calibre change is induced, which gives rise to the variation above described.

To recapitulate. These observations may be divided into two classes, according to the psychical symptoms of the patients.

1. Those made in cases presenting the phenomenon of delirium, or the initial stage to it. In these the most evident change observed was a rounded condition of the retinal veins,
the cross-section being circular; a turbid appearance of the vessel; very slight variation in diameter, at first a slight increase, then a decrease back to normal diameter or a little less than that; the retinal arteries showing a decided decrease in calibre, preceded, in the most typical case, by a slight dilatation.

2. In a series of cases presenting the phenomenon of sopor alternans, considerable variation in vessel calibre was observed, no persistent type being recognizable. This seems to be due to the decided tendency to rapid variation coincident with the sleeping and waking stages. There seems to be reason to suppose that the primary vessel change in these cases is the same as in the first group, viz.: retinal veins nearly normal, arteries contracted, and that the variations from this type are due to the nature of the injury to the brain, which tends to induce rapid and alternating changes in calibre of the intracranial vessels.

Two brief remarks may be added. 1. As to the significance of calibre changes in the main retinal vessels. The investigations of Ludwig and others have shown that the physiology of the circulation of the blood is a vastly more obscure subject than it once was supposed to be. From investigations in circulatory areas more accessible than that of the retina, the conclusion is probably warranted that the circulating fluid at any given moment in the retina is vastly less than the cubical capacity of its vessels. The result would be that, were there no restraining influence, the retinal blood would flow through its vessels like water out of a colander, and there could be no nutrition carried on; the efficient agent of restraint being the contraction of the minute arterioles. Now all this is mentioned to show that the circulation of the retinal blood is a much more complicated process than might be supposed, and that the rationale of retinal vessel calibre changes is obscure. The object of this paper is not to attempt to explain the physiological process, but simply to place on record certain clinical observations. 2. The cases cited have been divided into two groups, according to the psychical symptoms, and the conclusion might be drawn that there was immediate connection
between the calibre changes and the delirium and sopor alternans. It is by no means certain that this is so. The changes in the retinal vessels may, and probably do, indicate a corresponding change in the large intracranial trunks; but the relation of such changes to the production of psychical phenomena is a matter at present unknown.

AMAUROSIS IN WOMEN—THREE CLINICAL CASES.

BY T. Y. SUTPHEN, M.D.,

NEWARK, N. J.

The following cases are reported for their statistical value. The history of only a few similar ones having been published it seems proper to put these on record.

Case No. 1 was loss of sight in both eyes, following suppression of menstruation. The young woman was kindly referred to me by her physician, Dr. J. H. Bradshaw of Orange, N. J. I quote the Doctor's notes: "On the 8th of March, 1891, my patient, Miss Bertha K., was in bed, asleep, when her father, at midnight, in a drunken frenzy, drove her out of doors. The ground was covered with snow, and she was obliged to walk a quarter of a mile bare-footed, and in her night-clothes. She was menstruating at the time, and the exposure brought about an immediate stoppage, with great pain in the pelvic region. I saw the patient the next day, and the pain then, which she described as unbearable, was confined to her head. Several weeks passed before I again saw her. In the meantime she had menstruated normally, and her frequent headaches had been relieved repeatedly by phenacetine in gr. v. doses.

"About eight weeks from the night of exposure, she began to lose the sight of her right eye, and when I saw her she told me she could see nothing with it. Finding that, in fact, her sight had diminished to a mere discernment of the hand close by, I ordered iodide of potassium internally and recommended to her the advice of an oculist." The young lady came under
my personal observation at that time. I found the left eye normal. The pupil of the right was slightly dilated, but responsive to light. She was able with that eye to count fingers at two feet, but the field of vision was contracted to a small area on the temporal side. The ophthalmoscopic examination was negative, save that the retinal vessels, both arteries and veins, were small. No muscular trouble was found, and the urine was normal. She was a magnificent specimen of English womanhood, 18 years of age, with perfect general health, and weighing 165 lbs. She was placed upon mild diaphoretics and the iodide of potassium continued. I saw her quite frequently for several weeks. There was no material change in her vision, she complained but little of headaches, and had no nausea. Ten weeks after the right eye became affected she returned to me with complete blindness in the left, which she said had come on suddenly a few days before. The eye appeared normal except that the pupil was somewhat dilated and the retinal vessels were small. The vision in the right had also diminished. She went to her home to continue further treatment, but I learned later that, through the persuasion of friends, she had returned to her native town, Manchester, England, where she hoped to have her sight restored.

Case No. 2 was one of complete loss of sight following parturition. Mrs. R., a healthy looking German woman, 34 years of age, came to me in February last, at the suggestion of Dr. Nadler, with the following history: Two months previously she had been delivered of a healthy child at term, by a midwife. It was her eighth confinement, and she had had no trouble in the birth of the seven preceding children. She had a great deal of headache during the last months of this pregnancy, but no trouble with her vision. Six weeks after confinement she had, to use her own expression, "such a dreadful headache that she thought it would kill her." She walked two blocks to make some necessary purchases and returned feeling so badly that she went to bed. On arising after a little while she found she could see nothing with her right eye. When she came to me, a few days later, she was totally blind in that eye. Both pupils were moderately dilated, and both discs pale, otherwise the eyes were apparently
normal. There was no muscular weakness, no specific history, no trouble with the urine. Potassium iodide in increasing doses was prescribed. Two weeks later the other eye became suddenly blind. She was seen by me at intervals of about ten days and was kept under observation for several months. During that time she had more or less severe headaches. There were decided variations in her vision, and at one time she was able to count fingers at ten feet with the eye first affected; with the left she had perception of light only. Her field of vision was limited to the temporal side in the right eye. I saw her recently and found both pupils dilated, a very pale disc in each eye already showing atrophic changes, perception of light only in the right, absolute blindness in the left. The poor woman is again pregnant.

Case No. 3 was one of blindness in one eye lasting three months followed by improvement. Sarah R., a large robust English girl, presented herself with the following history: On May 16, 1891, she noticed circles of light before her left eye, with dark specks like motes dancing about in the field of vision. Within a day or two she discovered that she was blind in that eye. Her health previously had been good. She had matured early, menstruating at the age of 12. She had had, as a rule, considerable pain at these periods, but nothing farther abnormal. There was nothing pointing to a specific taint as the cause of her eye trouble. The urine was healthy. On examination the vision of the left eye was found limited to perception of light and that in the temporal portion of the field only. There was slight dilatation of the pupil. Nothing abnormal to be found with the ophthalmoscope; occasional divergence of the left eye, but no other muscular irregularity. She had experienced no headache, dizziness, nor nausea. She was treated as many of our cases with obscure causation are, with the iodide of potassium. She could not take large doses on account of an irritable stomach. She is now slowly regaining her sight, at present being able to count fingers with the affected eye at ten feet. The field of vision is normal but there is a small central scotoma. All pronounced colors are recognized, but the patient calls pale blue pale green, and pink, gray or dirty white. There is no difference in the ophthalmoscopic appearance of the two eyes.
A NOTE ON HYOSCYAMINE.

BY S. D. RISLEY, M.D.,

PHILADELPHIA.

In the issue of the Philadelphia Medical Times for February, 1881, I published a preliminary statement on the use of the sulphate of hyoscyamine for the purpose of paralyzing the accommodation for the correction of anomalies of refraction; and in July of the same year presented a paper before the American Ophthalmological Society on "The Comparative Value of the Mydriatics," in which a more extended study of this drug was made. The conclusions in this paper were based upon ninety cases in which the hyoscyamine salt had been employed and careful records made of its influence over the pupil and accommodation, and the results compared with those attending upon the like employment of the sulphates of atropine and duboisine and the hydrobromate of homatropine. (Vid.: Trans. Am. Oph. Soc., 1881.) The preparation used was a white crystalline salt which, when placed in solution of distilled water, was entirely bland, causing no irritation of the conjunctiva. The salt proved so much superior to the other members of the group, when employed in those cases of refraction error accompanied by retinochoroidal irritation and asthenopia, that during the intervening years I have used it almost to the exclusion of the other mydriatics, except in selected cases, the ground of selection being the absence of any marked tendency to ciliary cramp, or where the eye-ground was in a fairly healthy state and headache was not a prominent symptom. After ten years of additional experience in its daily use, I have not found occasion to materially alter the conclusions then formulated.

The object in the present note is not so much to call attention to its great efficiency as a mydriatic, as to point out the cause of certain irregularities in its action. In the paper already quoted, the fact that some preparations of the drug were not trustworthy was foreshadowed in a single case the rereported, in which the returning accommodation had pursued the same course as though the sulphate of atropine had been employed. The dispensing
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druggist was consulted regarding the variation, and he exhibited the bottle from which the solution had been prepared. It bore the label of Merck's laboratory, and contained an amorphous, semi-fluid, brownish mass, instead of the crystalline salt with which I was familiar, and upon which the original observations had been made. The investigation was not pressed further at that time, but care was taken subsequently to procure the crystalline salt. Of late as the hyoscyamine has come more and more into use, I have experienced increasing inconvenience from the dispensing of inferior preparations. Not only was frequent annoyance experienced by the returning accommodation being delayed beyond the normal time for hyoscyamine, but very frequently the solutions furnished by the druggist caused severe and protracted smarting, in some instances so violent as to preclude a second instillation. When this occurred I found, in each case investigated, that the amorphous salt had been used.

I called the attention of Mr. Frank E. Morgan of Philadelphia to these facts and requested information regarding the chemical history of the drug.

In reply he placed in my hands a mass of literature on the alkaloids of the Solanaceæ and a carefully condensed statement which he had kindly prepared. From these sources the following facts, sufficient for my present purpose, were gleaned, and which I desire to present as a preliminary note to a more detailed study of the physiological properties of these alkaloids when employed as mydriatics. I am encouraged to make this brief statement since it seems to furnish a sufficient explanation of the irregularities observed.

In the first place, the mydriatic alkaloids extracted from the Solanaceæ are very complex, chemically considered, and when subjected to appropriate manipulation, yield a group of isomeric bodies differing more or less widely in their physiological action, although obtained from a common source. It would appear, furthermore, that the method of extraction employed, in the case of belladonna at least, determines whether the product shall be hyoscyamine or atropine.

As found in the market the alkaloids may be placed in two classes, the first of which properly includes those with a simple or homogeneous base and having the common formula, \(C_{17}, H_{23}\).
NO₃. To this class belong atropine, crystalline, hyoscyamine, and hyoscine. In the second class are included those having mixed bases, comprising the simple alkaloids of the first class as they are found mixed in the plants of the natural order of the Solanaceae, e.g., the atropa belladonna, duboisia myoporoides, datura stramonium, scopolia japonica, etc. To this class belong the commercial daturine, duboisine, amorphous hyoscyamine, and scopolein.

From this statement it becomes obvious that, if the simple isomeric alkaloids do in fact possess different physiological properties, and therefore different fields of usefulness as therapeutie agents, in order to secure this advantage from their employment in the daily routine of professional life, only the pure, or in other words, the carefully separated, alkaloids or their salts should be dispensed, since in using the mixed bases we could only expect to secure an effect which would in some sense be the resultant of their combined properties. In addition to these considerations it has been shown by chemical investigation that these simple bases are liable to conversion under certain methods of treatment.

The literature of the subject is extensive and confused, the confusion no doubt in part growing out of ignorance of this liability to conversion. The discovery of the alkaloid hyoscyamine was first announced by Brandes in 1820, but it was not successfully separated until 1833, by Geiger and Hesse, and later exhaustive studies were made by Ladenburg, 1879–1884, and by W. Will, in 1888, in a paper read before the Berlin Chemical Society, which was subsequently translated for the Pharmaceutical Journal and Transactions, for August, 1888.

Hyoscyamine has been found in hyoscyamus niger, atropa belladonna, datura stramonium, duboisia myoporoides, and anisodus lundus. It is isomeric with duboisine and atropine and is therefore closely related to the other mydriatics. Indeed W. Will has shown that when appropriate chemical manipulation is employed that hyoscyamine alone can be procured from the belladonna, and can then be converted into atropine by simply heating it to its melting point, or by treating it with an alkali, or by heat in the presence of hydrochloric acid. One gram of
hyoscyamine in 10% solution was converted into atropine by one drop of a soda solution in two hours.

As an illustration of the confusion which obtains in the study of these products of the Solanaceae it was claimed that at certain seasons of the year only hyoscyamine could be extracted from belladonna, and that at other seasons only atropine, but the later studies of Will renders it probable that this variation in the product of extraction was due to the methods employed. It is plain, therefore, that only by great skill in manipulation can a pure hyoscyamine be obtained, and as a mydriatic at least, none should be employed but the pure crystalized salt. The painful irritation following the instillation of solutions prepared from other preparations, e.g., the amorphous mass, is due to the presence of impurities, either resin coloring matter, or possibly tropine or tropic acid; while the irregularity in the duration of the ciliary paralysis and dilatation of the pupil is due to the presence of atropine, or possibly daturine in the mixed basic salt, a fact, as regards atropine, readily accounted for, since by the method of preparation directed in the Dispensatory, soda is freely used, and the hyoscyamine therefore converted into atropine.

Although these alkaloids are isomeric it is interesting to note that while the hyoscyamine has the power of rotating a beam of light to the left, atropine possesses no polarizing power.

From the foregoing the following conclusions seem justified:

First. That in prescribing hyoscyamine or its salts for ophthalmological purposes, only the pure crystals, skillfully prepared, should be employed.

Second. That in dispensing it the solution should be strictly neutral, that only very moderate degrees of heat, if any, should be used, and in filtering the solution, alkaline filtering paper should be avoided.

DISCUSSION.

Dr. George C. Harlan of Philadelphia.—My attention has been called to a statement in the last edition of the United States Dispensatory that recent chemical and pharmacological observations have shown that hyoscyamine, duboisine, and daturine, as found, at any rate, in the shops, are not only isomeric, but are actually one and the same alkaloid under different names.
SUPPLEMENTARY NOTE TO THE CASE OF USEFUL VISION MAINTAINED BY THE AID OF A TOTALLY DISLOCATED LENS, HERETOFORE REPORTED TO THE SOCIETY.

BY SAMUEL THEOBALD, M.D., BALTIMORE.

Probably some of the members present may remember the case described in the title of this paper, which I reported to the Society at the meeting in Newport, in 1881.

J. B. K., a lad, at that time twelve years of age, with total dislocation of both lenses, had learned to use one of his lenses, which floated freely in the vitreous humor, by throwing it into position behind the pupil, and by this means had been able not only to study his lessons and keep up with his classes at school, but also to read a great deal for his own amusement. In order to get the lens into the proper position and retain it there, it was necessary for him to bend his head down, with his face towards the floor, and in this position only was he able to read ordinary type. The pupil in the right eye was very eccentric, and only the left eye was employed in near vision, in the manner described. With this eye, when the lens was thrown into position, he could read J. No. 1 with ease; but, with his head erect and his lens in the lower portion of the vitreous chamber, he could scarcely decipher J. No. 17. His distant V. for each eye was 15/CC. Except that the eyes were myopically elongated and each exhibited a myopic crescent and some thinning of the choroido-retinal pigment, they were free from evidences of disease. His vision had been defective from infancy. There was no history of traumatism. As well as could be ascertained the lens in the left eye was, at that time, free from any opacity, and the same appeared to be true of the right lens, which, however, could not be seen as satisfactorily. Convex glasses for distant and near vision were prescribed, which gave V. = 20 L—, and enabled him to read J. No. 1 with his head in an erect position, and these he afterwards wore with much satisfaction.
Six years and a half after I had prescribed these glasses for him he paid me another visit (June, 1887). I then found that the myopic elongation of his eyes had increased somewhat, so that his distant lenses had to be diminished in strength, the left from $+\frac{4}{5}$ to $+\frac{1}{5}$, the right from $+\frac{3}{2}$ to $+\frac{1}{3}$, but with these his vision was now 20/1. I also discovered that the lens in the left eye was beginning to show traces of opacity, nevertheless he was still able to throw it into position behind the pupil, and by its aid to read J. No. 1 with ease.

An interval of a little over three years elapsed after this last visit without my hearing anything of him, when he again called to see me. This was in August, 1890, and he was now a man 22 years of age. He reported that two weeks previously the sight of his left eye, which before that had been as good as usual, had become "dim" and "dark," and that this change in the vision had been accompanied and followed by considerable pain in the eye and lachrymation. The eye exhibited some injection, had Tn, and V. = 20/1xx. A mydriatic was applied, and then with the ophthalmoscope it was easy to see what had happened—the capsule of the dislocated lens had ruptured, and the opaque lens substance was escaping freely into the vitreous chamber. Probably before this took place the lens had become cataractous. Numerous floating opacities were present in the anterior portion of the vitreous humor, but still the optic disc and other details of the fundus could be easily distinguished. Atropia, a lotion of opium and boracic acid, and salicylate of sodium internally were prescribed, and for some days the eye did well. It then became painful, the tension rose to +T1, the cornea became steamy, and V. fell to $4\frac{1}{2}$/cc. The atropia was discontinued when this change manifested itself, and pilocarpine was given internally in place of the salicylate of sodium. A temporary improvement followed this change of treatment, T. becoming normal, the cornea losing its steaminess, and V. rising to 20/CXXVII; but within a few days, although the pilocarpine was still being administered, the eye became worse again, and all of the unfavorable symptoms returned. Biniode of mercury was now given in liberal doses, a collyrium of pilocarpine muriatic prescribed and mercurial ointment applied to the forehead and
temples. Under this treatment a change for the better soon began to manifest itself, and this time the improvement was not a temporary one. The glaucomatous symptoms entirely disappeared, the opacities in the vitreous slowly decreased in size and in number, and the vision steadily improved, until by the latter part of December (the attack having begun, as I have said, in August) he had in this eye V. = 20/xxx(?) . Shortly after this (in January, 1891) he began to use his eye again, reading and studying, and found that he could do so without inconvenience.

Within the past few days (Sept. 7th) he has called at my office in response to a request that he should do so. The eye is again in good condition, and he tells me that he pursued his collegiate studies during the remainder of last winter and to the end of the college year without any trouble. His V. is now 20/xl—, and he reads J. No. 1 with facility. The vitreous humor is again perfectly clear, and I could not detect in it any remains of the lens substance. The capsule, however, is still floating in the lower portion of the vitreous chamber, and when the eye is directed upwards falls towards the optic nerve, and can be seen with the ophthalmoscope.

The floating lens in the other eye still seems to be intact, and gives him no inconvenience.

DISCUSSION.

DR. HENRY D. NOYES of New York.— I would like to ask Dr. Theobald a question for my personal information. We may, all of us, meet with congenital dislocation of the lens, and I have recently had to deal with some cases of that kind during the past winter. They are sometimes accompanied with a very high degree of amblyopia so that the vision is extremely bad, and no one would ever deem it right to interfere, but I have sought in vain for articles on the removal of lenses. Now they would not be removed if the lenses were not in a mobile condition. Is there any experience as to the propriety of removing these transparent lenses in these cases of congenital ectopia lentis? I would like to make this remark, that in certain cases where glaucoma supervenes and iridectomy is not available for any reason whatever, I have found extreme benefit from a combination of cocaine and eserine, eight parts of eserine to one of cocaine, frequently accompanied by fomentation of hot water.

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heated to 115 or 120 degrees Fahrenheit; that this will reduce the tension of the eye, and when acting in combination with the other I find them very useful in some especial cases.

Dr. R. J. McKay of Wilmington, Del.—Dr. Theobald’s case reminds me of a somewhat similar one occurring to me some eight or ten years ago, to which I was called in consultation, and my experience may serve to answer a question which Dr. Noyes has asked. It was a case of congenital double dislocated lenses, which were floating about in the vitreous and the patient was very highly amblyopic and myopic. She being very nervous and suffering considerable pain, I did not offer anything in the way of glasses or treatment at the first visit, and I saw the case no further after this, until some time afterwards when I was sent for suddenly by the family doctor to go sixteen miles into the country to see her. I found her suffering severely with iritis and apparently panophthalmitis. She was very nervous, and after I had prescribed for her I saw her no more. She went to Will’s Eye Hospital, and was under the care of Dr. Keyser, whom I afterwards asked about the case, and he said that the patient’s lenses had become dislocated and had got under the conjunctivæ, and he had to remove one lens and one eye. Perhaps some of the gentlemen here may remember the case; she was 25 or 30 years of age, and this was some ten years ago.

Dr. George C. Harlan of Philadelphia.—With regard to the removal of dislocated lenses, I can recall one case which came under my observation some 15 years ago, that of a young girl, 15 or 16 years of age at the time. The lenses were totally dislocated, and were bobbing about in the vitreous. They were both transparent. She suffered from violent neuralgic pain, and under the impression that the lenses might be the cause of it, we concluded to remove them. I did so, with some difficulty, on account of their transparency. I was obliged to darken the room, and have artificial light conveyed into the eye, and then I could see the lens only by the refraction at its margins. Both lenses were removed by means of the wire loop. I have seen this patient occasionally during the past few years. She still has good vision with cataract lenses. The case of Dr. Theobald’s in which the patient continues to have fair vision through a dislocated lens reminds me of one which was to me very interesting as an illustration of the Helmholtz Theory of Accommodation. The lens was separated completely from its connections, but was very little displaced from its normal position, and for five or six weeks remained transparent, admitting of good myopic vision. Ophthalmoscopic examination was easily made,
and the fundus was normal and presented no indications of myopic formation. The interesting point was that the degree of myopia caused by the liberation of the lens from its suspensory ligament corresponded exactly to the near point of the other eye, which was emmetropic.

**Dr. B. Alexander Randall** of Philadelphia.—As an interesting case in connection with the case mentioned by Dr. Theobald, I might refer to the result of a ruptured globe with traumatic subluxation into the anterior chamber, which I reported in this Society in '86, where, after the spontaneous reduction of the lens, the patient had fair vision for quite a while through the clouding lens. This gradually became opaque, and he tried the bramble-bush method, getting another blow upon the eye, which couched his lens neatly; and he has now very good vision—20/40, with a cataract lens, which is as much as he can see with the uninjured eye.

**Dr. R. A. Reeve** of Toronto.—About fifteen years ago I had occasion to enucleate the left eye of a young woman, who is now about thirty years of age. She had dislocation, congenital dislocation of the lens in the other eye. By wearing a cataract glass she now goes about with great facility, and in reading she bends her head well forward and is able to read the finest text with the naked eye.

I have had a number of cases of congenital dislocation. One case was that of a book-keeper in one of our banking institutions, who did the exacting work required in that capacity satisfactorily. I adapted for his use two sets of convex lenses, and he was able to do his work without interruption.

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**A NEW APPARATUS FOR DETECTING AND MEASURING THE ANOMALIES OF THE OCULAR MUSCLES.**

By S. D. Risley, M.D.,

Philadelphia.

The renewed interest which of late years has been awakened in the study of the ocular balance has served to demonstrate the necessity for some form of apparatus which would facilitate the work of the surgeon, and at the same time secure trustworthy measurements of the relative strength of the ocular muscles. The use of the series of prisms ordinarily found in
our sets of test glasses was notoriously tedious, fatiguing both
to patient and surgeon, and withal variable in results, so that the
temptation to avoid a wearisome task constantly presented itself,
since at the end there was but little confidence in the result.

It is not my purpose to discuss here the anomalies of the
ocular muscles, but to describe briefly an instrument devised
to meet the indications suggested above. In passing it may be
said that not infrequently muscular defects parade themselves
in a manner to deceive the observer as to the real muscles at
fault, or the defect may be wholly or in part concealed, butnever-
theless the cause of ocular disturbance or reflected symptoms.
To detect these latent disorders, or to unravel successfully the
vagrant and confusing movements of the eyes, it is helpful to
have the patient, as far as possible, in a position of general
muscular rest, and the eyes placed under conditions which re-
move the ordinary inducements to binocular vision. It is
furthermore desirable that these conditions shall be simple and
readily understood, since for the most part our patients are not

trained to habits of accurate observation. Then, too, the per-
sons suffering from these anomalies are apt to be "nervous,"
and are not infrequently afflicted with headache, particularly
with occipital pain which is aggravated by any protracted ex-
amination. The ocular muscles become irritable under the effort
to measure their relative strength, so that the more persistent
the trial, the less trustworthy are the results reached. Nothing
could be more annoying to the eyes of an already suffering
patient than the heavy trial-frame resting upon the nose, and
the placing and replacing in wearisome succession of the cum-
K. Holder for trial glasses, stenopæic slit, etc. N. A chin rest. L, L. Graduated rings with spring hinge and spring top to hold rotary prisms. M. Milled head screw for adjustment of bœw-rest M. (The screw for regulating the centering of the holder K projects at C, but is not shown in the cut.) J. A ring with stop-spring for holding maddox prism or glass rod. It is here shown turned aside out of the line of vision. The rotary prism glass rod or double prism are not shown in place.
bersome prisms of the test-set. To avoid these annoyances and at the same time meet the requirements for a rapid and careful determination of any existing anomaly I have had constructed by John L. Borsch & Co. of Philadelphia the apparatus here described. With various modifications I have used it daily for more than three years and now present it in the hope that others may find it an additional aid in the daily routine of office work.

At the meeting of the American Ophthalmological Society in July, 1889, I presented a convenient form of the Cretes Rotary prism, a description of which will be found in the transactions for that year. The wood cut of the instrument is here produced. The instrument now described is a fixed form of apparatus for the accurate use of the rotary prism and certain other accessories, e.g., the correcting glasses for any existing defect of refraction, the stenopæic slit, the Maddox double prism, and rod. The accompanying wood cut exhibits its details in a manner which will obviate any necessity for lengthy description. The essential part of the apparatus is the holder, which can be mounted upon a stand designed to rest upon a table or desk, or, as in the cut, upon a floor-stand which is placed by the side of the chair occupied by the patient. At the top of this stand there is placed a strong horizontal arm, which is carried to the front of the patient and supports a second upright shaft which moves up and down freely, but is fastened at any desired height by a binding screw. On this shaft is placed a chin rest, N, and at its top the holder, K, and accessories are supported. L, L, are a pair of rings or cells for the reception of the rotary prisms. These are hung on a spring hinge which permits them to be turned forward and downward below the line of vision, so that the prisms are out of the way when not in use, but are readily turned upward into place when desired. A rotary prism should be placed on each side for rapid work, the zero mark being fixed at 180° on one side and at 90° on the other. On the posterior surface of the holder, K, is seen the ring, J, J. This is hung on a spring hinge and on the left side is represented as turned outward, out of the line of vision, but in situ on the right side. These are designed for the reception
of the Maddox double prism or rod, each of which are mounted
in a cell which accurately fits these rings, and may be turned to
any desired position, being checked at 90° and 180° by a stop-
spring. These may be retained permanently in place, but are
readily removed and replaced when desired by other cells con-
taining a stenopæic slit, a blank disk for excluding one eye, and
a third with a central opening 2½ mm. in diameter to act as a
diaphragm in correcting certain cases of high refraction error
with widely dilated pupils. M is a brow rest, adjusted by
means of the screw, A. Just below the border of this is seen
a spirit level without which the triple images produced in using
the Maddox double prism or the bar of light, as produced by the
rod, are not easily maintained in a strictly vertical or horizontal
position. When inclined they are confusing to the patient.
The bar, with carrier on it containing the astigmatic chart, is
designed for work at a near point. The carrier moves freely to
and fro on the bar and carries a series of test cards. The bar
can be removed when not in use, or turned down out of the line
of vision. The rotary prisms, when in place as suggested above,
furnish a most ready and rapid method of determining the power
of adduction, abduction, and sursumduction. At 6n a small
point of light is used, while at the near point a small word of
D = .50 is placed in the center of a white card. In all these
respects, however, the instrument lends itself to the preferred
methods of the observer as readily as does his test set and trial
frames.

ADDITIONAL NOTE ON THE USE OF TORIC
LENSES IN ASTIGMATISM.*

BY GEORGE C. HARLAN,
PHILADELPHIA, PA.

I am convinced that an important factor in the difficulty
frequently experienced in wearing strong cylindrical and sphero-
cylindrical glasses is to be found in the fact that they are not
periscopic. It has been admitted for a good many years that

*See articles on this subject by same author Trans. Am. Oph. Soc., 1885 and 1889.
the meniscus can be worn with greater comfort, and biconvex and biconcave lenses have long been obsolete. Nobody ever thinks of using one. But the use of periscopic cylindrical and spherico-cylindrical glasses is by no means general. I have several times called the attention of the society to these glasses, and a practical experience with them for five or six years has left no doubt in my mind of their value; but one case, which occurred in my practice recently, and which may serve as an illustration, would seem to me sufficient to prove it.

A gentleman, fifty years of age, of unusual intelligence, was wearing a pair of glasses which he had had for some six years, and which, while they were not strong enough to give good distant vision, were too strong for near work, and he suffered a good deal from asthenopia and headache. I prescribed bifocal glasses — R — 5.50 — 2.50° ax. 65 and L. — 4.50 — 4° ax. 130, with a +2 cemented lens below on each. This gave distant V = 2/3 and a near point of ten inches. Periscopic spherico-cylindrical, or "toric", lenses were ordered. After using his new glasses for a day the patient came to me in great distress and said that it was impossible for him to wear them any longer — that they caused a sense of confusion and strain, and had given him a violent frontal and occipital headache, which had lasted through the night, and deprived him of sleep. The glasses were accurately ground, but, by a mistake of the optician, the ordinary form had been furnished. "Toric" glasses of the same foci were substituted, and he has worn them ever since, not only with entire comfort, but with great delight, and his headaches have disappeared. The evidence of this case seems to me strong from its accidental character and from the fact that any suspicion of "expectant attention" is excluded; for the patient supposed that he was wearing the glasses that had been ordered, and the mistake was only discovered when I came to test them. The only objection to the use of these glasses is the greater difficulty of obtaining them, as all opticians do not undertake to grind them; they would have to do so, however, if the demand became general.
CONTRIBUTIONS TO THE STUDY OF HETEROPHORIA AND ITS RELATION TO ASTHENOPIA, HEADACHE, AND OTHER NERVOUS SYMPTOMS.

BY SWAN M. BURNETT, M.D.,
WASHINGTON, D. C.

I assume that at least all but a very small minority of the members of the society recognize the existence of a condition of disturbed equilibrium of the external ocular muscles which gives rise to well-marked symptoms of asthenopia, headache, and other nervous symptoms; I also assume that we have not as yet reached the last word on the therapeutics of these conditions, and that we are all desirous of accumulating trustworthy evidence on the merits of the different methods that have been proposed for their relief. I can say in support of this, my humble contribution, that the observations have been made with a mind free from bias or prejudice, and the facts recorded with honesty.

I have used the terms heterophoria, exophoria, esophoria, etc., introduced by Dr. Stevens, because they are short, distinctive, and designate with sufficient exactness the actual conditions.

I have not found heterophoria of so common occurrence as has been reported by some observers. For a number of years I have, with few exceptions, tested every case of optical defect that came under my observation in private practice for a disturbance of equilibrium in the external muscles, and taking 100 cases at random in my case book, I find that among that number there were 22 in whom heterophoria of some kind and degree was present. In most of these, no attempt was made to correct the fault, either because the patient was not seen again or because the correction of the other ocular difficulties gave all the relief that was desired. Heterophoria does not, any more than ametropia, always give rise to asthenopia or call for correction; and I am inclined to believe, from my own observation,
that heterophoria of even small degrees is rarer than ametropia,—that is, that human eyes are more normal in regard to their muscular equilibrium than to their optical condition.

We are not yet, I am free to confess, in a position to generalize and formulate positive dicta in the matter, but my experience would lead me to infer that exophoria or esophoria of 2 P. D. in persons of average health does not, usually, give rise to trouble on ordinary use of the eyes; hyperphoria of that amount, I think, does. Moreover, the defect is a quantity constantly varying with the condition of the patient, so that we must allow ourselves considerable latitude in estimating its actual and permanent amount. It is this fact, which, probably beyond all others, lies at the foundation of our difficulties in therapeutics.

I examine the equilibrium always at an infinite distance, the eyes being then in a condition of accommodative relaxation and in a state of practically normal parallelism, or at least in a condition of normal muscular inertia.

In testing, I use the flame of an argand burner in my ophthalmoscopic room, 6 meters away, turned low, and produce diplopia by means of an 8 D. cylinder. This has all the advantage of the Maddox prism, with the additional advantage that, by moving the lens at right angles to its axis, the very much elongated image effected by the cylinder moves up and down laterally, enabling patients who are not very ready at observation to tell, at once, the relative position of the gas jet and the streak of light, that is, whether the latter passes through the flame or to one side. On the black wall of the ophthalmoscopic room, I have ruled white squares with 6 cm. between the lines; opposite the center of the system of squares I place the flame of the argand burner. The patient can then indicate, if there be any diplopia, the number of squares that separate the light streak, and the side on which it is, from the flame. At the distance of 6 meters each square of 6 cm. represents one prism dioptre of deviation, and thus the number of spaces of separation gives the amount of heterophoria expressed in the number of the prism necessary to correct it; and the side on which the light streak is seen gives us knowledge of the kind of heterophoria.
The test at an infinite distance I consider the necessary one, and that at the working distance less important, because less reliable. It is common to find quite a considerable heterophoria at a distance and yet none with the dot and line test of Græfe. The accommodation comes in here to vitiate the result. The power possessed by the individual muscles as expressed by their ability to overcome prisms, I do not rely upon as much as I formerly did. The power of overcoming prisms is one of education largely, and while not unduly depreciating the method, I consider it inferior to the test at infinity. It is here that the real relative power of the muscles is shown, and that is what we want to know. I do not deny the possibility of the existence of a positive weakness of the interni which will give a separation of the double images in convergence which is not apparent at the test at infinity, but I think such a condition must be rare, and I do not remember to have met it in my practice.

Another point on which we are in need of statistical investigation is the relative frequency of esophoria, exophoria, and hyperphoria. Formerly, insufficiency of the interni was considered the sole cause of muscular asthenopia, as it was called to distinguish it from that due to accommodative strain, and I think we have all been surprised to find how often weakness of the externi is the cause. Dr. Noyes, as is well-known, has found this condition the more frequent of the two.

I find that among fifty recorded cases of heterophoria taken in succession from my case book, there were twenty-eight of exophoria, eighteen of esophoria, three of hyperphoria, and one of combined esophoria and hyperphoria.

Coming now to therapeutics, there are, of course, only two methods of treatment, if we recognize the separate existence of heterophoria apart from ametropia,—and these are prisms and operation on the muscles. All cases of heterophoria do not demand correction for the immediate relief and comfort of the patient any more than all cases of ametropia do, but there can be no question that in the one case as in the other, such correction will place the patient in a much better condition ocularly, and probably forestall a future breakdown. But there is unfortunately a large suffering class who are clamoring for
relief, and it remains for us to choose between these two methods of cure.

It would seem, at first blush, that prisms would fill all indications, and that we had only to select the prism which appears to correct the faulty position of the double images, and the difficulty would be overcome and the desired relief obtained. In this, however, our hopes are often blighted. In some cases it is true, we hear no further complaint and the prisms are worn with perfect satisfaction. In another contingent of cases, the relief is only partial, and in many others no relief at all is experienced.

It has been assumed, heretofore, by practical ophthalmologists, and I think by all physiological opticians as well, that theoretically at least, the prism is able to correct optically all the difficulty. Though the prism is the simplest of all optical instruments except plane glass, it does not seem to be remembered that its optical properties are not a little complex, even under the conditions that usually prevail. Physicists, however, have for a long time been aware of these phenomena, and have treated of them mathematically, and a full consideration of the subject can be found in the recent works of *Aldis and †Heath.

In order that light be deviated by a prism in accordance with the well-known laws laid down in our ordinary treatises, the pencils must be parallel. When they become divergent not only do these laws become modified in such manner that deviation for the divergent is less than that for parallel pencils, but, in addition, the prism exercises a demonstrable astigmatic action; that is, a point from which the rays fall divergently on a prism has, after their passage through the prism, a focal interval of Sturm, in which, however, the focal lines are not, as in spherocylinders, straight, but of a peculiarly curved form. Moreover, it has been found that the thickness of the prism itself cannot be wholly ignored as we have been accustomed to do, and that the refraction is different at its apex and base. It is only in prisms of 5 P. D. and less that the accepted laws of prismatic refraction apply.

†R. S. Heath, Geometrical Optics, Cambridge, 1887.
Mr. C. F. Prentice has given a graphic representation of this in a paper now in print, and to be published in the number of the American Journal of Ophthalmology, No. 10, 1891.

Then again there is the annoyance experienced nearly always in getting accustomed to the use of prisms—a difficulty which is overcome only after a long period of education in many instances and sometimes not at all. And, furthermore, there is a class of patients which protests strenuously against the use of spectacles of any kind. There are many women who would rather submit to any number of tenotomies than wear glasses for a week. And we must remember too, that the wearing of glasses is a burden and a great inconvenience, and in not a few instances a handicap in the race of life. We have so accustomed ourselves to the inevitable spectacles in correcting ametropia that we do not sufficiently recognize that in heterophoria there is an alternative, and finally there are those cases where prisms do not give the desired relief. If then we shall determine that heterophoria is correctible by an operation, that operation will, and should, be the rule, and the use of prisms the exception.

The correction of disturbance of muscular equilibrium by tenotomies is now on trial in this country and evidence in its favor is constantly accumulating. Beyond the sea, so far as my knowledge extends, nothing of any consequence is being done in that direction in advance of what was accomplished by Græfe, whose work was directed wholly against the insufficiency of the interni in myopia. One explanation of this may be that they do not have the amount of asthenopia from the same cause there as we do here. Like nervous prostration, I think the asthenopia and headaches of heterophoria and ametropia is a disease developed largely by the American method of living; which, however, on that account, is none the less a disease which requires the most careful consideration at our hands. If tenotomy will restore the lost equilibrium of the muscles it is certainly the most scientific, the readiest, and, in every way, the most commendable method of dealing with the difficulty. My own experience with the operation is somewhat limited, but could have been greater had I been less conservative and cautious. The results, however, have been eminently satisfactory and such as
to convince me that not only is it a legitimate operation, but one that, under certain circumstances, is imperatively demanded.

I will give, as briefly as possible, the salient points in the histories of five cases in which I have done the operation of partial tenotomy.

Case I.—Miss J. H., a Western girl "with no nonsense about her," aged 19, was seen first December 13, 1889. She had been struck on the right eye with a stone when eight years old, and there is a remaining scar on the cornea on the outer margin. Vision, however, was the same as in the other eye, namely, with +0.75, 100° R. and +0.5, 80° L. became 8. The Keratometer gave L. 155° 44 D., 15° x. 1, R. 75° 44 D., 150° x. 1 ½. She had suffered so much from her eyes and head that it had been impossible for her to have any systematic education. Any use of the eyes would give her a violent headache. She was treated for a long time by one of the best ophthalmic surgeons in the West, but with no permanent relief. The muscular equilibrium had not, however, been tested until she came to me. I found that she had at the first examination an esophoria of 5 P. D. She fused a No. 5 prism base in and No. 20 base out. On the 16th her esophoria was 7°, and on the 24th 8°. She was given R. +0.75 100° 0 prism No. 4, base out; L. +0.5 80° 0 prism No. 4, base out. From the use of these glasses she experienced some relief, but she was still unable to use the eyes with any degree of regularity or reliability. On June 17, 1890, the esophoria was 10 P. D., and on the 18th 12 P. D. I then advised a tenotomy, and it was readily acceded to, the patient being willing to submit to anything for relief. Accordingly, on the 23d I made a partial tenotomy of the right internus correcting the esophoria to 4 P. D. On July 9th she was ordered R. 3 P. D., base out, L. 1 P. D., base out, and she went away for the summer. She used her eyes all summer in fair comfort, getting more use of them in three months, she said, than in any three years before. She came home and went to hard work, and her eyes began to trouble her again, and her prisms did not afford her the desired relief. I then made another partial tenotomy of the same muscle on Oct. 22d, leaving only a few fibres above and below. The correction was complete for an instant,
the images then separating somewhat, homonomously. In a few days this settled down to 2 P. D., at which it has remained approximately ever since. She has been able to use her eyes with comfort most of the time since, has continued her music studies and sews and reads as she has never done before in her life. As she says herself, "it has made a new girl of me," and certainly her general appearance is vastly better than before the operation.

**Case II.**—Miss Annie B., a stout healthy-looking girl, aged 17, was first seen March 23, 1886. She had at the time myopic astigmatism, R. — 2 — 0.5 90°, L. — 1.5 — 0.5 90°. No note is found that the muscular equilibrium was examined at that time. She returned on February 25, 1889, with serious complaint of her eyes and head. She looked worn and haggard and her headache was almost constant and had been for eighteen months. The myopia had increased in the right to — 5 D., and there was, at the first examination, an exophoria of 4 P. D. She fused 4° base in, 14° base out. She was ordered the prisms in addition to her ametropic glasses, but they were not at all satisfactory. She had a little less pain when she used them than when she did not, and the exophoria increased during those months to 8 P. D. I advised a tenotomy, and it was done on November 13, 1889. The exophoria was reduced to 3°. This varied from time to time, being sometimes more, sometimes less, until it finally settled at 3°, on Nov. 26. On the 6th of December she reported that she reads all she wants to without pain and her headaches are gone. On January 28, 1891, she had an attack of asthenopia and the old pain in the head from overwork and the exophoria was 4 P. D., and we thought we might have to make a tenotomy, but a few days rest relieved it, and she has been in comparative comfort ever since.

**Case III.**—Miss C. W., aged 21, I first saw April 24, 1887. She complained of great pain from the use of her eyes, which went from the back of the eyes to the back of the head and neck. She had suffered then for a year and had done everything for it. Her vision was 6, and there was no ametropia. She fused 3° base out, 21° base in, and there was an exophoria of 5° or 6°. She was given R. 3° base in, L. 2° base in. I heard
nothing more from her until January, 1891, when she came to
me from her physician with a request that her eyes be examined
again. She had been wearing the prisms ordered nearly four
years ago, and with some relief at first, but the headaches had
lately become so constant and intense that life was a burden.
She was willing to submit to anything that promised relief.
Her exophoria was 8 P. D. She accepted the proposition for a
tenotomy readily, and I made it Jan. 31st, reducing it to 2°.
On February 4th it was 4°, on the 10th 4°, and on the 14th 6°.
The relief at the time was very marked. I saw her no more
until June, when she returned with the old complaint. I found
that the exophoria was again 8 P. D. and the red glass gave
double images, the result of the first operation being nil.
Another partial tenotomy was made on the right eye on June
13th, and this time I cut away a triangular piece of the middle
of the tendon. I allowed at this operation a slight over cor-
rection of 1 P. D., and which remained after a conjunctival
suture was applied. On the 10th the stitch was removed and
complete correction was found, the false image varying how-
ever, sometimes a little to the right and sometimes to the left.
On the 18th the exophoria 2 P. D., on the 22d 1½ P. D., and on
the 26th 2 P. D. She then went away for a vacation, her
nervous system being a total wreck. She is better than she
was, but the relief is not complete, though certainly her eyes
are now in a more nearly normal condition than they have ever
been.

Case IV. Mrs. I. D., a lady of 58, five years ago had some
trouble with her head which was diagnosticated congestion of
the brain. Not long afterwards she noticed that her eyes
pained her on use, and that headaches were frequent. These
symptoms increased, and for three years she has been unable to
use her eyes at all. The reading of more than a dozen lines
of print at one time is impossible, and she has accustomed her-
sel to write with her eyes shut the letters which her business
demands of her. Her general health seems to be good, and she
spends the greater part of her time out of doors in the country.
Her eye disease had been considered as a retinitis by an oculist
under whose care she had been for a long time past, and the
prognosis was considered to be grave. There was no evidence of retinitis apparent at the time of my examination, and with +0.75 V. = 5/6 in R. and with +0.75 $\in$ 0.90° V. = 5/6 in L. A necessarily hasty examination at that time revealed an exophoria of 5 P.D. at infinity and a much greater one for the working distance. A red glass before one eye produced diplopia. The nature of the trouble was explained to her and she was encouraged to believe an operation might relieve her if the glasses (3° base in R. 2° base in L.) did not lead to a satisfactory improvement. She reported by letter, from time to time, that the prisms were beneficial but the relief was not perfect, and finally she came down, on May 9, 1891, to have the operation performed. The exophoria was then 10 P.D., as it was on the 12th, when the tenotomy was made. She was able at that time to fuse 1 to 1 1/2 P.D. base out. I made a tenotomy of the left exterminus, leaving a few fibres above and below, and the correction was well-nigh perfect. I then cut out a small triangular piece of the tendon between these attached fibres. I did this in the belief that the greater diminution of power would follow its reattachment on account of the diminished length. Immediately after the operation she fused 2 P.D. base in. On the 13th she fused 3 P.D. and a 3 P.D. base in superposed the images. On the 15th 2 P.D. superposed them, though there was a great deal of unsteadiness, as there was, indeed, until she left for home, on the 17th. On that day, however, she read several pages without fatigue. I have not seen her since, but the value of the operation in her case can best be expressed by an extract from a letter which she wrote me some four weeks after the operation: "You will remember that before going to you I could do absolutely nothing that required the use of my eyes without pain in both head and eyes, so great that I would be obliged to stop in a few minutes. When I first came home there would be some sense of strain, some little quivering sensation after reading or sewing for a while; this has gradually passed off, and I now read or sew or write as long as is convenient, as much as three or four hours at a time." Naturally such a result as this is not likely to lead me to an early abandonment of partial tenotomy in heterophoria.

OPH.—15
CASE V. Miss H. J. B., aged 20, a sister of case II, I saw for the first time on July 25, 1891. She is a strong young woman, both mentally and physically, but had been obliged to give up her studies at Wellesley College on two occasions for a year on account of persistent headache, confined almost exclusively to the occiput and back of the neck. For this she had tried all sorts of things, but with no avail. She would often be disturbed in the night by the pain, and it was commonly present on waking in the morning. As her vision was good she did not connect the pain with her eyes, but only came to have her eyes examined as a dernier ressort, and with a hope that something might be found, the correction of which would relieve her of her burden. She is emmetropic, the ophthalmometer showing only the normal corneal astigmatism, and vision = 5/5. She had, at the first examination, a manifest exophoria of 7 P.D. The next day it was 8 P.D. I gave her No. 3 prisms for each eye to wear during my vacation. I saw her next on the 6th of September, and the manifest exophoria was 10 P.D. The prisms had given some little relief, but she was more than willing to have a tenotomy performed, and this I did on September 9th, on the right eye, leaving some fibres above and below, but excising a piece of the middle portion. The exophoria was reduced immediately to less than 2 P.D., and the false image in the test would sometimes be directly above the true image. It varied but little from day to day and has finally settled down to 2 P.D. She fuses 5 P.D. base out, and in the test at the working distance there is no demonstrable insufficiency.

A word or two in regard to the technique of the operation. It has been doubted in some quarters whether a permanent weakening of the muscular power can follow a division of less than the whole of the fibres of the tendon. In some cases it would seem that after the final healing of a single operation the heterophoria was little, if at all, diminished. To what the failure is due is not always apparent. I have thought it possibly caused by a want of sufficient retraction of the divided fibres, and have sought to compensate for this by an excision of a portion of them. The results in the cases on which I have done
it have appeared to justify the procedure. Some, and among them Dr. H. D. Noyes, have favored a total separation of the fibres and a subsequent regulation by means of sutures. This would undoubtedly accomplish the purpose in view, but it seems to me that the risk of malposition of the tendon in the new insertion is very great in this plan. A slight rotation of the globe in adjusting the sutures might easily bring about such a change in relative position of the eyes as to render the later condition of the patient much worse than the first. This danger of an improper reattachment of the muscle is one to which I think we have not paid sufficient attention, and it has induced me to modify my operation for advancement by leaving a few lateral fibres attached, and advancing the tendon along the line of its central fibres. Dr. G. T. Stevens has considered this question in his last paper in Knapp's Archives, July, 1891.

The therapeutics of heterophoria by prisms has been treated of in so thorough a manner by so many competent authorities that its consideration here by me would unnecessarily increase the length of this paper, already over long. In many cases I have found them satisfactory, especially when the heterophoria was of low degree; but in a large number of instances their use did not bring the relief desired, and almost never when the heterophoria exceeded 4 P.D.

Among the exceptional cases is the following:

Case VI. Miss C. N. T., aged 18, has been suffering from violent headaches for a number of years, and they have been almost constant during the last twelve months. Her vision 5/5, no ametropia. She fuses 5 P.D. base down, 1 P.D. base up. Has a hyperphoria of 6 or 7 P.D. Diplopia caused by red glass before one eye. I advised a tenotomy, but it was refused; and I ordered 3 P.D. base up in R., 3 P.D. base down in L. With these she has been using her eyes in fair comfort, with only one breakdown from over-study, since January of this year. It is more than likely, however, that a tenotomy will yet have to be done.

Note.—January 20, 1892.

As some months have elapsed since these histories were recorded, the value of the statistics will be enhanced by a short statement of the present condition of the patients.
No. I has now no heterophoria, and is using her eyes for sewing and music all she desires to. Prolonged reading, however, gives rise to some inconvenience.

No. II has no complaint to make, and an examination failed to detect any heterophoria.

No. III came back from her short vacation still suffering from her head, and becoming impatient went to a physician, who "did not treat the eyes but the cause of the eye trouble in the general system." In the course of some weeks she began to improve and is reported to be quite comfortable. I have no hesitation whatever in referring all her relief to the tenotomies. She had been treated for 7 years previously for her general health without relief.

No. IV is a perfect and permanent cure.

No. V is now doing work as principal of a high school, which it would have been impossible for her to have done at any time during the last 5 years. She still has some headaches at night, but they are gradually diminishing. No heterophoria.

In No. VI I was finally obliged to do tenotomies. I first operated on the superior rectus of the left eye, reducing the hyperphoria to 4 P.D. Two weeks later I tenotomized the inferior rectus of the right eye, making complete correction. Three weeks later she wrote from her home in Virginia that she was cured of her headaches, read as much as she wanted to, and was happy.

DISCUSSION.

DR. R. J. MCKAY of Wilmington, Del.—Dr. Burnett's paper was a very interesting one to me. I have done a good many tenotomies, and the more I do, the better I like the results. I have done tenotomy on muscles the second time, and I concur with most of the views promulgated by Dr. Stevens. I am using many prisms in combination with sphero-cylinders.

DR. HENRY D. NOYES of New York.—I think I might have written that paper of Dr. Burnett's and put my own name to it. Most of the things which he describes are entirely in accord with my own experience and belief. The tests that have been spoken of are tests for distance and not for the near. Furthermore, the prisms have a value even if with limited range. Last year I was able to clearly show that they had no value in some cases and that tenotomies were preferable. But very often
prisms have a value, which I think will sooner or later be found by other observers than myself.

I have no objection to the modern nomenclature in general but I do object to one implication which they contain when we use the terms heterophoria, or esophoria, or exophoria—in that those terms are applied to the artificial condition caused by producing vertical diplopia. If we are to rely upon the normality or abnormality of the muscles according to whether, vertical diplopia being produced, the images stand to the right or left, I can assure the gentlemen present that they will fall into trouble. It is not a reliable test. It is only a test valuable up to a certain point, and, if you are to get a true idea of the right conditions, you must take the abduction and adduction test and also that for vertical diplopia; otherwise you will find great errors.

Dr. Burnett has operated on cases upon which I think no one would for a moment hesitate to operate. If I saw a case of esophoria or exophoria amounting to what he describes, I certainly believe that that would come within the domain of surgery, and you can always calculate upon good results. One thing more. The more I deal with these cases—and perhaps I have had more experience with them than most practitioners present—the more sure do I become that the essential element is a spasm of the muscles rather than a weakness of the muscles. And I can account for many features in these cases upon the assumption of spasm which I cannot account for on the ground of paresis. The conditions may combine and for that reason I am certain that the temporary benefit which results from a partial tenotomy is accounted for on this hypothesis. But I still hold that a total tenotomy performed with the utmost care is better than a partial tenotomy. The reason lies in these anatomical facts—anatomical facts have not yet found sufficient credence among ophthalmologists—that the extrinsic muscles of the eyes depend not only upon the strength of the muscles but also upon the ocular fascia. I would advise the members present to consult the work by Motais, a volume recently issued. There are chapters in it which show you how variable is this structure, and how greatly it influences the action of the muscles. For that reason a tenotomy will be found in certain cases to have no effect, in other cases it will have a good deal of effect, but you must always reckon with the extent and density of fibrous tissue; it depends also upon whether the sub-conjunctival tissue is disturbed. It is a question of technique.

These are some of the suggestions that I wish to offer, and I am glad Dr. Burnett is coming out upon the plane where I find myself.
DR. SAMUEL THEOBALD of Baltimore.—I would say a word with regard to Dr. Burnett's having performed only a partial tenotomy in a case in which he mentions the presence of eight degrees of esophoria. My own experience would have warranted me under similar circumstances in doing a complete tenotomy of the internal rectus, with the expectation that I would eventually have to do a free tenotomy of the internus of the other eye. I have in mind a case—I do not remember the exact degree of esophoria, but I think it was not more than eight, or possibly ten, degrees at twenty feet—in which I did just such a tenotomy of the internal rectus of both eyes, first upon one and later on the other, and there still is a marked degree of esophoria left. The performance of partial tenotomy for esophoria amounting to anything like eight degrees would, in my experience, be a very ineffectual measure.

I would ask Dr. Burnett if I understood him correctly when he said that he gave prisms for one eye base in and for the other base out?

DR. BURNETT.—No, sir.

DR. B. ALEXANDER RANDALL of Philadelphia.—As to the use of prisms I would like to say one word for the bridge that has, thus far, generally, carried me over; and I have to thank Dr. Risley for the pair of prisms he gave me several years ago, thereby very greatly increasing my ability to use my eyes and relieving my muscular asthenopia.

I would like to ask those who do much in correcting small degrees of heterophoria whether there is any real value in testing at the moment of operation the heterophoria, which remains after the snipping of the whole or a part of the tendon has been accomplished, because I have seen results so nugatory as to make me doubt very much whether such tests carried on at the moment of traumatism had any value. It seemed that if a man did his tenotomy in accordance with what he had previously found, he did as much division as he judged right with approximate accuracy; but that, if he undertook to correct that operation in accordance with what he then found, he was walking on a quicksand.

DR. GRADLE of Chicago.—The occurrence of heterophoria has been so much emphasized by some, and, on the other hand, denied by so many others, that I have thought it best to test for its existence by other means than the prism test. I have devised a method for the purpose which I demonstrated at the International Medical Congress last year, and which is comparable to the haploscopic method of physiologists. A partition held projecting from the nose divides the field of vision of one
eye from that of the other so that the position of lines in the separate field of vision of each eye may be compared at either a large distance or at a short range. The patient reads off directly any degrees which the eye deviates, if any, from its proper position. In this method no optic device like prisms is used, thus avoiding accidental sources of error. On examining fifty normal and pretty nearly two hundred asthenopic sets of eyes, I found that minor degrees of latent squint are exceedingly common, but without any morbid significance whatever, if they do not exceed a certain latitude. The numerical indications furnished by this method are very constant at different examinations, and generally a little less than the deviations found by the prism test. Moreover, the deviations by my method are expressed in angular degrees. Deviations in a vertical direction I found to be the same for distance or short range. Horizontal insufficiency, however, varies with the distance at which the object is held. I have learned that vertical heterophoria of less than one or possibly one and one-half degrees is a very frequent deviation which does not ordinarily lead to annoyance. Similarly an exophoria of less than two or three degrees for the distance I should consider harmless, while for short range it may amount to six or eight degrees without causing any inconvenience. Latent deviations of sufficient intensity to cause either asthenopic or nervous symptoms have come very rarely indeed under my observation. I cannot but regard them as an uncommon occurrence, although they do exist. But, if of sufficient intensity to cause morbid consequences, the squint is apt to appear manifest at times as well, and is extremely easy to recognize by means of my method as well as by any other mode of examination. Prisms I have not found satisfactory for the correction of heterophoria. A fact previously noticed by Dr. Stevens is that the correction by means of a prism, although complete to-day, may appear insufficient to-morrow; in other words, that under a correcting prism the deviation may continue to increase in extent.

Dr. Noyes’s view that spasm is the cause of these deviations would seem to be supported by this observation. My surgical experience in the correction has been limited to very few tenotomies, and those only complete and never partial.

DR. MYLES STANDISH of Boston.—This subject is one to which I have paid a great deal of attention for the last two years, since reading a paper before the Society with regard to this particular matter. I must say that my conclusions are absolutely those of Dr. Burnett’s, that there is a very considerable proportion of cases of ametropia who have insufficien-
cies of the muscles, that the greater quantity of those cases are cured by correcting the error of refraction, and that in the few that are left it is advisable to do a partial tenotomy, and that partial tenotomies do cure this condition which has been the disgrace to our refractive work heretofore. Two years ago I reported to this Society my first five cases. I have done quite a number since. Of those five cases all but one had been through the hands of many members of this Society, they had been for seven or eight years incapacitated for their work, had been in the hands of neurologists, had not been improved, and were operated upon by me by partial tenotomies, and perhaps were treated by suggestion as several members of this Society intimated at that time. Seeing the title of this paper on the bulletin before I came to Washington, I took the trouble to write those cases to find how they had been doing since, and I am happy to tell the members of the Society that the suggestions made to them had lasted ever since; that these people are well, all of them about their avocations, all marvels to their friends and all that sort of thing.

I think that there are a number of things to be considered with regard to these partial tenotomies. In the first place we do not want to do a partial tenotomy simply because we find insufficiency; in the next place we must remember that our insufficiency may be a spasm, as Dr. Noyes suggests, or it may not be, as Dr. Noyes did not suggest. Now, if you take many cases of insufficiency and examine them the first time they come into your office, you find that there is a large amount of insufficiency. If you undertake to correct their error of refraction by atropine and then examine them, you find a different sort of thing altogether. You may find very much less and the insufficiency may be in the opposite direction. Therefore, haste in this operation is very disastrous.

Now it seems to me that Dr. Noyes is perfectly correct in many of his statements that the diplopia test with prisms is not under normal conditions, but Dr. Berry of Edinburgh has suggested the glass rod test for insufficiency, which amounts to the same thing as the strong cylinder test suggested by Dr. Burnett. The glass rod makes no diplopia, horizontal or vertical, but shows insufficiency without any prism imposed. It is superior to anything we have had up to the present time. I think that the measurement of the amount of the power to overcome prisms is utterly fallacious. I said two years ago I was not inclined to place much dependence upon it. Now I say I place no dependence upon it whatever.

Dr. P. A. Callan of New York.—I want to make a few
Dr. J. E. Colburn of Chicago.—I have the honor of being an accredited visitor to the Society, and, with your permission, I would like to make a few suggestions with regard to this matter. In my opinion, the unsatisfactory results registered and reported during the first years that Dr. Stevens's work was on trial relative to the value of the graduated tenotomy as a legitimate operative procedure, were due to the failure of operators to recognize the existence of these small bands of attachments which have been mentioned by Dr. Noyes as binding the tendons to the ocular walls, and also extending anteriorly to the capsule of Tenon and the conjunctiva. These, unless cut, will prevent the full result of an operation for a complete tenotomy. To prevent a failure in such operations, I use a divulsor, thoroughly separating such bands. In the higher degrees of heterophoria I have modified the operation for graduated tenotomy, as follows: Begin as in the graduated tenotomy. After cutting through the tendon, pass the needles of a double-armed suture through the cut-end of the tendons back and out to the conjunctiva at the distance that the operator deems it advisable to displace the tendon, then terminate the section of the tendon as in complete tenotomy. The suture is then tied. The wound through the conjunctiva should be parallel to the border of the tendon. I also make this operation for manifest squint. The only modification is that of passing the needles further back through the conjunctiva. In following this method of procedure I have found it advisable to make advancement of the tendon in fewer cases, and there is also less danger of displacing the tendon, thereby producing hyperphoria as the result of such malposition.

Dr. J. A. Lippincott of Pittsburgh.—In testing for muscular insufficiency I think it unwise to rely exclusively upon any single method. I have seen cases in which repeated examinations with the rod test revealed no abnormality, but in which either exophoria or esophoria was actually present as demonstrated by the vertical diplopia test, and also by the consequent history. I am satisfied that the abduction tests have decided value especially if we employ them to estimate not only the resistance to double images—the staying power—but also the power of fusion of such images after diplopia has been induced.
This measurement can be made in the following way; In trying the power of the internal recti, for example, the power of the rotary prism is progressively increased in the usual manner until double images are evoked. Then, without removing the apparatus from the eye, the power of the prism is gradually lessened until fusion of the images takes place. A patient with decided exophoria may show a resistance to double images equal to, say, 24°, but it will be found as a rule in such a case that fusion does not take place until the prism is reduced to a strength of 8° or 10°, or even much less. This method of using the rotary prism has been found, in my experience, to considerably enhance its value.

Dr. R. A. Reeve of Toronto.—Dr. Lippincott has forestalled me in his statement of this procedure. I have done the same thing in very many cases, and I believe that it is a valuable modification in testing with prisms.

I am glad to see the evident tendency to conservatism in the discussion of the paper read by Dr. Burnett, and the conservatism which was indicated by Dr. Burnett’s paper. I am sure that we should take into consideration, before passing to operative work, the etiological factor in these cases of want of co-ordination. I am sure many of them are temporary, depending upon rheumatic conditions of some senile muscle, and under proper treatment they disappear—to recur again perhaps. Then again many of them grow out of want of similar conditions in the two eyeballs; that is to say, a case of ametropia with astigmatism of varying degrees in the two not corrected is very apt to set up a want of similar movement in both eyeballs, which to-day may be esophoric and to-morrow hyperphoric. I think it is necessary to break up this possibly temporary condition by treatment by paralysis of the accommodation and stopping all use of the eyes at a near point. Again and again my record book shows disappearance of slight degrees of esophoria and very much more frequently the disappearance of hyperphoria under the prolonged use of mydriatics. I am glad to see a tendency to conservatism, as I have said before, in the treatment of these cases of hyperphoria, so-called.

Dr. S. J. Jones of Chicago.—It seems probable that the conservatism to which Dr. Reeve has referred in terms of commendation may, with advantage, be carried to a still greater extent. If we will be less specialists—in the ordinary acceptance of that term—and more physicians, I believe that more of these cases that are characterized by asthenopia may be so benefited by judicious constitutional treatment as to obviate the seeming necessity for surgical procedures. I do not mean to
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say by this that I am under the impression that such constitutional treatment is wholly disregarded by ophthalmologists, but that sufficient importance is not attached to it, and that it is not carried far enough to ascertain whether recovery would not result without surgical interference in the so-called graduated tenotomies.

With such constitutional treatment, supplemented by use of the galvanic current, I think it will be found that prisms and tenotomies will be less frequently required, for these troubles are but one form of expression of lowered physical tone and of nervous irritability, which characterize modern civilization. It is in such patients that these cases are found. Like the subjects of hay fever, they are usually neurotic individuals — either debilitated, overworked people, or their progeny.

With their more delicate organism and with less natural or acquired resisting power, women are more frequent sufferers from sustained effort at accommodation of the eye, at the near point. Naturally these facts suggest the origin of much of this trouble, and, at the same time, indicate the direction in which effort should be made to obviate the conditions which lead to this result, and to aid in securing recovery from it where it has occurred.

I believe this to be correct in theory, and in practice I have found it to work satisfactorily.
VASELINE IN GONORRHOEAL CONJUNCTIVITIS.

BY F. M. WILSON, M.D.,
BRIDGEPORT, CONN.

The use of vaseline in gonorrhoeal conjunctivitis is nearly as old as vaseline itself, and before the days of vaseline, ointments of various kinds were used. Nevertheless, I have ventured to intrude upon the society's time with this old, old subject. From January to July, 1889, it was my misfortune to have in private practice four bad cases of gonorrhoeal conjunctivitis, in all of which necrosis of the cornea took place. On July 1, 1889, a fifth bad case presented itself. It was arranged that my associate, Dr. J. T. Byron, should take entire charge of this case, fifteen to eighteen hours out of each day.

The case was three days old when first seen. The clinical evidence of infection was clear. His brother, who took care of him while Dr. Byron slept, became infected. The lids were red and swollen so that they could be separated only with the fingers. The discharge was profuse, but somewhat thin, chemosis moderate, cornea clear. The treatment was mainly cleanliness and antisepsis. Iced cloths, atropine, and vaseline were also used. One application of arg. nit. (gr. xx ad 3 i) was made to everted upper lid.

The cases got steadily worse for a week. The swelling of lids, discharge, and chemosis, all justified the adjective tremendous. The cornea had become cloudy. The disgusted patient informed me that vaseline was the only thing we had used which seemed to him to have done any good.

All applications were stopped except atropine and vaseline. The conjunctival sac was filled with vaseline every fifteen to thirty minutes, and later boric acid was added to the vaseline. In twenty-four hours the eye was appreciably better, and under the same treatment slowly recovered, without ulceration of the cornea.

This brief clinical statement before N. Y. Academy of Medicine is all that I have said in public concerning this sub-
ject until to-day. But since July, 1889, I have personally watched forty-seven patients with purulent conjunctivitis, in which the filling of the conjunctival sac with vaseline as often or oftener than once an hour formed a part of the treatment. Some of these cases were at the Manhattan Eye and Ear Hospital, some at the Bridgeport Hospital, and some in private practice. I regret to add, that in a majority of the cases, a microscopic examination of the pus was not made.

Nineteen were babies, and in nearly all of them both eyes were affected; of these, two eyes were lost. Purulent conjunctivitis in babies gets well under a great variety of treatment. In forming my own opinion I have not considered these cases. The remaining twenty-eight were all males over sixteen years of age, with clinical evidence of gonorrhoeal infection in each case. There is, of course, no hard and fast lines between mild and severe cases; but I have ventured to classify twelve of the twenty-eight as mild cases, from the fact that there was at no time extreme swelling of lids, extreme chemosis, or cloudiness of the cornea. These all recovered with good sight.

It is my own belief that in these so-called "mild cases" (especially without microscopic examination), the diagnosis can often be questioned, so that I have excluded these cases also. Finally, we have left sixteen severe cases—cases welcome at no clinic, hospital, or office—cases disagreeable from every point of view, but cases which are a standing reproach to ophthalmic science. In each of them, there was extreme swelling of lids, extreme chemosis, profuse discharge, and in all except two ulceration of the cornea. In these two the cornea became cloudy, but I never detected any loss of substance. The average duration was between five and six weeks. In all the cases, cleanliness was considered the most important factor in the treatment. Iced cloths, atropine, saturated solution of boric acid and vaseline, were used in all the cases.

In many of the cases, vaseline was used so freely that it might be said that the eyes were washed with vaseline, and in all of the cases so much of the pus came out with the vaseline, that much less of the watery solutions was used.
Arg. nit. was used in nine of the cases, but not many times in any single case, and was always applied by the surgeon.

Bichloride and Panas fluid were used; each in eight cases. In ten of the sixteen cases, there was necrosis of cornea; in two, coarse vision, less than \( \frac{10}{200} \); in one, \( \frac{9}{8} \); in one, a marginal opacity which did not affect vision; and in two, no opacity of cornea at all.

My own impressions from the study of these cases are to a certain extent favorable to the use of vaseline. The results are better than I have ever had before. The principal change in treatment has been a more careful supervision of the cleansing, and the free use of vaseline. I think the former more important.

Three of the sixteen cases were treated with vaseline as the principal application. All of these eyes were lost.

Vaseline, if it acts at all, acts merely as a protective application, and from a theoretical standpoint it seems rational that a conjunctival membrane covered with vaseline is less exposed to irritating pus than one without it. It seems as though a coating of vaseline on a cornea ought to protect it. But protection alone is not enough. We must fight the gonococci, and here vaseline has no power. Hence, it must be kept well in mind that the use of vaseline is not a mode of treatment by itself. Iced cloths, nitrate of silver, bichloride, and Panas fluid are all used to lessen the formation of pus. Vaseline is used to lessen the irritation of the pus after it is formed. It can be used with any form of treatment. There are no contra-indications to its use.

I am very sure that it makes the patients more comfortable. The ten eyes lost were lost with less pain than any I have seen before. I do not think that, as a rule, we use enough vaseline. In each case the patient should lie flat on his back, and the lids so manipulated, that at each application, fresh vaseline reaches every part of the conjunctival sac.

If this is made a part of the treatment in all severe cases, I think occasionally an eye will be saved which would otherwise be lost.
DISCUSSION.

Dr. Samuel Theobald of Baltimore.—Was the vaseline melted before its insertion?

Dr. Wilson.—No sir. Put in cold, and it is afterwards melted by the warmth of the conjunctiva.

Dr. David Webster of New York.—Just one word as to vaseline and the method of applying it. Since the time two or three years ago, when the Doctor first proposed this method of treatment, and told us about the use of it, I have been applying vaseline in these cases. I find the best thing to do is to get the pure white vaseline, that which comes in the artists's tubes. You unscrew the cap and insert the mouth of the tube under the upper lid, not touching the cornea, and see that you squeeze the vaseline well up into the cul-de-sac. I would like to know if that is the way Dr. Wilson applies it.

Dr. Wilson.—I think the most important point is to get the vaseline after it melts clear to the bottom of the cul-de-sac. I use the same vaseline spoken of by Dr. Webster, and apply it between the lids, and rely upon manipulation afterwards to extend it in the required directions. I keep up this manipulation until I am sure that the vaseline has become quite liquid. I think that is a very important thing.

Dr. R. J. McKay of Wilmington, Del.—I have had recently three cases of purulent conjunctivitis, one gonorrheal, in which I started to treat with vaseline and boracic acid, one of the latter, and two of the white vaseline, and for awhile it seemed to do very well. One was a very bad case from Will's Eye Hospital, Philadelphia, in which there was loss of one eye, when the patient came to me both eyes were filled with purulent matter; this case was not one of gonorrhea. Yet, complete destruction was going on. I tried the peroxide of hydrogen, one part to two parts of a $\frac{1}{1000}$ of bichloride, after cleaning the eye by injecting it with the largest nozzle of the lachrymal syringe well up into the cul-de-sac, I found that it seemed to saponify and get rid of the pus very fast, and thus I got rid of a large amount of the “running” in a most surprising manner to me; and at the present time I hope to go back to find that old man a good deal better. I do not know whether I shall save the remaining eye or not, but I believe the peroxide of hydrogen injection was a most valuable thing. I first tried it upon the eye that had been lost, and found so large a diminution of the purulent discharge that I tried it upon the other eye, with equally satisfactory results.

Dr. Henry D. Noyes of New York.—I am glad to be able to corroborate the remarks that have been made as to the
advantages occurring from the use of vaseline. I think Dr. Wilson has stated the matter judiciously. It is not a curative agent, but it adds greatly to keeping the eye clean and protecting the cornea. I was delighted as well as surprised to find a case in which I had used it last winter—not a severe case—but one of the patient’s eyes had been lost—how thoroughly it protected the cornea, which kept glistening and bright. The vaseline has to be thrust up by a small spatula, and of course used in connection with the other treatment, the cold bichloride solution, the nitrate of silver, and all other methods that may be proper.

In regard to peroxide of hydrogen, I would say that it was tried at the Eye and Ear Infirmary several years ago, when it was going the rounds, and I have this much to say regarding it. It does have a wonderful power of controlling the secretion. It will remove the purulent discharge quicker than anything I have found; but it leaves oedema and the destructive processes going on as rapidly if you rely upon that alone, as if you did not use it. It is wonderful in its control over the secretions, but it does not help you out, and I do not think we cure any more cases by this than by ordinary treatment. Of course, we were not then using vaseline, but I shall never hercantly treat these cases without vaseline and shall keep the eye continually smeared with it.

Dr. Albert G. Heyl of Philadelphia.—I would like to add a note from my own experience, which, though recorded elsewhere, may be of use to the members of this society. I treat these cases with an ointment of lanoline and cubebs, which, applied to the skin surface of the upper lid, is absorbed and acts very happily in these adult cases. I use an ointment ten grains oleoresin-cubebs to the drachm—stronger than that makes a very painful application.

This disease is a very destructive one, and I thought that this hint might be of use to the members of the society in some of their cases.

Dr. F. B. Loring of Washington.—In connection with this case there is one thing that I have used with great success, and that is an application of menthol and vaseline for the breaking up of furuncular processes. I take two drachms of menthol and dissolve it in liquid vaseline, apply that, and the pain almost entirely disappears, and resolution takes place very rapidly. These little furuncles are apt to come in a series of three. I have never seen recurrences after this method of treatment. It produces some little inflammation of the conjunctiva if it gets in the eye, but it is very much slighter than
you would naturally think from the strength of the application. I have used it repeatedly on the eyelids, and in the meatus of the ear, and I have found it to be superior to anything else I have tried.

Dr. R. A. Reeve of Toronto.—I would suggest the dipping of a point that is slightly flattened in gelatol emulsion, and to apply that to the bottom of the cul-de-sac.

Dr. W. V. Marmion of Washington, D. C.—I have heard nothing of division of the outer canthus during this discussion of vaseline in the treatment of gonorrhoeal ophthalmia. It has always seemed to me, that pressure was more instrumental in destroying the cornea than purulent discharge; and I would dislike to trust a case of mine to nitrate of silver, vaseline, or other agent, without first getting rid of the pressure of the upper lid. The free division of the canthus renders it easier to make applications, besides permitting eversion of the lids, which is most important.

Dr. F. M. Wilson of Bridgeport, Conn.—Just one word in closing. I think that all instruments of any kind put inside of the lid to get at the bottom of the cul-de-sac are apt to do harm unless kept in the hands of the surgeon himself. If we trust these cases, we are obliged to leave them in the hands of hospital nurses and inexperienced persons in private houses; and in cases where the lids can be separated at all, if you get the vaseline between the lids, and will work them backward and forward long enough, it will melt and penetrate to the bottom of the cul-de-sac, and will not have to be pushed back. I think that the person who takes care of the eye and removes the pus is the most important factor in all cases. Vaseline has no power as an antiseptic. But if introduced without mechanical violence, it is a valuable auxiliary.
TRANSACTIONS

OF THE

AMERICAN

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Twenty-Eighth Annual Meeting,

New London, Conn., 1892.

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1892.
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<td>Boston, Mass.</td>
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<td>Dr. Leroy P. Walker</td>
<td>200 E. Franklin Street</td>
<td>New York, N. Y.</td>
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<td>Dr. David Webster</td>
<td>120 Charles Street</td>
<td>Richmond, Va.</td>
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<td>Dr. J. A. White</td>
<td>C., B. &amp; Q. R. R.,</td>
<td>Boston, Mass.</td>
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<td>Dr. Robert Willard</td>
<td>15 Arlington Street</td>
<td>Chicago, Ill.</td>
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<td>Dr. Chas. H. Williams</td>
<td>317 State Street</td>
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<td>Dr. Henry W. Williams</td>
<td>20 South Seventh Street</td>
<td>Bridgeport, Conn.</td>
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<td>Dr. F. M. Wilson</td>
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<td>Terra Haute, Ind.</td>
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<td>Dr. J. P. Worrell</td>
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Total: 113

HONORARY MEMBER.

Dr. C. Schweigger, Berlin, Prussia.

Whole Number, 114.
MINUTES OF THE PROCEEDINGS.

TWENTY-EIGHTH ANNUAL MEETING.

FORT GRISWOLD HOUSE,
NEW LONDON, July 20, 1892.

The Twenty-eighth Annual meeting of the Society was called to order by the Vice-President, Dr. Geo. C. Harlan, at 9.50 A.M. The President announced the following committees:

Committee on Bulletin—Drs. Edward Jackson and Swan M. Burnett.


Auditing Committee—Dr. H. G. Miller.

A number of names were proposed for membership and referred to the Committee on Membership.

The Committee on Bulletin reported and the following papers were read:

1. "Gunpowder Injuries of both Corneae," Dr. C. A. Oliver.
2. "Removal of Steel from Vitreous by Electro-Magnet," with preservation of nearly normal vision, Dr. S. Theobald.
3. "Foreign Body in Retina," Dr. F. Buller.

*Dr. Adams, H. W. Ring, Thomas, and Dixon were invited to attend the sessions and take part in the discussions.
These four papers were discussed by Drs. Kipp, Roosa, Bull, Pooley, Howe, St. John, Hansell, H. D. Noyes, Carmalt, Risley, Andrews, H. W. Ring, Reeve, Mittendorf, Taylor, Theobald, Kollock, Hunter, C. E. Rider, and Buller.

   "A Case of Hyaline Bodies in the Nerve-head," Dr. John Green (by title).
6. "Two Cases of Symmetrically-placed Opacities of Cornea in Mother and Son," Dr. C. A. Oliver.

Adjourned at 1 o'clock.

Session resumed at 2.30.

The names of several candidates for membership were read and referred to the Executive Committee. The Treasurer's report was read and referred to Auditing Committee. Reading of papers resumed.

   Discussed by Drs. Randall, Dennett, and Buller.
Twenty-Eighth Annual Meeting.


Adjourned to 8 P. M. (Executive Session.)

Executive Session called to order at 8 P. M.

The Auditing Committee reported Treasurer's report correct. The report was accepted and ordered placed on file.

The following-named gentlemen were recommended for admission by the Committee on Membership and were elected: Drs. J. A. White, W. B. Johnson, G. W. Hale, and R. L. Randolph.

The Committee on Membership reported the following nominations for officers for the ensuing year:

For President — Dr. HASKET DERBY.
For Vice-President — Dr. GEORGE C. HARLAN.
For Corresponding Secretary — Dr. J. S. PROUT.
For Recording Secretary — Dr. S. B. ST. JOHN.
For Publishing Committee — Drs. C. S. BULL, W. S. DENNETT, and the Secretary (ex officio).

Delegate to next Congress of American Physicians and Surgeons, Dr. JOHN GREEN. Alternate, Dr. D. B. ST. J. ROOSA.

The above officers were unanimously elected.

Voted, That the assessment for 1892–3 be five dollars.
Voted, That the next annual meeting be held at New London.
Voted, That the stenographer may furnish a copy of his notes to any medical journal desiring them that is approved by the Secretary.
Voted, As a standing rule, that any member have leave to publish a paper read at the meeting previous to the issuing of the transactions, provided that he preface it with the announcement that it was so read.

Voted, As a standing rule, that the sessions between the meetings of the Congress of American Physicians and Surgeons be held on the 3d Wednesday of July, and extended to the afternoon of the following day when the work of the society seems to require it.


Thursday, July 21.

Meeting called to order at 9.30. Reading of papers resumed.


21. "Corneal Nerves (demonstration of)," Dr. C. Koller.


23. Recurrent Bilateral Inflammation of Tenon's Capsule in connection with Mercurial Poisoning," Dr. C. J. Kipp.


25. "Subconjunctival application of Cocaine," Dr. C. Koller. Discussed by Dr. Lippincott.

Twenty-Eighth Annual Meeting.

27. "Gumma of Ciliary Body (specimen)," Dr. C. J. Kipp.


32. "Some Extractions of Cataract, without Iridectomy," Dr. O. D. Pomeroy (by title).

Adjourned.

S. B. Sr. JOHN,  
Secretary.
Present at the Twenty-eighth Annual Meeting:

Dr. F. W. Ring, Dr. D. DeBeck,
Dr. W. F. Mittendorf, Dr. L. Howe,
Dr. P. A. Callan, Dr. H. G. Miller,
Dr. C. J. Kipp, Dr. T. Y. Sutphen,
Dr. J. J. B. Vermyne, Dr. G. Hay,
Dr. E. W. Bartlett, Dr. J. A. Andrews,
Dr. C. A. Oliver, Dr. S. Theobald,
Dr. S. D. Risley, Dr. J. B. Emerson,
Dr. L. H. Taylor, Dr. F. M. Wilson,
Dr. W. H. Carmalt, Dr. G. E. de Schweinitz,
Dr. C. M. Culver, Dr. H. S. Hansell,
Dr. C. S. Bull, Dr. H. D. Noyes,
Dr. H. W. Williams, Dr. D. Coggin,
Dr. O. D. Pomeroy, Dr. William Thomson,
Dr. William Rankin, Jr., Dr. F. Buller,
Dr. C. W. Kollock, Dr. R. A. Reeve,
Dr. B. A. Randall, Dr. D. W. Hunter,
Dr. R. H. Derby, Dr. Wm. S. Dennett,
Dr. W. E. Lambert, Dr. H. Knapp,
Dr. Geo. C. Harlan, Dr. R. Murdock,
Dr. T. R. Pooley, Dr. E. E. Holt,
Dr. D. B. St. J. Roosa, Dr. John Green,
Dr. S. B. St. John, Dr. B. E. Fryer,
Dr. S. M. Burnett, Dr. O. F. Wadsworth,
Dr. Edward Jackson, Dr. W. T. Bacon,
Dr. F. P. Capron, Dr. C. F. McFarland,
Dr. J. O. Tansley, Dr. H. S. Oppenheimer.
THE EYE OF THE NEGRO.

BY CHARLES W. KOLLOCK, M.D.,

CHARLESTON, S. C.

In presenting this paper for your consideration, it is not contended that any new discoveries have been made, nor that there is anything very wonderful about the eye of the negro; but after a somewhat extensive experience among them, it seems that some points of interest heretofore not emphasized might be brought more into notice, and others which have already attracted very general attention may be further elaborated and discussed. The writer has read but little on the subject, for the reason that there was not much to read; and opinions and beliefs have been mainly formed from experience gained in his own practice. It is well known that the negro race in this country is fast losing its identity as far as purity of blood is concerned. The mulatto is seen on every hand, and when the lighter color is not as perceptible, the mixed blood may be readily detected by the thinner lips, higher nose, and less prognathous skull. In what is known as the low country of South Carolina and the Sea Islands which are adjacent to the coast are probably as pure-blooded negroes as can be found out of Africa. On many of these Sea Islands it is even now impossible for the stranger to understand their speech. From a study of these people and the mulatto this paper has been prepared, and, though you may smile when it is said that the eye of the negro is not as good as before the war, none the less it is true; and, furthermore, their eyes are deteriorating every day, and blindness is rampant among them. This statement may need some explanation. During the days of slavery the master was as jealous of the good health of his slaves as of his family; the best medical talent was engaged for their protection, and on many plantations the doctor was paid by the year to make regular visits. The slaves were well fed and clothed, and as far as disease was concerned, led lives but little exposed.
Syphilis and other wasting diseases were rare among them, and their eyes were strong because the vision was not taxed by difficult near work. They were employed, for the most part, in ordinary agricultural work on the plantations; hence there was little or no opportunity for using their eyes upon any work that was likely to cause strain. With the war came many troubles. Negroes were sent to assist in the construction of the fortifications along the coast; troops from both armies camped in their midst, and syphilis, having thus a comparatively new field, spread as the fire on the prairie, carrying everything before it; so that now it is scarcely an exaggeration to say that when you see a negro you see a case of syphilis. Then came freedom, and the negro was no longer under the surveillance of the careful master; the doctor was no longer employed to see him regularly; food and clothing were not provided; and he was truly a free man, but an outcast. Evil habits and careless living took possession of him, and consequently to-day we see a race that thirty years ago was strong and healthy now honeycombed with syphilis and its sequelæ. They are an eminently prolific race, and bring into life thousands of children who, if they survive, only live to increase the squalor and hasten the decadence of the race. A careful inquiry among the older physicians proves that before the war these people had little or no eye trouble beyond cataract; that ulceration of the cornea, which now numbers its victims by the thousand, was almost unknown; and it is certainly very unusual that nebulous cornææ, iritic adhesions, and eyes lost from ophthalmia neonatorum are seen among the older and ex-slaves, while among the younger — the post-bellum negro — such cases are not only of daily occurrence, but steadily increasing. It is a well-established fact that the race as seen now is peculiarly liable to corneal diseases, and it has been supposed that there was some racial peculiarity to account for this weakness. But it is not unlikely that this may be due to the diseased condition of the people, who, being now thoroughly syphilitized, possess all the dyscrasias that may follow such a condition, and present a most fertile soil for all ulcerating and wasting diseases. Not to syphilis alone can all this be laid, but in a measure to their habits and modes of liv-
ing. They have become careless of consequences, and in too numerous instances they never consult a physician at all, or not until perforation of the cornea and prolapse of the iris have occurred. Parents are utterly indifferent to the condition of their children, allowing them to go unattended for months, or, perhaps, using the filthiest of domestic remedies. Blindness, or greatly impaired vision, is seen on all sides from this cause, and the outlook is truly discouraging. Trachoma is comparatively rare among them, but so it is among the whites in Charleston, and, for that matter, throughout South Carolina. Up to the present time but few immigrants have come to this State, and it seems probable that the worst forms of granular lids have not been introduced. Equally as many cases have been treated in the negro as in the white, and the most severe occurred in the eye of the former. Iritis, as might be supposed, is of very common occurrence, and in point of frequency stands next to ulcerative keratitis. Very many eyes are lost from this inflammation. Cataract is quite as frequent in the negro as the white, for upon referring to the records, and taking indiscriminately seven hundred cases of whites and blacks, there were thirty-six cases of cataract among the seven hundred whites and thirty-seven among the same number of negroes. The thirty-seven negroes were, for the most part, old persons, who had been slaves, who either could not read, or had never used their eyes for trying work, and hence the cataracts cannot be said to have been caused in part by eye-strain, which is regarded by some observers as a potent cause among the whites. Glaucoma occurs about as often among the negroes as it does among the whites. Retinitis, optic neuritis, and choroiditis are not infrequently seen in the eye of the negro, but retinitis pigmentosa has not been observed in the pure-blooded black, though Dr. Ayres of Cincinnati has recently reported such a case as occurring in the eye of a mulatto. Albuminuric retinitis is not so commonly observed among them as in the white. Two cases of embolism of the retinal artery have been seen by the writer in mulattoes, but none in the true black. Xerosis conjunctivæ seems in the vicinity of Charleston to be a condition which is peculiar to
the negro, and especially the children, for during seven years' experience among several thousands of negroes and whites the writer has not seen a single case among the latter. Not until recently was a case treated in the adult negro, and this was a man of fifty-odd years of age. He came to the city hospital complaining of night blindness—a condition that almost invariably accompanies this form of xerosis. The altered condition of the conjunctiva was well marked, and at the outer and inner corneo-scleral junctions were the satin-like, triangular-shaped patches which are seen at times, and always indicate hemeralopia, but are not invariably present when that condition exists. The corneal ring of ulceration was absent in this case. The iris responded promptly when atropine was instilled, and an ophthalmoscopic examination showed a nerve somewhat whiter than normal and vessels not contracted, but over the whole was a slight haze which it is impossible to say existed in the vitreous, or about the papilla itself. No distinct opacities were visible in any of the media. The field of vision was very much contracted—a point which seems heretofore to have escaped notice—and the color sense was fairly good. The man was a laborer, who lived an exposed life, but was in fair physical condition. That this affection should be met exclusively in the negro (oftenest in those of purest blood), and especially in children, is extremely interesting. That it shows a low state of health is undoubted, and that in many cases tonic treatment and good food will bring about a cure, while in others nothing seems to improve, and they gradually waste and die, has been proved by a considerable experience. Several theories have been advanced as to the cause of the condition of the eyes, but none are satisfactory, because it has not been explained why it occurs only in negroes, and especially children, when whites living under almost exactly the same conditions are not affected. It would appear that the negro is less likely to have ocular or orbital tumors than the white. But two cases have come under the observation of the writer—one a sarcoma of the orbit in a mulatto woman, and the other a small pinkish growth situated behind the iris, and impinging upon the lens, which by pressure had become cataractous and
partly dislocated. This latter growth was slow and painless, and the man (a mulatto) declined an operation. Two cases of abscess of the orbit have been observed in negro children, both of which made prompt recoveries after incisions had been made. One of these was interesting on account of the tender age (two months) of the infant. No necrosed bone was detected, though it was denuded.

The refraction of the eye of the negro is a very interesting study. Descended from a primitive race, they remained in much the same condition in many respects even after they became slaves. Their masters were generally averse to their learning to read, and but a few were taught the trades. The maid-servants were frequently taught fine needle-work, but never gave much time to it. They were essentially plantation hands, and, therefore, had little cause for straining the vision. It is said that myopia is a sign of civilization; therefore it was not of common occurrence in the pure-blooded negro of ante-bellum days, and even now it is rare to find a pure black who is myopic, except in those cases where it may follow corneal diseases. The writer has never seen but three cases of myopia in the pure black, and one was of very high grade—7 D. Though this young man was very black, still his features indicated a doubt as to the purity of his blood. High grades of hyperopia seem equally rare among the true negroes, but one case of really high grade having been observed, and that, too, was 7 D; and this man also had white blood, though his skin was black. Comparatively few of the pure bloods have been examined for refractive errors, for the reason that few ever come with any complaint that calls for such examination. The vision has been almost invariably tested, and the opthalmoscopic examination made; and where no haziness of the media existed the vision was rarely below the normal. Among the mulattoes, however, a very different state of affairs exists, and numerous cases of defective vision caused by refractive errors are seen. More of the mulatto women than the men use glasses, for the former are principally dressmakers and school teachers, while the majority of the men are waiters and barbers. Sixty cases of negroes, blacks and mulattoes, have been recently examined,
and but with a few exceptions their eyes were under the influence of a mydriatic, atropine, or homatropine.

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Of the sixty cases examined, eleven were blacks and forty-nine were mulattos. Of the eleven blacks, six were men and five were women; four of the males were emmetropic, and two were myopic; none were hyperopic or astigmatic. Of the five black females, three were emmetropic, one hyperopic, and one had compound myopic astigmatism. Of the forty-nine mulattos, seven were males and forty-two were females. Of the seven males, four were hyperopic and three were myopic. Of the forty-two females, one was emmetropic, twenty-one were hyperopic, seven myopic, eleven had compound hyperopic astigmatism, and two had compound myopic astigmatism. From the above it is seen that more than four times as many mulattos were treated for refractive errors as blacks, and that out of the forty-nine mulattos but one was emmetropic, while of the eleven blacks seven were emmetropic. Among the mulattos more than five times as many females were treated as men, but among the blacks the males outnumbered the females by one. There can be little doubt but that the eyes of the mulatto are more defective than the blacks, and that eyes of those blacks who have never learned to read, and who have not been weakened by syphilis, are emmetropic, or very slightly hyperopic. In conclusion, it may be said that the eye of the negro is retrograding, which retrogression is due to three causes, viz., civilization, syphilis, and education. Civilization brought him in contact with the white, from whom he contracted syphilis, and also produced the mulatto; the latter not only inherits syphilis,
but a tendency to refractive errors; and education, resting upon an insecure foundation, is gradually bringing on myopia.

DISCUSSION.

DR. D. B. St. John Roosa, New York. — What is Dr. Kollock's standard of emmetropia? What is his method, and what does he consider as the normal refractive condition?

DR. Kollock. — The examinations were made under atropine or homatropine. The blacks who were emmetropic, for the most part, could not read. They were tested with cards with figures prepared for that purpose. They were all able to distinguish the figures on the proper line at fifteen feet.

DR. Roosa. — Did they decline to read the same line with a convex glass?

DR. Kollock. — I did not try that, as I considered that the mydriatic was sufficient.

DR. D. B. St. John Roosa, New York. — I do not think that an eye can be said to be emmetropic even if under a mydriatic vision is 20/XX, unless it has also been tested with a convex glass and under atropia. These investigations are so important and interesting that I hope the Doctor will continue them, and that in his examination of supposed emmetropic eyes he will employ atropia and the convex glass. The condition of refraction in the uncivilized races is to me an exceedingly interesting subject, as it is, perhaps, to all; and I think that as yet we have no data that are at all reliable — no such data as Dr. Kollock has begun to make. Catlin wrote about the Indians with a good deal of care, but he knew nothing about the critical examination of the eye, and his opinions as to Indians' vision are not worth much. He states in general that the Indians have good sight. The Indian is a survival of the fittest. The papoose that was not of much account was, like the Spartan infant, allowed to die; so that we cannot judge from that. With civilized races we try to keep everybody. As to myopia being the result of civilization, I am an agnostic on that point. Until the investigations are made in the way that they are now made, I do not conceive that we have data on which to form an opinion. The other day I heard a member of the society make the observation that progressive myopia was a disease of the uncultured races. That may be true, but that myopia does exist in considerable proportion in the patients with
illiterate ancestry I think that we all know. Unfortunately for science, a graduate of the Manhattan Eye and Ear Hospital died while in the midst of investigations of the eye of the Indian. He was an assistant surgeon in our army, and we have been unable to get at his papers.

Here is a large field in which we may finally settle some matters as to the effect of civilization upon the eye and the standard of refraction in the uncivilized, as well as our races.

DR. SAMUEL THEOBALD, Baltimore. — There is one point that surprises me, and that is that trachoma was found practically as often among the negroes as among the whites. I have had some cases of follicular conjunctivitis which were suspicious, but I certainly have never seen a well-marked case of trachoma in the negro race. Very nearly fifty per cent. of the patients that come to our eye clinics are negroes, but I do not believe that I have ever seen a true trachomatous conjunctivitis in either a mulatto or in a full-blooded negro.

DR. B. E. FRYER, Kansas City. — Some years ago I made, in an incomplete and unsatisfactory way, an examination of the refraction of several Indians belonging to the Nez Percé tribe. My examination included only a small number comparatively. I found no myopia. I saw no case of convergent strabismus. In the tribe were a number of cases of trachoma. I have never seen a case of myopia among the Indian tribes, and I have seen several tribes.

DR. THOMAS R. POOLEY, New York. — In regard to the first paper of Dr. Kollock, I would inquire whether in any of the other members of the family the eye presented the appearance shown in the picture passed around, which appears to represent a coloboma of the sheath of the optic nerve?

DR. KOLLOCK. — That was the only case that showed this coloboma of the optic nerve.

DR. SWAN M. BURNETT, Washington. — As some of you are aware, I have been much interested in the eye diseases of the negro, and have written several papers on the subject. In some of the main features I agree with the author, but in others I am at variance with him. With regard to myopia, I am sure the negro is becoming myopic. My experience is obtained in Washington among the same race of people that Dr. Theobald is likely to see. Whether the race on the outskirts of South Carolina is different or not I cannot say. I agree with Dr. Theobald that trachoma among the negro of Virginia and Maryland is rare. I have never seen trachoma or pannus in the negro. That the negro is becoming myopic with civiliz
ation is without question, and that corneal troubles are more frequent with him than other eye diseases is also true. I have seen pronounced cases of retinitis pigmentosa in negroes. I think that they are more subject to optic nerve atrophy than the whites.

My observations in Washington will bear out the statement of Dr. Kollock that the negro is particularly prone to syphilis, and that it is especially pronounced in them. My observation would indicate that syphilis is even milder in the eye of the negro than in the white. They succumb to treatment more readily, and I think that we do not see the same disastrous results as in the eye of the white. Certainly it is no worse. The experience of my surgical friends in Washington is that syphilis does not manifest itself so violently in the negro as in the white. It is accounted for on the ground that the negro is more liable to suppuration, and the poison when taken up and carried to the glands, makes the glands suppurate, and so the same amount of poison does not enter the system.

Another point which Dr. Kollock has not mentioned, and which is very remarkable, is that the negro is not cross-eyed. I do not know that I have seen more than half a dozen cases. If it occurs, it is usually the result of paralysis or injury. I have never operated for strabismus in the negro.

DR. PETER A. CALLAN, New York.—Since 1875 I have been interested in the refraction and the diseases of the eye of the negro. In 1875 I examined two schools aggregating five hundred scholars. I found in one school one per cent. of myopia, and in the other, the high school, three per cent. I could not atropinize the pupils' eyes, so I put atropine in my own eye, and with the ophthalmoscope and test glasses made the examination. Eighty per cent. were hypermetropic.

In later years I have been connected with a colored orphan asylum. Trachoma is so rare that we look upon the cases as follicular conjunctivitis.

As far as syphilis in the negro is concerned, my experience is limited. I have not seen its ravages very marked so far as inherited syphilis is concerned. In this asylum Hutchinson's teeth are not so common as in other orphan asylums. The notching of the teeth is misleading. We may have that without inherited syphilis. It is the peg tooth. Notching and pegging of the teeth is the sign of syphilis.

DR. DAVID DEBECK, Cincinnati.—The negro seems particularly prone to corneal ulceration, particularly of a phlyctenular character. They seem to be subject to it at a greater
age. In whites it is almost exclusively a disease of children. In the colored race it is seen more commonly in the adult.

In regard to iritic trouble, I must differ from what has been said. In the colored race I have found particularly grave forms of iritis and irido-cyclitis, and in these cases, where the pupil becomes filled with lymph and the iris bound down to the lens, iridectomy proves of little value, because the posterior chamber has been blocked with lymph.

Another point that I have particularly noticed is the tendency in negroes for iritis to take on a condylomatous or gummatous character. I have tabulated eighteen cases of gumma or condyloma of the iris and ciliary body, and nearly all occurred in the colored race.

I have found trachoma very rare in the colored race. We have in Kentucky a most horrible form of trachoma, which is spoken of as Kentucky trachoma. The negro population in the district from which these cases come is equal to the white, but we see no cases of trachoma in the negro.

As regards refraction, I have not tabulated my statistics, but my impression is that the majority of blacks are hypermetropes.

Dr. H. S. Oppenheimer, New York. — In a critical study of the race problem, it is difficult to accept any of these statistics as correct, from the fact, to which Dr. Kollock has called attention, that there are very few pure-blooded negroes. We have been in the habit of classing as a negro every one that has negro blood in his veins. The fact is that the mulatto is as much white as negro. When we come to the quadroon or octoroon, we have three-fourths or seven-eighths white blood. In the clinics all these cases are classed under the head of negro, when they should be classed as mainly white. This brings in an element of error.

Dr. O. F. Wadsworth, Boston. — We do not have very many members of the colored race in Boston, but among them I have certainly seen undoubted trachoma. Probably we have but few pure-blooded negroes, and it may be that the trachoma is due to the admixture of white blood; but I should not suppose that there was a great difference between the negro of Boston and that of Washington and Baltimore in respect of purity of race. The experience of Dr. Burnett and Dr. Theobald is certainly more extensive than my own in this matter, but for me there is no question that trachoma is occasionally found in the negro.

Dr. Samuel D. Risley, Philadelphia. — I rise to place myself on record a step in advance of the position assumed by
Dr. Roosa. I cannot say that I am an agnostic on the relations of the myopic eye to civilization. While it is unquestionably true that myopia is a concomitant of civilized life, it is not necessary to our civilization, and, therefore, not one of the results of which we can boast with pride. It is an evil consequence of our complex necessities, and falls alike upon the student in our colleges, the seamstress, and the artisan. We cannot retreat from the teaching of Donders. Myopia is a disease, and, like certain other forms of disease, is one of the results of civilization; but, like them, to be avoided by the application of a broader knowledge. When we reach the ideal management of the eye in civilized life we shall prevent it, except in the extremely rare cases of congenital near sight, by better hygienic conditions, and by the correction of congenital malformations of the globe by optical means before the strain of school life is undertaken, and thus avoid the pathological conditions upon which it depends.

DR. B. ALEXANDER RANDALL, Philadelphia. — Of course, Dr. Risley does not exclude the distended eye, where the myopia follows choroiditis, as from scarlet fever. In the investigations of Tscherning among recruits, he found a number of cases of high myopia, where the eyes had not been subjected to education, but in which there had been choroidal inflammation.

DR. EDWARD JACKSON, Philadelphia. — In Philadelphia we have quite a large negro population. At the Polyclinic a large number of the patients are negroes. Trachoma is rare, but I have seen several cases in mixed bloods, but one or two were pretty nearly pure-blood negroes; but these are exceptions, which go far towards proving the rule. Such cases have yielded to treatment very much better than the average cases in other races.

I think that the statement has been made that glaucoma is unusual among the negro; I do not mean by Dr. Kollock I agree with Dr. Kollock that it is as frequent among the negroes as among the whites. The only case of glaucoma following the use of a mydriatic that I have seen occurred in a negress between 30 and 40 years of age. The drug used was duboisine.

DR. CHARLES W. KOLLOCK, Charleston, S. C. — So far as trachoma is concerned, it would seem that the consensus of opinion is against me. It would appear as though I did not recognize trachoma. I have seen trachoma in the pure black, and have seen pannus a number of times. I speak entirely from the standpoint of South Carolina, where may be seen the
purest-blooded blacks out of Africa. Some of the islands are populated entirely by negroes.

I agree with Dr. Burnett as regards convergent squint, and had intended to mention that in my paper. I have never seen squint caused by a refraction error. The pure-blooded negro is rarely myopic or hyperopic to a degree that will cause squint, if it does so. I have seen squint from paresis and amblyopia. I do not believe that myopia occurs once in five hundred cases of pure-blooded negroes. I have only three cases recorded, and have examined many thousand negroes.

I did not mean to say that syphilis is more intense in the negro, or that it does not respond to treatment; but the negroes are so careless that they do not come for treatment until the iris is entirely bound to the lens from inflammation.

Dr. Russell Murdoch, Baltimore.—Six weeks ago I operated for internal squint in a full-blooded negro.

CONTRIBUTION TO THE SUBJECT OF INTRACRANIAL LESIONS, WITH DEFECTS IN THE VISUAL FIELDS. FIVE CASES WITH AUTOPSIES.

By Charles Stedman Bull,

New York City.

Case I. — Pachymeningitis of the Convexity of the Brain. Extensive Endarteritis at the Base. A lady, aged 50, presented herself in May, 1886, with the following history. Four years before she had suffered from a very severe mental shock, brought on by the sudden death by an accident of two members of her immediate family. Previous to this she had always enjoyed a fair state of health, though she had never been strong. The sudden shock brought on a series of convulsions, which ended in a profound condition of neurasthenia, lasting for more than five months, before she began to improve. The nervous prostration was accompanied by a profuse menstrual flow, coming on every three weeks and lasting for twelve days. Somewhat less than a year later, the vision of the left eye became affected, the first symptom being night-blindness. The ambly-
opia of the left eye progressed very rapidly, so that in less than
three months she was unable to read the largest type with any
glasses. With every recurrence of the uterine hemorrhage, the
vision in the left eye became suddenly much worse. About
one year later the right eye became affected in the same way,
but not with the same rapidity, the first symptom being again
night blindness. She then began to suffer from headaches of
a peculiar type, beginning at the vertex, with a feeling as if a
sharp instrument had been driven through the skull and had
then been turned round in the brain, and she would shriek
with the sudden pain. When I saw her in 1886, these
headaches had changed in character, and were of a dull per-
sistent nature, and located in the occipital region. At that
time the mobility of the eyes was unimpaired, the irides and
pupils were normal and the media were clear. An examination
of the eyes gave the following results: R. E. $\frac{3}{3}$ — unimproved.
Reads Jaeger 4 with sph. + D 1.50. Small positive central
scotoma for form and color. Color sense normal outside the
limits of the scotoma. Ophthalmoscopic examination negative.
L. E. $\frac{2}{3}$ eccentrically. Large irregular central scotoma.
Total color blindness. Neuro-retinitis in the stage of decline
but without hemorrhages or positive exudation, and without
papillitis. Optic nerve in the first stage of atrophy, with slight
discoloration of the disc, and with the arteries and veins re-
duced in calibre. At times there is entire obscuration of the
field of vision of the right eye, which always occurs slowly and
as slowly disappears.

The hearing was normal, the knee-jerks were normal, there
was no difficulty in walking, and the dynamometer gave a fairly
normal result.

The urine was repeatedly examined and showed nothing
abnormal save an excess of urates.

Under observation the vision in the left eye gradually sank
to distinguishing the movements of the hand eccentrically, and
the vision of the right eye diminished to $\frac{3}{3}$ —. The left optic
disc became atrophied with indistinct outline.

The patient was seen at intervals up to the spring of 1890,
when she died. The headaches gradually returned with increas-
ing severity and frequency, and she became at times mildly delirious. During the last year of her life she had repeated attacks of unilateral convulsions, mainly confined to the left side, but occurring occasionally on both sides, and she died in an unusually violent convolution, which seemed to be general in character.

This patient had never had syphilis nor any symptom of tuberculosis, though the latter disease existed in her family. The autopsy showed extensive pachymeningitis of the convexity of the left cerebral hemisphere, most marked over the anterior lobe, with some patches over the anterior lobe of the right hemisphere, and one large patch, the size of a fifty-cent piece, over the parietal lobe of the right side low down. All the arteries at the base of the brain were thickened and their lumen was narrowed, and this was particularly marked in the left anterior and middle cerebral arteries. The optic tracts and chiasm presented no macroscopic change. There was no exudation and no pachymeningitis at the base of the brain. There were no extravasations of blood anywhere within the brain. The relation of cause and effect in this chain of symptoms seems difficult to unravel. We have to deal first of all with a sudden and violent mental shock, followed immediately by convulsions and ending in profound nervous prostration. On recovering from this latter condition, menorrhagia set in and was followed by night blindness of one eye and gradually increasing loss of vision, with both subjective and objective central scotoma for form and color. Headaches then began, which were at first boring in character and located at the vertex, but subsequently became of a dull, persistent character and were centered in the occipital region. Then the second eye became affected in the same way, while the first eye developed a neuroretinitis, which ended in atrophy. Then followed unilateral convulsions, transient attacks of amblyopia in the second eye, and finally a general convolution ending in death. Reasoning from the results of the autopsy, the endarteritis was probably already well-developed at the time of the occurrence of the mental shock, which in its turn hastened the progress of the arterial degeneration and indirectly the development of the
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Pachymeningitis. The neuro-retinitis was probably to be attributed more to the long-continued loss of blood than to the pachymeningitis of the convexity, for though there was marked disease of the arteries at the base of the brain, there was no meningeal complication in this region. The occurrence of night-blindness as the first symptom of the loss of sight was unusual, as there was no extensive retinal lesion in the fundus, and none at all at the periphery. The scotoma in the field of the right eye gradually increased in diameter, until it reached 45° on the nasal side, 60° on the temporal side, 35° upwards, and 40° downwards. The convulsions were probably the result of the vascular degeneration and the meningeal inflammation.

Case II.—Sarcoma of Optic Chiasm and Nerves. A young man, aged 24, called on me in February, 1888, and gave the following history: For more than a year he had suffered from headaches, which were at first confined to the frontal region, and were slight and transient. They however increased somewhat rapidly in severity and intensity, and involved the whole head, so that at times he felt as if his skull would burst open. After about six months had passed, there appeared muscular twitchings in the upper extremities and face and occasional attacks of vertigo, but with no loss of consciousness. About the same time the vision of both eyes also became affected, as if a slight haze covered everything, and this gradually grew worse. Three weeks before I saw him, while he was in the third story of an unfinished building, superintending some work, a very violent headache came on accompanied by vertigo, and this was succeeded by a general convolution, in which he fell to the ground, a distance of thirty feet, striking on his back and side. He was unconscious for a few minutes and then came to his senses, and after awhile stood up and walked home, a distance of nearly half a mile, without assistance. This was his first convolution and there has been none since. The headaches are now constant, and are at times very severe and general. An examination revealed nothing abnormal in the appearance or motility of the eyes. The irides and pupils were normal and the media were clear. The optic discs were very hyperaemic and the veins pulsated, but the outlines of the papillae were clearly defined and the
retinae were intact. There was no diplopia. The field of vision showed a slight concentric narrowing in each eye. Vision was \( \frac{3}{10} \) improved in both eyes. The hearing was normal and there was no tinnitus. The patient had never had syphilis and appeared to be in a good state of health. The urine was carefully and repeatedly examined, but nothing abnormal was found except a high specific gravity. It seemed impossible to make a satisfactory diagnosis, though from the persistence and severity of the headaches, the muscular twitches and the convulsions, the presence of a tumor was suspected.

Before I saw the patient, he had had four partial tenotomies done for the relief of his headaches, three on the right eye and one on the left, but with no result. His refraction was hypermetropic D 0.75 in each eye under atropia. He had no astigmatism. Potassium iodide was administered and he was requested to report at the office once a week, which he did faithfully as long as he was physically able to do so. The vision slowly grew worse, and the concentric limitation of the field gradually grew more marked. The headaches continued in spite of the large doses of potassium iodide (60 grains three times a day), and after two months it was discontinued, as he began to show signs of iodism. About three months after I first saw him the optic discs lost their hyperaemic condition and began to grow pale. Strychnia was then administered but had to be discontinued as it made the headaches worse. Nearly five months to a day after I first saw him, he had a violent convolution lasting nearly six minutes and this was followed by a second convolution some hours later, after which he never had another. The optic discs rapidly assumed anathrophic condition, the field grew very narrow in both eyes, and vision sank to \( \frac{3}{10} \). He became very irritable, and this condition was followed very soon by a stupid, somnolent condition, which gradually deepened into profound coma, in which he lay for nearly ten days before death came, about eight months after his first visit to me.

The autopsy revealed nothing abnormal on the convexity of the brain, but the skull in the vicinity of the left fronto-parietal suture was very much thickened and the dura mater was very firmly adherent to it. On attempting to remove the brain from
the skull, a growth was apparently discovered at the base in the vicinity of the sella turcica. After much careful dissecting in this vicinity with the handle of the scalpel and the finger, and division of the spinal cord as low down as it could be reached, the brain was removed, and it then became possible to study the location of the tumor. It was as large as a Brazil nut, and involved very closely the optic chiasm, both optic nerves near the chiasm, and the hypophysis. It was moderately hard, with smooth surface and on being divided was seen to be of a grayish hue and of the same consistence throughout. The optic nerves just beyond the chiasm were flattened by the pressure of the tumor. The growth did not seem to extend backwards into the optic tracts, nor upwards into the hemispheres, but it had made a distinct depression in the under surface of both hemispheres. It was somewhat firmly adherent to the dura mater at the base. Macroscopically the tumor had apparently originated in the optic chiasm or in the connective tissue surrounding it. There were no other lesions discoverable anywhere in the brain, after a most minute examination had been made. The tumor was carefully hardened and then examined microscopically. It proved to be a small-cell sarcoma, tolerably vascular in character, with relatively large development of the connective tissue framework. It could not be accurately determined whether it had originated in the hypophysis or in the connective tissue of the chiasm. The nerve fibres were in many places entirely atrophied, and this was particularly noticeable in the origins of the optic nerves. There were no signs of meningitis or of neuritis, and the case seemed to be one of simple atrophy from compression. Papillitis or choked disc was conspicuous by its absence, which was an interesting point in the case. Another interesting fact was the very small number of convulsions which occurred in the course of the development of the tumor, and the long period, nearly six months, which elapsed between the first and second convulsions. The autopsy showed that no injury to the skull had been caused by the severe fall of thirty feet, and this corroborated the statement made by witnesses of the accident, that he had struck on his back and side and not on his head. No satisfactory attempt
was made to locate the tumor before death, and not the slightest suspicion was entertained that the growth involved the optic chiasm.

Case III. — Sarcoma of Left Occipital Lobe of Brain. In December, 1888, a gentleman, aged 37, presented himself at my office with the following history: For the past seven months he had noticed a loss of vision in the right half of each field. For about two months previous to the appearance of the hemianopsia there had been a constant severe headache in the left parietal and occipital regions, but this pain gradually grew less and finally subsided. Six weeks ago he suddenly lost completely the sense of smell. For the last three weeks he had noticed a failure of vision in the remaining portion of the field of the left eye.

Examination showed nothing abnormal in the external appearance of either eye, and the motility of both eyes was unimpaired.

R. E. $\frac{20}{100}$ : with sph. - D 1 $\subset$ cyl. - D 1.50 ax. 180° = $\frac{2}{6}$. L. E. $\frac{7}{8}$ : with cyl. - D 1.50 ax. 180° = $\frac{2}{4}$.

The media were clear. Both optic discs were pale, the discoloration being most marked on the temporal side and in the left eye. There was a slight reduction in the caliber of the retinal arteries. The perimeter showed a bilateral right hemianopsia, with some concentric limitation in the remaining half of the field in each eye.

At the time I first saw the patient there were no other symptoms than those already mentioned. He had contracted syphilis twelve years before, the chancre being followed by secondary symptoms, but he had been entirely free from constitutional symptoms for more than six years, until his headaches appeared, and these were confined to the left side. No explanation could be offered for the recent sudden onset of the anosmia, which lasted till the death of the patient. There was no interference with the sense of hearing and nothing abnormal in the appearance of the drumheads. A careful rhinoscopic examination showed nothing but a mild form of chronic naso-pharyngeal catarrh, with some hypertrophy of the adenoid tissue in the naso-pharynx.
In spite of the absence of other symptoms, the hemianopsia and the beginning atrophy of the optic discs pointed to the existence of a lesion in the brain on the left side, and probably somewhere in the vicinity of the cuneus. With the patient's syphilitic history, it was supposable that the intracranial lesion was a gumma, and on that supposition potassium iodide was given for a period of nearly three months, the dose being increased until he took six drachms daily, which he bore very well. But instead of there being any improvement, there was a progressive loss of vision, and a steady increase in the concentric limitation of the field of both eyes. About two months after he came under my observation, the headaches returned in the left occipital region, and finally became continuous, although they were never very severe. The potass. iodide was then stopped as useless, and the only treatment consisted in relieving the patient's symptoms as they arose. There was never any hemiplegia or hemianaesthesia, and no symptoms of motor disturbance till two weeks before his death, when he began to have muscular twitchings of the face and hands, which never amounted to an actual convulsion. He gradually became stupid, lost his memory, sank into coma, from which he at first could be aroused, but which soon became profound, and in this condition he died, not quite fourteen months after the first occurrence of his headaches.

The autopsy proved the diagnosis of an intracranial tumor and its location to have been correct, but the microscopic examination showed that it was not a gumma. The tumor, the size of a large walnut, or rather olive, was found in the cuneus on the left side. It lay close to the median line and near the base of the left occipital lobe, its long diameter pointing to the left side. It was of firm consistency, perfectly smooth, apparently inclosed in a capsule, and the surrounding brain tissue seemed to the naked eye normal. There was no other lesion found in the brain. Careful examination was made of the vicinity of the olfactory nerves, but there was no sign of any inflammatory or softening process. The olfactory lobes were atrophied and the olfactory nerves reduced to mere threads. Not a trace of meningeal or periosteal inflammation could be
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found anywhere within the skull. An examination of the
tumor showed it to be a typical example of the small-cell sar-
coma, with marked development of connective tissue trabeculae.
In this patient the pulse, respiration, and temperature were
closely watched, but there was nothing abnormal observed till
towards the end, when there was a slight evening rise in the
temperature.

Case IV. Thrombosis of the Middle Cerebral Artery—
Recent Clot in the Middle Cerebral Lobe—Sarcoma of the Right
Optic Tract. Early in October, 1889, an old lady, aged 72, was
brought to me by her son, who gave the following history:
About six months before, having gone to bed one night as well
as usual, she was awakened early the next morning by a severe
pain in her head, a sense of confusion, and apparently total
blindness in the left eye. She had previously been in fair
health, but close questioning brought out the fact that she had
suffered from headaches at intervals for more than a year, which
she had attributed to some abnormal condition of her stomach.
She was confined to her bed for several weeks, complaining all
the time of the blindness, confusion of ideas, and a numbness
of her right arm and leg. She slowly recovered from most of
these symptoms, but ever since she has been blind in the left
side in both eyes.

An examination showed the following condition: slight
ptosis of both upper lids, but no diplopia. Speech still thick
and slow, as if she were searching for a word. The tongue
pointed to the left side. Partial right facial paralysis. R. E.
\$\$: L. E. \$\$: unimproved. Irids and pupils normal. Slight
peripheral and nuclear opacities in both lenses. Some small
floating opacities in the vitreous of both eyes. Ophthalmos-
scopic examination negative. The perimeter showed typical
bilateral left hemianopsia, and in addition concentric limitation
of the halves of the visual fields still remaining. There was
organic valvular disease of the heart, with aortic obstructive
murmur, and hypertrophy of the organ. Several exhaustive
analyses of the urine gave negative results. In going carefully
over the history of the case, I thought the patient had probably
had a thrombosis and subsequent rupture of the middle cerebral
artery on the left side; and from the condition of the heart and blood vessels, I gave an unfavorable prognosis, and an opinion that she would probably die in another similar attack, at no distant day. She lived, however, for nearly twenty months, during which period the fields remained practically the same. The vision, however, slowly failed, which may have been partially due to the growth of the cataracts. The bilateral left hemianopsia, however, together with the headaches existing for nearly a year before the sudden attack of thrombosis, aroused a suspicion that there might be an intracranial tumor, and she was carefully watched until the end came, without discovering any additional symptom. There had never been any loss of motion in the extremities, and the ill-defined right hemianesthesia entirely disappeared. She was found one morning unconscious and breathing stertorously, and remained comatose until the end, three days later, April 29, 1891. The autopsy revealed a very interesting condition of things in the brain. In the left anterior lobe of the cerebrum was a patch of softening as large as a horse-chestnut, and in a branch of the middle cerebral artery running through it, there was an old plug, which obliterated its lumen entirely. There was a recent rupture of a large branch of the middle cerebral artery on the left side, and a large clot of blood in the middle lobe of the brain, close to the fissure of Sylvius. All the arteries of the brain were diseased, and some of them extensively so. At the base of the brain on the right side, overlying the right optic tract and pressing upon it, was a small tumor, about the size of a hazelnut, situated just in front of the corpus geniculatum laterale, but not pressing upon it. The tumor seemed to be developed in the right optic tract, which it partially surrounded and compressed. It was of firm consistency and smooth surface, and proved on examination to be a small-cell sarcoma originating in the optic tract itself. Here was the probable cause of the hemianopsia and the cause of the headaches which preceded the attack of cerebral thrombosis by nearly a year. It seems strange that there was no ophthalmoscopic sign of cerebral disease such as neuro-retinitis or papillitis when I first examined the patient, but these may have appeared later, when
the advancing opacity of the lenses prevented further ophthalmoscopic investigations.

Case V. Glio-Sarcoma of the Cerebellum. A gentleman, aged 35, called on me in February, 1890, and gave the following history: He had been perfectly well up to about three years before, when he began to suffer from frontal headaches. He had been an overworked man for many years, confined for long hours to office work, and devoting the evenings and late into the night to professional studies. His general health had always been exceptionally good, but the years of overwork and great strain had told upon his strength, and the headaches gradually increased in frequency and severity. At first confined to the frontal region, they subsequently extended all over the head. They were in the beginning intermittent and were occasionally accompanied by nausea and vertigo. For the past three months they had been constant and at times very severe, but the nausea had disappeared. Four years ago he had received a severe blow on the left side of the head and face from a falling wooden shutter, which knocked him down, but did not cause unconsciousness. There was bleeding from the left ear at the time, which however soon stopped, and was not followed by any purulent discharge. Tinnitus began in this ear at once, and the hearing was impaired and steadily grew worse. About three months before I saw him tinnitus began in the right ear and has continued ever since, but the hearing of this ear is not impaired. His condition did not vary much, with the exception that the headaches increased in frequency and severity, until about nine months before I saw him, when he suddenly began to see double. This diplopia was at first accompanied by transient attacks of blurred vision which later became permanent and progressive. By the advice of friends he consulted an oculist, who told him that he was astigmatic and had extreme hyperphoria and esophoria, and that he must have the muscles of his eyes cut and wear glasses. He became a victim of the partial tenotomy craze to the extent of five operations, without receiving any benefit in any way. The diplopia increased his vertigo and general unsteadiness of gait, so that he was afraid to go alone in the street, especially at night.
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About six weeks before I saw him, he first noticed a loss of sensation on the left side of his mouth, pharynx, tongue, and lips, and this still remains. When he presented himself to me, he had an anxious, worried expression, and a visible convergence of both eyes from paresis of both external recti muscles. The paralysis was not complete, as both eyes could be moved somewhat outwards towards the external canthi.

R. E. \( \frac{3}{4} \) unimproved.
L. E. \( \frac{2}{4} \) unimproved.

Irides normal in reaction and pupils of natural size. Media clear. The fundus of each eye showed marked papillitis with numerous hemorrhages, all the symptoms being more marked in the right eye.

Homonymous diplopia for all distances. Perimeter showed an irregular central scotoma for color, but not for form. The patellar tendon reflex was normal and the dynamometer showed no difference between the two sides of the body, and no apparent loss of power. The patient had never had syphilis. Repeated examinations of the urine showed albumen, but no casts. When he walked, his vertigo was at times so marked that he staggered and apparently rotated towards the right side, and this was not materially lessened by closing one eye. At other times he apparently had no vertigo, and he walked perfectly straight when one eye was excluded.

A diagnosis was made of intracranial tumor, probably located in the occipital lobe or in the cerebellum.

The patient was under observation at brief intervals from February, 1890, till his death in April, 1891. His vision slowly grew worse until he could only recognize the movements of the hand. There was no very marked change in the fundus, the papillitis remaining at about the same stage throughout, with the occurrence of fresh hemorrhages at intervals. The headaches became frightful in their intensity and could only be controlled by large doses of morphia. Towards the end he was at times wildly delirious, and about a week before his death he sank into a stupor which rapidly deepened into profound coma, from which he never rallied.

The autopsy showed that the diagnosis and location of the
tumor had been correctly made. A tumor, nearly globular in form, measuring about an inch in its longest diameter, was found in the right lobe of the cerebellum, close to the peduncle. It was of rather soft consistence and proved to be a gliosarcoma. It had compressed the convolutions of the cerebellum mainly upwards and outwards. The chief interest in this case lies in endeavoring to trace the cause of the development of the tumor. A patient, the slave of excessive mental work for years, receives a sudden, violent blow on the left side of the head, which causes bleeding from the left ear, tinnitus, and impaired hearing, which is permanent. Subsequently he begins to suffer from headaches, at first frontal, but subsequently becoming general and increasing in frequency and severity, until they become constant, and are accompanied by nausea. Then follows vertigo on walking, tinnitus in the opposite ear, and a sudden attack of homonymous diplopia, which is found to be due to paresis of both external recti muscles. Immediately succeeding the diplopia, comes defective vision in both eyes, which is found to be due to papillitis with hemorrhages. The vertigo increases, the patient apparently rotates towards the right side in walking, and the loss of vision and headaches become worse, till delirium sets in, ending in coma and death. The weak point in the relation of cause and effect between the blow on the side of the head and the development of the cerebellar tumor, is that the traumatism occurred on the left side over the parietal and frontal bones, while the tumor was found on the right side.

DISCUSSION.

DR. R. A. REEVE, Toronto.—If one may venture to criticize such an able paper, I would call attention to the fact that Dr. Bull states that in the third case the atrophy of the disc and the hemianopsia, point to lesion of the cuneus. Some authorities have pointed out that atrophy of the disc has occurred where the lesion has involved the optic tract. In regard to the fourth case I think the Doctor diagnosed hemorrhage from the middle cerebral artery in connection with hemianopsia which persisted. It has been pointed out that hemianopsia may occur in connection with hemorrhage, but then it is transient.

In the fifth case, the doctor states that the diagnosis of cerebellar tumor was proven correct by autopsy. In this con-
nection I may cite a case occurring in the last month where I was asked to see a patient in the hospital. He had no focalizing symptoms except pain in the region of the cerebellum increased by palpation. He had diplopia and optic neuritis but no other sign. A diagnosis of cerebellar tumor was made. There was vertigo, but no paralysis and no incoordination. The autopsy showed a large cyst of the cerebellum in the middle lobe running into the right lobe. The Doctor says that it is difficult to account for the tumor occurring on the side opposite that of the injury. I think that it is pretty well established that in injuries of the skull, we have lesions by contre-coup.

I should like to refer to a case which I saw a few months ago. A man in the prime of life had suffered with moderate cethalalgia for three or four weeks, and this had been intense for three days before I saw him. The history did not elicit anything bearing on the etiology. There was no history of syphilis or of injury. There was no paralysis of sensation or motion, and no vertigo with the exception of slight dizziness for three or four days. The pupils were normal and responded normally to light and accommodation. He had left-sided hemianopsia. He had papillitis incipient on the right side, and distinct on the left side. I found also hemiopic pupillary reaction and ventured the diagnosis of the basal lesion of some kind, probably tumor. The papillitis pointed to a basal trouble rather than to one in the occipital lobe and the hemiopic pupillary reaction pointed to interference in the tract between the corpora quadrigemina and the eye. The patient died three weeks later and at the autopsy a tumor was found in the occipital lobe. On inquiry I learned that the left optic tract was softened and that the growth pressed on the right side of the corpora quadrigemina.

Dr. C. S. Bull, New York.—In the second case I did not make any connection between the cerebral hemorrhage and the hemianopsia. It was the hemianopsia that led me to make a diagnosis of an additional tumor.

In the fifth case I made no mention whatever of a relation of cause and effect between the injury on the left side of the head and the location of the tumor on the right side. I do not consider that the blow had anything to do with the formation of the tumor.

Dr. Reeve has misunderstood me in regard to the second case. I did not base the diagnosis of tumor in the cuneus on the condition of optic atrophy. Leaving out of consideration the condition of the optic nerve, the examination of the field and the partial hemianopsia with the other symptoms led me to
locate the tumor in or about the cuneus. I was led to do that from a close perusal of Gowers and also of Seguin. I made no connection between the atrophy of the optic nerve and the lesion in the cuneus.

DR. H. KNAPP, New York. — One of the cases reported by Dr. Bull reminds me of a case which was seen also by Dr. Bull and Dr. Noyes. She had hemianopsia in one eye, followed later by color hemianopsia in the other. Both optic discs gradually became atrophic. She had convulsions and died. A tumor almost like that in Dr. Bull’s second case was found involving the chiasm. Shortly before death there was an escape of liquid through the pharynx, evidently from the sphenoidal cells. The tumor originated either in the chiasm or one nerve trunk and gradually extended to the other side. It had no connection with the brain, was circumscribed without having a capsule. It seems to me that this is a type of tumor of which there are similar cases on record. One is described in a recent Swedish work on cerebral tumors. The general history of these tumors does not seem to have been traced. They probably have a common cause. As to a special diagnosis they are exceedingly puzzling.

DR. HENRY D. NOYES, New York. — I might add a word in reference to the case mentioned by Dr. Knapp. The young lady was under observation but the diagnosis was not made until lethal symptoms appeared. There was a history of a severe blow upon the forehead from the head striking the edge of a door. From the peculiar character of the hemianopsia and the atrophic condition of the optic nerve, it was suspected that there had been fracture in the orbital region with possibly hemorrhage in the commissure passing from one side to the other. As shown by the autopsy, the sarcoma was almost entirely on one side, not like Dr. Bull’s case, in the middle line. The obscurity of the diagnosis was extreme. Everyone was surprised to find that the lesion was a tumor. There had never been any papillitis, nothing but atrophy.
THE PRIME ETIOLOGICAL FACTOR OF GLAUCOMA IS CONSTITUTIONAL.

BY S. O. RICHEY, M.D.,
WASHINGTON, D. C.

This paper will be occupied with the presentation of one idea, for a résumé of the literature of glaucoma would unprofitably take much space, as so much has been written offering diverse views of its different features, each with a show of reason.

Mr. Jonathan Hutchinson, in the Bowman lecture, 1884, discusses the relation between certain diseases of the eye and gout. The tissues of an individual long subject to the causes of gout may become modified in such a way that they are liable to suffer in a peculiar manner when exposed to the ordinary causes of disease; the nervous and vascular systems are specially so disposed.

Rheumatic gout may have such a relation to true gout; and he names “hot eyes,” calcareous bands of the cornea, arthritic iritis, relapsing cyclitis, glaucoma, and retinitis haemorrhagica, as having such connection, and asks if it can attack any of the structures of which the nervous system is composed.

In the London Lancet, January, 1873, he describes an iritis occurring at an early age, differing from other forms of arthritic iritis in being persistent and insidious, rather than paroxysmal. Without any attack of acute inflammation, adhesions quietly form between the iris and the capsule of the lens. . . . This affection usually begins in but one eye, and advances to almost entire loss of vision in it before attacking the other. It is insidious and for the most part painless, but is liable to exacerbations and periods of improvement. It is remarkably intractable, prone to attack both eyes, and to end in blindness. This is the position of an acute observer as to the influence of gout upon the eye.

The question as to the cause of increased tension is still open; whether due to too rapid infiltration, or to impeded excre-
tion, with a leaning to the latter. Opposed to Mr. Priestley Smith's theory that "glaucoma of every form is essentially a disease of retarded excretion" (Trans. Seventh International Medical Congress, Vol. III, p. 84), are the conclusions of Schnabel (Archiv. Ophthalmology, Vol. VII, p. 14), supported by clinical and pathological studies, that "glaucoma may be present without obliteration of the sinus of the anterior chamber; that the latter can exist without glaucoma; that glaucoma can be cured without obliteration of the sinus of the chamber being removed."

"It has been proved by Mr. Windsor of Manchester that acute glaucoma may occur where there is congenital absence of the iris."*

A doubt, which reaches almost a denial, is general as to whether excavation of the disc is due to pressure, or not. In Rydell's case (v. Graefe's Archiv., XVIII, 1–51, 1872), blind from acute glaucoma of three weeks' standing, without excavation, pain was relieved and tension reduced, but vision was not improved. Mauthner (Archiv. Ophthalm., Vol. VIII, p. 38) claims that "We find in the beginning of an excavation that pressure frequently is not increased. I have recently examined the left eye of a patient, in which there is beginning of a pressure excavation, of which there was not the slightest sign a year ago when I saw him for paresis of one of the muscles. The functional disturbance is extraordinary, and shows itself in transitory obscurations; central S. is less than in R. E., which has S = §, while with L. E. a few letters of 6 are not seen at 6 m. distance. Without glasses the patient, who is 45 years old, reads with R. E. J. 2, with the left eye J. 3; F. undisturbed. The well-known appearance of the vessels is very marked at the upper lateral edges of the papilla. T. is precisely the same in both eyes, and falls even below the physiological maximum. Would such a pressure produce such a picture?" (p. 39, vid. sup.) "Some morbid process which has attacked the intra-ocular end of the optic nerve causing a diminished resistance (softening) of the lamina cribrosa so that it yields

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to even normal pressure in the eye, but at the same time there is going on in the optic nerve an alteration which has the greatest resemblance to that in the lamina cribrosa, and leads to a softening, to a giving way of the supporting connective tissue."

Reading these comments on glaucoma with an open mind, our previous ideas are subverted, because we must conclude that increased tension is not necessary to excavation; that excavation is not always present even when increased tension has existed sufficiently long to produce it; that excavation may result from "some morbid process"* in the nerve, lessening its resistance; that increased tension is not dependent upon obstruction of the channels of excretion.

If the last proposition be true, that increased tension is not dependent upon obstruction of the channels of excretion, and Schnabel supports his conclusion by dissections of the organ, which he had observed while affected with the malady, then increased tension must be caused by too rapid infiltration or secretion. Schnabel argues further (Archiv. f. Augenheilkunde, Vol. XV, p. 311) that glaucoma is a disease of the bloodvessels of the eye, which develops either gradually, or at once, in the region supplied by the long anterior and posterior ciliary arteries, the central bloodvessels, and those of the scleral circle; that the disturbances of nutrition and function are the direct result of these disturbances of circulation, etc.

Mr. Priestley Smith's theory was obviously derived from the study of glaucoma of local origin, and yet, as Mr. Brailey of London (Trans. Seventh International Congress, Vol. III) says, "It fails to account for temporary glaucoma, for glaucoma without the characteristic application of the iris, for glaucoma in young persons, for one-sided glaucoma, for glaucoma in aphakic eyes, and especially for cases where a traumatic dislocation of

*Garrod on Rheumatoid Arthritis, Reynolds' System of Med., p. 553. "In the early stage, when swelling is prominent, a considerable increase of synovial fluid is found, and the joint exhibits the same appearance as in case of ordinary inflammation. The lining membrane is often red from over-injection of the bloodvessels. If the bone be sawn through, it is often found spongy, and contains a large amount of oily matter from the occurrence of a species of fatty degeneration."

N. B. All the italics in the paper are my own. — R.
the lens backward has been quickly followed by increased tension. It also does not explain the invariable inflammation and atrophy of the ciliary body and optic nerve."

To the theory of increased secretion, or more properly, too rapid infiltration, a *vis a tergo*, some derangement of the general system is a *sine qua non*. The uric acid diathesis, of which gout is a characteristic feature in many instances, offers the most satisfactory explanation; true gout, of acute inflammatory glaucoma; rheumatic gout, of chronic simple glaucoma.

In nearly all particulars acute gout of the toe, and acute inflammatory glaucoma are alike. Observe their points of resemblance:—

*Acute Inflammatory Glaucoma.*

1. An inherited tendency.
2. Most frequent after the period of presbyopia.
3. First attack is usually in cold weather.
4. Premonitory symptoms: impaired A., premature presbyopia, increasing H., halo, rising clouds or smoke, heaviness of brow, shooting pains in the eye, increased tension. These may be so slight as to cause no anxiety.
5. Sudden seizure, usually at night.
6. Constitutional disturbance; febrile excitement, with some nausea and vomiting.
7. Circumorbital pain; peri-epineal and subconjunctival injection; slight protrusion of the globe; sluggish, dilated iris; cornea dull and anaesthetic; humors greenish; ischaemia.
8. As the attack passes off there is great chemosis, lachrymation, and photophobia. The cornea becomes roughened.
9. The inflammatory attack passes off in a few days or weeks.
10. The disease is not arrested; there may be a recurrence of acute inflammatory attacks, chronic inflammatory exacerbations, or the disease may progress insidiously.

*Acute Gout of the Great Toe.*

1. The inherited tendency.
2. Most frequent after the beginning of senile changes.
3. First attack is usually in winter or spring.
4. Premonitory symptoms may be so slight as to pass unnoticed, or may be very distressing.
5. Attack is sudden, usually between two and five o'clock A.M. (Garrod.)
6. Chilliness, heat of skin, and perspiration, thirst, loss of appetite, a white tongue, constipation, and restlessness.
7. Toe is swollen, red, hot, and exquisitely tender. Veins proceeding from the toe are turgid with blood, and the joint is stiff. Great tension of the skin.
8. As the attack passes off, there is pitting of the skin (oedema), then desquamation.
9. Duration from four days to three weeks.
10. Gout recurs, and the frequency of the paroxysms increases.
Richey: Constitutional Glaucoma.

(11) No pus.
(12) Urine?

(13) No analysis of the aqueous humor, so far as I know.
(14) The disease may attack first one eye and then the other.
(15) Occurs most frequently in women.

(11) No pus.
(12) Urine scanty, high colored, and deposits a colored sediment on cooling.
(13) The synovia contains urate of soda.
(14) Gout not uncommonly seizes first one great toe, then the other.
(15) Is rare in women.

Thus, each may be inherited and have the premonitory symptoms; the attack is sudden and at night; in each it is characterized by great pain, engorgement, and tension, followed by oedema and exfoliation; duration, from a few days to a few weeks; recurrence of the affection, possibly to attack the other side, or to become chronic. No pus.

Such is the clinical picture.

That acute inflammatory glaucoma is more frequent in females, and gout of the great toe more frequent in males, may be due to the greater emotional tendencies of women, for, according to Schweigger, "mental emotion and loss of sleep favor acute glaucoma." While women derive a certain immunity from podagra by reason of menstruation (Hippocrates), yet at the approach of the climacteric, a period of greater or less tendency to vascular cerebral disturbance, arising from the intermittence of the derivative action of this function, acute inflammatory glaucoma is most frequent, and chronic simple glaucoma develops.

"The great toe contains a considerable amount of tissues peculiarly liable to become the seat of the deposition of urate of soda; as, for example, the cartilages and ligaments, tissues having either little vascularity, or nourished independently of bloodvessels: the great toe being very remote from the heart, the circulation is weaker there. . . . The reasons for the great toe on one side of the body being affected apply equally to the other; and hence the disease not uncommonly attacks first one, and then the other, within the short space of a few hours or days." *

Anatomically, the eye is in an extremity of the body, not

quite so far from the heart as the toe, and exposed to variations of temperature and to injury; the sclerotic, the cornea, and the tendons of the extrinsic muscles are of dense fibrous tissue, with little vascularity; the stroma of the choroid and iris is of reticular connective tissue, supporting pigment cells, bloodvessels, etc.; the zonule of Zinn is a fibrous perforated membrane; the lens capsule is a structureless membrane; the corpus vitrei depends upon bloodvessels not its own for nutrition, and contains mucin, and (Picard) .5 per cent. of urea, and about .75 per cent. of sodic chloride. The posterior surface of the iris and the ciliary body secrete the aqueous humor (synovia?), which contains a small amount of albumen, sugar, and sodic chloride = \( \frac{1}{3} \) of its volume. With increase of blood pressure and intra-ocular pressure, there is increase of albumen and the production of fibrine in the anterior chamber (Jesner and Grünhagen).

Taken with the fact that a local derangement, as a dislocated lens, does not seem sufficient to cause the whole train of symptoms, general as well as local, called glaucoma (though it may precipitate an attack which would probably have taken place at a later date), the clinical history of a seizure, and the anatomical peculiarities of the regions under consideration, present a picture of such mimicry are we find nowhere else repeated. The crucial test, the presence of urate of soda, I have had no opportunity to apply since recognizing the resemblance. To again read Garrod (Reynold’s System of Medicine, Vol. I, p. 533), “The impure state of the blood due to the presence of urate of soda is probably the cause of the disturbance which often precedes the gouty paroxysm; that is, of the so-called premonitory symptoms. Urate of soda in abnormal quantity in the blood is essential to an attack of gout, ... but does not constitute gout; ... that the amount of deposited urate of soda is not in proportion to the intensity of the inflammation, and that in some structures the infiltration may ensue and scarcely give rise to any inflammatory action. ... The inflammation of the gouty paroxysm tends to the destruction of the urate of soda in the blood of the inflamed part, and probably of the salt also which has been thrown out.” Soelberg
Wells (A Treatise on Dis. of the Eye, 3d Am. ed., 1880, p. 589) observes that "Males who are attacked by glaucoma frequently suffer from gout or disorders of the digestive organs"; . . . of primary glaucoma, "when once the one eye has become affected by glaucoma, there is great tendency in the disease to invade the other also." Mr. Hutchinson (Trans. Seventh International Congress, Vol. II, p. 92) asserts that "All forms of rheumatism and all forms of gout are included in the common term, arthritic. But we cannot limit the term to the joints, as its etymology might seem to require, but must allow it also to apply to certain affections of the muscles, fasciae, tendons, and other fibrous structures which have been proved to be dependent upon the same peculiar state of health. . . . Under the term, rheumatism, we include all arthritic maladies which are not proved to be gouty. . . . I must protest at once against any attempt to limit the term, gout, to cases in which attacks of acute inflammation of the great toe occur. . . . Rheumatism differs from gout in being of nerve origin, and due to reflex disturbance of nutrition; . . . it is, according to my hypothesis, the basic diathesis to which a small minority of cases of gout is superadded."

The younger Garrod says that rheumatic gout lacks the distinguishing feature of gout, urate of soda.

Many of the manifestations of rheumatic gout are associated with chronic glaucoma, viz., enlarged or distorted joints; a peculiar senile pallor or muddiness of the skin; periods of mental depression, and other symptoms attributable only to changes in the nervous system. I have found nowhere any reference to pathological alteration of nerve tissue in gout, although the existence, character, and specific cause of such changes, which are presumed to exist because of the nervous symptoms present in lithiasis, would have important bearing upon the subject in hand in explaining the structural changes in the lamina cribrosa and the intra-ocular end of the optic nerve; the condition of diminished resistance associated with excavation without increase of tension, in cases of chronic glaucoma. Dr. W. W. Johnston, Washington, D. C., published in the Medical News, March 12, 1892, some thoughts "On the
Nature and Treatment of Forms of Disease characterized by Indigestion, the Presence of Bile, Urates, and Uric Acid in the Urine, and by Nervous Symptoms,” which suggest a possible cause and explanation of the nerve changes in chronic glaucoma.

In his own words, “The question of the continuous production of toxic substances in the intestinal canal in health and the protection of the organism by physiologic elimination, as well as the auto-intoxication of the organism by the absorption of poisons in alterations of the gastro-intestinal tract was developed in detail by Professors Albertoni and Silvia at the meeting of the Fourth Italian Congress of Internal Medicine held in Rome. Professor Silvia enumerates the following substances as probable poisons: peptoxine, organic bases (ptomaines and leucomaines), indol, phenol, lactic acid, ammonia, sulphuretted hydrogen, acetone, etc. The direct proof of the fact that the nervous phenomena in such cases are due to the absorption of toxic matters from the intestine is not yet found, but the argument is a forcible one. The existence of indigestion is known by the symptoms; the presence of toxic matters in the intestines in health is proved. . . . The relationship of acute indigestion and nervous disturbances, and the association of fermentative dyspepsia with nervous symptoms and an excess of these products in the urine and feces, give sufficient grounds for adopting this theory as reasonable.”

Dr. Johnston has given much attention to the subject of digestion, and if a reference to his able paper will induce those who have the care of cases of chronic glaucoma to read it, it will probably divert attention from glaucoma, except as a local manifestation of a general malady (although he does not refer to glaucoma), broaden the view of the subject, and enable us to comprehend the changes in nerve tissue going on elsewhere in the system in rheumatic gout by that which takes place in the intra-ocular end of the optic nerve, exposed to observation, in chronic glaucoma.

Returning to the subject of intra-ocular tension, Mr. Priestley Smith (O. R., Vol. VI, p. 196) claims that “high tension depends more upon an excess of blood in the eye than upon an excess of intra-ocular fluid,” while Dr. Spender (Garrod, A
Richey: Constitutional Glaucoma.

Treatise on Rheumatism, Am. ed., 1890, p. 245) has observed as early symptoms of arthritis, an increase of pulse rate, with high arterial tension. Mr. Hutchinson (O. R., Vol. III, p. 385) concludes that "It is probable that there are many different forms of inflammation of the eye, or of parts of it, which are in connection with gout. They may be divided into two groups: (a) those which go with acquired humoral or renal gout; (b) those which depend upon inheritance of structures damaged, or at any rate specialized, by gout in predecessors. The difference between the two classes of the affection is very marked. In the one, attacks of a transitory nature are the rule, and the attacks are often acute and attended with much pain. In the second group, although a tendency to temporary recovery and recurrence is often observed, yet there is a great proneness to chronicity and persistence. The invasion is often insidious, but the disease is usually, in the end, destructive." If the difference between the forms of acute inflammatory and chronic simple glaucoma had been in the mind of Mr. Hutchinson, the description could not have been more effective than in the specification of the two groups named above. His address will bear reading with this thought.

Ordinarily, when both eyes are attacked by the same disease process, we rationally conclude that the cause is constitutional, and do not treat an expression of the dyscrasia, but rather its cause. In chronic glaucoma a local manifestation is treated (for sooner or later both eyes are attacked), and then we wait to see what "turns up," with about the results presented by Dr. Bull of New York, to the American Ophthalmological Society, 1889: the detailed history of ninety cases of chronic simple glaucoma subjected to the operation of iridectomy during a period of seventeen years.* The paper is most interesting and instructive, especially the summing up: — "One hundred and fifty-four operations were done on the one hundred and eighty eyes under consideration. Vision was temporarily improved by iridectomy in both eyes in two cases, and in one eye in six cases; but in all eight cases, after a few months, a steady


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loss of vision and narrowing of the field set in, and continued progressively as long as the patients were under observation.

"Vision remained unchanged, neither better nor worse, after the operation for a period of one year or longer in both eyes in eight cases, and in one eye in twenty cases.

"Vision grew slowly and steadily worse after the operation in both eyes in forty cases, and in one eye in twenty-nine cases.

"Vision grew rapidly worse after the operation in both eyes in two cases, and in one eye in eight cases."

He concludes that "the health and age of the patient exert a decided influence upon the operation, and any marked evidence of senility is distinctly unfavorable to the operation."

Dr. Gruening * of New York: — "In chronic glaucoma with degenerative changes, neither iridectomy nor anterior sclerotomy will give the patient the desired relief; posterior sclerotomy may do it at times."

Mr. Power † of London: — "In cases of chronic glaucoma no operation is of much service." This terse statement, it seems to me, covers the whole ground. The good results of operation in chronic glaucoma are in comparatively small ratio, and are therefore accidental, and not scientific; for it often precipitates disaster by additional irritation. So long as the two chief clinical characteristics of glaucoma, increase of tension and excavation of the disc, are not satisfactorily explained, the management of such cases must be empirical. The author of iridectomy for glaucoma acknowledged it to be empirical, and only experience has taught us in what cases it is of most value, those of acute inflammatory glaucoma; for here it saves the eye until another time; it does not cure the disease. Dr. Bull's statistics do not teach us to do iridectomy in chronic glaucoma, cases of which form of the disease are in excess of any other, unless upon the plea of dernier resort; because we know of nothing better. They indicate that the majority of eyes are worse after iridectomy; in a few the status quo ante is maintained; in a still smaller percentage, there is some improvement. With this diversity of result, who, save in the occasional

case of immediate gain or loss to the eye, can say what influence is attributable to operation? Might the case not have done just as well without interference? Is the surgeon justified in a feeling of certainty that he has done a service? If all such cases followed approximately a given course, he would have a guide; but they vary so much. If it progresses slowly after an operation, it might have done so without it. If it remains stationary for a time, can that be attributed to the operation? If the patient goes rapidly blind, has he a right to reproach the surgeon? In operation is possibility, not probability. In simple glaucoma it has a questionable rationale, and experience teaches that, if done at all, it must be done with caution. It is double-edged and may cut either way. As such cases pursue so chronic a course, it would seem wise to discover the constitutional cause and to begin with that, instead of with the last expression of the disease, leaving the cause in action.

Rational management of the disease involves a study of the general condition and a correction of all the habits of the individual. This is difficult, but our function is advisory, and each sufferer must "work out his own salvation" with our guidance.

It is a prime necessity that a quiet, healthy, outdoor life should be led, apart from occupations of much nervous excitement, causing loss of reserve force; that a condition of self-possession should be maintained; that the dietary should be regulated as to time, quantity, and quality, for over feeding and bad feeding is a conspicuous vice of the age. In adult life, the effort should be to preserve the balance between waste and repair, and to see that both processes are normal. This is a duty which the family physician may share.

By controlling the quantity of food productive of uric acid, and by reducing the whole quantity to the possibility of easy digestion and assimilation, thus lessening the amount of toxic substances in the intestinal tract; by the regular entire excretion of what is excessive by way of the kidneys and bowels, harm in this way is obviated. Tonic aperients (not irritants and excitants), which encourage natural action of the intestines, serve a good purpose when used with judgment. Hunyadi water, taken at bedtime, lies in the tract all night, does not
purge, but by its solvent power prevents accretions. Nothing should be done to lessen digestive power, and a quantity of food should be taken small enough to insure its digestion and proper disposal. Anything (as coffee) which retards digestion must be rejected for obvious reasons.

Salicylate of phenol, it is claimed, has been found in the joints of gouty persons taking it; therefore its purpose is apparent. Lithia waters secure the excretion of some uric acid; piperazine, a new synthetical compound, is commended as having twelve times the solvent power of lithia upon uric acid. Strychnia acts by stimulating the functional action of all the organs of the physical economy.

Galvanism, if properly and steadily used, is profitable. After ten minutes' use of two milliamperes, direct current to the sympathetic, in an ordinary case, ocular tension is lessened, the pupils seem more active, and the patient becomes calm, often almost falls to sleep. By the experiments of Onimus and Legros (Traité d’ Electricité Medicale, Paris, 1872), it has been shown that if the direct current (positive pole at the nerve center) be employed the circulation is augmented; within a few moments the arteries have increased in bulk and the whole network of capillaries is seen in great commotion; faradization contracted the bloodvessels, but after a time contraction ceased, and the arteries became larger than before the application. The continuous current, on the other hand, renders circulation more active and re-establishes it when it has been arrested. The induced current causes spasmodic contraction of the unstriped muscle, while the continuous current produces a vermicular contraction (Bartholow). The latter thus favors the natural movement of the vessel, and while directly increasing the amount of blood passing, by reaction the amount of blood in the part supplied by the vessel is reduced to the normal. The object to be gained, stimulation of the cervical ganglia, the trophic centers of the region of the trigeminus, is accomplished as well with the cathode held in the hand, as in contact with the affected region; yet, when placed on the temple or above the eye, it has some additional mental effect, which is not undesirable.
HOLT: Orbital Cellulitis.

The writer has endeavored to cover the ground as concisely as possible; to offer the salient points of a view of the subject he has entertained for several years, especially that in regard to too much food.

He thinks that, in the hypothesis discussed, we find the true etiological factor of that most intractable of diseases, chronic glaucoma; that acute inflammatory glaucoma is a paroxysmal expression of the same affection; that local irritation, or trauma, excites an attack of glaucoma only in the presence of the dyscrasia; that operation saves the eye during the paroxysm; that operation serves little purpose in chronic glaucoma, even when it does not, by irritation, hasten the disease process or precipitate a paroxysm; that chronic glaucoma is a neurosis, a progressive atrophy, with the feature of inflammation with deficient power, varied by periods of apparent rest; that correcting and controlling individual habits, especially in the character and amount of food taken, will do more to preserve vision than operation; and that there may be a possibility of aborting chronic glaucoma, if the tendency to it be recognized at an early stage.

ORBITAL CELLULITIS, THE INFLAMMATION SPREADING TO THE TEMPORAL REGION, THENCE TO THE NECK, OBSTRUCTING DEGLUTITION, EXTENDING TO THE BRAIN, AND PRODUCING DEATH. WITH REMARKS UPON THE SAME AND BRIEF REPORTS OF FIVE OTHER CASES.

BY E. E. HOLT, M.D.,
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On February 2d I was called to see Carroll Jennings, aged 18 years. He was a deaf-mute, did chores for Mrs. Glover, and attended the school for the deaf. I found the upper eyelid swollen and oedematous, with the ocular and palpebral conjunctivæ injected. He told the folks he thought he had something into the eye. Careful inspection of the cornea and parts exposed by separating the lids as much as possible failed
to reveal any foreign body. To make sure there was no foreign body under the lid, I pressed out the oedema a little, so the lid could be raised better—it was so thick from swelling that it could not be everted—and passed a shell cataract-spoon along the whole length of the retro-tarsal fold. The spoon brought out some particles of a foreign body. This was repeated until nothing came out. A drop of a two-per cent. solution of hydrobromate of homatropine was instilled, and also a drop of castor oil. I ordered an antiseptic collyrium to be applied freely over the eye on absorbent cotton. Dr. Pendleton had been called in, and ordered a saline cathartic and a fever mixture of nitre, acetate of ammonium, camphor water, and syrup of tolu. I was out of town twenty hours, and during my absence Dr. Pendleton said that the patient was completely unconscious at an early hour in the evening, and those in attendance said he remained so till early the following morning—a period of about ten hours. The pulse was high, 120 per minute, and the temperature 105°.

At the consultation on the afternoon of the 3d the temperature was 104°, and the pulse was full and hard at 100 per minute. One minim tinct. aconite, to be taken every hour, was prescribed. Ten grains of calomel were ordered, and two leeches were applied to the temple. At this time the inflammation of the oculo-orbital tissues had continued, and the swelling of the lid increased, and began to invade the tissues outside the orbit on the temporal side. The pupil of the eye responded to light and accommodation, and there did not appear to be any paralysis about the eye or body. On the 3d day of the attack his temperature was 104°, and his pulse was softer, at 110 per minute. The calomel had acted freely at 4 o'clock in the morning. He was removed, without accident or apparent fatigue, to the Maine Eye and Ear Infirmary, and appeared fairly comfortable in the evening. The temperature and pulse, however, remained about the same, and the inflammation and swelling about the eye had not abated, but had rather increased. On the 4th day of the attack the temperature in the morning was 103½°; pulse about 100 per minute. At noon the swelling about the orbit and forehead was such that it was decided
to make an exploration to see if pus was not present deep in the orbit. The oculo-orbital tissue had become intensely swollen, the eye was pushed forward and outward, and the chemotic conjunctiva projected from the palpebral aperture. Accordingly, a needle was passed into the orbit above the eye, at the upper and outer quadrant, down to near its apex. No pus was found. A Graefe cataract knife was then passed in, and a free incision was made, but no pus was reached. It was thought that the origin of the inflammation might have been in the frontal sinus. Accordingly an incision was made above the brow, and the frontal sinus was entered at the upper and inner angle of the orbit. No pus was found there. This wound was united with interrupted sutures, and a flaxseed poultice applied over both wounds. In the evening the temperature was $105^\circ$ and pulse 100, softer, so that aconite was discontinued, and he was given a sponge bath. He appeared better, and expressed himself so, notwithstanding the high temperature. On the 5th day of the attack the temperature was $103\frac{1}{2}^\circ$ in the morning and $105\frac{1}{2}^\circ$ at night. The pulse was about 100. The inflammation had extended further over the temporal region, and there was considerable swelling of the parts. He was ordered one grain of quinine every four hours, and one drachm of whisky every two hours; liquid diet, mostly milk. On the 6th day of his sickness the temperature was $103\frac{1}{2}^\circ$ in the morning and $104\frac{3}{4}^\circ$ in the evening. The pulse was from 100 to 110. The inflammation had extended down the left side of the head, and involved the neck, which had become swollen and hard, so that it was with great difficulty that he could swallow.

For the past twenty-four hours he had complained a good deal of his throat, had coughed, raised some stringy mucus, and said his throat was sore. Dr. Gordon was added to the consultation, and agreed with Dr. Pendleton and myself as to all the essential features of the case and the treatment. Twenty drops of the tinct. chloride iron were ordered to be given every four hours, in addition to the quinine and whisky, while the fever mixture was to be omitted. On the 7th day the temperature was $103\frac{1}{2}^\circ$ in the morning, and the same in the even-
The pulse was recorded 100 per minute in the morning and 90 in the evening. The swelling in the left orbit had subsided, the conjunctiva had retracted, the lids had relaxed, and there was some movement of the eye, and the pupil responded to light, as it had all along. There had, however, been but little or no discharge from the opening made into the apex of the orbit for drainage. The inflammation had extended, and there was swelling of the right cheek. The patient had a fairly comfortable day. On the 8th day the temperature was 103° in the morning, 100° at noon, and 103° in the evening. The tissues of the neck had become tense, and he was unable to swallow. Enemas were used, and most of them were retained. The tissues about the eye had assumed quite a normal appearance. There were two soft places above the temporal region on the forehead, indicative of the formation of pus. On the 10th day the temperature was 98°, and the pulse 80 per minute, dicrotic, and not regular. His general appearance was not as good as on the preceding day. On the 11th day the temperature was 103½° in the morning and 101½° at noon. The pulse was irregular, about 100 per minute. An incision was made into the two places on the forehead above the temporal region, and pus and broken-down tissue were pressed out. Dr. Pendleton ordered a poultice to be applied over the points of incision. Stimulants were ordered to be given more freely. Early in the afternoon the wounds began to bleed freely; and, upon being informed of the fact, Dr. Pendleton ordered the poultice to be discontinued, and had a compress applied; but, upon being informed later that the wounds were still bleeding, he immediately saw the case, and united the wounds with deep sutures and applied a compress. He also gave a hypodermic injection of morphia. The pulse at this time was estimated at about 200 per minute, and the respiration from 48 to 60. In the evening Dr. Sullivan and Mr. Clough could find no radial pulse, but estimated that the heart-beats were about 200 per minute and the respiration 48. Stimulants were given per rectum, as much as he could retain. He gradually sank, and died on the morning of the 13th at 2.30 o'clock, nearly twelve days from the beginning of the attack.
In reviewing this case there are several interesting points to be considered. Although the patient was deaf and dumb, and therefore could not express his feelings very well, yet there was no doubt about the diagnosis of inflammation of the cellular tissue of the orbit. He was of a kind, willing disposition, inclined to extenuate his sufferings, so that the amount of pain he suffered was difficult to ascertain, and on this account the diagnosis of the involvement of the periosteum was not so clear. Having made a positive diagnosis of inflammation of the tissues of the orbit, the next point to be considered was what was the cause. General inflammation of the tissues of the orbit in a previously healthy boy of eighteen years of age is not of common occurrence. It rarely exists as an independent affection, but generally can be traced to inflammation of tissues adjacent to this cavity.

The numerous openings, through which pass important vessels and nerves, place the orbit in direct communication with other parts, and readily show how inflammation may extend from them to it, and vice versa. Its close proximity to these cavities, which are not infrequently the seat of inflammation that may extend and break away the delicate natural boundaries between them and it, explain why orbital cellulitis is frequently dependent upon inflammation in these cavities. In the diagnosis of this affection these anatomical relations and the inflammation that may arise in them must be borne in mind if we are to make a correct diagnosis and adopt proper treatment. Careful examination convinced me that there was no inflammation in the antrum or the nose, and the opening made into the frontal sinus demonstrated that the inflammation did not have its origin there. We are left, then, to determine whether it had its origin in one of the fossae connected with the orbit or the cranial cavity.

I think the history and preponderance of symptoms point to its origin either in the orbit or cranium, and our diagnosis narrows down to these two places. He had got his feet damp or wet, and had taken cold; had lost a schoolmate, and had wept a good deal; and also had got some foreign substance into his eye. He also had a quilt tied up with rope suspended
over his head, attached to one end of a lever, which was connected at the other end with an alarm clock. When the alarm went off in the morning it disengaged one end of the lever, and allowed the quilt tied up in the rope to fall and strike him on the face. As it fell four or five feet, it would produce quite an injury to a delicate organ like the eye if the rope should strike across it. As bearing upon the origin of the inflammation in the cranial cavity, he fell downstairs about two weeks previous to this time, striking upon the right side of his head. The fall produced so little temporary or permanent effect that it was not mentioned to me until the affection had assumed a more serious aspect, and I was searching for a cause.

There might have been a latent affection of the ears connected with the temporal bone, which was set into activity by the fall; but in the absence of any condition externally pointing to it, or of any symptom that would indicate that it existed, it must be excluded. The fall, too, was two weeks previous to his sickness, during which time he had enjoyed his usual good health. I think we must exclude this as a cause producing the inflammation. We are left, therefore, to decide whether the inflammation originated de novo in the cranial cavity and extended to the orbit, or whether it was primary in the orbit. We had a clear history of two of the most common causes of this affection, namely, idiopathic and traumatic. The cold he took, the weeping, and the foreign body under the lid, with the probable injury from his arrangement to wake him, were sufficient to localize the inflammation in the region of the orbit. There was first redness of the oculo-palpebral conjunctiva common to a cold and excessive weeping—just the condition to give rise to inflammation from the addition of a foreign body or an injury. This inflammation, once started, extended rapidly to the subconjunctival tissue, thence to the connective tissue of the orbit and lids, producing great swelling of them, with but little secretion. There was pain, which was increased by pressure upon the eyeball backward, immobility of the eyeball, and high fever—a group of symptoms and conditions that form a true picture of the first stage of orbital cellulitis. The only diseases with which orbital cellu-
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Cellulitis is likely to be confounded are periostitis of the orbit and new growths.

Periostitis of the orbit does not develop as rapidly as orbital cellulitis. Pain here, as elsewhere, is a prominent symptom of inflammation of the periosteum. There is usually much less swelling, and the finger can be passed around the margin of the orbit, thereby increasing the pain. This is an important diagnostic symptom of periostitis. In new growths the development is still less rapid, and there is usually functional disturbance previous to the occurrence of inflammation. The eye is rarely pushed directly forward in new growths. There are cases, however, as in the diagnosis of other diseases, where it is extremely difficult to make out the exact condition. This is well illustrated in a case cited by Dr. Harlan. The emperor sent Jaeger to Milan to see Marshall Redetzy, who had been suffering three months with exophthalmus and its accompanying symptoms. He reported that the patient, who declined any operative interference, was affected with scirrhus of the soft parts of the orbit, which would soon end his life. Not long afterward, under homoeopathic treatment, there was a copious discharge of pus, and the eye returned to its normal position.

Having determined that the affection was cellulitis and primarily in the orbit, it behooves us to account for other conditions that existed. The loss of consciousness on the night of the second day of the attack may be accounted for in the rapid development of the inflammation in the orbit producing enormous swelling of the parts, and consequently great pain. We see loss of consciousness produced by severe pains in other parts of the body, like that from the passage of gall-stones. But here in the orbit we have not only all the conditions for the development of great pain when general inflammation exists, but we have the structures involved in close contiguity and continuity with the brain—the seat of all consciousness—and hence in violent inflammation of them we should expect to have disturbances of the function of this organ.

If we examine the relationships, we find that the optic nerve and retina are early outgrowths of the brain, which is de-
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veloped from the epiblast. They are, therefore, genetically closely related, and this intimate relationship is continued through the lymph space which Schwalbe has shown to exist between the arachnoidal space and the lymph spaces which surround the sheath of the optic nerve and pass over into Tenon's capsule. We have in the eye and its surroundings all the different tissues of the body represented. Its fibro-vascular tissue is developed in common with those of the brain from the mesoblast, and, therefore, they are genetically closely related. The blood supply is through the ophthalmic artery, which is a branch of the internal carotid. This in its course lies along the inner wall of the cavernous sinus, into which the ophthalmic vein that returns the blood from the eye and orbit empties. This sinus is of large size, extending from the anterior lacerated foramen to the apex of the petrous portion of the temporal bone. It communicates freely with its fellow, and with all the other sinuses of the dura mater. This brief review of the embryological, anatomical, and physiological relationship of the tissues of the orbit and those of the brain serve to recall how profoundly the latter may be affected by rapid and extensive inflammation of the former, without that inflammation extending and involving those tissues. It also serves to recall how readily inflammation of the orbit may extend and directly involve the tissues of the brain, and, for this reason, why orbital cellulitis is considered a serious affection.

From the condition of the patient as described by Dr. Pendleton and the attendants, I have no doubt that his unconsciousness during the night of the second day of the attack was due not only to the great pain incident to the inflammation of the orbit, but that this latter had extended, and directly involved the tissues of the brain. Had psychical disturbances followed this attack of unconsciousness, it would have been conclusive evidence that the primary inflammation was intra-cranial. Although deaf and dumb, he had been taught to express his thoughts orally, and had quite a command of language, so that when the person addressing him was in the right position he always answered intelligently. His uninflamed eye, too, revealed a clear mental condition. In looking over published
cases, I fail to find anywhere the temperature was recorded as high as it was in this case. Indeed, it is not mentioned in a large majority of the published cases. The constant high temperature and condition of the orbit led us to anticipate the formation of pus, and justified us in performing the operation on the fourth day. The extension of the inflammation over the forehead and temporal region (at two points of which pus was finally formed) down the neck, involving the other side up nearly to the other eye, and interfering with deglutition to such an extent that the patient was unable to swallow, is certainly a very rare complication, as I find no similar case recorded. It may account for the constant high temperature.

The subnormal temperature on the tenth indicated a subsidence of the inflammation, which, however, recurred on the eleventh day. It clearly pointed to intra-cranial inflammation, and he undoubtedly died from the effects of meningitis, although no post-mortem was obtained.

In looking over my case-books, I find that nearly three thousand cases were recorded before this affection occurred, and I find only six among over twelve thousand recorded cases. The first case occurred in April, 1884, in Mr. H. H. B., aged 46, upon whom I had performed tenotomy of the left internal rectus, with advancement of the left external rectus. The patient was an overworked lawyer, who had an attack of diarrhoea, which he had contracted in the army. He made a good recovery, although the treatment was somewhat prolonged.

The second case was in November, 1885. This was a young man, T. J. P., aged 19, who went a-fishing with slippers on, got wet, and took a severe cold. He had pain over the right eye. He saw a physician, who advised him to apply a poultice, and to return the next morning. The pain continued and the lid swelled, and he continued the use of the poultice several days without seeing the physician. When I saw him suppuration had been established under the use of the poultice, but the eye broke down, and its contents ran out.

The third case was a lady, Mrs. D——, aged 71, who consulted me with Dr. Sullivan in October, 1888. She had had a
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decayed tooth, with considerable suppuration, which she had removed. Very soon after, accompanied with severe pain, the tissues of the orbit began to swell. The pain and swelling continued with great severity. The eye was pushed forward, and when I saw the case several incisions had been made, with a view to let out pus, but none escaped. As symptoms pointed unmistakably to suppurative inflammation of the antrum of Highmore, I removed a decayed bicuspid tooth and opened the antrum at this point, letting out considerable pus.

As the eye had been blind thirty years and was very hard, I removed it, and found the orbit had become involved through the infra-orbital canal, the bone around which was in a carious condition. Her recovery was tedious and unsatisfactory.

The fourth case was seen in consultation with Dr. Wallace of Rochester, N. H., in January, 1889. It was a child, aged two and a half years, who, without apparent cause other than a cold, had marked swelling of the lids of the left eye, with proptosis. As far as could be ascertained, the inflammation seemed to be primary in the orbit. It was not in a proper state for making an incision, and I advised waiting. In two days Dr. Wallace made an incision, evacuating pus, and the case made a good recovery.

The fifth case is the one here related in full.

The sixth case was seen in April, 1892. This occurred in a girl, aged 10 years, who had had purulent inflammation in this eye about a year before this time, and sustained a loss of the cornea to Decemet's membrane at the scleral-corneal margin, leaving the eye irritable and with poor vision. She had recently had the measles, and the eye became irritable and painful, for which leeches had been applied by her family physician, Dr. Morgan of Dover, N. H. The eye grew worse, and when seen the lids were intensely swollen, with the eye bulging outward. The temperature was 102°, and she was in a decidedly critical condition. As but little hope was given that the child would live, Dr. Ring was called in consultation, and on the following day Dr. Gordon was called. The temperature kept high for several days. The swelling remained about the same as when first seen, and at no time was it
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thought advisable to make an incision, and the inflammation subsided without suppuration. The eye became totally blind, shrunken, and irritable, and was removed in June last.

In the preparation of this paper reference has been made to the following articles:


13. "Two Cases of Orbital Abscess." Trans. Am. Ophth. Society, 1884, by J. A. Lippincott. Dr. Theobald, in discussing this paper, reports a case of orbital cellulitis resulting in abscess, which was evidently primary.


306 Sutphen: Scleral Puncture in Detachment of the Retina.


The articles upon "Orbital Cellulitis" in the following textbooks on ophthalmology: Stellwag, Wells, Noyes, DeWecker, Schweigger, Meyer, Swanzy, Berry, Green, Juler, Schmidt-Rimpler, Nettleship, and Harlan’s article in the "Reference Handbook."

RESULT OF SCLERAL PUNCTURE IN TWO CASES OF DETACHMENT OF THE RETINA. THE FIRST SUCCESSFUL IN RESTORING GOOD USEFUL VISION, THE SECOND RESULTING IN SLIGHT IMPROVEMENT ONLY.

By T. Y. SUTPHEN, M.D.,

NEWARK, N. J.

Case I.—Hugh M., aet. 50, came to St. Michael’s Hospital July 30, 1891. The right eye was practically useless. Two years before he had been injured in the face by an explosion of giant powder. This had left the right eye with a scar upon the cornea and a ragged opening in the iris directly opposite, the pupillary space being partly occupied by the shrunken lens, vision 20/200 with glass +10. D. sph. In the left eye was found a small dark spot upon the sclerotic, two lines to the temporal side of the margin of the cornea, beneath which was a large detachment of the retina. Adjacent to this, the lens was somewhat opaque. The vitreous was only slightly clouded, but the field of vision was very limited. The patient stated that the stain upon the sclerotic was the result of a grain of powder striking his eye at that point, and that his vision had been good up to two weeks previously, when, suddenly, he had
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discovered a dark cloud before his sight. The patient was ordered to bed and treated by injections of pilocarpine, and later iodide of potassium was administered internally. There was a steady increase in the detachment until it became total. Scleral puncture was made upon the left eye December 1, 1891. There was no reaction whatever from the operation, and slight oedema of the conjunctiva which lasted three days. Material improvement in vision was noted from the second day following the operation. The patient remained in bed three weeks, and left the hospital January 15, 1892, with the retina in its normal position throughout and vision 20/30, good, considering the fact that the opacity in the lens had increased during the period of retinal detachment. Five months later the patient reported that his sight was still as perfect as when he left the hospital.

Case II. — December 17, 1891, Mrs. S., aet. 48, a myope of moderate degree, sought treatment for a cloudiness before both eyes, which had existed for two years, but which had greatly increased in the right eye during the last few days. On examination the vitreous of each eye was found clouded, the right containing numerous large floating opacities. The details of the fundus could not well be made out. With the right eye the patient could count fingers at 18 feet. With the left her vision was 20/50 w. —.75 D. sph. □ —1.50 D. cyl. ax. 180°. Under treatment with the iodide of potassium the vitreous in each eye cleared up markedly. On February 3, 1892, the patient returned saying that her right eye had become suddenly worse. On examination the retina was found detached throughout the nasal quadrant. Treatment in bed with pilocarpine and salicylate of soda availed nothing, and the case went on to complete detachment and total loss of sight in that eye. Scleral puncture was made May 18, 1892. The operation was followed by a little oedema of the conjunctiva, but no reaction. For a few days patient’s vision was excellent in certain portions of the field, none in other parts. The retina was found in its normal position in patches. Soon the outlines of these faded and nothing was distinctly seen by the patient. Everything was hazy. The patient remained in bed three weeks. At her last visit to the office the retina was found detached throughout the

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lower half only, and vision was limited to the lower portion of
the field where she could count fingers at 5 feet. The vitreous
was very cloudy.

Believing in the value of recorded results, both favorable
and unfavorable, I present these two cases. In both, the opera-
tion was made under cocaine with strict observance of antiseptic
care, making use of the bichloride solution, one part to twelve
thousand. The puncture was made with a narrow Graefe knife
near the equator of the globe, between the insertions of the
external and inferior recti muscles, directly through the con-
junctiva. The rotation of the eyeball back to its normal posi-
tion when released by the fixation forceps, virtually converted
the scleral wound into a subconjunctival one. The escape of the
subretinal fluid caused no trouble other than a slight oedema
for a few days. No inflammatory reaction whatever occurred.
The reason for the success in one of these cases, and failure in
the other, must be sought in the different conditions in the two
eyes. In the first case there were no inflammatory changes
noticeable, and the vitreous was clear. In the second there was
no doubt a choroiditis, which may not have entirely subsided
at the time of operation. Still in this latter case there might
have been a better result had the scleral wound been larger,
and drainage more complete.

THE LAW OF SYMMETRY OF OUR EYES AS MAN-
IFESTED IN THE DIRECTION OF THEIR ME-
RIDIANS; ITS RULE AND ITS EXCEPTIONS.

BY HERMAN KNAPP, M.D.,
NEW YORK CITY.

Much has been said and written about the symmetry and
asymmetry of the meridians of our eyes, yet there is a lack of
precision, even of clearness, in the definition of these terms.
Our eyes are symmetrical organs, as our hands, feet, ears, etc.,
but, in contradistinction to these bilateral organs, each eye
singly may be split into two symmetrical halves, as our whole
body by the median plane; the plane dividing the eye symmetrically is, however, not vertical, but horizontal, passing through the center of the cornea, the optic nerve, and the fovea centralis. I do not purpose to consider in this place the symmetry of one eye, but that of both eyes in relation to the median plane of the body; furthermore, I shall confine my remarks to the direction of the meridians of our pair of eyes, and limit the discussion of the subject to the determination and correction of astigmatism.

A few attempts have been made to treat this question in a thorough and practical manner. The only paper which rests on a firm basis is, as far as I know, that of Snellen, "The Direction of the Principal Meridians of Astigmatic Eyes," in Graefe's Archiv. für Ophthalmologie, Vol. XVI, No. 2, p. 200, 1869. The paper of J. H. Claiborne, Jr., "The Axis of Astigmatic Glasses," N. Y. Med. J., June 25, 1892, is of a speculative nature, without statistical support. Snellen bases his conclusions on the practical examination of 472 eyes, in 278 persons, whose astigmatism he examined and corrected with glasses. His patients were taken from his private practice and the material of the Hollandish Eye Hospital at Utrecht during the years 1864–1868. The symmetry of the two eyes, though only briefly mentioned in Snellen's paper, agrees with the result of my examinations.

My object has been to examine a larger number of astigmatic eyes with regard to the direction of their principal meridians in order to ascertain whether the direction of the meridians follows a certain rule, and if so in what sense and how frequent are the exceptions to this rule. As the results of such investigations are the more general, the greater the number of cases examined, I wanted, for a first approximation, to collect a thousand pairs of astigmatic eyes. They were all taken from my private case books, all from patients whom I had examined and recorded myself. All of them were examined with the ophthalmoscope, in the inverted image, and with spectacles, a limited number with the ophthalmometer of Javal-Schiotz and retinoscopy. The values used for the questions under consideration are the numbers of the glasses which gave the best
correction of distant vision. The patients refer to all the successive cases of binocular astigmatism for whom I prescribed glasses and who have worn them with more or less satisfaction. They date from Oct. 19, 1888, to July 13, 1892. Intercurrent with these 1,000 cases of binocular corrigible astigmatism there were 186 cases in which a cylindrical glass was prescribed for one eye only. Adding these to the former 1,000, I see that astigmatism furnished 11.5 per cent. of my private patients during the period stated. The percentage in the single years does not vary much.

In the following I shall disregard the cases of monocular astigmatism and consider only the 1,000 binocular astigmatics. They subdivide themselves into

305 cases of simple myopic astigmatism,

259 " " hyperopic "

175 " compound myopic "

224 " " hyperopic "

32 " mixed "

5 " in which one eye had myopic the other hyperopic (heteronymous) astigmatism.

In arranging the tables the determination was made according to the direction of the meridian of strongest refraction (shortest radius of curvature) with regard to the median plane of the body or the vertical plane of the eye. The upper end of the vertical meridian was denoted with 0, its leaning towards or away from the median plane by so and so many degrees of nasal or temporal deviation, for instance 10° or 10'. This notation brings out at a glance whether the deflection in both eyes is symmetrical or not, whereas the designation of the meridians customary in this country lacks directness and harmony; for instance 10° according to our designation means 10° of nasal deflection for the right eye as well as for the left, and is the same whether the glass is looked at from the patient's or the physician's side, whereas in the American designation 10° means 80° for the right and 100° for the left eye, and it is understood that the degrees are noted as the patient looks at the glass, which differs from the result obtained when the physician looks at it.
The meridians are symmetrical when they cut the median plane of the body (or the eye) under the same angle, which, of course, includes the vertical and horizontal directions of the meridian of the strongest refraction as well as equal degrees of nasal or temporal deflection. 30° means a deviation of 30° in each eye towards the median plane of the body, or from its own vertical plane. Parallel meridians (I always mean the meridians of strongest refraction) are such as deviate by so many degrees temporally in the one eye as nasally in the other, for instance 35° in the right, and 35° in the other eye. Such cases occur, but they are exceedingly rare. In the present series of 1,000 cases there was not a single example of this condition. If the meridians of strongest refraction are vertical, they are geometrically parallel, but they remain symmetrical just as the horizontal principal meridians are symmetrical, but when the meridians of strongest refraction in each eye are placed somewhere between the vertical and horizontal (intermediate or oblique positions) and are parallel, they are no longer symmetrical, as their corresponding points no longer occupy corresponding positions with regard to the median plane of the body.

The classification of the 1,000 cases of binocular astigmatism with regard to these points of view has given the following result:

A. Symmetrical Direction of the Meridians.

1. Strongest meridian, vertical in both, . . . 605
2. “ horizontal “ . . . 110
3. “ diagonal (45°) “ . . . 43
   a. Upper end of both on the nasal side, 27
   b. “ “ temporal “ 16
4. Strongest meridian, intermediate, i.e., between vertical and horizontal, omitting the diagonal position, . . . 82
   a. Upper end of both on the nasal side, 49
   b. “ “ temporal “ 33

Total, . . . . . . . . . 840
B. UNSYMMETRICAL DIRECTION OF THE MERIDIANS.

1. Strongest meridians intermediate—
   a. Both nasally deflected, .................................................. 18
   b. Both temporally “ .......................................................... 21

2. Strongest meridian vertical in one eye, horizontal in the other, .................................................. 13

3. Strongest meridian nasally deflected in one eye, temporally in the other, .................................................. 8

4. Strongest meridian vertical in one eye—
   a. Nasally deflected in the other, ........................................... 33
   b. Temporally “ “ ................................................................. 39

5. Strongest meridian horizontal in one eye—
   a. Nasally deflected in the other, ........................................... 12
   b. Temporally “ “ ................................................................. 16

This table shows a high degree of symmetry in the direction of the meridians of our eyes, namely, eighty-four per cent., in which the strongest meridian occupied, with regard to the meridian plane, the same position in the one eye as in the other; the sixteen per cent. of eyes with unsymmetrical meridians would still be considerably reduced if differences of from 5° to 10° had been disregarded, a negligence which in weaker glasses would have no appreciable effect.

The dominating direction, 60 per cent., is the vertical, as has long been known, and such cases are termed "according to the rule," whereas it struck me somewhat by surprise that the cases "against the rule," the horizontal direction of the strongest meridian, came up as high as 11 per cent., which means one case for every 5½ of those according to the rule.

Next in frequency was the diagonal position, 4.3 per cent., in which the nasal deflection prevails over the temporal (2.7 per cent. to 1.6 per cent.)

In the intermediate positions no particular meridian has proved distinguished by its frequency, the greatest percentage was found in the meridian of 10° which showed nasally 2.2 per cent., and temporally 1.2 per cent.; the meridian of 15° showed nasally, 0.5 per cent., temporally, 1.2 per cent.; the meridian of
20° showed nasally, 1.2 per cent., temporally, 0.8 per cent. The others were less frequent. To ascertain more accurately the prevalence of direction in the intermediate or oblique meridians, the number of cases examined ought to be considerably larger.

The foregoing investigation has demonstrated that in the position of the principal meridians, as well as in that of the optic nerve, the muscles, etc., our eyes are a pair of remarkably symmetrical organs, as only one pair out of every 6½ shows appreciable deviations from the law of symmetry. This knowledge may give us many hints in the selection of cylindrical glasses, for, if symmetry is the rule, we should try to approach this rule in the 16 per cent. of exceptional cases as near as is compatible with a good correction of the visual acuteness.

In conclusion, I would beg leave to say a few words about the nomenclature to express the different positions of the meridians. Our present designation of the meridians is not only clumsy, but insufficient. We only speak of astigmatism according to the rule and against the rule, for which simple adjectives would be much more convenient. But such I could find only in the German language, namely regelrecht und regelwidrig. We might resort, as we so often do, to the Greek language, and choose the words, homologous and heterologous. If we, justly, call the vertical direction of the meridian of greatest refraction astigmatism according to the rule (regelrechter, homologous astigmatism), the term astigmatism against the rule (regelwidrig, heterologous) should comprise not only those cases in which the strongest meridian is horizontal, but all those in which it is not vertical. Taking the position of the upper end of the vertical meridian as the basis of our classification we could divide the cases of astigmatism into vertical, horizontal, and intermediate or oblique. The intermediate could be subdivided into nasally intermediate (oblique), or briefly nasal, temporally intermediate (oblique), or briefly temporal. A special name could, for the sake of convenience, be given to the meridian of 45°, on account of its relative frequency, namely diagonal, subdividing the cases in nasally diagonal and temporally diagonal.
DISCUSSION.

DR. B. ALEXANDER RANDALL, Philadelphia. — I would call attention to the observations of Dr. Little made in 1880–81, which bear out the same law of symmetry.

DR. W. S. DENNETT, New York. — I would protest against the nomenclature for astigmatism. In all my private records of astigmatism I say that it is astigmatism of so many diopters at such an angle, thus recording the position of the axis of least curvature. To speak of astigmatism as myopic or hyperopic is not correct, or is correct only on account of very general usage of a very bad nomenclature. The distinction between myopic and hypermetropic-astigmatism is a distinction without a difference.

DR. EDWARD JACKSON, Philadelphia. — I think that Dr. Knapp’s suggestion as regards nomenclature is a good one, indeed, and its adoption will make it easier for us to understand each other.

DR. SWAN M. BURNETT, Washington. — I was not aware that the terms astigmatism against the rule or with the rule had gotten into scientific writing. I always record astigmatism according to the axis and the number of diopters. I agree with the gentlemen, and would expunge the terms against the rule and with the rule, although it is strictly true, since there is that which is common and that which is a variation, as shown by Dr. Knapp’s observations. Vertical axis astigmatism is the rule as shown in eighty per cent. of the cases recorded by Dr. Knapp, with which my own statistics substantially agree.

DR. F. BULLER, Montreal. — I think that it would be a pity to change our present mode of recording and sending to the optician a diagram representing the axes 0 to 180 from left to right for each eye. If we depart from this method, which seems to have become general on this continent, it will lead to confusion, for a time at least.
STATISTICS OF THE DIRECTION OF THE PRINCIPAL MERIDIANS IN BINOCULAR ASTIGMATISM.

BY DR. GEORGE C. HARLAN,

PHILADELPHIA, PA.

As a contribution to the subject of the symmetry of the globes, one of my clinical assistants, Dr. Radcliffe, has collated all the cases of binocular astigmatism occurring among the last twelve hundred patients whose refraction he has corrected at the Will’s Hospital, with the following result:

Total number cases, 1,200. Refract. under myd.
Total number cases binocular astig., . . . . . . . . . . . 499
Number cases in which the principal axes were exactly symmetrical, . 350
Number cases axes within 10° of being symmetrical, . . . . . . 40
Number cases axes asymmetrical (i.e., a difference of more than 10°), . 109
Number cases principal axes on same side of the vertical meridian (these cases are included in the 109), . . . . . . . . . . . 12
Percentage of symmetrical axes, . . . . . . . . . . . . . . . . . 70.14
Percentage of asymmetrical axes, . . . . . . . . . . . . . . . . . 29.86
Including the 40 cases within 10° of being symmetrical, the percentage, . 78.15

Cases in which the principal meridians were on same side of the vertical meridian — i.e., nasal in one eye and temporal in the other:

| Case No. 1 | O.D. ax. 65° | O.S. ax. 65° | Case No. 7 | O.D. ax. 130° | O.S. ax. 130° |
| Case No. 2 | O.D. ax. 80° | O.S. ax. 80° | Case No. 8 | O.D. ax. 80° | O.S. ax. 80° |
| Case No. 3 | O.D. ax. 95° | O.S. ax. 95° | Case No. 9 | O.D. ax. 95° | O.S. ax. 115° |
| Case No. 4 | O.D. ax. 120° | O.S. ax. 120° | Case No. 10 | O.D. ax. 65° | O.S. ax. 80° |
| Case No. 5 | O.D. ax. 110° | O.S. ax. 110° | Case No. 11 | O.D. ax. 65° | O.S. ax. 35° |
| Case No. 6 | O.D. ax. 10° | O.S. ax. 10° | Case No. 12 | O.D. ax. 160° | O.S. ax. 150° |

The degrees are numbered according to the plan in general use in this country, commencing with zero at the left extremity of the horizontal meridian, and numbering on the
upper arc to $180^\circ$ at the right extremity. The directions of
the axes were determined with great care, without reference
to their correspondence, and their accuracy can be depended
upon. Except in the cases of a few old subjects, a mydriatic
was always used. It will be seen that in all but twelve cases
out of five hundred there is an approach to symmetry, which in
more than seventy per cent. is absolute. It is a singular fact
that in eight of these twelve exceptional cases there is a sym-
metrical asymmetry—that is, the principal axes have the
same inclination on the nasal side of one eye and the temporal
side of the other. The proportion is rather large for coinci-
dence, though that is the only explanation that occurs to me.

THE GENERAL FORM OF THE HUMAN CORNEA
AND ITS RELATIONS TO THE REFRACTION
OF THE EYE AND VISUAL ACUTENESS.

BY SWAN M. BURNETT, M.D., PH.D.,
WASHINGTON, D. C.

Ever since the first ophthalmometric investigations of Senff
and Helmholtz it has been known that the human cornea is
not the section of a sphere; and by numerous measurements
since, it has been established that it is not only not an ellipsoid
of revolution, but not even an ellipsoid with three axes. The
highly asymmetrical curve of the cornea is now an accepted fact,
and though there are abundant observations to verify it in gen-
eral terms, it is yet in order to record observations which would
tend to show the common law of asymetry, if such there be,
in emmetropia, and any variation from this that accompany the
ametropic conditions.

The measurements that are herewith submitted were made
with the Javal ophthalmometer, and show the curvature taken
at the visual axis and at intervals of $5^\circ$ on each side along the
principal meridians up to $20^\circ$. In order that those measure-
ments may be expressed in terms with which we are all familiar, I have recorded them in reciprocals of dioptrics of refraction. They were made on cornea that, so far as I could know, had not undergone any pathological change.

Recently the accuracy of the Javal instrument has been called in question,* and I can see that, in adapting it to its present form as an apparatus which is to be used in daily practice, some sacrifice of its more refined capabilities has been necessary. Yet I doubt if any modification of it will ever be made which will increase its value or reliability as an instrument for promptly determining the refraction of the cornea in its principal meridians with an approximation to accuracy sufficient for all practical purposes. And, in any event, its inaccuracies are not likely to affect, in any very important manner, the comparative measurements of the same cornea by the same instrument, and particularly when the differences in the various readings are so great that we can afford to neglect all values less than 0.5 D. A glance at the table will show at once two important facts which, so far as these statistics go, are unvarying. 1st. That the cornea diminishes in curve and consequently in refraction from the apex towards the circumference, and 2d, that the diminution is much more rapid on the nasal than on the temporal side of the visual axis.† This difference between the refraction at the visual axis and 15° to the nasal side is sometimes enormous, amounting in one case (34) where there was no demonstrable ametropia and V = ⁸ to 4.5 D. The temporal side of this meridian showed a difference of only 0.5 D. even at 20° from the visual axis. The average difference for the nasal side

* Dr. C. Weiland, Med. News, June 4, 1892.
† Since this paragraph has been written and all the measurements in my table had been recorded, an abstract of a paper by Dr. H. V. Wuerdemann has been published in the Am. Journal of Oph. for June, 1892, which contains statements totally at variance with the facts as recorded in these statistics. "He finds all cornea highly astigmatic in their periphery and that in most cases the curvature diminishes more rapidly in the vertical than in the horizontal meridians." It is said again that "Degrees of corneal astigmatism of 3 or 4 D. may be produced by the visual line passing eccentrically through the cornea, and in his opinion is one of the principal factors in its production." My measurements would not bear out any such statement in anything like a general application. On the contrary, in astigmatism against the rule, as pointed out by Bajardi (see infra) the general astigmatism of the eye diminishes as we move from the center of the cornea towards the periphery. This eccentricity is, however, probably a factor in the shifting of the principal meridians along its course from the visual axes towards the periphery (as in cases 1, 2, 10, 11, 18, etc.)
at 15° is about 2 D.; for the temporal side about 0.5 D. It is also demonstrated that the limit of regular curvature which can be measured is much closer to the visual axis on the nasal side, the difference probably representing the value of the angle a.

It will be noted also that the highest degrees of ametropia, and especially of astigmatism, are not always associated with the largest differences between the refraction at the axis and periphery, though there is generally a rather close connection between the two. In one case (1) where there was an astigmatism + 4.5 90°, the difference on the nasal side was 4.5 D. at 15°; in another (16) with the same amount of astigmatism it was only 2.5 D. The highest degree of simple M. astig. — 5 D. 180° (4) had a difference to the nasal side at 15° of 3 D., and the same amount in the vertical meridian downward.

In the two cases of mixed astigmatism (8 and 31) the corneal curve was what may be considered normal in the horizontal meridian, but with a slight excess of normal difference in the vertical meridians.

In the three eyes with astigmatism against the rule (10, 14, 24), there was not any material change from the normal in the horizontal meridian, but in two of them (10 and 24) the diminution of the curve in the upper half of the vertical meridian was rather more rapid than usual.* The curves of the cornea after cataract extraction are given in case No. 35. These measurements were taken one month after the operation, and the healing, though good, had been slow. The astigmatism, as is always the case after cataract extraction, is contrary to the rule, but in excess of what it usually is at this date after the operation. It will be observed that the cornea suffers its greatest change at the upper inner quadrant. I should state here, however, that in a case which I measured since the table has been made in which the healing had been perfect, the cornea at the end of three weeks was still more irregular than in this instance.

The important deduction to be drawn from a study of these measurements is that the outer side of the cornea is much more regular in curve than the inner, and the main practical inference

* P. Bajardi has recently contributed an article on this subject to the *Annali d' Ottalmologia*, Anno xx, Fasc. 4, 1891.
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The numbers represent the readings on the right arm of the arc of the ophthalmometer. To have the exact refraction in dioptries, 2o must be added to the number so recorded, thus: 20 + 22 = 42 D. The sign oo signifies that the image was too blurred to allow an accurate reading.
is that in making an iridectomy for optical purposes the place of election is under this part of the cornea as being more regular throughout a greater part of its extent than the inner side. There seems to be but little difference between the upper and lower portions in that particular. Incidentally these tables also corroborate what I said when I first brought the ophthalmometer to the notice of the profession in this country in 1885, and which I have ever since insisted on, that while this apparatus of Javal is, on the whole, the most valuable single instrument at our command in working out astigmatism, it is not to be relied upon to the exclusion of other means, since it gives us no indication of the amount of lenticular astigmatism, the frequency of whose existence this apparatus has itself been mainly instrumental in establishing. It would seem from some recent statements that the ophthalmometer is now in greatest danger in the house of its injudicious friends.

I cannot say that these statistics give us any certain or reliable knowledge regarding the cause of the diminished visual acuteness in ametropia, and particularly in that of high degrees, for, as mentioned at the beginning of this paper, they fail to show any constant association between a diminished visual acuteness and an abnormal corneal curve. But they do give, I think, an explanation of the very much reduced acuteness of vision with a dilated pupil, as compared with that of normal size which we so frequently meet with. In fact, we cannot but wonder that with so much and so constant an irregularity of corneal curve that we are possessed of the amount of visual acuteness we do enjoy, and we again wonder, without, however, denying absolutely the fact, how very weak lenses can give by their optical action the amount of relief to asthenopic symptoms which they seem, in some cases, to do.

OLIVER: Symmetrically Placed Opacities of the Cornea. 321

DESCRIPCIVE SKETCH AND DRAWINGS OF TWO CASES OF SYMMETRICALLY PLACED OPCITIES OF THE CORNEÆ, OCCURRING IN MOTHER AND SON.

BY CHARLES A. OLIVER, M.D.,

PHILADELPHIA, PA.

On the 23d of February, 1891, a sturdy-appearing eight-year-old schoolboy, the son of German-born parents, applied at Wills' Eye Hospital for the removal from both eyes of what the physician who sent him supposed to be cataract.

The opacities, which had been noticed for a long time, had gradually increased in size and density until one year previously, when, after an attack of malarial fever (the only illness that the child had ever had), they seemingly enlarged and became, just as they are now, quite conspicuous. At no time were the eyes ever red, irritable, or inflamed.

The upper incisors were normal in appearance, and the boy failed to present any of the facial or general characteristics of inherited syphilis. Laveran's corpuscle was searched for, but was not found. With two diopters of hypermetropia and a slight degree of astigmatism in each eye, uncorrected vision was reduced to one-fourth, and the accommodative power was limited to eleven diopters; and, with the exception of an esophoria of two (P. D.) degrees, no extraocular muscle disturbance was obtainable. The pupils were three millimetres in their horizontal meridians, and the irides were freely and equally mobile to light, stimulus, accommodation, and convergence. The cornea presented the dense superficial and deep opacities so noticeable in the accompanying sketches, which were kindly made for me by Dr. B. Alexander Randall.

Careful examination of these drawings will at once make it evident that in each instance there is a deeper and more compact central area, which is surrounded by an annulus or ring of superficial pin-dotted opacities, that of the left eye being the larger and the slightly more peripherally situated.

Not a trace of inflammatory vascularity could be seen. The eye-grounds, which were plainly visible and which were most carefully explored, failed to reveal any gross changes.

Although physical examination gave no evidence of any organic disturbance, alteratives and local treatment were experimentally and persistently tried; yet up to the present writing, nearly sixteen months after the first visit, no perceptible change in appearance of the corneal spots is evident.

During the first weeks of the study of this case advantage was taken to examine the mother, who was a widow, and her other child, a daughter of fifteen years of age.

The sister of the patient failed to exhibit any ocular abnormality, except a minor degree of correctible simple hypermetropic astigmatism.

The mother, however, a seemingly healthy woman of forty-five years of age, without any apparent organic lesion or history of pronounced illness, stated that she had had a difficulty

*It will be noticed in these sketches that the pupils are represented as though they were dilated. This has been done intentionally, so as to better give the configurations of the corneal opacities against a dark background.
Oliver: Gunpowder Injury to both Cornea.

with her eyes, which was similar to that of her son's, as long as she could remember.

Utterly free from any evidences of other gross ocular lesion, her corneæ presented the peculiarly circumscribed deep and superficial opacities shown in the lower part of the sketch, they being more irregular in outline, and their central portions much fainter, than those of her son.

The apparent heredity in the two cases is almost certain, when we for a moment consider that here we have a seemingly healthy woman with long-standing, peculiarly-localized, and symmetrically-placed opacities of the cornea, who, although giving birth to an as yet unaffected daughter, has a duplicature of her ocular infirmity directly repeated in an otherwise healthy son; a similarity in two of the most impressionable of blood relations—a mother and son—in whom, in spite of all attempts at solving the problem by the most scrutinizing search into family and personal history, the most careful and extended general and local examination, and the most persistent and prolonged antidyscratic treatment, have so far failed to give any other clue as to the true causative factor.

HISTORY OF A CASE OF GUNPOWDER INJURIES TO BOTH CORNEÆ, IRIDES, AND LENSES, WITH SUBSEQUENT RESTORATION OF VISION TO ALMOST FULL ACUITY.

By Charles A. Oliver, M.D.,

While S. McF., aged eighteen years, a private in the Third Regiment of the National Guard of the State of Pennsylvania, was participating in a sham battle at Lansdowne on the afternoon of the Fourth of July, 1891, he received the powder contents of a blank cartridge, which was projected from a rifle

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held in the hands of a companion at three feet distance squarely in the face, causing, as the gravest part of the injury, several penetrating wounds of both cornea with deposition of powder in both irides and lenses.

After having remained on the field for several hours, and the treatment happily having been limited to the continued applications of cold water, he was brought to Wills' Eye Hospital at midnight of the same day, where the resident surgeon, Dr. M. W. Zimmerman, after placing him immediately to bed, thoroughly washing the conjunctival membrane with boric acid solution, and freely instilling strong percentages of cocaine and atropine into the conjunctival sac, picked the cornea, the conjunctiva, the sclerotics in a few places, and the lids as free as possible from any loose and adherent grains of powder; employing ice compresses for the prevention of much reaction.

On the following morning — sixteen hours after the accident — when the writer first saw the patient, the lids of both eyes were somewhat puffed, and marks of superficial traumatism and discoloration were plainly evident over nearly all of their exposed anterior surfaces. In the left cornea there was a rather peripheral penetrating wound in the lower nasal quadrant with a tear in the corresponding part of the iris tissue, through which a powder grain could be seen sticking into the lens. Another deep wound, extending almost through the corneal substance, and holding some remnants of a powder grain, was observable in the upper outer quadrant. Although there were both tarsal and ciliary injection with marked ciliary tenderness, yet no pain was complained of. The lens was but slightly swollen, and the pupil was irregularly dilated, allowing a view of the fundus, which, as far as could be explored, appeared devoid of any damage.

In the right eye, the condition of affairs was much worse. The iris was wounded in its lower portion directly opposite a large corneal break, and several grains of powder could be seen lying in a rather deep and dense blood clot situated at the lower angle of the anterior chamber. The pupil was partially and irregularly dilated and the lens which was swollen and rapidly becoming opaque, with broken and infiltrated cortex
matter protruding through the pupillary area into the anterior chamber, contained several minute though plainly visible masses of powder. Although there was no neuralgia, points of pronounced ciliary tenderness could be obtained upon the slightest palpation.

Treatment was continued.

In four days’ time, during which the plan of procedure as above detailed was persisted in, the lids became less swollen, and most of the superficial powder remnants sloughed from the exposed portions of the eyeballs. Ciliary injection was lessened and ciliary tenderness in the left eye disappeared; the pupil of this eye being three-fourths and evenly dilated, its lens but slightly swollen, and its intraocular tension normal.

In the right eye the condition of affairs was quite different—an outburst of secondary glaucoma with all of its symptoms, especially that of increased intraocular tension, appeared the night before, the lens substance being greatly swollen and pushed so far forward with the foreign bodies and blood remnants, as to almost entirely fill the anterior chamber. This, the resident surgeon endeavored to stop, relieving severe ciliary neuralgia by the substitution of eserine for the atropine, and the cessation of the ice compresses, which had become quite painful.

As the myotic had caused the intraocular tension to fall to but little above normal, the eye had become much more quiet and comfortable when the writer visited the hospital on the following day, and as he was compelled to immediately leave the city, he, in consultation with one of his colleagues, Dr. S. D. Risley, left instructions with the resident surgeon that while continuing treatment he should carefully watch the eye during the night, and if an exacerbation of pain ensued or intraocular tension rose again, he should immediately perform a downward iridectomy so as to include the wounded portion of the iris, and to get rid of as much of the lens matter, blood, and foreign material as possible.

On the following day, under the guidance of Dr. Risley, the resident made a free clean-cut inferior coloboma, giving egress at the same time to much of the lens substance, the blood, several small grains of powder, and a bead of vitreous, causing tension
to fall to normal and all pain to disappear. The wound healed promptly, after which, by reason of a persistence of a slight tenderness in the ciliary region at the point of operation, atropine was again resorted to. At this time, light projection appeared good in all parts of a large and uninterrupted field of vision.

The left eye steadily bettered, became more and more quiet, and the lens matter perceptibly lessened, under the use of the atropia and cold compresses, the latter being discontinued in a week's time and the former gradually decreased, until, in three weeks' time, one drop of a four-grain solution was used but once a day. In this eye, with the exception of one small posterior tag of iris adhesion to the nasal side, the pupil was round, the field of light perception was broad in every direction, and projection was good in all parts of the visible area.

The symptoms gradually bettered until the fourth of September, when the patient was discharged from the hospital with a pair of eyes that had good perception of light. In the left eye there was considerable unabsorbed lens matter, the pupil was equally dilated in all meridians except to the inside where a small remnant of powder could be seen caught in a tag of iris tissue and capsular material. Tension was normal and there was not a single point of ciliary tenderness obtainable upon the most decided palpation. The right eye, which had also become comfortable, had a normal tension. In the upper part of its pupil there was a small mass of encapsulated powder, which was held in position by dense capsular bands, coming from the sides and above, the lower half of the pupil being covered by a thin though opaque sheet of capsular débris. Most, if not all of the lens matter in this eye seemed to have absorbed. The coloboma, which was narrow, was free except at its lower portion, at which position a broad, firm band of organized lymph-like matter seemed to connect the two previously cut edges of the iris.

Two weeks later, the writer excised a broad, round hole of from four to five millimetres in diameter from the lower half of the capsule, taking care not to break the encapsulated mass just above it from its attachments, thus securing a vision of $\frac{6}{10}$ with a correcting lens of $+ S. 10. D. \odot + C. 1. D. ax. 180^\circ$. At the same sitting, without disturbing the small powder mass in the
nasal portion of the iris, he did a free double discussion in the left lens, obtaining a large central opening, through which the patient had a vision of nearly $\frac{1}{10}$ with a + S. 11. D. alone; for near work, the eyes requiring an additional + 'S. 3. D. to obtain a reading distance of twenty centimetres for 0.50 D. type. At this visit, as in all of the subsequent ones, the ophthalmoscope failed to show any abnormal or inflammatory fundus changes.

At present, little longer than one year after the accident, during which the patient has been steadily employed for eight months as an outside delivery agent in a large retail store, the eyes have remained perfectly quiet. There is a clear pupillary area in the left eye, and that of the right eye still having its little mass of powder securely caught in the capsula folds.

The case is of interest not only upon account of the successful outcome of a desperate state of affairs where both superficial and deep traumatism with the entrance of foreign material into the substance of the irides and lenses, caused the appearance of marked inflammatory symptoms which extended to the most dangerous portion of the ocular globe—the ciliary region, but is of value as an exposition of the totally diverse methods of treatment made necessary in the same subject by the profound and grave symptoms of increased intraocular pressure produced by too rapid lenticular swelling in the one organ. Further, the case is of clinical value in showing the after good effects of removing as many sources of danger—the loose powder grains, from the interior of the eyes as advisable, leaving but two small masses that are encapsulated in safe positions, and thus in great measure prevented from acting as sources of irritation.
REMOVAL OF A FRAGMENT OF STEEL FROM THE VITREOUS CHAMBER, BY MEANS OF THE ELECTRO-MAGNET, WITH PRESERVATION OF NEARLY NORMAL VISION.

BY SAMUEL THEOBALD, M.D.,
BALTIMORE, MD.

The successful employment of the electro-magnet for the removal of fragments of iron or steel from the interior of the eyeball has become of such frequent occurrence that one hesitates to report such cases unless they present features of especial interest. The fact that in the present instance the foreign body was not removed until the eleventh day after its entrance into the vitreous chamber, and the further fact that in an eye otherwise doomed to destruction nearly normal vision was restored through the magnet's efficient action, seemed features of sufficient interest to justify my presenting a brief report of the case to the Society.

C. H., aged 12 years, was first seen on April 1, 1892, in the out-patient department of the Baltimore Eye, Ear, and Throat Charity Hospital. Six days before, while striking a hatchet with a hammer, a small fragment of steel had been broken from one of them, and had struck his left eye with such force as to cause severe pain and much impairment of vision. The eye exhibited marked conjunctival injection, and, upon closer inspection, a small scar was discovered at the upper and outer corneal margin, and just in line with this a hole in the iris, close to its periphery, of corresponding size. At the anterior pole of the lens, apparently just under the capsule, there was a slight opacity, and with the ophthalmoscope, besides numerous floating opacities in the vitreous, so much diffuse clouding was discovered that the details of the fundus could not be distinguished. Vision was found to be 16/xxv. There was little room to doubt that the piece of steel was in the eye, although, owing to the clouding of the vitreous humor, its location could not be determined with the ophthalmoscope, and its removal
with the electro-magnet was proposed. The instrument not being at hand, the operation was postponed until the next day. On the following day the chloride of silver ("dry cell") battery with which I had provided myself failed to produce in the magnet (Hirschberg's) any but the most feeble action, and a further postponement was unavoidable. An interval of four days occurred after this before an opportunity to operate upon the eye presented itself. In the meantime the inflammation had not lessened, and iritis had set in.

I had decided misgivings as to the likelihood of my efforts to remove the foreign body being successful, after so long an interval from the date of the accident; but it was evident that enucleation at no distant day was the other alternative, and, influenced by this consideration, I did not hesitate to undertake the operation. Chloroform was administered, and antiseptic precautions, consisting in the sterilization of the magnet point and other instruments with boiling water and the flushing of the conjunctival sac with sublimate solution (1 to 8,000), were exercised. A free longitudinal incision was then made through the conjunctiva, between the external and inferior recti muscles, behind the ciliary body, and the tissues dissected back so as to expose the sclerotic at this point. A Baer's knife was then passed through the sclerotic and inner tunics of the eye, making a longitudinal incision about 4 mm. in length. There was considerable hemorrhage, but the vitreous showed no tendency to escape. Although it had not been possible to locate the foreign body, the greater amount of opacity in the outer and lower quadrant of the vitreous humor and the accessibility of this part of the sclerotic determined the site of the incision.

The magnet point, freshly sterilized, was now introduced a short distance into the wound and withdrawn. Examination of its tip showed that the fragment of steel had not been attracted to it. A second, third, and possibly a fourth introduction of the point, which was pushed farther into the vitreous chamber and turned in various directions, failed as completely to accomplish the desired result, and I almost concluded that it would be useless to make further attempts. I determined, however, to try once more, and this time probably carried the
magnet point nearer to the ciliary body than I had done before, and upon withdrawing it was rejoiced to find the bit of steel adhering to it. It was irregular in shape, having one edge especially sharp, measured about 1 ½ mm. in length, 1 mm. in width, and ½ mm. in thickness, and weighed but a fraction of a grain.

The magnet, which was operated by a single, small Grenet cell (zinc and carbon), was tested before the operation, and found to be capable of lifting a pocket key-ring with four or five keys attached to it.

The after treatment of the eye consisted in the constant application, by means of a bandage and linen pad, of a lotion of opium and boracic acid and the instillation of atropia. The improvement in its condition was rapid and uninterrupted, and when the patient left the hospital on April 23rd (seventeen days after the removal of the foreign body) the subconjunctival injection had greatly diminished, and the vitreous humor was clearing rapidly; the opacity at the anterior pole of the lens was also less marked. Vision at this time was 16/1XLV. The pupillary margin of the iris, at a point corresponding with the wound made in the cornea and iris by the entrance of the foreign body, had formed an adhesion to the lens capsule before the removal of the steel, and this persisted, despite the liberal use of atropia.

The case was kept under observation in the out-patient department, atropia only being used, and continued to progress favorably. May 2d V. had improved to 16/xxx.

At my request, the patient called at my office a few days since (July 6th). No treatment had been practiced for seven weeks. The difference in the appearance of the two eyes was scarcely perceptible. The pupil of the injured one was not quite circular, and there was just a trace of hyperæmia in the finer conjunctival vessels. In the neighborhood of the wound made through the sclerotic at the time of the operation the hyperæmia was, of course, more marked, and there was still considerable thickening of the episcleral tissues at this point; but this could be seen only when the eye was directed upwards and the lower lid somewhat everted. The lad assured me that
the injured eye gave him no annoyance whatever, and that he felt no dread of light. Upon examining the lens, a very small, well-defined circular spot of opacity was found just under the capsule at the anterior pole—the only remains of the more diffuse opacity observed in this part of the lens when the case first came under observation. The peripheral wound through the iris was easily found, but was less conspicuous than when first discovered. The ophthalmoscope revealed no opacities in the vitreous humor, and showed a normal fundus, except in the region of the sclerotic incision. The site of the latter was indicated by a linear white patch, and just in front of this, and separated from it by an isthmus of normal choroid and retina, there was another spot of atrophy, much smaller and circular in shape, through which the sclerotic could also be distinctly seen. I could make out no evidences of retinal detachment.

The small, circular area of atrophy, which was situated between the sclerotic wound and the ciliary body, marked, in all probability, the point where the fragment of steel impinged, and to which it remained attached. If such was the case, the point of the magnet must have been in close proximity to the foreign body each time that it was introduced, and only failed to extract it at first because, as might have been expected after the lapse of so considerable a time from the receipt of the injury, it had become more or less perfectly encapsuled.

A test of the vision of the two eyes, both of which were decidedly hypermetropic, showed but a slight difference between them. With +.75s, the left (injured) eye had V. = 20/xxv +, and the right eye, with +.87s, V. = 20/xx —. The possibility of making a further improvement in the vision of each by means of cylinders was not gone into.

It is too soon yet, and probably always will be too soon, to say that an eye which has been through the experience this one has will never give trouble, but in the present instance I have little fear as to the future.
A FOREIGN BODY IN THE RETINA.

By Dr. Buller,

Montreal, Canada.

On the 19th of January, 1891, A. M., a healthy young man, granite worker, came on account of an injury to the left eye received six days previously. The account he gave of the injury was that while at his usual work he felt something strike the eye, and for half an hour afterwards there seemed to be a scum over the eye; this cleared off, all except a black spot seen constantly in front of the eye since the accident.

On the fifth day after the injury, on getting up in the morning, he noticed for the first time a very considerable impairment of vision. Examination showed Rf=E V=6/12. The eye is painless, and presents a normal appearance, except that by focal illumination a minute scar is seen near lower corneal margin, and a corresponding minute aperture in the iris, at its lower periphery. This little opening is nearly circular, and not more than 1 mm. in diameter.

There is no opacity in the lens, but some dark flocculi in the anterior part of the vitreous. The optic nerve has a blurred appearance, and the surrounding retina is decidedly cloudy, its veins dark and tortuous. At a point about three discs below the papilla, and nearly on a line with its temporal border, there is a piece of metal lodged in the retina. It is of the shape and relative size shown in the accompanying sketch which was kindly made for me by Dr. J. S. Booth, four days after I first saw the injured eye,—that is about ten days after the injury.

The bright crystalline surface of the metal fragment is beautifully distinct, and only a little obscured near its upper end by a thin film of blood; a considerable quantity of blood could also be traced forward through the vitreous, and was most abundant anteriorly; evidently, the apices of one or more ciliary processes had been injured. Around the piece of metal is a narrow, sharply defined, densely white zone. There are no
haemorrhages or opacities in the retina elsewhere. Ordered rest of the eyes, protection from strong light, and a two-grain solution of atropia to be instilled twice daily.

January 20th. The zone of opacity around the foreign body has distinctly increased since yesterday, and some similar opacity has formed in the retina a short distance from the metal, just at the end of a small blood clot in the vitreous.

On the 18th of February, or twenty-six days after the injury reports that the eye feels quite well, but patient says it is a little dim. V. = 6/12, or the same as at first visit. The optic nerve presents the appearance of a pronounced neuro-retinitis. There are several haemorrhages and some white spots in the retina between the foreign body and the macula lutea. The retina is cloudy all around the nerve and macula, but especially so near the haemorrhagic spots mentioned. There is, in fact, a pretty extensive retinitis which, however, only reaches a short distance peripherally, and is most intense in the area including the foreign body, optic nerve, and macula.

The zone of opacity immediately around the metal fragment has almost disappeared, and there is now no blood in the vitreous in its vicinity, but several dark clouds are still visible anteriorly. The fragment of metal is less glistening than formerly, though still fairly bright. The most remarkable change is in the choroid.

For a considerable distance all around the foreign body there is an atrophy of the choroidal pigment, so that the choroidal vessels are clearly mapped out, while in the remainder of fundus they are barely distinguishable.

April 12th. V. −6/9. The eye does not give him the least trouble or annoyance.

The retinitis has mostly cleared up, though there is still some cloudiness in the area most affected, and the retinal vessels are larger and more tortuous than in the other eye.

For a long distance around the macula the retina has a markedly "shot-silk" appearance. The piece of steel is still bright, and glistening in parts; the effusion in the retina has disappeared except a trace to the temporal side of the foreign body. Vitreous nearly free of blood.
May 10th. V. −6/7.5 with each eye.

May 17th. V. −6/7.5 each. The injured eye, he says, is perfectly well. All the blood in vitreous, near foreign body, has cleared away, leaving only a little dotted opacity, best seen with +3d., above and external to the piece of metal. Anteriorly, the vitreous shows some stringy opacity. The retinal haemorrhages and cloudiness have gone, and its vessels are more normal in appearance. Only the papilla is redder than usual, and its lower and outer margins are indistinct.

The lower vessels, near the disc, have white borders for some little distance, and there is no further change in the appearance of the foreign body. From this date, I lost sight of the case, but after a good deal of searching managed to find him again on the 17th of this month. The eye, during the interval of fourteen months, has given him no trouble, and he imagines he can see as well as ever with it.

This illusion was quickly dispelled since the usual test of vision only gives V.=6/27; and I find with the ophthalmoscope a diffuse hyalitis with much fine opacity in the vitreous. Some of the longer opacities are grey and glistening, but most of them fine shreds and dots of a dark color.

The optic nerve is red and swollen, its outlines quite obliterated; at the macula a shot-silk retina is dimly seen, but the foreign body has utterly disappeared from view, its former seat is marked by a small irregular patch of pigment like the remains of a blood stain.

The vitreous humor is evidently abnormally fluid. These changes seems to foreshadow the usual disastrous result of foreign bodies remaining in the eye.

It might, perhaps, have been better to have used a magnet and removed that piece of steel when we first saw it, but the total absence of urgent indications, the excellent vision during the first few weeks of observation, and the ultimate quiescent condition of the eye gave ample ground to hope we had to deal with a corpus alienum of benign tendency, one that had done its worst and would for the future be content to rest in peace.

It is still something of a mystery why a clean foreign body should remain so long comparatively inert and then re-kindled.
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Destructive changes. The initial retinitis, which it must be admitted was greater than there seemed to be reason for, had at one time entirely, or almost entirely, subsided; for months the piece of metal showed no signs of altering its position. It can hardly have been absorbed; if not, it has traveled a long distance from its original position.

How this has been accomplished we can only conjecture. No doubt it was lightly imbedded in the retina, and the retaining lymph was gradually absorbed. Doubtless, too, the adjacent inflammatory process involved the vitreous at that part or perhaps throughout, rendering it more fluid, so that with the rotary movements of the eye the "wash" of the vitreous upon the projecting surface of the foreign body finally dislodged it from its position to roam at large within the eye, and hence the diffuse hyalitis, etc., now in progress.

I hope to be able to report the outcome of this unusual case at some future meeting of this Society.

CASE OF TRAUMATIC IRIDO-CHOROIDITIS FROM CONTUSION OF THE EYEBALL, ENDING IN THE DEVELOPMENT OF INTRAOCULAR GLIOMA.

[By Chas. Stedman Bull, M.D.,
New York City.

Maggie P., aged 3, was first seen on December 9, 1890, and the father gave the following history. On November 28th, while seated at the dinner table, the child was struck a severe blow on the left eye by a large tablespoon in the hands of an older child. The convexity of the bowl of the spoon struck the eye. The child immediately cried out and complained bitterly of the pain. The eye was bathed with cold water by the mother, and after a while the child stopped crying and complained that she could not see. The lids remained swollen for nearly a week, and there was some discharge of a muco-purulent character. On December 9th, when I first saw the child, the swelling of the lids and the discharge had entirely ceased,
but the eye was apparently sightless. There was a central infiltration of the cornea with loss of the epithelium; a dilated, discolored, and immovable iris; marked ciliary injection; and a slightly hazy vitreous. With the ophthalmoscope there was a distinct yellowish reflection from the nasal half of the fundus, which was most marked in the supero-nasal quadrant, and seemed to be due to an exudation with vessels running over it. The refraction of this part of the fundus was +1.0. The child complained of no pain, and the eye was not sensitive on pressure. The other eye was normal in every respect, and the child appeared healthy, and had always been so. The family history was very unsatisfactory. One child, an older brother, had died of pulmonary tuberculosis, and a maternal aunt had died of some form of brain disease.

On December 15th there were numerous hemorrhages found in the retina and vitreous, and the tension of the eye, which had been normal, perceptibly increased. From this time, however, all external signs of inflammation slowly subsided. The ciliary injection disappeared, the vitreous cleared up, there was no recurrence of the hemorrhages in the retina and no pain.

On March 20th, I discovered an extensive lobulated detachment of the retina outwards, upwards, and downwards, with marked fluctuation of the detached retina. Over the rest of the fundus was a yellowish reflex, with a few blood-vessels running over it, and resembling both an intraocular neoplasm and a mass of exudation. From the history of the case and my continued observation, I was inclined to believe it to be a mass of exudation, the results of a choroiditis and hyalitis. The tension still remained above the normal standard. I advised enucleation, but it was declined. On May 4th, I first noticed an apparent thinning of the sclera in the ciliary and equatorial regions, and as the tension was still increased I urged an enucleation, to which the parents would not consent. I saw the patient once a week till June 1st, and then did not see her until October 30th. Up to June 1st, there was no change in the appearance of health of the patient, but on October 30th there was a very decided change for the worse. The child was anæmic and emaciated, and scarcely ate any food, except what
was forced upon her. Between June 1st and October 30th, there had developed a very large ciliary and equatorial staphyloma, and the sclera had become so thinned that in the superonasal quadrant it had nearly perforated. There was almost no anterior chamber, the iris being dilated *ad maximum*, and closely applied to the cornea at its periphery. The lens was opaque and pushed forward almost against the cornea. The tension was + 2. The eyeball was freely movable in all directions, and there was no pain, and no sensitiveness on pressure. I again urged an enucleation, and the parents consenting, the left eye was removed on November 2, 1891. The child immediately began to improve in appearance. Under the influence of iron, quinine, and plenty of food, she increased in flesh and weight, and this improvement continued until December 19, 1891, when she began to complain of headache and nausea, and actually vomited several times. The orbit was carefully examined and nothing abnormal found. On December 26th, the left pre-auricular gland was found to be enlarged, as well as the gland at the angle of the jaw on the left side. One week later, the submaxillary and the upper cervical glands were found enlarged. There was still nothing discoverable in the orbit, and the other eye remained intact. The child, for about six weeks past, had been taking iron and cod-liver oil.

On January 11th, she complained bitterly of severe frontal headaches, sometimes screaming aloud from pain. On January 14th, there was first noticed a probable return of the growth in the orbit, the tissue being hard and infiltrated, and the lids being slightly swollen and sensitive.

By February 5th, there was a very perceptible infiltration of the orbital tissue along the floor of the orbit, and a more decided enlargement of the glands on the left side, particularly of the submaxillary gland. The frontal headaches were now constant and very severe.

On February 12th, the symptoms were all more marked, and for the first time the right eye was found to be involved, there being a small but distinct yellowish reflex in the infero-temporal quadrant of the fundus.

On February 19, 1892, the glandular enlargement on the
left side of the neck had become enormous, so that the head was carried towards the right side, and there was considerable difficulty in opening the mouth. The left orbit was filled up by the new growth nearly to the orbital margin, and the lower lid was pushed forward. In the right eye, the iris was very much dilated, and very sluggish and discolored, and there was a large and distinctly elevated yellowish patch in the infero-temporal quadrant of the retina. There was no marked change in the appearance of the papilla, but the child was evidently nearly blind. There was faint quantitative perception of light.

This was the last time I had an opportunity of examining the child, as she became stupid and gradually comatose, and died early in March. Most unfortunately an autopsy was not permitted by the parents.

The eyeball which was enucleated was given to Dr. J. E. Weeks, the Pathologist of the New York Eye Infirmary, who has been kind enough to make a careful examination of the specimen, and has sent me the following report:

The eye measured 24 mm. in the vertical diameter, 24 mm. in the transverse diameter, and 32.5 mm. in its longest diameter through the apex of the staphyloma. The latter measured at its base 18.5 × 10 mm. On opening the globe, the anterior chamber was found to be almost abolished, the lens being pushed forward by a large grayish mass, which extended from the posterior part of the globe forward to and filling the staphyloma. At the equator the grayish mass was separated from the sclera by a collection of thin, brown fluid.

Microscopical Examination: The iris was atrophic, and was firmly adherent to the cornea at its periphery. In the vicinity of the staphyloma it was entirely disorganized. The lens was pushed forward and decidedly shrunken, so that it did not fill its capsule. The ciliary body was much reduced in volume and decidedly flattened, and at the site of the staphyloma it was entirely destroyed. The choroid was very much atrophied, and a few isolated groups of glioma cells were found on its inner surface.

As regards the retina, very little of it could be recognized. Anteriorly, but away from the vicinity of the staphyloma, it
was atrophic, but traces of it were still present. Farther back it was infiltrated with small cells, and was enormously thickened and soon lost in the central mass, its elements being entirely indistinguishable. In the optic nerve there was a small cell infiltration of the nerve-bundles and a collection of small cells in the sheath. It was difficult to determine whether these cells were merely leucocytes or something else. In the sclerotic, at the apex of the staphyloma, the connective tissue-bundles were separated from each other, the spaces being filled by the cells of the new growth. In some places the cells extended almost to the surface. Wherever vessels or nerve-trunks passed through the sclerotic, a small cell infiltration was found. The cornea was almost normal.

The central mass was composed of an aggregation of small cells with large nuclei and little protoplasm. Very fine fibres, apparently off-shoots from the cells, passed in all directions. Vessels with very thin walls pass through the mass in all directions, and in some places were surrounded by quite wide lymph-spaces. The tissue is apparently that of glioma.

DISCUSSION.

DR. D. B. ST. JOHN ROOSA, New York. — The cases reported by Dr. Theobald and Dr. Buller present two aspects of this subject, which I think are very interesting, the one in which the early removal of the foreign body, under unfavorable circumstances, left such very favorable condition, and the other in which the failure to attempt the removal was followed by severe chronic inflammation which may destroy the eye. It seems to me that there has been too much stress laid upon, not the importance or necessity of removal of the foreign body when it can be done without damage to the eyeball, but upon the prognosis. The disappointments that have come to all of us after the successful removal of a foreign body, in spite of which there has followed inflammation of a destructive character requiring enucleation, I am sure have lessened our congratulations when we have done with the case. At this very moment, I am hearing from a patient from whose lens I successfully removed without difficulty a foreign body a few weeks ago. This was eight or ten days after the accident. I have just received word that although it healed — not very promptly — the eye is undergoing such serious inflammation that it will
probably be enucleated this week. That is merely an indication, it seems to me, of what we find in a large proportion of cases. While I mean to make it clear that I do not for a moment think that we should not do as Dr. Theobald did, on the other hand, Dr. Buller need not think that the early removal in his case would have certainly saved the eye. I think that the chances are in favor of it not saving the eye.

There was an important medico-legal case in Cincinnati, which Dr. Pooley will remember, as he and I were witnesses. A surgeon was charged with malpractice. He had failed to find the foreign body in an eye, and advised enucleation, which was declined because the eye was in tolerably good condition, and the patient did not appreciate the importance of the surgeon’s advice. This was before the days of the electro-magnet. The eye was finally lost, and it was claimed that it was lost because the foreign body was not removed. In that case the ground which I think all in the Society will accept, and on which I think sufficient stress is not laid, was urged, and the prosecution failed. The point is this: that no matter how promptly or successfully the foreign body is removed, the eye, as a result of the original injury, may be left in a condition where there is danger of sympathetic inflammation of the fellow eye or of destructive inflammation of the affected eyeball, and the eye is by no means free from danger for years, and perhaps, as Dr. Theobald says, never. The original injury, especially if it is in the danger line—in the ciliary region—is of itself sufficient at any time in a large proportion of cases to set up destructive inflammation.

Dr. Charles Stedman Bull, New York. — I think that the site of the original injury and the site of implantation of the foreign body has a great deal to do with the prognosis and our opinion as to the necessity of attempting removal. Seventeen years ago I first saw a young man injured by a foreign body entering the eye. There was a wound in the cornea, inside the limbus, a perforation of the iris, and the foreign body had penetrated the lens near the periphery, in the superior nasal quadrant. I saw him three days after the accident. There was no hemorrhage. The body was visible in the retina. I saw him frequently for five or six years. Vision was 20/20. I saw him again last autumn, seventeen years after the injury. There had been no irritation, and the foreign body is still visible, as glistening as ever.

Dr. Thomas R. Pooley, New York. — I should like to bring out, with some emphasis, a point in treatment which I think is of great importance. In Dr. Buller’s case, the inflam-
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matory condition of the eye which occurred was evidently due to the shifting of the position of the foreign body. Had the foreign body become encapsulated, the result would probably have been as good as in the case reported by Dr. Bull. This seems to me to enforce the necessity of keeping the patient quiet for a time. Absolute rest and the dorsal decubitus is essential to favor encapsulation of the foreign body; and when a foreign body lodged in the retina becomes securely encapsulated we know that the outcome is better even than when we remove the body from the vitreous with the magnet.

DR. LUCIEN HOWE, Buffalo. — I wish to refer to a point with regard to the recognition of these particles of steel. I do not think that the text-books call sufficient attention to the necessity of looking carefully for these opacities on the capsule, to which Dr. Kipp has referred. My attention was called to them in Schiller's clinic, and I could easily recognize them under the glass. I consider them as of great assistance in diagnosis.

With regard to the removal of the foreign body with the magnet, we have all tried that, and I think that we have at times all failed. Two cases where the foreign body had been in for years taught me a lesson. I found that I could make a magnet of an iridectomy knife by attaching it at the end of the magnet, and thus reach the particle at once before there was loss of aqueous. In one case, I could move the foreign body, but could not remove it. In another case, I could feel the foreign body distinctly in the vitreous. I think that, not infrequently, we draw the foreign body up to the opening, and that it is then scraped off as the instrument is removed.

DR. SAMUEL B. ST. JOHN, Hartford. — This subject of foreign bodies in the eyeball is so important, and the conditions vary so much that the contribution of single cases can not fail to be of interest. In a case which came under my care last year, a linear piece of steel had been thrown against the cornea, and had passed almost completely through the cornea so that it hung in the anterior chamber, projecting directly towards the lens. The problem was to remove it without injuring the lens. If I opened the anterior chamber the escape of the aqueous would almost certainly have resulted in spitting the lens on the foreign body. I passed a narrow knife into the anterior chamber to bring the foreign body against the back of the cornea, and hold it there while I cut down upon it. In attempting to cut down, the motion communicated to the piece was such as to cause it to fall down upon the lens. Fortunately, it fell in a horizontal position. Withdrawing the narrow
knife the aqueous still remained. It then occurred to me that there would be less danger of wounding the capsule of the lens if the foreign body could be drawn from its central position to a more peripheral one, and I applied the magnet to the cornea at its center, and moved it toward the periphery. I found that the attractive force of the magnet was such that when this procedure was applied, the piece of steel followed the magnet. In this way it was drawn to the external surface of the iris, at a point where it was easy to make an incision at the edge of the cornea, and remove it with the electro-magnet.

In regard to gunpowder injuries. Two years ago I had a patient in whom a fragment of gunpowder had passed through the edge of the cornea, through the iris and edge of the lens, causing partial traumatic cataract. It lodged in the vitreous, and is there to-day. There was incarceration of the iris, which I did not meddle with, and there is distortion of the pupil, but vision is not essentially impaired.

The Society will remember that I reported at the Washington meeting a case in which the extraction of a foreign body, eight millimetres in length, was accomplished from the posterior portion of the vitreous by the electro-magnet, which was introduced three times. The resulting vision was 25/xxx. That case has remained under observation, and there have been no degenerative changes, and I trust that there may be none.

DR. H. F. HANSELL, Philadelphia.—I have now under treatment a patient with a grain of gunpowder in the anterior chamber. It is in the lowest part of the anterior chamber against the iris and cornea. I am treating it with palliative measures, and I am pleased to find that the piece of powder is gradually becoming absorbed.

DR. HENRY D. NOYES, New York.—The chief advocate of the removal of the foreign body has been to Hirschberg, and has recently summed up his experience: "In 65 cases, where the foreign body was in the vitreous, the magnet was used only for exploration in 24, and of these 9 had enucleation, 10 had sight, and 4 saved the globe. Of the 41 extractions, 28 had enucleation, soon or late, 7 saved sight permanently, 6 preserved the globe without sight. Enucleation was done in 57% ; sight was saved in 26% ; the globe saved without sight in 17% ."

A case, such as Dr. Bull referred to, came under my observation. A man with a traumatic cataract wanted this removed. I succeeded in removing a capsular cataract, and then found that the cause of the cataract was a foreign body on the fun-
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dus. There was considerable amblyopia from choroiditis, but the foreign body had created no disturbance in the eye.

I should like to ask attention to the real thing which makes the interest in these cases of foreign body. The real thing is the liability to mischief, not only of the eye involved but also of the fellow eye. While we are alive to the importance of sympathetic ophthalmia, I should like very much if we would all give our attention to ascertaining if possible the mode of action of the sympathetic process, when it does attack the fellow eye. My reason for referring to this is the occurrence of a case, during the last year, in which the propagation by way of the optic nerve has been most absolutely proven. A child had received a wound of the eye from a piece of glass. There was prolapse of the ciliary body and iris, and the patient was sent to the eye infirmary. I kept the case under observation. The eye seemed to do well for weeks. I had occasion to be absent for a short time, and did not see the case for ten days. On my return, I found that the vision of the other eye had become impaired, and that the impairment was due to neuro-retinitis without ciliary or iritic trouble. It was a clear case of optic neuritis from the affected eye. This is one of the comparatively few cases in which this method of propagation has been clearly ascertained. I enucleated the injured one, and put the child on mercurials, and the process was stopped and vision, nearly normal, secured.

My only explanation of such a case is septic propagation from the wound itself, and that septic organisms had been introduced at the time of the injury. I think that this is of the greatest importance in the present attitude of our knowledge of sympathetic ophthalmia.

DR. WILLIAM H. CARMALT, New Haven.—To my mind the question of sympathetic ophthalmia is of more importance than that of the injured eye, because that involves loss of both eyes. I think that we cannot be too careful to advise in the first place the removal of the foreign body as soon as possible; and in the second place, the removal of the eye if evidences of inflammation keep up. In regard to this point, I had a case several years ago in which I think that four other members of the Society were consulted. A young man came to me with the history that two hours before he had been injured in the eye with a piece of steel. Vision of the injured eye was almost as good as that of the other. The eye was firm, and anterior chamber in good condition, and apparently no evidence of trouble. Atropia had been put in by the physician who had first seen the case. I, at first, doubted whether there had been
penetration of the eye. He was conscious of no difference in
the vision of the two eyes, and only knew that he had been
struck with a piece of steel in the eye. With the ophtham-
scope, I found almost in the center of the lens a little darken-
ing of the radial fibres of the lens, and careful oblique illumination showed the line of penetration of the cornea, directly in
the center. There was no blood in the vitreous, but at one
point there was a little reflection from the fundus, which made
me think that there was something wrong there. I told the
patient that there probably was a foreign body there, but that I
thought that it had lost its force in going through the lens, and
had not injured the retinal vessels. Not having at hand a mag-
net, and as there was no positive indication for operation, I
advised waiting. He then left my office, and I did not hear
anything more from him for two weeks, when I wrote to his
physician and inquired about the case. I learned that after he
left me he had taken the next train for New York, and had
gone to see Dr. Knapp, but he was out. He then went to Dr.
Noyes. Dr. Noyes told him that the foreign body was there,
and rather advised enucleation. He then went to Dr. Roosa
who told him that he had a traumatic cataract, and had better
have it taken out right off. Dr. Emerson seeing the case at
the same time doubted whether there was anything in the eye,
and thought that it had better be let alone. The patient then
returned to Dr. Knapp’s office. The doctor said that he
thought that the foreign body was there, and that the proper
thing was to remove it, and at once proceeded to remove it
with the magnet. An incision was made in the equatorial
region, the magnet introduced, and I am told that the foreign
body jumped across the vitreous to the magnet with such force
that the bystanders heard the click. It was successfully re-
moved. This is the report of the case as it was given to me,
coming through a fourth party. The patient remained in New
York under treatment for some time. There was severe in-
flammation of the eye, which eventually atrophied, and I am
told it had to be removed a year later to avoid sympathetic
trouble.

The successful removal in a short time with as little injury
as is possible, therefore, does not always save the eye from
atrophy and subsequent degeneration.

In regard to the question of the way in which sympathetic
ophthalmitis occurs, that is a very important matter. We
know that even a long period of quiescence does not remove
the danger of sympathetic trouble. The report of the Commis-
sion of the Society of the United Kingdom shows that there is
no time after which sympathetic ophthalmitis may not de-
velop. I have had cases within a short time where the injury occurred thirteen years ago, and the eye had to be removed for sympathetic trouble, which was a cyclitis. There are cases reported by the Commission in which the sympathetic trouble did not develop until after twenty years had elapsed.

The case referred to by Dr. Noyes is of interest, as showing a double cause for the sympathetic disease. Dr. Knapp and the late Dr. E. Loring have reported cases of sympathetic neuritis. We are obliged to consider the question raised by Dr. Noyes as to whether there may be two forms of sympathetic inflammation. The usual form is that of reflex irritation through the ciliary nerves; but the cases reported by Dr. Noyes and others go to show that in a certain number of cases the inflammation may possibly be of a septic character. Deutschman claims that he had proved that sympathetic inflammation is always due to septic infection, but Dr. Randolph of Baltimore in a series of experiments in the Johns Hopkins laboratory in connection with Dr. Welch, has I think shown that septic infection has very little to do with the great number of cases. Indeed, the history of sympathetic inflammation occurring so long a time after the reception of the injury is different from that of the ordinary forms of septic trouble. We do not get septic troubles several years after the injury. The evidences of sepsis are immediate. If sympathetic ophthalmitis is of a septic nature, we should expect it to manifest itself immediately after the injury and not after an indefinitely long period of quiescence. We cannot say positively that it is not so, but the evidence is that it is so, it is so only in a limited number of cases. I shall not deny that there may be two modes of getting sympathetic trouble,—one through the medium of the ciliary nerves, and the other by septic inflammation in the optic nerve tracts; but the former is the rule.

Dr. Samuel Risley, Philadelphia.—I have reported two cases of unquestionable sympathetic neuro-retinitis, one in 1876, and the other two years ago before this society.

Dr. J. A. Andrews, New York.—In regard to the question raised by Dr. Carmalt, that where a foreign body has been in the eye for some time, say several months, and the purulent inflammation excited by it has apparently disappeared, it is improbable that such a foreign body would again give rise to purulent inflammation, or that the sympathetic inflammation which the foreign body might excite in the fellow eye would be a bacterial inflammation. I have seen a case of sympathetic ophthalmia occur eight months after the purulent inflammation
(purulent panophthalmitis) had apparently entirely disappeared, in which bacteria were found in the sympathetically inflamed eye. The foreign body had, in the first instance, given rise to purulent panophthalmitis, and after this eye had, apparently, been free from irritation for three months, a slight blow with a towel on the injured eye (still containing the foreign body) gave rise to a purulent panophthalmitis and in the fellow eye to a sympathetic inflammation. The sympathetic ophthalmia was not a purulent inflammation.

DR. R. W. RING, New York. — I can add one case where I removed the eye two years ago on account of iritis where the injury was received twenty-seven years previously.

DR. R. A. REEVE, Toronto, Canada. — Some time ago a young man twenty-eight years of age consulted me. He had injured the eye a month previously. There was defective vision, and I found detachment of the retina. Six months later he came with the eye in a glaucomatous condition. I did paracentesis and iridectomy. Then a second iridectomy. The eye became hard and there were evidences of tumor. I advised enucleation, which was done six weeks after the onset of the glaucoma. I found a melanotic sarcoma occupying about one-sixth of the space of the vitreous chamber. Its size was eight by ten millimeters. In view of the fact that in a series of 350 cases the average age was 46 years, and that in one hundred cases Langford found in seven per cent. that the tumor had followed trauma, and as in this case the growth appeared seven months after the injury, I thought that in this case the development of the tumor could be ascribed to the trauma.

DR. W. H. CARMALT, New Haven. — What is Dr. Andrews’s reason for supposing that in his case the sympathetic ophthalmia was an infectious process?

DR. J. A. ANDREWS, New York. — The evidence furnished by the microscopic examination. The patient died suddenly—it was believed from heart disease. An autopsy was not permitted, but I removed the eyes. I admit that the absence of the evidence which an autopsy might have furnished, vitiates the value of this case as illustrating the theory that sympathetic ophthalmia may arise from the simple migration of bacteria to the second eye. There may have been other pathological processes in the body which might have explained the migration of the bacteria found in the sympathetically inflamed eye. But the point I wish to make is that an encapsuled foreign body may possess infectious properties. We have an illustration of an analogous condition in cerebral abscess. We
know that cerebral abscess may become encapsuled and remain latent for months.

Dr. W. F. Mittendorf, New York.—There is a point in the history of the case reported by Dr. Bull which probably has not been communicated to him and which to my mind alters that case considerably. The relatives and friends of the child had noticed a peculiar appearance of the eye during the preceding summer. The injury occurred on Thanksgiving day. I had occasion to see the child in the early part of February, and I found the intraocular changes so extensive that I thought that they could not have progressed so far in the two months following the injury. I think that the glioma existed long before and that the injury was only a complication. I may be mistaken, but I doubt if, as a rule, glioma is of traumatic origin. We all know that sarcomatous growths frequently follow an injury. I think that the point to which I have referred was not communicated to Dr. Bull.

Dr. Charles S. Bull, New York.—All that I can say is that careful inquiry was made of the father, the only living parent of the child, who said that he knew that the eye was perfectly sound previous to the injury. Another point which Dr. Mittendorf mentions is that gliomata are not all traumatic. No one says that they are,—the vast number are non-traumatic. There are, however, a number of cases, more than twenty, on record of glioma secondary to traumatism and supposably due to traumatism.

Dr. Samuel Theobald, Baltimore.—Dr. Noyes spoke of his case as though the method of transmission was perfectly clear,—that there was a progressive optic neuritis. On the contrary I think that it is begging the whole question to assume that sympathetic inflammation, because appearing as a neuro-retinitis, is necessarily transmitted through the optic nerve. Some years ago I pointed out in a paper on the pathogenesis of sympathetic ophthalmitis that the posterior pole of the eye is especially rich in ciliary nerve supply, and that the assumption that sympathetic neuro-retinitis is transmitted through the optic nerve or its sheath is unwarranted. Next to the ciliary region, the posterior pole of the eye would appear to be, because of this rich nerve supply, the most probable seat of sympathetic trouble. Another point that occurs to me is that if the secondary inflammation be of septic origin, enucleation of the primarily injured eye ought not to have an appreciable influence on the inflammation of the second eye. If the septic germs have already found their way to the second eye, removal of the primarily in-
jured eye should have no effect upon the sympathetic process. It is a pure assumption to say that the inflammation necessarily traveled along the optic nerve or lymph sheath because it is found at the posterior pole of the sympathizing eye. There, the ciliary nerve supply, as I have said, is especially rich and we may have a neuro-retinitis due to an influence transmitted through the ciliary nerves, as well as an iritis or a cyclitis.

DR. CHARLES W. KOLLOCK, Charleston, S. C.—In a record of experiences with foreign bodies, it may be well to speak of a case that I saw at Wills' Hospital. The patient was an Italian who had injured one eye, and sympathetic irritation developed in the other eye. With the permission of Dr. Schell, I enucleated the injured eye. The foreign body was found and the man said that it had been there for thirty years. That is the longest period that I know in which a foreign body has remained in an eyeball. There was no vision in the affected one, and he did not know how long vision had been lost.

On Sunday last, afternoon, I saw a case in some respects similar to the one reported by Dr. Bull. On Friday last, a lady, while opening a soda water bottle, was struck in the eye by the cork. Vision became nil. I was called in consultation Sunday afternoon. At that time, the pupil was irregularly dilated, as the physician in attendance had put atropine into the eye. There was no vision beyond what might be called light perception, and the ophthalmoscope failed to show any internal injury. There were slight remains of hemorrhage in the anterior chamber. There was no dislocation of the lens, no rupture of the choroid, and no hemorrhage in the retina. The only thing that I could make out was slight indistinctness of the disk. It is too soon after the injury to say what will be the outcome.*

DR. D. W. HUNTER, New York.—Dr. Noyes stated in regard to his case that there was no sign of ciliary trouble. Dr. Noyes was away for ten days and did not see the case, but the first sign of trouble was slight ciliary injection. Atropine showed two posterior synechias, which were broken up. When Dr. Noyes returned there was no sign of ciliary trouble, but there was marked neuritis which was discovered as soon as the pupil was dilated.

DR. CHARLES E. RIDER, Rochester.—In regard to the longest time that a foreign body has been in the eye, I would state that if you look in the Transactions of the New York State Medical Society for 1872, you will find a case reported by

* Since the above discussion took place vision has almost fully returned.
myself where a piece of percussion cap had remained in the eye from 1835 until 1870, and where the eyeball was removed and the foreign body found. The enucleation was done on account of sympathetic irritation accompanied by considerable ambylopia. These symptoms disappeared after the enucleation.

DR. F. BULLER, Montreal, Canada. — In regard to the point made by Dr. Pooley, that we might have secured adhesion of the foreign body by keeping the patient quiet, I would state that the lymph surrounding it was absorbed in a few weeks after the injury, but the foreign body did not escape for many months.

HYALINE BODIES (DRUSEN) IN THE NERVE-HEAD.

BY G. E. DE SCHWEINITZ, M.D.,

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(Photomicrographs by William M. Gray, M.D.)

Since Heinrich Mueller found in preparations from eyes of elderly people, globular masses, 0.0008 to 0.003 mm. in diameter, close to the inner margin of the optic nerve ring, and also that the circular tissue around the optic nerve trunk very often contains a peculiar formation of globular masses, which he suggested might be discovered with the ophthalmoscope, to the most recent communication upon this subject by Terson, more than a score of communications have appeared concerning an affection of the nerve-head characterized by the formation of small excrescences in its tissue, which have been called globular masses, hyaline bodies, hyaline verrucosities, and "drusen" of the optic papilla.

It is evident from an examination of the cases which have been reported that they may be variously classified. For example, Nieden, writing from the ophthalmoscopic standpoint, shows that the globular formations may arise: (1) As a nonsenile occurrence in young persons; (2) As wholly confined to

‡ Archiv d’Ophthalmologie, June, 1892, p. 367. This paper contains a complete bibliography.
§ Loc. cit.
the optic nerve; and (3) As confined to the optic nerve, with
good vision, and in an otherwise normal fundus. That is, they
may occur in association with retinitis pigmentosa, choroido-
retinitis, optic neuritis, and with alterations incident to Bright’s
disease (Nieden, Stood, Ancke, Remak, Oeller, and Gurwitsch);
or they may appear in an eye free from other pathological
changes (Nieden, Jany, Iwanoff). So far as our knowledge of
the nature and origin of these bodies is concerned, the reported
cases naturally divide themselves into those in which the bodies
have been found incidentally in the examination of sections of
eyes, and those in which they have been submitted first to
ophthalmoscopical and afterwards to microscopic examination.
To the latter class the case which I present for your considera-
tion belongs, although the bodies occurred in a nerve-head that
was notably diseased independently of their presence.

Daniel Fix, aged 45, married, a native of France, and a cabinet-maker, was
admitted to the Insane Wards of the Philadelphia Hospital June 21, 1890. Physi-
cal condition negative, with the exception of “a linear scar one-half inch long,
beginning two inches above the external angular process of the frontal bone, and
running backward.” His mental condition was apathetic and forgetful, but no evi-
dences of insanity were present. “His eyesight was poor.”

He was discharged to the Nervous Wards, May 8, 1891, a short time before
which I examined his eyes thoroughly and on many occasions. The V. equaled
counting fingers at three and six feet, respectively. The pupils were round and
acted equally, though slowly, to the reactions of shade and light. The form field
was concentrically contracted; the color field was not measured.

In each eye the ophthalmoscopical appearances were closely similar: An oval
slightly prominent papilla, grayish white in color, and largely devoid of capillarity.
In a circle, slightly within the apparent margin of the nerve-head, were a number
of globular masses. These were most prominent above, where they seemed to
overlap the border, and, particularly in the right eye, were capped with shining
particles which glinted like cholesterin crystals. The center of the disc was
filled in, the lamina cribrosa was obscured, the vessels were not much changed in
size, and the veins exhibited about their usual degree of tortuosity. Some white
tissue was apparent at the emergence spot of the arteries. There was no change
in the surrounding eye-ground; and no evidence of former inflammatory or hemor-
rhagic condition.

I am indebted to Dr. Francis X. Dercum for the following additional notes:

The man had been an immoderate drinker. About two years ago he had severe
head-pains which confined him to bed for five months, during which time he had
one convulsion. Neither fever, delirium, nor loss of consciousness was present.
There is a history that he was shot in the head twenty years ago.* He had a pecu-

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* Iwanoff found globules (3 out of 5) in eyes which had lost their vision from injury.
In several of Nieden's patients there had been severe injury to the skull. The same condition
has been noted by Gessner.
Figure 1. Hyaline bodies or drusen on each side of the central vessels, showing their position anterior to the lamina cribrosa and their relation to the choroid, from which, however, they are distinctly separated. (× 75).

Figure 2. Drusen more highly magnified; also change in the vessel wall most marked upon the right side. (× 300.)
Figure 3. Single, large hyaline body showing concentric markings, and several smaller bodies detached from the main one. ($\times$ 500.)
De Schweinitz: Hyaline Bodies in the Nerve-Head.

Liar, shuffling gate, while his shoulders were stooped and his head bent forward. Apparently all functions were normal except the eye sight, although, as before stated, there was some mental apathy, and occasionally he complained of pain in the head. During the latter part of the winter of the present year, he died quite suddenly. The autopsy was performed by Dr. Dercum and myself, and the brain and posterior halves of the eyes reserved for microscopical examination by preservation in Muller's fluid. Longitudinal sections of the nerve entrance were prepared by Dr. William M. Gray, and the following lesions were found:

Microscopic Examinations: Anterior to the lamina cribrosa, and on either side of the central vessels, are two oval masses, of whitish color, and composed of a series of smaller bodies in which the markings with concentric lines is very distinct. The mass to the right side is the larger, measuring in its long diameter $\frac{4}{10}$ of a mm., and in its short diameter $\frac{3}{10}$ of a mm. The measurements of the other mass are respectively $\frac{3}{10}$ of a mm. and $\frac{2}{10}$ of a mm. (Figure I). In other words, these sections are compound hyaline bodies. In immediate proximity to these masses are several smaller bodies of like structure, but of somewhat pinkish tint, owing to the absorption of the staining fluid (Figs. I and II). From an examination of a series of sections, it seems likely that these masses represent cross cuts of a ring of hyaline tissue which, of varying circumference, occupied the tissue of the nerve-head in advance of the lamina and surrounded the central vessels, but did not pass beyond the outer margin of the papilla. Even in those sections which have not included the vessels, small hyaline bodies can be seen in the upper central part of the cuts. This arrangement represents what Hirschberg and Cirincione have called a "drusen ring." The tissue surrounding the cavity in which the "drusen" lie is somewhat matted and condensed, probably by pressure. The hyaline body for the most part is separated from immediate contact with the adjoining structures by a clear space, no doubt the result of contraction of the hardening process. Most of the sections show the well marked concentric lines, and exhibit the appearance which has led to a comparison between these bodies and the corpora amylacea (Fig. III), but in some slides the concentric lines and glass-like structure are replaced by a yellowish and more granular composition interspersed with dark granules, indicating a calcareous change.

The optic nerve, in general, exhibits the lesions of well
marked atrophy: Increase in connective tissue, thickening of the bloodvessel walls, and wasting of the nerve fibers. There is marked alteration in the vessel walls, consisting chiefly of thickening of the adventitious coat, and in some of the smaller arterioles in the body of the nerve below the lamina this thickening and condensation of the fibrous coat presents a well-nigh homogeneous appearance. Above the lamina, near the right branch of the central artery, the wall is greatly increased in size, nearly homogeneous, of whitish color, except on the margins, which have imbibed some of the carmine stain, and contains here and there, particularly near the lumen of the vessels, some small semi-transparent drops. This condition seems to be analogous to the hyaline change which has been found and often described in the adventitious coats of arteries.*

(Fig. II.)

In the retina gross lesions are absent, and with the exception of some oedema of the various strata, particularly of the nuclear layers, there is no very evident pathological change. The layer of the rods and cones is entirely absent, or so deficient that it cannot be effectively studied. Wherever vessels are manifest their coats are thickened, but a hyaline change cannot be seen.

The layers of the choroid are well preserved. The lamina vitrea is everywhere intact, and with the exception of somewhat undue filling of the larger bloodvessels, many of which are plugged with blood-clots, there is no special pathological change. The hyaline excrescences which have so often been seen and described in this membrane are nowhere present.

Dr. Dercum has made a most thorough examination of the brain. I append the notes which he has kindly furnished:

"Examination of a large number of sections of the angular gyrus and cuneus of either hemisphere yielded a negative result. The nerve cells, their contents and their processes, are well preserved. Here and there the peri-ganglionic lymph spaces seem a little dilated, but even this appearance is infre-

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* In the sections stained by Weigert's method, the "drusen" have been colored a deep black, but the coat of the vessel has not been affected by the coloring material, indicating that the "drusen" and the altered tissue in the adventitious coat are not composed of the same material.
quent. The neuroglia has undergone no change. The vessels also are normal, although a few of the larger ones appear to have slightly thickened walls. No distinct degenerative change is anywhere present."

I also removed portions of the other cranial nerves and examined them microscopically without finding the slightest lesion.

The notes of the general post-mortem examination follow: Calvarium normal. Dura much thickened; pia and arachnoid thickened, especially at the base. Brain tissues soft and oedematous. Extensive dilatation of all ventricles due to ependymitis. Walls of the ventricles velvety. Infundibulum and floor of the third ventricle cystic and oedematous. In the position of the optic tracts nothing but a slight increase in density in the surrounding oedematous tissue is observed. The optic nerves are apparently shrunk. In the other organs of the body, thoracic and abdominal, no gross lesion is present save very general venous congestion, most marked in the lungs, together with oedema of the bases. Some spots of atheromatous change are present in the aorta and coronary arteries. The spinal cord was not examined.

From these examinations it is evident that the following lesions are present:

(1) Compound hyaline bodies, or "drusen," in the nerve-head, situated in their seat of predilection, within the tissue of the papilla, anterior to the lamina cribrosa.

(2) Atrophy of the optic nerve, which may or may not have antedated the formation of the "drusen," but which evidently was not caused by them.

(3) Thickening of the coats of the arterioles in the optic nerve below the lamina, and above, in the central artery, in the neighborhood of the "drusen," a change in the adventitious coat of the vessel, suggesting the appearance of hyaline degeneration, but shown by a differential stain to be of different composition from the "drusen."

As negative results it may be stated that:

(1) The retina and choroid exhibit no distinct pathological lesion, save some thickening of the vessel walls. Hyaline bodies springing from the lamina vitrea are absent.
The other cranial nerves, so far as examined, were normal.

(3) The investigation of the structure of the brain yielded a negative result, and hyaline changes in the bloodvessels were not present (Dercum).

Nature of the Pathological Material. In the series of sections which I present for your consideration, the ordinary staining fluids have been employed, without special endeavor to utilize reagents that would give some information in regard to the exact pathological nature of the material which has been designated "hyaline." About a year ago Hirschberg and Cirincione* published a communication in regard to "drusen" in the nerve-head. These investigators carefully employed differential reagents, and as their case in many respects is singularly like the one which I report to-day, I may quote some of their results in this respect:

"Concentrated hydrochloric acid affects the yellowish fragments slowly, developing large gas bubbles which form in a wreath around each single piece, but the pieces are not dissolved. This acid does not have any effect upon the more peripheral, round, reddish, rough flakes. On the addition of concentrated acetic acid, exactly the opposite results seems to take place, the acid leaving the central fragments intact and attacking the peripheral flakes. But this is only apparent. The influence of the acid extends only to the tissue between the deposits, which becomes transparent and invisible in the greater part of the microscopical visual field, and not to the concretions, which, on the contrary, become more distinct, due to their power of absorbing light. The concentrically striped pieces do not give any amyloid reactions with safranin and methylviolet; tincture of iodine imparts a yellowish color to them."

From these experiments Hirschberg and Cirincione conclude that the deposits should be regarded as hyaline masses whose more exact composition is unknown, and which are partly calcified secondarily in the interior of the papilla. With the assistance of Dr. Perles, still other reactions were utilized in this in-

*Centralbl. f. prakt. Augenheilk., June and July, 1891.
vestigation. The transparent, faintly yellowish bodies in the head of the optic nerve were proved with the polarization microscope to be, very probably, not crystalized. Viewed simply with the direct and transmitted light, they appeared as broken fragments, with sharp corners, generally provided with acute angles, frequently resembling rhomboidal tables, with a fine substance lying in lamellae. On single, small pieces, a very fine concentric drawing, with faintly colored rings, could be observed, which were evidently due to interference, and pointed to a stratiform arrangement of thin lamellae. To still further investigate their nature, Hirschberg and Cirincione had recourse to micro-chemical reactions, for the details of which I must refer to their original paper. Suffice it to say, that these investigations seem to prove that the bodies were amorphous and organic, but that they did not partake of the nature of cells, neither did they yield albumin, fat, nor glue reactions, and on account of their indifferent behavior toward the most usual solvents, their composition appeared most to resemble that of elastin.

Assuming that the bodies in the case which I describe today are exactly analogous to those which were so thoroughly investigated by these two observers, it is reasonable to believe that their composition is identical, and these results have been quoted as the most authoritative opinion in regard to the nature of the tissue in question. However, the observation with Weigert's stain (see foot note, page 352) should be taken into consideration.

Origin of the "Drusen" and Nature of the Process which Caused them. Two views have been prominently maintained in regard to the origin of the "drusen."

1. They are hyaline excrescences of the vitreous lamina of the choroid, imbedded in the head of the optic nerve and have there become partly calcified, in this respect presenting a senile change. (Müller, Iwanoff, Wedl and Bock, Nieden.*

2 They have nothing in common with the choroidal excrescences, but are the expression of a pathological process con-

* This observer, basing his belief on Kuhnt's observation of the relation of the lamina vitrea to the optic nerve and choroid ring, considers the hyaline bodies as a degeneration product of the lamina elastica of the choroid. His own investigations of this disease, however, depend alone upon ophthalmoscopic examination.
fined to a small portion of the optic nerve, possibly on account of local anatomical reasons, and finding their counterpart in the calcification of other tissues, particularly the cheesy nodules in the lung. (Hirschberg, Cirincione, Gurwitsch.)

The first view depends largely upon the support which was given to it by previous observers, especially Müller and Iwanoff, and also upon topographical relations, inasmuch as the lamina vitrea approaches very near to the optic nerve tissue, the fibres of which curve around this structure on their way to form the retina. In my own specimens it is easy to see the very close relation of the hyaline bodies to the vitreous lamina, and yet, in spite of their immediate proximity, the boundary between the two is unbroken and distinct. Terson,* although admitting the intimate connection which has just been stated, thinks that it is not safe to base an argument upon these topographical relations, but that a decision must be reached by the aid of convincing histological preparations.

Supporters of the second view place no faith in an argument based upon topographical relations. Indeed, according to them this, as has just been intimated, is not correct. The choroid does not exist in the place where the change developed, and consequently there is no vitreous lamina. Moreover, it would seem reasonable, if this view were accurate, that the hyaline bodies should not be located alone in one small confined portion of the optic nerve, and that certain transition stages should be found. Again, a similar process in the choroid as a point of origin ought to be present. Independently of these considerations, the histological aspect of the disease is the one upon which a differential consideration should be based. The choroidal excrescences are more or less extensive masses in concentric layers, attached with a broad base to the vitreous lamella of the choroid, and always project toward the interior of the bulbus. Their surface is covered with epithelial cells more or less developed, and they frequently contain within their interior one or more cells. Their consistency is that of fibrous tissue, but they are not so firm as to prevent an entrance of connective tissue cells and even secondary ossification. The

*Loc. cit.
most satisfactory investigation in regard to their nature seems to indicate that they are a colloid transformation of the protoplasm of the pigment epithelium. The argument just recited is the one employed by Hirschberg and Cirincione in the paper several times quoted, and seems to be convincing, especially when taken into consideration with the differential stains and micro-chemical reactions which these observers employed. The hyaline bodies in question, as they occur in the optic nerve, lack every trace of epithelial covering, and contain neither cells, nuclei, nor pigment. They are not attached with a broad base, but are practically free in the tissue. So far as my own examinations are concerned, they point very distinctly to a confirmation of the results which have just been quoted and of the arguments which are so forcibly used by the observers from whose research they have been abstracted. It may be interesting at this point to refer to the paper of Gurwitsch, who has described these bodies in eyes which were removed from cases of Bright's disease. He is quite in accord with the view that the bodies have nothing to do with the choroidal excrescences. He suggests that possibly the hyaline degeneration precedes an amyloid transformation.

My own case tends to confirm the views of those who believe that the "drusen" in the nerve-head represent a disease entirely distinct from excrescences springing from the lamina vitrea of the choroid. It adds somewhat more to our knowledge of this disease than we have previously been able to obtain, because the examinations include not only the nerve-head, but in addition, the entire optic nerves, the other cranial nerves and the brain, with the practically negative results that have already been recorded—results which seem to emphasize the local nature of the process.

The apparent hyaline transformation of the adventitious coat of a part of the central artery of the retina does not, it seems to me, count for very much when we consider the inflammatory process which must have been present in the optic nerve at some earlier date. According to Hirschberg, in those cases in which the "drusen" occur in the head of the optic nerve in connection with pigmentary degeneration of the retina, their
deposition is favored by the stenosis of the vessels in the retina, and they do not contribute anything to the disturbed vision. Perhaps in this case a similar argument might apply, but I hardly think so, and am constrained to believe that the optic atrophy and the “drusen” are two entirely distinct processes, the atrophy being a condition which probably came on after the compound hyaline bodies had been formed. Moreover, the differential stain to which I have referred before, gives evidence that the “drusen” and the change in the vessel wall are not analogous tissues.

Cirincione, in concluding his report on the microscopic lesions of this disease, says, “the first cause of this hyaline transformation and subsequent calcareous deposit in the papilla, however, remains to be determined, and likewise the reason why it remained confined to this small territory alone, instead of expanding or appearing scattered in other parts of the bulbus. We have not found sufficient proofs to solve this question and therefore, instead of indulging in more or less probable hypotheses, leave the solution of this question to future examinations.” Unfortunately, the present case does not give any information which helps to solve the question which this observer, as well as others before him, have found it impossible to answer.

DISCUSSION.

DR. HENRY D. NOYES, New York.—This lesion does not often make its appearance. I saw it a few years ago in a young man from Chicago. He had had scarlet fever, albuminuria, and neuro-retinitis. I saw him twelve years ago. Vision was normal, and greater in one eye than the other. Since that time I have seen him at intervals. There is no change in vision. There is a pronounced appearance of choked disc. Careful examination shows nodular masses and the minute specks, and the intense white reflex which comes from certain portions of these nodules shows something different from neuro-retinitis. I have seen a few other cases, but they rarely present themselves, and I have seen none accompanied with a serious loss of vision. I agree that the loss of vision must be explained by a different and concurrent affection of the optic nerve tissue.
THE FULL CORRECTION OF MYOPIA.

BY EDWARD JACKSON, M.D.,
PHILADELPHIA, PA.

Statistical studies of ametropia, the natural history of eye-strain, and the behavior of emmetropic and ametropic eyes under the requirements of our present civilization, all support the idea that the emmetropic eye is the ideal eye, that emmetropia is the standard toward which the evolution of the eye has proceeded. The mass of eyes present low hyperopia, that is, they approximate the emmetropic standard from the side of hyperopia — the safe side,— and they approach it with remarkable nearness.

The ametropic eye is at a disadvantage. It has to sustain itself and do its work under conditions to which the delicate balances of its actions and nutrition have not been adjusted by the process of evolution, and that under such conditions, those balances are destroyed, and disease results is not to be wondered at. Further, all statistics of the refraction of the eye in childhood or in races living under primitive conditions, as well as the known requirements of human life up to the late generations of civilized man, indicate, that of all forms of ametropia, the one to which the conditions of nutrition are least likely to be adapted is myopia.
This proposition is supported by all clinical observation. The myopic eye almost invariably presents the evidence of such destruction of the balance of the nutritive processes as constitutes organic disease of its nutritive coat, the choroid. Of the intimate connection of myopia and choroidal disease, there is no question, and without asserting that the myopia is always cause, and the choroidal lesions effect, it must be admitted, that to a considerable extent and in the more advanced cases, such a relation does exist.

In view of these facts, it would seem rational, that when an eye is found working under the disadvantages of myopia, it should at once be placed under the same favorable conditions as the emmetropic eye, that its myopia should be fully corrected and the correcting lens constantly worn, except at such time and to such extent as the emmetropic eye would require the aid of convex lenses for presbyopia. This is, I believe, the proper attitude to take toward myopia. Such treatment to be followed, unless it be clearly and definitely contraindicated, in one of the ways to be referred to hereafter.

It is, however, certain, that on the part of a considerable number of ophthalmologists, there is a disposition to avoid the giving of a full correction for myopia, or a timidity about it that keeps them from giving such lenses for constant use, or induces the advice to use the glasses as little as possible. This timidity is abundantly evidenced in ophthalmic literature and in the practice of colleagues, and was formerly largely shared by myself. To aid in showing that such timidity is mistaken and harmful, I offer a portion of my clinical experience in this matter.

The following are notes of all the cases remaining under observation for three years or upwards, after they commenced the constant wearing of concave lenses, fully correcting their myopia or myopic astigmatism. The letters M. and F. indicate male and female. The age given is that at which the wearing of the full correction was commenced; and the occupation that followed by the patient during the time the correcting lenses have been worn.
Case I.  F., age 31, school-teacher, was ordered:
Left — 0.75 cyl., axis 180°.  Vision = 4 — 4ths.
After wearing these for three years constantly, the refraction and acuteness of vision remained unchanged.

Case II.  M., age 24, bank clerk, was ordered:
Right — 1.75 sph. ⊕ — 0.37 cyl.  axis 45°.  Vision = 4 — 3ds, partly.
Left — 0.75 sph. ⊕ 0.62 cyl., axis 30°.  Vision = 4 — 3ds, partly.
After three years, refraction and visual acuteness unchanged.

Case III.  F., aged 23, housekeeping with reading and sewing, ordered:
Right — 5.50 sph. ⊕ — 1. cyl., axis 90°.  Vision = 4 — 8ths.
Left — 5.50 sph. ⊕ — 0.75 cyl., axis 135°.  Vision = 4 — 8ths.
After three years, refraction and visual acuteness unchanged.

Case IV.  F., age 52, librarian, was ordered:
Accommodation being entirely gone, she was ordered for near work, right — 11. and left — 10.  D.  Previously, she had worn 8 D. lenses for constant use with a pair of — 5.  D. lenses in extra fronts which she occasionally added for clearer distant vision.  After three years refraction and visual acuteness remain unchanged, and the change of glasses has been in every way satisfactory.

Case V.  F., age 45, housekeeping and reading, has ordered for constant use:
This was the full correction for the right eye, but the left required an additional — 8 D. spherical which gave vision = 4 — 12ths, mostly.  She could not use the two eyes together satisfactorily, so the above was given, allowing her to use the
right for distant and the left for near vision. After three years refraction and visual acuteness remain unchanged.

**Case VI.** M., age 36, clerk, was ordered:

Right — 2.25 sph. ⊕ — 1.25 cyl. axis 105°. **Vision = 4–4ths.**

Left — 2.25 sph. ⊕ — 1.25 cyl., axis 65°. **Vision = 4–4ths.**

Three years constant use of the glasses with hard eye work leaves the eyes healthy, with refraction and visual acuteness unchanged.

**Case VII.** M., age 24, architect, was ordered for constant use:

Right — 0.25 ⊕ — 0.50 cyl. axis 115°. **Vision = 4–4ths.**

Left — 0.25 ⊕ — 0.25 cyl., axis 20°. **Vision = 4–4ths.**

After three years the refraction and vision remain unchanged.

**Case VIII.** F., age 16, in school, was ordered:

Right — 0.50 cyl., axis 180°. **Vision = 4–4ths.**

Left — 0.50 cyl., axis 180°. **Vision = 4–4ths.**

Three and one-half years later, the refractive condition and vision were as follows:

Right — 0.25 sph. ⊕ — 1.25 cyl., axis 180°. **Vision = 4–4ths.**

Left — 0.50 sph. ⊕ — 0.75 cyl., axis 180°. **Vision = 4–4ths.**

**Case IX.** F., age 56, a teacher of Latin, in poor general health, was ordered:

Right — 5. sph. **Vision = 5–9ths.**

Left — 6.50 sph. **Vision = 5–9ths.**

These were used for distant vision, while for near work concave lenses three dioptres weaker were given. After four years visual acuteness and refraction unchanged.

**Case X.** F., age 34, housekeeping, was given for constant use:

Right — 0.75 sph. ⊕ — 3. cyl., axis 180°. **Vision = 4–8ths.**

Left — 0.75 sph. **Vision = 4–4ths.**

Four years later her correcting lenses and vision were as follows:
JACKSON: *The Full Correction of Myopia.*

Right — 0.75 sph. $\circ - 3.25$ cyl., axis 170°. Vision = 4−5ths.

Left — 0.50 sph. $\circ - 0.50$ cyl., axis 60°. Vision = 4−4ths.

The improvement of vision in the right eye being, doubtless, of the kind that frequently occurs from the wearing of the correction for high astigmatism.

CASE XI. M., aged 56, an actor, was ordered for distant vision.

Right — 1.25 sph. $\circ - 1.50$ cyl., axis 95°. Vision = 4−4ths.

Left — 0.75 sph. $\circ - 1.50$ cyl., axis 75°. Vision = 4−4ths.

For reading, glasses were given allowing 2.75 D. sph. for presbyopia. After four years he is still using the same lenses with comfort, with acuteness of vision unchanged.

CASE XII. F., aged 27, housekeeping, was ordered for constant use:

Right — 0.75 cyl. axis 170°. Vision = 4−3ds.


Four years later she was found to require the following:

Right — 0.75 sph. $\circ + 1.25$ cyl., axis 82°. Vision = 4−3ds.

Left — 1. sph. $\circ + 1.50$ cyl., axis 90°. Vision = 4−3ds.

The myopic meridian having remained unchanged, and the emmetropic meridian become notably hyperopic.

CASE XIII. M., aged 48, editor, was given for distant vision:

Right — 3.50 sph. $\circ - 0.62$ cyl., axis 95°. Vision = 4−3ds.

Left — 3. sph. $\circ - 0.62$ cyl., axis 70°. Vision = 4–3ds.

For reading he was given glasses with three dioptres weaker sphericals, and after four and a half years, requires the following correction:

Right — 3.50 sph. $\circ - 0.87$ cyl., axis 100°. Vision = 4−3ds.

Left — 3.25 sph. $\circ 0.75$ cyl., axis 75°. Vision = 4–3ds.

Before coming under my care he had suffered from serious
choroidal irritation, and his myopia had been to some extent progressive. There has since been no choroidal change.

**Case XIV.** F., aged 19, student and teacher, ordered for:
Right — 2.25 sph. ⊕ − 0.50 cyl., axis 5°. Vision = 4–4ths.
Left — 2.50 sph. ⊕ − 0.25 cyl., axis 165°. Vision = 4–4ths.

After five years she was found to require:
Right — 2.25 sph. ⊕ − 0.75 cyl., axis 15°. Vision = 4–4ths.
Left — 2.50 sph. ⊕ − 0.62 cyl., axis 165°. Vision = 4–4ths.

**Case XV.** F., aged 12, in school, was brought to me for eye-strain. Under full mydriasis, she was found to be emmetropic with vision equal 4–3ds partly in each eye. With other measures she was given convex spheralics of 1. D. combined with prism 1° base in for use in reading and studying, and was entirely relieved. Two and one-half years later, she returned and was found to require the following correction, which was prescribed and worn constantly:
Right — 0.50 sph. ⊕ − 0.25 cyl., axis 110°.
Left — 0.25 spherical.

These for a time also relieved her, but two years later she required:
Right — 1.75 ⊕ − 0.62 cyl., axis 110°.
Left — 1. sph. ⊕ − 0.25 cyl., axis 60°.

Vision has remained the same, and since the last change of glasses four years have elapsed without material change of refraction.

**Case XVI.** M., aged 16, student, ordered for constant use:
Right — 1.75 sph. ⊕ − 0.37 cyl., axis 80°. Vision = 4–3ds.
Left — 1.75 spherical. Vision = 4–3ds.

This patient came with a very clear history of myopia recently progressive, and its course was immediately checked, although near work was continued as before. Two and one-half years later he was found to require:
Right — 2. sph. $\circ - 0.37$ cyl., axis $65^\circ$.
Left — 1.75 sph. $\circ - 0.37$ cyl., axis $80^\circ$.
Since then three years have elapsed, and he has continued
without change of vision or refraction.

**Case XVII.** F., aged 11 years, at school, required and was
ordered:

Right — 6. sph. $\circ - 0.50$ cyl., axis $90^\circ$. Vision =
4 - 5ths.
Left — 6. sph. Vision = 4 - 5ths.

These have been worn constantly for five years without
change of visual acuteness or refraction.

**Case XVIII.** M., aged 28, book-keeper, was ordered:

Right — 1.25 sph. $\circ - 0.50$ cyl., axis $110^\circ$. Vision =
4 - 3ds, partly.
Left — 1.25 sph. $\circ - 0.75$ cyl., axis $10^\circ$. Vision =
4 - 3ds, partly.
For a little time he was given weaker spherials with the
same cylindrical lenses for close work, but soon gave them up.
After five years his refraction was:

Right — 1. sph. $\circ - 0.37$ cyl., axis $115^\circ$.
Left — 0.75 sph. $\circ - 1.37$ cyl., axis $5^\circ$.

Vision remained unchanged.

**Case XIX.** F., aged 14, in school and subsequently teach-
ing, ordered:

Right — 2.75 spherical. Vision = 4 - 4ths.
Left — 1.50 sph. $\circ - 0.50$ cyl., axis $35^\circ$. Vision =
4 - 4ths.

This patient came with history of increasing near-sightted-
ness, for which she had been using, for about a year, concave
1.50 spherials for distant vision. The disks were obscured
by pink striated swellings, the neighboring retina swollen and
hyperæmic, the choroids “fleecy,” and the best obtainable vis-
ion = 4 - 6ths. After ten days’ use of duboisine, her vision had
improved to that given above, the swelling and hyperæmia had
subsided, and a narrow crescent of choroidal atrophy was visible
at the temporal side of the disk. After this, with the constant
use of the glasses, vision remained clear and satisfactory for
several years. Then she noticed gradual failure of distant vis-
ion without other inconvenience, and at the end of six years
was found to require:
Right — 4.50 spherical.
Left — 3. sph. — 0.37 cyl., axis 25°.

In two years that have elapsed since, there has been no
change of refraction, and vision is as good as ever. During
the whole period she had been engaged in exacting eye work.

Case XX. M., aged 49, merchant, was given for distance:
Right — 0.50 sph. ⊕ — 3.25 cyl., axis 33°. Vision =
4 — 4ths, partly.
Left — 0.75 sph. ⊕ — 4.25 cyl., axis 160°. Vision =
4 — 4ths, partly.

And for near work 2. D. spherical was allowed for presbyopia.
After six years his visual acuteness was unchanged, and he re-
quired the following correction:
Right — 3.50 cyl., axis 33°.
Left — 0.37 spherical ⊕ — 4.50 cyl., axis 163°.

Case XXI. F., aged 34, book-keeper, came for acquired
myopia and difficulty of a week’s standing with the vision of the
left eye. She had a small partial central scotoma due to acute
choroiditis at the macula. This promptly yielded to treat-
ment, and she was ordered:
Right — 1.25 sph. ⊕ — 0.50 cyl., axis 100°. Vision =
4 — 4ths.
Left — 1. sph. ⊕ — 0.25 cyl., axis 180°. Vision =
4 — 4ths.

She was also given glasses with weaker spherials for near
work, which have been used considerably from time to time.
At the end of seven years she requires:
Right — 1. sph. ⊕ — 0.87 cyl., axis 95°. Vision =
4 — 4ths.
Left — 0.87 spherical. Vision = 4 — 4ths.

Case XXII. F., aged 24, art student, and later house-
keeping, was ordered:
Right — 5. sph. ⊕ — 1.25 cyl., axis 35°. Vision =
4 — 8ths, partly.
Left — 3. sph. ⊕ — 1.25 cyl., axis 140°. Vision =
4 — 4ths.
Jackson: The Full Correction of Myopia.

She has worn these glasses constantly seven years. Vision remains unchanged for a distance. She states "they meet every requirement," and that the eyes "never ache or give any trouble." But as her eyes have not been recently tested, there may be some decrease of myopia.

Case XXIII. F., aged 17, student, teacher, and journalist, was ordered:

Right — 3.75 sph. ∞ — 0.50 cyl, axis 10°. Vision = 4—5ths.


After four years it was found that she required:

Right — 3.50 sph. — 0.75 cyl., axis 15°. Vision = 4—3ds, partly.

Left — 3.50 sph. — 0.37 cyl., axis 150°. Vision = 4—3ds, partly.

These glasses have now been worn four years, vision is unchanged, the eyes quite comfortable and the fundus normal.

Case XXIV. F., aged 14, student and teacher, was ordered:


Left — 5.75 spherical. Vision = 4—6ths.

After six years she returned with trouble with her eyes and the habit of looking obliquely through her glasses, and was found to require:


Left — 5.75 sph. — 0.87 cyl., axis 175°. Vision = 4—4ths, partly.

These latter glasses she has worn for two years without farther change or trouble.

Case XXV. F., aged 21, housekeeping, great reader, was given:


These were worn constantly for five years. Then a — 0.50 cyl., axis 180° was added to the left eye, and she continued to use them without any change of acuteness of vision or trouble with the eyes until her death four years later.
Case XXVI. F., aged 32, music teacher, had irregular astigmatism and increasing myopia, for which she had worn concave 3 D. sph. She was given for constant use:


These have been worn for nine years without change of visual acuteness or trouble of any kind with the eyes.

Case XXVII. M., aged 17, student and book-keeper, came with a history of myopia increasing for two or three years. He was ordered:


Three years later his eyes were still comfortable and acuteness of vision unchanged. But about eighteen months after that, he returned with symptoms of eye-strain and imperfect distant vision. He was now found to require and was ordered:

- Right — 5.25 sph. ⊙ — 0.25 cyl., axis 30°. Vision = 4—3ds, mostly.

Two years later, after a period of profound anemia and disturbance of general health, he returned and was given the following correction:

- Right — 5.50 sph. ⊙ — 0.75 cyl., axis 60°. Vision = 4—3ds, mostly.
- Left — 5 sph. — 0.50 cyl., axis 120°. Vision = 4—3ds, mostly.

Since then two years have elapsed without farther change of refraction or evidence of disturbance of ocular nutrition.

A review of the above shows, that of the twenty-seven cases nineteen showed no change in the amount of myopia of over one-quarter dioptre, during the periods that they were under observation, varying from three to nine years. That in five cases, 8, 15, 19, 24, and 27, there was some increase of myopia; and that in three cases, 12, 20, and 23, the myopia diminished. It is however of equal importance to observe, that in no case was there any diminution of visual acuteness, that all cases of
increase of myopia were between the ages of twelve and twenty-five years, and that in every case the full correction of the myopia checked, at least, temporarily, the increase and the progress of disease in the eye, and gave relief from the symptoms of eye-strain, which in a large proportion of cases brought the patient to seek professional aid.

In cases 4, 5, 9, 11, 13, and 20, the patient having passed the age of forty-five, allowance had to be made for presbyopia; but except for near work, the full correction was worn constantly, without increase of myopia or other unpleasant effect in any case.

The cases above reported are all that I have treated in private practice by the constant use of the full correction, that have remained under observation three years or upward. In addition, I have had a considerably larger number that were under observation for shorter periods, in none of whom have I reason to think there has since been increase of myopia or other unfavorable symptoms, although it is not unlikely that such cases have occurred. The cases that might be considered unfavorable, those in which there was subsequent return of asthenopia and increase of myopia, are all included in the above series. I can furnish an equal number of unfavorable cases from a much smaller series of similar cases treated by partial corrections before becoming satisfied of the superiority of the plan of full correction.

If clinical experience makes such favorable report of the plan of full correction, and I believe that my experience in this respect will not be found exceptional, it will be of interest to inquire why it has been regarded with doubt, or the practice directly opposed by so large a number of writers and practitioners. Apparently this attitude is due to a fear that use of the accommodation is likely to cause increase of myopia. This fear is readily recognized in the teachings of many ophthalmologists, as in this statement which Landolt (Refraction and Accommodation of the Eye, English Edition, p. 490) emphasizes by printing in small capitals. "A myope must be prohibited from wearing a concave glass for any distance at which he can see clearly without accommodation."
It is taught that use of the accommodation tends to increase the intraocular tension. In support of this, reference is sometimes made to certain experiments upon the lower animals. But of these experiments, it is only needful, in a clinical paper, to remark that their results have, on the whole, been utterly contradictory, and that the conditions of experiment are so different from those of physiological accommodation, as to make even definite and confirmed results inapplicable to the question under consideration.

Next, there is adduced the phenomenon to which attention was first called by Graefe, that if, during the ophthalmoscopic examination, the patient be induced to make a strong effort of accommodation, there occurs a visible increase in the pulsation of the retinal veins. The observation as to this increased pulsation is easily verified; and the most probable explanation of it is that of increased intraocular tension. But the inference that this increase of tension is due to the use of the accommodation, is not so well founded. No such exertion of the accommodation as is required to cause the increased pulsation is possible without increased innervation of the lateral recti muscles, if not actual convergence of the visual axis. And in view of the compressing effect, that contraction of the recti muscles necessarily exerts on the globe, it is entirely gratuitous to attribute any accompanying change of tension to exertion of the accommodation. Furthermore, the pulsation occurs under similar effort in eyes in which the accommodation is completely paralyzed by a mydriatic.

Again, it is frequently stated, that the power of accommodation is essentially less in myopic than in hyperopic and emmetropic eyes, and this statement is commonly supported by references to alleged differences in the ciliary muscle in myopic and hyperopic eyes, and a plausible explanation of why we ought to expect the accommodative power to be less in myopes. As a matter of careful observation, I do not find any general or essential deficiency in the accommodative power of myopic eyes. And where at the first trial some deficiency is found, it rapidly disappears with the constant use of the correcting lenses.

The best reason for fearing harm from accommodative effort
in myopia is found in our acquaintance with its disastrous effects in other forms of ametropia. The retinal and choroidal changes of eye-strain are constantly before our minds, and they are, without doubt, often associated with undue effort of accommodation. But it should be remembered that for the accommodation, as for every other function, there is a normal activity as well as an abnormal one, there is use as distinguished from abuse, and that the one is probably as important a factor in sustaining the ocular health as the other is in developing disease.

In this connection let me submit this thought. It is probable that there is some method of physiological compensation for increased functional activity within the eyeball by an increased secretion and outflow of fluid. Now from what we know of the relation of the ciliary body to the intraocular nutritive supply, and its relation to the paths of outflow, it is extremely probable that the act of accommodation does exert a decided influence upon the nutrition of the eye, and that the exertion of the accommodation in some such manner as it is exerted in emmetropic or slightly hyperopic eyes is an important factor in sustaining the intraocular health. It is not unlikely that certain choroidal conditions, common to myopic eyes, and those that are suffering from senile degeneration, are directly due to the absence of active accommodation.

Finally, those who do not practice the full correction of myopia feel confirmed in their position by the frequently manifest injurious effects of partial corrections. They reason, that if the wearing of a weak concave lens is disastrous, the wearing of a stronger one would be more disastrous. But in this they err, failing to appreciate that the wearing of a partial correction of myopia is necessarily more dangerous than the wearing of a full correction. The reason of this is, that the myope with a partial correction will, in the effort to see as well at a distance as possible, look obliquely through his glasses, and so get the effect of a tipped or obliquely placed lens. What this effect is has been well-shown by Pickering and Williams, Proceed. Am. Acad. of Arts and Sciences, 1874–75, by Dr. G. Hay, Transactions of the American Ophthalmological Society, 1875, page 319, and by Dr. John Green, in the same for 1890, page 690.

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In 1887 I called attention to its practical influence in a paper read before the Section on Ophthalmology of the American Medical Association (Journal of the Am. Med. Assoc., Nov. 19th). But it is still far from being so generally appreciated as its importance demands. This looking obliquely through his correcting lenses causes the myope to receive heterocentric or astigmatic pencils of rays, exposing him to all the dangers of uncorrected astigmatism, aggravated by the fact that with every movement of the head or eyes the amount of such astigmatic effect varies.

Of the conditions contraindicating the constant use of the full correction for myopia, coexistent presbyopia has already been alluded to. Being universally recognized, no more need be said of it. But allied to it is the condition of a few younger patients doing large amounts of near work, who get along better if myopes with an under correction, if hyperopes with an overcorrection, for near work, and even though emmetropic are helped by convex glasses. Two of the patients in the above series were of this class, at least temporarily. Such cases may be suspected from their history and certainly recognized by trial. But it must be emphasized that they are in myopia, as in other refractive conditions, quite rare.

A second contraindication is such diminution of visual acuteness that perfect focusing of the rays falling on the retina is not appreciated. Here there remains no need for giving the full correction, and little danger from the partial correction, while to get the largest retinal image the weakest lens compatible with such vision as is attainable is indicated. Similar in effect is the condition reached by old myopes, when on account of long familiarity with them they prefer the large blurred image of uncorrected or partly corrected myopia to the small, sharp image of full correction.

Another class of cases to which the full correction should not be given, the only class to which Landolt's dictum, above quoted, applies, is that in which binocular fusion has been partly or wholly given up in the interest of better monocular vision. If relative divergence is fully tolerated, the strain of convergence, which is one of the great indications for the use of the
correcting lenses, no longer exists; but is liable to be excited consensually by efforts at accommodation. As this class includes many high myopes its exception is an important one.

In this connection it should be mentioned that the inconvenience and even pain excited by the first attempts to wear strong correcting glasses are not a contraindication to their continued use. These may be tempered to the impatience or skepticism of the patient by partial correction or interrupted use of the glasses; but they are of precisely the same significance as the cramp or soreness produced by any other unfamiliar exertion and co-ordination of muscular effort. They are always temporary, and usually trifling in comparison to the benefit soon realized from persisting in the effort.

CONSTANT CORRECTION OF HIGH MYOPIA.

By GEORGE C. HARLAN, M.D.,
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Perhaps I should hardly have dared to bring so trite a subject as the correction of myopia before this meeting, but when Dr. Jackson assured me recently that he had the temerity to do this thing, it occurred to me that my private records might furnish, as illustrations, the cases of some patients who had worn strong glasses for a good many years. I remember, when a member of the International Congress in New York in 1876 intimated a desire to know the practice of his colleagues as to the constant correction of myopia, hearing a youthful ophthalmologist sitting near me mutter contemptuously, "Why does he take the time of the Congress with that? Why don't he go read his text-books?" It is probable that that was just what he had been doing, and that it was the unsatisfactory result of his investigation that induced the question. He did not take up much of the time of the Congress, however, as the question was ignored. There seemed to be a general impression that it was finally settled, though if each one had given his opinion as
to just how it was settled, there would probably have been considerable diversity. At any rate, after sixteen years more of ophthalmological progress, comparison of textbooks, papers that appear from time to time in medical journals, discussions in societies, talks with colleagues, and the occasional examination of floating patients who have been under treatment at home and abroad, show that there is far from being a general consensus of opinion on this important practical subject and that it is still one, like Sancho Panza's puzzling legal case, "concerning which many things may be said on both sides." For myself, a rather careful experience of a good many years has convinced me that excessive convergence without accommodation is the most important factor in progressive myopia, and that our most valuable therapeutic measure is the restoration, as nearly as possible, of the normal relation of these two functions.

As I have included only cases which I have chanced to have an opportunity to examine after a full correction of from 4 D. upward had been worn constantly for more than five years, I have been greatly disappointed with the smallness of the number, but have taken some comfort from the reflection that no news is, to a certain extent, good news, as patients are not only likely to return if their glasses prove unsatisfactory, but are prone to attribute a great variety of ills to the delightfully tangible cause of a pair of spectacles. These may at least serve as a text and an excuse for expressing my opinion.

Case I. P. N., school boy, aet. 14, Dec. 23, '74. Has never worn glasses. O. D. and O. S. with —7.5 D. & 1/8. With correction can read only 4.5 Sn. and not nearer than 20". Slight partially atrophied crescents to outer side of discs. Otherwise normal. Rx. — 4 D. in spectacles for constant use and — 4 in eyeglass to be added occasionally for distance. June 6, 1875, has a near point of 8" with full correction and V. = 2 3/8 Rx. Franklin glasses. July 9, 1875, has now P. = 3 1/2" with full correction, Rx. — 7.50 D. constant. June, 1886, V. = 3 3/8 sharp—and no increase M. after eleven years.

mydriatic) atrophic crescents, with —16 D. reads at 6". Rx. —16 D. constant. Nov., 1883, with atropia — O. D.—18 D. $\frac{4}{8}$ and O. S.—16 D. $\frac{2}{8}$. P = 4$\frac{1}{4}$. July, 1892, with —16$\frac{4}{8}$ and reads No. 1 Sn. at 4". Uses eyes freely without discomfort. No increase in M. or diminution in V. in seventeen years.

**Case III.** H. S., school-girl, age 12, April, 1877, O. D. and O. S., with —8 D. $\frac{4}{8}$. Can't read with full correction. Atrophic crescents about $\frac{1}{4}$ d. wide and some thinning of choroid beyond. Macula sound. Rx. —5 D. for present. One week later Rx. —6.50 D. Three weeks later, Rx. —8 D. with which P. = 4" and V = $\frac{2}{8}$. No mydriatic used at this time. April, 1883, O. D. with atropia — 9 D. —1.50° 40° $\frac{3}{8}$. O. S. with atropia — 8.25 —75°, 30° $\frac{2}{8}$°. No change in fundus. After wearing —8 D. constantly for six years, there was very slight increase of M. with development of a low degree of As., and an improvement in V.

**Case IV.** Mrs. J. M. P., aet. 25, Nov., 1877.

O. D. (atropia) —5 —1° ax. 10
O. S. " —5 —1° ax. 20 \{ V. = $\frac{2}{8}$.

Sharp, narrow, crescents out. Otherwise normal. P. = 4", but some fatigue and strain in use. Rx. —3$\frac{1}{2}$ constant; a month later — 4; six weeks later, full correction; no asthenopia.

Jan., 1892, O. D. — 5 D. —2° ax. 15 \{ V. = $\frac{4}{8}$°.
Jan., 1892, O. S. — 5 D. —1° ax. 20 \{ V. = $\frac{2}{8}$°.

After wearing —5 D. constantly for fifteen years the spherical correction remains exactly the same. There is a very slight (doubtful) increase in As., and rather an improvement in V.

**Case V.** Miss E. T., aet. 20, Dec., 1877.

O. D. (atropia) —5 = $\frac{3}{8}$°.
O. S. " —4 = 1.25° ax. 30 $\frac{3}{8}$°.
P = 4". Eyes very irritable. Fundi normal. Rx. —2.75; a month later full correction.

Sept. 1890, O. D. — 5 V. = $\frac{3}{8}$°.
O. S. —3.25 —2.25° ax. 30 $\frac{3}{8}$°.

After wearing —5 in one eye and —4 with 1.25° in the other for thirteen years, the refraction of the former is unchanged, and in the latter there is rather less myopia and a little increase in As. Vision decidedly improved.
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Case VII. Miss M. R., school teacher, aet. 20, Feb., ’78. Always short-sighted; comes on account of severe and almost constant pain in eyes, forehead, and occiput. No asthenopia, under atropia, O. D. —4.50 —75° ax. 170 and O. S. —4 —50° ax. 165 V. = 3/8 P. = 4". Fundus in each normal. Rx. Full correction for constant use. Oct. 1885, nearly eight years afterwards, no increase in M.; no diminution of V.

Case VIII. Miss A. F. W., student, aet. 18, April, 1881. Always short-sighted. Has been using glasses for six or seven years. Has —5 for distance and occasionally uses them for near; covered eye deviates in near V. without glass — fixation perfect with glass. Fundi normal. Under atropia O. D. and O. S. —5.50 4/8? P = 6" with correction. Rx. full, constant. July, 1892. Without mydriatic O. D. —6 D. O. S. —7 D. 2/8? After more than eleven years an increase of about .50 D. in one eye and of 1.50 D. in the other and V. stationary. Has used eyes very freely.


May, 1889, with homatropine:

July, 1892, with same correction 3/8, some of 15, P. = 5". In ten years no increase M. and decided improvement in V. (possibly from more perfect correction).
CASE X.  H. R. C., school boy, aet. 16, Sept., 1883.  Always short-sighted, and M. has progressed rather rapidly.  Got present glasses a year ago.

Has
- O. D.  $-3.25 -4^e$ ax. 10
- O. S.  $-3.25 -3.50^e$ ax. 180 $\{ V. = \frac{20}{60}$

With atropia,
- O. D.  $-6 -4.50^e$ ax. 10
- O. S.  $-6 -4.50^e$ ax. 170 $\{ V. = \frac{20}{68}$

Oph. normal except very narrow crescent to temporal side of disc. P. (corrected) with either eye, 4", with both, 6".  Right hyperphoria = 12°, apparently from congenital paresis inf. rectus. When fixing object is approached within 9" O. D. turns upwards.

Rx.  Full, constant.  Dec. 1887, with atropia $-7.50 -4.50^e \frac{20}{68}$. Hyperphoria as before. Declines operation. Rx. Full, combined with 5° vertical prism on each eye.

March, 1892, some asthenopia with glasses:

- O. D. with duboisia $-8.50 -4.50^e$ ax. 15
- O. S.  "  " $-8 -4.50^e$ ax. 165 $\{ \frac{20}{68}$

Slight increase in atrophic crescents.  Free section of superior rectus followed by left hyperphoria = 2°.  A month later a return of 4° right hyperphoria — but no asthenopia with full correction without prisms.  After nine years of full correction, no diminution of vision.  In four years without prisms an increase of M. of 1.50 D.  In subsequent five years with prisms an increase of 1 D. in one eye, and .50 in the other.  The moderate increase of M. probably due chiefly to muscular strain.

CASE XI.  C. A. W., clerk, aet. 35, March, 1887.  Always short-sighted.  Has been wearing glasses since about fourteen years of age.  Has two pairs — 6 D. for distance and 5 D. for near.  Considerable asthenopia —

With homatropine
- O. D.  $-6 -1.50^e$ ax. 60 $\{ \frac{20}{60}$
- O. S.  $-6 -2^e$ ax. 90 $\{ \frac{20}{60}$

With full correction P = 6.5"  Rx. Full, constant.  July, 1892, with correction $\frac{20}{60}$, P. = 84".  Uses eyes freely with perfect comfort.  No change in V. or M. in five years.

CASE XII.  N. J. T., age 20, broker, November, 1875.
Always short-sighted. Has been wearing —12 D. for six years. Reads with some strain at 5" with correction.

O. D. with atropia —18 D. 2\%.
O. S. " " —14 D. 2\%.

Condition of muscles not recorded. Extensive choroidal atrophy in each eye, surrounding disc, and extending outward to macular. Choroid stretched, vessels straightened. Rx. —14 distance; continue —12 near. August, 1891. Has been using distant glasses constantly for the last four years. V. = \( \frac{20}{20} \) with glasses and with —1 D. added, \( \frac{20}{20} \). This case is not included among those of full correction because even during the last four years when he was wearing —14 constantly, there was probably —1 D. of increased M. not neutralized. It is of interest on account of the length of time the patient was under observation, and the very discouraging appearance of the fundus. Including the six years during which he wore glasses, before the first examination, he used —12 for reading for eighteen years, and afterwards for four years preferred the constant use of —14. Sixteen years after the first examination there had been an increase of only 1 D. in myopia and no diminution of vision.

Case XIII. W. C. McB., aged 12, May, 1883. Eyes always "weak." Dimness of distant vision, asthenopia, and chronic blepharitis. O. D. and O. S., under atropia, with —4 D. \( \frac{20}{20} \). Fundus in each eye normal. With full correction, has a near point of three inches. Rx. —4 D. constant.

July, 1886, O. D., under homatropine —5 V. \( \frac{20}{20} \) ?

O. S., " " —6 \( \frac{20}{20} \), some of 20.

Rx. O. D. —5. O. S. —5.5.

July, 1892, with above correction V. = \( \frac{20}{20} \). P. = 5" — Eyes quite healthy.

Though comparatively few these cases offer considerable variety in the ages of the patients, the degrees of M., and the condition of the fundus when the full correction was ordered. The ages vary from 12 to 35 years, the degrees of M. from 4 D. to 16 D.— with an average of about 8 D.— and while in some the fundus was normal, some had moderate myopic crescents, and in
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others there were extensive choroidal changes. No case is
noted in which the patient had not worn the correction for more
than five years, and the period of time extends from that to
seventeen years. In no case was there the slightest diminution
of vision and in most the vision became more acute. In eight
the M. was stationary. In four cases there was a slight in-
crease of M.; from .50 to 1.50. In one case only was there a
considerable increase — 2.50 D. — after constant correction for
nine years, and this occurred chiefly during the first four years
when there was an uncorrected hyperphoria. In some cases
the patients were able to wear the full correction at once, and
in others not until after a gradual increase in the strength of
the glass for several weeks or months; and this does not seem
to depend on the degree of the myopia. Some patients with
comparatively low myopia have very little accommodative power
at first, while, on the other hand, I have often been astonished
at the high degree — sometimes even beyond the normal—
possessed by high myopes who have never worn glasses and
have had little or no use for their ciliary muscles. To avoid the
danger of over-correction, the refraction should be tested under
thorough mydriasis.

Several of these patients had marked insufficiency, which
was relieved at once by the correction of the myopia. The
convergence will generally fall into line when the accommoda-
tion is put to work, or, if it does not, it can usually be made to do
so by prisms or tenotomy. Exophoria that exists, with the
correction decided upon, in distant vision should receive atten-
tion at once.

Of course I don't wish to be understood as claiming that
every case of myopia should receive full correction, and attempt-
ing to solve this difficult and important problem by finding out
the degree of the optical defect and clapping on the glass with
the corresponding focal distance; but only that the degree of
comfortable accommodation that exists at the time, or can be
acquired by practice with gradually increasing lenses, should be
the chief guide in deciding upon the glass to be used. Complete
correction of the optical defect with full restoration of the
normal relation between accommodation and convergence is the
ideal condition, but an ideal that cannot always be reached. The acuteness of vision, the effect of strong concaves in diminishing the size of the retinal image and the nature of the patient's occupation should of course have due consideration; and persistent sense of strain and discomfort in near work should suggest a compromise. As to the nature of this compromise, I think that it should rarely consist in the ordering of two pairs of glasses, but that the lenses habitually worn by the patient should become a permanent part of his optical system. Other considerations aside, the mental worry and accommodative disturbance involved in the incessant changing of glasses is a factor by no means to be disregarded. This fact was well illustrated by the case of a young lawyer who consulted me a few years ago. His myopia had been carefully and accurately corrected by a very well known ophthalmic surgeon who had given him glasses for distance and for near. He could read fairly well with his near glasses, but complained that when he wanted to look for a book on his shelves the glasses had to be changed, and when he changed again and resumed his work it was some time before his eyes adjusted themselves comfortably to reading or writing. Then when he went into the street with his distance glasses he was always uncomfortable and sometimes so dizzy that he reached home with difficulty. He had almost constant headache and got into such a nervous and irritable condition that some obscure cerebral or neurotic trouble was suspected and he was referred to a general practitioner for treatment, but without result. The symptoms disappeared entirely and at once under constant correction.

When it is not practicable to use full correction for near work, the easiest way out of the difficulty is often to sacrifice something of distant vision, and patients with very high degrees of myopia — say from 10 to 18 D. — are usually content with the distant vision that they get with from 1 to 3 D. deducted from the fully neutralizing glass, or, if desired, distant vision can be sharpened occasionally by holding weak concaves in front of the habitual correction by means of "fronts," lorgnettes, or even a single glass. Some patients prefer to wear the distant correction constantly and add a weak convex for reading.
Better than either is the use of bifocal lenses. The practical genius of Franklin appreciated the fact that life is too short to spend so much of it in taking off one pair of glasses and putting on another, and invented the well known "slit glasses" which still bear his name; but in young subjects the bifocal glass is often more than a mere convenience and has a distinct therapeutic value.

DISCUSSION.

DR. O. F. WADSWORTH, Boston. — I should like to add my testimony to that of Dr. Jackson and Dr. Harlan as regards the advantage of full correction in many cases of myopia. It has been my practice for many years to give full correction in cases where there was no serious disturbance in the fundus, where vision came up practically to normal and where accommodation was good. While I can give no statistics, it has been my impression that there were great advantages in that practice. There have been a good many instances where patients have come to me using partial correction and who were at an age when myopia is likely to continue to progress, whose myopia ceased to progress as soon as they used full correction, whether in consequence of this or not, it is difficult to say. Theoretically, I think it an advantage that the ciliary muscle should be exercised, just as much as that other muscles should be exercised. No one would think of preventing any other muscle from acting in order to improve its condition.

There is one point which I do not remember hearing touched upon by the readers which I think is an objection to partial correction, or to one correction for distance and another correction for near use. It is, that with such correction the patient is obliged to learn and practice two different methods of association between accommodation and the external muscles. That must be a disadvantage.

DR. D. B. ST. JOHN ROOSA, New York. — Some years ago I was led into full correction of myopia from what might seem an empirical method of observation. I studied as far as possible all myopes who were at the same time ophthalmologists, and I found that these men without exception corrected their myopia fully. They used one pair of glasses for all work, and I reasoned that a myope also an ophthalmologist would know much more about the subjective sensations from full correction than any hypermetrope or hypermetropic presbyope. From experience I soon found that my patients did as well as I could expect with full correction, and I have approximated
that as near as possible. If you do not use atropia, it is impossible to remove a certain quantity of artificial myopia in some instances, but that is not always present and then you may use atropia where you are particularly anxious to exactly correct the myopia. As to the influence of correction of the full measure of myopia in diminishing the progress of the myopia, I am an agnostic on that point,—I do not know. I am satisfied that my patients are more comfortable with full correction, and that the argument that has been advanced in the paper is a very strong one against the use, of two kinds of glasses, until one is actually compelled to do so.

I wish simply to refer to another point. Dr. Harlan in his paper evidently lays stress upon the correction of latent insufficiencies of the muscles. Of course you know, if you have done me the honor of reading anything of what I have lately written, that I have no faith in correcting latent insufficiencies of the ocular muscles, except in so far as can be accomplished by correcting errors of refraction. With the general principle of the full correction of the myopia, I am in accord. I have found in my experience that a few of my myopic patients with a high degree of myopia and a considerable quantity of corneal astigmatism sometimes will not accept in the time that they have been under my observation cylinders in addition to the concave glasses, nor is their vision sometimes markedly improved by them. It seems to be true, since I have been using Javal's method of measuring astigmatism, that in myopia of high degree a considerable astigmatism is quite well tolerated, and that the patients decline the cylinders and are perfectly comfortable without them. We all know that this is always different in hypermetropia.

DR. SAMUEL D. RISLEY, Philadelphia.—I feel like thanking our President and Dr. Jackson for bringing this subject of the full correction of myopia to our attention. The management of progressive near sight has always seemed to me to be one of the most important and difficult branches of ophthalmic practice. In all essential particulars the tenets of the papers are in accord with my views and practice, since it has from the first been my habit to fully correct the myopia and to search for and correct even low grades of associated astigmatism. Reasoning a priori from the physiological facts in our possession, I feel sure this is correct practice, and in my hands has borne well the test of a steadily increasing experience. The majority of young persons will be able to wear with both comfort and safety fully correcting glasses both for distant and near vision. Special corrections for the reading distance must
of course be allowed for those who have reached the age of presbyopia. It is not only in presbyopia, however, that special corrections for reading and all continuous work at a near point are required, but also in many young people with progressive near sight, if the progress of the disease is to be arrested, and the eyes used with safety and comfort. This is especially the case where there is associated pathological conditions of the fundus, e.g., a woolly choroid and beginning pigment absorption; dilated anterior perforating vessels and thinning anterior sclera, even if the characteristic changes at the posterior pole are not present. These are the conditions which in my judgment disturb the nutrition of the eye, and both permit and are active in causing stretching of the eyeball. While in use the vascular choroid becomes engorged with blood, the intraocular tension is thereby increased and further distention of the ball favored. Rest is therefore an essential factor in the treatment of these tender eyes, but since this cannot be rigidly insisted upon, all strain should as far as possible be avoided, by relieving the tension upon the ciliary and converging muscles during work at a near point. This is in large measure accomplished by glasses calculated for an artificial far point, which shall approximate the ordinary working distance, combined with prisms, base toward the nose. With this end in view I have therefore ordered for such patients a full correcting glass for distance and under-corrections with prisms for protracted near work. The prisms are combined with the working glasses as a compromise with the discordance introduced between the accommodation and convergence by the under-correction, and this I consider a point of great importance. Young eyes with progressive myopia are not liable to be painful eyes for the reason that the intraocular pressure is relieved by the stretching of the globe. The absence of pain may therefore be delusive. It is the resisting eyeball that is painful, as we constantly see demonstrated in the asthenopia set up by the hypermetropic eye with astigmatism in the more rigid eye of adult life. My experience has differed from that of Dr. Roosa, in the correction of the astigmatism in myopic eyes. I, believe it is very rarely absent in myopia, I have for a long time contended that probably the most essential factor in the etiology of myopia, is the existing astigmatism, and that the myopia is progressive until the astigmatism is carefully corrected. The low degrees of astigmatism are important since these are readily overcome by the accommodation, and therefore do not cause a serious impairment of the acuity of vision, but nevertheless cause great irritation and set up the pathological states underlying the distending eyeball. The careful correc-
tion of myopic astigmatism in the manner I have outlined so briefly has been on the whole very satisfactory. The corrections have been uniformly made under mydriatics which have not only been employed to set aside the accommodation, but for their therapeutic value, often for many days,—in a word, until the turgid condition of the intraocular tunics had subsided. I have unfortunately been unable to complete in time for this meeting a study of upwards of eighteen hundred cases of myopia which I have in process of tabulation, but I was gratified in looking over the incomplete tables to see how small a percentage of them had suffered any considerable increase in their myopia. To sum up I therefore agree with the authors of these papers that the myopia and astigmatism should be fully corrected, the corrections being made under a mydriatic, and in young persons the glasses should be worn both for distant vision and near work. In all presbyopes, and in young people with progressive myopia with the associated pathological states, special formula for reading and near work should be given, and the want of harmony thus introduced between accommodation and convergence met by the addition of prisms combined with the sphero-cylindrical correction.

DR. D. B. ST. JOHN ROOSA, New York. — I do not mean to say that I do not usually correct the astigmatism in the cornea made manifest by the ophthalmometer. What I mean to say is that I found certain cases of high degrees of myopia where the ophthalmometer showed an astigmatism of 1 D., in which the patient would not accept the correcting glass, and where they had good vision with the correction of the myopia and were comfortable. I agree with what Dr. Risley has said in regard to the general importance of correcting the astigmatism.

DR. B. ALEXANDER' RANDALL, Philadelphia. — I have always had a certain amount of suspicion of the ophthalmometer results, but I did not expect Dr. Roosa to give such a black eye to the ophthalmometer as he does. It more than confirms my impression in regard to it.

It was not surprising to me after seeing the methods of work in many foreign clinics that progressive myopia was so common and so important a matter in the minds and writings of many of our European confreres, who have written more than ourselves upon the subject. Viewing the matter from the standpoint of the correction or mal-correction which I saw commonly made in German clinics, it struck me that it was a happy thing that under-correction was the rule which they adopted, or else they would have over-corrected and habitually given over-corrections to their myopes. It has been an exception to me
to see progressive myopia even in cases where I had every reason to expect that the myopia would progress. I have followed the same lines as Dr. Risley, and it has been surprising to note how little as well as how rarely the myopia has increased. Instead of confirming the statement made by some writers that myopia is usually progressive, I have found in the majority of cases well and fully corrected, particularly with the mydriatic rest which these eyes usually require, that progress was the great exception and was generally brought under control, if promptly and rationally taken in hand.

**Dr. W. S. Dennett, New York.—** We occasionally have cases of myopic astigmatism where the cylindrical glasses are not worn, but where the patient adds the astigmatic feature by tipping the myopic glasses in the manner that Dr. Green has described. I have two patients who do that habitually. One has an astigmatism of 1 D. and the other of 3 D.

**Dr. Henry D. Noves, New York.—** What I intended to say has practically been said by Dr. Risley. It has for years been my practice to give full correction for myopia with certain limitation. The first is the age of the patient; second, the degree of visual acuity possible after careful correction, and this of course determined by conditions giving rise to amblyopia, alterations of the membranes at the bottom of the eye; third, the conditions of muscularity must always be recognized when you give full correction. There must be a careful study of these muscular conditions to decide whether the patient can wear the glasses with comfort. I have used prisms for many years past. I shall never forget a woman whom I saw many years ago to whom I had given full correction for myopia with a prism of 7° and correction for astigmatism, and it was the first glass with which she could see things approximately correctly.

It is not uncommon to find an inequality in the eyes of young people. This is usually corrected by an advance of the myopia in the less myopic eye during a period of five or ten years, so that the patient will accept approximately the same glass in each eye.

In looking over a series of cases of myopia with Dr. Hunter he remarked that it is astonishing to see how few cases of myopia have been corrected by a simple spherical lens. Most of them have a cylinder. Not more than ten per cent. receive pure spherical glasses.

**Dr. William Thomson, Philadelphia.—** I have for twenty years given the full correction for myopia wherever possible.
I had concluded that the theory that progressive myopia was dependent on the use of the accommodation was a fallacy. If myopia progressed simply by strain of the accommodation the time would come when it would cease to progress; and if from persistent use of the ciliary muscle there would be elongation of the eyeball, we could hope that hyperopia might disappear. But we know that it does not. In very high degrees of myopia I frequently find that people who lead a town life are better satisfied to have I D. of myopia uncorrected, simply as a matter of convenience.

DR. HENRY D. NOYES, New York.—There is a progressive myopia which is a choroiditis. That is congenital. It is seen in the peasantry, in negroes, and in illiterate people. That is choroiditis.

There is another class where people do not want perfectly clear vision for distance because they have a horror of seeing objects so clearly. I have had such cases particularly in advanced life come to me repeatedly. I know a man in New York, a distinguished politician, who said to me that if I gave him glasses to read with, he did not care what was in the rest of the world. I have also seen nervous or hysterical women who would not wear glasses.

DR. D. B., ST. JOHN ROOSA, New York.—In regard to the "black eye" that the ophthalmometer is said to have received by what I last said. The ophthalmometer does not tell what glasses to prescribe. It does not interfere with the accuracy of the observations of Dr. Noyes or Dr. Thompson in myopia to say that they cannot always cause the patient to wear the glasses that they should wear. It does not interfere with the accuracy of the ophthalmometer that the patient will not tolerate the correction indicated. The gentleman misconceives the idea of the ophthalmometer. Mental capacity and judgment are to be used with the instrument. All that it does is, to tell how much astigmatism there is, and that it will tell as certainly as anything can be told, as certainly as the mariner at sea can tell by his quadrant where he is. After we have found out how much corneal astigmatism there is, there is much latitude as to the glasses to be prescribed. The ophthalmometer can receive no black eye as a scientific instrument.

DR. SAMUEL B. ST. JOHN, Hartford.—There is a moral to be drawn from what Dr. Noyes has said as to the unwillingness of high degree myopes to receive the proper glasses, that is that we should catch these cases younger, so that they will be trained to appreciate images. They will not then be
startled by the too clear images. Myopes should be treated like other people. If there is asthenopia, take that into consideration. If there is insufficiency of the ocular muscles, take that into consideration. Correct the myopia, with reference to the other conditions. In an emmetrope who has asthenopia and has insufficiency of the recti muscles, you would give certain glasses. Do the same thing with the myope after correcting the myopia.

I have myself worn full correcting glasses for the last thirty years, and during the last twenty-seven years my myopia has not increased. I am one of the exceptions that Dr. Roosa may note, where a considerable degree of astigmatism (1.5 D) is corrected and accepted with pleasure. My myopia is now 9 D. I have never had the slightest trouble with my eyes. Until the last year, I have not shown any presbyopic symptoms. Between the ages of 17 years and 21 years the myopia advanced from 5.5 D. to 9 D.

DR. SAMUEL D. RISLEY, Philadelphia. — During the years of the increase of the myopia, did you have the astigmatism corrected?

DR. ST. JOHN. — No.

DR. RISLEY. — The correction of the astigmatism is of importance in preventing the increase of the myopia. After careful correction of the astigmatism, increase of the myopia is very rare.

DR. H. F. HANSELL, Philadelphia. — I have been a myope as long as I can remember, and since the age of 13 years, now twenty-three years, I have worn glasses. During the first fifteen years the astigmatism was not corrected. During that time I wore spherical glasses giving full correction. While I cannot say what the exact degree of the myopia was at the time I began to wear glasses, I judge it was 3 D. or 4 D. Ten years ago I had the astigmatism corrected. Up to that time the myopia had increased to 8 D. After that it increased much more slowly, until now full correction equals 9.5 D with 2 D. of astigmatism. Visual acuity is perfect. For the last ten years I gave myself a near glass which was 2.5 D. less than full correction. In that way I have been able to read many hours in the day or night as I want to. Reading with full correction for five minutes will give dizziness and headache and the print is difficult to see, but with partial correction I can see at ten or thirteen inches with perfect comfort.

The relative accommodation in myopia must be considered from a different basis than the relative accommodation in emmetropia or hypermetropia.
SOME INCIDENTAL PHENOMENA OF THE SHADOW-TEST.

BY SWAN M. BURNETT, M.D.,
WASHINGTON, D. C.

As with all other methods of determining refraction, the shadow-test has been undervalued by some and overestimated, perhaps, by others; but I think that no one who has used it long, with a knowledge of its underlying principles, can have failed to recognize its great advantage in certain classes of cases and its assistance as a control method in all. Infallibility, or an accuracy closer, in the majority of instances, than 0.5 D. should not be claimed for it. One obstacle to its more general use, as I have stated elsewhere* is the want of a handy method of employing it,—a fault which I have endeavored to overcome by using a disk whose periphery is set with a series of lenses that can be brought in rapid succession before the eye to be examined.† Though I have found the method generally reliable and use it, by routine, in every case of refraction which I examine, there are some incidental phenomena which I have observed in a number of cases which seem to be of sufficient importance to have attention directed to them more pointedly than has been done hitherto.

When the refracting media are uniform in curve and transparency the illuminated area with a shadowy edge which moves across the pupillary space is of an even reddish color and in its passage from side to side, through the rotation of the mirror, is unchanged except sometimes when the faint shadow of a large retinal vessel obtrudes itself. I have found, however, that this illuminated area is by no means constantly uniform. In quite a percentage of cases there is within this space a very

†I think it should be stated, in this connection, that the instrument constructed and advertised by Queen & Co. of Philadelphia, as "Wurdemann's Skiascope" differs in no essential particular from that exhibited by me at the meeting of this Society in Washington in 1888. Dr. Wurdemann, I am informed, had some made in Vienna, with his name attached, in 1890.
appreciable play of shadows, more or less crescentic, which change their position and shape with each change in the position of the mirror, in the same manner exactly as we have it in conical cornea, only, of course, not so pronounced. These appearances must come necessarily from some obstacle to the regular refraction of the rays that proceeds from the illuminated retinal area in their passage outward to form the aerial image of this area at the far-point of the eye. The phenomenon is more evident when the plane mirror and a weak illumination are used.

Exactly where the defect lies I have not been, as yet, able to determine. The appearance and movements of the shadows are so like those of conical cornea that one's first thought is naturally towards some change in the corneal curvature. But every case in which the phenomenon was at all pronounced was examined carefully by the ophthalmometer of Javal, the measurements being taken at every five degrees along the principal meridians from the line of the visual axis to the periphery of the cornea in the manner described in my paper on the "General Form of the Cornea, etc.," and in only a single instance did the change in the corneal curve deviate from that of corneas which can be considered normal, sufficiently to account for the phenomena. Neither did the corneal reflex of Placido's disk show any marked change in the size or form of the rings.

I have excluded from this consideration all cases where even the slightest trace of a corneal or lenticular opacity was discernible by ordinary oblique or direct illumination. In some cases, however, there was a history of a previous inflammation of the eye, and it is possible that an inflammation of the cornea might have healed with a normal surface curve but with some permanent change in the density of the tissue beneath, which would not reveal itself by the usual methods of examination as a clearly-defined opacity.

My next thought was that the irregularity might be due to a conicity of the lens or, at least, an irregular curve, on one or both of its surfaces. Of the existence of such irregularity I have not been able to satisfy myself by the Sanson-Purkinje experiment. The method is not, however, I think, sufficiently
refined to be of any use in determining small irregularities of curves. Then there comes in another possible cause, the variations in the density of the lens tissue. Pronounced opacities in the lens, such as we find in commencing cataract and particularly when the nucleus is first or most affected, do unquestionably give rise to these shadows, but the instances where I have found them most pronounced have been in young people in whom there was no reason to suspect any pathological change in the lens.

Another feature which has shown itself in many of these cases is one which tends to set a limit to the reliability of the test. In a number of cases where I have observed this phenomenon I have found a want of correspondence between the lens which gave a reversal of the shadow movement and the glass which gave the best visual acuteness. Of this the following case is an example.

Miss E. F., aged 18, has vision in either eye of \( \frac{4}{18} \), and so far as she remembers it has never been any better. The cornea examined at the visual axis gave an astigmatism of 0.5 according to the rule. Skiascopy gave a general M. of 1.5 D. As minus glasses of any strength failed to improve vision she was put under a mydriatic. The shadow-test still gave, with the dilated pupils, a reversal of movement only with \(-1.0\) D. at two meters examining distance; her best vision, however, was obtained with \(+0.5\) \(90^\circ\) L. \(100^\circ\) R., when it was barely \(\frac{5}{7}\). The crescentic unstable shadow within the illuminated area was very marked, and in the direct ophthalmoscopic examination there was observed that changing in the distinctness of the retinal vessel along its course or with a shifting of the mirror which is so characteristic of conical cornea. An examination with Placido's disk did not reveal any noticeable change in the form or course of the rings. The cornea was measured in its principal meridian at intervals of \(5^\circ\) from the visual axis to \(20^\circ\) on each side. The measurements of the left cornea expressed in dioptres of refraction are given in the following table:
Burnett: Incidental Phenomena of the Shadow-Test. 391

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It will be seen from these measurements that the corneal curve is much more regular than the average as exhibited in the table in my paper on the “General form of the human cornea.”

Mr. O. R., 18 years old, has R. vision = 1/8 with +2 100°. Skiascopy on repeated examinations gives invariably +1.75 180° and +4.90. The ophthalmometer reveals 1.25 D. of astigmatism according to the rule at the visual axis.

The general corneal curve is not abnormal. The unstable shadows within the illuminated area were very marked. He said he had had granular lids when he was younger, but there are no corneal scars visible by the usual methods of examination.

Mrs. S. R., 33 years old, V. = 8 — and no glass improves. Skiascopy gives —1.75; corneal curve regular and not abnormal. Shadows quite pronounced.

Miss E. M., 23, V. = 8. No glass improves. Internal shadows very pronounced. The shadowy edge in skiascopy was so ill defined that nothing definite could be learned from the movements. Corneal curve normal.

Mrs. H. B. W., 30, under homatropine R. V. = 8 with 0.75 1.165. Ophthalmometer at visual axis 40 D. at meridian 30°, 39.5 D. at 120°. She had inflammation of the eyes in childhood, but there are no corneal scars visible. The corneal curve is normally regular, except at the upper inner portion, where it becomes slightly irregular. The internal shadows are very marked. In the other, L. eye, the shadows are less marked and the corneal curve is normal in both principal meridians. V. = 8.

*See page 319.*
In some cases in which the internal shadows were clearly discernible the visual acuteness was normal, but in none have I seen it exceed the normal of $\frac{1}{6}$. In no case, however, in which it was at all pronounced have I seen the acuteness of vision come up to the standard.

It would seem, therefore, from this, that the shadow-test is to be relied upon implicitly only when there is perfect regularity in the refraction, and, as a converse corollary to this, the method is one of great value in detecting such irregularities when they are not otherwise determinable.

**DISCUSSION.**

**Dr. Gardner, New York.** — The shadow-test is a hobby with me and I agree with Dr. Burnett in his remarks. It is a most valuable aid in astigmatism and with a moderate degree of practice you can easily ascertain an astigmatism of $0.5 \text{ D.}$ I have found even $0.25 \text{ D.}$ You can find out not only the degree but also the axis. The great objection to the method is its inconvenience. I have tried to suggest some method to facilitate the examination. The difficulty has been to introduce the cylinder. Mr. Meyrowitz has worked out an apparatus. The cylinders are introduced in a parallelogram in front of the mirror, the minus lenses with the axis horizontal and the plus lenses with the axis vertical. The whole apparatus turns and it is easy to determine the axis. In this way the test can be readily applied. I find this test more accurate than any other. I also use the astigmometer of Javal.

**Dr. Gustavus Hay, Boston.** — I think that Dr. Burnett stated that in one case he found with the Javal instrument that there was astigmatism of $0.5 \text{ D.}$ according to the rule, but the glass given was a plus cylinder with axis horizontal.

**Dr. Burnett.** — The ophthalmometer does not give the lenticular astigmatism.

**Dr. Hay.** — I know that when the Javal instrument gives a certain measure of astigmatism according to the rule, we have to subtract. The amount to be subtracted is often $0.75 \text{ D.}$ or $1 \text{ D.}$ What shall we do if the instrument shows only $0.5 \text{ D.}$? Cases may occur where after two careful examinations there is found $0.25 \text{ D.}$ or $0.5 \text{ D.}$ according to the rule, and yet the correction is made with plus cylinders axis horizontal. Javal alludes to this in one of his communications. One remark in regard to a recent criticism of the Javal instrument. Tscheming*

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* *Memoires d' Ophthalmometrie, Paris, 1891, page 594.*
comparcs the refraction of the cornea, with the air in front and the aqueous behind, to that of a glass lens in the air with a focal distance equal to the anterior focal distance of the cornea. This seems allowable for certain purposes. I understand the critic to think that we must look upon the light as passing from the air into the aqueous and that we must consider the power of the cornea as equal to that of a lens with a focal distance equal to the posterior focal distance of the cornea. Although this may be an allowable method, I think that the other is also allowable and perhaps has certain advantages. It is a question of measuring the astigmatism of the cornea. We may start with a parallel pencil in the aqueous and consider how it will be refracted in passing through the astigmatic cornea into the air. It would seem allowable in this way to say that the cornea is equivalent for our purpose to a glass lens in air whose focal distance is equal to the anterior focal distance of the cornea. In this way the astigmatic pencil to be corrected is in the air and we can conceive our corrective glass cylinder to be directly applied to it. But in the other way, the astigmatic pencil to be corrected, or made homocentric, would be in the aqueous, and we could not apply directly to it the corrective glass cylinder. As to the relation between refraction and the images formed by reflection. The ophthalmometer makes use of images formed by reflection from the anterior surface of the cornea, but involves also the consideration of refraction of light in passing through the cornea. The size of the image formed by reflection is in relation with the refractive power of the cornea; varies with the refractive power. The instrument makes use of the difference in size of the image to get the difference in the corresponding refractive power of the cornea.

Dr. Swan M. Burnett, Washington.—I should like to say that while I have not given Dr. Weiland's paper careful perusal, I think that he misunderstands what Javal has done. Three or four years ago I read a paper before the society in which I gave the refraction of the human cornea in five hundred and seventy-six eyes, transmuting the measurements into diptres of refraction. In doing that I found that it was necessary to change somewhat the value of Javal's calculations because he had taken at first an index of refraction which is not correct. If you transmute these measurements into diptres you have to take into consideration the refractive index of the aqueous and cornea.

Dr. William Thomson, Philadelphia.—We all know that Javal's instrument at best only affords a convenient method of quickly determining the variation between the curves in differ-
ent meridians of the cornea, but is inferior for accuracy to the ophthalmometer of Helmholtz. I got the first of Javal's instruments that came to this country. While its value is unquestioned, it cannot be said that it determines once for all the degree of astigmatism that we may correct. It is not unusual to find the two principal meridians of the cornea similar in curve and yet to find astigmatism when the whole dioptic apparatus of the eye is tested.

Another point of interest is that patients can see as well as they do with such imperfect cornea. With the shadow test it is often evident that the refraction at the center of the pupil differs very much from that of portions a short distance from the periphery. In such cases the best correction must be carefully selected by every method at our command. On the cars, coming to this meeting, I encountered a gentleman with such an eye that I had corrected in 1876, and who was still constantly wearing his glasses, and carrying in his pocket the formula of them to provide against possible accident to them.

Dr. Edward Jackson, Philadelphia.—It seems to me that Dr. Burnett's irregular shadows in connection with the shadow-test, and the variations of curvature of the cornea as shown by the ophthalmometer, open up the most important path of further advance in the field of the refraction of the eye. To understand how we see with such different refractive conditions in the same eye, when only one portion of the pupil can throw a perfect image on the retina, we have to remember that the retina is quite capable of appreciating an image formed upon it although there may be other diffused light falling upon it at the same time. Under the most favorable circumstances a large quantity of unfocused light reaches the retina. The visual acuteness depends upon the perfection of the image formed on the retina to some extent irrespective of the amount of unfocused light.

The shadows resembling conical cornea were referred to by me in a paper in 1888 on symmetrical aberration of the eye. The peculiar movements of conical cornea are due to different rates of movement of the light. If a portion of the cornea has its point of reversal near the observer's eye, the light moves rapidly. If its point of reversal is further off, the light moves more slowly. It is this difference that accounts for the movements resembling those seen in conical cornea, which can be brought out in a large number of eyes. As you reach the point of reversal you will get some such movement. The fact that in the majority of eyes this variation is the opposite of that which would be caused by the variation which we find in
the curve of the cornea with the ophthalmometer, establishes conclusively that the aberration of the lens is greater than that of the cornea. In cases of irregular cornea the proper thing to do is to find out what portion — it may be a small portion — of the cornea will give a perfect image with any lens that we can give. In the case reported by Dr. Burnett, I cannot help thinking that it must be accounted for on the supposition that there was some portion of that pupil that would have given on the shadow-test a refraction that was indicated by the acceptance of the convex lens although in the greater part of the pupil the refraction was more myopic. In analyzing the pupillary area in that way it is important to use a small point of light and at the distance where it is most perfectly focused on the retina. With a small definite light area, you can get the different movements in the different parts of the pupil. With a large light area, they will all run together, so that the small parts of the pupil which have a different refraction may escape our notice.

Dr. Gustavus Hay, Boston.— With reference to the images on the cornea and refraction. In those tests where we get an image on the cornea, a certain image corresponds to a certain dioptre. The gentleman to whose criticism I have referred says that there is a certain relation between magnitude and corneal refraction.

Dr. Henry D. Noyes, New York.— One practical deduction from this discussion is that the use of atropia for determining the refractive error is by no means so necessary as has been inculcated. I have used atropia more as a therapeutic measure than as an aid in the determination of the refractive error, pure and simple. The exposure of a large area of the cornea may lead to error in the prescription of glasses.

It strikes me also that some of the difficulties in the shadow-test are dependent upon the lens, — to lack of accurate curvature of the lens or to lack of homogeneity of the lens. I think that if some of these cases were submitted to the experiment of viewing a small luminous point to determine how much irregular refraction appears, some light might be thrown upon the discrepancies described.

Dr. B. Alexander Randall, Philadelphia.— Since the appearance of the Javal ophthalmometer, I have always regretted that I did not have one except when I was using the instrument or listening to its friends discussing it. The instrument undoubtedly has its value, but how closely it comes to measuring accurately the corneal curve, and how far we can
from that deduce the corneal refraction, and from that guess what is the ocular refraction, are points on which we still need much light. I hope soon to have one of these instruments and to be able to discuss its demerits with the same friendliness which those who use it do.

An important point brought up by Dr. Burnett is in regard to these unusual appearances in retinoscopy. While recognizing the importance of what has been said, there is another element which enters into the matter even in the method advocated by Dr. Jackson of small sharply defined images, that is retinal asymmetry. I believe that with the retinoscopic mirror at three or four metres we can determine not only .5 D. or .25 D. but that in easy cases I constantly determine 0.1 D. I think in that we have the explanation of these irregular shadows, which are frequently due to the asymmetry of the surface of the retina exposed to illumination by the retinoscope. It is that which contributes in no small amount to these irregularities.

DR. W. F. MITTENDORF, New York.—In regard to the use of atropia, I have found it so misleading in low degrees of astigmatism that I have given it up. This is the position I took some years ago in a paper before the New York State Medical Society.

DR. EDWARD JACKSON, Philadelphia.—I cannot agree with Dr. Noyes in his deduction with reference to the slight value of mydriatics. In nine cases out of ten the dilatation of the pupil does not interfere with the subjective tests. The only part of the cornea that gives an image that the visual centers will consider at all and will be influenced by is the central part in nine cases out of ten. The other part will be entirely disregarded. My feeling in regard to the use of mydriatics is that if you have any accurate measurement to make, what you want to do is to get and hold the thing still that you want to measure. If it is a measure of weight, distance, or refraction it is the same. Unless you use a mydriatic to get rid of the variations of accommodation, you do not get that fixity, and the results are vitiated by an element of uncertainty. You may be right or you may be wrong. When a patient comes to the ophthalmic surgeon to have the refraction ascertained, I think he wants certainty, and should have the refraction ascertained as it is, not merely guessed at.

DR. SAMUEL D. RISLEY, Philadelphia.—I am glad that Dr. Jackson has made these last remarks. I think that mydriatics must be used if we are to determine the refraction error with accuracy.
Dr. W. S. Dennyett, New York.—If you want to find out what the eye shows with a mydriatic, of course you must use a mydriatic. If you want to find out with what glass the patient should read, you can nearly always find that out without a mydriatic.

Dr. Swan M. Burnett, Washington.—In reference to what Dr. Jackson has said, I would state that I was familiar with his paper in regard to the refraction of the cornea at the center and at the periphery. I examined all these corneae in this way. I examined as far out on the periphery as I was able, but it made no appreciable difference. Neither did it make any difference in this particular case. In this case the cornea was unusually regular. It was examined half a dozen times and under a mydriatic. It was the most pronounced case that I had and it set me to working the subject up.

THE CLINICAL VALUE OF REPEATED CAREFUL CORRECTION OF MANIFEST REFRACTIVE ERROR IN PLASTIC IRITIS.

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Since seeing the paper of Dr. John Green "On a Transient Myopia occurring in Connection with Iritis," read before this society in 1887, which was followed a year later by Dr. Mitten-dorf's communication on "Symptomatic Myopia," to be found in the Transactions of the same society, the writer has been so impressed with the importance of the subject, that he has taken advantage of his abundant clinical opportunities to make routine and periodic study of the refractive condition of every case possible of inflammation of the iris that has fallen under his care, hoping thereby to furnish some data upon this vexed question. Fortunately, personally, the subject has, in his hands, gone far beyond the theoretical points then at issue, and has resolved itself into a most valuable clinical procedure in his everyday treatment of this disease. To him it has been an attempt, at least, to formulate some definite guide and to obtain some cer-
tain rules for correct and appropriate dosage of both local and
general measures in this most important branch of ocular thera-
peutics; an attempt which ordinarily is merely gauged by rough
objective signs and the patient's feelings; an attempt that he
hopes may add its mite to help perfect this now one of the most
neglected portions of ophthalmology.

In this work the plan of study was not only limited to the
ordinary subjective method of lens-testing, but was accomplished
by some of the more certain of the various objective plans, such
as retinoscopy, ophthalmoscopy (both by the direct and indirect
methods), the fundus-image test, and lastly by ophthalmometry
as a method of control; Thomson's ametrometer and the chro-
matic aberration test were also employed at times.

The results thus far obtained, which are more or less expres-
sive of about forty suitable cases that have been carefully fol-
lowed to resolution,* although necessarily tentative in some
particulars, are here given without any further detail than offer-
ing a concise citation of two illustrative partially theoretical
examples in order that an outline plan of the method of pro-
cedure pursued may be understood; a résumé of the five years'
work being embodied in a brief series of observations which are
followed by a number of conclusions that have been deemed of
sufficient certainty to be offered at this time.

Case I.—On the 7th of January, 1889, T. H. R., aged 47
years, the wife of a traveling salesman, and the mother of two
healthy children, came for a left-sided plastic iritis. As stated
by her physician, she was inoculated by her husband in Sep-
tember of 1888, the initial lesion being followed in a short time
by epitrachlear and post-cervical enlargement, buccal and faucal
erthema and mucus patches, papular syphilide, slight alopecia,
and quite a large subperiosteal swelling in the left frontal region.
When first seen there was a pronounced plastic iritis in the left
eye, of nine days' duration, there being an irregularly contracted
pupil, many fine posterior synechia, with a marked deposition of
pigment on Descemet's membrane, the iris stroma being thick-
ened and dulled in tint. There was no involvement of the

* Quite a number of data were also gained and made use of from patients who escaped
from observation before completion of the case.
right eye, which had its uncorrected vision of two-thirds brought to normal by the employment of a + C. o.50 D. ax. 90°. The vision of the inflamed eye, which was reduced to one-tenth, could not be perceptibly increased by any lens combination.

By the bi-daily use of drachm masses of mercurial ointment, and the free application of an eight-grain solution of cocaine and atropine every third hour for two days' time, the iris was freed from its tags of adhesion to the capsule of the lens, allowing the pupil to become nearly seven millimetres diameter in all meridians. At this visit, vision was brought from one-tenth to two-fifths of normal by the use of a - S. 2. D. ⊖ - C. o.75 D. ax. 180°, the uncorrected artificial focussing point obtained by a + S. 4. D. being situated at about fifteen centimetres. Vision of the fellow eye was raised from two-thirds to normal by the previous Ah correction.

Two days later coincident with much betterment of the objective conditions, uncorrected vision of the left eye rose to nearly two-thirds of normal; this acuity being increased to full two-thirds sight by the employment of - S. o.75 D. ⊖ - C. o.75 D. ax. 180°. The right eye still remained uninvolved. At this time the atropine and cocaine, although kept to the same strengths, were reduced in frequency to three times a day.

Three days after this, the sixteenth day of the disease, vision still remained at two-thirds by the use of a - S. o.50 D. ⊖ - C. o.50 D. ax. 180°, the eye being much quieter.

In two days' time the minus cylinder was alone necessary to bring the vision of the inflamed organ from two-thirds to nearly full acuity. The instillation of the cocaine and atropine was ordered to be used but once a day, and although the eye was much better, the papules subsided, and the secondary node on the os frontalis had disappeared, the ointment was continued.

On the following day a plus meridian of one-quarter dioptr strength, at right-angles to that corrected by the negative cylinder appeared, causing the manifest refraction to assume that of mixed astigmatism.

Eight days later, under the same treatment, the minus cylinder was lost, and vision was brought from not quite full acuity to normal by a + C. o.50 D. ax. 90° alone. The local treatment
was now reduced to atropine every other night, the use of the mercury being faithfully persisted in.

Eight days after the above visit, during which she failed to report, a violent plastic iritis burst out in the right eye, causing severe ciliary neuralgia. The patient having been previously warned, immediately instilled quite a large amount of atropine into the right conjunctival sac, with the result of almost thoroughly dilating the pupil. Vision in this eye, which was now reduced to one-half, was brought to nearly normal by –S. 1. D. ⊀ –C. 0.75 D. ax. 180°.

In three days’ time, in spite of the liberal use of cocaine and atropine, continuance of mercurial inunction and free leeching, a Descemetitis appeared, lowering vision to an incorrigible one-fourth. Hot stipes were now added to the treatment, resulting in a quick subsidence of the severity of the symptoms and a restoration of vision from two-thirds of normal to nearly full acuity by the use of –C. 0.50 D. ax. 180°, the uncorrected artificial focussing point being but little inside of twenty-five centimetres.

Seven days later a fresh exacerbation of iritis in the left eye again lowered its vision to one-tenth of normal, which could be brought to full acuity by a –S. 1. D. ⊀ –C. 0.50 D. ax. 180°; the atropine having been instilled four times daily for two days.

Three days after this visit, while both eyes were quiet and no ocular or circumorbital pain of any kind existed, vision in the right eye, which was now two-thirds of normal, was brought to almost full acuity by the use of a +C. 0.50 D. ax. 90° (the lens originally used when O. S. was primarily inflamed), while that of the left eye which equalled one-half took a mixed astigmatism correction of –C. 0.50 D. ax. 180° ⊀ +C. 0.25 D. ax. 90° to bring it to normal.

As the original correction that had been required in the right eye had been reached, and as all of the other symptoms seemed to be in abeyance, the atropine was stopped in the right eye for experiment sake, and was reduced to but once a day in the left eye. In ten days’ time, under the modified use of the atropine and the continuance of the alterative, both uncorrected visions rose to almost normal, that of the right eye still retain-
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ing one-half diopter convex cylinder at ninety degrees to make the letters clearer, while the mixed astigmatism in the left eye became Ahm in variety; the new lens combination necessary to give normal acuity reading—C. 0.25 D. ax. 180° ⊕ +C. 0.50 D. ax. 90°.

Six days later, vision in each eye was the same (5/5), and each ametropia equaled +C. 0.50 D. ax. 90°. Atropine was stopped and the mercury was gradually lessened until in three weeks' time, when her eyes were perfectly quiet, she was again referred to her family physician, who asserts within a short time that she has not had any return of her eye symptoms, and that her present general health is seemingly good, there having been no subsequent outbreaks of the disease.

Case II.—On the 6th of June, 1891, the writer was consulted by a well-known scientific man, aged thirty-five years, who, while pursuing a most exacting literary life, complained of a recurrence of asthenopia, which was promptly relieved after careful estimation, under the full influence of atropine, by the employment of the following cylindrical combination:

O. D. +C. 0.50 D. ax. 90° ⊕ —C. 0.25 D. ax. 180°.
O. S. +C. 0.25 D. ax. 90° ⊕ —C. 0.50 D. ax. 180°.

each eye obtaining a vision of 5/5 with its appropriate correction, accompanied by an esophoria of two P. D. at five metres and muscle balance at thirty-five centimetres distance.

On the 2d of September of the same year he returned with a beginning left-sided plastic iritis of recent syphilitic origin.

A series of quickly repeated instillations of cocaine and atropine soon caused the pupil to become dilated almost ad maximum, except at one point up and in where a minute tag of adhesion to the anterior capsule caused the pupil to assume a heart shape. Vision, which had fallen with his correction to two-thirds of normal, was brought to full acuity by the following combination:—S. 0.25 D. ⊕ —C. 0.75 D. ax. 180°. Careful study with an ophthalmometer of Javal and Schiötz at this time failed to place this increase in the cornea.

By the prompt employment of mercurial ointment, general and local rest, and the instillation of the one-twentieth of a grain of sulphate of atropia three times daily, the synechiae gave
way in forty hours, leaving a perfectly round pupil, though the eye required a minus one-half diopter spherical lens over that of the first visit making \(-S. 0.75\) D. \(\ominus\) \(-C. 0.75\) D. ax. 180°, to bring the distant vision to normal, and to secure the best point of near vision at twenty-five centimetres with an additional \(+S. 4\) D. There was no pain, the media were clear, and there were no gross fundus changes of any character.

One week later, after faithfully continuing the necessary treatment, the vision of the affected eye was found for the first time to be normal with the original correction, the patient voluntarily stating that he had noticed a sudden improvement just after the instillation of the atropia the day before. The drug was now used night and morning only, while the alternative was scrupulously persisted in.

Two weeks after the first appearance of the "mistsiness," which had been the first and only subjective symptom noticed by the patient, vision remained normal with his correcting lenses, and all external symptoms of ocular inflammation had gone.

While carefully and assiduously watching for any objective and subjective signs of refractive change, the atropia was gradually reduced day by day, and the general alternative lessened in amount and frequency, and finally taken place by small doses of corrosive sublimate, until, in five weeks' time from the beginning of the attack, the atropine was discontinued.

Four weeks later the eyes, being perfectly quiet although daily employed, were for experiment's sake carefully reëstimated for correcting lenses while under the liberal employment of atropine. The lenses and the positions of the principal meridians of astigmatism were found unchanged from those of the original correction; this good result continuing unaltered to the present writing.

**OBSERVATIONS.**

I. In nearly every case of iritis, even after full pupillary dilatation, especially in the plastic form of the disease, there was an ever changeable, though relative increase of the refractive power, the amount of which in the majority of cases could be
readily determined by careful, repeated, and systematic measurement.

2. In every case of plastic iritis that could be properly studied, there were similar reversals of the principal astigmatic angles and meridians so commonly seen during the passage of ordinary hypermetropia into myopia; these temporary changes from the one gross form of ametropia (H.) to the other (M.) expressing themselves both subjectively and objectively in every case that could be steadily watched and persistently followed, by the following routine of condition: H + Ah, Ah, Ahm, Amh, Am, and M + Am.

3. In cases of plastic iritis occurring in young highly hypermetropic eyes, especially where corrections had never been worn or were originally too weak, the refractive changes seemed in most instances never to reach those recognized as myopia; the decrease of the hypermetropia appearing to vacillate some one to three diopters less than the total hypermetropia, and this being accompanied by varying expressions of astigmatism.

4. In quite a number of cases of plastic iritis that could be properly studied by the ophthalmometer, there appeared minor, though at times, plainly appreciable degrees of curious lessensings and increases of the corneal curvatures in the same case at different periods of the disease.

5. In nearly every case of plastic iritis that could be carefully and repeatedly studied by the ophthalmometer (even after any technical and mechanical error in the method had been expunged), the corneal changes seemed to register much less in proportion to those found in the same cases by other objective methods and the subjective plan of lens testing, thus indirectly showing the undoubted presence of lenticular disturbance.

6. In some cases of commencing iritis, especially in hypermetropic eyes, there seemed to be a most active clonic spasm of the ciliary muscle, causing rapid increases and decreases of lenticular form, so pronounced, in fact, that it became at times im-

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* A similar, though of course less marked, example of this condition during almost any form of strong or persistent mydriatic correction of ametropia, especially in young hypermetropes, can be seen in any practice where, although the pupillary areas seem to be dilated ad maximum, yet the findings of one day are found to be weaker than those of the morrow, and where repeated trials are compulsory before astigmatic angles can be properly chosen.

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possible to obtain any definite refractive result. Moreover, in this class of cases, persistent pupillary contraction often took place the moment any important curative measure was lessened or temporarily suspended.

7. In many cases of the plastic form of the disease, where there were points of ciliary tenderness of no matter how trivial a nature, especially when associated with irregularity of pupil-form, the astigmatic changes seemed to preponderate and remain more or less fixed for long periods of time.

8. Experimental research by the use of repeated instillations of strong solutions of eserine in such cases, showed marked refractive increases and all manner of change in the principal astigmatic curves; these peculiarities expressing themselves not only subjectively by the patients' assertions with trial lenses, but evidencing themselves by retinoscopic and other objective methods.

9. In every case of iritis there was much visible pigment where deposition, or where the crypts of the iris were thickened and infiltrated, and the pupil, although apparently equally enlarged in all meridians, refused to dilate to any more than one-half or two-thirds that of full size, the manifest refractive error, where adequately obtainable, seemed to become fixed at one point until objective betterment became apparent.

10. In many cases of the plastic form of the disease, even during apparent full pupillary dilatation, where the weaker solutions of strong drugs, such as atropia and daturia were inadequate to alter the manifest refractive error, therapeutical combinations, such as cocaine and atropine, with the employment of the artificial leech, or recourse to stronger drugs, such as dубо-сarea and hyoscyamine, seemed, in several instances, to soon unmask some hidden refractive error, markedly that of astigmatism, and to permit speedier cure of the disease.

CONCLUSIONS.

I. In nearly every case of iritis, especially of the plastic forms, there is a period, even after full pupillary dilatation has been seemingly artificially obtained, during which, owing to the persistence of inflammatory changes in the uveal tract, as so
expressed by the clinical evidences of ciliary spasm, etc., gradu-
ated instillations of mydriatics should be employed; the dura-
tion and gravity of this period being most accurately measured
and determined by the systematic and repeated estimation of
the varying manifest errors of refraction.

II. While it is true that, during this stage in nearly every
case of iritis, ophthalmometric, or rather keratometric study,
seems to show at times that there are bizarre and curious
changes of corneal curvature,* yet it must be conceded from the
additional findings of other optometric methods, that the bulk
of the ametropic change in such cases is due to perversion of
lens action from what Koller terms "spastic accommodation"
as the result of ciliary irritation and inflammation.†

III. In nearly every case of iritis the duration of this stage
can be promptly shortened by the judicious and ready use of
some quick and powerful intraocular muscle paralyzant; the
character of the necessary form of the drug and its amount at
the time in every instance being judged by the amount of man-
ifest refractive error found at that time.

IV. In some few such cases of iritis, however, during the
acme of the attacks, especially if the case be pronounced in type
and stubborn in character, the higher grades of the manifest
refraction error seem to obstinately persist with but little vari-
ation in amount, and to defy, for a long time, reasonable local
and general measures.

V. In some few cases of incipient iritis, where clonic spasm
of the ciliary muscle seems to present itself, or pupillary contrac-
tion repeatedly persists, local muscle paralysis as evidenced by a
relative decrease of refractive error, is often quickly obtainable
by the prompt and more energetic employment of some of the
more powerful and appropriate local and general remedies.

VI. Consequently, the careful systematic estimation of the
manifest error of refraction found during attacks of iritis is of

* It is the intention of the writer to make more extended study in this direction, reserving
his present unpublished results for another communication.

† Based upon clinical experience and reasoning alone, without the shadow of evidence
from experimental research, the writer here hazards the thought that impediment in lymph
stream flow, or even lymph formation itself, may be one of the factors in the production of the
ametropic condition.
great value in the rational and scientific treatment of this disease, offering itself as not only a means by which the general prognosis of the affection can be made more certain from time to time during its progress, but permitting itself to serve as a measure or guide, as it were, by which the attacks may be more properly and more understandingly treated, and their duration shortened by the judicious and intelligent use of appropriate drugs, thus giving better opportunity for lessening the chances of harmful and permanent after-changes to one of the most important and yet one of the most susceptible organs of the ocular apparatus.

THE PROMINENT SYMPTOMS OF HYPERPHORIA AS ILLUSTRATED BY THIRTEEN SUCCESSIVE CASES.

By HOWARD F. HANSELL,
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No. 1. Miss F., aged 18, school girl.
" 2. Mr. F., married, 49, stock-broker.
" 4. A. Van S., single, 19, farm hand.
" 5. Mr. R., married, 31, merchant.
" 7. Mr. K., " 36, merchant.
" 8. Mr. M., " 36, preacher.
" 9. Mr. B., " 55, superintendent R. R.
" 10. Miss M., single, 28, school teacher.
" 11. Mr. P., married, 43, lawyer.
" 12. Miss P., single, 16, school girl.

In this enumeration of symptoms, only those positively traceable to hyperphoria are included, as demonstrated by their relief or cure by the correction of the muscular anomaly. Other sources, such as errors of refraction, constitutional diseases, and uterine affections were excluded.
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In two the symptoms were purely local. The patients complained of the eyes only. No. 7, a strong, healthy man, free from nervousness of every kind, had pain in the near use of his eyes so that he was altogether debarrled from reading. A correction of a low degree of H., worn for several months, was of no service. He was relieved by a tenotomy. No. 3, a small, delicate woman, complained of constant lachrymation. This had been treated unavailingly for two years, during which time she had worn a full correction for a high degree of H., and As. No tears or mucous were retained in the lachrymal sacs. Both nasal ducts were permeable to large sounds, and yet tears constantly poured over on the cheeks,—a clear case of increased activity of the lachrymal glands. The condition was favorably modified by two tenotomies. The final result is uncertain since but a short time has elapsed since the second operation.

Photophobia in moderate degree was present in five cases: Nos. 2, 5, 8, 10, and 11.

Exposure to the lights of a theater combined with the effort of seeing the performance was followed the next day in each by pain in eyes and head, in No. 11, so severe that he was compelled to relinquish that form of amusement. Partial or complete relief was gained by one or more tenotomies. Pain in the eyeballs, constant or induced by reading, was a prominent symptom in all of the cases. It presented, however, no points of difference from that due to errors of refraction.

Reflex symptoms.—Six cases, Nos. 1, 2, 4, 5, 10, 11, complained chiefly of headache. Of these, 1, 2, 4, and 10 may be classed together. Their headache was a constant, dull pain, aggravated by any attempt to use the eyes, by traveling, by bright lights, and by similar circumstances. The pain in Nos. 5 and 11 was of an entirely different character. It was sharp, lancinating, intense, commencing in the eyes and spreading to the head, attended at times by nausea and vomiting, occurring twice or thrice weekly, increasing in severity as the day advanced and relieved by a night’s rest or quiet and opiates. Case 11 demands a special word. His headaches began during his college days, 25 years ago, and have continued, varying in
intensity and severity, until three months ago. A correction of M. and As. had no other effect than to improve his vision. Resumption of business after a year's absence from home was speedily followed by a return to his previous condition. A tenotomy for 2° hyper. has given him entire relief. Six months have passed and he has suffered but once, a few days after the operation. The history of No. 5 was similar but extended over a shorter period. His headache recurred three times weekly, necessitating the abandonment of all work. He was wearing at the time of my examination a perfect correction for a low degree of mixed astigmatism. Prisms for the correction of Hyper. 3° gave immediate relief with no relapse in three months.

Six cases, Nos. 2, 6, 8, 9, 10, 11, suffered with vertigo and dizziness, induced by reading, riding in a carriage or railroad train, or by watching rapidly-moving objects, by bright sun or artificial light, or by gazing for any length of time on objects in close proximity.

Two cases, Nos. 6 and 8, were subjects of violent dyspepsia. Digestion was slow, painful, and incomplete unless the patient sat quietly, with closed lids after meals.

In four cases, Nos. 2, 5, 6, and 8, the most prominent and annoying symptoms were excessive nervousness, irritability of temper, and at times mental confusion, associated with headache and inability to use the eyes without discomfort. No particular thought was given to the eyes as a possible source until many months or even years of unavailing treatment directed to other organs. Nos. 6 and 8 were conspicuous illustrations. No. 8 became unfitted through nervous prostration to perform the duties of his profession as a preacher. Study was absolutely impossible; writing a few minutes gave him a sleepless night. In conversation his ideas were obscured and thoughts confused by a painful consciousness of self. His temper became irritable. His equanimity was disturbed by trivial incidents of home life that formerly gave him no annoyance. He became unsocial, despondent, and fearful of himself. Two tenotomies, separated by an interval of two months, have brought about marked improvement, though he has not yet recovered his former physical health and mental vigor.
Hansell: Prominent Symptoms of Hyperphoria.

No. 6 had been under treatment for various affections, including uterine diseases, for several years, but at the time she came under my observation was free from physical ailment, and had concluded as a last resource, upon the advice of her family physician, to consult an ophthalmic surgeon. She was excessively nervous and restless, and could with difficulty remain quiet a few minutes. While undergoing examination for refraction, chorea affecting the muscles of the face, arms, and hands developed. Her nervous history included chorea, irritability of temper, temporary loss of memory, or a forgetfulness of the commonest things in everyday life. She was disturbed by trifles. Her self-control was lost at times and only regained by seeking seclusion in a dark room, when her thoughts immediately became logical. I found hyper. in emmetropia. A rational explanation of her symptoms should be sought in the exaggeration of the susceptibility of an exceedingly nervous organization induced by long-continued suffering from uterine and other complications, and maintained, after these causes were removed, by eye strain. I am warranted in this assumption by the change effected by correcting prisms. After wearing them a few minutes her restlessness subsided. After a few days she reported decided improvement. Withdrawal of the prisms was followed by a renewal of the symptoms. A tenotomy was performed, but I cannot at this time state the final result.

My experience with prisms and tenotomies for the cure of local and reflex symptoms, referable to the eyes, but not to an error of refraction, encourages me to seek for their cause in muscular anomalies.
CASES OF MONOCULAR AMBLYOPIA IN THE SAME FAMILY.

By Charles W. Kollock, M.D., Charleston, S. C.

Ocular defects of various kinds are not uncommon among several members of the same family, and an interesting instance of defective vision in the left eye of four members of the same family—two brothers and two sisters—has come under my observation, and so differently has the amblyopia showed itself that they seem worth reporting. The father of the patients is still alive though quite old and helpless. He has suffered recently from multiple neuritis, but as to the condition of his eyes I have no knowledge. Concerning the mother, but little information could be gained, and that was unimportant. The first member of the family examined by me was the younger brother, who was sent by his family physician. This gentleman was thirty years of age, and was suddenly stricken with paralysis which rendered him unconscious for a time, and it was several months before he could walk. When seen eight months after having been paralyzed he still limped on the right foot, and the hand and arm of that side had only partially regained their power. The vision of the right eye was 15/xx and that of the left only sufficient for the detection of large objects. No glass improved the left. The ophthalmoscope showed nothing wrong in the right eye beyond a slight indistinctness of the disk. The left presented a very different picture. The pupil was active and the media were clear, but in the nerve head, and occupying almost its entire area was a large excavation which measured 12 D. in depth. A narrow strip of the disk bordered the cup, and the vessels emerged, climbing over the inner, upper, and lower borders. One small vessel spanned the chasm and extended towards the macula. It was not necessary to look further for the cause of his amblyopia. From his physician I subsequently learned that his attack had been due to brain syphilis, but the condition of the
eye was of course not due to this. The elder sister, aged forty-seven, was next examined. Vision in the right eye was 15/1XX and in the left, 4/cc. - 1.50 D. increased the vision of the right to normal, but no glass improved the left, which had always been defective. The ophthalmoscope showed both eyes hyperopic between 3 and 4 D., but the papillae were not cupped nor was there anything in the appearance of the left to indicate amblyopia. The second sister was next examined. She was thirty-seven years old and had never had good vision, but the right eye had always been the better. Right, 15/1XX. Left, light and moving objects. The left cornea was slightly hazy from a blow which she had at one time received. Neither eye was improved by glasses. In this patient, though there was a family resemblance, were several conditions not seen in the other members. Her face was dished and the front teeth were notched. She was slightly deaf, she said from an attack of erysipelas when very young, and the sister said she was born with sores on her body. The ophthalmoscopic examination showed disseminated choroiditis and whitened nerves, but no cups. She had never borne children, though married, and had always been in delicate health. The remaining brother has been recently examined. He is in his fiftieth year and in good health. Vision in right eye 15/cc, and in left 6/cc. That in the right was increased by +2.25 D. to 1/8, and the left by +3.50 to 1/8. Nothing of special interest was seen by the ophthalmoscopic examination except a string-like object in the left, which was attached at a point near the nasal edge of the left disk and extended forward, gradually disappearing. The son and daughter of the elder sister were also examined. Both have slightly flattened faces. He was hyperopic, one-half dioptery in the right eye, and the left took +0.50 < +0.50 cyl. 90°. The daughter, aged twenty-eight years, came on account of a slight dilatation of the left pupil which could never be accounted for and still remains. Under the influence of a mydriatic she showed 1 D. of hyperopia. That several members of the same family should be amblyopic is not very unusual, but that the defect should be principally found in one eye and varyingly exhibited is exceedingly interesting and decidedly unusual.
And furthermore that the two children of the elder sister should both exhibit a condition in the left eye not found in the right seems rather more than a coincidence. The remote cause must have been the same in all, but whether due to inherited syphilis, which was plainly seen in the younger sister, is a matter for consideration. The hyperopia ran through them all. The younger brother had acquired syphilis, while in the elder brother and sister there were no external signs of the disease, nor in the children of the elder sister.

ON THE FREQUENCY OF POSTERIOR CAPSULAR OPACITIES AT THE PLACE OF ATTACHMENT OF THE HYALOID ARTERY.

BY W. F. MITTENDORF, M.D.,
NEW YORK CITY.

The opacities of the lens capsules to which I should like to call your attention have been variously classified, as posterior polar, posterior capsular, and as a form of congenital cataract. They are, however, so small and vary from the other forms of cataract so much, that they should rather be mentioned as punctate opacities of the posterior lens-capsule. On account of their size they are not unfrequently overlooked in ordinary examinations of the eye, and I find hardly any mention of them even in the latest and most complete text-books on ophthalmology.

They differ from the usual posterior polar cataracts by the fact that they are not the result of disease of the eye; that they appear not to be caused by proliferation of the epithelium of the capsule, as they occur in locations where the capsule is devoid of endothelium; that they do not cause any defect of vision and are not necessarily associated with poor sight of the eye; that they are found not at the posterior pole of the lens but at a point a little toward the nasal side; and lastly that they are not progressive.
Mittendorf: Posterior Capsular Opacities.

My attention was called to these opacities by the fact that I had at one and the same time a patient under my care with the remains of the hyaline artery extending almost from the posterior lens-capsule to the optic disk and another patient where only the anterior capsular part of the hyaline artery was visible. Right after I had seen these patients a physician of New Jersey came to my office for a refractive error, and in his case I found in each eye a well-marked spot, which looked whitish by focal examination and dark if seen with the ophthalmoscope, exactly in the same location, a little to the nasal side of the posterior pole of the lens, where the anterior attachment of the hyaline artery had been observed. Although these spots were quite distinct and could be seen without the aid of a magnifying lens, yet their presence had been overlooked at previous ophthalmoscopic examinations made by very competent observers. Shortly after seeing these cases, a well-marked opacity of the same kind was observed in the eye of a young lady, who came for the treatment of an acute catarrhal conjunctivitis. In looking over the literature of the subject I found that the occurrence of these punctate opacities had hardly been mentioned, nor their nature explained in any of the text-books, but their nature had been recognized by Ammon already, who reported a well-marked case of this kind, but it was only after the invention of the ophthalmoscope that their discovery was made easy, and Dr. Beck in his monograph on the Persistent Remains of the Foetal Hyaloid Artery, says that these spots are of common occurrence; he having seen three cases of it during one session’s clinic. Oeller strongly advocates the theory of the hypothesis, that they are connected with and due to the hyaline artery, but other writers do not appear to have thought it worth while to mention the frequent occurrence of these opacities. In order to study these spots more carefully, I decided to examine the eyes of every patient that I had an opportunity to see, with the ophthalmoscope and with a magnifying lens of 4 to 6 dioptries, and these examinations carried on for one year led to the following results:

Out of 1,140 males seen during the year from July 1, 1891, to July, 1892, as many as 36 had an opacity of this kind in
either one or both eyes which is 3.25 per cent., and out of 548 female patients, eighty or 1.6 per cent. had the same opacities. Out of the total number of patients, namely, 1,884, the large number of forty-four had this form of cataract. In the right eye it appeared to be most frequently met with, for it occurred here as many as 26 times, 10 times it was seen in the left eye only, and in 8 cases it happened to be present in both eyes. The sight of these eyes was apparently not affected at all, for in 34 of these cases the vision was perfectly normal, and in the remaining ten the vision was not up to the normal, four times on account of myopia, twice there was a high degree of hypermetropia with impaired vision, and in four cases there were corneal or partial lenticular opacities which accounted for the impaired vision of the respective eyes.

In conclusion I beg to state that these small opacities undoubtedly are at the point of attachment of the hyaline artery to the posterior capsule of the lens, and that during the disappearance of the artery the nutrition of this part of the capsule is sufficiently interfered with to lead to the cloudiness of this point, or that slight inflammatory changes during the process of absorption exist. That the location of the spot on the capsule is almost invariably a little to the inner side of the posterior pole of the lens. The size varies considerably from that resembling a dot caused by the point of a fine needle to that of a poppy seed. That the spots are usually well-defined, and only in one out of forty-four cases several radiating lines, probably corresponding to branches of the hyaline artery, were visible. That in no cases was there any connection of these spots with other opacities of the lens, which were seen to exist at the same time. That these spots are therefore non-progressive, and do not lead to any impairment of vision, nor are they apt to lead to any refractive or other change of the eyeball. That it is only in very exceptional cases that they produce subjective symptoms; the patient is usually not aware of their existence. That their occurrence is by no means rare, as they have been found to be present in 2.3 per cent. of a large number of eyes, and as they are congenital they are found equally often in young and old people. That they appeared to be oftener met with in the male
than in the female, I consider accidental as the number of eyes seen is hardly large enough to establish this point. Their greater frequency in the right eye is perhaps likewise accidental, for I am at loss to explain why the right eye should be more frequently the seat of these opacities, except that it is farther from the heart and the nutrition perhaps a little more difficult and the process of absorption on this account slower and less complete.

DISCUSSIONS.

DR. DAVID DE BECK, Cincinnati.—I am gratified to listen to this paper. Two years ago when I wrote a monograph on this subject, I had seen a good many of these little spots and found a few noticed in literature. I really hesitate in specifying the frequency with which I saw them, but this paper certainly demonstrates the frequency with which they may be found, and we may assume that we shall find them in otherwise normal eyes. We find either a little round spot near the posterior pole or a round spot with some radiating strands or sometimes the spot is absent and there are simply the radiating strands.

DR. ROOSA.—In these 1,884 cases was there any other lesion? Were the cases taken indiscriminately?

DR. MITTENDORF.—These cases represent the number of cases that I have seen at my office. They have come for refractive errors and for inflammatory conditions.

A CASE OF BILATERAL RECURRENT INFLAMMATION OF TENON'S CAPSULE IN CONNECTION WITH PROFOUND MERCURIAL POISONING.

BY CHARLES J. KIPP, M.D.,
NEWARK, N. J.

Louis Oxfurth, a German, 39 years of age, came to the Newark Eye and Ear Infirmary for the first time March 3, 1890. According to his statement, his right eye was wounded by pieces of glass in an explosion of an electric incandescent lamp, the day before. Immediately after the explosion he visited an infirmary in New York, where he was told that the injury was
insignificant, and that the eye would get well if he applied cold compresses to the lids. I examined the eye very carefully, but could discover only a very small wound of the cornea, close to its outer margin. I advised him to bathe his eye with a warm solution of boric acid. The patient did not return to the infirmary till the 29th day of March, twenty-six days after his first visit. He stated that his eye had not troubled him much till a few days ago, and that he had been working at his business since his first visit. His right eye was now in the following condition: The lids were oedematous but not markedly red, and a broad fold of swollen conjunctiva protruded from the palpebral fissure. On opening the lids, the whole ocular conjunctiva was found to be intensely congested and greatly swollen, and surrounded the cornea like a wall. The eyeball was considerably protruded, and its motility was greatly impaired in all directions. Attempts to move the eyeball in any direction caused much pain. There was absolutely no muco-purulent secretion in the conjunctival sac. The cornea was transparent, only a small macula indicating the site of the wound. The anterior chamber was of normal dimensions; the aqueous was clear. The iris and lens showed no evidence of disease. The vitreous was transparent, and no disease of the optic nerve, retina, or choroid could be discovered. The eye was slightly myopic (1.5 D.) and vision was 5/15. The left eye was apparently normal. In addition to the eye disease, I noticed that he was affected with what, at first glance, seemed to be shaking palsy. His very fetid breath, of which I had become aware during the examination of his eye, now induced me to examine his mouth, and I found that he was salivated, the gums were inflamed and ulcerated, and the teeth were loose. The tongue was very tremulous. Inquiry as to his occupation now revealed the fact that he was, and had been for many months, employed in exhausting the air from the glass bulbs of electric incandescent lamps, which is done by means of metallic mercury falling from a height. More or less of the mercury is spilt in this process and becomes volatilized, and is inhaled by the persons employed in the room. Considerable of the metallic mercury is also handled by the men, and, unless they are very
cleanly, is thus introduced into the system through the mouth and skin. The patient admitted that he rarely washed his hands before eating, and he seemed to think that the tremors and the other symptoms from which he was suffering, were unavoidably associated with his occupation. With this knowledge before me, I now made another and more thorough examination of the man’s condition, and found that he had the usual symptoms of profound mercurial cachexia.

I admitted the man into the wards of the infirmary on the 1st of April, and prescribed for him a generous diet, iodide of potassium in five-grain doses three times daily, six leeches to the temple, and fomentation of a warm two per cent. solution of boric acid to the eye. Under this treatment the chemosis and the congestion of the ocular conjunctiva gradually subsided. The eyeball resumed its normal position in the orbit, and the eye could be moved again in all directions. About the tenth day after his admission to the infirmary, the eye was so nearly well that I thought of discharging the man. At this time the man began to complain of pain in the left eye, which up to this date had been entirely healthy. An examination of this eye showed considerable injection of the ocular conjunctiva, especially at the equator, and slight oedema of the same, otherwise it appeared to be normal. On the following day, the left eye was found to be worse, there was greater congestion and oedema of the ocular conjunctiva, and both the upper and the lower lids were somewhat oedematous. I prescribed ice to the lids and leeches to the temple, but this treatment did not prevent the progress of the disease. The oedema of the ocular conjunctiva increased till a broad fold of the swollen conjunctiva protruded from the palpebral fissure. The eyeball was gradually pushed out of the orbit till it was protruded about two lines, and the eyeball could hardly be moved in any direction. In the meantime the right eye had become entirely normal in appearance and had resumed its normal position. Finding that cold applications to the lids did no good, I substituted fomentations of a warm two per cent. solution of boric acid. Frequent examination of the eye with the ophthalmoscope failed to reveal any change in the fundus oculi, and the cornea and iris were not
involved in the disease at any time. The eye remained in the condition above described for about four days, and then gradually improved, so that about the twentieth day from the beginning of the disease in this eye, only very moderate congestion and oedema of the ocular conjunctiva remained. The other symptoms having disappeared, I discharged the man April 29th, but advised him to continue the iodide of potassium, as the symptoms of mercurial poisoning, although much improved compared to the condition when he was admitted, were still well marked.

May 1st, the patient returned with the right eye again painful and red. The lids of this eye were puffy, and the ocular conjunctiva was intensely congested and oedematous. The left eye was nearly normal. The right eye was treated as in the first attack, but this did not stay the progress of the affection. To be brief, this attack did not vary from the first in any particular, and lasted about twenty days. After the subsidence of this second attack of the right eye, the left eye again became painful, and went through the same process a second time, the second attack, like the first, lasting about twenty days, and then passing away without any material damage to the eye.

June 12th.—Both eyes are now in their normal position in the orbit. The eyelids are normal and the ocular conjunctiva is still a little congested, though no longer swollen. The vision of both eyes is the same as before the attacks. The gums are more healthy looking and the tremors have subsided in a considerable degree. The man felt sufficiently well to go to work, and although I advised him to seek other employment, returned to his old occupation, and continued at this work till July 31st, when another attack of inflammation of his right eye compelled him to give it up. This attack did not differ greatly from the previous attacks, but was not quite as severe as the others; it passed away under the treatment above described. He again went to work in the same place and had no further trouble with his eyes till October 18th, when another attack brought him back to the infirmary. This time the left eye was affected. The attack was not as severe in character nor as long in duration as the previous ones. After his recovery from this attack, he found employment elsewhere, and since then
he has had no return of the eye disease. I have seen the patient several times during the last year, and on his last visit to me, about six months ago, I found that the tremulousness of his hands was hardly noticeable. His health was fair.

I have called the eye affection here described, an inflammation of Tenon's capsule, but think it very probable that more or less of the cellular tissue of the anterior part of the orbit was involved in the morbid process. The inflammation of the right eye undoubtedly followed an injury to this eye, but the inflammation of the left eye was not due to such a cause. Whether, in this case, the disease germs traveled from the right eye, through the sheath of the optic nerves, to the capsule of Tenon of the left eye, and then set up the same morbid process, or, whether the mercurial cachexia which was present was the cause of the inflammation of both eyes, I am unable to decide. I have not seen another case like it during the thirty years that I have practised medicine, and a somewhat careful search of the literature has failed to find anything similar to it.

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REMARKS ACCOMPANYING THE DEMONSTRATION OF CORNEAL NERVES.

By Dr. CARL KOLLER,

NEW YORK CITY.

Until a few years ago there was only one method of making the sheathless nerves visible, viz., to stain them with gold. The trouble with this method is, that gold stains also other elements, as the cells in the cornea; the whole preparation becomes very dark in a short time and is in no way available to give a good general view of the distribution of nerves in an organ.

About eight years since Ehrlich of Berlin made a discovery, which is certainly one of the foremost histological discoveries of later years—that if methyleneblue is injected into the bloodvessels of a living or recently killed animal, it stains the peripheral, sheathless nerves blue. I do not dwell on the theory by which Ehrlich tried to explain this, but the fact is that if
you kill an animal and inject into its arteries a saturated solution of methyleneblue, you will soon see the skin and the visible mucous membranes stained a dark blue color. After a short time the blue stain leaves the blood-vessels, and the membranes become first a paler blue and at last a blue-greenish white. If you now cut out the eyes of the animal and put them under water or look through the cornea sideways, you will see it stained blue notwithstanding its transparency. Cut out the cornea and put it under a microscope of weak power, you will see that under your eyes a vast system of nerves becomes visible. First the finest ramifications, and by and by the larger branches and trunks of the corneal nerves appear stained a dark blue in the middle of an uncolored and transparent tissue. May be a few other cells are stained too. Whoever beholds this picture for the first time will wonder at its beauty and lucidity. From the scleral margin a number (10–12) of large trunks composed of fine fibrillae enter the corneal tissue and while giving off branches dichotomously, tend towards the middle of the cornea and at the same time towards its outer surface. At the points where nerves branch off there are swellings and at the branchings of the smaller twigs a peculiar kind of triangular cells. There are anastomoses between the trunks and larger branches and a superficial system of arcades at the periphery of the cornea. While you are gazing at this marvelous revelation, and before you have time to take it in, and so picture it in your mind, the whole gradually fades again, and in a short time you have before you a colorless membrane, apparently without structure.

The attempts to fix this transient coloring have been many. Especially the Russian Dogiel, and lately Hosch of Basel have spent a good deal of time and trouble and skill to make the design lasting. Dogiel found Hoyer's Pikrocarmine a good fixative, and discovered that the active principle in it (for this purpose) was Pikrate of Ammonia. Hosch tried many other substances, but did not find any better. Even this one is by no means satisfactory. The preparations last only a certain length of time; they do not stand alcohol, therefore sufficiently thin slides cannot be obtained of them for the study of the finer ramifications,
Koller: Cocaine in Eye Operations

I have lately interested myself in the matter and made a series of experiments with the view of studying the corneal nerves. At the same time I was searching for a fixative that would allow the use of alcohol for the proper hardening and further treatment of the preparations. For the question of the terminals of the sensitive nerves can only be solved by very thin sections. For this purpose, I have, in the last few weeks, sacrificed a number of rabbits and about three dozen cats, injecting them with methyleneblue. The technique of these experiments is by no means an easy one. I think I have succeeded in finding a method of fixing that answers the requirements mentioned, and although it is not yet fully developed, I am confident that it will be very useful not only to study the nerves in the cornea, but may serve also for the retina and other organs. I do not care to give you the details of a proceeding that still requires finishing, but invite you to inspect two of my cornea preparations. In looking at the ramification of the nerves you will see that it does not agree by any means with the usual description of a plexus. The more complete and distinct a preparation is, the less it makes the impression of a plexus. Although anastomoses are present, the type of ramification is that of a tree, and this may be a general law for the distribution of sensitive nerves. I intend to further develop my method, and may at some later time give you the results attained by it.

THE SUBCONJUNCTIVAL APPLICATION OF COCAINE IN EYE OPERATIONS.

By Dr. Carl Koller,
New York City.

It is now eight years since I published my first experiments about the anaesthetic properties of cocaine and its application in eye-surgery. My suggestion to use instillations of a cocaine solution to produce anaesthesia for operations on the eyeball met with general approbation, and consequently the usefulness of cocaine in other branches of surgery was explored by other investigators.
While in general surgery the hypodermic application of cocaine for production of local anaesthesia became very extensive, in eye-surgery the original method of instilling was generally retained, as the organ seems particularly suited for this method of application. In my very first experiments with animals, and later in eye operations, I noticed the fact, that by instillations of cocaine we were sure to achieve an anaesthesia of the superficial tissues only. I could scratch, or burn, or cauterize the cornea without the slightest pain, but in the moment the iris prolapsed or was touched with an instrument, animals and humans gave brisk signs of pain. In a great number of cases I succeeded in making the iris anaesthetic by beginning the instillations half an hour before the operation, but I did not succeed every time. In my visits to eye-clinics of different countries I found that only in a very few of them instillations were begun in sufficient time before the operation to achieve this end. This circumstance, in my eyes, detracts from the value of cocaine-anaesthesia in a great number of eye operations. The patient does not care which tissue hurts him. He says he has pain and calls cocaine-anaesthesia a beautiful but delusive dream. The pain in touching the iris is especially troublesome in cataract operations. The patient who has been promised a painless extraction and experienced no pain in cutting the cornea is suddenly thrown out of his illusions of a painless operation, makes sometimes a sudden jerk, and may thus endanger the success of the operation. In squint operations one can notice every time that the patient does not feel the conjunctival cut, but does react quickly when the tendon is seized with the hook or forceps and divided.

Very soon after my first communication I began using subconjunctival injections in squint operations, and during my time of assistantship to Professor Snellen I performed many tenotomies and advancements of muscles all with subconjunctival applications of cocaine. If the latter is applied in this way the operation can be made perfectly painless, and we have the double advantage of sparing the pain to the patient and not bringing discredit on a good drug. I proceed in the following way: After having rendered the conjunctiva anaesthetic by
instillation of a 4 per cent. solution, I insert the speculum and
by means of a mouse-toothed forceps seize a fold of the con-
junctiva over the tendon to be operated upon. The needle of
a hypodermic syringe is inserted through this fold into the
subconjunctival tissue as deep as possible, and a few drops of a
two to four per cent. solution of cocaine are injected. I con-
sider 0.05 ( ⅛ of a grain) as the utmost limit for adults that can
safely be applied as an injection, if the locality of injection is
on the head, while on the limbs double that amount may
be allowed if applied gradually. But I am careful to keep a good
way within this limit. With a solution of 2 per cent., and even
of 1 per cent., an entirely satisfactory anaesthesia can be produced
if the solution is well distributed over the field of operation, and
I attribute to this use of weak solutions the fact that I have not
encountered yet any alarming accident from the use of cocaine.
After the injection the speculum is removed from the eye and
the eye is closed so that the artificial oedema of the conjunctiva
may be given time to disappear, which it does in about five
minutes. The disappearance may be helped by a little rubbing.
If you have prepared a patient in this way you can perform the
operation without the slightest pain, whether it be tenotomy or
advancement. In iridectomies and cataract operations I have
been in the habit of instilling a 4 per cent. solution every 5
minutes, beginning 20 to 30 minutes before the operations.
During this time I keep the eye closed to prevent evaporation
with subsequent haziness and desquamation of epithelium. In
most cases I succeed fairly well in making the iris anaesthetic.
But I do not succeed every time, and especially the hard eyes
of subacute or chronic glaucoma will withstand the action
of the drug, as in this class of eyes it is not absorbed by
the cornea in sufficient quantity to penetrate into the ante-
rior chamber. In the beginning of this year Prof. Snellen of
Utrecht communicated to me in a private letter that he was
using cocaine in form of subconjunctival injections for cataract
operations.* He writes: "In cataract operations we inject the

* Prof. Snellen has also described his way of proceeding in a communication concerning
cataract operations in the Annales d'Oculistique, January, 1892, page 75.
Koller: Cocaine in Eye Operations.

cocaine under the conjunctiva on the upper part of the eye, and
the artificial chemosis makes it easy to form a conjunctival flap,
which latter proceeding I have adopted since. I operate always
without iridectomy."

Following this suggestion I have used the subconjunctival
application of cocaine in a number of cases, where I had to
perform the operation of iridectomy or cataract extraction, and
I am very well satisfied with the results attained. The anæsthesia was complete; there were no disadvantages. I proceed
in the following way: First I instill a 4 per cent. solution of
cocaine, wait a few minutes, and then the instillation is re-
peated. Now I insert the speculum, and by means of a steril-
ized hypodermic syringe inject a few drops of a 2 per cent.
solution of cocaine under the conjunctiva next to that part of
the cornea where I intend to make the section — this will be in
most cases the upper part. The solution has been sterilized
previously by boiling it and the hypodermic syringe by rinsing
with alcohol and then 2 per cent. carbolic acid. After the in-
jection the speculum is removed again, and one has to wait from
5 to 10 minutes for the artificial oedema at the place of injec-
tion to subside, as it possibly would be in the way of the knife.
If it is slow to disappear gentle rubbing will hasten it. The
anesthesia thus attained is complete and will contribute to
diminish that percentage of prolapses of the iris that still
adheres to our statistics of cataract extraction. My experience
with the subconjunctival application of cocaine in iridectomies
and cataract extractions is so far a limited one, comprising two
cases of cataract, one case of chronic glaucoma, and two cases
of iridectomy for other causes. Nevertheless, I venture to con-
sider this method a safe one, having to my knowledge no dis-
advantages, and therefore recommend it to you for a trial.

DISCUSSION.

Dr. J. A. Lippincott, Pittsburgh. — I have employed this
method of using cocaine in operations of various kinds, especi-
ally in tenotomies and pterygium operations, for about a year
and a half, and always with great satisfaction. I have never
used it however in cataract extraction.
THE FORM OF RETINAL IMAGES IN THE ASTIGMATIC EYE.

BY DR. CARL KOLLER,

NEW YORK CITY.

In text-books and treatises on astigmatism, the course of a pencil of rays through media with astigmatic surfaces is minutely described, but I find very little mention made of the form and size of the images resulting. The general idea therefore about the retinal images in astigmatic eyes is not always entirely correct. Quite frequently I find in literature these images spoken of as distorted by writers otherwise well versed on optical subjects. I admit that the temptation to consider these images as distorted is a particularly great one, the reasons for it lying in the following circumstances.

1. To form an idea as to the mode of vision of astigmatic eyes, we are in the habit of taking a cylindrical glass and holding it before our emmetropic eye. Let us suppose we take a convex cylinder and hold it with the axis horizontal to produce myopic astigmatism. Now we see the image of a point as a short vertical line, the length dependent on the strength of the glass and the width of the pupil. All vertical lines we see clearly and sharply defined. The focal lines overlapping each other, all horizontal lines we see as ill-defined ribbons. In viewing an upright square we notice that its vertical sides are well defined, while the upper and lower outlines are ill-defined. Besides this we notice that the square has now the form of an oblong, standing with its longer side vertical. In the same manner we will see the line of a circle clearly defined on both sides, but indistinct at the top and the bottom — its form being also changed to a vertical ellipse. It is natural that without further reflection we should arrive at the impression that an astigmatic eye sees squares as oblongs and circles as ellipses.

2. We know that the retinal images of myopic eyes are
larger than those of emmetropic ones; and that the images of hypermetropic eyes are smaller than these latter. Being in the habit of speaking of one meridian of an astigmatic eye as myopic or hypermetropic it is not astonishing that we should transfer our idea of the respective size of the images to the dimension of the astigmatic image in the respective meridian, and arrive at the conclusion aforementioned.

3. In looking into an eye with the ophthalmoscope we will in fact see the upright image of the optic nerve distorted, provided we keep a certain distance from the eye. We will see the disk, apart from the indistinctness at certain parts of its outline, elongated in the meridian of strongest power. What is more natural than to conclude from the distortion of the disk, produced by the media of the eye, that a distortion is produced by the same media in the retinal images?

Though a careful consideration would show us that the conclusions drawn in the three cases mentioned are erroneous, the fact is that they are drawn very frequently. Figures are the best means to arrive at a clear idea, and so I have taken the trouble to calculate the form of the retinal images in astigmatic eyes. I based the calculation on the figures given by Helmholtz for the schematic eye and assumed this one to be astigmatic by different curvature of the cornea, almost everybody now agreeing that astigmatism in the vast majority of cases is caused by astigmatism of the cornea. For astigmatism caused by different curvature or oblique position of the lens a similar calculation would lead to similar results. In the calculation which is given below in extenso, I figured the position of the cardinal points, and, with the help of these, figured the size of the retinal images. Furthermore I calculated the position of the cardinal points consisting of an astigmatic eye and the correcting cylinder and calculated the size of the retinal images of such a system. The conclusion at which I arrived is that the retinal images of an astigmatic eye are indistinct, but by no means distorted, except the distortion produced by indistinctness. Even in cases of astigmatism of very high degree (produced by astigmatism of the cornea or oblique posi-
tion of the lens) the displacement of the cardinal points in the ametropic meridian is an extremely slight one and the dimensions of the image therefore are very slightly different from those of the emmetropic meridian. But considerable distortion of images in astigmatic eyes is produced by correcting the astigmatism by means of cylindrical glasses, as the figures below will show. Assuming that one meridian of the eye is emmetropic and identical with the schematic eye of Helmholtz, we find the radius of curvature for the ametropic meridian by using the formula

\[ \frac{n}{r} + \frac{n'}{r'} = \frac{n''}{r} \quad \text{or} \quad r = \frac{f_f (n'' - n)}{n' + n'} \]

where \( f \) means the amount of ametropia expressed in millimetres; \( f_f \) the posterior focal length of the emmetropic meridian (say: 7.8299); \( n \) the index of refraction of air; \( n_r \) the index of refraction of cornea, humor aqueous and vitreous.

Substituting for the different cases we find the radius of the cornea that shall produce

**Myopic astigmatism of 6 D. 6869 mm.**

5 D. 7.012
4 D. 7.161
3 D. 7.317
2 D. 7.476
1 D. 7.651

**Emmetropia, 7.829**

**Hypermetropic astigm. 1 D. 8.031**

2 D. 8.227
3 D. 8.433
4 D. 8.650
5 D. 8.878
6 D. 9.119

The anterior and posterior focal length of the cornea in the ametropic meridian is found by the formula:

\[ F_r = \frac{n_r}{n_n - n_r}, \quad F_r = \frac{n_r}{n_n - n_r} \]
<table>
<thead>
<tr>
<th>Asm, 6 D.</th>
<th>5 D.</th>
<th>4 D.</th>
<th>3 D.</th>
<th>2 D.</th>
<th>1 D.</th>
<th>Emmetropia, 1 D.</th>
<th>Ash. 1 D.</th>
<th>2 D.</th>
<th>3 D.</th>
<th>4 D.</th>
<th>5 D.</th>
<th>6 D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.277</td>
<td>27.844</td>
<td>28.429</td>
<td>29.049</td>
<td>29.680</td>
<td>30.388</td>
<td>31.095</td>
<td>31.891</td>
<td>32.669</td>
<td>33.487</td>
<td>34.349</td>
<td>35.254</td>
<td>36.211</td>
</tr>
</tbody>
</table>

To calculate the cardinal points of the eye in the ametropic meridian we have to combine the ametropic cornea with the crystalline lens by the formula —

\[
H_1 = \frac{D \cdot F_1}{D - \Phi_1 - F_2} \quad H_2 = \frac{D \cdot \Phi_2}{D - \Phi_1 - F_2}
\]

wherein \( H_1 \) means the distance of the first cardinal point of the whole system from the first cardinal point of the first part; \( H_2 \) the distance of the second cardinal point of the resulting system from the second cardinal point of the second part.

D means the distance of the first cardinal point of the second part from the second cardinal point of the first part. The first and second cardinal point of the cornea are identical, and situated at its front, the cornea having only one active surface. The first cardinal point of the lens is 2.1260 mm. behind its anterior surface, the second 1.2756 mm. in front of its posterior surface. As the anterior surface of the lens is 3.6 mm. behind the surface of the cornea, D will be = 3.6 + 2.1260 = 5.7260. \( F_1 = F_2 \), anterior and posterior focal lengths of the ametropic corneal meridian. \( \Phi_1 \) and \( \Phi_2 \), anterior and posterior focal length of the crystalline lens are alike = 50.6171.

The figures for \( H_1 \) give us the place of the first cardinal point of the eye in the ametropic meridian, that is, its distance from the front of the cornea. Not so the figures for \( H_2 \). They give us the distance of the second cardinal point of the eye in
the ametropic meridian from the second cardinal point of the crystalline lens. As this latter point is situated 5.9244 behind the front of the cornea, the figures for $H_2$ will have to be added to (or subtracted from) this number, in order to give us the place of the second cardinal point, that is, its distance from the top of the cornea.

<table>
<thead>
<tr>
<th></th>
<th>$H_1$ (at the same time distance of the first cardinal point from the front of the cornea)</th>
<th>$H_2$</th>
<th>Distance of $H_2$ from the front of the cornea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asm,</td>
<td>6 D.</td>
<td>1.616</td>
<td>4.012</td>
</tr>
<tr>
<td></td>
<td>5 D.</td>
<td>1.637</td>
<td>3.982</td>
</tr>
<tr>
<td></td>
<td>4 D.</td>
<td>1.658</td>
<td>3.947</td>
</tr>
<tr>
<td></td>
<td>3 D.</td>
<td>1.680</td>
<td>3.914</td>
</tr>
<tr>
<td></td>
<td>2 D.</td>
<td>1.702</td>
<td>3.881</td>
</tr>
<tr>
<td></td>
<td>1 D.</td>
<td>1.727</td>
<td>3.850</td>
</tr>
<tr>
<td>Emmetropia,</td>
<td></td>
<td>1.753</td>
<td></td>
</tr>
<tr>
<td>Ash.</td>
<td>1 D.</td>
<td>1.777</td>
<td>3.7698</td>
</tr>
<tr>
<td></td>
<td>2 D.</td>
<td>1.802</td>
<td>3.7320</td>
</tr>
<tr>
<td></td>
<td>3 D.</td>
<td>1.827</td>
<td>3.6931</td>
</tr>
<tr>
<td></td>
<td>4 D.</td>
<td>1.854</td>
<td>3.6530</td>
</tr>
<tr>
<td></td>
<td>5 D.</td>
<td>1.882</td>
<td>3.6118</td>
</tr>
<tr>
<td></td>
<td>6 D.</td>
<td>1.910</td>
<td>3.5692</td>
</tr>
</tbody>
</table>

The interval between the cardinal points (the same as between the nodal points) is:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Asm,</td>
<td>6 D.</td>
<td>0.2964</td>
</tr>
<tr>
<td></td>
<td>5 D.</td>
<td>0.3048</td>
</tr>
<tr>
<td></td>
<td>4 D.</td>
<td>0.3188</td>
</tr>
<tr>
<td></td>
<td>3 D.</td>
<td>0.3304</td>
</tr>
<tr>
<td></td>
<td>2 D.</td>
<td>0.3414</td>
</tr>
<tr>
<td></td>
<td>1 D.</td>
<td>0.3474</td>
</tr>
<tr>
<td>Emmetropia,</td>
<td></td>
<td>0.3569</td>
</tr>
<tr>
<td>Ash.</td>
<td>1 D.</td>
<td>0.3776</td>
</tr>
<tr>
<td></td>
<td>2 D.</td>
<td>0.3897</td>
</tr>
<tr>
<td></td>
<td>3 D.</td>
<td>0.4036</td>
</tr>
<tr>
<td></td>
<td>4 D.</td>
<td>0.4167</td>
</tr>
<tr>
<td></td>
<td>5 D.</td>
<td>0.4306</td>
</tr>
<tr>
<td></td>
<td>6 D.</td>
<td>0.4458</td>
</tr>
</tbody>
</table>
The anterior and posterior focal lengths of the ametropic meridian are found by the formulæ.

\[
f_1 = \frac{F_1 \phi_1}{\phi_1 + F_2 - D} \quad f_2 = \frac{F_2 \phi_2}{\phi_1 + F_2 - D}
\]

The ciphers having the same meaning as above.

<table>
<thead>
<tr>
<th></th>
<th>( f_1 )</th>
<th>( f_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asm, 6 D.</td>
<td>14.313</td>
<td>19.1041</td>
</tr>
<tr>
<td>5 D.</td>
<td>14.497</td>
<td>19.3769</td>
</tr>
<tr>
<td>4 D.</td>
<td>14.682</td>
<td>19.6249</td>
</tr>
<tr>
<td>3 D.</td>
<td>14.874</td>
<td>19.8791</td>
</tr>
<tr>
<td>2 D.</td>
<td>15.071</td>
<td>20.1424</td>
</tr>
<tr>
<td>1 D.</td>
<td>15.288</td>
<td>20.432</td>
</tr>
<tr>
<td>Emmetropia, 1 D.</td>
<td>15.4983</td>
<td>20.7135</td>
</tr>
<tr>
<td>2 D.</td>
<td>15.729</td>
<td>21.0218</td>
</tr>
<tr>
<td>3 D.</td>
<td>15.951</td>
<td>21.318</td>
</tr>
<tr>
<td>4 D.</td>
<td>16.167</td>
<td>21.607</td>
</tr>
<tr>
<td>5 D.</td>
<td>16.416</td>
<td>21.940</td>
</tr>
<tr>
<td>6 D.</td>
<td>16.658</td>
<td>22.263</td>
</tr>
</tbody>
</table>

The position of the nodal points is easily found, \( h_1, k_1 \), that is, the distance of the first nodal point from the first cardinal point, is equal to the difference of the two focal lengths. As the position of \( H_1 \) is known, it is easy enough to find that of \( K_1 \).

<table>
<thead>
<tr>
<th></th>
<th>Place of ( K_1 )</th>
<th>( K_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asm, 6 D.</td>
<td>6.407</td>
<td>6.703</td>
</tr>
<tr>
<td>5 D.</td>
<td>6.517</td>
<td>6.822</td>
</tr>
<tr>
<td>4 D.</td>
<td>6.601</td>
<td>6.920</td>
</tr>
<tr>
<td>3 D.</td>
<td>6.685</td>
<td>7.015</td>
</tr>
<tr>
<td>2 D.</td>
<td>6.773</td>
<td>7.114</td>
</tr>
<tr>
<td>1 D.</td>
<td>6.871</td>
<td>7.218</td>
</tr>
<tr>
<td>Emmetropia, 1 D.</td>
<td>6.9684</td>
<td>7.3253</td>
</tr>
<tr>
<td>2 D.</td>
<td>7.070</td>
<td>7.447</td>
</tr>
<tr>
<td>3 D.</td>
<td>7.169</td>
<td>7.559</td>
</tr>
<tr>
<td>4 D.</td>
<td>7.268</td>
<td>7.671</td>
</tr>
<tr>
<td>5 D.</td>
<td>7.373</td>
<td>7.789</td>
</tr>
<tr>
<td>6 D.</td>
<td>7.478</td>
<td>7.909</td>
</tr>
<tr>
<td></td>
<td>7.583</td>
<td>8.029</td>
</tr>
</tbody>
</table>
In subtracting the figures for $K_2$ from 22.8236, the length of the eye axis, we get the distance of the retina from the second nodal point, which distance is in direct proportion to the dimension of the retinal images.

The distance $N K_2$ is:

<table>
<thead>
<tr>
<th>Asm,</th>
<th>6 D.</th>
<th>16.101</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 D.</td>
<td>16.032</td>
</tr>
<tr>
<td></td>
<td>4 D.</td>
<td>15.904</td>
</tr>
<tr>
<td></td>
<td>3 D.</td>
<td>15.809</td>
</tr>
<tr>
<td></td>
<td>2 D.</td>
<td>15.710</td>
</tr>
<tr>
<td></td>
<td>1 D.</td>
<td>15.606</td>
</tr>
<tr>
<td>Emmetropia,</td>
<td>15.498</td>
<td></td>
</tr>
<tr>
<td>Ash.</td>
<td>1 D.</td>
<td>15.377</td>
</tr>
<tr>
<td></td>
<td>2 D.</td>
<td>15.265</td>
</tr>
<tr>
<td></td>
<td>3 D.</td>
<td>15.153</td>
</tr>
<tr>
<td></td>
<td>4 D.</td>
<td>15.035</td>
</tr>
<tr>
<td></td>
<td>5 D.</td>
<td>14.915</td>
</tr>
<tr>
<td></td>
<td>6 D.</td>
<td>14.795</td>
</tr>
</tbody>
</table>

In looking at the above figures we notice that the displacement of the second nodal point in ametropia by curvature is a very slight one, and accordingly we see that the distance between retina and second nodal point undergoes slight changes only. Provided the images in the astigmatic eye were distinct, the difference in size in the two chief meridians would be a very slight one. Suppose we place a stenopaic slit before the eye, and thus narrow down the lines of diffusion almost to a point, then it will become apparent that there is only a very slight difference in the size of the retinal image in the two chief meridians. In an eye of Asm. 3 D, a square of 155 mm. wide would appear as 155 wide in the emmetropic meridian, but 158 mm. wide in the myopic meridian, on account of the slight forward displacement of the second nodal point. Similarly in an eye with Ash. 3 D the side of the square would appear 151.5 mm. wide on account of the slight displacement of the second nodal point backward. But our assumption is not quite correct on account of the indistinctness of the image.
through the lines of diffusion, which tends to enlarge it in the ametropic meridian. The length of the lines of diffusion for images of distant objects depends on the width of the pupil and the amount of ametropia. I have calculated the length of the focal lines for a pupil of 3 mm. actual size, and for one of 5 mm. actual size in the different degrees of astigmatism. To find the length of the focal lines it is necessary to find first the position and size of the image of the pupil produced by the crystalline lens. The size of this image (I omit the somewhat lengthy calculation) is 3.1315 for the pupil of 3 mm. actual size; its position in front of the retina is 19.118 mm. For the pupil of 5 mm. actual size the image is 5.2191 mm; its place the same as before. The length of the focal line (diameter of circle of diffusion) we get by the formula:

\[ a : f = d + l_2 : l_2 \]

wherein \( a \) means the diameter of the pupillary image; \( d \), its distance from the retina; \( l_2 \) the distance of the posterior focus from the retina.

Actual size of pupil:

<table>
<thead>
<tr>
<th></th>
<th>3 mm.</th>
<th>5 mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.327</td>
<td>0.545</td>
</tr>
<tr>
<td>5</td>
<td>0.267</td>
<td>0.445</td>
</tr>
<tr>
<td>4</td>
<td>0.214</td>
<td>0.357</td>
</tr>
<tr>
<td>3</td>
<td>0.151</td>
<td>0.252</td>
</tr>
<tr>
<td>2</td>
<td>0.107</td>
<td>0.1785</td>
</tr>
<tr>
<td>1</td>
<td>0.0527</td>
<td>0.0878</td>
</tr>
<tr>
<td>Ash</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.056</td>
<td>0.083</td>
</tr>
<tr>
<td>2</td>
<td>0.108</td>
<td>0.180</td>
</tr>
<tr>
<td>3</td>
<td>0.157</td>
<td>0.262</td>
</tr>
<tr>
<td>4</td>
<td>0.212</td>
<td>0.353</td>
</tr>
<tr>
<td>5</td>
<td>0.263</td>
<td>0.438</td>
</tr>
<tr>
<td>6</td>
<td>0.305</td>
<td>0.508</td>
</tr>
</tbody>
</table>

In the case of Asm. 3 D. the image of a square would be widened in the myopic meridian by 0.151 or 0.252 respectively, and in the case of Ash. 3 D. it would be widened by 0.157 or 0.262 in the hypermetropic meridian. While in the one case the indistinctness produced tends to increase the widening of
the image in the ametropic meridian, in the other case the indistinct outlines would counterbalance or even overcome the narrowing of the image resulting from the backward displacement of the second nodal point.

As in a certain degree of astigmatism and a given width of the pupil the line of diffusion has always the same length, whatever the size of the image of a distant object may be, it is evident that the widening of the image by indistinctness is proportionally stronger in small objects and very insignificant in the images of large objects. So far I have assumed that the image of an object—for instance, our square—is widened in the ametropic meridian on each end by half the length of the line of diffusion, or in all by the whole length of this line. This assumption is evidently exaggerated. The line of diffusion (referring to a point) or the ribbon of diffusion are indistinct at their edges on account of less light being concentrated there, and certainly the limit of an object is not placed at the utmost limit of the ribbon of diffusion by an astigmatic eye.

In placing a stenopaic slit before the eye we can reduce the length of the focal lines to a minimum and do away almost entirely with the indistinctness of the image and the distortion resulting from it. There will remain the very slight distortion of an image resulting from the forward or backward displacement of the nodal points, widening in the meridian of stronger power, narrowing in the meridian of weaker power.

In case we correct the astigmatism by a cylindrical glass, as we are in the habit of doing, the rays of a homocentric pencil of light are united again to one point on the retina and the indistinctness of the image done away with. If we were able to place the correcting cylinder in the second nodal point of the eye, the correction of the indistinctness of the image would not have any consequences upon the form of the image. But this is not the case. We have to correct the astigmatism by a glass placed at a distance of from 15 to 20 mm. from the first cardinal point. This circumstance will have an effect upon the form of the images, just as in the case of spherical glasses it has an effect upon the size only. A convex cylinder will enlarge an
object in the meridian that forms a right angle with the axis, but will not change the size of the image in the direction of the axis. A concave cylinder will narrow the image in the corresponding meridian but leave it unchanged in the axis. This effect of cylindrical glasses to influence the form of the retinal images while correcting their indistinctness will increase with the distance of the glass from the eye, but it will always be present, just as is the case with spherical glasses regarding the size of the images. To avoid being misunderstood I think I should repeat that spherical glasses always alter the size of retinal images, and the law found by Knapp and formulated in his fundamental paper, "Über den Einfluss der Brillen auf die optischen Constanten und die Sehschärfe," does not alter this in the least. The law of Knapp says that in ametropia of axial origin the correcting glass placed in the anterior focus of the eye will give to the images such a size as they would have if the eye were emmetropic. The law of Knapp does not say that the images of a myopic eye are not diminished by a concave glass placed in the anterior focus, or anywhere else; nor does it say that the images of an hypermetropic eye are not enlarged by a convex glass placed in the anterior focus, or anywhere else.

I have calculated the cardinal points of a system consisting of an astigmatic eye and the correcting glass placed at the distance of 15 mm. from the first cardinal point of the eye, and also the cardinal points of a system where the correcting glass is placed 20 mm. before the first cardinal point. The formulæ applied are the same as before.

The table below gives the figures for the cardinal points, nodal points, and focal lengths. The size of the retinal image is proportionate to the first focal length. The last column gives the enlargement or the diminution.
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Astigmatism corrected by a cylinder, placed 15 mm. before the first cardinal point.

<table>
<thead>
<tr>
<th>Correcting glass, focal length.</th>
<th>Place at $H_1$</th>
<th>$F_2$</th>
<th>$F_1$</th>
<th>Place of $K_1$</th>
<th>$K_2$</th>
<th>Image smaller.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asm. 6 D. 154.6 mm.</td>
<td>1.548</td>
<td>3.794</td>
<td>14.242</td>
<td>19.042</td>
<td>6.342</td>
<td>8.598</td>
</tr>
<tr>
<td>5 D. 185 mm.</td>
<td>1.615</td>
<td>3.476</td>
<td>14.492</td>
<td>19.375</td>
<td>6.497</td>
<td>8.359</td>
</tr>
<tr>
<td>4 D. 235 mm.</td>
<td>1.638</td>
<td>3.228</td>
<td>14.662</td>
<td>19.590</td>
<td>6.572</td>
<td>8.162</td>
</tr>
<tr>
<td>3 D. 318.3 mm.</td>
<td>1.674</td>
<td>2.946</td>
<td>14.867</td>
<td>19.869</td>
<td>6.676</td>
<td>7.948</td>
</tr>
<tr>
<td>2 D. 485 mm.</td>
<td>1.704</td>
<td>2.666</td>
<td>15.073</td>
<td>20.145</td>
<td>6.776</td>
<td>7.738</td>
</tr>
<tr>
<td>1 D. 985 mm.</td>
<td>1.706</td>
<td>2.354</td>
<td>15.293</td>
<td>20.438</td>
<td>6.851</td>
<td>7.499</td>
</tr>
</tbody>
</table>

| Asm. 1 D. 1105 mm.             | 1.766         | 1.845| 15.718| 21.007        | 7.055| 7.134          |
| 2 D. 515 mm.                   | 1.774         | 1.572| 15.924| 21.279        | 7.129| 6.927          |
| 3 D. 348.3 mm.                 | 1.776         | 1.304| 16.113| 21.535        | 7.198| 6.726          |
| 4 D. 265 mm.                   | 1.775         | 1.036| 16.329| 21.823        | 7.269| 6.530          |
| 5 D. 215 mm.                   | 1.767         | 0.772| 16.530| 22.093        | 7.339| 6.335          |
| 6 D. 181.6 mm.                 | 1.753         | 0.513| 16.687| 22.302        | 7.373| 6.128          |

Astigmatism corrected by a cylinder, placed 20 mm. before the first cardinal point.

<table>
<thead>
<tr>
<th>Correcting glass, focal length.</th>
<th>Place at $H_1$</th>
<th>$F_2$</th>
<th>$F_1$</th>
<th>Place of $K_1$</th>
<th>$K_2$</th>
<th>Image smaller.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asm. 6 D. 146.6 mm.</td>
<td>0.869</td>
<td>4.420</td>
<td>13.778</td>
<td>18.390</td>
<td>5.481</td>
<td>9.932</td>
</tr>
<tr>
<td>3 D. 313.3 mm.</td>
<td>1.338</td>
<td>3.528</td>
<td>14.534</td>
<td>19.558</td>
<td>6.282</td>
<td>8.182</td>
</tr>
</tbody>
</table>

| Asm. 3 D. 353.3 mm.            | 2.046         | 0.995| 16.344| 21.843        | 7.545| 6.504          |
| 6 D. 186.6 mm.                 | 2.252         | -0.101|17.146| 22.915        | 8.021| 5.668          |

So far I have shown that correction of As. by cylindrical glasses will lengthen or shorten the retinal images in the ametropic, and corrected meridian. Another kind of distortion, but founded on the same cause, will take place in case the outlines of the object do not run in one of the chief meridians of astigmatism. I refer to the deviation of lines and the change of angles. In a paper entitled "Über eine eigenthümliche Sorte dioptischer Bilder—Ein Beitrag zur Theorie der Cylinderrinnen," Graefe's Archiv., 1887, I have described and given the theory of these and other phenomena shown by cylindrical lenses. The deviation of lines, that do not run parallel to one OPH.—28
of the chief meridians, is nothing else than a phenomenon of enlargement. Imagine that an astigmatic eye, the meridian of greatest power in the vertical meridian, that of least power in the horizontal, be corrected by a cylindrical lens, let us say concave — axis horizontal. The object be a square standing on one of the angles, the sides standing at an angle of $45^\circ$ to the vertical and horizontal. In consequence of the correction, the vertical diagonal of the square will be shortened compared with the horizontal, which is not changed by the correcting glass. The upper and lower angle become obtuse, while the right and left become pointed. The same will take place of course, if the axis of astigmatism be inclined by $45^\circ$ to the vertical meridian and the square stands upright. In this case where one diagonal running from right up to left downwards, or left up to right downwards, is shortened, it is quite evident that the sides of the square will seem displaced, turned to a certain degree according to the degree of astigmatism corrected and the distance of the glass from the first cardinal point. The displacement of lines is less where the axis of astigmatism makes angles with the direction of the line smaller than $45^\circ$.

I have calculated the amount of displacement of lines running at an angle of $45^\circ$ to one of the chief meridians, and have found it for Asm. 3 D. to be $1^\circ 10'$, for Asm. 6 D. $2^\circ 30'$.

In cases where in both eyes astigmatism exists with oblique axes, and of a symmetrical type, the displacement of lines by correction gives rise to the stereoscopic phenomena lately described by Dr. Lippincott. If one and the same line in both eyes is displaced, for instance, the upper end towards inside, this end by stereoscopic effect will seem nearer than the lower end, and the line will seem to lean forward with its upper end. A sagittal line upon the floor in the same case will seem to rise away from the observer and vice versa. We see that correction of astigmatism by cylindrical glasses goes with distortion of the retinal images, which however, happily, is corrected by experience and custom. The images of the astigmatic eye (except very small ones) are very much nearer to the natural form than those of the corrected eye. The question arises whether correction of astigmatism is possible without distortion of images.
Koller: Retinal Images in the Astigmatic Eye. 437

The answer is: It is possible. Let us suppose an eye with hypermetropic astigmatism, the horizontal meridian being hypermetropic, the vertical emmetropic. We can over-correct the astigmatism by a convex cylinder and place at a certain distance before it a negative cylinder, the axis parallel to the first, which counterbalances the over-correction and at the same time, although weaker, by its greater distance from the first cardinal point will counterbalance the forward displacement of the second nodal point. This question has only theoretical value, as in practice patients accommodate themselves by experience to the distortion of images.

Discussions.

Dr. Edward Jackson, Philadelphia.—The paper of Dr. Koller among other things covers some remarks which I made last year in a paper with reference to the direction of images and lines if parallel to the principal meridian. I think that he has covered the ground pretty thoroughly except possibly as to the demonstration of the relative amount of such displacement at different distances in front of the eye.

I think that the last statement, that this inconvenience is overcome in a few days, may be misleading because in very high degrees of astigmatism in quite young persons, I have seen such inconvenience continue for many—six or eight—weeks. I think that the practical thing that we can do to lessen the inconvenience is either to give partial correction of the astigmatism so that the lines will not diverge so much, or the eyelashes may be cut and the glasses brought very close to the eyes, and after a time moved further forward. The amount of distortion of the image is in proportion to the distance of the refracting surface from the cornea.

Dr. Carl Koller, New York.—I am sorry that I did not hear Dr. Jackson's paper. Dr. Jackson could have read my paper published in 1887 in Graefe's Archives, which refers to these displacements. I described the phenomena and analyzed them and gave a series of them mathematically.

Dr. Jackson.—I did read Dr. Koller's paper, and it was certain practical deductions from the phenomena that I referred to.
EXTRACTION OF CATARACT WITHOUT IRIDECTOMY.

BY OREN D. POMEROY, M.D.,
NEW YORK CITY.

These cases are reported in order to present some of the indications for and against the method of extraction without iridectomy. The results of the extractions are as follows:

| Vision 20/XX | . . . | 3 | Vision 20/C | . . . | 9 |
| " 20/XX | . . . | 2 | " 20/CC | . . . | 3 |
| " 20/XXX | . . . | 7 | " counting fingers at four feet | 1 |
| " 20/XL | . . . | 14 | | |
| " 20/L | . . . | 4 | | |
| " 20/LXX | . . . | 7 | | 50 |

In three cases both eyes were operated on successfully. The visual results might have been better under certain circumstances. It appears that a pupillary membrane was operated on thirty-one times, leaving nine without operation. Most of these might have been further improved by an operation, but in some cases the patients lived at a distance and subsequent operations were inconvenient. Again, many were satisfied with the amount of sight obtained, and did not care for more operations. In thirteen cases, or about a third, astigmatism required to be corrected, and it is not improbable that other cases of astigmatism were overlooked. I have been astonished to see how much the vision in certain cases has been improved by a more careful correction of the refractive error. Moderate prolapse of the iris occurred in two cases with a somewhat peripheral pupil where operative interference seemed unnecessary. In two cases, both young subjects for senile cataract, the lenses were swollen and encroached on the anterior chamber, making it difficult to pass the knife across, and the iris was wounded near the pupil, which caused the latter to be somewhat distorted, but the vision was good in each case. In another case the knife cut out a piece of iris, making a pupil something like that after an iridectomy; the healing was slow, but the ultimate result was good. Subsequently the appearance was the same
as in iridectomy. In another case the iris became caught in the wound a day or two after the operation, and there was failure to properly close the wound. One or two applications of strong nitrate of silver sufficed to cause coaptation of the parts, and the case did well. There were three cases of prolapse of the iris occurring from one to three days after the operation and without assignable cause. Two of these were iridectomized at once with good result; the third was incised, cauterized, and iridectomized, with a result of vision 20/cc. Another case resulted in kerato-iritis, with partial closure of the pupil and a small opacity on the cornea, dependent, evidently, on a too thorough replacement of the iris by the repositor. The vision, however, became good after an operation.

Two other cases showed the pupil drawn far toward the wound, but neither incarcerated nor prolapsed consequent on loss of vitreous. In the first case the lens was inadvertently extracted in its capsule. After it was nearly expelled the pressure was mostly removed from the cornea and considerable vitreous (one-third to one-quarter) escaped.

Immediately on the delivery of the lens I refused to manipulate the eye further than to lift the upper eyelid and observe the cornea deeply sunken into the globe, but in fair coaptation and with no prolapsus of the iris. This case recovered without excessive reaction, but vitreous opacities were found. The vision was 20/c. I could not account for the loss of vitreous in this case and also in the subsequent one. The latter, which is recorded as a failure, showed nothing unusual in the extraction until after the expulsion of the lens, when the Bowman spoon was used in manipulating the cornea so as to more perfectly restore the dislocated iris, when the wound suddenly widely gaped and from one-quarter to one-third of the vitreous suddenly escaped. No speculum was used; the eye was looking to the front, there was absolutely no faulty conduct on the part of the patient, and I could not in the least account for the accident. No violent reaction occurred; the pupil was drawn far upward without prolapsus or incarceration, but there has been circumcorneal injection and some photophobia most of the time since the operation, and the eyeball shows diminished tension. At
one time the vision was 20/c, but three months afterward it is not more than counting fingers at four feet.

I cannot but feel that extraction of cataract is sometimes an exciting cause of sympathetic ophthalmia.

Some years since, I reported to this society several cases of sympathetic ophthalmia following extraction of cataract. In this list of fifty extractions I had one case of extraction in the right eye, with no unusual reaction, but which was followed in two months by exudative iritis, with diminished tension in the left eye. Some of my colleagues did not regard this as a case of sympathetic ophthalmia.

In another of these cases a perfect extraction was done with a high visual result, and no secondary operation. In two years the patient returned to the hospital with the fellow eye far advanced in phthisis from iridochoroiditis, with no explanation of the cause of the trouble, except the operation on the fellow eye. The eye was red and irritable, and enucleation was at once done.

In none of these cases was iridectomy done except in those of prolapsed iris occurring one or more days after the extraction.

Some Details of the Operation. — Latterly the bichloride of mercury (one to ten thousand) has been used, bathing the eye freely with it before the operation and using it with some freedom during the operation. The instruments are all immersed in boiling water. Cocaine has been used, in the strength of from two to four per cent. solutions, instilled fifteen minutes before the operation for three or four times. The pupil should be about half dilated, as in this condition the knife is passed across the anterior chamber with less risk of wounding the iris, according to my experience.

If, however, the patient is nervous or lacking in self-control, the only alternative is ether or chloroform.

For the last year I have rarely used the spring speculum, as I have seen vitreous extruded in consequence of its use. It is not in the least difficult to do the section without it, in a majority of instances. The lower lid is cared for by the fixation forceps applied upon the lower portion of the eye-ball very near to the cornea, while the upper lid is drawn up by the fingers of
an assistant, or an elevator may be used, although it is not often necessary, and is less safe than the fingers. I have always used my right hand in operating, as I believe I do better with it than with the left. For the right eye the position is naturally at the head of the patient, and for the left the operator may stand on the right side, reaching across to the left eye. This is just as convenient in operating as in that of the right eye. A rather broad Graefe knife is always chosen, and in making the section an imaginary equilateral triangle is laid on the cornea with the base upward. The puncture and counter-puncture correspond to the two upper angles of the triangle. The knife enters about midway in the limbus, and emerges at a corresponding point on the opposite side; there is often a tendency to make the counter-puncture too deeply.

The section terminates at the margin of the sclera above, as nearly as possible, although in some cases, by an effort to avoid the iris, the incision may extend too far in the clear cornea. The latter condition seems to favor anterior synechiae.

A properly performed simple extraction does not ordinarily result in more than a very small amount of bleeding, and often none at all. In order to avoid the iris, the knife should be passed slowly and very deliberately across the anterior chamber, being careful not to tilt it so as to lose aqueous, and as soon as the point emerges at the counter-puncture a long and a quick thrust should be made, completing half or more of the section; by that time the knife has passed by the iris, when the section may be completed with sufficient deliberation. The capsule is lacerated with the Graefe sferam-shaped cystotome near the center of the lens, being careful to avoid the upper periphery for fear of lacerating the iris or rupturing the zonula. I prefer to deliver the lens by means of the Davel or Bowman spoon, one being placed on the sclera above and the other on the lower portion of the cornea. The spoon is preferable to the finger from the fact that the compressive force may be applied more exactly where required than when the too wide finger is used, especially if the pressure is used outside of the lid as is generally the case. One great drawback to simple extraction is the difficulty of removing bits of lens matter after the iris has
returned to its proper position. To avoid this, it is well to
deliver the broken-up lens matter while the body of the lens is
in transitu—that is, before the iris has been returned to its
position—by a stroking movement of the spatula on the cor-
nea, until the pupil appears black; this may be accomplished at
about the time the body of the lens is extruded from the eye.

After thoroughly irrigating the eye with the bichloride
solution I have latterly used eserin, in a solution of one grain
to the ounce, although I do not feel certain of its value in pre-
venting prolapsus of the iris; but, on the other hand, I have
not been impressed with its tendency to induce iritis, as has
been claimed by many. A piece of absorbent cotton dipped in
the bichloride solution is then laid on the eye, and on this a
sufficient piece of dry cotton, and the binocular bandage is
applied. Quite recently, instead of this, the sterilized vaseline
with the bichloride (1 to 5,000) has been used on the cotton
placed next to the eye; this prevents the dressing from
sticking to the part and enables the eye to be opened without
violence. On the next day the dressing is removed, and, if
there has been no untoward symptom, little or no discharge on
the dressing and no unusual swelling of the lid, the dressing is
reapplied without opening the eye. This process is repeated
for the next three or four days, when the bandage is removed
and a shade placed over both eyes. I am not, however, super-
stitious about opening the eye at any time, provided the symp-
toms call for active interference. The principal point seems to
be to do nothing to interrupt the healing of the corneal wound,
or to cause it to open after slight adhesions have taken place.
Atropine is used after three or four days. In one case an early
use of atropine apparently increased the intra-ocular pressure
and forced open the wound and induced a prolapsus of iris.

The prolapsus of the iris is the great drawback to this opera-
tion. In many instances the iris may be restored to position by
external manipulation. If the anterior chamber is allowed to
fill, the iris is much more likely to float back into position.
Sometimes the iris is kept from returning by being pinched in
the angles of the incision, and the manœuvre suggested by
Knapp—of depressing the lower part of the cornea so as to
make the wound gape—may overcome this difficulty. In a majority of instances, however, the repositor of Wecker is needed to restore the iris to position. I have observed frequently that if the pupil still remains with a little nick in it, pointing in the direction of the wound, after complete recovery we find the pupil of the same shape as at first. In one case great persistence was used in completely returning the iris, and a kerato-iritis resulted, leaving a small opacity of the cornea and a contracted and adherent pupil. The patient, however, recovered good vision after an operation.

The most insurmountable difficulty, however, results from prolapses occurring one or several days after the operation. These, in many instances, cannot be satisfactorily accounted for. Swelling of lens matter and opening of the wound, or failure of the wound to close perfectly and retain the aqueous, or too early use of atropine, are more frequent causes of this accident. Any violence inflicted on the eye during recovery oftener causes prolapsus of the iris than is usually supposed, and where it is practicable it is well to tie the patient's hands so that by no possibility can mischief be inflicted by touching or rubbing the eye. Prout's wire apparatus over the dressing would seem justifiable. When prolapsus has occurred a day or more after the operation I am in the habit of doing iridectomy under ether, as cocaine is not sufficient to quiet the eye at this time. I have heard that others have occasionally pushed the iris back after a twenty-four-hours prolapse, but this manifestly can not often be done. It may be needless to remark here that iridectomy under these circumstances must needs be an imperfect operation.

Incising or cauterization of the prolapsus has also been done on some of these cases with success.

I believe that, in order to obtain the highest visual result, almost every case requires, sooner or later, a secondary operation on a pupillary membrane without necessarily reflecting on the character of the previous operation. The two-needle operation has been done more frequently than others, the cutting or tearing needle being displaced in many instances by some form of knife-needle (Knapp's), on the theory that the latter may be
used to incise the membrane as well as to tear an aperture as with the ordinary needle. The knife-needle is also used to split the capsule (Knapp) without the intervention of the stop-needle. In very diaphanous membranes the ordinary needle has been used to displace them by pushing the membrane as far to one side as possible, sometimes twisting the needle so as to entangle it more perfectly on the needle point (Agnew). The procedure in very dense membranes of drilling an aperture by means of the needle, as suggested by the late Mr. Critchet, has also been employed. Agnew's hook operation, sometimes using the blunt hook when the membrane has been punctured, has also been done. Forceps, back-toothed or otherwise, have also been used to draw out the membrane. The instrument possessing the highest degree of effectiveness in incising the membrane seems to have been the Graefe knife. Iridotomy has also been done with this instrument. Since antisepsis has been practiced it has seemed to the writer that the danger of secondary operations has been much diminished. Some of these cases have required three or four operations to clear the pupil. The operation has been done after three weeks, provided the eye was quiet, but in some cases it has been done to relieve the irritability of the eye where it seemed to depend on dragging of the iris on an adherent membrane.

The simple extraction gives a circular pupil, which, in the most favorable cases, yields more perfect visual results; but this advantage is often diminished by the fact that in many cases the pupil is drawn somewhat toward the corneal wound from a tendency of the iris to prolapse or become incarcerated in the wound, or to a possible wrinkling of the iris. The traumatism inflicted on the sphincter iridis in the delivery of the lens may also induce a partial paresis which might account for the displaced pupil. The greater likelihood of leaving lens matter behind in simple extraction is an undoubted objection to the operation.

There is probably less traumatism in this operation than where iridectomy is done, and a speedier recovery may reasonably be expected. My notes are not specific enough on this point to draw exact conclusions, but I have been impressed with
the short duration of the healing process, some of these cases apparently having no reaction worthy of mention. I feel sure, in a general way, that repair in the better class of cases occurs more speedily than where iridectomy is done.

It might be supposed that there would be less astigmatism after simple extraction, but my cases show a considerable number where cylinders were needed.

The simple extraction is easier to do, as it is usually accompanied by little or no loss of blood and may be done with greater technical exactness, as the parts may be accurately inspected. Often, however, we have to confront a small-sized pupil which is not always as dilatable as could be desired. In an operation on the membrane there is less room in which to work than in a pupil after iridectomy, and consequently more embarrassment in the manipulation. In lacerating the capsule in simple extraction there is more danger of wounding the iris than in the older operation.

It is an undoubted fact that in the cases of prolapsus of the iris we are much worse off than had there been a previous iridectomy done.

Although I propose to continue doing the simple extraction, I cannot assert that, on the whole, it is a great improvement on the older operation.
SOME TENOTOMIES OF RECTI MUSCLES FOR INSUFFICIENCIES.

BY OREN D. POMEROY, M.D.,
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The subjoined cases are reported in order to study the value of tenotomy in certain eye symptoms, not, however, losing sight of the importance of correcting the ametropia before operating on the muscles.

CASE 1. — Mrs. H. T. G., aet. 53, has had considerable pain across the eyebrows for several years. She also experiences difficulty in looking down while walking or in riding.

On the right eye she is wearing constantly, except for reading, +.50 D. Sph. ⊕ +.75 D. cyl. axis 90°. In the left eye she has a correction of +.75 D. Sph. ⊕ +1.25 D. cyl. axis 135°. She has, at distance, an exophoria (tendency to turn outwards) of 2°. Hyperphoria (tendency of one eye to turn upwards), 3° +. Some conjunctivitis in each eye, but more in the right, which is the more uncomfortable.

On January 25th, four days after the first observation, the hyperphoria was 3°, the exophoria 2°. January 29th, hyperphoria 3°. February 1st, the hyperphoria was between 3° and 4°. On February 4th, the hyperphoria showing no signs of diminution, I divided the sup. rect. of the right eye under cocaine. It required four distinct efforts to divide the tendon sufficiently to produce the desired effect. The patient then saw double and the over-effect of the operation amounted to 2°+. On February 6th, there was diplopia and the same over-effect as before, but it does not annoy her in looking downwards. The diplopia grew less until February 19th, when it had disappeared entirely, unless occasionally when she looked upward; still 2° of over-effect by the prism test at distance. On March 15th, the eyes are in equilibrium, except that the image of the left eye is slightly lower than the right, whereas, before the operation, the image of the left was the higher. The headaches are gone and the patient has no more difficulty in looking down. I
regard this as a case where correction of the ametropia was unsuccessful in relieving the faulty muscular balance, and that tenotomy succeeded.

Case 2.—Bennie B., aet. 16, shows a tendency to convergent strabismus of right eye. The vision of the right eye is 20-xx with +6 D., and of the left 20-xl with +5.50 D. Has esophoria of 16°–18°. On May 3d, 1889, the tendon of the right internus was divided and an over-effect of 10° was obtained. After placing a suture in the conjunctiva, there was slight esophoria remaining. After a few days, much of the esophoria had returned, and on May 22d tenotomy of the left internus was done. After the operation there seemed to be some hyperphoria. On May 24th there still remained 8° of esophoria. On June 28th a large-sized granulation was removed from the site of the last tenotomy. There was no more tendency to convergent strabismus and the muscular balance seems about normal. This case presents many of the features of convergent strabismus. The sense of binocular vision was not strong, and frequently the patient only used the left eye. On account of the excessive insufficiency of the externi, I did not try to correct it by the use of glasses alone.

Case 3.—Miss T. L. C., aet. 45, by occupation a school teacher. She has had asthenopic symptoms for several years, headaches, pain in the eyeballs, etc., whenever the eyes are used for any considerable length of time. In addition to this she has been overworked for a number of years. Her manifest hypermetropia is +1.25 D., and so far there is no presbyopia. The adjustment of glasses afforded some temporary relief. She complained especially of the right eye. She had an exophoria at the far point, of 18°, the right internus showing less power than the left internus.

I divided the tendon of the right externus in a very thorough manner; several attempts were made before a sufficient effect was produced, the tendon being divided as thoroughly as in a strabismus operation. At the time, the balance of the eyes at the far point seemed perfect.

After two weeks there was found to be about 9° of exophoria. There was some relief to the symptoms, but the case
could not be followed up. I heard from her two years subse-
quent to the operation to the effect that the right eye gave her
very little trouble and that she regarded the operation as of
benefit. It was my purpose to have divided the externus of the
left. The fact that the patient had been used up by years of
overwork, operated unfavorably towards the accomplishment of
as much good as might otherwise have been hoped for.

Case 4. — Anna T., aet. 24, has headaches and pains in the
eyes, whenever she attempts to use them. She entered the
hospital Aug. 26, 1889. She has esophoria of 6°—7° and
hypermetropic as. of 0.75 D, in each, V = 20-xx +. This cor-
rection afforded no relief after being used several weeks and
the esophoria remained as before. The internus of the right,
and subsequently that of the left was divided, but after a few
days the esophoria was unchanged. On Feb. 12, 1890, six
months after commencing treatment, the right externus was
advanced after the modified Prince method, under cocaine.
This seemed to produce little effect after a few days, and in one
week (Feb. 19th) the left externus was advanced in the same
manner. On Feb. 24th the esophoria was 2°. March 17th,
esophoria the same as before the operation, and there was no
improvement. Prisms of 2°, bases outwards, were ordered for
each eye in addition to the first correction, and were worn with-
out benefit for one month. May 7th, esophoria 5°—9°, adduction
32°, abduction 3°, at the far point. The right internus was
then completely divided, with considerable dissection of the
conjunctiva; the patient was tested and two other essays were
made to measure the effect of the operation, until an over-effect
of 8° was reached and crossed diplopia resulted. On the
next day there was binocular single vision, with esophoria of 3°.
On May 16th the esophoria was one or two degrees. Until last
seen, on Aug. 23d, she had periods of apparently perfect bal-
ance of the eye muscles alternating, with some esophoria, di-
plopia, vertigo, headaches, etc. The last examination showed
esophoria of 4°. This was a most persistent case of esophoria
in which the symptoms failed to give way by any nearer
approach to perfect balance of the eye muscles resulting from
operations. Prisms were also inoperative.
Case 5.—Bertha P., aet. 20, has always had headaches when using eyes excessively. The vision is 20-XL with — 5 D. She has exophoria of 12°. On June 18, 1890, the left external rectus tendon was divided with exact correction of the insufficiency. On June 25th, the exophoria was 6°—8°. July 16th, she has been wearing the correction constantly and with comfort; few headaches; exophoria 3°. September 19th, no asthenopic symptoms, exophoria 1°—4°. In this case it is not conclusive, whether the myopic correction relieved the asthenopia, or the tenotomy, or whether both shared in the relief of the patient.

Case 6. R. L. R., aet. 18, a student, complains of headaches in the temples and occipital region most of the time. He has been wearing — 50 D. which seemed for a time to better his condition. He showed a tendency to turn his eyes to the right. I found exophoria of 16° for distance with hyperphoria 4°. Four days subsequently the exophoria was 19°, hyperphoria as before. The eyes were both emmetropic under homatropine (4 per cent. solution used six times before examination). I divided the external rectus of the right, which seemed the stronger of the two externi, and the balance of the eyes was completely restored as far as the externi and interni were concerned. Previous to the operation he had noticed a painful sensation about the right eye, as though it was being drawn outwards; this has completely left him. On September 22d, three days after the tenotomy, the patient has diplopia when looking to the right, although in the middle line there is 5° of exophoria; the hyperphoria has nearly disappeared. On September 27th there was 6°—7° of exophoria, but his symptoms have all disappeared, and he has returned to his studies. On October 18th, there was no diplopia when looking to the right; exophoria 9°. December 19th, sees double if he looks sharply to the right, or if he fixes on a very near point; exophoria 6°, hyperphoria 1°; uses his eyes from 9 A. M. to 10 P. M. March 7, 1891, has 12° of exophoria, with few asthenopic symptoms. From overwork he has had what his doctor called a bilious fever; there were some conjunctival symptoms. On March 16th there was 10° + of exophoria, and I divided the externus of the left eye, and at
first there was homonymous diplopia and an over-effect of 9°, which was corrected by a suture, when the balance was perfect. On March 19th there was exophoria of 5° when the conjunctival suture was removed. On March 23rd, the exophoria was 3°. When looking sharply to the right or to the left, there is diplopia, but it gives him no trouble. His eye symptoms are relieved and he has gone on with his studies. The operative procedures here may seem bold, but I have in mind the fact that the effect of a tenotomy tends to grow less after a time.

It is also worthy of note that the hyperphoria has nearly disappeared as a consequence of the operation.

Case 7. — Sarah F., aet. twenty-eight, applied to the hospital June 8, 1888, complaining of headaches. At first no glass was accepted. At distance there was an exophoria of 1° and the adduction was 12° with abduction 11°. Under atropine she accepted +1.50 D. and after the atropine +.75 D. There was then found to be exophoria of 3° at the far point. The +.75 D. glasses were worn for two months without relieving the headaches, and on September 26, 1888, the left externus was divided, and an over effect of 9° was obtained, when a stitch in the muscle restored the balance to about one or two degrees of esophoria, and for one day there was some diplopia. On October 15th the exophoria was 4°, with abduction 10°, and adduction 9°. On October 31st I did a tenotomy of the right external rectus, correcting 3° of the 4° of exophoria. November 5th, no insufficiency at the far point; adduction, 12°, abduction, 9°. The headaches are reported to be diminished.

It will be noticed that in this last tenotomy the effect was greater after a few days than at first.

Case 8. — Miss M. T., aet. 17, has —3 D. of myopia. Has had asthenopic symptoms with mild palpebral conjunctivitis, which showed a disposition to recur from time to time. She used a partial correction of her myopia with some benefit for two years. There was also some blepharitis marginalis.

I found difficulty in convergence, and at the far point there was exophoria of 5°. The left eye showed the greatest difficulty in convergence. There was now considerable pain in the eyes, but more in the left, when reading for only a few minutes.
I accordingly divided the ext. rect. of the left, getting the
tendon wholly on the hook at the first essay. There was 3° of
over-effect, and some diplopia for three or four days, when it
completely disappeared. On looking to the left, however, there
was some diplopia, which gave her no annoyance. Ten days
subsequently there was found to be an exophoria of 3° at dis-
tance, but she converged fairly well, and the asthenopia seemed
to have completely disappeared. The first effect of the tenot-
omy was less than half maintained.

Case 9. — Mary B., aet. 18, was referred to me from the
department of nervous diseases by Dr. Booth, to have her eyes
examined to determine whether the headaches depended on
their faulty condition. The vision is 20-xv in each, and the
patient accepts no glasses. The exophoria varied from 1° to 4°,
but after several examinations there seemed to be 3°.

On January 20th, I divided the externus of the right and
produced an esophoria of 18°. This was removed by a con-
junctival stitch. January 31, orthophoria, with abduction 4°
and adduction 7°. The patient is a dressmaker, and reports
that she has no more headaches and that her eyes may be used
without the discomfort at first experienced. Note the apparent
absence of refractive error in this case.

Case 10. Alice H., aet. 22, a servant, has complained of
her eyes for several years, especially after sewing or reading;
also has headaches. Dr. C. H. Calkins of Springfield, Mass.,
who referred her to me, had previously divided each of her ex-
terni with considerable temporary benefit (six months). Her
correction is for right —1.75 D. Σ — .50 c. axis 135°. Left —
1.50 D. Ω — 1 c. axis 150. Vision of right is 20-xv, left 20—
xxx. She has exophoria of 6°. I divided the ext. rect. of the
right. Two or three essays were made before a sufficient effect
had been produced; that is, there was esophoria of about 3°.
Three days subsequently the eye balance seems normal. She
was discharged March 26th, much improved. I have heard
from her since and the improvement seems fairly well maintained.

Case 11. — Mrs. G., aet. 38, has a myopia of —3 D., which
she has had corrected since four years. In spite of this, she
has had various asthenopic symptoms, as headaches, pain in the

Oph. — 29
eyeballs, vertigo when viewing near objects, with nausea and inability to use the eyes for near work long at a time. She has an exophoria of 4° at the far point, the left internus showing the lesser power of the two interni. The externus of the left was divided on April 11, 1872, and exact balance was obtained after two essays at tenotomy. After one month, however, there was 2° of exophoria. This condition has continued without material change, although many years have elapsed. For several months the patient could elicit diplopia by looking sharply to the left, but this has given her no annoyance. All the symptoms of asthenopia have disappeared. In 1884 she again had asthenopic symptoms, when it was found that she had a slight amount of astigmatism, which on being corrected relieved all the symptoms. At the present she is comfortable, although she has an exophoria of 3° at distance. The left eye converges readily at 6″, which was not the case at first, and the right eye still converges less readily than the left. I had advised her to have the right externus divided if she had more asthenopic symptoms. It seems clear enough that the tenotomy was of undoubted benefit.

Case 12. Henry G., aet. 65. The vision in the right eye is 20-xxx, corrected by + 1.20 D., and of the left 20-xxx, corrected by + 1.50 D. He has exophoria of 10° and hyperphoria of 5°. Abduction 12°, adduction 8°. Has some diplopia. On Nov. 19, 1889, I did a tenotomy of the left ext. rect. and corrected half the exophoria. On the next day there was 1° esophoria (slight over-correction), and only 1° of hyperphoria. Diplopia relieved. Patient was not observed after this, but the operation not only corrected the exophoria but also the hyperphoria, which has, as will be seen, resulted in other cases here reported.

Case 13. Maggie C., aet. 23, applied for treatment August 30, 1889, stating that whenever she held her head up or towards either side she saw double. After many careful examinations she was fitted to the following glasses: right eye + 1 D., ⊕ + 1.50 c. axis 90°, with vision 20-xxx; left + 1.50 D. ⊕ + 1.50 c. axis 90°, with vision 20-xxx. These not sufficing to correct the diplopia, it was decided to do tenotomy. The esophoria
after repeated examinations was found to be from 3° to 5°. The hyperphoria was about the same. On September 20th the left sup rectus was divided, which corrected the insufficiency within one degree. After a week, the hyperphoria seemed about as before. On October 11th the esophoria was about 4° at the far point, and a tenotomy of the right inter. rect. was done, correcting the esophoria. No further complaint of diplopia was made.

**Case 14.**—Mr. A. E. L., aet. 35, a druggist by occupation. He has been much troubled by diplopia and an inability to use his eyes without great pain, although he has worn properly fitting glasses. In the right he has a +1 D. in the vertical meridian and +2 D. in the horizontal, and in the left +1 D. in the vertical meridian and +1.75 in the horizontal. The vision of the right is 30-cc and the left is 20-Lxx. The double images were crossed. On November 27, 1888, the exophoria was at distance 7°. On the next day the exophoria varied from 5° to 18°. A hyperphoria of 9° was also noticed. I then divided the externus of the right without at first accomplishing anything, but after repeated efforts, and doing all that could be done at one operation, the insufficiency was nearly corrected. Two days subsequently there was vertical diplopia requiring a prism of 8° angle downward over the right eye to fuse the two images. There was, however, considerable swelling of the conjunctiva, which might temporarily modify the result, and the patient’s answers were somewhat uncertain. I felt sure, however, that there was not too much effect from the operation. I also intended to correct the hyperphoria by tenotomy unless the operation already done should accomplish that purpose. It became necessary for him to go a considerable distance to his home. March 8, 1889, the patient writes that complete relief from his symptoms resulted from the operation. I saw him on December 9, 1889, and there was an exophoria of 7° and no hyperphoria. He uses his eyes from 16 to 18 hours daily with ease! and there is no more diplopia. On December 3, 1891, still doing as well as ever.

I feel in this connection bound to make the statement, that in spite of the fact of great and undoubted benefit from teno-
tomy as shown by these cases my experience has led me to believe that most cases of insufficiency may be relieved by careful correction of the ametropia.

In dividing the tendon of the muscle, several methods have been practiced, including the making of an aperture in the centre of the tendon near its insertion and passing a very small hook in and successively dividing first one-half of the tendon, then the other half. This is a difficult manœuvre and, in the opinion of the writer, not at all necessary. I have for most of the time, caught up the tendon on the hook at its insertion, after dissecting up as little of the conjunctiva as possible, and then dividing it, not being particular to do it too thoroughly for fear of over-effect, then testing by prisms to see if a sufficient effect has been obtained. The record of cases will show that repeated efforts were often made to accomplish an adequate result. Sometimes extensive separation of the conjunctiva with division of every particle of tendon which could be found, became necessary. I am inclined to the belief that it cannot certainly be determined by inspection, whether all the tendinous fibres have been divided. In doing an ordinary tenotomy for strabismus under cocaine it is a frequent experience that apparently the whole tendon has been divided without any effect, when, on further persistence in the operation, the eye suddenly becomes restored to a proper position. I believe that in some instances a very small number of tendon fibres suffice to hold the eye in its original position. From considerable experience in tenotomies, I have concluded that the effect of a tenotomy is almost certain to become less after a time than at first, that is, what has been called a "latent insufficiency" of the weaker muscle. To meet this condition, I am in the habit of doing more than simply to overcome the insufficiency; vide the cases where diplopia continued for several days after the operation. In a few cases where a too considerable over-effect had resulted, a suture placed in the divided tendon and attached to the conjunctiva opposite has sufficed to annul the excessive effect.

In some of these cases where the muscles have been very weak, there has been diplopia when looking sharply towards a divided tendon, but this has been unimportant.
AN INSTRUMENT FOR SYRINGING OUT CORTICAL MATTER IN CATARACT EXTRACTION.

BY JOSEPH A. ANDREWS, M.D.,

NEW YORK CITY.

The accompanying cut represents a simple apparatus for syringing out cortical matter after cataract extraction. A is a hollow ground stopper drawn out into a tube which terminates in a smooth point, B, 1 mm. in diameter and curved as shown in the cut. The rubber nipple D serves to draw up and inject the fluid contained in the bottle. The ground stopper C closes the hollow stopper A, and prevents the fluid in the bottle from becoming contaminated by contact with the rubber nipple D when the bottle is transported. The collar E protects the mouth of the bottle from dust, etc.

The instruments in use for removing cortical matter in cataract extraction are either some sort of apparatus on the principle of the fountain syringe, with rubber tubing attached, or a very small hypodermic syringe (Meyer's). It is evidently not a simple matter to keep rubber tubing attached to such an apparatus aseptic, except by some such fluid as a solution of corrosive sublimate; and this, we know, is an objectionable injection for the anterior chamber of the eye. The same objection applies to the hypodermic syringe used for this purpose. The apparatus figured in this sketch is, therefore, simply a half-ounce bottle with a hollow stopper drawn out into a tube. The fluid used need never, if ordinary care be observed, pass up beyond the stopper C; therefore it comes in contact with glass only, which is readily sterilized by heat. The apparatus enables us to use a simple inoffensive fluid, as distilled water and one-half of one per cent. of chloride of sodium, which has, of course, been previously sterilized by heat, and which answers completely the purpose for which it is intended,
i. e., the mechanical removal of cortical matter from the anterior chamber of the eye. It is almost needless to mention that the injection of air-bubbles into the eye can readily be avoided by withdrawing the tube from the anterior chamber before the last drops of fluid have been injected. These bottles are also used for washing out the conjunctival cul-de-sac preparatory to cataract extraction, and for such solutions (atropine, eserine, cocaine, etc.) as are required in cataract extraction. These bottles are made by Hazard, Hazard & Co., New York. They must be blown, not cast in a mould.

AN IMPROVED TRIAL FRAME.

BY DR. BULLER,
MONTREAL, CA.

It will, I think be generally conceded that a perfect trial frame has not, as yet been devised, or at any rate if such a thing exists, it has not found its way into the trial glass outfits furnished by dealers in these articles. This too, in the face of the fact, that no one article in the ophthalmic surgeon's armamentarium is in such constant use, or so necessary for the comfort and convenience of both the surgeon and his patients. The essential features of a good trial frame are about as follows: It should be durable and not liable to get out of repair. It should be so constructed as to carry at least three glasses in front of each eye, and capable of adaptation to suit the various structural peculiarities of the human face in order that the glasses may be properly centered for each patient. It should permit of easy and rapid substitution of the trial glasses and provide for the rotation of cylinder glasses to any desired angle and indicate the same from 0° to 180°. It should be light and comfortable for the patient, and at the same time maintain the glasses in a proper position when in use.

The trial frames in common use are all defective in one or more of these particulars, for example: The Nachet frame
weighs nearly two ounces, and the weight alone makes it extremely irksome to the patient. The arrangement for rotating the cylindrical glasses rarely works satisfactorily, and with this frame the substitution of glasses is decidedly troublesome. Other metallic frames of well-known makers present similar faults in an exaggerated degree, and all of them are liable to get out of order. I have tried many different kinds of trial frames both of European and American manufacture, and have discarded all of them in favor of a frame constructed as follows:

![Diagram of trial frame]

The body of the frame consists of two steel plates 0.8 mm. in thickness, having circular openings nearly the size of the metal rim trial glasses of Nachet; the rim of each circle is prolonged above and nasallywards to form an arch for the nose. On the back of this arch are secured two hard rubber cleats grooved to carry a flat steel sliding bar, in the middle of which is a solid metal cube through which the nose rest passes. This contrivance readily admits of widening the frame or adjusting the nose rest to suit any patient. On the back of each circle is fastened a hard-rubber groove for the trial glasses, and in front is a similar groove made of aluminium, and marked from 180° on the left to 0° on the right to indicate the axes of the cylinder glasses. These may be rotated to a little beyond the vertical and horizontal in either direction so that any required position may be obtained with the utmost celerity. In front of each aluminium half-circle are two small knobs upon which prisms or other glasses may be placed if required. The temple pieces are attached by strong hinge joints to the outer margins of the circles. They are long and flat, and being made of spring steel hold the frame well in place. This frame seems to fill all the requirements stated above, and is by far the most convenient
and comfortable contrivance of the kind I have yet seen. It weighs less than one ounce, and I have never known a patient to speak of it as being uncomfortable. It is, moreover, much less expensive than some of the elaborate frames in use. Owing to the width of the anterior grooves a slight forward tilting of the thinner glasses is unavoidable as the trial glasses are at present constructed. The makers of these might, however, overcome this by making the edges of all the glasses of uniform thickness, so that they should fit simply into the frames. I have to thank Mr. E. B. Meyrowitz for carrying out my suggestions, and producing this really admirable contrivance in its present shape.
TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

Twenty-Ninth Annual Meeting,

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<td>Charleston, S. C.</td>
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<td>278 Prospect Street,</td>
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<td>Dr. William F. Norris</td>
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<td>Dr. Henry D. Noyes</td>
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<td>Dr. J. F. Noyes</td>
<td>14 Jackson Street,</td>
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<td>316 Lexington Avenue,</td>
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<td>Dr. J. A. White,</td>
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<td>Dr. Chas. H. Williams,</td>
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<td>20 South Seventh Street</td>
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Total, 120.

HONORARY MEMBER.

Dr. C. Schweigger, Berlin, Prussia.

Whole Number, 121.
MINUTES OF THE PROCEEDINGS.

TWENTY-NINTH ANNUAL MEETING.

Fort Griswold House,

The Twenty-ninth Annual meeting of the Society was called to order by the Vice-President, Dr. Geo. C. Harlan, at 10 a.m., who announced the following committees:


Auditing Committee — Dr. H. G. Miller.

A number of names were proposed for membership and referred to the Committee on Membership.

The Committee on Bulletin reported and the following papers were read:

1. "The Relation of the Patellar Tendon-reflex to some of the Ocular Reflexes found in General Paralysis of the Insane," Dr. C. A. Oliver.

Dr. Baker and Dr. Charlotte Baker of San Diego, Cal., Dr. Sprague of Providence, Drs. Friedenberg and Rising of New York, were invited to take part in the discussions.
2. "Clinical History of a Case of Spindle-celled Sarcoma of the Choroid, with study of the microscopic condition of the growth," Dr. C. A. Oliver.


   Discussed by Drs. Knapp, Randall, and Gruening.

   Discussed by Dr. Knapp.

6. "Can the loss of eyes by Ophthalmia Neonatorum always be prevented?" Dr. B. A. Randall.

The names of several candidates for membership were read and referred to the Committee on Membership.

7. "Notes on Refraction and Muscular Cases," Dr. B. L. Millikin.

8. "Notes on several cases of Lateral Heterophoria, in which the vertical diplopia test proved untrustworthy," Dr. S. Theobald.
   Discussed by Drs. H. D. Noyes, Jackson, Randall, Wadsorth, Standish, and Theobald.


Adjourned at 1 o'clock.

Session resumed at 2.30.

Treasurer's report read and referred to Auditing Committee.

Dr. Edward Swasey of Worcester, Mass., Dr. Calkins of Springfield, Mass., and Dr. H. W. Ring of New Haven, Conn., were invited to take part in the discussions.
Twenty-Ninth Annual Meeting.

Reading of papers resumed.
   Discussed by Drs. H. D. Noyes and Standish.
   Discussed by Drs. Gruening, Mathewson, and Sutphen.
   Discussed by Drs. H. D. Noyes and Risley.
16. "Traumatic Dislocation of the whole Iris under the conjunctiva," Dr. H. Knapp.
   Discussed by Drs. Theobald, Andrews, Sutphen, J. F. Noyes, Gruening, Callan, Capron, Wadsworth, Knapp, Bull, and Oliver.

Adjourned to 9 p. m.

Executive session called to order at 9 p. m.

The Auditing Committee reported the Treasurer's report correct. The report was accepted and ordered placed on file.

The following-named gentlemen were recommended for admission by the Committee on Membership, and were elected.


The Committee on Membership reported the following nominations for officers for the ensuing year:

For President — Dr. George C. Harlan.
For Vice-President — Dr. O. F. Wadsworth.
For Secretary and Treasurer — Dr. S. B. St. John.
For Corresponding Secretary — Dr. J. S. Prout.
For Publishing Committee — Drs. W. S. Dennett, R. H. Derby, and the Secretary (ex officio).

Voted, That the assessment for 1893–4 be five dollars.
Voted, That the Chair appoint a second Alternate Delegate to the Executive Committee of the Congress of American Physicians and Surgeons. Dr. R. H. Derby was so appointed.

Adjourned to meet at 9 a.m., July 20th.

THURSDAY, July 20.

Meeting called to order at 9. Reading of papers resumed.

17. "Removal of foreign bodies from the vitreous by Magnet," Dr. E. E. Holt.
   Discussed by Drs. Jackson, H. D. Noyes, and Howe.
   Discussed by Drs. Theobald, Knapp, H. D. Noyes, Risley, Randall, Holt, Jackson, and Johnson.
   Discussion followed on the treatment of symblepharon by Drs. H. D. Noyes and Holt.

Adjourned.

S. B. St. JOHN, Secretary.
Present at the Twenty-ninth Annual Meeting:

Dr. F. W. Ring, Dr. A. Mathewson,
Dr. P. A. Callan, Dr. L. Howe,
Dr. J. J. B. Vermyne, Dr. H. G. Miller,
Dr. C. A. Oliver, Dr. T. Y. Sutphen,
Dr. S. D. Risley, Dr. G. Hay,
Dr. L. H. Taylor, Dr. J. A. Andrews,
Dr. W. H. Carmalt, Dr. S. Theobald,
Dr. C. M. Culver, Dr. J. B. Emerson,
Dr. C. S. Bull, Dr. F. M. Wilson,
Dr. H. W. Williams, Dr. H. D. Noves,
Dr. William Rankin, Jr., Dr. D. Coggin,
Dr. B. A. Randall, Dr. R. A. Reeve,
Dr. W. E. Lambert, Dr. D. W. Hunter,
Dr. Geo. C. Harlan, Dr. H. Knapp,
Dr. S. B. St. John, Dr. E. E. Holt,
Dr. Edward Jackson, Dr. John Green,
Dr. F. P. Capron, Dr. O. F. Wadsworth,
Dr. E. Gruenig, Dr. E. C. Rivers,
Dr. W. B. Johnson, Dr. M. H. Post,
Dr. J. M. Ray, Dr. J. S. Prout,
Dr. J. F. Noves, Dr. B. L. Millikin,
Dr. D. Harrower, Jr., Dr. Myles Standish,
Dr. L. S. Dixon, Dr. F. W. Marlow,
GOUTY RETINITIS, CHORIO-RETINITIS, AND NEURO-RETINITIS,

BY CHARLES STEDMAN BULL, M.D.,

OF NEW YORK.

During the last few years my attention has been attracted by certain lesions occurring in the fundus in gouty patients, and the more I have studied these cases the greater has my interest in them grown. The pathological condition of the blood in gout does not always work in a way that readily attracts attention, and this is particularly true in regard to the eye. Most authors who refer to retinal complications occurring in the course of gout only mention a hemorrhagic retinitis as being the most frequent retinal complication. Thus Nettleship says: “Hemorrhagic retinitis is more commonly met with in gouty persons than in others. It may be unocular or binocular. The children or descendants of gouty persons, without being themselves subject to gout, are liable in early life to this insidious form of eye disease.” (Diseases of the Eye, 4th edition, p. 445.)

Other authors refer to the subject in a still more casual or general way. F. Gauté says that there is a gouty retinitis which strongly resembles certain types of syphilitic retinitis, and which may or may not be accompanied by opacities of the vitreous, retinal hemorrhages, migraine and zona ophthalmica. (Thèse de Paris, 1881.) Lychon speaks of intraocular hemorrhages and neuro-retinitis as due to gout. (Thèse de Paris, 1885.) Jonathan Hutchinson, in an article on primary intraocular hemorrhages, says that gouty persons are prone to hemorrhages, venous obstruction, and irregularities in circulation due to a too large arterial pressure and a relaxed condition of the vascular walls, and that vitreous opacities may in these cases be constantly present. According to him there are four possible sources of these phenomena, viz.: First, changes in the blood; second, increased arterial tension; third, disease of the walls of the blood vessels; fourth, hypertrophy of the heart. He considers that both low tension and high tension are alike compat-
ible with liability to rupture of the capillaries. A condition of loss of balance is easily induced, as the vessels are not well under vasomotor control. The risks of rupture of the capillaries will be increased if there be hypertrophy of the heart or weakness of the walls of the blood vessels. \textit{(Transactions of the Ophthalmological Society of the United Kingdom, Vol. I, p. 26.)}

Gowers speaks more positively in regard to retinal lesions in gout. He believes that spontaneous inflammation of nerve trunks and plexuses on one side only, and recurring after the age of thirty or forty, is seldom due to any other cause than gout. This always means primary perineuritis. Still, inflammation of the sheath of the optic nerve behind the eye is less common in ordinary gout than inflammation of the retina. Gowers thinks the characteristics of these cases are the greater degree of disturbance of the vision than corresponds to the visible changes in the optic disc, the tendency to irregular defects in the field of vision, and the strong tendency to lesion of the other optic nerve by an independent, symmetrical morbid process. \textit{(Medical Ophthalmoscopy, 3d edition, 1890.)}

Galezowski says that in this disease the changes may begin in the retina and extend to the choroid and give rise to a retino-choroiditis, characterized by an alteration in their vessels and deposits in and outside their walls. When the retina alone is involved there exist only vascular alterations. Atheroma (?) is frequent in the retinal vessels of gouty people, and usually attacks persons of advanced years—from seventy to seventy-five. The papilla is ordinarily not involved, but all around the macula and along the vessels are brilliant patches of exudation, generally along the arteries. The rest of the retina may remain intact. The lesion is generally unilateral. The subjective symptoms are the same as those of ordinary retinitis. Gouty retino-choroiditis occupies the central zone of the fundus, is circumscribed posteriorly, the exudation is usually extensive, with hemorrhages and sometimes pigmentary deposits. The disease develops slowly, usually involves both eyes, and never ends in total blindness, as the periphery of the retina is rarely affected. \textit{(Annali de Ottalmologia, XIX, p. 199.)}

We know that the retinal hemorrhages met with in gouty
persons may involve one or both eyes, and are of sudden onset. Small flame-shaped hemorrhages are scattered all over the fundus, and if the extravasations are punctate they have serrated margins. The disc may be hazy, but there is no such regular, glistening, white deposit as is met with in so-called retinitis nephritica. The veins are usually engorged and tortuous, and more or less indistinct by an effusion of blood into their sheaths. It seems hardly justifiable to separate this group of cases sharply from other forms of retinal hemorrhage associated with renal disease and diabetes, since renal disease is so often a concomitant of gouty cases. The influence of the cardio-vascular system must be carefully considered in these patients. Hutchinson thinks that these hemorrhages are due rather to venous obstruction, such as thrombosis of the retinal vein, than to arterial disease, as more explanatory of the suddenness of the attacks.

The effects of the poison of gout upon the vascular system are now generally recognized to be: First, a high blood pressure in the arteries; second, hypertrophy of the left ventricle; third, hard, incompressible arteries undergoing atheromatous change. From these result either apoplexy by rupture of a blood vessel or aneurism by dilatation of the vessel, or angina pectoris, or fatty degeneration of the heart.

Some years ago Dr. George Johnson found in cases of chronic renal disease a thickening of the muscular wall of small arteries and arterioles, which he attributed to increased contraction of the muscular coat due to the abnormal qualities of the contained circulating blood. This led to a damming of the blood in the arteries, a rise of blood pressure, increased action of the heart in systole, and hypertrophy of the left ventricle. Mahomed has since shown that high arterial tension is not a consequence but an antecedent of kidney disease. High blood pressure within the arteries is connected with spasm of the arterioles and hypertrophy of the thin muscular coat, and leads to hypertrophy of the left ventricle. The overdistension of the arteries causes a growth of connective tissue under the tunica intima of the arteries, which we call atheroma. Then follows hypertrophy with failing heart and arteries.

There seems to be no doubt that a gouty optic neuritis is occasionally met with, for Hutchinson and others have reported cases, and it is probable that the perineurium is first affected, leading to thickening and compression of the bundles of nerve fibres, the adjacent lymph spaces being filled with an exudation from the blood vessels. There is also but little doubt that a gouty phlebitis of the central retinal vein and its branches is occasionally met with. This leads to a roughening of the surface of the internal lining, which favors the occurrence of thrombosis. In these cases, owing to the gouty poison, there is naturally hyperinosis and tendency of the blood to clot. Duckworth thinks that there is probably a determination of acid urates to the part, which acts as the directly exciting cause.

Most of our knowledge of this condition of the arteries has been gained from Thoma's investigations. He concluded that arterio-sclerosis is caused by some general disturbances of nutrition, which are partly the result of infection, intoxication, and other pathological changes of varying kinds, and partly the accompaniment of senile changes. These general disturbances of nutrition cause not only disease of the arteries, but also of the veins and capillaries. In the arteries the middle coat is thinned, and there is a loss of elasticity by a diminution of the resistance which the wall of the vessel opposes to the stretching of the blood pressure. The vessel is stretched in all directions, it widens, and its lengthening leads to tortuosity. The widening of the lumen is followed by a connective tissue deposit in the intima, and this is followed in turn by a number of regressive changes, such as fatty degeneration, or calcareous degeneration, or hyaline degeneration. Similar changes occur in the veins. In the capillaries there is an increase in the porosity of the capillary wall and oedematous infiltration of the tissue. The important consequences of this so-called angio-sclerosis are varicose dilatation of the veins and aneurisms. In the beginning of the process there is a loss of elasticity of the vascular wall, shown in life by a soft, high pulse and pulsation and tortuosity of the arteries, notably of the retina. At this stage there is the greatest danger of rupture of the arteries. Later, the vessels, by reason of the deposit of connective tissue in the
intima, become firm and rigid. (Archiv für patholog. Anatomie, vols. 93, 95, 104, 105, 106, 111, 112, 113. St. Petersburger Med. Woch., 1890. Fortschritte der Med., 1884. Deutsche Med. Woch., 1888. Archiv für Ophthalmologie, 1889.) In endeavoring to explain the results of these vascular changes we must consider three factors: First, the shortening of the median coat; second, compensatory endarteritis; third, atrophy of the muscular coat of the artery. A permanent slowing of the blood current in an artery is followed by a narrowing of its caliber, which is brought about in a regular way on the one hand by a contraction of the tunica media and on the other hand by a deposit of connective tissue in the tunica intima. Any retardation of the blood current in the arteries and veins which is not completely and at once neutralized by a corresponding contraction of the media leads to a hyperæmia of the vaso vasorum and to a new growth of connective tissue in the intima, which narrows the lumen of the affected vessel and consequently does away more or less completely with the normal rapidity of the current.

With this there is associated later a similar formation in the media and adventitia. The first recognized departure from the normal condition of a vessel consists in the stretching of the media, which is the cause of the diffuse primary arterio-sclerosis characterized by a dilatation and tortuosity of the arteries, by an eccentric hypertrophy of the media, and by a diffuse, compensatory fibrous thickening of the intima. All of these changes I have repeatedly seen develop in the retinae of gouty patients while under treatment. We know from the investigations of Loring that arterio-sclerosis in the eye can be followed for years and the gradual obliteration of the vessel traced. Evidences of its presence are the tortuosity of the arteries, pulsation in their blood current, opacities in their walls, often a diminished lumen, hyaline degeneration of some of the vessels on the papilla, aneurism of the central artery, and varicose retinal veins. More rarely there occur complete obliteration of an artery and thickening of the walls of the veins with partial obliteration of their lumen. Changes like these in the central retinal artery and its branches are probably associated with similar changes in the ophthalmic artery and internal carotid.
More recently observers have begun to recognize corresponding changes in the veins, and to regard phlebo-sclerosis as a systemic disease analogous to diffuse arterio-sclerosis. Some years ago Sack described a condition which he called a chronic fibrous endo-phlebitis, and stated that it not infrequently appeared as a local lesion in consequence of local stasis in the venous system. Huchard in 1889 and Spillmann in 1890 both used the term phlebo-sclerosis to describe this process. According to the latter, phlebo-sclerosis in gouty persons may be both circumscribed and diffuse, the latter being met with in the small veins. The same pathological changes occur in the vaso vasorum, with an abnormal development of nuclei around the small capillaries. It is shown by his investigations that the venous lesions develop progressively and simultaneously with the arterio-sclerosis, without, however, ever ending in the profound alterations which change the arteries into rigid tubes. (Gas. hebdo. de Méd. et de Chir., Oct. 11, 1890.)

Pokrovsky has made still more extensive investigations upon thirty cases. Microscopically the veins showed no marked changes, though they were sometimes found studded with circumscribed, irregular elevated white patches, both soft and hard. He concluded from his investigations that chronic inflammation of the arteries, so called, arterio-sclerosis, or chronic endarteritis deformans, is accompanied by analogous, though less intense, morbid changes in the veins. The most frequent process is a compensatory, diffuse, fibroid endo-phlebitis, analogous to Thoma’s compensatory diffuse endarteritis. The endo-phlebitis commences with the appearance in the intima of the veins of many young cells, which are subsequently transformed into fibrous connective tissue. The young cells are supplied mainly by proliferation of the elements of the intima. Besides this diffuse inflammation there is a circumscribed nodose thickening of the venous walls, which is usually associated with retrogressive metamorphosis, and is analogous to the nodose arterio-sclerosis. As regards the regressive changes, the most frequent is hyaline degeneration, met with in all the coats of the veins. Fatty degeneration rarely occurs. In cases of intense endo-phlebitis the media frequently undergoes an inter-
stital inflammatory process, with the formation of numerous blood vessels, profuse cellular infiltration, and proliferation of interstitial connective tissue. The adventitia is usually affected in a slighter degree. (London Medical Record, August 20, 1890.)

Raehlmann's paper on the changes in the retinal vessels in general angio-sclerosis, also calls attention to the changes in the veins. In about half the cases examined there were corresponding changes in both arteries and veins in the retina. The veins were relatively widened, always had a whitish edge or margin, and in some cases appeared changed into white cords, and the blood column seemed entirely interrupted. In some places varicose dilatations were distinctly visible. (Zeitschrift für Klin. Med., XVI, 1889.) His investigations have shown that while extensive sclerosis of the vascular wall is usually accompanied by a hyaline degeneration of the tissue elements, showing like white lines along the blood column, it may sometimes be invisible with the ophthalmoscope. Raehlmann has noted the following changes in the retinal arteries: 1st. Distortion and narrowing, sometimes so marked as to simulate the condition met with in atrophy of the optic nerve, but usually accompanied by a normal field for form and color and normal activity of vision. 2d. White lines along the arteries, due sometimes to cloudiness alone, and sometimes to that and the thickening together. This consists microscopically in an alteration of the adventitia, by which the wall of the vessel is thickened without narrowing of its lumen, and also in a hyaline degeneration of the arterial wall. 3d. Local or patchy narrowing of the arteries, separated from each other by spaces of varying length in which the vessel has its normal caliber, the result of deposit in the vascular wall. In diffuse arterio-sclerosis the wall of the vessel has a more homogeneous, yellowish, glistening appearance, in which the structure elements are less distinguishable. In some places he has seen patches of arterio-sclerosis nodosa, occurring generally at the point of bifurcation. It is still an open question with Raehlmann how far these patchy proliferations of the intima, round or fusiform or irregular, as the case may be, have to do with the development of embolic and throm-
bolic processes. The vascular tension is probably increased in front of these narrowed spots, while it is diminished behind them. Complete closure of the lumen of an artery as a result of endarteritis nodosa occurs frequently. 4th. Aneurisms of the central artery and its branches.

In the venous system of the retina Raehlmann found white lines along the veins, narrowing of their lumen in local, circumscribed spots, and varicose dilatations also in circumscribed spots. He also met with pulsation in both arteries and veins, more frequently in the latter. Goldzieher has described the same pathological conditions in the eyes of a patient whom he first examined clinically, and whose eyes he subsequently examined microscopically. (Centralbl. fur prakt., Aug., 1889.) In one eye of this patient, besides the changes in and about the blood vessels, there was a circle of bright, glistening spots of varying size and shape, whitish-yellow in color, and without pigmental border, symmetrically grouped around the macula, which was intact. These patches of exudations proved to be entirely in the retina. He states that he has seen them in other cases, and that they were accompanied by impaired vision and an irregular central scotoma. The disc and periphery of the retina are in these cases usually normal, and the course of the disease is chronic and painless, and to these points I wish to draw particular attention, as they correspond closely with the clinical and microscopical appearances of the cases on which this paper is based.

Case I. — In June, 1889, I was consulted by a gentleman, aged 72, at the request of his family physician. Four years previously he had consulted Dr. C. R. Agnew, who found signs of what he considered chorio-retinitis in both eyes, most marked in the left eye. After a careful examination of his case Dr. A. came to the conclusion that the trouble was due to gout, and recommended strict dietetic treatment. This was not carried out with any regularity by the patient, and the condition in the eyes grew slowly worse. The main difficulty had been an inability to read any small type. Some months before I saw him he first noticed that he could not see objects at a moderate distance as distinctly as usual, and on testing each eye separately
he found that the main defect was in the left eye. This defect has slowly but steadily increased. I found on examination, R. E., V = 20/200, with sph. + D 1.50 = 20/50; L. E., V = 2/200, unimproved, and decidedly better eccentrically. He could still read Jaeger 6 with sph. + D 5.50 with the right eye. The tension was normal in both eyes. The media were perfectly clear in both eyes. A careful perimetric examination of the field of vision showed the presence of a small, irregular central scotoma for form and color in the right eye, and a very large scotoma in the left eye.

The ophthalmoscopic examination revealed a very interesting condition of the fundus. The outline of the discs was very much blurred, resembling the first stage of choked disc, but without the edematous swelling. In the left eye the arteries were much diminished in caliber, in several places the lumen being reduced to the merest thread, and requiring the closest examination to see the minute blood column that still existed. The white lines along the vessels, both arteries and veins, were very broad and distinct, and extended from the center of the papilla well out towards the periphery. In places, the veins seemed dilated like a fusiform aneurism, the vein on both sides of the dilatation being reduced in caliber. There were numerous patches of yellowish-white exudation in the retina, of varying size and shape, mainly grouped about the region of the macula and disc, but with no systematic arrangement, and one patch of considerable size in the macula itself. There were no hemorrhages in either eye. All these spots of exudation were in the inner layers of the retina. In the right eye vascular and exudative changes were much less marked. The white lines along the arteries and veins extended for only a short distance beyond the margin of the disc, and though the lumen of both sets of vessels was in places diminished, there was no apparent disappearance of the column of blood, and no fusiform or nodose dilatation of the vessels. The appearance of the optic disc, however, differed but little from that in the left eye. The action of the heart was strong, but somewhat irregular. There was a faint aortic and mitral murmur, and marked degeneration of the temporal and radial arteries. The urine had a specific gravity of
1018, was slightly turbid, light amber in color, and contained neither albumen nor sugar. There were no casts, but it was loaded with uric acid crystals, which were deposited on standing. His family physician confirmed the existence of gout, and agreed with me that the main treatment must be dietetic. After consultation with his family, it was decided to send him to Karlsbad, and he went, carrying a letter to Dr. Kraus, under whose care I placed him. He went through a carefully-regulated course of treatment by the waters, with strict attention to his diet, by which his general health was very much improved, but there was no improvement in his vision. On his return, I made a careful examination of the fundus of each eye, but could discover no appreciable change in the condition of the blood-vessels or the retina. While there was no demonstrable increase in the number or size of the patches of exudation, there was certainly no improvement. Peripheral vision was still fairly good, but he could not read at all with the left eye, and only with great difficulty with the right eye. This patient is still living, and the eyes show no perceptible change.

Case II. Early in March, 1890, I was consulted by a lady, aged 45, whose vision had been failing for some months, and who had never worn glasses. In November of the previous year she had suffered from an attack of "la grippe," which assumed the form of asthma and bronchitis. She soon recovered from this attack, but suffered from a relapse, which was accompanied by severe neuralgia of the left side of the face and teeth, and by marked oedema of both lids on the left side. She had long suffered from gouty symptoms, and was saturated with the disease, the chief symptoms being an obstinate general eczema and renal colic. She had one living child and had had four miscarriages. Syphilis could be absolutely excluded. She had been to Aix-les-Bains on several occasions, and had always been greatly benefited by the waters. When I saw her, there was marked oedema of the left upper lid and orbital tissue, but no other external evidence of trouble. There was compound hypermetropic astigmatism in both eyes, the right eye being the more defective, and with the refractive error corrected, her vision was 20/30—in each eye. She could read Jaeger 5 with sph.
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+ D. 2.50 ⊆ cyl. + D. 1.50, axis 180°, but could not read any smaller type. The cornea, anterior chamber, and iris were normal. There were slight peripheral opacities in both lenses, most marked downwards and inwards. There was an irregular central color scotoma in each eye, but no limitation of the field for form. The muscles were normal in their relation for all distances.

The fundus showed the following conditions: The optic discs were reddened, and their outline was decidedly blurred, as if smeared with a yellowish exudation. Both arteries and veins were reduced in caliber, and the white lines along the vessels were very broad and extended well towards the peripheral branches, particularly in the arteries. At the posterior pole were a series of patches of exudation, of varying size and shape, grouped irregularly around the macula, most of them being in the inner layers of the retina. There were no hemorrhages in the retina in either eye. The heart was quite feeble and irregular in action, and there was a faint mitral regurgitant murmur. She had never suffered from an acute inflammatory attack of gout.

Repeated and very careful quantitative and qualitative analyses of the urine were made, the whole quantity passed in the twenty-four hours being examined, and this never exceeded fourteen or fifteen ounces. Its specific gravity varied between 1020 and 1028, its reaction was decidedly acid, and it was always dark-colored and turbid, and on standing cast a bulky precipitate. It always contained a small quantity of albumen, but no sugar or casts were ever found. The precipitate was made up almost entirely of uric and phosphatic acid crystals.

This patient was immediately placed on the following dietary: For breakfast, weak black tea with a very little milk but no sugar, eggs scrambled or soft boiled, a small portion of fresh fish, and occasionally an orange or some grapes. Dinner in the middle of the day consisted of fish, poultry or game, underdone beef or mutton twice a week, some fresh-boiled green vegetables, toast, or graham bread. No butter, starches, sweets, or pastry were allowed. A glass of lithia water with an effervescent lithia tablet was allowed at each meal. Under this dietary her gen-
eral condition materially improved, and in the latter part of June she went to Carlsbad and placed herself under the care of Dr. Kraus. Under his carefully-regulated treatment, as to diet, baths, and drinking the spring waters, her improvement was very marked, not only in her general health, but also in her vision, so that when I saw her in October, 1890, her vision was 20/20—in the right eye, 20/20+ in the left eye, and she could read Jaeger 1 with ease. The fundus, however, did not show much change. The white lines along the vessels were as distinct as ever, and seemed to have extended still farther towards the periphery. There was no occlusion of the arterial lumen, however, at any spot. Some of the patches of exudation seemed to have shriveled or contracted in size, and there were apparently no new spots of exudation. The scotomata in the field were smaller. This patient has rigidly maintained the dietary laid down for her, and her general health is very satisfactory. An ophthalmoscopic examination is made at intervals of several months, but no material change has been noticed, so that it seems fair to assume that the diseased process in the eyes has thus far been stayed.

Case III.—In April, 1891, I was sent for to see a lady from the West, who had suffered from inflammatory gout for many years, and was so crippled by the disease that she moved with great difficulty. She was 68 years of age, and for some months had been conscious of a failure of vision in reading, and very recently for all objects at any distance. She had noticed that her eccentric vision was better than her central vision. The media were clear and the iris normal. R. E., V = 20/50 unimproved; L. E., V = 20/200 unimproved. There was a hypermetropia of one diopter, and with sph. + D 5 she could still read Jaeger 6 with the right eye. With the left eye she could read nothing smaller than Jaeger 14. The tension was normal. There was no limitation of the field for form in the right eye, but there was an ill-defined central scotoma for color. In the left eye there was an irregular scotoma both for form and color. The ophthalmoscopic examination showed in the right eye well-marked white lines along the arteries and veins, extending well beyond the margin of the disc, and one small patch of yellowish
exudation in the retina just above the macula. In the left eye the symptoms were much more marked. The caliber of both veins and arteries was decidedly reduced, and the white lines along the vessels were very broad. There were numerous patches of exudation in the retina, round and oval, and both superficial and deep, grouped round the disc and macula, but there were no hemorrhages. In two of the smaller arterial branches the lumen seemed entirely obstructed. This patient passed about 32 ounces of urine in the 24 hours, having a faint brown color and acid reaction, with a specific gravity of 1022, and a rather copious deep-yellow sediment was deposited after standing a few hours. It contained no albumen, no sugar, and no casts, after repeated examinations. The deposit consisted of uric acid crystals and urates. She stated that her father and several other members of her family had suffered from a similar loss of vision after they had passed middle life, and that they were all gouty. This patient was under my constant care for more than a year, and is still seen at intervals. At no time have there ever been any symptoms, either objective or subjective, of renal disease.

After a careful study of this case, it seemed almost hopeless to expect any benefit from regulating the diet, owing to her age and the advanced stage of the general malady, and I contented myself with prescribing a general tonic regimen, including small doses of whisky, and free lithium carbonate dissolved in lithia water. The changes in the blood-vessels and the retina slowly advanced, the white lines creeping towards the periphery, and the patches of exudation increasing gradually in size and number. On two occasions small hemorrhages occurred on the disc margin of the right eye, apparently capillary in origin. In October, 1892, she had a slight cerebral hemorrhage, causing temporary impairment of speech and transient numbness in the right arm and leg, from which she entirely recovered, and there has been no recurrence of these symptoms. She is still very helpless, and can only move about with great difficulty. The heart’s action is feeble, but fairly regular. The condition of the urine is somewhat improved. She passes about the same amount, but it has a lower specific gravity, and there is less sedimentary deposit.
Case IV. In April, 1891, I saw a man, aged 40, who gave the following history: He had always had somewhat imperfect vision in both eyes, owing to the scars of old corneal ulcers dating from childhood. He had been at various times a sailor, miner, ranchman, and bar-keeper, and had always "lived high" when his means allowed it. For some months the vision in the left eye had grown much worse, so that he was only able to read the largest type. When I saw him I found the following conditions. There were faint opacities in the cornea of each eye, that in the right eye being central, R. E. $\frac{2}{3}$ — unimproved: L. E. $\frac{4}{10}$ + unimproved. With the exception of the cornea, the media were clear. He could read Jaeger 3 with sph. + D 1.50 with the right eye, but with the left eye he could only read the heading of a newspaper. There was no scotoma for form, but there was an irregular color-scotoma in each eye. The ophthalmoscope showed in the right eye one small hemorrhage on the margin of the disc, but none in the left eye. In both eyes the white lines along the arteries were quite marked, particularly in the left eye, where they were also evident along the veins, and the lumen of both sets of vessels was narrowed, not only on the disc, but in the left eye for some distance beyond it. The outlines of the discs were blurred and smooched, and the discs themselves much reddened. There were no patches of exudation in the right eye, but in the left eye there were a number of irregular, yellowish patches above and to the nasal side of the macula, all apparently in the inner layers of the retina, and one patch on the temporal margin of the disc. The heart was irregular in action, but otherwise apparently normal. The urine contained albumen, but no sugar or casts. There were about 30 ounces passed in 24 hours, which was acid, had a specific gravity of 1026, and deposited a thick brown precipitate, consisting mainly of uric acid and urates. The man denied syphilis, and had no trace of any specific lesion. There was a mild eczema on his hands and feet, and some chalky deposits in the middle and third fingers of both hands. He had drank all sorts of wines and liquors for many years, but he had never used tobacco. The patient was very stout and his breathing was very short, and after any exertion he would have
attacks of mild dyspnœa. His diet was at once regulated, and his daily supply of alcohol was reduced to the lowest amount of whisky. He was put on a general tonic treatment, with digitalis and small doses of potassium iodide, and he was advised to drink lithia water freely. Under this treatment his general condition began to improve, but its progress was slow, while the condition of the eyes grew steadily worse. The scotoma increased in size, the central vision deteriorated, the outlines of the discs became absolutely lost, though there was no swelling and no rupture of retinal blood vessels. During the first month of treatment, sub-conjunctival ecchymoses occurred in both eyes, and this happened several times during the following four months. The patches of exudation increased in number and size in the left eye, and new ones appeared in the right eye, all grouped around the macula or in the vicinity of the optic disc. The degeneration in the walls of the blood vessels became more and more marked. The white lines broadened and extended farther towards the periphery, the deposit being more marked in the arteries than in the veins. The lumen of both arteries and veins became narrower, and towards the end of life there were several small arterial branches, which were apparently entirely occluded. In both eyes there developed in several places fusiform aneurysmal dilatations of the arteries, and on the distal side of these dilatations the artery was always markedly reduced in caliber. The white lines were always broader and more marked at the points of bifurcation of the vessels.

In the latter part of September the patient developed pneumonia on the right side, and while ill with this pulmonary complication had a cerebral hemorrhage, which produced partial hemiplegia, though his speech was but little affected. He did not rally from the pneumonia, and died on the sixth day, apparently from heart failure. I was fortunately enabled to make an autopsy, and removed the posterior halves of the eyes and optic nerves as far as the chiasm for examination. The autopsy showed very extensive degeneration of all the intracranial vessels, both arteries and veins. The circle of Willis was very stiff and rigid. The larger arteries retained some elasticity, but the smaller vessels were very stiff and in places
had apparently lost all power of contractility. There was a small clot in the right anterior lobe, near the lower margin of the paracentral lobule, and another one in the right corpus striatum, near the supero-anterior surface.

The microscopical examination of the retina, optic nerve, and choroid proved very interesting, and absolutely confirmed the ophthalmoscopic diagnosis. All of the sections of the retina, choroid, and optic nerve showed the signs of wide-spread arteriosclerosis and phlebo-sclerosis. The adventitia and media were decidedly thickened, but in most of the sections the main increase was in the intima, which in many places was so marked as almost to obliterate the lumen. This was particularly noticeable in vessels at some distance from the margin of the disc. The proliferation in the adventitia was largely granular, while the thickening in the intima was mainly due to hyaline proliferation. Numerous fusiform, aneurysmal dilatations were found in the arteries, almost always at the point of origin of a branch, and on the distal side of these dilatations, the caliber of the vessel was markedly narrowed. No extravasations of blood were found, except a small one in the right eye near the disc, and previously noted with the ophthalmoscope. The nerve fibres on the papilla and in the retina were markedly varicose, and separated by spaces filled with finely granular matter. The connective tissue fibres were but little altered. In the retina there was a decided thickening of the nerve-fibre layer due to infiltration between the fibres of a mass of fine granules, aggregated in heaps, with occasional distinct cells provided with a cell-wall, and filled with the same granular contents. These aggregated masses of fine granules and cells extended through all the layers of the retina except the external layer, but the bulk of them were in the nerve-fibre layer. The capillaries on the optic disc were greatly dilated, and accounted for the hyperemic condition seen with the ophthalmoscope, but between the capillaries were patches of fine granules, similar to those in the retina. Sections of the optic nerves as far back as the chiasm showed the same changes in the walls of the blood vessels as existed in the retina, but there were no special changes in the nerve fibres back of the eyeball, and the nerves could be regarded as healthy.
In the choroid the blood vessels showed the same changes. The adventitia and intima of the arteries were thickened, the proliferation being more marked in the adventitia. The veins also showed the presence of phlebo-sclerosis. No very marked pigmentary changes were found, though there was some slight atrophy of the hexagonal cells. No exudation of any kind was found in the choroid, except in the thickened coats of the blood vessels.

Case V. — In October, 1891, I saw a lady, aged 65, who for some months had noticed a gradually increasing blur before the right eye, and recently the same indistinctness of vision had appeared before the left eye. The media were perfectly clear, and the external aspect of the eyes was normal. R. E., V. = 20/40 +; L. E., V. = 20/30 — unimproved. The ophthalmometer showed a hypermetropic astigmatism of one diopter, axis 90°. She could read Jaeger 5 with sph. + D 3 with either eye. The tension was normal, and there was no scotoma or other limitation of the field. The ophthalmoscope showed an interesting picture. The optic discs were very red but not swollen, and the outlines completely blotted out, though oedema was scarcely perceptible. The appearances resembled those of papillitis without the swelling, and were more marked in the right eye. The vessels, both arteries and veins, showed the white lines well marked almost to the equatorial region of the eye, the deposit in the adventitia being, however, very irregular. In places there seemed to be a fusiform, aneurysmal dilatation in both arteries and veins, the lumen of the vessel on the distal side of these swellings being nearly obliterated. This change was more marked in the arteries than in the veins. At the first examination no spots of exudation were discovered, but as time passed, and her vision grew worse, patches of exudation in the retina began to make their appearance around the macula, and between the latter and the papilla. This patient had always been gouty, and for some years had maintained more or less carefully an anti-gout dietary. The heart’s action was feeble and irregular, but no organic lesion was made out. There were about 26 ounces of urine excreted in the 24 hours, which was dark yellow in color, acid, and deposited a copious
brown precipitate. There was a small amount of albumen, but there were no casts and no sugar. The precipitate consisted mainly of uric acid and the urates, with some phosphatic crystals. It was very interesting to note the gradual development of the patches of exudation in the retina, and the very slow extension of the disease of the vascular walls. The very marked development of this lesion in the retinal vessels, together with the condition of the urine and the gouty history of the patient, pointed to extensive disorganization of the vascular walls throughout the body, and to a probable rupture of some one of the cerebral vessels at no distant day. The vision slowly grew worse, so that eight months after my first examination she could no longer see to read even the largest type with either eye. Under dietetic management and the free use of lithia, the condition of the urine improved very much, but the uric acid never entirely disappeared. Thirteen months after her first visit to me she was, without warning, attacked by all the symptoms of an "apoplexie foudroyante," and died in three hours, without regaining consciousness. I was permitted to make an autopsy, and to remove the posterior halves of the eyes for microscopic examination.

On taking off the skull-cap, the venous congestion of the dura-mater and pia-mater was very marked. All the arteries of the brain were found extensively diseased. In the substance of the left frontal lobe, about half way between the middle and inferior frontal convolutions, and dipping backwards towards the fissure of Rolando, was a very extensive clot, as large as an olive, and in the paracentral lobule near the median line was another extravasation, not so thick, but extending for nearly an inch in every direction, breaking down the brain substance completely. The middle and anterior cerebral arteries were in spots almost completely rigid, and their walls very thick and brittle. The same condition existed to a marked degree in all the arteries at the base of the brain. There was another small clot in the pons near its under surface and far back, about as large as a split pea. The optic chiasm, optic nerves, and posterior halves of the eyeballs were carefully removed and hardened for future examination. In making the sections from
the nerves, my attention was directed principally to the condition of the blood vessels, and in all of the sections of the nerve, retina, and choroid there were evidences of extensive arteriosclerosis and phlebo-sclerosis, resembling closely the lesions described by Thoma. The adventitia and media were enormously thickened by hyaline and atheromatous infiltration, and the intima was in many places so increased in diameter as to project into and narrow the lumen of the vessel, particularly at the points of origin of small vessels. In two places in the retina there was found complete obliteration of one of the smaller arterial branches by the thickened intima, and one section showed a similar obliteration of the lumen of one of the smaller veins. The changes in the coats of the blood vessels were relatively as marked near the equatorial region of the retina, as it was near the papilla. In most of the arteries the thickened adventitia was accompanied by a corresponding thickening of the intima, but in the veins this proportionate relation did not seem to hold good, the changes in the outer wall being here more marked.

As regards the nerve fibres on the disc and in the retina, they were here and there separated by oval spaces, which were sometimes empty and sometimes contained a mass of fine granules. There was in places slight varicosity of the fibres, and in the retina there was a decided thickening of the nerve-fiber layer, and to a less degree of the connective tissue elements. Those sections which included patches of exudation showed marked thickening of the nerve-fiber layer, the thickening being due to a mass of granular bodies, some being distinctly provided with a cell-wall and nucleus, while others seemed mere aggregations of granular matter. Within the limits of these patches of exudation the nerve fibres showed many varicosities. The same variety of granular exudation or degeneration was found in all the deeper layers, except that of the rods and cones, but to a much smaller extent. The exudation was largely confined to the nerve-fiber layer, and in several instances the spaces between the nerve fibers seemed absolutely empty. There were no hemorrhages found in any of the sections. The region of the margin of the disc showed
marked changes in the capillaries, which were generally dilated, though their walls were thickened. This condition existed all over the disc, and accounted for the extreme red appearance seen with the ophthalmoscope.

The blood vessels of the choroid showed similar lesions to those found in the retina. The adventitia and intima of the arteries were thickened, the former showing the greater change. In a few sections the veins also showed a distinct thickening of their coats. The layer of hexagonal pigment cells showed patches of atrophy in some places. There were no patches of exudation found in any of the sections, and though spaces were found in the connective tissue framework, which sometimes contained a few granular masses of small size, they did not differ materially from the ordinary chronic signs of senile degeneration of the choroid. There was no conspicuous pigmentary change found in any of the sections. Sections made from the optic nerve back of the eyeball showed the same marked changes in the central artery of the retina, mainly in the adventitia. There was little or no change in the aspect of the nerve fibers in this part of the optic nerve from that which is met with in a state of health.

In conclusion, the points to which I draw attention are as follows:

1st. The changes in the fundus are always bilateral, though rarely symmetrical, in the two eyes.

2d. The degeneration in the walls of the blood vessels and in the retina cause marked impairment of central vision, little or no impairment of peripheral vision, and never end in blindness.

3d. The loss of central vision is always progressive up to a certain point, unless the cause of the disease is recognized early in the outset, and immediately and properly handled. Improvement of the vision after the disease is established cannot be expected.

4th. Hemorrhages into the retina are rare, except in the beginning of the disease. Their absence later is probably due to the fact that the strength of the vascular wall is increased by the deposit, though its elasticity is diminished.
5th. The most marked feature in the fundus is the development of the arterio-sclerosis and phlebo-sclerosis. This is seen by the ophthalmoscope in the vessels of the retina, and the microscope shows that the degeneration exists as well in the vessels of the choroid and optic nerve.

6th. Another almost equally pathognomonic symptom is the peculiar yellowish granular exudation in the retina, located by the ophthalmoscope around the posterior pole of the eye, and generally leaving the macula intact, and proved by the microscope to be mainly in the nerve-fibre layer, though found in all the layers except that of the rods and cones.

7th. The changes in the optic nerve fibres seem to be almost entirely intraocular, and cannot be traced for any great distance back of the eyeball.

DISCUSSION.

Dr. Hermann Knapp, New York. — I have listened with the greatest attention to this paper. The conditions which Dr. Bull describes are familiar to all of us, and if I could go over this subject without the preconceived idea of gout being its cause the number of cases would extend into the hundreds. In only three of the cases since my attention was forcibly drawn to this condition were there distinct gouty manifestations. One showed the yellowish white deposit encircling the yellow spot, and between that and the optic disc, which Dr. Bull speaks of as almost pathognomonic. This is not unusual in hemorrhage after the hemorrhage has disappeared. Dr. Bull says that the condition is invariably binocular. It was not in this case. Besides the presence of marked gouty deposits in the fingers there was nothing abnormal. The other two cases where there was marked gout, showed the retinal hemorrhages and the white patches. The picture of arterio-sclerosis which Dr. Bull has described so thoroughly is, of course, the one which is produced in the majority of cases of arterio-sclerosis. I am not aware that this is produced by gout in the percentage of cases that Dr. Bull assumes. I have always thought that these changes were those of age and due to the disturbance of the circulation in the retina and its consequences. The identical picture is found in one eye in younger and older persons where there is not a suspicion of gout. There must be some material obstruction which takes away the vis a tergo, and thus the capillaries and veins are under low pressure and its results. In the
future, when I have such cases, I shall look very carefully for gout as the cause. I thank Dr. Bull very much for bringing the subject before us.

DR. HENRY D. NOYES, New York. — I agree as to the accuracy of the picture in many cases of disease of the fundus, and we have reason to be much indebted to Dr. Bull for the careful study which he has made of the pathological anatomy of those cases, both from literature and from his own observation. That arterio-sclerosis and phlebo-sclerosis lie at the bottom of many of the changes in the retina, we are all well aware. These changes exist in variable degrees, and, as I call them to mind, they seem to belong to the later period of life. As I turned over in my own mind the picture which the doctor drew I failed to see in what way the description of the changes in the fundus could be declared to differ from the changes which I have many times seen in persons suffering from diabetes-mellitus. Perhaps my attention has been called to this more frequently last year than before, but it has happened that I have seen a considerable number of cases in which this granular whitish-gray deposit was present, not in radiate form, but in irregular masses; not at the macula, but between the macula and the nerve, and distributed irregularly around the fundus, with, in some cases, a few hemorrhages, and in others, none. Sometimes there is a little hyperaemia of the nerve, but frequently none whatever, and with marked typical appearances of degeneration of the blood vessels. Examination would show that these patients were suffering from diabetes. I have no objections to the view that many cases are due to the gouty diathesis, but the gouty diathesis is a somewhat vague entity, and recent investigations on uric acid make us disposed to be more careful. I wish to call attention to the fact that in many cases the fundamental element is arterio-sclerosis, and we have to go further back in order to find out on what it depends. That we must call most of these cases gouty seems to me an assumption as yet requiring proof and observation; diabetes seems to me to justify this qualification of the statements which in the main command my concurrence.

DR. B. ALEXANDER RANDALL, Philadelphia. — For some time I have intended to bring before the society a case of this character, where a history of sudden blindness of one eye received a partial explanation in changes about the macula and the marked crescent of rather superficial retinal hemorrhages and infiltration which occupied the area beyond the macula. The other eye showed a few traces of hemorrhage, but nothing as compared with the condition of the right eye. Careful
physical investigation of the patient (a hard-working woman 70 years of age), showed neither the affected joints nor the other indications of gout. The case has been under observation at intervals for several years, and only at the last visit was a trace of albumen found in the urine, with a few casts. The other eye has had some variations of vision, but has presented no such sudden loss as was complained of in the eye first affected, and has remained nearly normal.

The only pathological study which I have made, having the slightest bearing upon this subject, was in connection with a careful study of this arterio-sclerosis and phlebo-sclerosis made by Dr. Arthur V. Meigs, and published in the Transactions of the College of Physicians of Philadelphia. I had the pleasure of studying a number of his specimens, which I also photographed. Some of his most marked specimens were obtained from a young child who presented no other conditions but those which are sometimes set down as syphilitic disease of the blood vessels. Other specimens were from an adult who had lived for many years apparently healthy. The degeneration in the veins far exceeded the condition found in the arteries.

DR. O. F. WADSWORTH, Boston.—I think that the condition as I understand it from Dr. Bull's description is not an unfamiliar one, and it has seemed to me that it must be due to a variety of original causes; sometimes apparently to hemorrhages and sometimes without precedent hemorrhage. The conditions exist sometimes in one eye and sometimes in both, and I have been in the habit of regarding it as coming from vascular sclerosis due originally to one cause or another, or in company with secondary vascular sclerosis from a variety of causes. In my experience the general condition of the patient has varied.

DR. SAMUEL D. RISLEY, Philadelphia.—I have been intensely interested in the admirable picture of disease which Dr. Bull has so skillfully drawn; all the more because I am engaged in the study of a group of cases which to a certain extent belong to this class. To my mind this study leads us into the most mysterious realms of pathology, the ultimate processes of nutrition, the faulty performance of which leads to various forms of disease of the vascular tree; to nephritis, diabetes mellitus, and those curious forms in which excess of uric acid and the urates alternate with sugar; and also a group of cases which simulate very closely the commencing stages of tabes dorsalis. In the latter it seems to me that the influence of the nervous system over the process of nutrition leads to
the formation of products which are irritating and poisonous, and these to the vascular changes which have been described. On the other hand, it is doubtless true that persons who have lived a long time in malarious districts, and therefore the subjects of chronic malarial poisoning, suffer from disturbances of nutrition growing out of pathological states of the spleen and liver, and the lesions are established which lead to the picture which has been described.

It is also interesting to inquire whether or not the vascular changes in the eye-ground which have been described by Dr. Bull may not in some cases be the result of long-standing irritating processes which are purely local in character. Whether long-standing local irritating processes resulting from the improper or undue use of the eyes may not lead to certain vascular changes which simulate closely those which have been described, is a question worthy of careful consideration.

**DR. EDWARD JACKSON,** Philadelphia.—I have seen a few cases which correspond with the clinical picture drawn by Dr. Bull—the white lines on the vessels, the opaque exudation near the disc and macula, and the change in vision. In these cases (and the same is true for the large group of cases of albuminuric retinitis), the fact which to my mind is most definitely established is that there are always great vascular changes, arterio-sclerosis and phlebo-sclerosis. Whether these are dependent upon the circulation in the blood of some such substance as uric acid, or upon other influences, is obscure; and we had better keep our minds open on the question of whether or not they are due to gout. As regards the extensive changes in the walls of the vessels, I am satisfied that they are general.

**DR. CHARLES S. BULL,** New York.—I am entirely aware of the fact that this is no new discovery, but I wish to say a word in regard to the picture. The exudation that I spoke of is distinct from the punctate one which Dr. Knapp has depicted. It exists in patches irregular in shape and size. The outline of the patch is definite and the color a dull yellow, never glistening, and always in the inner layer of the retina. The picture of arterio- or phlebo-sclerosis is something with which we are all familiar. In these hundred or more cases all gave manifest evidences of acquired or inherited gout, and I could exclude chronic renal diseases and diabetes. I do not know of any better name for these lesions than gouty retinitis. At the same time I agree with Dr. Jackson that this is a very vague term, and that it behooves us to observe carefully. From what I have seen in these cases and from what other observers have
seen in other cases, I am convinced that the lesion is at the bottom a vascular degeneration, but what is the cause of the degeneration I have not satisfied myself. It did seem that in these cases the most probable cause was the gout poison.

CLINICAL HISTORY OF A CASE OF SPINDLE-CELLED SARCOMA OF THE CHOROID, WITH A STUDY OF THE MICROSCOPIC CONDITION OF THE GROWTH.

BY CHARLES A. OLIVER, M.D., OF PHILADELPHIA, PA.

X. Y. Z. of Indian Territory, an active, energetic, and well-known business man of thirty-four years of age, consulted the writer for advice in reference to his left eye. He stated that five years previously he suddenly noticed that objects situated to the right side became dimmed when he attempted to look at them with his left eye. This dimness gradually and painlessly crept over the whole field of vision until in little more than three years' time the eye became blind.

In October of 1889, he consulted Dr. J. H. Thompson of Kansas City, who, finding that he complained of dimness of vision in the left eye, — 20/1 brought to 20/xxx by minus cylinder O 50 D, axis 60°; the vitreous about the disk being clouded.

As he gave Dr. Thompson the history of primary syphilis six years previously, he was placed on tri-daily doses of thirty grains of iodide of potassium. Under this treatment the patient did reasonably well. At this time, however, as Dr. Thompson informs the writer, the patient had some trouble with his liver.

He was seen again in June of 1890, when a tumor of the choroid beneath a detachment of the retina was noticed, which Dr. Thompson — although afraid of sarcoma — upon account of the diminished tension and irregularity of the blood-vessels, — was inclined to believe was a detachment of the choroid. Thinking
that it might be syphilitic, he renewed the treatment, and in another month's time was enabled to make the diagnosis of sarcoma, begging the patient to have the growth removed.

Since that time he has had a number of varying diagnoses, such as retinal detachment, possible tumor, syphilitic gumma, etc., given to him. In spite of the fact that he was placed almost constantly under some form of alternative treatment, the tumor-growth gradually increased in size.

In the early spring of 1892, exacerbations of intense temporal neuralgia more marked on the left side, supervened, lasting several hours at a time and rendering the patient irritable, morose, and unmanageable at times. At the same time, the left eye began to recurrently diverge until in a period of a few weeks it became fixed outwardly. It was then noticed that he several times lost the power of counting money, making change, and performing any arithmetical problem.

When first seen by the writer, on the seventh of June, 1892, a large yellowish-red and quite vascular growth was apparent in the upper outer part of the globe, just posterior to the crystalline lens. The broad, mushroom-like head of the tumor, which was separated from the body of the mass by a ring-like constriction, curved sufficiently forwards, inwards, and downwards, to hide the upper outer portion of the optic disk. The entire bulk of the tumor seemed to be enveloped in a membranous bag, which sharply curved around it in a fluid vitreous.

Although studied by strong illumination and highly-magnifying convex lenses, the mass did not appear to move with any motion given to the eyeball. The pupil, which was irregularly round, dilated to about four millimeters upon monocular exposure, and failed to present any apparent synechiae. Tension was normal, and no ciliary tenderness could be elicited upon the most pronounced palpation. Vision was absolutely lost, and the iris failed to respond to the strongest light-stimulus from every meridian. Although there was a marked divergence of the left eye, and an inability for the internal rectus muscle of the same eye to act during attempts at convergence of the right eye upon a fine fixation object situated a short distance along the median line, yet the same muscle acted promptly in
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association with the right external rectus muscle in right lateral deviation.

Ophthalmoscopic examination without the use of a mydriatic, showed the optic nerve-head dimly through numerous vitreous opacities. The upper nerve distribution of the central retinal veins, which were all that could be plainly recognized, seemed somewhat enlarged and tortuous. Dilatation of the pupil to six millimeters in all meridians by cocaine, allowed the fundus to be fairly well seen. The optic disk was seven by eight in apparent size with its long axis at 120°. The scleral ring was visible all around. The central retinal vessels were everywhere tortuous, the inferior nasal branches being quite large. The growth, which was now certain, sprang from the upper outer portion of the choroid and extended forwards, downwards, and inwards to a point immediately behind the lens. Its periphery, which projected directly out into the vitreous chamber, could be recognized throughout its entire extent. The deeper-lying vessels of the growth itself could be seen underlying in many places those of the superimposed retina.

The right eye, which was functioning properly in every particular, was entirely free from any evidences of the disease.

The diagnosis being certain, an immediate enucleation was advised and accepted.

Careful physical examination failed to reveal any evidences of organic disease. The lungs were capacious, gave good resonance throughout, and were free from râles. The heart was large for a man of his size, but not pathologically so. There were no murmurs and no evidence of any cardiac disease. Both the spleen and the liver were slightly, though insignificantly, enlarged. No enlargement of the superficial lymphatics could be recognized, and no lesions indicative of syphilis could be found. The urine, which was normal in appearance, had a specific gravity of 1.015, and was free from albumin and sugar.

With the assistance of Dr. Daniel Longaker, enucleation was done on the following day under ether, there being but little hemorrhage. The external surface of the globe was carefully examined and found to be entirely free from any nodules and maculae. The proximal end of the optic nerve was re-ex-
cised far back, and the orbital tissues were painstakingly, though (happily) unsuccessfully searched for any indications of extension. The socket healed firmly with but little apparent conjunctival scar. In a month's time, after having him placed under carefully gauged anti-syphilitic treatment, an artificial eye was ordered and the patient allowed to return to his home.

Immediately after the enucleation, in presence of the patient's wife, who would be thus made witness of the correctness of the diagnosis, the eyeball was opened by a series of circumlinear incisions extending half way around the lower border of the optic-nerve entrance, and continued forward by two long longitudinal cuts in such a direction as to avoid touching the tumor-mass.

It is interesting to note that on the sixteenth of August, 1893, the writer received the following note: "The operation has astonished the natives here. Most of them doubt my having a glass eye, and my only way of convincing them is to put my fingers against it." In November of the same year he wrote: "I am pleased to be able to report to you a decided improvement in my health, and I have gained seventeen pounds since coming home. My appetite is excellent, and I do not suffer from my old ailments. My headaches have left me entirely, and I trust that they and I have parted friendship forever."

The patient has been seen by the writer within a few days. He has gained in weight, is sanguine, happy, and full of life and energy. The socket is clean, well-shaped, and free from any irritation, nodules, or maculations. No metastases in any available situation could be determined after the most careful physical examination.

The accompanying reproduction of a photograph, which was kindly taken for the writer by Dr. Henry W. Cattell, Demonstrator of Morbid Anatomy in the University of Pennsylvania, shows the exact size and position of the tumor-mass. The inferior wall of the globe (seen at the top) is turned back upon itself.
so as to expose the interior of the eye. The eye is resting partly upon its corneal surface, and the superior wall is everted by a couple of pins so as to bring the growth and its attachment more prominently into view. The eversion of the wall of the globe by the pins in the photograph, causes the summit of the tumor to appear to point more posteriorly than it did when the globe was in its proper shape and form.

After the growth had been properly hardened in Müller's fluid, and had been placed in equal parts of this fluid and alcohol, the following measurements were made by Dr. Cattell: From the inside center of the tumor to inside center of the crystalline lens, the distance was eight millimeters. From the base of the tumor to the top of the growth, the distance was nine and a half millimeters. The greatest length of the mass was in the longitudinal direction of the eye: this situation—slightly beneath the top, measured one centimeter from side to side. The vertical diameter at this point measured one-fourth of a millimeter less. The pedicle varied from nine to nine and a half millimeters across, at different points. The mass again slightly broadened as it reached its base. The tumor pointed from the concavity of the eye towards the crystalline lens in such a way as to make its convex top visible during life to the ophthalmoscope.

The specimen was submitted to Dr. Joseph McFarland, Demonstrator of Pathological Histology in the University of Pennsylvania, to whom the writer is indebted for a careful microscopic examination and the accompanying drawings.

As can be seen in Figures 3 and 4, the neoplastic formation proved to be a spindle-celled sarcoma. Figure 1 shows how it sprang from the external layers of the choroid, projected into the sclerotic tissue, and extended extensively into the vitreous chamber. The overlying retina was elevated by the mass, dissected loose in places, and so torn at many points as to frequently render the tumor devoid of any internal covering. The spindle cells, which are small, quite uniform in size, and contain oval vesicular nuclei, run in irregular bundles. Throughout the growth numerous cavernous vascular spaces or sinuses could be recognized. In Figure 2 three of them are visible, each containing
red blood-corpuscles, and, in Figure 3, one can be noticed that is partly surrounded by an imperfect fibrous wall. As pointed out by Dr. McFarland, a second variety of sinuses could be found. These are shown in Figure 3. To use the language of his report, he says: "A second variety of sinuses exists similar to, but different from the blood channels, and seemingly having no connection with them. In these, too, a second cellular element is present, viz.: large, round, pigmented cells. These are almost constantly found in these open spaces, while but rarely seen in the blood channels. They are very probably leucocytes loaded with pigment granules which have been picked up in the interstices of the tissue. Just what these second series of channels represent is questionable. At first one would suspect them of being patches of degenerated tissue, but after careful study we have been led to conclude that they are cavernous lymph spaces. If this be correct, we can account for the many pigmented cells which they contain, by supposing that leucocytes (which we find sparingly in the tissue), having picked up loads of pigment granules from the interstices of the tissue, are now returning through the lymph channels. Except for these pigmented cells, a little fibrin, and occasionally a little molecular matter, the channels were continually empty."

The case is of the utmost interest, not only upon account of the recognition of the growth very early in the non-irritative stage of the disease, the comparative youth of the patient, the relative infrequency of the variety of the neoplasm, as well as the promptness in removing the tumor and its limiting nidus at the commencement of the second stage, and the rapid disappearance of the curious, though interesting cerebral symptoms after the enucleation and during the employment of the medicinal agents, but is of value where, by careful and painstaking analysis of the post mortem findings, it was distinctly proved that the neoplastic cells had extended at their utmost point to about four-fifths the lateral extent of the most resistant (and yet the most important for the life of the patient) of the ocular tissues. Fortunately, the position of the growth allowed its early recognition, and the late and sudden development of the incipient secondary stage, gave sufficient time and enough pain
FIG. 1.

SARCOMA OF CHOROID IN REGION OF POSTERIOR POLE.

GRUELING.
for prompt radical action to be taken both upon the part of the patient and his medical advisor. The rather large, diffusely-placed and slowly-growing cells, the abundance of intercellular material, and the point of origin of the growth in the outer layer of the choroid (thus confirming Knapp's statement to this effect), are all of interest; while the scarcity of pigmentation in the youngest cells, the characteristic parallel tracks of the cellular elements, their uniformity in size, their typical oval vesicular nuclei, and the imperfectly walled vascular sinuses, crowded in places with red-blood corpuscles, teach much as to the etiology of the mechanism of the formation of the neoplasm; and lastly, the peculiar, though probable cavernous lymph spaces containing the pigment-laden leucocytes, gives a new point for reflection and study to the scientific student and educated physician.

A CASE OF SARCOMA OF THE CHOROID, WITH REMARKS ON THE EARLY DIAGNOSIS OF INTRAOCULAR SARCOMA (with one plate).

BY DR. E. GRUENING,
NEW YORK CITY.

The early notice and the complete removal of sarcomatous growths secure to the patient a better chance of escaping both the local recurrence of the neoplasm and the metastatic deposition of tumor elements. As an intraocular disease, sarcoma occurs frequently in the choroid, but its prompt recognition is rendered very difficult, and at times even impossible, owing to the retinal detachment which supervenes in the initial stage of the choroidal growth. It is only later, when to an apparently simple retinal detachment ciliary irritation and glaucomatous tension are added, that the presence of a malignant tumor behind the retina is suspected. Such are, generally speaking, the obstacles which we meet in the early diagnosis of intraocular sarcoma. Departures from this common course in the development of the growth occur, however, in the ciliary region, where
choroid and retina are more intimately connected, and in the
macular region, where the venous supply is not very abundant.
In both these localities, as has been pointed out by Knapp, on
the one hand, for the ciliary region, and by Carl Becker, on the
other, for the macular region, the retina remains in contact
with the growth, and retains its transparency a long time.
Through the overlying retina the new growth can be seen and
studied with the ophthalmoscope.

Quite recently I had the rare opportunity of diagnosticating
a choroidal sarcoma in the primary stage of development. The
tumor grew from the region of the posterior pole of the eye,
and showed behind the retina a system of vessels neither be-
longing to the choroid nor to the retina.

On April 17, 1893, Mrs. P. G., an apparently healthy woman,
three years of age, consulted me concerning her right eye. She
stated that about four months previously she had noticed
that she could not see as well with the right eye as with the
left. The eye had not been inflamed, and had never pained
her.

At the examination I found the media of the right eye clear,
the pupil circular and movable, and the tension normal. The
ophthalmoscope showed a myopic refraction of ten dioptries,
and such atropic changes in the choroid as are usual in high
degrees of myopia. In the macular region I saw peculiar
changes. A greenish-gray mass, over which the course of the
retinal vessels could be distinctly traced, projected into the in-
terior of the eye. The mass appeared evenly rounded, had no
nodules, no folds, and did not shake when the eye was moved.
The base of the prominence was circular, and measured four
papillary diameters. The apex came distinctly into view with a
convex spherical glass of ten dioptries, and the base with a con-
cave spherical glass of ten dioptries. The sides sloped grad-
ually into the level of the fundus. Behind the retinal vessels,
which were lifted by the tumor, a peculiar system of vessels
was discovered. It consisted of several broad red bands, with
many anastamosing branches, all uniform in size and color.
Fig. 1 exhibits this interesting ophthalmoscopic picture. I am
indebted for the drawing to Dr. Percy Fridenberg.
FIG. 1.

SARCOMA OF LID.
GROENING.
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The visual impairment of the right eye was a central scotoma, corresponding to the macular changes. Peripheric vision was still good. The left eye was myopic, and its function unimpaired.

Without hesitation, I diagnosed choroidal sarcoma, and advised the removal of the eye. The patient consented, and the operation was performed three days later, on April 20th. The microscopic examination of the tumor proved it to be a vascular, spindle-celled leucosarcoma of the choroid. The retina and sclera were not involved.

The early diagnosis and the prompt removal of the growth entitle us to hope that the patient may escape both local recurrence and metastatic deposits. The writer can support this hopeful view by one personal observation. It is now seven years since he removed an eyeball containing a leucosarcoma in the second stage of development—that is to say, when glaucomatous symptoms had already appeared. A few days ago the patient, Mr. M., a merchant of this city, presented himself in excellent health.

A CASE OF SPINDLE-CELED SARCOMA OF THE LID.

By Dr. E. Gruening,

New York City.

Primary sarcoma of the lid is of rare occurrence. The case here reported is the only one hitherto observed by the writer.

Anton Kottofsky, a Slavonian laborer, aged 23, was admitted to the German Hospital, New York, on January 1, 1893, with the following history: Five years ago the patient noticed a small swelling about the size of a pea on the lower lid of the right eye. This swelling bled frequently. In time the hemorrhages ceased but the growth increased steadily in size. Three years ago an operation was performed in an Albany hospital, but the tumor soon recurred. On admission the following condition was observed: In the right lower lid there was a swelling of the size of a hazelnut. It involved the outer two-thirds of the lid. The lid was everted and sunken. The skin cover-
ing the mass was movable and bluish-red in color. Along the lower edge of the mass large, dark blue vessels running parallel with the edge of the lid were seen through the skin. The free edge of the lid was rounded off and thickened. The intermarginal space had disappeared and the cutaneous surface of the lid passed into the conjunctival surface without a distinct line of demarcation. In the outer third of lid the lashes were wanting. The appearance of the lid is shown in the colored drawing, for which I have to thank Dr. Percy Fridenberg.

To the palpating finger the cutaneous side of the mass presented a smooth globular form and a firm consistency. The conjunctival side was soft, very vascular, and bled even when gently handled. A small piece of the conjunctival part of the tumor was excised for the purpose of microscopic examination, and Dr. Isaac Adler, the pathologist of the hospital, diagnosticated spindle-celled sarcoma. From the point of excision the oozing of blood continued several days and could only be checked by a pressure bandage.

On the 18th of January I removed the outer two-thirds of the lid with the conjunctiva. The incisions were carried through the sound tissues. The extirpation of the tumor was followed by blepharoplasty. The new lid was formed by a flap with a pedicle from the right temporal region. On the fifth day after the operation the sutures were removed, primary union having taken place. The patient was discharged two weeks later, and did not return.

PATHOLOGICAL EXAMINATION BY PERCY FRIDENBERG, M.D.

The portion of lid enclosing the tumor mass measured 25 mm. in length, 10 mm. in thickness, 15 mm. in height.

Immediately after excision the specimen was placed in Müller's fluid, hardened, and imbedded in celloidin. Sections were made and stained in haematoxylin and eosin.

Examined with a low power (Zeiss obj. α 3 oc. 1) of 20 diameters the tumor appears as a circumscribed mass occupying the whole thickness of the lid. It is covered by a thin investment of skin and sub-cutaneous connective tissue externally and at the free margin of the lid. On the conjunctival surface the
delicate connective tissue capsule is not continuous and is wanting in some sections. This surface of the tumor is quite vascular. The tumor is bounded at its base by loose connective tissue corresponding to the structure of the attached lid border. In this region a number of muscle bundles of the orbicularis palpebrarum may be traced up and into the mass of tumor, where they become infiltrated and lose continuity.

Near the surface the normal structures of the cutis are seen. These present no evidence of pathological change. The connective tissue of the base at a depth is quite vascular; vessels can however not be traced into the growth. Under a power of 175–580 diameters (Zeiss obj. DD. oc. 1–5) the tumor presents itself as a non-vascular, spindle-celled sarcoma of fascicular structure. The center of many of the fascicles is occupied by the remains of an obliterated vessel around which the proliferation of sarcoma cells has taken place, evidently starting from the adventitial sheath. The conjunctival surface of the tumor contains many newly-formed capillaries. These are wanting in the body of the mass. There is no production of pigment to be detected anywhere.

The connective tissue capsule and the cutis investing the tumor show, at different points, localized foci in which small round cells are accumulated in the tissue or about the walls of blood vessels. These cells contrast by a nearly indigo color with the purplish stain assumed by the sarcoma cells. Numerous dilated capillaries and, at some points, extravasation of blood are found in the subcutaneous tissue. At the base of the tumor there is even more marked vascularity of the fibrous envelope.

The vessels are numerous and small cell infiltration noticeable. Along some of these vessels leading from the tumor sarcoma cells are seen, although in small numbers. There is no apparent extension of the tumor by continuity.

The epidermis and papillary layer of the cutis are intact and free from infiltration by tumor cells.

The growth is a fascicular spindle-celled sarcoma, almost completely covered by a thin fibrous capsule and still covered by normal skin. It seems to have been totally extirpated.
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In Fig. 2, which exhibits a section through the whole thickness of the lid, the relation of the tumor to the lid and the circumscribed character of the sarcoma is shown.

LITERATURE.


DISCUSSION.

DR. HERMAN KNAPP, New York.—Last year I met with two cases of traumatic sarcoma of the lid—a thing which was novel to me. Both cases terminated fatally. In the first case the diagnosis was very difficult. I failed to make it, and only conditionally was it made by Dr. McBurney, whom I asked to make the operation. A child four or five years old fell and injured his eyebrow, and was brought to me several weeks afterward on account of considerable swelling in the upper lid. The lid was swollen and doughy, and when I put the stethoscope on it there was a peculiar bruit. This was present at times, and then
disappeared. This, together with the etiology and the appearance of the red skin, made me suppose that it was an aneurism. To test this, I took a small Graefe knife and went into the tumor, but it proved to be hard, and nothing came out but a little blood. I took the case to Dr. McBurney, who said that in all probability some artery had been injured, and the case was one of spurious aneurism; but yet he said the diagnosis of traumatic sarcoma could not be entirely excluded. He operated in my presence, with the idea of finding the dilated blood vessels. There was nothing of the kind found. The tumor was surrounded by vascular tissue, but in its bulk was lardaceous and hard, presenting the appearance that we see in orbital sarcoma. He removed as much of the tumor as was feasible. It was in no way circumscribed, and the infiltration went into the neighboring skin and adjacent tissues, so that a radical operation could only have been done by removing the whole thing and the surroundings, which was not done. A most unfavorable prognosis was given. The portion removed was examined at the Roosevelt Hospital, and found to be a small spindle-celled sarcoma. In a short time there was recurrence, and in four months the child died from exhaustion, with the tumor larger than at first.

A few weeks later I saw a second case, with a similar tumor, occurring in the same way, and with the same termination. In this case the tumor had existed longer, and had been operated on once or twice. When the child came to me the tumor was so large that I advised abstinence from operative procedures, and gave a hopeless prognosis. The tumor continued to grow, and the child died from exhaustion.

Traumatic sarcomata of the lid are mentioned in literature, but these are the only two case that I have seen, but they were both exceedingly characteristic in their course, and left an indelible impression upon my mind. I think that the case of Dr. Gruening is somewhat different. It may have originated in the glands of the lid. Such tumors have, more or less, the character of epithelial growths, and it is only in the center that the fibrous mass is found. These tumors in the lid are well described by Elsching and some others, and they project rather favorably on the inner surface. They have been described under different names. They are essentially glandular tumors. In the Archives of Ophthalmology, No. 3, 1891, a number of these cases will be found reported by Salzmann. They have the characteristic feature that they are circumscribed, as in Dr. Gruening’s case. I think that they are less malignant.

DR. B. ALEXANDER RANDALL, Philadelphia. — The case
which I had occasion to report some years ago differed somewhat from those reported to-day. In that case the traumatism was a little problematical. The case had been twice operated on for chalazion, which had recurred. Looking at it across the room, I considered it different from any chalazion that I had ever seen. Closer examination indicated what the microscope later showed—that we had to do with a tumor more or less distinctly encapsulated, and with the meibomian glands entirely behind it. I could not connect it with any of the meibomian glands, and the evidence seemed to be that it had originated between the meibomian plane and the skin surface, with which it was strongly adherent. So cyst-like was the growth that, when it recurred six months or more after my first operation, a colleague treated it for months with yellow oxide inunctions; and it was only later that the patient returned to me with a growth as large as the finger tip on the conjunctival surface. In removing it I was forced to remove two-thirds of the lid from the outer canthus. Both the primary and recurrent growths were spindle-celled sarcomata, little pigmented.

TUMOR OF IRIS, PROBABLY TUBERCULAR.

By Dr. Geo. C. Harlan,

Philadelphia, Penn.

The following history of this case is furnished by my assistant, Dr. Schwenk, under whose observation it first came. "The patient, a male child, was born September 5, 1890, after natural labor, and was well developed at birth. After the seventh day, the mother's milk having failed, he was artificially fed: various cereal preparations were used up to the seventh month, after which cow's milk became his principal diet. He continued in moderate health up to eighteen months of age, when he began to improve and was in excellent condition up to the latter part of January, 1893. He then became restless and peevish and less playful, and soon after a bronchitis developed. About the middle of February a weakness of the right eye was noticed, with photophobia and lachrymation. His condition grew worse until he was brought to my office on the 6th of March. The father of the child is one of four brothers, all of whom are in excellent health. The grandfather is living, aged 61 years. The grandmother died in confinement."
The child's mother is one of four sisters, who all enjoy fair health. No death from phthisis has occurred on either side. The only case of this disease known in any branch of the family is that of an aunt of the mother, who is still living, aged 58.

When first seen, March 6, 1893, the child seemed fairly well nourished, but his skin was pale and sallow and he had a troublesome cough. Physical examination showed moist bronchial rales, but no sign of tubercular deposit could be discovered. There were no glandular enlargements, and the joints were all healthy. The eye was irritable and watery. There was some conjunctivitis but no chemosis. Well marked pericorneal zone, and small posterior synechia. A number of small yellowish white rounded nodules were noticed on the periphery of the iris. These increased rapidly in size and others were added, and on March 13th the patient was referred to Will's Hospital, where a careful examination of the eye was made under ether. There was a well marked ciliary zone, and iritis with posterior synechia. The cornea was slightly hazy but oblique illumination failed to show any punctate opacities. The upper and outer third of the iris was covered with an irregular mass of yellowish gray deposit, roughly triangular in form, with its base in the angle of the anterior chamber and its apex extending not quite to the center of the pupil. The mass was slightly vascular except at its apex and along the lower margin, where it was quite free from capillaries. There were also a number of small round grayish nodules scattered over the rest of the iris—chiefly towards the periphery, though there were a few near the pupillary margin. In two days there had been a very decided increase in the deposit; it completely covered the pupil and filled the upper outer third of the anterior chamber. The new additions were not vascular but nearly white. The child's general condition had grown worse, and there was now intense photophobia of the sound eye.

Enucleation was performed March 15th. The patient improved rapidly after the operation, and was discharged from the hospital in five days, when all signs of irritation of the remaining eye had subsided. When last seen, on June 23d, the child
was well and strong and had increased in weight, and was wearing an artificial eye with comfort.

The ball was given, immediately after the operation, for examination, to Dr. S. S. Kneass, who has furnished me with the following report:

"Bacteriological examinations, both by inoculation or artificial media, and by Ziehl-Niessen and Erlich-Weigert methods of staining, were negative.

"Microscopic examination of the iris deposits showed a number of foci composed of lymphoid and epithelioid cells. Neither any giant cells nor any caseous degeneration were observed. The ciliary body, spaces of Fontana, proximal portions of choroid and retinal layers were involved. There is enlargement of the glands of the ciliary body, thickening of the retinal fibre layer and hypernucleation of the optic nerve. The cornea and sclera seem to be free."

This microscopic preparation of half of the globe was made by Dr. Posey, one of Dr. Oliver's clinical assistants. I have spoken of this case as probably tuberculous, because the only positive proof, the discovery of bacilli, is wanting. Perhaps inoculation of a rabbit's eye, as has been so successfully done by Dr. Knapp, might have given more positive results.

Tubercular family history is also absent. Could the child have been infected by the cow's milk upon which it was fed?

The very rapid increase of the deposit is worthy of notice.

DISCUSSION.

DR. HERMAN KNAPP, New York.—This tumor if tubercular has not the ordinary aspect of inoculation tuberculosis of the iris. At first there are distinct points and afterward there is radiating segmentation. Then the further course in some cases leads to atrophy and the infiltration disappears, and in other cases leads to caseation. That is exceedingly important and has given rise to a good deal of discussion. It has been questioned whether these appearances in the iris which look like tuberculosis and even respond to the bacteriological tests, are really due to the consumption bacillus or to something else. Then the hypothesis was advanced that this was an attenuated form of tuberculosis or something entirely different. That it is the real tubercle bacillus can be proven, for I used for my
inoculations in Berlin and here pure cultures of the tubercle bacillus obtained from the tuberculosis of man, and they produced exactly the same picture with recovery in one set and caseation and destruction of the eye in another set. So far as I have followed it up, it never generalizes itself through the body. So it comes in analogy with similar cases of local tuberculosis, with strumous glands, etc., which in the majority of cases get well whether extirpated or not, and the individuals get entirely healthy. In other cases, they may lead to general tuberculosis. This seems to lie in the life history of the tubercle bacillus, which in the majority of cases is slow and probably exhausts itself or is killed in the surrounding tissue, while in other cases it leads to acute disease. It certainly is the same agent. It develops rapidly to destruction in one, in others its vitality dies out and the organism in cast off. This can be due only to difference in the surroundings. In one case the body is much healthier and can survive the slow growth of the bacillus. In other cases the surroundings are more favorable and there is not vitality enough to tide the life of the individual over the life history of the pathological process. This is what we see in most infectious diseases; otherwise none of us would live.

A CASE OF TRAUMATIC DISLOCATION OF THE IRIS UNDER THE UNBROKEN CONJUNCTIVA —EYE DAMAGED, BUT PRESERVED—TYPICAL SYMPATHETIC OPHTHALMIA IN THE OTHER.

BY DR. HERMAN KNAPP,
NEW YORK CITY.

Last winter a patient presented himself to me with an injury to his left eye such as I had never seen, and the consequences of which were so grave that I beg to report his case and submit it to your consideration.

Mr. A. C. M., strong, healthy, 45 years old, told me on Dec. 21, 1892, that 10 days previously his left eye had been struck by the head of a small pet dog with whom he was playing. The eye had been red and black ever since, not painful, the sight impaired. I found subconjunctival hemorrhage all around the cornea. On the inner side, 2mm. back from the corneal
margin, the conjunctiva was raised by a round black substance 1 cm. in diameter. It was the iris. The conjunctiva and cornea on the closest examination showed no wound or scar. On focal illumination the whole iris was found absent from its normal place, the lens in position and transparent. The ciliary processes encircled the lens all around and showed nothing unusual. At the inner anterior part of the sclerotic, just opposite the location of the iris on the outer side, there was a rupture in the sclerotic, 3 or 4 mm. long, from which a small tuft of white fibres passed on the edge of the lens. Some blood was in the lower part of the vitreous. The fundus was veiled, yet sufficiently clear to see that there was neither neuroretinitis, nor an isolated rupture of the choroid. Tension of globe and visual field normal. Vision, 15/200. The right eye was free from any irritation, and ophthalmoscopically normal. S. is noted in my book as 20/30.

Under these circumstances I could not advise the removal of the injured eye, nor did I think it judicious to split the conjunctiva and remove the displaced iris, which caused no irritation whatever. I advised the patient to stay at home, bandage the eye lightly, not use the other eye, and take good care of himself.

For the next week there was diminution of the blood under the conjunctiva, no pain in either eye, the sight and interior of the left eye the same. The right, tested for sight, gave S. 20/70 with a convex glass. He said it had always been a weak eye. There was no trace of iritis, and the eye was ophthalmoscopically normal. I made this examination carefully, for the impulsive patient, tired of staying at home and feeling absolutely well, asked me to let him do some work again. He was an actor and pleaded very urgently. I told him he might try, but he should be careful.

January 9, 1893, i.e., 29 days after the injury and 10 days after he had gone to the stage again, he came back and said that during the last four days he had noticed some redness of his right eye, and some blurring of sight, but no pain. I found slight circumcorneal injection, S. 20/50, fundus normal. He wanted to go back and play in the evening, as, he said, he could
not be spared. I forbade that categorically, and told him that he was in danger of getting blind from sympathetic inflammation in the uninjured eye. He had to stop playing for weeks, perhaps months. I ordered him leeches in the temple and instillation of atropine.

The next day he returned and said that he had not played, but had taken his leave from the company. He wanted to devote himself entirely to the preservation of his sight. He had no pain in his eye, his sight was still 20/50 with the right and about 10/200 in the left eye. F. and T. in both were normal. In the right there was circumcorneal injection, and the pupil did not enlarge (circular synechia). Background normal. In the left there was no irritation; some blood on and behind lens; fundus veiled, retina apparently a little swollen.

I need not give a detailed account of the further course of the disease. The patient was put to bed, his room moderately darkened, atropine was instilled, leeches put to the temple, salicylate of soda given the first days, afterward mercury to salivation, then warm applications and iodide of potassium. In three or four days the inflammation subsided markedly, the pupil became over medium-wide, with three filiform adhesions and less redness around the cornea. In the third week after the attack, the pupil was regularly dilated, though not a maximum, so that it seemed that the case might behave like an ordinary plastic iritis. Relapses, however, occurred, followed by temporary improvement for months. The eye soon showed the picture of sympathetic irido-cyclitis. Frequently increased eyeball tension made me order pilocarpin instillation instead of atropine. Then the tension would get normal or diminished. The uneven, velvety drab-colored iris gradually became smooth again, is now more lustrous, but lies flat and immovable on the lens (total synechia). The pupil is closed by a dense gray pseudo-membrane. Tn. Fn. S. 1/200. Eye white and painless.

In the left eye the opacity of the vitreous became denser and, by oblique light, gray excrescences could be seen, not only near the wound, but all around the ciliary circle, especially on the lower side. The fundus soon became so veiled that details were no longer discernible. It could, however, always be illum-
inated in every direction. When last seen, July 3, 1893, S. was 2/200. Lens in position and transparent. No irritation of eye. T. and Fn. The displaced iris has shrunk to a flat blackish patch, scarcely raised above the sclera, covered with conjunctiva.

REMARKS.

That a blunt force ruptures the sclera at the insertion of the iris, and throws the whole iris under the unbroken conjunctiva, while the lens remains in its normal position and normal in appearance has been a novel observation to me.

That this accident, twenty-five days after the injury, led to the development of typical sympathetic ophthalmia, is not unprecedented if the cases of subconjunctival dislocation of the lens are included in this class of injuries.

The blood and opacities of the vitreous in the injured eye made the diagnosis of a plastic uvæitis very difficult at the beginning, yet later its existence was well recognizable by oblique light.

That plastic uvæitis always precedes the development of sympathetic ophthalmia is a fact long known to the ophthalmic clinician, and recently supported by Schirmer* through the microscopic examination of ten injured eyes which had given rise to genuine sympathetic ophthalmia of their fellows. Whether, in our case, the enucleation of the eye when I first saw it, i.e., ten days after the injury, would have saved the other eye, is a matter of speculation. I have always held that we are not entitled prophylactically to remove an injured eye as long as there is hope of preventing it from blindness, for cases are known where after early enucleation the other, then apparently still healthy, eye nevertheless developed sympathetic ophthalmia; moreover, cases are on record in which the removal of the injured eye was refused, and the latter recovered sight, whereas its already sympathetically affected fellow became blind. These facts, known to you all, constitute not only a rule for guidance, but also an important point in law.

As to the pathogenesis of the sympathetic ophthalmia in this case the irritation theory of the ciliary nerves will present no

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* Grütz's Archives, Vol. XXXVIII, No. 4, 1892.
more difficulties than the micropbic theory. All the nerves of
the iris were torn, and some of the nerves in the ciliary body
may have been seriously injured, for the blunt force which tore
off the whole iris and drove it out under the conjunctiva
through a small rupture in the sclerotic, must have bruised
the ciliary body and choroid, causing plastic cyclitis, the essen-
tial link between the primary and sympathetic inflammations.
The micropbic theory can be upheld only by adding, with Sachs* and Schirmer, another hypothesis, namely the supposition that
minute ruptures of the conjunctiva occurred during the injury
or later, and formed the entrances for the hypothetical microbes
which, by as yet unknown paths, traveled from the injured eye
to the other, and provokes, in as yet unknown a manner, the
other eye to develop a plastic irido-cyclitis.

The mechanism of the injury in our case is difficult to
understand. The force which tore the whole iris off, and ex-
pelled it through a small rupture of the sclerotic while it left
the lens and its suspensory ligament unhurt (there was no dis-
location or tremulousness of the lens) must have acted in a
most peculiar manner, difficult to analyze. Similar conditions
are certainly exceedingly rare, for the case is, as far as I know,
unique.

DISCUSSION.

DR. SAMUEL THEOBALD, Baltimore.—The eyes were, per-
haps, not normal at the time of the accident. If the eye were
myopic, it would be more readily explicable why such slight
traumatism should produce such a serious injury.

DR. J. A. ANDREWS, New York.—It seems to me that this
case stands almost alone in our literature—the injured eye pre-
served and the fellow eye lost from sympathetic ophthalmia. I
think that the only case on record which has any resemblance
to Dr. Knapp's case is the one published by Dr. T. R. Pooley
over 20 years ago — Arch. of Ophth., Vol. I. I have recently
seen a case of unusual injury to the eye from a blunt instru-
ment. A week ago, a woman came to me, who was hurt four
hours before, while splitting wood with an axe, by a piece of the
wood, two feet long and four inches in diameter, which lay at one
end of the log she was chopping, flying up and striking the eye.
There was no injury to the eyelid; the ocular conjunctiva was

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*SACHS, Ueber traumatische Scleralruptur resonders im vord Bulbusabschnitt Arch. f. Augenth. XX, p. 367, 1889.
slit up from the caruncle to the margin of the cornea, but the
sclerotuc beneath was apparently uninjured. The rupture of
the cornea involved nearly one-half of its circumference. A
flap was produced which was formed by the wound extending
from about 2mm. from the upper margin of the cornea, near its
vertical diameter, to near a corresponding point below and then
upwards and inwards almost to the center of the cornea. The
anterior chamber was empty; but there was no prolapse of the
iris and the lens was uninjured. I made the conjunctival sac
as aseptic as possible and bound up the eye. There has been
no iritis and the eye has done well. This seems to me to have
been an unusual injury with an uncommonly favorable result.

Dr. T. Y. Sutphen, Newark.—To us younger men it is a
great satisfaction to learn from older ones in such cases as these.
The report of this case makes me glad that I enucleated an eye
quite recently where there was a traumatic dislocation of the
lens under the conjunctiva in the ciliary region, and that I did
not take the risk of removing the lens or waiting for a possible
subsidence of the irritation.

Dr. J. F. Noves, Providence, R. I.—Some years ago a sol-
dier went into a saloon and got into a dispute and received a
blow with the fist first in one eye and then in the other. I
found dislocation of the lens in the eye first struck. It had
passed out of the eye through a rent in the sclero-corneal junc-
tion upper segment, carrying with it the iris. It lay under the
conjunctiva. In the other eye I found a similar rent and the
lens partly dislocated. The first lens I took away and the
other I let alone. The man recovered with tolerably good
sight. I thought that was rather a remarkable blow that pro-
duced almost the same injury in each eye.

Dr. Emil Gruening, New York.—The question raised by
Dr. Knapp is one of the most serious in ophthalmology,—the
question what to do with such an eye which is apparently but
slightly injured. I have had a case of perforation of the sclero-
corneal margin with prolapse of the iris. We know that such
an injury may produce sympathetic ophthalmia. Are we justi-
fied in view of this danger in removing such an eye? Again,
sympathetic ophthalmia having occurred, we are brought face
to face with the question whether or not we are entitled to re-
move the injured eye when there is yet good sight. I have had
to face this question, and have refused to remove the eye. I
have never removed an eye which was useful even when sympa-
thetic ophthalmia threatened. To remove an eye because there
is dislocation of the lens through the sclera, I think is wrong.
We must save the eye if possible. There is no immediate dan-
ger of sympathetic trouble. If there is danger of sympathetic trouble and the eye is blind, then is time enough to enucleate it. I take this position that we are not entitled to remove an injured eye that still has practical sight, even when the fellow eye becomes sympathetically affected.

DR. T. Y. SUTPHEN, Newark.—In my case the injury had occurred two weeks before I operated. There was no sight in the eye and the iris having been dragged forward with the lens, irido-cyclitis was already developing.

DR. PETER A. CALLAN, New York.—If the injured eye remains painful, it is always a sign that there is liability of danger. If pressure on the upper ciliary region causes pain, it means careful watching. If the case develops sympathetic affection of the other eye with diminished vision, no matter what the vision is of the first eye, I recommend removal.

DR. F. P. CAPRON, Providence, R. I.—Is there any danger attending removal of the affected eye if the other becomes inflamed? If the eye has been inflamed for twenty-four hours is it considered advisable to remove the injured eye? I have been confronted with this question in a case where the eye was injured by a stone. In three weeks sympathetic inflammation developed in the other eye. In forty-eight hours, I removed the affected eye. The other eye went on until vision was almost entirely destroyed. It has been a question whether under the circumstances it was advisable to remove the eye. I had instructed the patient's family to watch for the development of sympathetic ophthalmia, but they had not done so. It has been my practice to remove the injured eye if there is evidence of sympathetic ophthalmia.

DR. O. F. WADSWORTH, Boston.—I should like to speak of a case which was a very melancholy one and which occurred some ten or twelve years ago. In this case a spit-ball blown from a toy gun ruptured the sclera in the ciliary region without rupture of the conjunctiva, so far as I could make out. The boy was twelve years of age and an only son. There was no particular tenderness. There was perception of light and evidently a good deal of hemorrhage in the vitreous. I saw the boy every day. Both eyes were kept bandaged for two weeks, and he was then allowed to have one open. At the end of three weeks he came to me with a slight cold in the head and slight congestion of the second eye. It was exceedingly slight and not particularly about the ciliary region. He had been the day before, against orders, in his father's stable, where the man was washing a carriage, it being in the winter. There seemed to be no reason to think that the slight congestion was due to
sympathetic trouble. The condition continued for another
week and did not increase. I saw him one day and he had per-
fected vision, perfect power of accommodation, and the ophthal-
moscope showed the fundus normal and not sensitive to light.
He came the next day after looking out of the window at the
bright sun. There were numerous dots on the membrane of
Descemet, the pupil was sluggish and atropine showed posterior
synechiae. The other eye was enucleated the same afternoon,
but he lost sight in the remaining eye within a couple of days.
There had apparently been no wound in the conjunctiva and no
tenderness on pressure.

Dr. R. A. Reeve, Toronto, Canada.—It has happened to
me to be able by iridectomy to restore useful sight to an eye
which had been injured and had given rise to sympathetic in-
flammation. The only case of sympathetic ophthalmitis that I
have had in which useful vision was recovered, was where I had
done enucleation before any sign of sympathetic inflammation
had occurred. As far as my experience and judgment go, symp-
pathetic inflammation may arise in two ways,—as the result of
infection of the excitant, and of a diseased state without infec-
tion. The etiology of tetanus in which the organisms remain
at the point of entrance while the toxic products creep centrip-
etally and produce centric irritation; and the occurrence of
iritis in gonorrhoeal rheumatism and in syphilis tend to throw
light on the etiology of sympathetic ophthalmitis, and to show
that the actual invasion of the second eye by organisms is not
necessary. Formerly it was held that suppuration could not
occur without the presence of microbes, but it is now known
that suppuration may result from mechanical irritation and the
action of various substances. In some instances may there not
be a morbid state of the ciliary nerves and the ganglia con-
ected with a diseased eye capable, apart from infection, of
exciting sympathetic inflammation? As regards operative inter-
ference, where sympathetic inflammation exists and the excitant
is plainly a source of toxines, enucleation is indicated, but when
the primarily diseased or injured eye is in such a condition that
it may prove to be the better eye of the two, and especially if
it seems free from infection, I should hesitate to operate.

Dr. J. F. Noves, Providence, R. I.—I wish to relate the
history of another case in which I was in doubt what to do. A
young man playing base-ball was hit by the ball on the cheek
bone and stunned, but I did not see the case until three weeks
afterwards. He then came on account of failure of vision in
the eye on the injured side. I also found symptoms of sympa-
thetic trouble in the other eye. I advised enucleation of the
first eye, but to this he did not consent. He became totally blind, but neither eye showed any great amount of inflammation. The question arises whether or not the second eye would have been saved if the first had been removed?

Dr. Herman Knapp, New York.—With regard to this case, there was an unbroken conjunctiva. There are in the whole realm of literature only a few of these cases where sympathetic trouble followed where there was an unbroken conjunctiva. The cases have been collected by Schirmer in a paper published in the latter part of last year in Graefe's Archives. He being an adherent to the bacterial origin of this affection sees no escape except by saying that there was microscopic rupture of the conjunctiva forming a door for the entrance of germs. In this case the iris was under the conjunctiva, but there was no reaction. Such an iris which is bruised will certainly act as a foreign body and will produce chemical products by what it is termed chemotactic action. The irritation caused by these products in the other eye is always local and will soon disappear. The difference between sympathetic irritation and inflammation is that irritation will disappear after removal of the cause; inflammation will not. With regard to the theory of suppuration referred to by Dr. Reeve, I know that puriform inflammation can be produced by agents not microbial, but while the secretion looks like pus, it is not pus. If you inoculate such puriform material no suppuration will follow. Sympathetic ophthalmia following a non-penetrating wound is so rare that Boé gives the rule that under no condition need an eye be removed where there is no external injury. That was the case here. I do not think that any one of you have seen sympathetic ophthalmia without an external lesion of the eyeball. It is a process of bacterial origin. Nevertheless there are six cases, and this is perhaps the seventh, where there was no external injury.

Now something about prolapse of the iris in eyes that have been injured. This is an exceedingly important matter, and I have made it a rule not to touch a prolapsed iris unless I could get it entirely fresh. I have never seen sympathetic ophthalmia where there was prolapsed iris which had not been wounded by the injury or by the surgeon’s knife. If you leave the iris in the wound and prevent it from being torn, I have never seen sympathetic ophthalmia. I only speak from my own personal experience during the past ten years. Cases that have come in the first four or five hours, where a clean iridectomy could be made and I am sure that the foreign body was not an infecting one, then I make an iridectomy. If they come sometime after-
ward, I leave the prolapse alone, for it is very difficult to get at the lateral portions which will be incarcerated in the corners of the wound, and if operated on they are more apt to be followed by sympathetic ophthalmia or purulent infiltration than if left alone. The report of one case may be of interest. A boy was brought to me with prolapsed iris. He had a corneal wound produced by a lead pencil. There was no cataract and no signs of inflammation. I told the grandmother that the eye could in all probability be saved, and that I advised against operation. I watched the boy and kept him in the dark. In two or three days the prolapse swelled a little, but there was no trace of irritation. The prolapse then began to shrink and finally left only a linear scar. Sight was 20/xxx. That is only one case, but I have had a number.

Dr. Charles S. Bull, New York.—I wish to endorse in an emphatic way what has been said in regard to excision of a prolapse of the iris. It is my rule never to excise a prolapsed iris unless it is very recent. I have never seen or heard of a case of prolapsed iris not excised, inducing sympathetic inflammation in the other eye.

Dr. Charles A. Oliver, Philadelphia.—I can confirm what Dr. Knapp has said about cases of fresh prolapse. As illustrative of the good effects of cleanly cut excisions of irritated, bruised, and even inflamed irides, the following brief notes of an instructive instance can be cited. Two months ago a young man was brought to the Will’s eye hospital who eight hours before had been struck by a small splinter of iron. There was a wound in the upper portion of the cornea and a piece of iron was sticking in the iris. Although the injury had occurred only eight hours previously, there was lymph around the foreign body and in the bottom of the anterior chamber. I made an incision with a von Graefe knife almost opposite to the position of the foreign body and seized the iris with the foreign body and removed it, making a clean cut coloboma. In other words, I removed not only the offending substance, but also the offending bed in which it was situated. Atropia, iced compresses, and boric acid were employed. In thirty-six hours the lymph had disappeared, the pupil was large, the coloboma was clean, and there was no reaction. The patient quickly recovered with a resultant vision of 5/v.

Dr. Samuel Theobald, Baltimore.—Dr. Knapp has stated that there are only six cases recorded of sympathetic ophthalmia following injury to the eye without external wound. This, perhaps, may be true, but I think that there have been many cases reported of sympathetic ophthalmia where there has been no
wound at all, where there has been inflammation of the ciliary
body or deeper structures of the exciting eye without trauma-
matism.

Dr. J. F. Noyes, Providence, R. I.—Will Dr. Knapp ex-
plain the case that I have just reported where the blow was
received on the cheek without injury to the eye, and there was
little or no appearance of inflammation in the eye, yet sympa-
thetic trouble followed?

Dr. H. Knapp, New York.—I am not wedded to the
microbes. I can not explain every case of sympathetic ophthal-
mia. In regard to not touching the iris. In cataract extractions
I have never seen sympathetic inflammation after prolapse of
the iris. I have lost two cases where I cut the iris.

Dr. R. A. Reeve, Toronto, Canada.—Chemotaxis, we know,
consists in the active migration of leucocytes to a spot where a
foreign body or other irritant may be, but sympathetic inflam-
mation occurs where there is no suppuration. Indeed, the latter
is regarded as one of the safeguards against sympathetic oph-
thalmitis. And, of course, the most intense inflammation may
be non-suppurative. I have more than once seen such follow a
simple Keratonyxis for secondary cataract without sepsis.

INDIRECT MASSAGE OF THE LENS FOR THE
ARTIFICIAL RIPENING OF CATARACT.

By Edward Jackson, M.D.,

At a meeting of the American Medical Association in 1892,
Dr. Joseph A. White of Richmond, Va., reported to the Sec-
tion on Ophthalmology a series of cases in which the ripening
of immature cataract had been hastened by the method sug-
gested by Dr. S. R. Pooley of New York (New York Medical
Journal, December 26, 1885), and in the Archives of Ophthal-
mology, Vol. XXI, No. 4, he publishes a paper upon the sub-
ject.

Since hearing Dr. White’s report upon it I have tested the
method in a series of cases, in which it seemed indicated by

Oph.—34
the presence of more or less clear, soft cortex; and, finding it in the main satisfactory, desire to call your further attention to it. The following are abstracts of my notes on the cases in which the method was employed:

Case I.—R. C., a draughtsman, aged 62, always near-sighted, applied August 13, 1891, on account of recent increase in difficulty in seeing. Each lens presented a moderate nuclear haze, with apparently normal vitreous and fundus. His correcting lenses and vision were:

\[
\begin{align*}
R. &\equiv 1.50 \text{ cyl.}, \text{ axis } 180^\circ = \frac{6}{10} \text{ ths.} \\
L. &\equiv 2.50 \text{ sph.} = \frac{6}{2} \text{ ths.}
\end{align*}
\]

He was fitted with these lenses, and kept under observation. The nuclear opacity continued to increase, until, before the operation for preliminary ripening, vision with glasses had fallen to

\[
\begin{align*}
R. &\equiv \frac{4}{6} \text{ ths.} \\
L. &\equiv \frac{8}{20} \text{ ths.}
\end{align*}
\]

On June 14, 1892, the anterior chamber was emptied with a paracentesis needle, and massage of the lens practiced through the cornea. No immediate effect on the lens was noticed. On the 15th there was considerable conjunctival hyperemia and pericorneal injection.

June 21st. There still remained some pericorneal injection, and the opacity of the lens had much increased. Four days later all hyperemia and irritability had subsided.

July 23d. No fundus reflex could be obtained in any part of the dilated pupil. The iris cast no shadow, but there still appeared to be fragments of clear cortex near the anterior pole of the lens. He was told to wait until cooler weather for extraction, but meeting with an accident which confined him to bed for some weeks, did not return until December.

Simple extraction was done December 8th, the lens proving to be entirely opaque, above the average size, and with a great deal of soft cortex, which, however, came cleanly away, without difficulty. Healing was normal, except for some adhesions of the iris to the upper lip of the corneal wound, and a high post-operative astigmatism, which diminished slowly.
March 13, 1893. With the right eye he could count fingers at six feet; left with + 8 sph. ⊕ + 4 cyl., axis 158°; vision ⅘ths, mostly.

Case II. — T. G., an iron-worker, aged 51, had noticed failing sight for eight years in the left eye, and in the right for two months prior to his appearance at the clinic.

September 27, 1892, his vision was:

R., ⅘ths.
L., ⅘th.

In the right lens there was opacity of the anterior and posterior cortex in the lower portions, with good view of the fundus above. In the left there was nuclear and extensive cortical opacity, most dense at the anterior and posterior poles, with good fundus reflex in the margin of the dilated pupil.

September 29, 1892. Paracentesis and indirect massage of the lens was done on the left eye. Immediately after the operation there was a faint gray reflex from the lens' surface, not previously present.

October 1st. The eye was free from hyperemia. There was slight increase in the lens' opacity, and the patient was permitted to leave the hospital and go home.

October 18th. The opacity of the visible cortex was complete; the anterior chamber distinctly more shallow than in the other eye.

October 20th. Lens extracted, proving to be large, with much soft cortex, which came away completely. There was more than the average reaction following extraction, and slight iritis. However, in two weeks the eye was almost free from hyperemia; pupil free and circular.

December 6th. Without needling capsule, correcting lens and vision were:

R. — 0.50 ⊕ + 1.75 cyl., axis 30° = ⅘ths.
L. + 8. ⊕ + 2.50 cyl., axis 170° = ⅘ths.

Case III. — W. S., aged 52; piano-maker. Finds all glasses that he can get unsatisfactory.

L., ⅘ths.
Right, high mixed astigmatism; cortical opacity of lens in lower temporal quadrant, which does not encroach on the undilated pupil. Left, high astigmatism, radiating and cloudy opacity in both the anterior and posterior cortex, with full fundus reflex through most parts of the lens.

R. + 2.75 sph., $\ominus - 5$ cyl., axis 180° — $= \frac{5}{10}$ths.
L. Not improved.

He was seen from time to time, vision continuing to grow worse until December 24th. In the left eye he was then only able to count fingers at 2 feet. Paracentesis, with indirect massage of the lens, was practised.


January 5, 1893. Vision reduced to perception of moving objects. Anterior portions of the lens opaque. Lens removed by simple extraction. Posterior cortex still fairly clear. The healing was normal.

March 18th. R. with + 12 sph., $\ominus + 0.75$ cyl., axis 145°; vision $= \frac{5}{10}$ths, without secondary operation.

CASE IV.—Mrs. J. G. B., aged 64, had noticed failure of vision in R. for one year, and in L. for three months, before applying, January 14, 1893. She has been wearing concave spherical lens, 4 D.

Vision = R., counts fingers at 12 inches.
L., $\frac{5}{10}$ths.

The right pupil was occupied by gray opacity, tinged with faint red reflex. The upper portion of the lens seemed slightly hazy throughout, with more dense opacity near the anterior and posterior poles. The left eye presented opacity mainly in the posterior cortex of the lower outer third of the lens, with one spicule in the anterior cortex.

January 28th. Condition unchanged. Paracentesis and indirect massage was done on the right eye. After the operation there was a faint gray film at surface of the lens, and a slight pink or faint claret color to the whole aqueous humor—prob-
ably from slight hemorrhage from the iris. Two days later the eye was quite free from hyperemia, and no trace of red reflex visible in the pupil. Simple extraction was done February 7th.

April 22d. Without needling the capsule, her correcting lenses and vision were:

R. + 8 $\ominus$ + 0.75 cyl., axis 180° = $\frac{2}{3}$ths.

CASE V. — Mrs. H., aged 33; housework. Several years ago first noticed failing vision in the right eye, and for the past three years there has been similar failure of the left. February 14, 1893. The right eye presents diffused opacities of the lens, hiding the condition of the vitreous and all details of the fundus. Good fundus reflex in all directions. Left: Nuclear opacity of lens; fundus dimly seen, apparently normal, and normal vitreous.

Vision. R., $\frac{1}{3}$th.
L., $\frac{6}{9}$ths, slightly improved by a — 0.50 D. sph.

April 6, 1893. No change in the condition of the eyes under treatment. No improvement by glasses. Vision the same. I did paracentesis and indirect massage on the right eye, taking special care to withdraw all aqueous, and making more vigorous and prolonged massage than in any of the previous cases. At the close of the operation a slight film was noticed at the anterior surface of the lens.

April 8th. Free from hyperemia. The film before noticed has disappeared.

April 20th. The lens remains precisely as before the operation. Vision unchanged. Made small incision in the anterior capsule with Bowman’s stop needle.

May 23d. There is still but a very small, strictly localized opacity at the seat of puncture of the anterior capsule. Vision $\frac{1}{3}$th. Extracted a comparatively clear lens, which came away completely through a rather small incision.

June 15th. The eye free from irritability. Some wrinkling and opacity of capsule, with diffused and localized opacities of the vitreous. The capsule was freely incised, and July 12th, with $+ 9. \ominus + 4$ cyl., axis 10°, vision = $\frac{6}{12}$, partly.

CASE VI. — Lewis C., aged 15, peddler. Two years ago
had pain and inflammation in the right eye, attended with failure of vision.

February 18, 1893. Drooping of the right upper lid, excluding that eye from vision. Chronic conjunctivitis, with thickening of the lids. Pupils equal, normal. Right eye slightly divergent. Diffused cloudy opacity, apparently near the anterior surface of the lens. Good fundus reflex in all directions. Vision equal to 1/60th. Left eye, hyperopia 1 D.; media clear; vision equal to 1/60ths.

March 18, 1893. No change in the right eye under treatment. Paracentesis and indirect massage of the lens, decidedly more vigorous than I commonly employed, produced no perceptible change in the opacity.

June 24th. Vision 1/60th. Appearance of lens as when first seen.

Case VII. —A. O. S., aged 60, compositor; had noticed failure of vision in the right eye for three years, progressive.

April 22, 1893. Vision — R., counts fingers at four inches. L., 1/60ths.

By dilation of the right pupil, vision was increased to counting fingers at four feet. The whole lens was found hazy, but with perceptible red reflex showing through it in all portions, there being no dense localized opacities. L., vision normal.

April 25th. Paracentesis and indirect massage were done on the right eye.


May 2d. With fully dilated pupil, counts fingers at 10 inches. There is still faint red reflex visible through certain part of the lens; marked increase of opacity in the anterior cortex.

May 9th. No red reflex. Vision reduced to light perception.

May 23d. Lens, mainly soft cortex, portions of the posterior layers of which were comparatively clear, was removed by simple extraction. Recovery normal.

July 7th. 11 D. ⊕ + 3 cyl. ax. 180° lens. Vision equal 1/60ths. As regards the efficiency of the operation, it will be noticed
that the cases here reported may be divided into two groups. Case V, aged 33, and Case VI, aged 15, showed no change whatever in the condition of the lens' opacity as a result of the operation. As regards these cases, it was quite ineffective.

The other five cases, ranging from 51 to 64 years of age, all show rapid and satisfactory increase in the lens' opacity as the result of operation.

The practical efficiency of the operation is seen by the fact that in all five cases the vision was speedily reduced to light perception, all red reflex abolished, the extraction was complete, and good vision was obtained without any secondary operation.

I believe that in nearly all cases after extraction there comes a time when the vision is markedly improved by division of the capsule, and that in the majority a secondary operation will give better vision from the start. The point of importance here is that in these cases the indications for division of the capsule were no greater than after the extraction of cataracts that have attained complete maturity without surgical interference.

In the matter of efficiency, my experience indicates that indirect massage is decidedly superior to Foerster's operation. It would appear, however, that it is efficient only in senile cataract—that is, only when the opaque lens contains a rather large, firm nucleus.

In support of this, my colleague, Dr. A. D. Hall, informs me that he has twice tried the operation for juvenile cataract, with precisely the same experience, not the slightest effect being produced on the lens' opacity.

As regards the safety of the operation, I can only say that the ocular and physical conditions in these cases were not more favorable than in the average of cataract cases; yet they exhibited little more reaction than would be expected from the puncture of the cornea and the withdrawal of the aqueous humor. There has not been any sign of iritis, or a single posterior synechia; and the eyes all did well at the time of extraction and subsequently.

There was nothing like dislocation of the lens produced in any case, nor do I think such an accident could ever result
from the manipulations necessary to effect the desired maturity of the cataract, except in eyes in which it is liable to occur spontaneously, or from some slight blow or jar to the head.

As to the need for such an operation: It seems to me very important, both for physical, mental, and economic reasons, that cataract should be removed so soon as it has reached visual maturity—that is, so soon as it greatly interferes with the independence and comfort of the patient—if its removal is at all likely to restore the patient to comfort and independence. If, then, it is best that a cataract should also be surgically mature, that the lens should be completely opaque before its removal is undertaken, the need for such an operation as this seems clear and imperative. But whether it is really best to always secure complete opacity of the lens before proceeding to extract it may still be questioned. My own experience in extracting immature cataract—that is, lenses which still have some soft cortex, without a previous ripening operation—has been less satisfactory than that detailed with reference to this operation. Yet, on the whole, it has been by no means unsatisfactory, and something might be said in favor of extracting immature cataracts, as against their previous maturation.

The Method of Operating. After the full dilatation of the pupil and the free instillation of cocaine, the anterior chamber is tapped with a paracentesis needle or broad needle, the incision being kept open by the point of the needle until the aqueous has been completely withdrawn, with some little pressure of the fingers through the lids upon the globe. I use the fingers for fixation, without a speculum. Then a tortoise shell spatula is pressed upon the cornea within the area of the pupil and rubbed around in a circle, and then in radiating lines, stroking from the center toward the periphery of the cornea. During this latter manipulation the margin of the pupil will be seen to retreat before the spatula, so that a large part of the anterior surface of the lens can be acted on without pressure upon the iris.

The manipulation continued one and a half to two and a half minutes. The after-treatment consists of closing the eye for a few hours, and the subsequent instillation of a mydriatic,
until the eye is free from hyperemia. The preliminary instillation of cocaine is repeated three or four times, using it more freely than I would for cataract extraction, with the idea of rendering the cornea more flexible.

To summarize my conclusions with reference to this method of ripening cataract:

It seems more certainly efficient than Foerster's.

It is almost entirely free from danger.

It is probably a better means of avoiding prolonged practical blindness than the extraction of the immature cataract.

DISCUSSION.

DR. R. A. REEVE, Toronto, Canada.—There is a small proportion of cases in which the lens does not become opaque after the usual manner, and where attempts at artificial maturation will likely fail; the lens is smoky, and there are no sector-like bands, and extraction need not be put off, though vision be fairly good. I had a marked case a few years ago in a patient over 80 years of age, who was lame and so deaf that he could only hear loud tones. I could see the fundus very well, but the lens was so smoky he could not read, and he was in a sad plight; V. 5/50. I extracted without difficulty, the lens coming away entire. At different times I have removed lenses of that sort, as have others, where there was fairly good sight, and with good results. In such cases artificial maturation seems contraindicated, and extraction need not be postponed.

DR. CHARLES A. OLIVER, Philadelphia.—I should like to know whether in the extraction of cataract where artificial ripening had been employed if the cortex does not break up more readily, and if more cortex matter is not left in the anterior chamber than where the preliminary operation has not been performed?

DR. EDWARD JACKSON, Philadelphia.—These cases all showed striae, and had lasted a long time without becoming opaque. There can be no question but that the operation did rapidly produce opacity of the lens. It was opacity, with some swelling, and often, when I did the extraction, the swelling appeared to be at its height; yet all the cases did well.

The cortex was more friable than we commonly find it, and, although the lens was large, it came through an incision of the same size, or smaller, because the cortex readily gave way. In all of these cases I washed out the anterior chamber, and in all the extraction was clean.
JACKSON: Artificial Ripening of Cataract.

DR. J. A. ANDREWS, New York.—Nothing has been said about the age of the patient. In patients of the age that Dr. Reeves has mentioned, we would all agree that the cataract comes out readily enough. I believe that between the years 60–65, senile cataract, even if considerable portions are still clear, may be safely extracted, without leaving large enough remnants behind to be dangerous. Under this age the clear part of the cortex forms a sticky substance, which is likely to remain behind, swell, and cause trouble. I should like to know what the gentlemen think of the operation for artificially ripening a cataract, and whether it is adapted to patients over 60 years of age?

DR. HENRY D. NOYES, New York.—I have been waiting to hear more distinct and sharply defined indications as to the occasion for dealing with the lens in this way. It depends upon whether or not the stage of sclerosis of the nucleus has arrived. The stage of sclerosis may arrive at the age of 50 years or under. When that has appeared and vision is so far impaired that comfort is interfered with, I have no hesitation in extracting without any preliminary proceeding, although the lens may be semi-transparent. Artificial ripening pertains to a period prior to that, where you have cortical opacity without hardening of the nucleus, and the lens is not hard enough to permit you to operate. To operate on a lens with immature and soft cortex is to incur the risk of leaving sufficient transparent lens matter to give rise to serious reaction. By this method the cortex matter is rendered opaque, and you know when the pupil is clean. It is to this class of cases, usually below 50 years of age, that the operation is applicable. These cases are comparatively few, and this operation is not likely to have so large a field as was at first supposed. We can say that it is badly adapted to sclerosed lenses, that it is badly adapted to posterior polar cataract; it is badly adapted to all cases where the lens for any reason, although transparent, is still hard. The lens must have a certain softness, and be disposed to yield to the trituration before you are safe in entering upon the procedure.

DR. H. KNAPP, New York.—I have tried the operation for ripening a few times. If there is sufficient time, I wait. At other times I operate. I prefer the risk of operating on an unripe cataract to the double risk of maturing and extracting afterwards. It may be that the manner in which I operate has something to do with it. I make the incision in the capsule high up under the iris, so that the remaining lens matter does not come in contact with the pupil. It is shut up in the sac of the lens, and later, if necessary, can be dealt with by division.
Dr. Emil Gruening, New York. — When the mode of ripening cataract was first published, I tried it on a few cases. I do not mature any cataracts now. I do not find any cases where the method is applicable. In cases over 50 or 60 years of age the cataracts are sufficiently hard. The cataract does not adhere to the capsule very intimately, and I extract without attempting to make it mature. In the other cases I wait until the cataract ripens naturally. There is one form in which in former years I was induced to do the operation especially—that is, in cases of myopia, where the nucleus becomes opaque and the patient has sufficient vision to be about, but still can no longer read; but in these cases also it is not necessary to resort to this method. I have recently removed such a lens without difficulty. The cortex was hard. If I had attempted to make it mature, I should have incurred a greater risk.

Dr. S. D. Risley, Philadelphia. — Notwithstanding the remarks made, I think that there is a limited group of cases in which this operation is desirable. Of late years I have operated on immature cataracts with more freedom than formerly, and have had no cause to regret it. I recall very distinctly the case of a woman 65 years of age, who was deaf, and had immature cataract. I attempted its extraction, and left a perfectly black pupil, so far as I could determine; and went away quite pleased with the result. The next day I found the pupil quite white, with a mass of cortical material, which had fortunately remained in the capsule, in which a T-shaped incision had been made. I subsequently did a secondary operation. Although the operation was done more than ten years ago, I recently saw the old lady sitting at the window reading. In that case the cortical material adhered strongly to the capsule. This case is one of quite a group where I have been disappointed in finding that not all the cortical material had left the capsule, but cannot but think that had massage been previously performed, it is probable that the cortical material would not only have been opaque, so that it would have been visible at the time of the extraction, but would not have adhered so closely to the capsule.

Dr. R. A. Reeve, Toronto, Canada. — The point referred to by Dr. Noyes is of practical importance. Dr. Andrews's experience led him to remark that after sixty years there was no difficulty in evacuating the cortex. That has not, however, been my experience.

Dr. Samuel Theobald, Baltimore. — One point has been overlooked. The degree of the cortical opacity is not a sure index of the maturity of a cataract. A German observer has called attention to the fact that in those cases where the cortex has a
glistening, mother-of-pearl appearance the lens is not ready for extraction, although it may be much more opaque than in other cases of advanced cataract where the maturity is complete. We are all familiar with the amber-colored cataracts where the patient can see to count fingers and the ophthalmoscope gives a red reflex; yet they are readily removed, and the maturity of the cataract is complete. On the other hand, in many of the cases where there is absolutely no red reflex and the lens is quite opaque we have a condition which we do not like to find: we have cortical matter which does not readily leave the capsule, and which, if left behind, swells up and undergoes a slow process of ripening before it can be absorbed by the aqueous humor, increasing the liability to secondary cataract and iritis. I am rather inclined to agree with the last speaker as to the extraction of cortical matter not being such an easy matter. I wish that those who have found it so easy would tell me how to do it. I try to bring out as much cortex as possible with the nucleus. I have tried the douche. This answers well in some cases, and in others it fails.

DR. J. A. ANDREWS, New York.—I think that one of the most important things to assist us in removing cortical matter after cataract extraction is proper illumination. I have frequently been surprised to see distinguished surgeons extract cataract under very inadequate illumination. Pieces of cortical matter may remain behind, which you cannot see without proper illumination, especially in the operation of extraction without iridectomy.

RETINITIS PUNCTATA ALBESCENS.

BY MYLES STANDISH, M.D.,

BOSTON, MASS.

Cases of retinitis punctata albescens are not uncommon, and yet what we really know about the condition seems to be very little. In no text-book to which I have been able to get access is there a clinical history of the disease, or much of anything in regard to the etiology or prognosis. In fact, the literature of the subject is surprisingly small for a condition which presents such a striking physical picture to the ophthalmoscope. In practice the majority of such cases come complaining of some discomfort in the use of the eyes, and the white, rounded,
glistening spots are discovered in the retina in the course of the examination, the patient is kept under observation some weeks or months, the comfort in the use of the eyes gradually returns, and the patient finally drifts off and is seen no more, but without the white, rounded spots disappearing from the retina. Even what the substance is that produces the appearance is still undetermined.

With this condition of our knowledge, any case which will help to build up the clinical history should be put upon record. The case that I am about to report, very briefly, apparently fills out the clinical history of these cases as far as the prodromic and acute stages are concerned, and is, I am sure, unusual in that particular.

A. B. C., a strong athletic appearing man of 31 years, was first seen by me on the 22d of April, 1892. He said his eyes did not give him much trouble, that he had no pain or headache, but that he had noticed for several weeks that he did not see as well with the right eye. **VOD = 20/xx.** The vision in the left eye was very little if any better, and as no change was made out in the fundus with the ophthalmoscope, he was told that there was nothing to be seen, and that it was probably of no importance, but to return if it became worse.

I did not see him again until early in October, '92, when he returned and reported that he had been away upon business for some months, but that his eye had grown steadily worse, especially in the last preceding month. Upon examination I found **VOD = 20/c,** and upon examination with the ophthalmoscope found the region about the macula hazy and lighter in color than the rest of the fundus. About the outer edge of light area the vessels had one or two rather gradual wave-like bends, and there was absolutely nothing else to be seen to account for his great loss of vision. I ordered him 1/2 of a grain of pilocarpine at night, but as he almost immediately went away upon another business trip, he only took the medicine a few times. The next time he came under observation was on the 28th of October, when he was seen by Dr. W. D. Hall, from whose notes I am kindly permitted to extract the following account of the ophthalmoscopic appearances at that time. "There is exudation and
infiltration about the nerve, and some of the vessels are obscured; at the macula there is turbidity and a few shining white opaque spots." The vision was about the same as when seen by me about three weeks earlier, \( i.e. \), \( VOD = .2 \). He was next seen by me a week later, when the exudation and infiltration had quite disappeared. No vessels were covered, but the rounded white spots of retinitis punctata albescens were numerous and very characteristic. They were placed as usual all about the macula region, and more numerous in the area between the macula and the nerve, as is also usual.—\( VOD = 20/xxx+4 \).—Since which time there has been very little change and no further improvement in vision. From which case it would seem that the white spots are in all probability the result of a preceding retinitis, and are some form of degenerative change.

The etiology of the case was inquired into with no definite result. The gentleman had never had syphilis, rheumatism, or any acute fever, there was no nephritic disease, and so far as he knew, was perfectly well otherwise. The only ocular history was that a year before he was first seen by me he had been in an electric power station when some accident happened, and had seen a very powerful electric arc caused by the break in the machinery. The result had been that for a moment he had been blinded, and saw yellow spots for the next twenty-four hours, after which he had noticed nothing unusual. It seems hardly probable, however, that a retinitis should supervene a year afterwards from any such cause; moreover, both eyes were exposed to this light, and only the right has had the retinitis.

I will not attempt to draw any conclusions from one case, but offer it as a study that may be helpful some day when the complete clinical picture of this disease is drawn.

DISCUSSION.

DR. HENRY D. NOYES, NEW YORK.—I hesitate a little to say anything about this case for the reason that it is so difficult to form a judgment about a picture described only in words, but the title of the paper signifies a disease which in my experience does not agree with the statement that it is of frequent occur-
ience. That title, so far as I am informed, was first employed by Moore some ten or more years ago, and within that period I have seen a very few cases that appeared to correspond with the description that Moore gave. It is my recollection that there was not any important degeneration of sight and that many of the characteristic features of the case reported to-day were wanting. I do see a good deal of colloid disease of the fundus and that is sometimes sufficiently marked to give rise to doubt whether there is not some progressive malady; but colloid disease is rather an accidental discovery than a condition brought to our notice by impairment of sight. I am confident that many cases which are really colloid degeneration of the choroid are labeled as more serious maladies. It looks to me as though this case was of the more ordinary and diffuse kind of retinitis to which the title given is hardly to be applied. I should be glad to be corrected if in error, but in the interests of nosology it is important to be accurate in our mode of describing disease.

DR. MYLES STANDISH, Boston.—I think that there is no doubt as to what the trouble was but perhaps it was unwise to say that the disease is “not uncommon.” I have seen six or seven cases in ten years. The appearance is quite characteristic, the rounded, glistening white bead-like spots. They are not the spots which I have considered due to colloid degeneration, which are not so white and glistening or so rounded. It seems to me that so far as any one can tell from the published descriptions, this case would be classified as a case of retinitis punctata albescens. I have brought it forward to demonstrate that this appearance is probably simply a product of something that has gone before. I do not say that it is a distinct disease. Heretofore we have simply had a picture to which we have affixed a name, and that is apparently all we knew about it. If there is anything that will help to clear up the clinical history it should be offered. It is with that object that I have presented the paper.
A SERIES OF WOOLS FOR THE READY DETECTION OF "COLOR BLINDNESS."

BY CHARLES A. OLIVER, M.D.,

PHILADELPHIA, PA.

It has long been known, even since the time of Wilson, that of the three methods for the quick and ready determination of subnormal color-perception (direct comparison of pigment colors, direct comparison of spectral colors, and the study of subjective after-color — complementary color), the first is the best, the most convenient, and the most accurate. The cheapest plan, and the one that is the freest from error, is that of Holmgren (really Wilson), where the candidate is made to individually express his color defect by the handling of a series of inexpensive wools. It is thus free from the objections of fixed tests, such as the color tables of Daae, the yarn-covered spools of Schenkl, the pseudo-isochromatic wools of Donders, the embroidery patterns of Cohn, and the stick of Thomson. It avoids the errors of these plans where the colors, which are mere arbitrary choices of the devisor, not only fail to express any definite percentages of lowered color-vision, thus permitting many candidates to escape by reason of the confusion-wool not being equal to the exact amount of the color-error, but greatly curtail any choice to be taken by the candidate, by reason of the process of fixation upon tables, spools, sticks, etc. Further, it escapes the faults of a fixed method of nomenclature, as, for instance, the odd and even numbering in Thomson's stick, where the one salient point of the test is liable to become known and the test thus rendered practically worthless.

To remedy these defects amongst the only proper and legitimate class of color-tests, the writer, in 1887, brought before this Society a series of loose wools, which were intended not only to avoid any mistakes which might arise from imperfect material as to color, dye, its character, and the choice of instrumentation, but to give to any instructed (even though lay) examiner a definite and intelligible grading of the exact amount and character of any lowering of the color-sense—a grading that can
be compared and contrasted with any past or future examinations, and can be understood throughout the ophthalmic world.

To accomplish this purpose, he made the following modifications to the Holmgren series:

I. Five principal tests were used — pure green, pure red, rose, pure blue, and pure yellow. In spite of any theoretical prejudices, the last two colors were added upon account of their having served through a long individual experience as most useful tests in the detection of extremely slight and almost imperceptible color changes.

II. Loose and separate skeins of wools were employed. This, the fundamental principle of the value of the Wilson and Holmgren method, can be well understood when it is considered that here no discoverable plan is given to the candidate, — he merely having a mass of color matches from which to take his own choice.

III. The colors were made of equal relative intensity. Here rests one of the greatest claims for the employment of this individual test. Nothing that is arbitrary was placed in the color-series. Each skein had a definitely related percentage of one or two of the principal test-colors, thus allowing the plan to resolve itself into the question of color-matching alone.

IV. The value of the color used in each test-skein was expressed. The unit of color, or equivalent, and its relation with every other skein in the test, was given by a system of metallic bangles which were made incomprehensible to all but the scientifically initiated.

V. The set was so constructed that it could be employed by any educated layman. This was accomplished by the system of nomenclature on the bangles, which, although unknown in their scientific value and signification by the lay-examiner in any case requiring such service, could be fully understood by any expert to whom the case was given for after-decision. This was done by reference to the key to the test, accompanying each set. This method embraces the ingenious plan of Thomson. Should the case not necessitate such intermediacy, the expert examiner would know in a moment, by reference to his registry blank, the true value of the color-sense laid before him for examination.

Oph.—35
OLIVER: Detection of "Color Blindness."

VI. The test was so constructed that passing color-changes could be preserved and permanently kept for future comparison. This was done by the wool-naming, and was of value in furnishing means by which more accurate study of disease could be made, better notions of prognosis given, and more useful plans of therapy applied.

VII. The test was so constructed that written and verbal expressions of the character and amount of subnormal color perception could be given. This avoided the use of the vague terms designative of lowered color-perception, and placed the system of naming upon a sound and scientific basis, as in acuity of vision, range of accommodation, etc.

VIII. The wools were made of one grade of manufacture and were dyed with vegetable material. This avoided any errors that might arise from supplemental use of touch, rendered the tints more lasting to light exposure, and avoided any danger from detection of tint by odor of the employed dye.

IX. A black surface was used in testing. This was done so as to avoid as much as possible the simultaneous and successive contrasts which are so apt to form in irritated and degenerating visual organs.

After several years' trial, the writer found that he could dispense with all but the five principal test-skeins, five pure match-skeins, and eighteen confusion-skeins of relative equal value to
THEOBALD: *Vision Maintained by a Dislocated Lens.* 541

the pure match-skeins, thus reducing the test to an extremely simplified, though scientifically correct, process; which could be used at will in a few seconds' time each by any educated layman or by the expert himself; a plan that was as sure to be understood in ophthalmic writings, and as certain in its answers of the ever-varying conditions of individual cases, as any other methods of precision given to the scientific and busy physician.

For these reasons, the writer has thought it well to introduce the new and simplified series, believing that it is of practical advantage to every working ophthalmologist, ophthalmic expert in railway and marine service, and every neurologist who finds it necessary to obtain a most delicate answer to the amount and degree of disturbance of sensory action in the visual apparatus.

E. B. Meyrowitz of 104 E. Twenty-third Street, New York City, has kindly undertaken the manufacture of these tests, and has a most admirable, convenient, and cheap series ready for distribution.

AN ADDITIONAL NOTE IN REFERENCE TO THE CASE OF USEFUL VISION MAINTAINED BY MEANS OF A TOTALLY DISLOCATED LENS, HERETOFORE REPORTED TO THE SOCIETY.

BY SAMUEL THEOBALD, M.D.,
Baltimore, MD.

I have already upon two occasions brought this rather remarkable case to the notice of the Ophthalmological Society—first, in 1881, when I described the singular way in which, by means of a totally dislocated lens, J. B. K., then a lad of twelve years, had been enabled to read and write, the lens, for this purpose, being thrown into position behind the pupil by a forward inclination of the head; and how much more satisfactory vision was afforded him by the adjustment of cataract glasses, which made him, thereafter, independent of the floating lens; and again, in 1891, when I spoke of the capsule of the lens having ruptured some months previously; of the marked inflammatory reaction which occurred in consequence of the
extrusion of the lens substance into the vitreous humor, and which was accompanied by glaucomatous tension, clouding of the cornea and vitreous and marked decline of vision, and of the gradual disappearance of these symptoms and the restoration of the sight to its previous satisfactory condition. I also described at this time how the bits of lens substance, which could be seen floating in the vitreous humor as the media became clearer, gradually underwent absorption, until finally it seemed they had all disappeared, and only the ragged capsule could be detected, moving with the movements of the eye, in the lower part of the vitreous chamber.

The sequel, however, shows that, as to this point,—the absorption of all the fragments of the lens substance—I was in error, for, in October, 1892, this patient again called to seek my advice. His eye, he said, was giving him some annoyance, feeling irritable and incapable of doing its usual amount of work. It should be stated that he has always depended for useful vision entirely upon the eye of which I am speaking, the left, as the other eye, owing not only to a dislocation of the lens, but to the pupil being in a very eccentric position, has never been of much value to him.

A glance at the eye showed that a fragment of the lens had found its way into the anterior chamber, and the patient, an intelligent observer, assured me that he had noticed it in this position for six months.

The peculiar appearance and behavior of this fragment is my excuse for once more bringing the case to the notice of the Society. It was triangular in shape, with sharply cut angles and edges, slightly yellowish in tint and quite transparent. As it lay in the lower angle of the anterior chamber, moving with the inclination of the head, it had every appearance of being a foreign body—a fragment of glass of about the color of topaz.

If the patient's impressions can be relied upon, it had been in the anterior chamber, exposed to the action of the aqueous humor for six months, and, as the rupture of the capsule occurred in August, 1890, it had, in all probability, had an extra-capsular existence of more than two years. That it should have resisted the opacifying and solvent powers of the fluids of the eye during all this period was, it seems to me,
very singular. It was doubtless a part of the nucleus of the lens, but it must be remembered that the patient was only twenty-two years of age at the time the capsule ruptured.

Hoping that it might have some solvent effect upon the fragment, I prescribed small doses of biniodide of mercury and iodide of potassium; but, after watching it for two months, I could not discover that it had undergone an appreciable change, either as to its size or transparency. In the meantime, however, the eye had grown less tolerant of its presence in the anterior chamber, and it became necessary to decide upon some more energetic course of action. Two procedures suggested themselves—to remove it through a corneal section, which would not be without risk and might result in the formation of an anterior synechia, or to induce it to return to the vitreous chamber, where it had lain so long without giving rise to any trouble, and where its presence again might be expected to be as harmless as before. The latter procedure seemed to me the safer one to adopt, especially in view of the fact that the fragment could doubtless be brought back into the anterior chamber again, and subsequently removed, if its return to the vitreous chamber proved to be a mistake.

Having decided upon this course, I dilated the pupil with cocaine and homatropia, and, directing the patient to keep his face turned upward, succeeded without much difficulty, by manipulating the lids and causing him to make rapid movements of the eye, in inducing the fragment to pass through the pupil and fall into the vitreous chamber. Eserine was then instilled, to contract the pupil, and a weak solution of eserine prescribed to keep the pupil in this state for several days, so as to lessen the likelihood of the fragment again finding its way into the anterior chamber.

No irritation followed this procedure, but, on the contrary, the sub-conjunctival injection below the cornea, which had been present while the bit of lens was lying in the lower angle of the anterior chamber, soon disappeared, and the eye regained its former quiescent condition. The patient is away from Baltimore at present, and I have not been able to see him, but I learn from his family that he has had no further trouble with the eye.
THE RELATION OF THE PATELLAR-TENDON REFLEX TO SOME OF THE OCULAR REFLEXES FOUND IN GENERAL PARALYSIS OF THE INSANE.

BY CHARLES A. OLIVER, M.D.,

PHILADELPHIA, PA.

The following observations are given as expressive of some of the most important and most certain of the findings that have been obtained in a clinical study of the ocular symptoms of general paralysis of the insane as found in a large proportion of the male inmates of the State Hospital for the Insane at Norristown, Penn. Although tentative in measure, and not to be found to equal degrees in each individual case, yet, by reason of a combination of a large series of similarly related groupings, these observations may be justly offered as showing the relationship existing between the patellar-tendon reflexes and the ocular reflexes in this disease.

With such provisions, and with the hope that these studies may serve as inducements to others for similar research, the following formulations are herewith offered:

1. In some of the cases in the second stage of the disease, especially when the patellar-tendon reflexes were unequally exaggerated, there appeared to be an irregular and unequal spastic innervation of the two irides, causing irregularities in pin-point pupil-forms.

2. In a few cases, especially in the third stage of the disorder, when the patellar-tendon reflexes were unequally diminished, and the pupil size, though small and its shape somewhat irregular, the iris seemed to be acted upon but little by any powerful mydriatic.*

3. In many cases, especially in comparatively young subjects in the third stage of the disease, when the patellar-tendon re-

*In several such cases there were marked depressive effects with grave constitutional symptoms produced by single instillations of the one-fourtieth and the one-twentieth of a grain of neutral sulphate of atropia in the conjunctival cul-de-sacs.
Oliver: Ocular Reflexes in Paralysis of the Insane. 545

Reflexes were unequally diminished, there appeared to be an unequal paralytic innervation of the two irides; the pupillary dilatation manifesting itself at times, though not as a rule, in the eye with the greater amount of objective optic nerve-head degeneration and retinal change.

4. In a few cases, especially in men beyond middle life, in the third stage of the disorder, when the patellar-tendon reflexes were markedly diminished and when the ataxies were quite pronounced, there were marked temporary asymmetries of pupillary form, one often being quite small and irregular for several examinations, while its fellow was large and ovoid or oval.

5. In quite a number of cases, especially in the advanced stages of the disease, when the patellar-tendon reflexes were either unequally exaggerated or diminished, there was a failure of the irides to respond to even major degrees of light stimulus; this being true not only for those subjects exhibiting a true spastic myosis, but more especially shown in those instances in which, with partial dilatation of the pupil, mydriatics failed to act.

6. In many instances, especially in the older cases, when the patellar-tendon reflexes were, as a rule, unequally diminished or even lost, there was not only failure of iris-response to the strongest light-stimulus carefully thrown upon the retina, but, when obtainable, the irides seemed to fail to react to the various coarse and rough subjective and objective procedures necessary to be used in order to evolve both separated and associated efforts for accommodation, and associated efforts for convergence.

7. In some instances where ciliary muscle innervation could be satisfactorily obtained, both the spastic excitation and the paralytic enervation at times found by subjective reading-tests and objective study with the retinoscope, seemed to be in direct ratio with the patellar-tendon reflexes as the iridic changes.

8. In quite a number of cases where there was marked inequality of the pupils, with more or less want of reaction of the irides to light stimulus, the patellar tendon-reflex on the side of the larger pupil seemed to be the more greatly diminished.
9. In a number of instances, especially during the very earliest stages of the disease, when the patellar-tendon reflexes were beginning to lessen to unequal degrees, there often appeared momentary secondary ataxic dilatation of the pupil during exposure to strong light-stimulation.

10. In many cases, especially during the second stage of the disorder, when the patellar-tendon reflexes began to become irregular and inconstant, pupillary inequalities as expressive of unequal iris innervation and action, became more and more constant.

REMOVAL OF STEEL FROM THE VITREOUS BY THE ELECTRO-MAGNET.

By E. E. HOLT, M.D.,

PORTLAND, ME.

An eye that has sustained an injury by the penetration of a foreign body into its interior presents an interesting problem for the surgeon who is consulted to consider. The surgeon's responsibility is the same whether sight is immediately affected or a wound has been produced that tends to that end and sympathetic inflammation. He must decide from his own experience, or that of others, what shall be his treatment of each individual case, and, as there seems to be a difference of opinion as to the best method to pursue in such cases, it is certainly our duty as members of this Society to report our experience. With this end in view, the three following cases, which have occurred in my private practice during the past year, are added to the six reported by me to this Society in 1891:

Case 1. O. A. W. (8689), aged 34, while chiseling out a set-screw, a piece of steel struck his right eye about ten hours before he presented himself at my office. Examination showed a wound in the cornea, near the junction of the middle and lower third of its vertical diameter, of about two millimeters in diameter. There was a notch in the iris of about the size of
the wound in the cornea, and the missile had passed obliquely through the lens, fracturing it in such a manner that no view of the interior of the eye could be obtained. The seriousness of the wound to the eye was stated to the patient. The possibility of the steel becoming encapsulated or setting up sympathetic inflammation, and finally, the chance of removing it by the electro-magnet, was made as clear as possible to him. He decided to have it removed by the electro-magnet, with the understanding that if the attempt was not successful the eye would be removed before he recovered from the influence of the ether. With the assistance of Dr. Bowers and Mr. Clough he was placed under the influence of ether. The conjunctiva was dissected off between the external and inferior recti muscles back to the equator of the eyeball, and an incision eight or ten millimeters long was made near the equator of the eyeball horizontal to its antero-posterior diameter. As the knife passed into the vitreous it came in contact with the steel, and its easy removal was anticipated. There was not much hemorrhage and no escape of vitreous. The long straight point of Bradford's magnet was introduced, but no steel was touched or came out on its point. This was repeated for the fifth time before the steel was secured. It was one and a half millimeters long, and its width and thickness were less than a millimeter. The sclerotic wound was cleaned and approximated and the external conjunctival wound was united by one suture. Both eyes were covered with cotton, which was held in place with silk isinglass plaster. The patient was advised to rest in the recumbent position as enjoined upon persons after cataract operations. There was no pain, and the patient made an uninterrupted recovery. The lens became absorbed, and with a cataract glass he had good vision. The field of vision was good and he was enabled to estimate distances correctly with the other eye. This enabled him to resume his occupation, which was that of machinist. This accident occurred the first part of last August, nearly a year ago, and he has had no trouble since he began work.

Case 2. W. K., aged 23 (9571). While placing a block upon the platform around a circular saw revolving twelve hundred revolutions a minute, the hook by which he held the block
struck the saw and a piece of the steel flew and struck his left eye. There was a wound in the upper nasal quadrant of the cornea midway between its vertical and horizontal diameters, its upper end just crossing the sclero-corneal margin. A corresponding opening existed in the iris, and the missile had passed obliquely through the lens, fracturing it so that no view of the fundus could be obtained. The case was stated to him and his friends as in case No. 1. They elected to have the steel removed by the electro-magnet if possible. Failing in that, it was understood that the eye should be removed. He was placed under the influence of ether with the assistance of Mr. Clough. The conjunctiva was dissected off between the external and inferior recti back to the equator of the eyeball. An incision was made in the sclerotic near the equator, below its horizontal diameter and obliquely to it. As the Graefe knife passed into the vitreous it came into contact with the steel. Upon withdrawing it and inserting the long straight point of Bradford's magnet the steel was found on its end when it was withdrawn. The sclerotic wound was cleaned and the external wound was united with one suture. The eyes were dressed and the patient put to bed, as described in the previous case. There was no interruption in the recovery of the case until the seventh day, when he began to have severe pain in the eye, which was no doubt due to swelling of the lens. This pain continued, more or less severe, for about a week, in spite of active treatment for its relief. The lens became more or less absorbed, and the field of vision thus obtained was useful in his ability to estimate distances, and enabled him to return to his work.

**Case 3.** H. W., aged 16 (9806). Two days since, while driving down an iron hoop on a pork barrel with a cold-chisel, he felt something strike his right eye. On examination of the eye there was a wound in the cornea about three millimeters long, crossing its horizontal diameter on the nasal side near the scleral-corneal margin. There was a horizontal quadrangular opening in the iris opposite the wound in the cornea, which at first glance looked like a foreign body on the iris. The steel passed through the edge of the lens, but its center remained
clear so that the optic disc could be seen. Search was made with the ophthalmoscope for the foreign body, but it could not be located on account of the opacities of the media due to the injury. There was a small amount of pus in the anterior chamber, and after stating the case to him as clearly as possible and advising him that the easiest way out of the accident was to have the eye removed, he still insisted upon having the steel removed by the electro-magnet, but consented to have the eye removed after it should be found that the steel could not be removed by the electro-magnet. He was placed under the influence of ether by the assistance of Mr. Clough. After dissecting down between the external and inferior recti muscles a small incision was made near the equator of the eye. As the Graefe knife passed into the vitreous it came in contact with the steel. Passing in the long straight point of Bradford's magnet I was gratified to find the steel upon its point upon withdrawing it the first time. The sclerotic wound was cleaned and the conjunctival wound united with one catgut suture. The next morning the hypopyon had disappeared, and at the end of a week the eye was clear. This was, on account of the suppurative inflammation present, the most unpromising one of this series, but it made the most rapid recovery, without pain and with good vision, equal to two-tenths.

DISCUSSION.

DR. EDWARD JACKSON, Philadelphia.—I think that Dr. Holt was extremely fortunate in two points. In all the cases the steel entered through the anterior chamber and passed through the lens. I cannot help thinking that has an important influence on the subsequent history, and lessens the liability to infection and serious disease remaining after the extraction. The second point is, that in each case the knife struck the steel when he made the incision. I have seen, with a colleague, a case where a piece of steel was suspended close behind the lens where it could be watched. The incision was made without attempting to carry the knife to the particle of steel, hoping that the magnet would draw the body through the vitreous. We made many trials but failed to get out the steel. At the recent meeting of the American Medical Association, Dr. Baker told of a case where he had failed to remove the steel, and enucleated
the eye. Afterwards he could bring the magnet in contact with the steel, and thus raise the eye without dislodging the steel. The case impresses the difficulty of removing particles of steel from the vitreous unless there is an open wound down to the foreign body.

DR. HENRY D. NOYES, New York.—That is pointed out by Hirschberg; you must carry the knife through the vitreous close to where you assume the foreign body to be. Unless you do that you meet insurmountable difficulty in removing it. We should insist upon having a considerable amount of tractile power in the magnet, and it is for that reason that I employ the Hirschberg electro-magnet instead of the weaker form. Inasmuch as it is not certain that the magnet will come in contact with the foreign body, you must supplement your resources by employing as much power as possible. You must have not only a sufficient number of elements, but the point must be large and not too long. The greater the length the less the capacity.

In one of Dr. Holt's cases he introduced the magnet five times. I have repeated the introduction of the magnet many times, and should be willing to churn up the vitreous with the magnet, hoping to save the globe, even if there were no vision. Recent statistics go to show that in about twenty-five per cent. vision is saved, and that in about forty per cent. the eyeball is saved. The remainder have to submit to enucleation.

DR. LUCIEN HOWE, Buffalo.—This is a matter of interest to us all. I have been struck with the great difficulty of drawing the piece of iron through the wound, even after we know that it is attached to the magnet. It is scraped off as the magnet is drawn out.

A case seen some time ago showed me the great tenacity with which the pieces sometime hold. I used the magnet, but had to enucleate. After enucleation I tried to move the body, which looked free enough although lying out the retina, but no magnet with which I have any acquaintance would have moved it in the least.
SUPPRESSION OF THE VISUAL IMAGE.

BY WALTER B. JOHNSON, M.D.,
PATERSON, N. J.

In convergent strabismus, except the squint be of the alternating variety, there is present an amblyopic condition affecting the squinting eye, in which there is more or less marked diminution of the vision.

Hypermetropia was thought by Donders and many other writers to be the most frequent cause of convergent squint, constantly exciting excessive efforts at accommodation, resulting in convergence, confusion of images, and subsequent mental suppression of the visual image of one eye, finally terminating in an amblyopic condition, in which the ability to see varied, vision being more acute in some cases than in others.

It has also been claimed by Schweigger, Alfred Græfe, and others that amblyopia is not caused by squint, but exists as a primary or congenital condition, probably caused by some change, structural or otherwise, in the eye itself or in the nerve centers. This produces convergence in consequence of confusion of images caused by deficient sight.

The variety of amblyopia or suppression of the visual image in question is apparently a purely physiological condition; ophthalmoscopic examination indicates a perfectly normal fundus, although the eye is generally hypermetropic. The nerve centers must certainly be affected by the continued mental suppression of the visual image and their functions finally practically destroyed. Unless an operation be performed, which results in re-establishing binocular fixation and fusion of the retinal images, the amblyopia persists, being a progressive mental condition made permanent in the nerve centers by their loss of use and exercise of the power of vision. Amblyopia may be and sometimes is overcome, when it is first established, by a proper correction of visual defects; the commencing squint and the increasing loss of sight may thus be entirely prevented without resort to operative interference. Squint generally
appears at an early age, when satisfactory examination is not practical; the amblyopic condition may be present, but not demonstrable; for that reason the time of loss of vision cannot be definitely ascertained and the question of the probable presence of amblyopia before the onset of the squint, or of its onset as a result of the squint, is very difficult of solution and proof. It is presumed that an amblyopia may come on as a result of squint and persist forever after, even though the eyes are brought to a state of apparently perfect parallelism by operation; the vision in the amblyopic eye rarely, if ever, becomes equal to the vision of the fellow eye. The squinting eye cannot, does not, and will not enter into the visual act, and has no ability to, and can take no cognizance of any object which appears on its visual axis; the power of suppressing images having become a condition, and the vision decreased to such an extent that the eye is practically sightless.

The case here reported, which presents the character and history of many other cases of concomitant convergent strabismus, shows conclusively that whatever the change which led to the loss of vision, it was not structural either in the eyeball or the nerve centers, but was in all probability a pure case of amblyopia which resulted from the long-continued mental visual suppression induced by the confusion of images caused by the loss of parallelism of the eyes, and that the amblyopia was in all probability the result of the squint.

The amblyopia having entirely disappeared after the loss of the fixing eye, when all the existing conditions were changed, indicates the certainty that in this case amblyopia was a condition and not a disease. The remaining eye, which had been apparently almost sightless, having become excessively amblyopic, after instruction and exercise designed to assist the visual effort, gradually increased its power of vision until perfect sight resulted and the sensitive point returned to the region of the macula lutea. The results of any past amblyopic condition entirely disappeared, the eyeball itself and the nerve centers returning to a perfect state of health and visual acuity.

T. McK. Age 19, June, 1887. File forger. Has been cross-eyed since he was three years of age, and states that dur-
ing his recollection he had been unable with the left eye to discern any object and define its character.

He has a manifest hypermetropia and constantly fixes with the right eye.

R. V. = 20/15 20/15 w. +1.25 D.
L. V. = fingers at 6", no improvement with glasses.
The fundus was apparently normal.

He applied for treatment, intending to have his squint corrected by tenotomy.

June 13th, while working at forging, a hot file flew from his tongs and struck him in the right eye.

Two hours after the injury the eyeball was examined, a large wound of the globe was discovered, having extremely ragged edges and involving almost the entire globe, cutting through the cornea, iris, lens, and sclerotic in the ciliary region. Enucleation was advised and performed in the usual manner in the afternoon of the same day.

June 18th. The patient was doing nicely and stated that he believed he could see better.

L. V. = fingers at 3'.

Ophthalmoscopic examination discloses a perfectly normal fundus and a hypermetropia of +1.50 D.

June 19th, was first instructed in locating letters in the test card. His field of vision was limited to any single object upon which his attention was fixed; if placed directly in front of a test card with the region of the macula in the axis of vision he could see L. V. = 3/200. If allowed to read the letters on a plane of his own choosing, bringing the hypersensitive retinal spot into use and wearing +2 D., the test card would appear to be 13 inches to the left of its actual place of hanging; but he was able to read 2/70, and as his instruction was continued he read 2/15, and at times 2/12 and 2/8, the letters being apparently moved 10 inches to the left of their actual position. He finally read 4/15.

June 20th, after 15 minutes instruction, he was able to read L. V. = 20/30 w. +1.25 D. on a new test card, never seen before, stating that in order to see the card he was obliged to look to the left of it, although he apparently saw it directly in front of him; he could read 20/200 without a correcting glass;
although there are six cards on the test frame, he insisted that he could only see one of them at a time, and that in its false position.

June 21st to 25th. He has been instructed daily, with constant improvement in the field of vision and in the rapidity with which he could locate the letters and cards, +1.75 D. having been ordered and worn constantly.

June 26th. He is able to select letters on any of the test cards and now locates the card in its exact position and can see all six cards at once without special effort. His vision for near was tested for the first time since the loss of his eye with +1.75 D. He was able to read Jaeger No. 9, but in locating a word on the test paper with a pointer he would point considerably to the left of its actual position.

July 1st. The improvement has continued daily since last date. He can read 20/15 with his correcting glass and Jaeger No. 1 at 12 inches, locating the words with a pointer in their correct place. He declines to accept the +1.75 D. He had been wearing and was ordered +1.25 D. His visual field is normal.

January 23d, 1890, nearly three years after the loss of his eye. His vision = 20/15 with or without +1.25 D. He reads Jaeger No. 1 with or without any correcting glass, although he prefers his +1.25 D. for reading.

He never has had any pain or discomfort or any blurring of his sight since last examined, and has worked at his trade constantly since that time.

DISCUSSION.

DR. SAMUEL THEOBALD, Baltimore.—The case is an exceedingly interesting one, and I am not aware of a similar one having been reported, where through the loss of the good eye, the amblyopic squinting eye being forced to take part in vision, has so rapidly and completely recovered visual power. I think that the doctor is justified in the view that he has taken of the significance of the case. It is extremely improbable that a congenital amblyopia would entirely disappear as happened in this instance. The case offers strong testimony, I think, in favor of the view combatted of late years by Schweigger and Alfred Graefe, but which I attempted to defend several years since,*

that the amblyopia of squinting eyes is a consequence and not a cause of the squint.

Dr. Herman Knapp, New York.—This case is the best evidence of amblyopia ex anopsia that I know of. I have had one case somewhat parallel. An old lady had cataract in an eye that had squinted from youth. She was operated on by Schweigger, and I had to make an operation for secondary cataract, by which she got vision 20/xxx. This case comes near to that of Dr. Johnson, but it does not furnish a complete evidence of amblyopia ex anopsia and subsequent improvement of sight, as the latter had not been tested before the cataract developed.

Dr. Henry D. Noyes, New York.—This is the first case in which I feel any confidence in the assumption that the amblyopia was acquired. It is the only one I know of except the equally remarkable one of Javal. Javal had a case in which he brought the vision up to normal after three years' exercise. It must nevertheless be distinctly stated that a case like this only proves that very defective sight belonging to the unused eye is capable sometimes of remarkable improvement. It does not prove anything as to the source of the defective function. The two things are logically distinct from one another. I am willing to concede that in a portion of cases of strabismus, the amblyopia may be acquired and is not congenital, but I am far from being convinced that the majority of them are of that character. I have examined an enormous number of cases in which there is congenital amblyopia of one eye without squint. I intend to put on record my cases of congenital monocular amblyopia with refractive error. These cases are much more common than is usually supposed.

In regard to this particular case, I should have been glad if examination had been made to determine whether or not there had been color scotoma at some period of the history. Color scotoma is very common in amblyopia and strabismus. Furthermore, other conditions obtain. I recently saw three cases of strabismus. In one the squinting eye had an absolute scotoma of ten degrees, with absolutely no light perception. The patient was a woman 26 years of age who had been operated on in each eye, but the squint had not been cured.

The most probable explanation in favor of the view that squint amblyopia is acquired is the assumption that the central part of the visual function is in suspense, and by continued suspension loses conscious activity. This, however, is a very different thing from the usual assumption which makes the lesion ocular. In opposition to this view are numerous cases where persistent scotoma or persistent dimness of sight argues in favor of a local
lesion in the eye which I do not believe is the result of disease. An interesting feature that Dr. Johnson records is the improved projection in looking at an object. It seems to me that that might have been corrected by a tenotomy of the internal rectus. In time he overcame that. That is a fact that is frequently observed in dealing with strabismus when you attempt to restore binocular vision.

I may perhaps make this remark with the view of assisting in the determination of central scotoma. If you have a patient whose vision in the amblyopic eye may be 3/x and type consisting of a line of five letters, you ask him to look at the middle letter, and he will tell you that he cannot see it, but that he sees those on either side. Then you may change his point of fixation from one point in the line to another. You will find that the object on which they attempt to fix is not clear, while objects eccentrically placed are seen. This is better than the perimeter. You can do it with the perimeter, or better with the blackboard.

Dr. Samuel D. Risley, Philadelphia.—I think that the existence of amblyopia ex anopsia in convergent strabismus can no longer be doubted. I some time ago recorded a group of such cases in which the presence of amblyopia from disuse was demonstrated. In one case the right eye, which was amblyopic, had been operated on to correct a strong convergence, and after four years the case came under my observation, the left eye now being the squinting eye. The right eye before the operation had been "almost blind," but was found with \(V = 6/viii\). In each eye there was hypermetropia of 3 D. She could barely count fingers, left eye fixation being eccentric. The right eye had normal acuity of vision, 6/vi. I did tenotomy on Loth interni, corrected the refraction and insisted upon exercise of the amblyopic eye for half an hour, morning and evening, the right eye being excluded by a bandage. Vision steadily improved, so that at the end of three months it had come up to 6/7½. Here was an instance where the amblyopia had existed at different times in each eye and had been recovered from.

Another case was that of a small boy, aged 2 or 3 years, who was brought to me with developing convergent strabismus. I followed my usual habit, and placed the eye under a mydriatic, gave smoked glasses and exercised the right eye, which showed the greatest tendency to convergence, and followed the boy through three years. Finally he had learned his letters, and I found that he had vision of 6/7½ or 6/9 in each eye with correcting glasses. He had hypermetropic astigmatism with asymmetrical axes. Finally after an absence of six months, he
came back; and vision had sunk 1/3 in the right eye and main-
tained its former standard in the fellow eye. I then placed an
opaque disc between the glass and the eye on the right side,
and had him wear this morning and evening. Under this, vision
came up once more to 6/12 and some letters in 6/9. In other
words, it distinctly improved under exercise, and the exclusion
from vision of the fixing eye. After watching the case for a
few weeks longer, I did tenotomy on the right eye with the
result of correcting the tendency to convergence and restoring
binocular sight. Two weeks from the date of the operation
vision was 6/6 in each eye with correcting glasses. I think
that with the evidence of such experience we can no longer deny
the existence of amblyopia from disuse, and must admit that all
these cases certainly are not congenital, since the amblyopia
developed under observation and disappeared under the measures
adopted for its relief.

Another case which has already been published was that of
a child, the daughter of a physician, who had convergent stra-
bismus with vision reduced to one-half in the squinting eye. I
corrected the existing hypermetropic astigmatism, with the result
that the strabismus, which before had been fixed, became periodi-
cal. She came back after several years on account of headache
following work at a near point. The strabismus had been so
entirely removed by the use of glasses, that I did not sus-
pect it to be a case of strabismus until the former record was
consulted. Vision was perfectly normal in each eye, i. e., the
amblyopia had disappeared. In view of these clinical facts, it is
futile to deny the occurrence of amblyopia from disuse.

DR. B. ALEXANDER RANDALL, Philadelphia.—Cases of
cure of "amblyopia ex anopsia" will but rarely be recorded, in
spite of the challenge of those who deny such a condition. These
cases must always be a little difficult to definitely settle because
of the youth of many of the patients and the difficulty of apply-
ing the tests of vision in such cases. A case that has greatly
interested me is one that has grown up under my eye. Strabis-
mus occurred periodically in the second or third year, always
with fixation of the right eye. Mydriatics relieved the habit to
a certain extent up to about the fifth year, but the strabismus
then became nearly fixed, and glasses seemed necessary. A glass
of some 6 D was given, and under its use the child began "to
see," could learn her letters, and I was able to determine that
he now slightly convergent eye had 20/xI, as contrasted with
20/xxv in the right. To-day the hypermetropia remains the
same, and the case has never been operated upon. Vision is
6/vi, in each one although the tendency to strabismus has never
been wholly overcome. She has full normal vision, rather better in the left eye, which still tend to converge and turns strongly in the moment her glass is removed; and ordinarily she has no difficulty with vision with both eyes, the eyes working in perfect harmony with normal vision. Each of the other less hypermetropic children has had periodic strabismus, but has escaped with only a need for glasses at near work, vision having always been normal in each eye.

DR. SAMUEL THEOBALD, Baltimore.—The region in which the highest grade of amblyopia exists in the squinting eye has, I think, an important bearing upon the question whether the amblyopia is due to the squint or is a congenital condition. The retina is most amblyopic about the yellow spot and to the nasal side of this region in convergent strabismus; while in divergent strabismus it is the macula and the temporal portion of the retina which are most affected, just where it is most important in order to prevent diplopia and confusion of vision, that the retinal image in the squinting eye should be suppressed. The other portions of the retina are much less amblyopic. A case illustrating this point has occurred to me. A young woman of 25 years had a convergent squint without diplopia. I did a tenotomy upon one internal rectus, leaving a considerable residual squint, and still no diplopia. Then I divided the internal rectus of the other eye, and got a slight over-correction, and at once there was diplopia. The moment the retinal image, through the over-correction produced by the second operation, fell upon the outer side of the yellow spot, there was diplopia, the vision in this region of the retina having remained comparatively unaffected, because the images formed upon it caused little or no confusion of binocular sight, and so were not mentally suppressed.

DR. E. E. HOLT, Portland, Me.—Several years ago (1885), I read a paper before the Society entitled "Strabismus, its correction when excessive and in high degrees of Amblyopia," in which I described the method I had then practiced seven years of advancing the weakened, attenuated muscle in conjunction with tenotomy of its opponent, which maintained the deviation in these cases. I reported a case in which this double operation had been performed, when several tests showed that the eye operated on was blind, but after the operation, finding that there was sight, practice brought the vision up to 1/24. Some of the members of the Society doubted the accuracy of the records, although it was related that several tests were made with the same result. I think that continued practice with strong lenses will give surprising results in some cases, but it requires patience and perseverance.
DR. W. B. JOHNSON, Paterson.—It seems to me that the peculiarities in this case are the length of time that the amblyopia had persisted, the return of perfect vision, and the shortness of time required for the vision to become normal. I was surprised to hear cases reported today in which, after operation for squint, vision in the amblyopic eye became normal. In my case vision became normal in the amblyopic eye, but there was no counteracting feature on account of the loss of the eye, which had previously performed the entire visual act. In my experience I have failed after operations for squint to find perfectly normal vision restored to the squinting eye, even when binocular single vision was attained.

The physiological central scotoma which Dr. Noyes speaks of was present. The period of time required for the return to normal vision was from the 13th of one month to the 1st of the following month, the vision then being 20/25 with a correcting lens and subsequently becoming 20/25 with or without such correction. It would seem to be established that almost complete loss of vision from amblyopia certainly can and does exist without any diseased condition being present, either in the eye itself or in the nerve centers; that amblyopia is in that case due to the continued “suppression of the visual image,” which is a condition self-limiting under certain circumstances, and not a disease either causing or caused by strabismus.

CASE OF CONGENITAL CYST OF THE ORBIT WITH ANOPHTHALMOS.

BY GEORGE C. HARLAN, M.D.,
PHILADELPHIA, PA.

I am encouraged to report this case to the society by the fact that it belongs to a very rare class of malformations, and is, even among them, in some respects, unique. I believe, also, that the subject has never before been brought to the notice of the society.

V. A. D., a well-developed and healthy female child five months old, was sent to my clinic at the Wells Hospital by Dr. William Leiser of Louisburg, Penn., on account of a congenital tumor of the right orbit. The left eye and its appendages were in all respects perfectly normal. A tumor about as
large as a small hen's egg filled the right orbit and projected considerably beyond it. The orbit was fully of adult size. The lids were bulged forward equally and distended to more than twice their normal dimensions. They were fixed by the pressure from behind, and their margins were separated so as to leave a commissure two centimetres wide and four and a half centimetres long. The skin was movable and natural in appearance. There was no ectropium. The cilia were well developed and in natural position, except that they were widely separated from each other by the stretching of the lid margin. The exposed conjunctiva was congested but not much changed, and there was no discharge. There was nothing to mark the position of the cornea but a just perceptible puckering of the conjunctiva. There was no movement of the tumor and no pulsation, and it was absolutely incompressible. Fluctuation was decided but very tense.

There was nothing else abnormal about the child except the cicatrices left by several small tumors (cystic?) which had been moved from the right side of the face.

As the tumor was said to be growing and the deformity that it produced was monstrous, it was thought best to attempt its removal. This was done under etherization. An incision was made through the conjunctiva just below the margin of the upper lid, and gave exit to a quantity of clear, watery fluid. The cyst wall was double, the outer portion being fibrous and tough and the inner bluish, semi-transparent, and delicate. It was dissected out chiefly with the flat knife handle and a pair of blunt scissors. The hemorrhage was quite free and necessitated some haste in the operation, but was easily controlled after the removal of the tumor. The cavity was filled with strips of lint soaked in a 50 per cent. solution of fluid boroglyce-ride in glycerine. The condition of the child was alarming during the operation, but she reacted well and passed quite a good night. The next morning her condition seemed favorable, but later in the day she vomited, gradually sank into a condition of collapse, and died about midnight. There were some slight muscular twichings, but no other signs of meningitis, and an hour before death the ophthalmoscope showed a perfectly nor-
mal fundus in the left eye. Death was probably the result of exhaustion following upon shock.

Nothing resembling an eye could be found, though at the bottom of the sack there was an undefined mass of tissue about half as large as a hazel nut which seemed like a thickening of the cyst wall at that point.

It was impossible to obtain an autopsy, but Dr. Norris and myself made a careful inspection of the orbit after death. It resembled a normal adult orbital cavity with the contents removed, and had no connection with the intracranial cavity. There was no indication of an optic nerve.

The cyst was placed in Müller's fluid and has been examined microscopically by the resident surgeon, Dr. Parker, and by Dr. Joseph McFarland, demonstrator of pathological histology to the University of Pennsylvania. The latter reports that "a peculiar tissue was found which resembles an atypical cerebral tissue, and which contains the typical perivascular spores about the blood vessels. In some portions of the section there are collections of nuclei exactly corresponding to those of the neuropia." This tissue may perhaps represent embryonic retinal elements. He has been unable to find any other anatomical elements but dense connective tissue and "isolated muscle fibres and muscle fibres loosely bound together in fasciculi which may represent some of the muscles of the eyeball." How far the presence of external muscles can be accepted as proof of the existence of a rudimentary eye I do not know. They seem to be very constant. In two cases, for instance, examined at the Pennsylvania Institute for the Blind the eyeballs were represented by minute nodules scarcely as large as a pea, which were in constant and active nystagmic motion. Wilde, in his work on "Malformations and Congenital Diseases of the Organs of Sight," says that "even in cases of the total deficiency of the visual organs rudimentary muscles have been observed. . . . We have many instances on record of the muscles being present in children born with brains, although the globes into which they would have been attached were totally absent." According to Minot "there is no part of embryology so obscure at present as the development of the muscular system."
The range of diagnostic probabilities in the case of a congenital tumor of the orbit is limited. Orbital meningocele has long been recognized. The absence of pulsation in this tumor and its incompressibility made that improbable. An additional means of diagnosis which should have been resorted to in this case but was not, is the chemical examination of the contained fluid; the fluid contents of serous cysts is freely coagulable, while cerebro-spinal fluid is not at all so. The absence of any communication between the orbital and cranial cavities, however, absolves me from the suspicion of having cut into a meningocele. Another possibility is what Wecker calls a "cyst by occlusion." He supposes that a late closure of a congenital deficiency in the orbital walls which has given passage to a hernia might result in such a tumor. I do not know that the existence of such a cyst has ever been proved. It would not be likely to be accompanied by anopthalmos. Chemical examination of the fluid might aid in the diagnosis.

Dermoid cysts are usually superficial, but cases have been reported in which they have attained great size and extended deeply into the orbit. This possibility is excluded by the character of the contents of the cyst and the absence of epithelium in its walls.

Hæmatocele, and probably aneurism, may be possible as a result of injury during delivery, but would bear little resemblance to the present case, which I think may be safely referred to the rather wide category of "congenital cysts of the orbit with microphthalmos or anopthalmos." They are usually described as "congenital serous cysts of the orbit situated beneath the under lid (or congenital serous cysts of the under lid) with anopthalmos or microphthalmos."

Berlin, in Graefe-Saemisch, refers to them as peculiar malformations, the nature of which is not yet understood, and says that "the character of these congenital tumors is that they are associated with microphthalmos or anopthalmos. They appear as large, bluish, transparent bladders pressing forward the lower lid, are situated between the skin and the conjunctiva, and sometimes stretch backward deeply into the orbit. In this last position they may be properly described as orbital cysts, pro-
vided that they are in fact really cysts. But as to that opinions widely differ."

Wecker, Panas, Talko, Holmes, Van Duyse, Snell, Tillaux, Skilbitzky, Lang, Dor, Kundrat, and others describe these tumors as always in relation with the lower lid. In a careful search of the literature of the subject I have been able to find only three cases in which the tumors are described as filling the whole orbit and having no reference to the lower lid. Sagliano (Wecker et Landolt, T. i. 249) reports the case of a child four days old whose left eye was perfectly formed, but who, in place of the right eye, had a huge cyst filling the whole orbit and hanging down upon the cheek to the extent of an inch. It contained 30 grammes of serous fluid. On extirpation it was found that its walls were about two lines thick and externally were rather of a fibrous structure, but within were more transparent and included elements of a normal cornea. In the interior traces of choroidal pigment cells were found, but no vestige of a retina or optic nerve. The author describes it as "a congenital transformation of the eye into an organic cyst."

Pflüger reports a case in which the cyst filled the whole orbital cavity. There were striated muscular fibres on its external surface, and it was connected internally with a rudimentary globe represented by choroidal and sclerotic tissue.

Chlapowski's case was that of a boy 16 years old in whose left orbit there was a congenital cyst as large as a walnut, filling the whole cavity. It had a slight projection in front corresponding to the cornea, and a stem behind representing the optic nerve. It moved in unison with the right eye, and muscular fibres were cut in the extirpation. At the bottom of the orbit was a small lenticular mass of tissue supposed to represent a rudimentary eye. There seems to be some doubt about this case, as the character of its contents is not noticed. Manz, however, has no doubt that it was a high-grade hydrophthalmos.

The pathology of congenital serous cysts of the orbit is involved in great uncertainty. Panas indeed considers this the most obscure chapter in ocular pathology. Most authors agree with Berlin that the microphthalmos or anophthalmos is not a mere coincidence, but that the cyst is formed of embryonic
elements which were intended for the development of the eye, while others believe that its origin is independent of the globe, whose evolution is prevented or development checked by its presence.

Talko, who has reported seven cases, insists that they have no necessary connection with the globe and nothing in common with it. He favors the hypothesis suggested by Hoyer that they arise by an entanglement of the upper part of the lacrimal sac. In all his cases the tumors were situated behind the lower lid, and in only one was there apparent complete anophthalmos.

Panas thinks that serous cysts have an intrauterine origin similar to that of dermoid cysts, except that instead of the derm it is the endoderm, or mucous, which is invaginated. He found glands on the cyst wall closely resembling those of the pituitary membrane, and attributes the origin of the tumor to fetal inclusion of the mucus of the nasal fossae and sinus.

Others have found choroidal and retinal elements in the cysts, and think that they are developed from the globe. Kundrat believes that true absence of the eyeball is very rare, or does not exist, and considers a defect in the development of the middle cerebral vesicle as the primary cause of these cysts and of the microphthalmos that invariably accompanies them. In several of his cases defects in the brain were discovered. He says that some other congenital malformations, such as hare lip, nasal cleft, etc., can usually be found. In the case that I have reported there had been several small cystic (?) tumors on the cheek and face.

According to Manz, congenital serous cysts of the orbit are of two kinds: First, corresponding to an hydrophthalmos, a high degree of fetal cystoid degeneration of the bulb, probably the result of an intra-uterine inflammatory process of the nasal tract; second, subpalpebral serous cysts with microphthalmos or anophthalmos which have their origin in an encysted coloboma and are developed at the expense of the sclerotic.

Of the latter kind a case reported by Lang, in which the tumor was very thoroughly examined by Treacher Collins, seems conclusive. A rounded, fluctuating swelling the size of
a pigeon’s egg bulged forward the lower eyelid, and was fixed far back in the orbit to a very small globe. The cyst cavity opened into the cavity of the ball, and its walls were continuous with the sheath of the optic nerve and the sclerotic. There was no choroid beyond the neck of the cyst, but the pigment layer of the retina passed into the neck, ending where the cyst commenced to expand. Vestiges of retina extended into the cyst. The remainder of the cyst wall was made up of fibrous tissue.

In the light of the investigations so far made upon this subject it seems most probable that the tumor I have reported was formed in some way of the embryonic elements of the eye, and that it was one of the two kinds suggested by Manz, i.e., that it was either an exaggerated hydrophthalmos or originated as a fœtal encysted coloboma, which in this case, by its early inception and its enormous growth, prevented the evolution of the eye. The great rarity of cases that could admit of the former explanation, only three or four having been reported, and the close resemblance of this tumor in anatomical structure to the so-called subpalpebral cysts, incline me to the latter view.

I had prepared a bibliography of the subject, but as most of my references are included in the recent paper of Mitvalsky (Knapp’s Archives, July, 1893), I append those only which are not found in Mitvalsky’s bibliography.

Beale, Orbital serous cysts, Med. Times, Aug., 1851.


Bröer und Weigert, Teratoma orbitæ congenitum, Arch. für Path. Anat., 1876, s. 318.


Gaillemaerts, Kyste congenital de la Paupiere avec microphthalmos, Société des Scien, Med. et Naturel, de Bruxelles, Dec. 5, 1892.

Rindfleisch, Beiträge zur Entstehungsgeschichte der angeborenen Missbildungen des Auges, Graefe Arch. f. Ophthalmol., 37, s. 192.
AN OCULAR MASK.

BY FRANK W. RING, M.D.,

NEW YORK CITY.

This mask, which I have the honor of presenting to the Society, is designed for the protection of eyes against injury, especially after cataract extraction; and I present it with the conviction that it serves all the purposes for which it is intended. It is quite unnecessary for me to dwell upon the fact that not infrequently eyes are lost after extraction, from force inflicted by the patients, either consciously or unconsciously.

One great advantage consists in the perfect security with which the bandage may be permanently removed at the end of thirty-six or forty-eight hours, by simply filling in the oval depression with cotton. The sooner an eye is relieved from the pressure of the bandage and the consequent heat and soaking which it receives thereby, the quicker it will whiten and heal.

Another element in its favor is the eagerness with which
patients welcome its adjustment, feeling comfortable in the belief that it affords complete protection against injury.

The mask is easily and firmly adjusted over the bandage, and to those who do not use the bandage after operation, it is all the more serviceable. It is made of papier mâché, covered with black silk and lined with white linen. The tapes may be tied, or fastened by means of the buckles. The perforations seen in the cut are not found in the masks as they come from the shops, but may be made at the pleasure of the surgeon according to the eye needing a ray of light.

DISCUSSION.

DR. HENRY D. NOYES, New York. — I can only say that I have used the mask on three consecutive cases of cataract extraction, and that it gave a wonderful degree of satisfaction both to myself and the patients. I was able to dispense with the bandage on the second or third day, and the adjustment of the mask was exceeding comfortable. I regard the apparatus as extremely valuable in protecting patients from the accidents to which they are liable, and rendering them comfortable. It comes into use in connection with the bandage, and also after the bandage is laid aside.

DR. SAMUEL D. RISLEY, Philadelphia. — I have not used this form of apparatus, but I have used a wire screen for years with satisfaction to myself and patients. If the patient has once had it on, he will ask for it if omitted. He is fearful that he may injure the eye in his sleep and has a sense of security with the screen on.

DR. FRANK W. RING, New York. — The advantage of this mask over the wire screen is that it is very light and shuts out all light. It can be used without cotton, and one can let in a ray of light, at pleasure, by simply making a perforation with a knife. Patients have all been pleased with it.

A PERMANENT MAGNET FOR USE IN REMOVING FOREIGN BODIES IN THE CORNEA.

BY WALTER B. JOHNSON, M.D.,

PATerson, N. J.

The magnet is presented as a useful instrument which can be manufactured at a very small cost and is always ready for immediate use.
It is made from a bar of the highest quality steel, which is turned down until it is shaped like a cone-pointed cylinder slightly elongated at each end and very highly tempered, six inches in length, each cone measuring one and one-half inches, the cylinder one-half inch in diameter, and three inches long.

The instrument is charged by rotating it within the magnetic field of a generator when the molecular changes which occur render it a permanent magnet.

It will continue in full magnetic strength for a long period of time, gaining or losing in a slight degree, but always retaining sufficient magnetic strength for all ordinary purposes.

It could be re-magnetized in a minute or so at any place where a dynamo is in operation.

It has served an excellent purpose on several occasions in removing small particles of steel from the cornea which had perforated and almost entered the anterior chamber, in which efforts at removal with a needle were not safe, endangering the passage of the foreign body into the anterior chamber, and in which the passing of a Baers' knife through the cornea behind the foreign body has been recommended before its removal was undertaken.

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CAN LOSS OF THE EYES BY OPHTHALMIA NEONATORUM ALWAYS BE PREVENTED?

BY B. ALEXANDER RANDALL, M.D.,
PHILADELPHIA, PA.

It is questionable wisdom for a man to publish a case of non-success with any expectation that his view of the treatment will receive full acceptance, and his failure meet no adverse criticism. I do not expect this. But in a spirit of conscientious self-criticism, and with the feeling that I did all in my power in the premises, and can fairly blame neither myself nor my colleague, I wish to report a disastrous result of ophthalmia
neonatorum, and point a moral which was strongly brought home to me.

On the second of November last I was called in consultation by a most skillful physician and obstetrician to see an infant of ten days of age, whose eyes had become inflamed on the fourth day after birth. The mother had not the slightest leucorrhea before labor—a normal first confinement, save that a tiny laceration seemed to demand a stitch and healed with perfect promptness—and an unusually close study of the conditions during her pregnancy gave no reason to anticipate trouble. Yet, routine antiseptic cleansing of the eyes, with a boric wash, was scrupulously observed immediately after birth. Vomiting and other disturbances had rendered the entire pregnancy most miserable, and the blooming mother was much reduced by them; the infant, severely jaundiced, desquamating copiously, with a bloody mucous discharge at anus and vulva, and vomiting bilious matter, was in as wretched a plight as ever falls to the lot of the offspring of healthy parents. For days her life hung by a thread, the sole salvation being that the gastric disturbance was soon overcome and she nursed well. Inflammation appeared on the fourth day, first in the right eye, and was promptly met by free and frequent washing with hot bichloride solution (1:8000), and touching of the everted lids with 1 per cent. silver twice daily. On the evening of the ninth day both corneas seemed clear; but on the following morning ulceration of the lower part of the right cornea was noted, and I was summoned immediately.

I found the typical picture of severe purulent conjunctivitis, the swollen lids discharging copiously and their cutaneous surface somewhat excoriated. The cornea was rather difficult to study, but revealed not the slightest lesion on the left; while the right presented a large crescentic ulceration below the pole that had extended rapidly in area and apparent depth even during a couple of hours. The hot bichloride douching was employed thoroughly by myself, as it had previously been used by the physician and trained nurse, and the conjunctiva was vigorously and most thoroughly touched with 2 per cent. silver. Atropia was instilled and an emollient ointment applied to the exterior
of the excoriated lids. I met the physician morning and evening for study and treatment of the case, had the cleansing carefully continued every hour during the day, and, taking up my quarters at the house, I made the hourly cleansings myself during the night, hoping that an assured hand might be gentler and safer to the yielding cornea, while more rigorously thorough than any other could dare to be. The destructive process was wholly unchecked. Instilling drops of boiling water cleaned the ulcer on the right, but never arrested its extension. On the left a corneal clouding appeared at the inner side on the fifteenth day and disappeared under the boiling water—the sole ray of hope that illumined the progress of the case—but the iris became discolored by lymph, hypopyon developed, and the cornea, never superficially involved, clouded and melted down from within. About the twentieth day the nurse infected slightly both of her own eyes, and had to be replaced by another, fresh, capable, and conscientious; and several days later, on suspicion of having infected my left eye, I so stirred it up with hydrogen peroxide and silver that several days of active conjunctivitis nearly incapacitated me. But the fight went on steadily from hour to hour. I have not preserved notes of the case as to details of treatment, which were varied to meet the apparent needs, and also in the endeavor to find more efficient measures; and while no ophthalmic colleague was called in formal consultation, the case was continuously discussed with Drs. Risley, DeSchweinitz, and others. The attending physician, in a huge obstetric experience, had seen many bad cases, although he had always succeeded heretofore in averting disaster; and the general condition of the child, which seemed the real matter at fault, was closely, but rather despairingly, studied with medical friends, who had little hope for the child’s life. The right cornea thinned, distended, shrunk, and granulated, with nothing to show that it ruptured under the strains of any one of the thousand washings to which it was subjected; and the left cornea preserved an outwardly intact surface, but followed a like course—an island in its upper part long preserving some transparency and affording a shadow of a chance for vision.
Discharge had virtually ceased about the fortieth day, the cornea were cicatrized and flattened, the child's general condition good, and the outlook was fair for a healthy life with sightless but undisturbing eyes. This prospect has been rudely disturbed by recurrent attacks of irritation and distension, sometimes threatening rupture, especially of the left cornea; and there exists now a condition of buphthalmos with a large corneal staphyloma on the left, that may at any time enforce abscession or enucleation.

Reviewing the weary and heart-sickening fight, which still haunts me like a nightmare—for the parents are warm personal friends, and my distress could hardly be greater were the child my own—I fail to see what could have changed the result. I believe that the applications of boiling water were as disinfecting as the actual cautery could have been, and much safer. In the left eye, indeed, with its intact corneal surface, there was no place for that potent measure. My earlier observations of its effects have taught me dread of the cautery, which later successes have never effaced, and I am still very chary of its employment. In other respects the treatment was classical, guided and largely personally applied with all the skill of which I was capable.

In the third week of my work all real chance of sight was gone, and I ceased my almost unremitting nightly attendance, and, as the discharge lessened after the fourth week, could omit an occasional daily visit: but throughout the critical period I made about ten of the hourly cleanings myself and closely studied the eyes at least thrice daily.

I can suggest no certain improvement upon the treatment that was given before I saw the case. It was promptly, judiciously, and conscientiously applied, and in a number of previous cases has been crowned with success. I can only believe that there was not sufficient recuperative vitality to permit of recovery.

While this case was under treatment, my attention was frequently called to an "Open Letter" in the December Century Magazine, with its statement as to blindness from purulent conjunctivitis. "It is not claiming more than statistics justify
to assert that not one of these fifteen thousand persons would have become blind had the proper measures been instituted at the right season." It was my good fortune that the indignation with which it was read by the afflicted family was not against me and my non-success, but on my behalf; though I can hardly think that such was the feeling of all of the many who called their attention to it, nor do I believe that the professional standing of any man, or anything short of the strong hold which I have upon their friendly affection, would have saved me from severe criticism and perhaps still more unpleasant consequences. I have reason to be profoundly grateful for the firm loyalty of my friendly patients, and I most sincerely pity the practitioner, old or young, unknown or famous, who may meet such a result and not have a like good fortune. Especially do I hope that the writers of such articles may never be visited with such disaster, or they may rue the day they laid down such uncompromising lines. But it is particularly for those still younger than myself that I wish to make protest; for I believe that such writings are two-edged weapons, capable of filling the minds of patients with life-long, impotent, and sometimes causeless regrets, and of inflicting serious or fatal wounds upon our professional friends.

**DISCUSSION.**

**Dr. T. Y. Sutphen, Newark.—** I have always prided myself on being able to save the eyes if I saw the case before the cornea was affected. During the past year, however, I met with a case almost exactly like that of Dr. Randall's. The baby was a premature seven-months child, of healthy parents; it was cared for by a trained nurse, and the attending physician was a competent man. I was called soon after its birth and suggested a line of treatment, the attending physician promising to let me know if any change occurred. Ten days later, I was sent for and found that corneal ulceration had developed in one eye. The other cornea was perfectly sound. I visited the case two and three times a day thereafter, and rather assured the parents that there was no danger to the other eye. I saw the affected cornea, in spite of all that I could do, melt away. Three days after my return to the care of the case an ulcer developed upon the other cornea, and growing broader and deeper perforated. The result was total adherent leucoma in one eye, while the other has good vision with a macula. The seriousness of the
case seemed to increase constantly, without arrest, until the child began to develop physically. The child being premature was poorly nourished, but, from the day it seemed to grow stronger, the ulcer in the better eye began to repair.

DR. FRANK W. RING, New York.—I have been much interested in this subject, and just before leaving New York I hastily noted down patients whom I have treated during the past few years to the number of twenty-five. In this number, thirty-eight eyes were affected (twenty with gonorrheal ophthalmia), twenty-six were saved, eight damaged, and four lost. The vision in the damaged eyes was as follows: 20/L, 20/XL, 20/LXX, and 20/cc. Of the lost eyes, three had perception of light (these were gonorrheal cases) and one was totally lost (a case of ophthalmia neonatorum).

A surgeon who contends that all eyes afflicted with ophthalmia neonatorum can be saved, asserts that which at sometime in his career he may not be able to substantiate. He also reflects upon just as able a man who may have lost eyes notwithstanding the most strenuous efforts. I think I am justified in the remark that all eyes thus afflicted ought to be saved if seen at an early period, but we often get patients in dispensary practice too late to offer much encouragement.

A few words in regard to treatment. My sheet anchor in gonorrheal ophthalmia is nitrate of silver, properly used. I also cleanse the parts with a bichloride solution, and inject between the lids bichloride vaseline; not that the vaseline has any curative properties, but it thins the secretion and enables it to flow more freely from the eyes. Atropine and eserine, according to indications. Iced cloths continually. I also employ peroxide of hydrogen; I am sure every time the peroxide is used the eye is freed from all purulent secretion. If I cannot get under the lids I make a canthotomy. The eyes are cleansed every ten minutes during day and night. The danger to the cornea arises greatly from the pressure and also from contact with the secretion. I have one case which is especially interesting. A young man came to the hospital quite blind in both eyes; there was a symblepharon of the upper lid covering the entire cornea of the right eye. I promised to give him more freedom of action in the lid by dissecting it off, and, upon doing so, found the upper half of the cornea quite clear. So from total blindness he was restored to good working vision.

DR. HERMANN KNAPP, New York.—I should like to put myself on record as believing that it is impossible for us to guarantee the sight of any eye, child or adult, when it is affected with gonorrhea. In children, with good nursing, the majority
are cured. In adults it is much more difficult to cure. Even in children, however, where we get them in good condition, with both corneæ clear, there are sometimes circumstances injurious to the eye that are beyond our control, and I may mention one case, the child of wealthy parents. The child did well and passed on to the third week, when the cornea began to ulcerate suddenly where the day before there was no opacity. The eye was doing well on Saturday morning, and on Monday morning there was a central ulcer with considerable infiltration. On Saturday night the child was taken with a violent attack of summer diarrhœa, and it was only by the strictest care that the diarrhœa was soon stopped, and from that moment the ulcer began to heal. It cleared up and the child had nothing but a central opacity, not very large, but I am sure that if the diarrhœa had continued, the cornea would have sloughed. In the treatment of these cases of ophthalmia neonatorum, I have always taken into consideration the general health. If I have never allowed the mother to wean the child as long as it is in danger. The weakest mother may nurse her child if she does it rationally, five times a day and not at night, nursing it at 6, 10, 2, 6, and 10 o'clock. From the second or third day they are as regular as clock work and sleep the whole night through.

Among other circumstances may be mentioned wounds of the cornea in the act of cleansing.

Dr. J. A. Andrews, New York.—I wish to say a word about ophthalmia neonatorum. Three years ago I took up the investigation of this question again for the reason that I found that the children transferred from the Maternity Hospital to the ophthalmic wards of the Charity Hospital, were losing their eyes, and I believe that the reason was to be sought for in the treatment rather than in the disease. I had come to the conclusion that a considerable percentage of the cases of ophthalmia neonatorum were not gonorrhœic, and I believe that the majority of these children transferred to my division did not have gonorrhœal ophthalmia. Through the courtesy of my colleagues, Drs. Coe, Garrigues, and Murray, I took in hand the treatment of all cases of ophthalmia neonatorum that developed in the Maternity Hospital. I found that the disease was quite common in one ward, and I set to work to find out the cause. I examined the vaginal discharge of the mothers, but found no explanation for it there, in the majority of instances. I also examined the discharge from the babies' eyes. I went further, and made plate cultures from the air of the room; but even there I did not find a satisfactory explanation. In the majority of cases the disease developed on the third or fourth day after
birth. When it appeared on the fourth day, I believed that it was due to infection after birth, whether through the atmosphere or through carelessness on the part of the nurse, I was not sure. I told the physicians that I believed that the nitrate of silver was spoiling the eyes. I had become convinced of this some years before. I am speaking of ophthalmia neonatorum not due to gonorrhœic infection. In such cases, the simple washing of the eye, the application of cold, and the flooding of the eye with vaseline cured every case; but where silver was used there was always mischief done to the cornea. The eye was not necessarily lost by a single application of silver, but where this treatment was persisted in the eye was invariably lost. When the disease is gonorrhœic I believe the nitrate of silver, not stronger than 2 per cent., is invaluable; but even there it must be used with caution and with due regard for the indications. Where there is little discharge and swelling of the conjunctiva, the silver should be used very sparingly or not at all. As to guaranteeing a cure in ophthalmia neonatorum, I believe the physician should never guarantee a cure in any disease.

DR. LUCIEN HOWE, Buffalo.—I am glad that this subject has been brought up and has been so admirably presented and I think there are few who look back fifteen or twenty years, who can not recall cases similar to the sad one which Dr. Randall has presented; at the same time, it seems to me that we should not allow our views of the subject to become indefinite and cloudy, as to what we as a society should endorse as to any general opinion that we should have. What exceptions there may be, should be recognized as exceptions. I think that there are exceptions, and I think that I can turn to the statement where that class of cases is excepted, those of premature birth, poorly nourished, and where we have certain general conditions. I think that they should not be brought into the general category. We should keep them in a distinct class and we can make assertions in regard to the others more dogmatically.

In regard to treatment, it would lead us into an indefinite discussion to consider whether nitrate of silver should be employed in every case after Credé’s method or whether there is a certain class that do better without silver. These are digressions. The main point for the society to keep in mind when we are discussing this point should be made clear. I think that we should reiterate the statement made so often and which I believe can be made truthfully that in the vast majority of these cases the eyes can be saved in healthy children when seen in the early stage.

DR. EMIL GRUENING, New York.—I do not think that we
as a society can formulate anything. We are not responsible as a corporate body; we are merely responsible as individuals and can only state our individual experience. My experience is this, in ophthalmia neonatorum I rely upon nitrate of silver. If I were deprived of the silver, I should not know how to treat the cases successfully. The treatment is that advocated by Graefe. I have seen cases in which the physician used silver in a solution of thirty grains to the ounce, three or four times a day. That is not the use of silver as I understand it. The lids should be everted and the eversion done with a deft hand so that the corneal epithelium is not disturbed. The man who cleanses the eye every hour or has the nurse do it and wipes away the epithelium is the one who does the mischief. It is the man who does too much that does the mischief. The silver should be applied once a day and then we should wait quietly for the eschar to be thrown off. If the eschar is not thrown off in twenty-four hours we cannot apply the silver. It may be necessary to wait twenty-four hours, forty-eight hours. I speak simply of ophthalmia neonatorum, and I have succeeded well. I use a one per cent. solution, or, if there is considerable thickening, a two per cent. solution. I do not speak of gonorrheal ophthalmia, which is quite different. I have saved eyes and lost eyes.

DR. SAMUEL THEOBALD, Baltimore. — I think that Dr. Randall has clearly brought out what is usually the cause of ill success in dealing with ophthalmia neonatorum; that much depends upon the general condition of the newly-born infant. Where the child is fairly robust, and the case is seen early, it can almost always be brought to a successful issue. There are, however, exceptions where this is not the case. In the Lying-in Hospital, of the University of Maryland, there was a virulent epidemic of ophthalmia neonatorum. The Crede method was practiced, but a number of eyes were lost even under careful and judicious management. I did not see the cases myself. This shows that, in exceptional instances, even where the general state of the system is good, it does happen that eyes go to the bad in spite of judicious treatment. I think, however, that in almost all cases, the real cause of the trouble lies not so much in the virulence of the local disease as in the poorly nourished condition of the system and the consequent inability of the tissues to resist the destructive action of the inflammation.

DR. T. Y. SUTPHEN, Newark. — In an experience of twenty years I think that I have not seen more than two or three cases where the disease seemed to have been communicated to others by the child. I have, however, always felt under obligation to
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warn the parents and nurses of the contagiousness of the disease. I should like to know the experience of others on this point.

Dr. Emil Gruening, New York.—My experience is that where the disease is contracted by the adult from the child, it is much more grave. I remember two cases, one of which I saw with Dr. Knapp twenty years ago, where the mother of the child had died and the mother's sister was infected and lost one eye completely.

Another case occurred recently in the Mount Sinai Hospital where one of the nurses contracted blenorrhoea from a child. This nurse had perforation of both corneæ, but the eyes were saved. The child had no trouble whatsoever. These are two instances and there have been others, the particulars of which I cannot recall.

Dr. H. Knapp, New York.—I have seen such cases. There was one epidemic of ophthalmia neonatorum in which a nurse caught it and a number of adults also caught it. One nurse lost both eyes.

Dr. Arthur Mathewson, Brooklyn.—I recall the case of a child with ophthalmia neonatorum where the nurse was infected and lost the sight of one eye, while the child got well.

Dr. W. B. Johnson, Paterson.—During my term of service at Charity Hospital, Blackwell's Island, there was considerable ophthalmia neonatorum at the Maternity Pavilion and two of the nurses were infected. While the children did well, each of the nurses had the sight of one eye either seriously impaired, or lost.

With reference to legislation for the prevention of blindness I should like to say that the object of such legislation should be clearly defined; that laws should simply be so enacted as to indicate the necessity for the use of extraordinary precautions on the part of every person who is thrown in contact with such cases, to prescribe penalties for the neglect of the use of such precautions, and to place the proper enforcement of the laws enacted in the hands of the State or local health boards, making reports of all cases compulsory.

I fail to see how the enactment of health laws can be injurious to the standing of professional men or by inference indicate that such cases can be prevented either by legislation or by the skillful care of any medical man, but only indicate that the medical profession are anxious to do all that they can to check the spread of preventable disease.

Dr. Henry D. Noyes, New York.—I wish to raise one point, and that is whether the very hot applications proposed by Dr. Fryer of Kansas City, in lieu of very cold applications, which has been the accepted method, has been found successful
by other members of the society. I have not employed them, and am rather indisposed to make any use of them.

DR. FRANK W. RING, New York.—I have tried hot applications in gonorrheal ophthalmia, but it was not well borne by some of the patients and I had to resume cold applications.

DR. ARTHUR MATHESON, Brooklyn.—I have used hot applications, and, in gonorrheal cases, have had better results. I have employed them by irrigation. In a case in an adult where both eyes were affected, the house surgeon kept up hot applications on one side and cold on the other side, and better results were obtained from the hot applications.

DR. SAMUEL D. RISLEY, Philadelphia.—I have used hot applications to a considerable extent in this class of cases, and have found that frequently after the use of cold, a time is reached when hot applications will work better. When cold begins to be uncomfortable to the patient, the discharge is usually materially lessened, and a gray film forms over the conjunctiva. I think that it is then well to change to hot applications. In the class of cases to which Dr. Randall’s belongs, those of lowered vitality, I am sure that at the outset, hot applications should be chosen to commence with, whereas, in vigorous, well-nourished people, I should use cold applications at first.

DR. W. H. CARMALT, New Haven.—Dr. Randall referred to the use of boiling water. How did he make the application?

DR. B. ALEXANDER RANDALL, Philadelphia.—I have long used hot applications in preference to cold applications, although frequently using the iced compresses to the lids in adults. In children, particularly in infancy, it has seemed to me that the use of iced compresses was a precarious measure. In the case reported I regarded such a measure as more likely to lead to disaster than to be of advantage. The lids were inverted readily and I used warm irrigation—temperature a little over 100°—and to the corneal ulcer, where many would use the actual cautery, and where in adult cases I have myself employed it with success, I used applications of boiling water made with a fine pipette, the water being as near as possible to the boiling point. I have seen, under this treatment, cleaning up of the ulcer and healing with beautiful promptness in a large number of cases. I believe that the method has proven to be fully equal to the galvano-cautery and a far safer procedure, for which we are indebted to Dr. Lippincott of Pittsburgh.

DR. J. A. ANDREWS, New York.—I have used hot applications in two instances. It was in that class of cases which we see occasionally where there is a dense plastic infiltration of the
ocular conjunctiva with interference with the circulation. In this class of cases I thought that hot applications might be more useful than cold. I used them, but the eye was lost. One gentleman said that he never lost an eye from purulent ophthalmia in the new-born; and others had had a similar experience. No one has said anything about having observed a distinction between gonorrhœic and non-gonorrhœic ophthalmia in the new-born. In studying this subject two years ago, I examined the secretion from the eyes of 88 infants in which the ophthalmia has developed from 50 to 72 hours after birth. The gonococcus was found in only two of these cases, in the mother and child; the one infant having been infected at birth, the other six days after birth, through carelessness on the part of the mother. The typical clinical picture of gonorrhœic conjunctivitis was absent in 86 cases; nevertheless, five eyes were lost among five of the infants, and one infant lost both eyes, the disease being in these 6 cases non-gonorrhœic. The Credé method has been employed and the instillation of 2% solution of nitrate of silver persisted in for several days before the infants were transferred to the ophthalmic division. I believe that the silver was responsible for the loss of these eyes. In my experience, ophthalmia in the new-born which is non-gonorrhœic has been cured by simple means; but gonorrhœic ophthalmia in the new-born does not always get well in spite of the most careful treatment.

Dr. Emil Gruening, New York.—The microscope can decide this question. The clinical evidences have been in favor of the gonorrhœal origin of the inflammation. I could trace the gonorrhœa in the father frequently. The child that has the ophthalmia is usually the first born. It is rare to find that the second, third, or fourth child has any amount of ophthalmia. The father has generally had gonorrhea a few months before marriage and considered himself well, and communicated the disease to his wife. Also in the case of widowers who re-marry, the first children often have blennorrhœa. These cases do not behave so well as those in whom I cannot trace the gonorrhœal origin.

Dr. Samuel Theobald, Baltimore.—In regard to the application of cold. With a considerable experience, I have found no occasion to use either heat or cold. I have kept the eyes clean, but have never directed iced or hot applications in ophthalmia neonatorum. I, however, make a sharp distinction between these cases and those of gonorrhœal ophthalmia in the adult. There I have used iced applications systematically. It is difficult to use such applications in young infants, and, if my experience is worth anything, it shows that they are not neces-
sary. I keep the eyes clean with a saturated solution of boracic acid used every half hour, and employ nitrate of silver in not very strong solution.

Dr. F. M. Wilson, Bridgeport.—I do not think the discussion should be closed without allusion to one thing, and that is, the deft hand. That is the most important single thing in the treatment. It is my experience to find that this is a scarce article. It is rare to find a nurse without special training who can take care of the eye properly. After several weeks treatment one single wipe with an unskilful hand will obviate the results of all the treatment.

Dr. E. E. Holt, Portland.—I wish to mention one remedy which has given me satisfaction. In cases where I am called late and the cornea has commenced to ulcerate, I find that by putting in iodoform the suppurative process stops at once and the eye seems to do better than with anything else that I have used. It stops the suppuration and gives a great deal of satisfaction to all concerned.

Dr. Myles Standish, Boston.—My experience has been similar to that of Dr. Holt. Take a gonorrheal case doing badly, with a great deal of discharge, there is nothing that does so well as iodoform. I fill the conjunctival sac and cover the lids with a layer of iodoform, to the depth of a quarter of an inch or more, and apply a bandage. The result is that all the discharge is absorbed immediately and you do not get any collection of pus in the eye. The virulent effect of the discharge is also neutralized. I have had cases which came into the hospital late, with ulcers of the cornea, and which every one prophesied were going to do badly, do well. They were also treated with nitrate of silver, but had no hot or cold applications, although kept clean. I consider the use of iodoform a very valuable method of treatment.

CLINICAL NOTES ON SOME REFRACTION AND MUSCULAR CASES.

By B. L. Millikin, M.D.,
Cleveland, Ohio.

In the routine refraction work of an office one occasionally meets with cases to which the ordinary rules and methods of examination do not apply, and these cases tax the ingenuity of
the observer often to the utmost. A few cases of this sort have come under my notice and I have thought a brief record of them would perhaps be of interest to the Society. In very high degrees of astigmatism I have found correction with the ophthalmoscope far the most satisfactory method. In fact, testing with the stenopic slit or lines, or the usual test glasses and cards, has in my hands proved quite useless and unsatisfactory. My experience with the ophthalmometer of Javal & Schiotz has not been, as yet, extensive enough to base any definite conclusions, and in degrees of astigmatism beyond 7 or 8 D, I do not believe it would be very accurate, but for the purpose of diagnosis and for the angle would have a decided advantage. In several cases, however, of considerable degree of astigmatism I have found the ophthalmometer does not give regular images at all, and in these cases the steps appear at angles to one another, and are of no or very little value in determining definitely the degree of astigmatism. In my hands the ophthalmoscope has given the most satisfactory results, and by verifying its reading with glasses I have been enabled to correct cases of extremely high degrees when all other methods I have been able to employ have been unavailing in greatly improving the vision of patients. A couple of cases will suffice, as illustrating what can thus be done and the visual results obtained.

Case 1. — Miss M. C., aged 32, American, stenographer. Applied to me in February, 1893, with a history of much pain in the eyes and frontal headache after hard, close work, and also had not been able to see much with the left eye, and could not read except very coarse print. Examination gave the following facts:

O. D. v. = 6/9.
O. S. v. = 6/60.

Javal's ophthalmometer showed about 1.00 D. ast. in O. D. and O. S. a very high degree, the steps being very markedly at angles to one another, and I was unable to determine either the angle of the astigmatism or the amount of it. With the ophthalmoscope the fundus of each eye was normal with the exception of a very high astigmatism of the left eye. Atropia
was prescribed and after its use for four days I was able to obtain the following results:

O. D. + 1.50 D. s. ⊕ + 1.25 D. cy. ax. 5° v. = 6/6.
O. S. + 4.00 D. cy. ax. 20° ⊕ — 4.00 D. cy. ax. 110° v. = 6/9.

In testing the left eye I could get nothing satisfactory from the ordinary means of testing, and it was only by carefully working out the different meridians with the ophthalmoscope and then trying the proper glasses that I was able to get good results. The following glasses were prescribed:

O. D. + 1.00 D. s. ⊕ + 1.25 D. cy. ax. 5°.
O. S. + 4.00 D. cy. ax. 20° ⊕ — 4.00 D. cy. ax. 110°.

These have been worn with entire comfort and complete relief of the headaches. After a month’s use of them the vision of the left eye became 6/6 and now is practically as good as the right. The patient works constantly at stenography and has had no trouble since wearing glasses.

The following case is unique in my own experience, and I have not happened to meet with so high a degree of mixed astigmatism in any of my reading:

Case 2. — On Aug. 26, 1891, Mr. E. A. S., American, aged 39, was referred to me by Dr. Sherman of Cleveland. He gave the following history: At the age of 18 he had an attack of rheumatism, since when he had complained somewhat of his eyes, and for the past seven years has noticed his sight failing gradually until recently he has not been able to read ordinary newspaper print with any satisfaction. All his life he has been subject to frequent attacks of headache in the fronto-temporal region. For two and one-half years he has worn strong myopic cylinders, which have improved his vision somewhat, but still he is unable to do any ordinary eye work with comfort. Examination showed the following condition:

The man was a robust-looking, moderate-sized, rather sparsely built individual with nothing about his face that was particularly striking. I found his vision as follows:

O. D. v. = 3/60.
O. S. v. = 4/60.

The vision in the two eyes being nearly the same. The
ophthalmoscope showed in O. D. a very high degree of mixed astigmatism, the horizontal vessels being seen with a + 4.00 D. s. or 5 D. s. while the vertical vessels could be seen to very poor advantage, the pupil being rather small. By the indirect method, however, the fundus could be clearly made out, the mediae being clear. The disc was greatly elongated vertically, the vessels of fair size and normally distributed, and the fundus was very fair. O. S. less marked mixed astigmatism, the horizontal and vertical vessels being respectively made out with + 4.00 D. s. and — 6 D. s. Fundus very good, disc vertically elongated in appearance. A peculiarity of each cornea noted was a sharp line rather irregular in its outline around the periphery of the cornea about two or three millimeters within its margin, the portion of the cornea within this line being perfectly clear while outside of it the tissue was quite hazy, having the appearance of an arcus senilis in color, its shape being very unusual, the inner margin very sharply marked. For the purpose of testing the case I prescribed a 4 gr. sol. of atropia, to be used four or five days, after which the examination was made. With the ordinary test letters, lines, stenopaic slit, etc., I could get no satisfactory result, so I proceeded to work out the case with the ophthalmoscope, and by this means I obtained the following results:

O. D. — 10.00 D. cy. ax. 90° ⊗ + 7.00 D. cy. ax. 180° v. = 6/9. Lines alike.

O. S. — 6.00 D. cy. ax. 100° ⊗ + 4.00 D. cy. ax. 10° v. = 6/9. Lines alike.

When it is remembered that the highest cylinders in our cases are 6.00 D. the difficulty of holding four glasses at the proper angles and then examining with the ophthalmoscope for clear images can be appreciated. I then gave him the following glasses:

O. D. — 10.00 D. cy. ax. 90° ⊗ + 7.00 D. cy. ax. 180°.
O. S. — 6.00 D. cy. ax. 100° ⊗ + 4.00 D. cy. ax. 10°.

The full correction being prescribed. Examination with the glasses on, with the ophthalmoscope, showed the disc of right eye quite irregular in shape, the lower outer quadrant running
out to a blunt oval point, but the fundus was clear, the vessels normal in size and distribution. The glasses I had made perfectly round so that if the angle should need to be varied, this could readily be done. In the wearing of the glasses the angle requires to be in a certain position to be of advantage. This gentleman has now worn these glasses for nearly two years and with the greatest satisfaction, and has been able to read as much as he likes; and now follows the vocation of bookkeeping, working from 7.30 A.M. to 6 P.M., using his eyes for evening work as much as he likes, with no discomfort whatever and no headache since using them. I had the opportunity of going over his eyes on the 12th of the present month and found the following, with glasses:

O. D. v. = 6/6.
O. S. v. = 6/6.

All but one or two letters of the 6/6 line correct. His accommodation is as follows:

O. D. 1.00 D. 7' - 20'.
O. S. 1.00 D. 6' - 25'.

The ophthalmometer gave some interesting results. The image of the large white outer circle containing the figures instead of being circular in shape appeared as an irregular ellipse; ax. is at about 100°, the side to the patient's right being much more bulged out than that to the left. The principal meridian was found at about 100°, but in this position the "mires" are very irregular in shape. With the arc in the horizontal position the parallelogram which has its long axis vertical shows in this image the long axis reversed and the borders of it curved, likewise the steps of the notched "mire" are curved, and the lines are seen with much difficulty. When the arc is turned toward the vertical direction the images of the "mires" change in quite a remarkable way. When the arc is half way between the horizontal and vertical meridians, the two images are displaced laterally much more than the width of the "mires" and at the vertical meridian the notched "mire" has passed to the opposite side of the rectangular one, and is distant from it more than its own diameter. In other
words the images of the two "mires" make a complete revolu-
tion about one another when the arc is turned over a semi-
circle. In no position are the borders of the images parallel,
but are greatly distorted and remind one very much of looking
at objects in a concave or spherical mirror. So far as any
accurate measurement of the refraction of this eye was con-
cerned the apparatus was entirely unsatisfactory.

In the left eye the image of the large white circle was
exactly the shape of an egg, with the large end down, its long
axis being at about 100°. In this the images of the "mires"
were somewhat distorted, but fairly accurate measurement of
the astigmatism could be made. In October, 1891, Dr. Tilley
of Chicago saw this gentleman and made some notes which he
has been kind enough to place at my disposal, especially with
reference to the examination with the ophthalmometer and
which quite agree, I think, with my own observations recorded
above. . . .

As time goes on we are bound to take more and more
cognizance of muscular insufficiencies of one variety and
another, and facts which will enable some new genius, as a
Donders, to give rules for the management of these cases,
should be collected so that conclusions of value may some day
be at the disposal of the profession. Neither the exercise of
the various muscles, the wearing of the prism glasses, nor
operative procedures have reached such a stage of accuracy or
perfection that we can predicate in any given case what final
result we can reach in giving relief to the suffering. The
influence of the personal equation in every muscular case is an
element which plays a very large rôle, and until we are able to
estimate this with some degree of accuracy we are likely to
find ourselves disappointed in expected results. Unquestionably
we are able to afford relief to vast numbers of patients by one
or more of these methods of treatment, but we meet with too
many who are not relieved, and who tax our ingenuity and our
patience to the utmost. A few unusual cases I have had in
which the unexpected has resulted to the advantage of the
patient, and these I briefly narrate; and every one may draw
his own conclusions.
CASE 1. MRS. A. H. M., aged 40. Came to me on January 9, 1892, complaining of chronic headaches, with the pain always located in the top and frontal portion of head. Seven months previously had a miscarriage, and since then had been perfectly miserable. Examination gave the following:

O. D. v. = 6/9.
O. S. v. = 6/9.

The ophthalmoscope showed fundus of each eye about normal, and eye emmetropic. At 20' had a vertical insufficiency of 8° and but little or no lateral. I told her I thought an operation would be the only thing which would give relief, but to this she would not listen. The next best thing that I could think of was the proposition to put prisms on and try what they would do for her. I gave her no sort of promise of relief, but told her she might try this glass:

O. D. Prism 3° base down.
O. S. Prism 3° base up.

I heard nothing more from her for four months, when she reported at my office that she had worn the glasses constantly with entire relief to all her symptoms and had not had so little difficulty for 16 years. She was able to use her eyes as much as she pleased for close work and for all purposes, and suffered no inconvenience.

CASE 2. F. R. W., aged 20, a perfect athlete, a student at Cornell University, came to me in August, 1892, complaining of severe headache after much use of the eyes, and recently had been unable to do much work with any comfort.

O. D. v. = 6/6.
O. S. v. = 6/6.

Ophthalmoscope showed nothing abnormal and the eyes nearly emmetropic. Under the use of atropia for four days tests gave:

O. D. + 0.50 D. s. v. = 6/6.
O. S. + 0.75 D. s. v. = 6/6.

I gave him full correction glasses for close work, there being very little muscular insufficiency. In December, 1892, he re-
ported to me that he had to give up entirely his work and was not comfortable using his eyes at any distance, and was wearing a pair of 1° prisms, bases out, for constant use. These gave much relief for going about and distant use of eyes, but were of no advantage in doing close work. I then more carefully examined his muscular condition and found at 20' he had 2° base out insufficiency, but at 15'' had 3° base in insufficiency. Practice with prisms had been carried out for several weeks before this examination, but even with this he was only able to fuse at 20', 2° base up or down, 5° base in and 15° base out. I permitted him to use the same prisms for distant purposes and gave him the following for close work:

O. D. + 0.50 D. s. ⊝ prisms 1½° base in.
O. S. + 0.75 D. s. ⊝ prisms 1½° base in.

There was no insufficiency of the oblique muscles. Since then he has been able to go on with his studies as a law student with entire comfort so long as he keeps to his glasses.

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CASES OF LATERAL HETEROPHORIA IN WHICH THE VERTICAL DIPLOPIA TEST PROVED UNTRUSTWORTHY.

BY SAMUEL THEOBALD, M.D.,

BALTIMORE, MD.

Having, many years since, become convinced that the tests which undertake to determine the strength of the external and internal recti muscles by the amount of lateral diplopia (prismatic effect) which they are capable of overcoming are very frequently misleading, it has been my habit for a long time, in measuring the relative strength of the lateral muscles, to place my chief dependence upon the vertical diplopia test. This test, also, I learned from experience was open to several possible sources of error; but, I found it practicable to eliminate them, and, in the great majority of cases in which I have employed it, it has proved an entirely trustworthy guide. It has been, therefore, a disappointment to me to find, as I have upon OPH.—38
several occasions within the last year or two, that, even when all known sources of error are guarded against, this test may prove entirely untrustworthy.

We all, of course, at the present day, appreciate that in order to obtain satisfactory results with the vertical diplopia test, the refractive condition of the eyes, the presence of anisometropia, and, especially at the reading distance, the tension of the accommodation, must be taken into account, and that the test object employed must be of such a character as to eliminate as far as possible all disposition upon the part of the subject of the examination to blend the two retinal images,—a fault which was conspicuous in the test object originally proposed by Von Graefe. The several cases which I shall report briefly show, however, that, even when all these precautions have been taken, the test occasionally fails entirely to give us a true index of the condition of the lateral muscles. A description of the cases in point will make my meaning plainer, and, to save time, I shall give only such details of each as are necessary for this purpose.

Case I.—Sister M. N., aged 40. Hypermetropia of high grade, anisometropia = 75 D. and astigmatism, according to the rule, in each eye of .62 D. At her first visit, without glasses, and with the test object at 20', the cover test gave marked divergent squint of each eye, with slow return of binocular fixation on removal of the cover, occasionally the squint seeming not to disappear until the eyes were turned away from the test object. The vertical diplopia test gave, with the conditions all exactly the same, a variation in the position of the two images, indicating at one moment exophoria and at the next esophoria of slight degree. Had the relation of the visual axes been the same with the vertical prism as with the cover test, there would have been an exophoria of, probably, 15° or 20°. Two days later, with +3 s. for the left eye and +3.25 s. for the right (which were prescribed at the time for constant wear), the vertical diplopia test gave no insufficiency at 20', although the cover test gave marked divergence, as at the previous visit without glasses. Six months after this, the manifest hypermetropia having increased considerably meantime,
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with +4.50 s. for the left eye and +4.75 s. for the right (giving V. = 20/xx —) there was esophoria at 20', with the vertical prism, varying from 1° to 0°, while with the cover test there was wide divergence of the right eye, and marked, but less wide, divergence of the left eye.

At this examination it occurred to me to try the cover test in combination with the vertical prism (the refraction being corrected as just mentioned), and, to my surprise, I found not only that the covered eye diverged as usual, but that on removal of the cover the divergence disappeared, although the vertical diplopia was maintained by the prism, with about the same degree of promptness as when the cover test alone was employed. In a word, the vertical diplopia seemed to have no controlling influence whatever upon the action of the lateral muscles.

CASE II. — Miss S. G., aged about 15 years, refraction about emmetropic. Unconfirmed divergent squint of left eye, for which a free tenotomy of left external rectus was done, January 19, 1892, with happy result, the squint being corrected and the asthenopia relieved. Four weeks after the tenotomy a test of the muscular balance gave the following contradictory results: Cover test shows at 20' divergent squint of the left eye most of the time, at 13'' divergence which is not always corrected upon removal of cover. Vertical diplopia test (prism before either eye) gives esophoria at 20' varying from 1° to 0°, and at 13'' neither esophoria nor exophoria.

CASE III. — Mrs. S. B. T., aged about 55. Compound myopic astigmatism. With correction as follows: L. eye — 2 s. 112 c. 50°; R. eye — 2.25 s. 135°; giving V. = 20/XLV, the muscular balance was tested, with this result: Cover test gives wide divergence with prompt correction at 20', wide divergence with slow correction at 13''; vertical diplopia gives no insufficiency at 20', and only 2° of exophoria (less than the normal amount) at 13''.

CASE IV. — Miss S. C. N., aged 15. Compound Ah. of low grade, marked exophoria, asthenopia, headache; free tenotomy of R. external rectus February 20, 1891. March 24th cover test gives divergence at 20' with prompt correction; still wider divergence, especially of right eye, with equally prompt
correction, at 13". Vertical diplopia gives exophoria at 20' of variable amount, about 3°, and at 13" esophoria at times of 3° and again exophoria of uncertain amount. Seven months later the tests were repeated with the following result, the error of refraction not being corrected: With cover test, decided divergence (either eye) at 20' and at 13", with deliberate recovery. With vertical diplopia, no insufficiency at 20' or at 13", dots varying in position at each distance, indicating at one moment slight esophoria and at the next slight exophoria. Had the relation of the optic axes been the same with the prism as with the cover test, a high grade of exophoria would certainly have been shown.

Case V. — Mr. W. W., aged about 44. Hypermetropia in left eye, comp'd Ah., against rule, in right eye, insufficiency of externi. Is wearing for near and far L. eye + 2.25 s. = Prism 3° base out; R. eye + 2.25 s. ⊕ + 1.50 c. 180°. This case presented the same phenomenon described in Case I, the disappearance of a squint produced by the cover test, notwithstanding the presence of induced vertical diplopia. With his correcting glasses the vertical diplopia test showed only 4° of esophoria at 20'; with no glasses, it gave at the same distance esophoria varying from 9° to 0°. The cover test, without glasses, gave marked convergence (either eye) with usually prompt recovery, but occasionally the squint would remain for some moments after the cover was removed. When, with the vertical prism in position, the cover test was employed, the excluded eye would at once squint decidedly in, and upon removal of the cover the squint would disappear with about the same promptness as when the cover test alone (without vertical diplopia) was employed.

The foregoing cases do not constitute all those of similar character which I have met with in the past two or three years, for there are doubtless some that I have not been able to recall; but, supposing the total to be twice the number reported, it would still be very small, and quite insignificant when compared with the whole number of cases in which the vertical diplopia test was employed during the period named. While, therefore, disappointed, as I have said, at finding even a few
cases in which this test failed me, I continue to employ it daily, and regard it as having great practical value.

I have endeavored to find a satisfactory explanation of the phenomena I have described, but without success. The first explanation that suggested itself was that, while the two images of the test object were certainly not fused (in the tests with the vertical prism), possibly the ends of certain vertical lines present in the two retinal pictures, such as the edges of the card upon which the asterisk employed in the near test stands or the margins of the blackboard which carries the white disc used in the test at 20', were unconsciously blended; but, this, at most, would have given lateral orthophoria, whereas the vertical prism gave esophoria in several of the cases reported, while exophoria of high grade was shown by the cover test.

Again, if we assume the presence of marked anisometropia, and suppose that with the cover test the fixation was with one eye, and with the vertical diplopia test with the other, we might account for a marked difference between the results of the two tests; but, this source of error was eliminated, at least in all but one of the cases, by excluding first one eye and then the other in applying the cover test.

Complete relaxation of accommodation during the cover test and tension of accommodation with the vertical prism could hardly account for the discrepancies observed, for the same test objects were used in each instance, and every effort made to guard against just such a misadventure as this.

DISCUSSION.

DR. HENRY D. NOYES, New York. — I do not wish to open a discussion on this subject, but the observations of Dr. Theobald are entirely in accord with what I printed some years ago, namely, that this experiment is only one of a number of experiments which we must perform in determining the muscular condition.

In regard to the explanation proposed, a suggestion can be made. The function of binocular vision is in its essence a cerebral function. It is a function over which the visual portion of the cortex presides. When a device is used to make fusion of the images impossible it does not follow that the dominating influence of the cerebral cortex can be entirely elimina-
ted. It is true that that is usually the result, and that under such a suspension of its potentiality, so to speak, the eyes may take the position proper to the muscular condition, but inasmuch as the cerebral function and the muscular co-operation are not linked together in an absolute and unvarying manner, I think that it will be found that in that lies the explanation of the irregular behavior of different individuals in the employment of these tests. It is the cerebral function of vision with which we are dealing, and it does not follow that the muscles invariably blindly surrender themselves or continue their previous activity according to whether we suspend the cerebral function of vision or not. That to my mind is the clearest physiological explanation of the varying conditions we find in practice.

DR. EDWARD JACKSON, Philadelphia.—This thought, it seems to me, is worth bearing in mind with reference to the tests which Dr. Theobald has described. The whole co-ordinating apparatus by which we secure binocular vision is adapted to overcome the conditions that we produce by our diplopia tests. If for any reason the eyes are not properly directed and diplopia comes about, it is the function of this co-ordinating mechanism of muscle and nerve to change the position of the eyes so that the images shall fall upon corresponding parts of the retinas. When we test for heterophoria by removing one image from the other beyond the physiological limits, we set ourselves squarely against this physiological function. Under slighter stimulus, the mechanism in question is excited to do its utmost, and I see no reason why in a large proportion of cases, it should not be excited by our tests, so that we should get a condition of excessive action rather than a condition of relaxation.

It is worth while to separate those tests in which the two images are removed from each other by such an interval that the normal muscles cannot bring them together, from those tests in which one image is so changed that there remains no tendency to fusion. In my experience the latter class of tests is decidedly the better, although inferior to the test of covering one eye.

I regard the testimony of the objective test as most credible with reference to the condition of rest. But a test like the rod test, where we do not remove the images one from the other but allow them to be superimposed, preventing fusion by their difference, is superior to the tests with diplopia by prisms. What I have recently used with a great deal of satisfaction is the test of covering one eye with a very dark glass, thus avoiding the tendency to fusion.
We have had for a near only the Graefe test or its modifications. It is quite difficult to use points of light or colored glasses for the near test, but the rod test can be so modified that it can be used satisfactorily as a test of the tendency of the muscles at the near point. The modification is to simply use a weak enough cylinder to get an elongated image of a dot on white paper. With a cylinder of 6 to 12 D. you get with one eye an elongated image and with the other a round image, which will separate where there is a tendency for the eyes to diverge.

DR. B. ALEXANDER RANDALL, Philadelphia.—The point made by Dr. Noyes seems to me of great importance in its application both to our tests and to our therapeutic measures. It must not be left out of sight that we are dealing with an active organ that does not submit itself to purely physical laws, and that whatever the results of our tests, they are guiding and not absolutely directing factors to be logically followed in the treatment of our cases. We may find in some cases that at one time there is comfort and at another discomfort, the conditions remaining the same. It has been my experience that where the exophoria has remained the same, years of comfort have alternated with years of discomfort. The eyes themselves are constantly making experiments as to how far they can relieve convergence or divergence, and are working without that perfect static adjustment which we assume to be a necessary condition. Orthophoria is the exception, not the rule, as I have previously shown. Such findings, I am sure, are frequently met, and these eyes show variations at our tests because they are in the habit of making these experiments.

DR. MYLES STANDISH, Boston.—With reference to a point brought up by Dr. Jackson in regard to the rod test and the vertical diplopia test, I should like to say a word. When the rod test was first brought to my attention, I hailed it with enthusiasm. I thought that by it I had a means of obviating certain errors which I believed to exist in the vertical diplopia test. For a long time I used it on every case in conjunction with the vertical diplopia test. Instead of finding a discrepancy between the two, the results were almost entirely identical, and my theoretical objections to the vertical diplopia test were dissipated.

DR. SAMUEL THEOBALD, Baltimore.—I have no doubt that the explanation given by Dr. Noyes, as far as it goes, is the true one: that for some reason or other the brain control over the action of the lateral muscle is not always annulled by the vertical diplopia test, while it is annulled by the cover test. I
think that this still leaves a great deal to be desired, however, to make these cases intelligible. I may say that in one or two of the cases I used the Maddox prism, and the result was practically the same as with the vertical diplopia test. I use the Maddox prism to test the vertical deviation, but not, as a rule, the lateral deviation.

In regard to the test at the reading distance, I long ago found that there is a great tendency to blend the two ends of the vertical line suggested by von Graefe, and the test that I have used is a small printed asterisk, without the vertical line, the object being to stimulate the accommodation and to avoid the fusion just referred to.

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ON THE REMOVAL OF HARD CATARACT BY SUCTION.

BY LUCIEN HOWE, M.D.,
BUFFALO, N. Y.

It is probable that every operator in the removal of cataract has occasionally experienced some difficulty in satisfactorily completing the final act of extracting the lens. In the endeavor to make the corneal incision just large enough to allow the lens to escape, he finds that he has misjudged the size of the nucleus. Whether an iridectomy has been made or not, he discovers that, although the lens engages properly in the wound, although every portion of the operation up to that point has been a perfect success, a difficulty now presents itself. For the lens will not advance. To press below either with an instrument or with the lid simply bends that portion of the cornea in deeper, and if, as usual, the spoon is used, the epithelial coat is abraded more and more, in proportion as the efforts to extract the lens are greater. On the other hand to press above on the sclerotic causes the additional danger of having the lens advancing suddenly beyond its widest diameter and then shooting up, to be followed by a gush of vitreous humor. It may be said that if the wound is
in proportion to the size of the cataract this complication would never occur. Quite true. But the fact that every operator occasionally loses vitreous at this stage demonstrates this difficulty of making the wound exactly proportional to the cataract. Every one, I think, has attempted at this point to catch the lens with forceps and draw it outward, and every one also has had the chagrin of finding that the soft semi-tenacious mass does not allow of any traction. Occasionally it is possible to lift one edge of the lens slightly out of the wound, and it is astonishing how little force is required to disengage it from its perilous position.

Many years ago, in one of Knapp's reports of cases, I remember the remark that it would be advantageous if we possessed a pair of forceps similar to those used by the obstetrician. I had often recalled this observation when confronted by the disagreeable difficulty to which I refer. A pair of forceps is of course out of the question, but some time since it occurred to me that a simple device might be employed to lift the cataract when it is thus partly projecting from the eye, and I put the suggestion into practice by applying in suitable time, a large dropping tube, which, acting as a partial vacuum, catches the protruding lens and in this way enables it to be drawn out further. An elaboration of this principle is what I wish to call attention to in this short communication. Taking the ordinary dropping tube I changed the curvature of the end and enlarged it; of late I have had some blown about the size of the ordinary dropping tube, but with an opening, sufficiently narrow in one direction, and long in the other, and with the end slightly curved on the longitudinal diameter, to enable these points to fit with a certain degree of exactness upon the edge of the partly projecting lens. A great deal depends upon the exact size and form of this opening of the tube. The addition of even a millimeter to the thickness of the glass at this point materially interferes with the usefulness of the instrument. The opening itself should be slightly curved upon the long diameter, the radius of the curve corresponding to the radius of the crystalline lens. It is absolutely essential that the glass should be as thin as possible. In this form the instrument serves the desired purpose, but it is
entirely useless if the opening is not of the proper size, or the glass too thick.

In obtaining the vacuum, various trials have been made with a large syringe provided with a spring on the interior, which pushed out the piston, and thus created a vacuum. An exhaust air pump of considerable pressure has also been used, but the easiest of all methods to obtain the vacuum is mouth suction. In other words, a piece of thick rubber tubing is fastened to the glass tube and the other end (furnished for convenience with a mouth piece) is held between the lips while the glass point is attached to the lens.

In using this suction tube it is usually sufficient to draw down the globe of the eye with the fixation forceps in the left hand and, holding the tube with the right, apply the end to the lens. With proper suction, the projecting portion at once engages in the mouth of the tube, is held fast to it, and a very slight traction is necessary to remove it compared with the pressure usually exerted on the cornea below or the sclerotic above. Should it be desirable to press at the same time that suction is used, of course the hand of an assistant is necessary; in which case it is safer to have him fix the globe while the operator presses with the left hand, and holds the suction tube in the right. Although this suggestion is simple, and the principle not entirely new, I think those who care to make the trial will find this a valuable assistance, in a moment sometimes exceedingly critical.

DISCUSSION.

Dr. Emil Gruening, New York.—It has happened to every operator to find that the wound is not proportionate to the size of the lens. The most experienced operator may make the section too small, but he should be taught to enlarge it. This is simpler than to put a suction tube over the eye.

Dr. A. Mathewson, Brooklyn.—A plan which I have sometimes followed with satisfaction where the lens has engaged and pressure seemed to endanger extrusion of the vitreous, has been to have an assistant with a double hook rotate the lens from one edge to the other. I do not try to introduce it into the anterior chamber. This has succeeded better than any other plan.
RESTORATION OF THE UPPER LID BY A PEDI-CLE-FLAP TAKEN FROM IMMEDIATELY BELOW THE LOWER LID.

BY S. B. ST. JOHN, M.D.,

HARTFORD, CONN.

Distortion of the eyelids from the contraction of cicatricial patches near the eyes, whether as the result of burns, ulcers, abscesses, or lacerations, often present to the ophthalmic surgeon a problem difficult of solution. The same problem is encountered when, after removing a tumor of the lid involving the skin, a large denuded surface is left, which if allowed to granulate and cicatrize will inevitably result in lid distortion when the cicatricial contraction occurs. Hence the various ingenious devices with which we are all so familiar, and which have all one aim, viz., to prevent a denuded surface from granulating by covering it with new skin. This new skin may represent only the epithelial layer as in the Thiersch method of grafting, or may be the whole thickness of the true skin as in Wolff's transplantation method, where the skin is taken from the arm and freed from all its previous vascular connections, or lastly it may be a flap of skin dissected up from a region immediately adjoining the space which it is destined to fill, care being taken to preserve the vascular connection by leaving uncut a fairly broad base through which the nutrition of the flap may be assured. This pedicle-flap is raised from its bed, and by sliding or twisting is brought into the gap it is destined to fill. The vacancy resulting is filled usually by undermining the edges and bringing the opposite edges of skin together, or by sliding another flap into its place as suggested by Dr. Harlan (Trans. Am. Oph. Soc., 1891), if it is desirable to shift the position of the surface that must be allowed to granulate.

The method I am about to describe has certain features which so far as I know have not yet been brought forward. The nearest to it that I can find is the operation of Fricke,*

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* Die Bildung neuer Augenlider (Blepharo plastik), J. C. G. Fricke, Hamburg.
but Fricke took his flap from the temple to repair the gap in the upper lid, whereas in my operation it is taken from below the lower lid and care is taken to so place the incisions that the cicatrix beneath the eye shall fall in the natural furrow that is found at the lower edge of the orbicularis muscle. It is a very common procedure in filling a gap in the upper lid to "turn in" a flap from the temple, a less common one to take it from the forehead or side of the nose, a still less common one to take it from the side of the face, while, as above stated, I have found no description of one taken from immediately below the eye and carried across the eye to repair the gap in the upper eyelid.

The method is especially applicable to cases where a large gap is to be repaired, for it is easy to obtain a flap having a breadth of an inch at its center. It is of course to be recommended where by reason of cicatrices on the temple or forehead these regions are unavailable, but in my opinion the cheek is the preferable region from which to take the flap, even if the temple and forehead are intact, as the scarring is less and the pedicle of the flap undergoes less torsion, while the course of the nutrient arteries is such as to offer a practical guarantee against sloughing of the flap.

In both of the cases in which I have done this operation, illustrations of which are herewith presented, it was done to rectify serious deformity by reason of displacement of the upper lid, in the one case it being drawn directly upward and in the other upward and outward and accompanied by considerable eversion. In the first case (Fig. 1) it was a second operation, I having previously done a Wharton-Jones operation, which resulted in bringing the edge of the lid from the line of the eyebrow down to the position seen in the figure. (The scar upon the forehead represents the lines of incision in the Wharton-Jones operation.)

The first step is to free the edge of the lid so as to be able to replace it in its original position. By making the incision about 2 mm. from the ciliary border along the whole lid I was able in each case to effect this, though in the case of the young woman (Fig. 3) it required much additional dissection, in the course of which a vein had to be ligated on both sides of the
dissection area and divided between the ligatures. The edges of the lids were slightly pared and the upper and lower lids united by four sutures, which were left in position for several weeks. The incision by which the lid-edge was freed was extended outwardly to a point about 3 cm. from the external canthus, and from this point a curvilinear incision carried following the natural fold and keeping about 2 cm. from the edge of the lower lid. This incision extends to the side of the nose and then turning sharply upon itself runs in a slightly crescentic curve (concavity upwards) below its former course and distant from it, at a point exactly below the center of the lid, from 2 to 3 cm. according to the width of the gap to be filled. This incision is prolonged in the direction of the ear at least one and one-half inches beyond the external canthus, and an incision from the upper edge of the gap left when the lid was dissected free is also carried outwardly parallel to the one just described. The tongue-like flap below the eye is then dissected up and the dissection carried to a point at least an inch beyond the canthus.

![Fig. A.](image1)

The flap is then laid in the gap to be filled and secured by numerous fine sutures. The large gaping wound left upon the cheek is filled by undermining with scissors the lower edge only, and this undermining must be very extensive, at least two inches in order to have as little tension as possible to avoid dragging upon the lower lid. To still further avoid dragging, I use a sling of adhesive plaster made broad below to spread out over the lower maxilla and rapidly narrowing as it passes up-
ward. This is made to adhere firmly to the skin covering the maxilla and then, the cheek being held firmly up, the narrow part of the plaster is passed over the head and fastened to the skin of the forehead and back of the neck. In the two cases in which I have used this method I found no trouble whatever from dragging upon the stitches, and think I could have taken a much wider flap had it been necessary. The annexed woodcuts show Fig. A, the lines of incision, and Fig. B, the lines of suture, in the case of the young woman (Fig. 3 and Fig. 4).

Case I.—C. M., a lad about 14 years old, had the middle half of the upper lid shot away by the discharge of a pistol which he had placed, muzzle upwards, in his pocket while getting over a fence. The wound involved only the skin and subcutaneous tissue. When healing and contraction had taken place, the center of the edge of the lid was fastened at the line of the eyebrow and the deformity was very marked, closure being impossible even by forced effort. After the Wharton-Jones operation the appearance is shown in Fig. 1. He could then close the eye by moderate effort, but it did not close in winking and was always open during sleep. Fig. 2 shows the result of the flap operation. This was my first operation and I think the flap was made broader than was necessary, giving an appearance of unnecessary fullness to the upper lid, which however has lessened somewhat since the photograph was taken.

Case II.—Miss E. N., 25. About six years before she came to me she was caught by revolving shafting in a mill and her entire scalp torn off from forehead to occiput, including the most of one ear. The vast granulating surface was, by the patient skill of her physician and the sacrifices of many friends who contributed bits of skin, brought nearly to a complete cicatrization by the process of skin grafting, but the contraction which resulted produced the deformity shown in Fig. 3. In this case the right side only was operated on, but the result shown in Fig. 4 was so satisfactory that she is considering the question of having the operation done upon the left side.

Discussion.

Dr. Knapp, New York.—I have always been in the habit of replacing injuries in the upper lid by flaps from below and
vice versa, in order to diminish the effects of contraction. I have commonly taken the flaps from a little lower down.

Dr. Lucien Howe, Buffalo.—Why did Dr. St. John prefer this operation to the ordinary Wolfe method? The latter has the advantage that it does not make any scar, and, in the second place, if it is a failure, as it is in only a small proportion of the cases, another operation can be resorted to. I had occasion to go over this subject before the Society when I reported a case, one of the largest on record. The flap was a little over three inches in length, but subsequently it was none too large. I see no occasion to vary my view that this operation is always worthy of trial at any rate for the first operation.

Dr. Charles S. Bull, New York.—In the first case which I saw operated on by Dr. Loring, a large flap from one side of the fore arm entirely disappeared. This has occurred to me half a dozen times. In doing that operation, I always bear in mind the possibility of failure.

Dr. Henry D. Noyes, New York.—The mode of operation described is not especially new. I have resorted to it a number of times. The Wolfe operation has become comparatively unsatisfactory in my practice, with a certain number of successes I have had a great many failures which, were so nearly total that while I continue to employ it as the first method in some instances, I am by no means enthusiastic about the ultimate issue. In a case of excessive burn of the scalp, forehead, and face I resorted to the Wolfe method. The first flap entirely disappeared and that was in a measure due to the great exhaustion of the patient from long continued suppuration. Subsequent operations were successful to a greater degree, when after the lapse of time the cicatrix on the forehead had acquired sufficient firmness that I could use it. It is not rare to find that in time cicatricial tissue will acquire sufficient vitality to bear transplanting.

If in order, I should like to speak of something akin to the present subject, viz.: the result of operation for transplantation after the method suggested by the President two years ago for the cure of deformity of symblepharon. An Italian had his face burned, I think by lime, the right eye being affected so that the lower lid went up over the lower third of the cornea. The outer and inner canthi were obliterated and there was intimate adhesion between the lid and the eyeball. For such a condition I know of no method of any real value except what I shall refer to. The introduction of a Thiersch graft or a Wolfe flap, would according to my experience be of no value in attempting to restore the cul de sac of the eye. In this case
I separated the eyeball down to where the cul de sac should be and then made an incision through the skin. From that point downwards a rectangular flap was taken and dissected upwards like a shutter and tucked through the incision in the skin so that the skin surface was applied to the eyeball and the raw surface to the lid. The flap used was large, so that I had to make an extraordinary dissection of the face to close the gap, but I succeeded in doing it. The process of healing went on satisfactorily and it was interesting to see how the epidermis not only became softened but assumed the character of mucous membrane. On the eyeball redundant granulations sprang up, and it was necessary to cut them down with pure nitrate of silver. After three weeks I could not fail to realize that there was gradual cicatization coming in from the sides and that the parts were to a certain degree agglutinated. In the end, however, the result was that I had established a condition in which the eyeball could be elevated as it could not before and the lower portion of the cornea was visible. The lid adhered to the ball below the cornea. At each corner there was an opening through which a probe could be passed. The final result was an improvement to a moderate degree of the original condition, but I was impressed by yet another experience of the extreme difficulty of coping successfully with symblepharon when the cohesion of the surface is extensive and complete.

Dr. E. E. Holt, Portland.—Dr. Noyes says he knows of no other way of successfully treating a case such as he describes. I was not aware that it was so difficult. I had a case this year where the lower lid was adherent to the eyeball by strong bands throughout its entire surface. These were dissected off and a thin piece of lead, conformed to the shape of the eyeball, was placed between it and the lid. This lead was allowed to remain till cicatization was complete, and a successful result was obtained so far as the removal of the symblepharon was concerned.

Dr. Henry D. Noyes.—I tried the lead plate twenty years ago, but have given it up.

Dr. William H. Carmalt, New Haven.—The ultimate result of a Wolfe transplantation is not to be determined in a few months. I have tried it in many other parts of the body besides the eyelids and have found that the process of atrophy or absorption will go on for several months with most disappointing results; flaps which at completion of union all around seemed to be all right would subsequently atrophy and shrivel away to almost nothing. I have especial reference to plastic operations undertaken to relieve the deformities produced by deep burns where the resulting cicatrix has by contraction rendered a limb more or less useless; in dissecting out the scar
and supplying the gap with fresh and healthy skin, although the first effect might bid fair to give a useful member, the result at the end of two years, more or less, has been unsatisfactory in the contraction returning to nearly if not quite the original condition.

Dr. Lucien Howe, Buffalo.—I was aware that a certain amount of contraction takes place. In fact, after the epithelial coat comes off, one can see the contraction. It is new to me to hear that the entire flap could be absorbed. In the case that I referred to the deformity had not materially increased in a year and a half or two years.

Dr. S. D. Risley, Philadelphia.—The President will, I think, recall the case of a burn involving both the upper and lower eyelid in which he kindly aided me, placing a plant from the arm. The upper eyelid was drawn strongly upward, the cilia being joined with the hairs of the eyebrow. The cornea was exposed and as a consequence subject to superficial ulceration. The edge of the lid was freed from its attachment, and the upper and lower lids stitched together. A gaping crescentic wound was left two centimeters broad at the center. This was filled by transplantation. The plant adhered throughout by first intention, appeared rosy and healthy for six days, and then turned gray and leathery, and was slowly thrown off as a slough or absorbed. The result was a gain of about 6 mm. Later the lower lid, which was drawn strongly downwards, was freed at its border and stitched to the upper lid. The resulting open wound was then covered with the thin Thiersch grafts taken from the fore arm, all of which adhered promptly, giving an almost perfect result. After three months but little contraction had taken place. Subsequently I employed the same method with a much more extensive burn of the face. The contracting scar had drawn the eyelids strongly outward to the temple, and there remained still a large open surface over the malar bone, which would not close owing to the severe tension in all directions. This was covered with the Thiersch grafts which led to prompt healing of the granulating surface. The contraction of the surrounding scar tissue, however, soon broke down the delicate pellicle of epithelium. The grafting was repeated, but with the same result. A vertical incision was then made through the cicatricial tissues in such a manner as to free the outer strain upon the eyelids, and a second horizontal incision passing backwards from this in order to free the tension in the opposite direction. The result was a large triangular wound, left by the withdrawing of the cicatricial tissues from the lines of incision. This was filled with the Thiersch
grafts, which adhered promptly, entirely closing the wound with an epithelium covering, the result being most gratifying. The eyelids assumed gradually an almost normal position: the great discomfort produced by the tense scar tissue entirely disappeared, and the appearance of the face was markedly benefited. After four months the wound was still closed; some contraction had taken place, but far less than I have ever seen follow any transplantation procedure of the thicker grafts.

DR. SAMUEL THEOBALD, Baltimore.—I wish to say that one of the two cases of transplantation by the Thiersch method reported two years ago, has been under observation ever since. There was an extensive burn of the lids and forehead from sulfuric acid. Two weeks after the accident I transplanted after the Thiersch method, making a number of successful grafts. There has been no contraction since the report.

DR. EDWARD JACKSON, Philadelphia.—Apropos of Dr. Noyes' case, I would say that Dr. Hotz has used the Thiersch skin grafts to the conjunctiva, and Dr. de Schweinitz showed at a meeting of the Ophthalmological Section of the College of Physicians, a case in which several months before Thiersch's grafts had been placed on the eyeball for symblepharon. The surface had become smooth and slightly opaque. There had been no serious contraction and the condition had been completely relieved. Even in a case as bad as Dr. Noyes's, it would be possible to place on the globe such grafts, and even if a raw surface were left inside the lid, there would be little danger of adhesion.

DR. SAMUEL D. RISLEY, Philadelphia.—In quite a number of cases I have tried the Thiersch graft to the eyeball. The main difficulty that I have experienced has been in keeping them in place on account of the collection of tears. In only one instance did I succeed in keeping the graft in contact. Even then one edge had been lifted up by the tears.

DR. R. A. REEVE, Toronto, Canada.—In a case reported by me some years ago, where a most successful result was obtained, the patient did not reappear for a year and the lids were allowed to remain united for that time. I think this was the reason there was so little after-contraction, and that the good result persisted. It seems important to keep the lids united for a longer period than some do.
CASE OF SINGLE PULSATING EXOPHTHALMOS DUE TO TRAUMA. LIGATION OF BOTH COMMON CAROTIDS, WITH IMPERFECT RESULT.*

BY R. A. REEVE, M.D.
TORONTO, CANADA.

William S——, of B——, a robust young man, presented himself October 7, 1890, with the following history: About six months previously he had been kicked by a horse, receiving the blow on the inferior border of the inferior maxilla just in front of the ramus, on the right side. He was knocked down but not rendered unconscious. In two days a very “fine” noise, “a kind of squeaking in a high key,” was heard in the right ear; and a few days later, moderate convergent squint of the right eye with diplopia appeared. About four weeks after the accident pulsatory and “threshing-like” noises began; and prominence of the right eyeball and well-marked swelling of the veins of the adjacent parts developed. There has been but little pain.

Present condition:† The eyelids of the right side are dusky and swollen and the veins of the temple and right half of the forehead much distended and quite sinuous. There is marked proptosis, so that the eyelids cannot be brought together. The center of the right corner stands out from (temporal) rim of orbit 13/16 in.; of the left 8/16 in. Outward displacement 7/16 in., downward 1/5 in. Marked swelling and tortuosity of conjunctival veins; caruncle large and fleshy and projecting between lids; paresis of right external rectus, the image being projected upwards 5° and outward 30°. V., O. D. = 20/ xl; O. S. = 20/xxx. Field of vision normal, also pupillary reaction. There is hyperaemia of the right optic disk and a slight retinal sheen. Vessels sinuous but not larger than those of the left side, which are straight. On palpation of the lids a distinct

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*This paper was read at the 28th annual meeting, but was unavoidably omitted in the Trans. for 1892.
†See Figs. 1 and 2.
thrill is felt, and also pulsation in the veins along the brow. Steady pressure diminishes the proptosis but increases the noises in the right ear. The right globe jumps forward 1 mm. at every systole. A low bruit and confused churning noises can be heard on auscultating at the right temple, but much more loudly at the inner end of right brow; and they cease at once upon making firm pressure on the right common carotid. At

the same time the greatly distended orbital veins become flaccid and slight pressure suffices to reduce the proptosis.

Diagnosis: In view of the nature of the injury and of the symptoms a diagnosis was made of aneurismal varix from rupture of the internal carotid artery in the cavernous sinus, with pumping of arterial blood into the orbital veins.

Treatment: The patient was put upon potassium iodide,
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digitalis and ergot; compression of the right common carotid to be practised, and to be kept up as long continuously as could be borne.

At the end of one week there was a slight but distinct decrease of the displacement. At a meeting of the Toronto Medical Society where the patient was then shown, ligation of the common carotid was favored by one or two surgeons as likely to effect a prompt and radical cure, but the writer preferred to test the effect of pressure in conjunction with a course of potassium iodide, because there were no urgent symptoms present, the sight was good, there was no pain, the process was seemingly at a standstill, and compression had availed in various cases; while, on the other hand, ligation had sometimes failed, and was itself not quite free from risk. The

FIG. 2.
patient returned on February 11, 1891, in about the condition of the previous October. Compression of the carotid (and potassium iodide) had been faithfully tried. Indeed, a rude truss had been made so that pressure could be kept up for hours continuously without the fatigue of digital compression.

At my request, ligation of the right common carotid was done (Feb. 14th, 9 a. m.) by Dr. I. H. Cameron, assisted by Doctors G. A. Peters and A. Primrose, and Scadding (anaesthetist). A single ligature was applied in the “triangle of election.”* The subjective noises, bruit, and pulsation were arrested by the operation, but they returned in a few hours, though with much diminished intensity. Unfortunately, there were frequent attacks of vomiting during the first day.

Feb. 15th, p. m. No subjective noises or pulsation of veins at the time of visit.

Feb. 17th. There was a short cessation to-day.

Feb. 20th. Only the original note in a high key is heard. No pulsation is felt on pressing the finger-tip deeply into the dilated but now soft ophthalmic vein. Opening the mouth widely stops the bruit.

Feb. 21st, p. m. V. = 10/xv. Bruit stopped a half-hour to-day. There is distinctly less superficial engorgement and proptosis. The ophthalmic vein pulsates slightly but is soft.

Feb. 23d. For two or three days occasional compression of the left common carotid has been made for a short time; and this arrests all pulsation and bruit for the time being. Patient reports that now and then to-day the noises heard would take a higher key and then stop suddenly, to return in a few minutes.

Feb. 26th. Pulsation in right external carotid first noted to-day, and compression of this vessel stops the venous pulsation.

March 4th. Patient returned home taking double truss in order to practise pressure on the right external and the left common carotid. V. = 20/xxx.

On his return September 17, 1891, the patient reported that he had applied the truss during the daytime for two months, and nearly every night. Sometimes the noise would

* The wound healed by first intention.
not return for an hour after he took off the pressure. He had
done some light farmwork during the summer, and for two weeks
or more during that period he was free from the noises even
when at work. The bruit was, however, always heard when the
patient went to bed. Ordinarily, it would cease for a half-hour
after rising and would also stop for a few minutes several times
in the forenoon, continuing pretty steadily during the afternoon.
For the past two weeks the noises have been barely perceptible
except when stooping or recumbent.

Pressure on the right external or the left common carotid
stops all noise, and the pulsation in the orbital vessels. There
is little or no displacement of eye downwards; 2\text{1/16} in. out-
ward, but the proptosis is about as before the operation. The
right brow is a good deal higher than that of the left, and it
and the upper lid are also made prominent by a doughy sac-like
dilatation of the emergent veins. The latter are felt to pulsate
slightly, and are easily emptied by pressure. There is also
slight pulsation of the eye, but none of the retinal vessels.
The right retinal arteries are double the calibre of the left and
the veins are also larger and sinuous. \( V = 20/\times \text{L} \), 5 Jaeger at
8 inches. No lens accepted. Field of vision normal. Eyes
parallel; partial paresis of right external rectus; diplopia only
to the right of vertical mesial line. \( V \text{., O. S.} = 20/\times \text{xx} \).

When seen again, Feb. 4, 1892, the patient said that for
about a month after his last visit (Sep. 17th,) and again during
the past month, he had worn the truss so as to compress the
left common carotid, but a low bruit would continue in spite of
its use. \( V = 20/\times \text{xx} \text{ and with plus } 0.50 \text{ cyl.} = 20/\text{xx} \). Image
up \( 4^\circ \) and out \( 4^\circ \). Displacement about as last reported.

Feb. 8, '92, 9.30 A.M. The left common carotid was tied
by single ligature by Dr. I. H. Cameron, assisted by Doctors
Peters and Primrose, with Dr. Scadding, chloroformist. The
bruit and pulsation went on as before, but they were at once
arrested by compression of the right external carotid. When
seen at 10 P.M., the patient reported that the tinnitus was quite
loud on his awakening, about 12 M., but it had gradually
lessened, changing to a sort of purring noise. Auscultation
yielded a kind of purring bruit and also a low but distinct
musical note. A thrill could be felt in the ophthalmic artery, the enlarged ophthalmic vein was less prominent and was quite soft, and there was less congestion of the ocular vessels and less proptosis. The sight was unimpaired. The retinal veins were full; the arteries small and wavy and of varying calibre as if from defective vis-a-tergo. There was no vertigo or headache. The operation was not followed by any untoward symptoms, but the patient was kept in bed for ten days to ensure desirable quietude.

Although pressure on the right external carotid would stop the pulsation and bruit, it was decided upon consultation to defer tying this vessel until time enough had elapsed to show the full effect of the second operation. Moreover, the ligation of the external carotid low enough to be effective was agreed to be difficult; and the possibility of its failure, by virtue of the anastomosis of its branches with those of the vertebral, was borne in mind.

The patient was heard from several months after his return home, and appeared to be in the condition last noted.
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