[Transactions of the American Ophthalmological Society] ; Transactions of the American Otological Society : second annual meeting, Newport, R.I., July, 1869.

Dupl. Imperfect.

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MEMBERS

OF THE

American Ophthalmological Society.

ACTIVE MEMBERS.

Dr. C. R. Agnew	New York,	New York.
Dr. C. M. Allin	" "	" "
Dr. H. Althof	" "	" "
Dr. F. J. Bumstead	" "	" "
Dr. William H. Carmalt	" "	" "
Dr. Edward M. Curtis	Oswego,	" "
Dr. Edward Delafield	New York,	" "
Dr. Francis Delafield	" "	" "
Dr. H. Derby	Boston,	Massachusetts.
Dr. John H. Dix	"	"
Dr. A. Du Bois	New York,	New York.
Dr. E. Dyer	Philadelphia,	Pennsylvania.
Dr. John Green	St. Louis,	Missouri.
Dr. A. D. Hall	Philadelphia,	Pennsylvania.
Dr. Gustavus Hay	Boston,	Massachusetts.
Dr. J. H. Hildreth	Chicago,	Illinois.
Dr. John H. Hinton	New York,	New York.
Dr. Edward L. Holmes	Chicago,	Illinois.
Dr. W. Hunt	Philadelphia,	Pennsylvania.
Dr. B. Joy Jeffries	Boston,	Massachusetts.
Dr. H. Knapp	New York,	New York.
Dr. Edward G. Loring	" "	" "
Dr. Arthur Matthewson	Brooklyn,	" "
Dr. T. G. Morton	Philadelphia,	Pennsylvania.
Dr. Russell Murdoch	Baltimore,	Maryland.
Dr. Homer G. Newton	Brooklyn,	New York.
Dr. Henry D. Noyes	New York,	" "
Dr. J. F. Noyes	Detroit,	Michigan.
Dr. O. D. Pomeroy	New York,	New York.
Dr. Orestes M. Pray*	Brooklyn,	" "
Dr. J. S. Prout	"	" "
Dr. Charles E. Rider	Rochester,	" "
Dr. C. A. Robertson	Albany,	" "
Dr. D. B. St. John Roosa	New York,	" "
Dr. Henry B. Sands	" "	" "

* Deceased.

Dr. W. W. Seely	Cincinnati,	Ohio.
Dr. Henry L. Shaw	Boston,	Massachusetts.
Dr. Francis Simrock	New York,	New York.
Dr. Francis P. Sprague	Boston,	Massachusetts.
Dr. O. F. Wadsworth	"	"
Dr. Robert Watts	New York,	New York.
Dr. A. D. Williams	Cincinnati,	Ohio.
Dr. E. Williams	"	"
Dr. Henry W. Williams	Boston,	Massachusetts.

Total 43

HONORARY MEMBERS.

Dr. G. A. Bethune	Boston,	Massachusetts.
Dr. Isaac Hays	Philadelphia,	Pennsylvania.
Dr. R. Hooper	Boston,	Massachusetts.
Dr. John Jeffries	"	"
Dr. E. Reynolds	"	"
Dr. C. Schweigger	Berlin,	Prussia.
Dr. George Wilkes	New York,	New York.

Total 7

Whole Number 50

AMERICAN

Ophthalmological Society.

The American Ophthalmological Society held its sixth annual meeting at the Atlantic House, Newport, Rhode Island, July 21st, 1869. It was called to order by the President, Dr. H. W. Williams, of Boston.

The following members were present:

Dr. C. R. Agnew ..... New York, N. Y.
" C. M. Allin ..... " "
" H. Derby ..... Boston, Mass.
" John H. Dix ..... " "
" E. Dyer ..... Philadelphia, Pa.
" John Green ..... St. Louis, Mo.
" G. Hay ..... Boston, Mass.
" E. L. Holmes ..... Chicago, Ills.
" W. F. Holcomb ..... New York, N. Y.
" B. J. Jeffries ..... Boston, Mass.
" E. G. Loring ..... New York, N. Y.
" Henry D. Noyes ..... " "
" C. E. Rider ..... Rochester "
" D. B. St. John Roosa ..... New York "

The following gentlemen were invited to seats at the meetings and to take part in the proceedings:

Dr. R. F. Weir ..... New York, N. Y.
" W. Argyle Watson ..... " "
" N. Bozeman ..... " "
" H. Knapp ..... " "
" J. O. Green ..... Boston, Mass.
" Mauran ..... Providence, R. I.

The minutes of the last day's meeting of the last session were read and approved.

The following committees were appointed by the Chair:

A Business Committee, whose duty shall be to prepare and present a bulletin giving the titles of papers, the order in which they shall be read and the time they will occupy; to select a topic for discussion at the ensuing annual meeting; to nominate two members of the Publishing Committee; to fix the amount of the annual tax, and to designate the Committee on the Progress of Ophthalmology. The committee consisted of Drs. Agnew, Derby and Holmes.

Another committee was appointed to receive the names of those proposed for membership, to nominate officers, and to report on matters of ethics. The committee consisted of Drs. Green, Jeffries and Dyer.

The Treasurer's report was read and referred to an Auditing Committee, consisting of Drs. Roosa and Holmes.

The Secretary announced the death of Dr. O. M. Pray, of Brooklyn, N. Y., and alluded to the estimable traits of his character. Dr. Agnew made similar remarks.

The Auditing Committee reported the Treasurer's accounts correct and properly vouched for. The report was accepted.

The Business Committee reported the first paper, viz.:

Test Letters for Astigmatism, by the late Dr. O. M. Pray, presented by Dr. Noyes. Remarks were made by Drs. Green and Williams.

The second paper was presented by Dr. B. Joy Jeffries, referring to a case of synchisis. Remarks were made by Drs. Knapp and Green.

Third paper. The inaccuracy introduced into tests for vision by disregarding the magnifying or diminishing effect of spectacles, by Dr. Knapp.

Immediately after the conclusion of Dr. Knapp's paper the Society went into executive session. On returning to open session, Dr. Knapp's paper was discussed by Drs. Noyes and Jeffries. The papers already read were referred to the Publishing Committee.

Fourth paper. Case of vascular tumor of the iris, with colored illustration, by Dr. Roosa.

Cases somewhat similar were reported by Drs. Dix, Williams and Holmes. Referred to Publishing Committee.

The fifth paper was presented by Dr. Green, on the use of leaden styles in the treatment of lachrymal disease.

Remarks were made upon the subject by Drs. Derby, Agnew and Dix. Dr. Noyes alluded to the use of hard rubber styles in his own practice, and also reported some cases of the performance of Stilling's operation for internal division of the stricture, and exhibited a knife for this purpose.

The sixth paper, on Strabismus, was presented by Dr. Loring. A part only was read, when, by the author's request, the whole paper was referred to the Publishing Committee.

Seventh paper, on test types, by Dr. Jeffries. Referred to Publishing Committee.

At 3 P. M. adjourned to meet at 5 P. M.

JULY 21, 1869.

The Society met at 5 P. M. The minutes of the preceding session were read and approved.

Dr. Agnew moved that the Society be allowed to pay the cost of engraving the plates for the illustration of Dr. Green's paper on Astigmatism in the last number of the Transactions. Carried.

The next business was the

Eighth paper, on Divergent Strabismus, illustrated by photographs of cases, by Dr. Agnew. Dr. Jeffries alluded to the danger of ulceration of the cornea. Dr. Noyes instanced cases of panophthalmitis. Dr. Knapp described his mode of operating Dr. Agnew was requested to put his statements in writing, and then to be referred to the Publishing Committee.

The ninth order on the bulletin was a case of spontaneous dislocation of the lens, by Dr. Holmes. Referred to Publishing Committee.

Tenth. Case of spontaneous dislocation of the lens, by Dr. Williams. Referred to Publishing Committee. Dr. Rider described a similar case.

Eleventh paper. Monocular Glaucoma supervening upon binocular retinitis hemorrhagica, by Dr. Roosa. Referred to Publishing Committee.

Twelfth order on the bulletin, a modified form of ophthalmoscope, by Dr. Loring.

Dr. Noyes also exhibited a new form of ophthalmoscope. The description of both instruments to be put in writing and referred to Publishing Committee.

Thirteenth. Dr. Noyes exhibited a variety of specula for separating the lids, and other instruments. He was requested to furnish a written description of such as are new and desirable, and put it in the hands of the Publishing Committee.

Adjourned to evening entertainment at 9 P. M., and to business session at 9 o'clock to morrow morning.

JULY 22, 1869.

The Society met at 9½ A. M., in executive session. After entering upon open session the Business Committee reported Newport as the place for the next annual meeting. They reported as the Publishing Committee Drs. Loring, Roosa and the Secretary. The annual tax for the ensuing year, $10.00. Committee on the Progress of Ophthalmology, Dr. B. J. Jeffries. All of which recommendations were adopted.

Dr. Dyer gave notice of an amendment to the By-Laws, making Thursday the day of meeting, instead of Wednesday.

The Committee on Admissions reported the names of Drs. H. Knapp, of New York, and Robert Watts, of New York, both of whom were elected. On motion, adjourned for recess of fifteen minutes.

On resuming the session the Business Committee reported the following for officers for the next year:

President, Dr. H. W. WILLIAMS, of Boston.

Vice-President, Dr. C. R. AGNEW, of New York.

Recording Secretary and Treasurer, Dr. HENRY D. NOYES, of New York.

Corresponding Secretary, Dr. H. ALTHOF, of New York.

All of whom were elected.

The amendment naming Thursday in place of Wednesday as the day of beginning the annual meeting, was adopted.

The next topic on the bulletin was in order.

Fourteenth. Dr. Dyer exhibited an apparatus for making graduated pressure on the eye by means of a column of water.

Remarks to be reduced to writing and referred, with suitable illustrations, to the Publishing Committee.

Fifteenth. Dr. Agnew described his mode of dressing the eye after important operations. Remarks to be put in writing and referred to Publishing Committee.

Sixteenth. Dr. B. J. Jeffries read a paper on photography of the fundus oculi. After remarks by Drs. Noyes and Knapp, referred to Publishing Committee.

The Business Committee reported as topic of discussion for the next annual meeting—

"Ophthalmic therapeutics, their occasional abuse."

The committee expressed the hope that the discussion of this subject, within proper limits, may tend to lessen the indiscriminate use in medical practice of irritating collyria and patent drugs, as well as to restrain the employment of certain panaceas. The subject was adopted.

The following were the papers next in order on the bulletin.

Seventeenth. Cyst of the iris, by Dr. Knapp.

Eighteenth. Apparent movement of muscæ, by Dr. G. Hay.

Nineteenth. Two cases of sympathetic ophthalmia, by Dr. H. W. Williams.

All these papers were duly referred.

Dr. Agnew offered the following resolutions:

Resolved, That all communications made to the Society at this annual meeting be delivered to the Publishing Committee before October 1st.

Resolved, That proofs of all articles appearing in the Transactions be sent to their authors returnable to the committee within one week; in case the proofs are not so returned the articles may be omitted, at the discretion of the committee.

The resolutions were adopted.

Dr. Green moved that arrangements be made for publishing the Transactions of the Ophthalmological and Otological Societies jointly. Carried.

Dr. Dyer reported additional cases of fracture of the crystalline lens in cases of death by hanging. Dr. Dyer was requested to furnish to the Publishing Committee a report of all the cases of this kind which he has yet observed.

On motion, adjourned.

HENRY D. NOYES,

Recording Secretary.

A Case of Simple Synchisis. By B. Joy Jeffries, of Boston, Mass.

A. B., a perfectly healthy gentlemen, some five and twenty years of age, applied to me March 27, 1867. Five days previous he noticed a "sudden darkening" before his left eye. He has, and has had, no pain or other sensation about the eye, complaining only of the "cloudy darkening." Externally the eye looks perfectly normal. Right eye V. = 1-1; without atropine and by Jäger's weak light the fundus was found normal. Left eye, the patient could read about Jäger Nos. 8 to 10, the exact number not being recorded. Under atropine the pupil dilated readily, and the ophthalmoscope showed black shreds moving freely in the fluid vitreous and some black stationary particles; the fundus could be but dimly lighted and was not clearly seen. Patient was ordered grs. ij. pillulæ hydrg. every night, the eye to be shaded, and rest. Four days later the pupil remained dilated, and the papilla could be indistinctly seen. Few threads were seen and no fixed black spots as before. Four days after this the patient read Dyer's L. at 20 feet, V. = 2-5, and Jäger No. 2 at 10 inches. The nerve and vessels could now be seen; the latter were rather congested. The field of vision was taken and found much limited on the upper part, as seen in the accompanying register. A leech to the temple was ordered and cathartic medicine *pro re nata*. Two days later much the same, except the eye was more sensitive to light; shade to be worn and eye to be protected from glare and exposure. The vitreous cleared up steadily after this, and nine months later I saw the patient accidentally; he speaks only of a few muscæ volitantes. April 4, 1869, two years after commencement of the liquefaction of the vitreous, the ophthalmoscope reveals nothing abnormal but one floating opacity, seen at the same time by the patient. V. = 1-1 in each eye, reads Jäger No. 1 fluently, at 10 inches, with either eye. The field of vision was tested and found normal. Patient now says that previous to the sudden obscuration he had occasionally, when not feeling well, noticed muscæ volitantes.

Liquefaction of the vitreous humor accompanies or is the consequence of very many of the traumatic and idiopathic diseases of the ocular tunics. Till the researches of Virchow

and Weber it had been a matter of great doubt whether the vitreous is capable of inflammation in the ordinary sense of the word, since the changes it undergoes might be attributed to the effect of inflammation in some of the tissues around it, and any thing which could affect it might equally well be supposed to affect these tissues.

Upon examination of the authorities I cannot find it anywhere recorded or admitted that the vitreous may inflame, or, if this word is objected to, may break down and become fluid, without other disease of the eye, *either before or after its liquefaction*. Hence the importance of this case, and my only excuse for reporting it. Its value, I freely admit, depends entirely on the exactness of the record and the capacity of the observer to decide the presence or absence of other disease. Not imagining such a complete restoration of vision possible, my prognosis was guarded, and not favorable as respected subsequent sight. To me it does not seem probable that any disease of the surrounding tissues, which could cause such complete and sudden turbidity of the vitreous, should exist without exhibiting symptoms recognizable by the tests this eye was subjected to.

The Inaccuracy introduced into the Determination of Visual Acuteness by disregarding the Magnifying or Diminishing Power of Spectacles. By H. Knapp, of New York.

Visual acuteness depends upon the density of the percipient retinal elements. The deviation of the lines which connect two nearest retinal elements with the posterior nodal point is called the smallest visual angle. The size of this angle may be changed by widening the shortest distance between two approaching retinal elements (amblyopia), or by alteration of the position of the nodal points, especially the second one, as is the case when we look through spectacles. The diminishing power of concave lenses may *simulate* amblyopia, and the magnifying power of convex lenses may *conceal* amblyopia. That spectacles produce this effect is well known, but how great the error introduced by them is has not yet been deter-

mined. To get a thorough understanding of the effect of spectacles on vision, we must calculate the optical constants of a dioptric system combined of glass lenses and our eye. This I did, and used the respective formulæ in Helmholtz's "Physiologische Optik," p. 56, 11 *a*, etc.

The *first focal point* is found by formula 11 *a*:

$$a_{,}\ t_{,} = \frac{(d - \phi_{,})\ f_{,}}{d - \phi_{,} - f_{,,}}$$

If we place the lens 14.858 mm. before the first principal plane of the eye, the above expression becomes 0, which means that the *first focal point of the compound system coincides with the optical centre of the glass placed in the first focal point of the eye.*

The *first principal point* is determined by formula 11 *d*:

$$h_{,} = \frac{d\ f_{,}}{d - \phi_{,} - f_{,,}}$$

Since $f_{,} = f_{,,}$ and $d - \phi_{,} = 0$, therefore,

$$h_{,} = -\ d = -\ 14.858;$$

which means that the first principal point of the compound system lies 14.858 mm. ($= \phi_{,}$) behind the first principal point of the first system, viz., behind the optical centre of the glass lens. Therefore, the *first principal point of the compound system coincides with the first principal point of the eye.*

The first nodal point may be determined by a similar equation, viz.:

$$k_{,} = \frac{d'\ f_{,,}}{d' - \phi_{,,} - f_{,}}$$

d' is the distance of the second nodal point of the first system, viz., the optical centre of the glass lens, from the first nodal point of the second system, and equals, in our case, the second focal length of the second system, $\phi_{,,} = 19.875$ mm.

$$f_{,,} = f_{,} \text{ and } d' - \phi_{,,} = 0.$$

In the above equation, therefore, $k_{,} = -\ 19.875$ mm., which means that the first nodal point of the compound system lies

19.875 mm. behind the second nodal point of the first system, that is, the optical centre of the glass lens, and at the same time the first focal point of the second system. Therefore we see that the *first nodal point of the compound system coincides with the first nodal point of the eye.*

The *second principal point* is found by Helmholtz's formula 11 *e*:

$$h_2 = \frac{d\ \phi_{II}}{d - \phi_I - f_{II}}$$

$d - \phi_I = 0$, the formula simplifies in

$$h_2 = \frac{d\ \phi_{II}}{-f_{II}}$$

Let us call the value of this equation $-\delta$ (δ being a positive number), then we see that the second principal point of the compound system falls in front of the second principal point of the eye. Since the distance of the nodal points from each other equals the distance of the principal points from each other, the second nodal point will lie as much in front of the first nodal point as the second principal point lies in front of the first principal point. We have, therefore, but one calculation to make.

If we put concave glasses before the eye, the value of h_2 in formula 11 *e* becomes positive, but does not change in quantity. This shows that by concave glasses of equal focal length, the second cardinal points recede as much as they advance by convex glasses.

This is all we have to calculate directly. We know the situation of the second nodal point, and know that its distance from the retina, the second focal plane, equals the first focal length. Since the first focal and nodal points of the compound system coincided with those of the unarmed eye, it is evident that also the second focal length of the armed eye is equal to that of the unarmed eye.

Thus far I have demonstrated the *remarkable fact that spectacles worn half an inch before the eye do not alter the position of the first cardinal points, nor the focal lengths of the eye, whilst they cause the second cardinal points to move by the same quan-*

tity and in the same direction, namely, forward if the spectacles are positive, and backward if they are negative.

Let us now consider what influence spectacles have on visual acuteness.

By my own and Donders' measurements we know that the radius of curvature of the cornea in ametropic eyes does not materially differ from that in emmetropic eyes. With regard to the curvature of the lens, only two measurements have been made, one by Helmholtz and one by myself, on myopic eyes. Both eyes showed no difference from the normal state. Similar conditions may be assumed in the hyperopic eye. Therefore, we may suppose that the optical constants of ametropic eyes do not materially differ from those of emmetropic eyes. The receding or advancing of the retina must be the cause of ametropia, a fact which is well corroborated by anatomical investigation. Since the retrocession or advancement depends on a dilatation or contraction of the posterior portion of the globe, the retinal elements will stand closer together, or wider apart, according to the degree of contraction or dilatation, and a visual angle of the same size, and having its apex in the first nodal point, will include about the same number of percipient retinal elements in the ametropic as in the emmetropic eye. By the addition of spectacles the first cardinal points do not change, as we have seen, but the second are advanced by convex glasses, and moved backward by concave glasses; *the visual angle, however, remains unchanged*, as the axial ray is only shifted on the optical axis parallel to its first direction. The greatness of this shifting—that is, the displacement of the second nodal point on the axis—determines the enlargement or diminution of the retinal image belonging to one and the same object. Since the triangles formed by the retinal images and their connecting lines with the second nodal point in its primary and secondary position are similar, *the dimensions of the retinal images are proportionate to their distances from the second nodal point.*

The distance of the posterior focal plane (retina in the emmetropic eye) from the second nodal point being equal to the first focal length of the eye (ϕ_1), we obtain the following relation of the retinal images without glasses (β) and with

glasses (β_{II}) to their distances from the focal point in the emmetropic eye (ϕ_I) and the ametropic eye ($\phi_I \mp \delta$):

$$\frac{\beta_{II}}{\beta_I} = \frac{\phi_I}{\phi_I - \delta}$$ for convex glasses, and

$$\frac{\beta_{II}}{\beta_I} = \frac{\phi_I}{\phi_I + \delta}$$ for concave glasses, δ being the quantity by which the second nodal point is displaced.

If we give β_I the standard value 1, we obtain for lens + 10

$$\beta_{II} = 1{,}0793.$$

If an object is seen without glasses at a certain distance, say Snellen XX. at 20 feet, the magnifying power of +10 will render its retinal image 1.0793 times larger. To let it appear of equal size with the image seen without glasses by an emmetropic eye, its distance is to be multiplied with the magnifying effect of the lens, viz., 1.0793. Thus we obtain that a hypermetropic eye of normal visual acuteness sees Snellen XX. at 21.58′ distance when looking through convex No. 10.

No. of Glass.	Advancement of $k_{,,}$ second nodal point)	Magnifying effect of Lens.	Distance in which Snellen XX. ought to be read by normal S with glass.
	Mms.		
+ 10	1.0909	1.0792	21.59
+ 5	2.1818	1.1721	23.44
+ 4	2.7272	1.2248	24.45
+ 3	3.6303	1.3240	26.48
+ 2	5.4544	1.5800	31.60

No. of Glass.	Receding of $k_{,,}$	Diminishing effect of Lens.	Distance in which Snellen XX. ought to be read by normal S with glass.
— 10	1.0909	0.9316	18.63
— 5	2.1818	0.8720	17.44
— 4	2.7272	0 8449	16.90
— 3	3.6303	0.8034	15.07
— 2	5.4544	0.7315	12.63

Remarks on the use of Leaden Styles in the Treatment of Lachrymal Obstructions, with Description of a New Plan for Facilitating their Introduction. By John Green, M. D., of St. Louis, Missouri.

In a communication to this Society at its last annual meeting,[1] I brought forward a modification of Dr. E. Williams' plan of treating lachrymal obstructions by wearing for several weeks a silver style, inserted through an opening made by slitting the upper canaliculus into the lachrymal sac.[2] The modification proposed by me consists in the substitution of the softest and most flexible lead wire for the rigid silver styles employed by Dr. Williams. The advantage claimed for this substitution depends upon the fact that the bony nasal duct is not quite straight, but is curved in a somewhat variable and therefore uncertain direction.[3] Besides this irregularity in the curvature of the bony duct, the position of the lower opening into the inferior meatus of the nose is equally variable, thus necessitating, in some cases, the passage of the style nearly to the floor of the nostril. In consequence of these variations it is often difficult to pass a large and stiff probe

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[1] See Transactions for 1868.

[2] This method is fully described by its author in the first part of Vol. i. of Knapp and Moos' Archives.

[3] The convexity of its curve is turned forward and outward (Cruveilhier)—forward (L. Hirschfeldt, *in text*), outward and backward (L. Hirschfeldt, *in plate*)—outward and backward, but differing in almost every case, being sometimes more pronounced outwardly, sometimes posteriorly. (Stellwag.)

as experience has shown that less dilatation is necessary than with the silver styles, and that medication of the sac by injections may, in most cases, be dispensed with.

The difference in the effect produced by wearing the flexible leaden styles, as compared with the rigid instruments of Dr. Williams, is important. By the use of the silver styles the lachrymal passages must, in many cases, be not only dilated, but also changed somewhat in direction to conform to the shape of the style; with the leaden instrument, on the other hand, it is simply dilated. This difference is well illustrated by the fact that the leaden probes always adapt themselves to any irregularities in the direction and curve of the nasal duct, and exhibit, after they are withdrawn, a very considerable curvature, varying in different cases, but uniform in the successive stages of the treatment of the same case.

The only drawback to the usefulness of this plan of treatment has been the difficulty of manipulating the very flexible lead wire, especially the smaller sizes. This is now remedied by making the styles tubular, and inserting a stylet of tempered steel wire. The stylet is withdrawn as soon as the style is placed in position, and the projecting top of the latter is bent over so as not to interfere with the movements of the eyelids. In this way the styles are readily introduced even to the floor of the nostril, and yet can be worn with, in most cases, only a very slight degree of discomfort.

The styles which I now use are of seven sizes, extending from seven-eighths of a millimetre to two millimetres in diameter, and numbering from twenty to fourteen of the com-

mon English wire gauge. Only the three or four smaller sizes require the steel stylet, but the larger sizes also may be made tubular in order to reduce their weight.

This method has proved extremely convenient in the treatment of certain obstinate cases of catarrh of the lachrymal sac, with obstruction at the lower end of the nasal duct. In treating such cases by Mr. Bowman's method, it sometimes happens that little or no permanent effect follows the successive introductions of the probe, but that by wearing a rather large style for a week or two, a free passage is opened. It is quite important, therefore, to be able to dilate the lower orifice of the duct with the least possible interference with the integrity of the bony portion of the canal; this indication is much more perfectly fulfilled, and the desired end more quickly reached, by the use of the flexible leaden styles than by the rigid ones used by Dr. Williams.

The use of metallic styles in the manner recommended by Dr. Williams, and especially of leaden styles, as described in this paper and in the last volume of these Transactions, will, I believe, be accepted as a valuable addition to the means previously at our command for the treatment of those severer and more obstinate cases of lachrymal obstruction in which the destruction of the sac by the hot iron or by caustic is still frequently practiced. In the milder forms of obstruction, which constitute the great majority of cases treated, I prefer Mr. Bowman's admirable method, by the intermittent use of probes, to all other known plans of treatment.

Relative Accommodation in Strabismus and Insufficiency of the Recti Muscles. By Edward G. Loring, M. D., of New York.

Mr. President: At our last meeting I had the honor of reading before the members of the Society a paper on Relative Accommodation.[1] My remarks at that time referred almost exclusively to the physiological connection between convergence and accommodation in the normal eye. It is now my desire to lay before you, as briefly as possible, some points

[1] Relative Accommodation. Trans. American Oph. Soc., July, 1868.

which seem to me to be of practical importance in regard to the manner in which these two muscular forces react, or may be made to react, upon each other in strabismus and insufficiency of the recti muscles.

It may be stated as a general law that, within certain limits, by increasing or decreasing the convergence, the amount of accommodation is also increased or diminished.

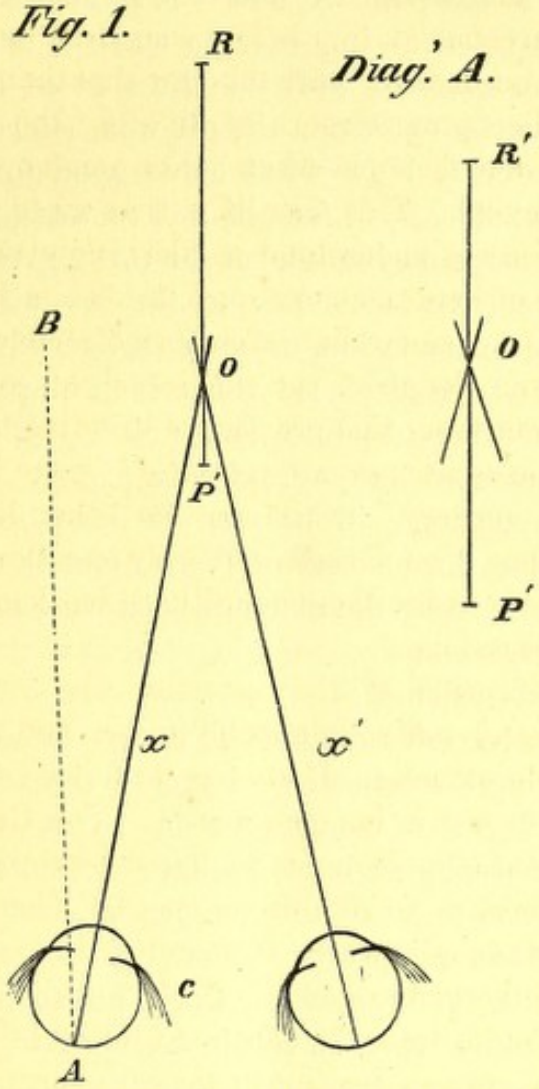
It was in accordance with this law that the practice, adopted by the earlier practitioners, of dividing the recti interni in those cases of asthenopia where there was no strabismus, often met with success. This was at a time when the errors of refraction were not understood as they now are, and when the true nature of hypermetropia and its results had not been recognized. At a somewhat later period Donders, with his vast and exact knowledge of the whole subject, could not refrain from characterizing this practice of dividing the interni, where there was no squint, as a "melancholy page in the history of ophthalmic surgery," while on the other hand no less an authority than Von Graefe not only sanctioned this division of the muscles under these conditions, but had even performed it on two occasions.

His justification of the operation and explanation of its modus operandi are so admirably given, and so essential for a correct understanding of what is to follow, that I will briefly read them to you in his own words. Von Graefe, speaking of the treatment of asthenopia in hypermetropic eyes, in which, however, there is no strabismus, says: "There is still another cure for asthenopia which is founded on the displacement of the relative accommodation. If we weaken by a suitable tenotomy of the internus its effective ability, in such a way, however, that a correct position of the eye operated upon shall still be maintained, then every given degree of convergence will be represented by a greater tension of the interni than that existing before the operation, and a corresponding displacement of the region of the relative accommodation toward the absolute near point will be the result. The demands on the energy of the accommodative force will consequently be less." (Arch. 8., ab. ii., s. 320.)

The principle involved in this statement is so important to

the subject under consideration, that I would call your attention for a moment to the diagram which I have drawn upon the board (Fig. 1), which is supposed to represent the condition taken by Von Graefe, that is to say, a pair of hypermetropic eyes suffering from asthenopia, but in which there is no

Fig. 1.



strabismus. x and x' represent the optical axes, both of which intersect each other at the object viewed, o, supposed to be at 14 inches from the eye. In all hypermetropic asthenopic eyes the amount of accommodative force actually used is greater than that which is held in reserve. The amount used in this case may be represented diagrammatically as extending on the vertical line from the point o to the point R′, that held in reserve as extending from o to P′.

If we now divide one of the interni, say the left, *c*, a certain amount of divergence of the optical axis, *x*, from its former position would be the immediate result, exactly as it is in the common operation for strabismus. This divergence may be represented on the diagram by the dotted line extending from the point B to the point A, and it is self-evident that the tension on the internus, in order to make *x* regain its former position—*i. e.* intersect with its fellow at *o*—must be as much greater, after the operation than it was before, as the divergence is greater. Now what holds good for one degree of convergence holds good for all; and as we have increased the amount of tension on the interni for every given degree of convergence, we have, according to the law, also increased the amount of accommodation, or, as Von Graefe more exactly expresses it, we have displaced the region of relative accommodation toward the absolute near point. This displacement may be represented by diagram A in Fig. 1. The whole relative accommodation will be seen to have been displaced toward the eye; the amount of force actually expended, represented in the line by the distance between *o* and R′, is seen to be much less, while that held in reserve is much greater than before the operation.

There can be no doubt then as to the truth of the statement that by cutting the interni we increase the amount of tension for a given degree of convergence, and that by so doing we do indeed, temporarily at least, displace the relative accommodation. But then this can only happen without exception, when binocular vision was present before the operation and is maintained after it. We can, therefore, by no means agree with the illustrious author when he continues by saying:

"When, on the contrary, in consequence of hypermetropia, convergent squint has resulted and characterizes the patient, not only at work, but at other times, I am then an advocate for tenotomy, which then in all respects appears rational. The better position of the eyes, which is obtained by the operation, will, *since a greater tension of the interni is represented, exercise the same effect on the range of relative accommodation as did the original condition of the convergence,* which was not only disfiguring, but which threatened the functions of

the organ for continuous work."[1] (Arch. 8, ab. ii., s. 321, note.)

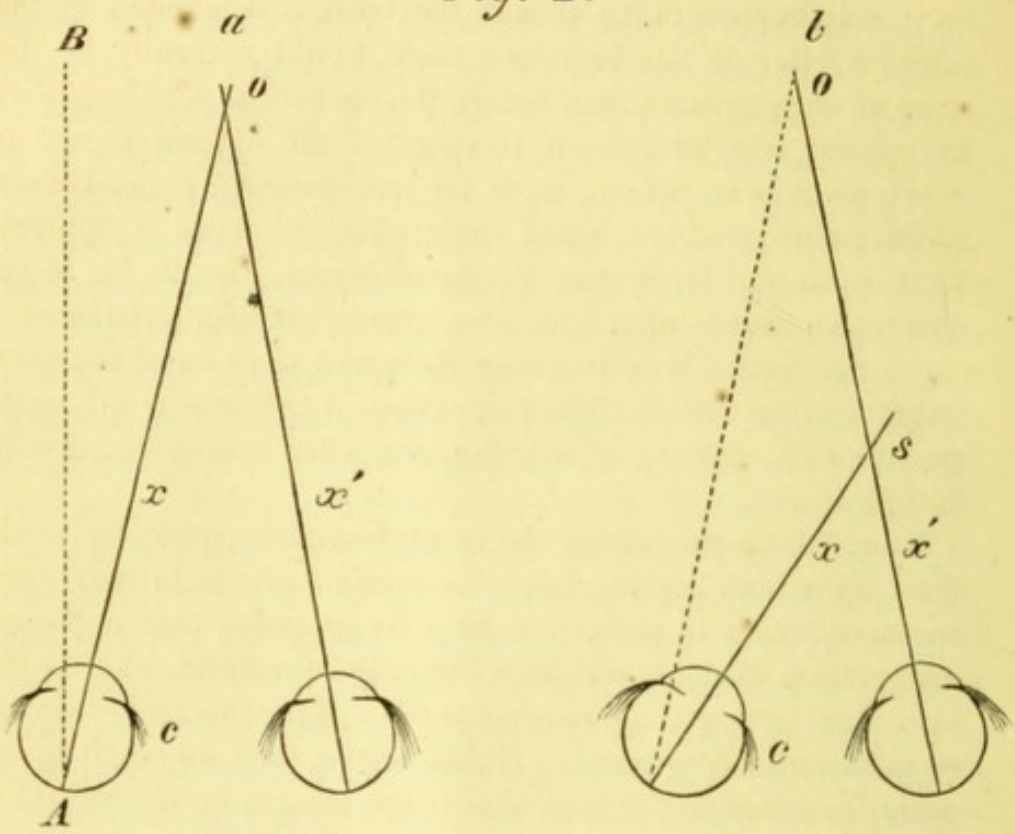
Now the conditions in the two cases taken by Von Graefe, namely, squinting and non-squinting eyes, are not the same, and we have no right to assume that if the same principle be applied to both it will in both be followed by the same results. The difference in the conditions taken will, perhaps, be made clearer by reference to Fig. 2, in which diagram *a* represents a pair of non-squinting eyes, and diagram *b* a case of well marked strabismus in the left eye. The other conditions we will suppose to be the same as those previously taken. It will be remembered that in the first diagram, representing non-squinting eyes, that binocular vision already existed before the operation, but that immediately after it there was a certain amount of divergence of the optical axes of the eye operated upon relative to the object viewed, which necessitated, in order that binocular vision might be reinstated, a certain amount of tension on the interni over and above what they used before the operation. But in the second diagram (Fig. 2, *b*), representing squinting eyes, if we cut the left internus so that the optic axes of this eye intersects with that of the right at *o*, and we thus obtain binocular vision, we have obtained it, not as in the former case, from a state of divergence relative to the object viewed, but from a state of convergence; so it will be seen that the conditions are at the outset very different. But in order to understand the question fully it will be necessary to recur briefly to the principle or law upon which the assertion is founded—"That after a tenotomy a greater tension of the interni is represented, with the same effect on the relative accommodation."

This depends upon a law propounded by Von Graefe some years ago, that the effect of a tenotomy is in exact relation to the amount of displacement of the insertion of the muscle. That is to say, a convergent strabismus of three lines will be removed by setting back the insertion of the muscle three lines, etc., etc. This law is founded on mechanical principles, and is perhaps as correct as the application of any mechanical

[1] The italics are my own.

formula to the human organism can be, where the conditions in no two cases are ever alike, and where they are constantly varying in the same individual case.

Fig. 2.



In order to explain this theory it was assumed that the amount of labor imposed upon the interni increased *pari passu* with the displacement backward of the insertion of the muscle, so that, although the convergence is lessened by the operation, the tension on the interni demanded to maintain this convergence is as great or even greater than before the operation. Admitting even that this is *per se* true, we must not forget that in estimating the power of a muscle which has a direct antagonist we must also take into consideration the force of this antagonist, and bear in mind that if the conditions under which one performs its functions are altered, those of the other are changed also. It must be remembered too that in squinting eyes, just as in others, there is a certain amount of tension on the internus of the eye which turns in, which is counterbalanced by a certain amount of tension of the externus.

Now the effective power of the externi increases with the amount of the convergence, and it must follow that the externus of a squinting eye, other things being equal, is in a better position to lay out whatever power it may possess, than in the case where there is a normal intersection of the optic axes. So it may happen that although the tension demanded of the internus after it has been set back would naturally be the same or even greater than before the operation, yet the ability to oppose this tension on the part of the externi is not as great as it was before, from the comparatively disadvantageous position under which their effective force is applied. That is to say (referring to the diagram, Fig. 2, *b*), it requires a greater effort for the externi to counterbalance a given amount of tension under a correct position of the axes, *x* intersecting with its fellow at *o*, than it previously did under an abnormal degree of convergence, when *x* intersected with its fellow at *s*.

Now if from any cause the externi are idiopathically weak, then their inability to resist the tension of the interni when accommodation is going on may be so great that a proper intersection of the visual lines can only be maintained after the operation, in case the opposing tension of the interni is reduced or even entirely relaxed. If this is true, then we ought to expect, according to the law, that if the tension on the interni is reduced the relative accommodation will not be, as Graefe asserts, displaced toward the near point, but be removed from it. And as a proof that precisely this may take place, and, as I believe, not unfrequently does where binocular vision is obtained, I would beg leave to refer to the following case, recently under the care of Dr. Agnew and myself.

About the first of last May a young lady, 19 years of age, visited us on account of strabismus, with which she had been affected from early childhood. The squint, amounting to about $3\frac{1}{2}$ lines, was perfectly concomitant in its character, as either eye was used indiscriminately, though the patient could always tell, if her attention was called to it, which eye she was for the moment employing. The total hypermetropia under atropine amounted to 1-36, vision being with suitable glasses a little less than one. But though there was this amount of vision in either

eye, no binocular vision in any proper sense of the term could be called forth, though many attempts to produce it were made with prisms, colored glass, Javal's mirror and the stereoscope. The accommodation was normal, as was also the excursion of the eyes, independent of the existing squint. As there was not the slightest contra-indication, and as the cosmetic effect was the only consideration which weighed at all with the patient, the rectus internus of the right eye was divided. As the necessary effect was not obtained by this operation, the other eye was operated upon six weeks later. I will add that, on both these occasions, the tendon was thoroughly separated from the sclera. About the first of October the patient again returned. The effect which had been gained by the last operation had entirely passed away, there remaining about a line of convergence for distant objects and something more for the near. Another attempt was made to see whether binocular vision could not be called forth, but without success. The patient seemed to have, to a marked degree, what is called in the text-books the "horror of binocular vision." As diplopia would not in all probability be caused, even if a slight divergence should be produced, it was determined to run the risk of a third operation, which was consequently performed.

The effect of this operation, after the wound had healed, was not as great as had been feared, only a very trifling degree of divergence being produced, which soon passed away for distant objects, while there still remained a perceptible convergence for the near. I found, however, that there was now an attempt on the patient's part at binocular vision; that once or twice while looking at distant objects she had seen them double. I then gave her Javal's mirror, with which she practiced faithfully for two months, at the end of which time she was able to see, as a constant thing, the three wafers in a vertical line, and was perfectly aware when she was using binocular and when monocular vision. She then informed me that latterly, since she had been conscious of using both eyes at a time, she did not see as distinctly as she formerly did; that she could not read at all when using both eyes, and that even in the street every thing was indistinct, and that she frequently had to shut her eyes, and on opening them again to use only one. When she

did this vision became distinct at once. This led me to make another examination as to the amount of vision and state of the accommodation. I found that when using both eyes at once vision was only 1-5; but with either eye singly it amounted to nearly 1. If, however, + 1-36 (the amount of the total H.) was given to the patient then binocular vision fully equaled, and I thought a little surpassed, the monocular, rising from 1-5 to nearly 1. So too in reading it was found that + 1-10 was the weakest glass through which there was easy and rapid binocular vision at 14 inches. (This convex 1-10 just represented the total H., 1-36, and the distance of the object seen, 14 inches.) Each eye singly, however, could read correctly at 5 inches without the aid of any glass, though only when its fellow deviated inward, the amount of this deviation decreasing with the strength of glass used till it entirely ceased under + 1-10.

It will be seen from the above that under binocular vision, and what may be certainly termed "a better condition of the optical axes," not only was the relative accommodation not displaced toward the absolute near point or remain as it was before the operation, but was removed from it, and that too to such a degree as to be annihilated, no accommodation at all remaining for any given degree of convergence from the negative far point (Ht. 1-36) to the nearest point of binocular vision at which the eyes were still accommodated for convergent rays.

But it may be said that the operations themselves had in some way so destroyed the relationship between the accommodation and the convergence that the former could not be brought into play. Admitting that this is just what did take place, it does not follow that this result is due simply to operative interference, for precisely the same thing may take place even when no operation has been performed; for Schweigger, in his remarkable monograph on strabismus, gives a minute report of a case of squint of four lines, in which binocular vision was obtained by systematic exercise with prisms. In this case, as in the one just reported, the total hypermetropia at once became manifest as soon as binocular vision was obtained, and the field of accommodation was so far removed that even with a convergence to eight inches the eyes still remained accommodated for convergent rays. (Zehender, Jan.–Feb., 1867, p. 8.)

In summing up the remarkable points of this case Schweigger mentions, as two of its individual peculiarities, that under the influence of binocular single vision the previously existing latent hypermetropia became manifest, and that the relative accommodation was displaced. I cannot think that these are by any means individual peculiarities of this particular case, as I have myself not unfrequently seen the latent hypermetropia become manifest after the operation, but have also occasionally seen the displacement of the relative accommodation, and believe that we should see it oftener if we examined carefully for it *immediately* after the operation; but the fact is, it is a much rarer thing to obtain real binocular single vision in a case of marked strabismus than we should be led to suppose from the books. I cannot think that results as remarkable as those mentioned in Schweigger's case and the one just described can be the result of chance, but believe that they are due to the common law which governs the connection between convergence and accommodation.

It seems to me that these two cases offer a beautiful example of the law sought to be established in my former paper, that for every increased tension of the ciliary muscle there is a corresponding and contemporaneous tension imparted to the interni. For, provided that accommodative efforts ceased, and the ciliary muscle consequently entirely relaxed, the externi, stimulated by the instinctive desire for binocular vision, had force enough to obtain the proper position of the optical axes, but not enough to *maintain* it, under the action of the ciliary muscle; for the slightest attempt to accommodate the eye, even for parallel rays (Ht. being only 1-36), at once destroyed binocular vision, producing convergent strabismus. This certainly could not have been the case had the tension of the ciliary muscle been independent of—that is to say, capable of being disassociated from—the interni. And I believe in all cases where binocular vision has been obtained from a condition of marked strabismus, that the reason why it is permanently maintained is not because the tension of the ciliary muscle is disassociated from that of the interni, but because the tension, imparted to them under accommodative efforts which would turn the eye in, is counterbalanced by the externi,

their natural antagonists, which keep the eyes straight. Now the desire for binocular vision and the power of the externi to fulfill this desire, vary exceedingly in different individuals, which accounts for the ease or difficulty with which, other things being equal, they obtain and maintain binocular vision, and neutralize any effect which the operation may have had on the relative accommodation.

There are very many points in this connection which I would gladly dwell upon, did not the limits of these remarks and a proper regard for your patience forbid.

The particular point of practical importance to which I wished to call your attention, and to arrive at which I have taken what may appear to you a needlessly long route, is this. *That where we have obtained binocular vision from a state of squint, we cannot tell what glasses may be necessary for its easy maintenance, even when we know the exact state of the refraction and the amount of monocular accommodation before the operation.* Take the case in question. Here there was only a total hypermetropia of 1-36 with a monocular accommodation of 1-4, and it might surely be supposed that binocular vision might, with so slight an error in refraction and such a range of accommodation, be maintained without any glass at all, or at the most with a correction of the total hypermetropia. But it not only required that this should be neutralized, but a very strong glass in addition, a convex 1-10 being the weakest glass which made binocular reading possible at 14 inches, which is over three times the amount of the total hypermetropia. So, too, in Schweigger's case, where the glass required for 8 inches was more than twice the total H.

May not the above fact explain the reason why convergent squint is so apt to recur after an operation even in emmetropic eyes, and why also we find it so difficult to obtain binocular vision in such eyes, especially for near work? And ought not such cases to point out the necessity for ascertaining at once what effect the operation has had on the relative accommodation? And if the effect has been to diminish and displace it outward, the deficiency should at once be supplied by the proper convex glasses, which should be gradually reduced in strength as the patient learns to associate a larger amount of

accommodation with a smaller degree of convergence than he has been in the habit of doing; that is to say, till he learns, for the sake of binocular vision, to oppose the tension on the interni by a counterbalancing effort on the part of the externi.

The best result which can be obtained after a tenotomy is, of course, binocular single vision, and this result should always at least be aimed at, even though there be a large amount of amblyopia in the squinting eye; for, by a correct intersection of the visual lines, the combined field of vision of the two eyes is increased in size, for the images formed upon the retina of the amblyopic eye, though not intense enough to produce real binocular single vision, are yet quite enough to give the patient perception of objects situated laterally, and thus free him, to a considerable extent, from the necessity of that continual turning of the head common to those who have only monocular vision. It is indeed asserted that even in its abnormal position the squinting eye often renders important aid, not only in lateral qualitative perceptions, but even in increasing the intensity of the impressions of the fixing eye. (Graefe.)

There is a great discrepancy among authorities as to the frequency in which binocular vision is obtained after tenotomy—Graefe and others putting the percentage as high as fifty in the hundred in its favor, while Stellwag boldly asserts that binocular single vision is scarcely ever, if ever at all, obtained.

It is manifest that both these statements are extreme, and that if, on the one hand, Graefe's statistics are, as Stellwag claims, made up on entirely untrustworthy data, his own are deduced from results given by tests which are entirely too severe. I allude to the so-called falling test of Hering. It is certainly any thing but fair to expect that a person who has been accustomed, perhaps all his life, to judge of distances with one eye with the assistance of surrounding objects, should, when these are excluded, be able, even when using two eyes, to obtain at once, after an operation, as keen a perception of perspective as those who have always possessed binocular vision.

Without at present entering further into this subject, I feel convinced that we often obtain a fair, sometimes even a very

large amount of binocular single vision—quite as much and sometimes more than is to be found among those whose optical axes have always intersected in a normal manner, but yet where, for some reason, one eye was amblyopic, as among those, for example, who have a large discrepancy in the refraction of the two eyes. For in these cases not only does the most ametropic eye always extend the field of vision, but often aids materially, even when the discrepancy is of a considerable degree, in the patient's estimation of perspective. This being the case, we should always endeavor by every means in our power, therapeutical as well as surgical, to obtain for the squinting eye as large a share in the common act of vision as possible, and should never be satisfied, as many are, with simply obtaining a good cosmetic result.

We can all of us call to mind numerous cases in our own and in our colleagues' practices where the intersection of the visual lines appeared perfect and where there was acute vision in both eyes, but yet where there was no single binocular vision; and I fear that most of us have been in the habit, after a few or perhaps without any trials with prisms, etc., of sending such patients away, quite as much elated by our own prowess in doing a tenotomy as the patient is by an improved personal appearance, and each as indifferent as the other whether vision is performed with two eyes or one.

The remarkable manner in which some patients will regain and maintain binocular vision, even after this has been lost for years, is too well proved by authenticated cases to need much comment. To show, however, that it may be often brought about by simple therapeutical means, and to illustrate some further points, I beg leave to cite the following case.

Miss L., some five years ago, had been operated upon for what she characterized as a "fearful squint." There had been two operations on the right and one on the left eye. The deformity seems to have been entirely removed, the optic axes apparently intersecting at the object viewed. The patient simply complains now of asthenopia. Vision is 1, in both eyes, though there is no binocular single vision. After a good many trials with prisms, Javal's mirror and the stereoscope, the patient was finally brought to have double vision, the

images being invariably homonymous, and separated about 10° of prisms in twelve inches. Paralysis of the accommodation showed hypermetropia = 1-9, though the patient had previously been wearing + 1-36. This would account for the asthenopia. After the atropine had passed off I ordered 1-18 for the distance and + 1-12 for the near, and she was to wear the glasses as constantly as possible. Shortly after putting on the glasses the patient came back to me complaining that the pain was greater with the + 1-18 and 1-12 than it had been with the convex 1-36. She wished to give up the glasses, as they were "too strong for her;" but I assured her that the pain which she had experienced was not because her glasses were too strong, but because they were too weak. I then told her to wear convex 1-12 continuously. After a little while she again returned, saying that the pain had been intense and constant, and that she could not wear such strong glasses. Thinking that the patient might have that intolerance of strong glasses which some hypermetropes of a high degree often show, I determined to reduce their strength. I found now, however, on examination, that the patient had easy and perfect binocular vision, and that a prism base upward gave vertical images throughout the range of accommodation, whereas in my former examination the images were homonymous, 10° in 12 inches. At the distance, however, the images were at times slightly homonymous, and the actual adductive power still preponderated greatly over the abductive, all through the range of accommodation. Thinking that the attempt to maintain binocular vision and the consequent strain on the externi was what had occasioned the pain, by giving rise to muscular asthenopia of these muscles, I encouraged the patient to continue with the glasses. Three months later the pain had almost ceased, while the condition of the muscles was as follows. At 20 feet, with no positive glass, but with the colored slide, there was an insufficiency of the *externi* equal to a prism of 12°. If + 1-18 was added the insufficiency sank to 3°; if + 1-12 then the images are exactly vertical and remain so throughout the range of A. The adduction at 20 feet (with the convex glasses) is 5°, while the abduction amounts to 7°. At 12 inches the adduction is only equal to 8°, while the abduction

amounts to 15°—the preponderance of power now lying two to one with the *externi*, which is exactly the reverse of what it should be in the normal eye. Thus in less than six months, by simply using suitable glasses, binocular single vision was obtained throughout the range of accommodation, and the patient, from having an insufficiency of abductive force of 10° for 12 inches, obtained a positive abductive power of 15° for the same distance—a clear gain in the power of the externi of 25°, as measured by prisms. This gain is no doubt due to the fact that as the ciliary muscle relaxed under the glasses, the tension on the interni which had always been associated with it was also gradually relaxed, thus *pari passu* increasing the power of the externi, even after binocular single vision had been regained.

So great a gain as this in the power of the externi would lead us to fear that the excess of power, at first apparent in the interni, was not due to their intrinsic strength, but rather to the reflected or associated force from the ciliary muscle under the excessive tension imposed upon it in order to overcome the error in refraction.

We cannot but fear that, where the abductive force for the greater part of the range of accommodation is nearly twice as great as the adductive, that the original and intrinsic power of the muscles has been weakened by the operations; so much so, indeed, that we may be justified in fearing that what was originally marked convergent strabismus may, after the operations and with glasses sufficiently strong to relieve the asthenopia, become insufficiency of the interni, or even pass into actual divergent squint.

And this leads me to a practical point upon which I wish to insist with some emphasis, and that is that we are prone, in that condition in which strabismus is most common, hypermetropia, to operate too often and at too short intervals.

As a general thing the most careful of us are satisfied with determining the amount of deviation, the state of refraction, amount of vision and accommodation; that is, we make a careful examination of the eye before beginning with the operations, but this once made we proceed in our attempts to remove by surgical means the deformity; that is, we deliberately attack

the effect without paying much attention to the cause of the squint. The effect removed, we then attack the cause by taking into consideration the error in refraction, and we prescribe glasses after one, two or three operations, as the case may be, not with the design that they may be of any independent value in themselves in removing or lessening the squint, for this has been done by the operations, but simply to prevent a relapse from that condition which has been obtained perhaps from repeated tenotomies.

Most practitioners avoid putting on glasses till the wound of the divided tendon is entirely healed, and then, surprised at the little effect gained, resort to another operation within a period of three or four weeks, or perhaps even follow it with a third. I have myself been in the habit of prescribing glasses almost immediately after the operation; but I have not been aware till lately how important it was not to found the indication for them upon even an exact knowledge of the state of refraction gained before the operation, even by the aid of atropine, but upon data furnished *after* the operation from a careful study of the state of the relative accommodation both for the far and near.

I have seen just such results as those mentioned in the preceding case follow, even where no binocular vision existed, and I dare say there are many more which will ultimately go the same way, the sight of which I shall be spared. Patients who have undergone the various vicissitudes from convergent to divergent squint have usually a disinclination to revisit the author of their woes, but there is none of us who does not from time to time get painful examples of each other's failings. The popular fear so often expressed that the eye "may go the other way," though gradually becoming less on account of improved methods of operating, is by no means extinct, either in theory or point of fact. And although we shall probably never be able to measure exactly the effect of a tenotomy, we can at least do every thing in our power to come as near to it as possible, and thus avoid disagreeable consequences, and one of the best ways of doing this is, I believe, to treat more and operate less. To this effect I would suggest the propriety, in all cases of convergent squint in hypermetropic eyes, of reducing as far

as possible the error of refraction before any operative interference is had at all, for the purpose of removing from the interni, as much as possible, the abnormal tension associated with excessive action of the ciliary muscle. By this means I am certain, from my past experience, that we should in the majority of cases reduce the angle of deviation, sometimes even to a great degree, and thus avoid to a considerable extent those numerous "settings-back" of the muscles so detrimental to the easy and lasting performance of their natural functions.

With this brief outline of the manner in which relative accommodation may behave in actual strabismus, I would call your attention for a few moments to a kindred condition—insufficiency of the externi, which is often provocative of homonymous diplopia and intermittent strabismus. Strictly speaking, weakness of the externi recti where there is no anomaly of refraction is exceedingly rare, while in myopia of the highest degree it is of not infrequent occurrence, and in hypermetropia want of proper abductive power is rather the rule than the exception.

We have seen, in the earlier part of these remarks, that if the tension upon the interni was increased the relative accommodation was displaced toward the near point, and it would naturally be supposed that if the tension on the interni was lessened the relative A., instead of being displaced inward, would be removed outward. Now if the externi are weak, it of course follows that it will require less tension on the interni to make the visual lines intersect at a given convergence than if they offered their usual resistance; and if this tension is lessened, it ought to follow that the relative accommodation will be removed further from the near point than under the normal equilibrium of the muscles. But in all cases of marked insufficiency of the externi which I have examined in emmetropic eyes, the field of accommodation was displaced toward the near point, not, as we should expect, removed from it.

These patients have to hold their book near to the eye, some exceedingly so, and the explanation might be sought in the fact that the externi are not strong enough to resist the interni, and thus obtain a proper crossing of the visual lines at even a moderate distance from the eye. But it must be remembered that

these very patients have the power of carrying out the visual lines to parallel axes, as is shown from the fact that their diplopia is rarely if ever constant, while in some cases it is never, as it were, spontaneous, but can only be called forth by the colored glass. Why is it, then, that these patients, if they can overcome the interni to such a degree as to obtain parallel axes, cannot carry out the visual lines sufficient to allow them to read at a distance greater than 14, 12, or even 8 inches, as the case may be?

The explanation of this is, I think, to be found in the action of the accommodation, or rather in the associated action of the ciliary and the interni recti muscles. Under the tension of the ciliary muscle necessary to make reading possible, there is also a corresponding associated tension on the interni, which has the tendency to turn the eye in, and which is counterbalanced in the normal eye by the opposing tension of the externi. If now for any given degree of convergence at which the object is held, the strain put upon the externi in order to resist the interni, while accommodation is going on, is greater than they in their weakened condition can bear, they must of a necessity yield to the superior force; and the result is that the eyes are thus converged to a point nearer than the object, which has to be gradually brought nearer and nearer till a point is reached where the tension on the interni is so great that the externi, though reduced in power, can resist it. But as soon as the accommodation necessary for distinct vision for a near point is relaxed, and with it the associated tension on the interni, the externi are then able, freed from any opposing force, to carry the visual lines out till they become parallel.

Now although a high degree of convergence is necessary in these cases for close work, of course the tension on the interni is not so great for the same degree of convergence where the externi are weak as where they are of normal strength. Thus we see that the relative accommodation may be displaced inward, even when the tension on the interni for every given degree of convergence is reduced.

In emmetropia it is evident that this displacement inward of the field of accommodation can only take place, to any

marked extent, where the insufficiency of the externi is of a very high degree, because as we approach the near point the effective ability of the externi gradually increases, and it requires but little force on their part to maintain the equilibrium of muscular power at the point ordinarily selected for near work. Still that this displacement may take place will be shown by the following case, which I the more willingly cite as I can find but one other like it on record.[1]

C. B., æt. 17, has complained of his eyes "being weak" for over a year, during which time he has been troubled with the common symptoms of asthenopia. He has been wearing a weak convex glass (+ 1-36), which has given him but slight relief. Latterly all his symptoms have increased, combined with occasional double vision. While reading, the patient habitually holds his book at about 7 inches, but can, with an effort, still read at 12, but not further. The examination gave the following results. Refraction emmetropic (under atropine); V. = 1; A. normal. If one eye is covered with the colored glass then homonymous images follow, separated, as measured by prisms, 30° in 20 feet. These images combine at 8 inches, and at 6 vertical diplopia is obtained by a prism, base up. If the candle is held at 8 inches and then moved to either side of the median line 4 inches, homonymous images follow, the images being always on the same plane. The diagnosis was consequently a large amount of insufficiency of the externi; there was, however, no actual strabismus.

The right internus was now divided, and six days after the operation the insufficiency had sunk from 30° to 10° for 20 feet; homonymous images were present only outside of 10 feet, and at 12 inches the candle could be carried all across the visual field without producing homonymous diplopia. The region of distinct vision for near work has been very largely increased, for whereas the patient could not read before the operation at a greater distance than 12 inches, he now reads as far as the type can be seen by the average normal eye, 3 to 4 feet. Ten days later the insufficiency had risen again from 10° to 18° for 20 feet, and it was not till the candle had approached the eye to 18 inches that the homonymous images combined. The ab-

[1] Klinische Beobachtungen Pagenstecher. Drittes Heft, 1866, p. 96.

duction at 12 inches now amounted to 2°, the adduction to 18°. The left internus was now divided, and the results of the examination made three weeks after the last operation were as follows. If the colored glass was used alone over one eye there was no homonymous diplopia, even for 20 feet, nor did this occur anywhere from the distance up to the near point, even when the candle was moved laterally across the field of vision; but if the prism, base up, was added, a small degree of insufficiency (one or two degrees) of the externi was still apparent. The patient is entirely relieved of his asthenopia and diplopia, and can use his eyes to the full amount without experiencing any inconvenience.

In the above case there are two principal points to which I would particularly call your attention. (1.) That although there was no actual strabismus, both interni had to be divided to restore the muscular equilibrium. (2.) That although the patient could, with an effort, carry out his optic axes to the parallel, the relative accommodation was so displaced inward, when the eye was adjusted for near objects, that distinct vision was not possible outside of 12 inches, while near work was usually performed at 7 inches.

To show that this displacement of the relative accommodation may take place when the insufficiency of the externi is the result of operative interference, I would call your attention to the very interesting case presented at one of the late meetings by a member of the N. Y. Ophthalmological Society. The patient was a young lad of about 12 years of age. In this case there was a total hypermetropia of 1-8, with vision = 1. There was an insufficiency of the interni amounting to 8° for the far and 14° for the near. In order to relieve this both externi were divided at the same sitting. The result of this double tenotomy was homonymous diplopia of so great a degree that single vision was only obtained when the object was brought within 6 inches of the eye. This diplopia gradually became less, till at the end of three weeks it only occasionally manifested itself. The patient's total hypermetropia was neutralized, + 1-8 being given. With these glasses vision was 1, and there was no diplopia. The error in refraction having been completely neutralized, the eye might be con-

sidered as an emmetropic eye, in so far that, when in a state of rest, it was accommodated for parallel rays, and consequently had to call forth only that amount of accommodation for a given convergence that a normal eye would; and yet the relative accommodation was very different from that of an emmetropic eye, it being displaced so far inward that the patient could not read outside of 14 inches, while a boy of his age, with vision 1, ought to be able to read common print at 3 or 4 feet.

It would be advanced at once in such a case that the externi had been so weakened by the operations that they had not strength enough to carry out the visual lines, so as to make them intersect at a distance greater than 14 inches. But why have not they the requisite force for this, if they have sufficient to produce parallel axes, which requires a great deal more strength? The only answer to this, that I can see, is the one already given, with a repetition of which I will not weary you.

A further examination showed that the actual abductive power remaining after the operations was, expressed in prisms, only 3°, which is a trifle less than one-quarter what it should be, while the adduction was only 6°, which is also only about one-quarter of what it is in the normal eye. The relative far point for reading is at 14 inches, while the near point is at 6, making the relative accommodation about 1-12, which is certainly one-half, if not one-third, what it should be. Thus we find, in a high degree of hypermetropia, a condition brought about which not unfrequently occurs in exaggerated forms of myopia, where an insufficiency of the externi coexists with that of the interni, together with a reduction of accommodative force.

This reduction in the power of the muscles presiding over the accommodation would lead, we might fear, to some form of asthenopia, either from the ciliary, interni or externi muscles. The fact, however, that notwithstanding the great reduction in force, the proportion between the abduction and adduction remains nearly normal, is very favorable, for if the actual power of both interni and externi increases, the muscular equilibrium between them will probably be maintained.

Although we very rarely find actual insufficiency or even a

reduction of abductive force in emmetropic eyes, in hypermetropia, on the contrary, it is so common as to be in fact the rule. This led Giraud Teulon to express the belief that there is the same inherent tendency in hypermetropic eyes toward weak externi that there is in myopic eyes toward weak interni. Now wherever there is a tendency so strong as to amount almost to a law there must be some cause for it, and the chief causes why the abductive force is abnormally low in hypermetropic eyes are, I believe, two. (1.) That the associated tension of the ciliary muscle in overcoming the error in refraction gives an increased amount of power to the interni. (2.) That the effective force of the externi is *per se* also lessened by the anatomical construction of the hypermetropic eye. In the normal eye, as you are well aware, the externus is inserted further back than the internus, which, in itself, other things being equal, gives an advantage to the interni, and this advantage is disproportionately increased in the hypermetropic, because from the shortened antero-posterior axis the centre of rotation, though relatively more posterior, is more on a plane with the insertion of the muscle, which for this reason has less leverage than in the normal eye.

This want of abductive force may be either actual or apparent. If actual, it depends on some want of power in the muscles themselves, and may be occasioned in three principal ways.

(1.) Through an abnormal preponderance both of volume and force of the recti interni over the externi, which may in themselves be below the normal standard. This condition is generally inherited from parents who have themselves squinted, and in whom, in consequence, the interni have become from constant exercise unduly developed, while the externi, from want of use and from being constantly on the stretch, have lost both volume and vigor.

(2.) From faulty insertion of the muscles, on account of which the interni have the preponderance of power.

(3.) From a state of debility, either temporary or permanent, which has been developed by a constant straining on the part of the externi in order to maintain binocular vision, while the eye is calling forth its accommodation in order to neutralize the error in refraction.

This latter depends on the intimate relation which exists between convergence and accommodation, and which has been more fully dwelt upon in the earlier part of these remarks.

It is evident that in these cases where there is inherent weakness, be it natural or acquired, in the externi, the correction of the error of refraction, though it may give relief, will not remove the whole cause of the trouble; and this is one of the reasons why some hypermetropes, even when provided with suitable convex glasses, still continue to suffer from asthenopia.

Instead, however, of being actual, this insufficiency of abductive force may be only apparent. When it is so, it is due entirely to the efforts of the accommodation to overcome the error in refraction, and disappears as soon as this is corrected by glasses. This will be better explained by an example.

A patient has Hm. = 1-16, Ht., as estimated by the ophthalmoscope, between 1-10 and 1-12. If the condition of the muscles is examined at twelve inches from the eye without the hypermetropia being neutralized by glasses, then the amount of adduction is found to equal a prism of 20°, while the abduction amounts to only 4°. But if the error of refraction is corrected, then the amount of adduction rises to 15°, while the abduction in this particular case undergoes but little change. It is, as a rule, however, slightly decreased.

This shows that the disproportionately low force of abduction is due in this and similar cases not to any idiopathic weakness of the muscles themselves, but to the fact that the nervous impulse, by which the ciliary muscle is able to overcome the error of refraction, is propagated to the interni, which thus throws the balance of power in their favor, and gives them, as long as accommodative efforts are going on, the preponderance of force. From which it follows that the tension on the interni can only be relaxed in these cases by relaxing that of the ciliary muscle. This, as a rule, the unaided eye refuses to do, for the reason that distinct vision would have to be given up. When, however, the hypermetropia is completely neutralized, the undue tension on the ciliary muscle is removed, and, as a consequence, that on the interni. The abnormal resistance which these latter offer to the action of the externi is thus re-

moved, and these muscles are then left at liberty to bring forth their power in order to maintain binocular single vision, as soon as this is threatened by placing prisms before the eyes with the angle outward.

It often happens that the effect of glasses in increasing, at least to its fullest extent, the abductive force in hypermetropic eyes, is not always obtained at once, even in cases where the externi are not idiopathically weak. It often takes some little time for the eyes to give up the exercise of a certain amount of tension, the employment of which habit has rendered instinctive.

On account of this low degree of abductive power an examination should be made (after the hypermetropia has been neutralized as far as possible) into the condition of the muscles, and if a marked degree of insufficiency of abduction is shown, a tenotomy is, in my opinion, not only justifiable, but necessary, notwithstanding the fact that no actual strabismus exists, and the weight of Donders' opinion against it. The cases requiring operative interference will, of course, be comparatively rare, and the tenotomy must be done, not with the idea of dispensing with the proper correcting glasses, which was Donders' chief objection to it, but with the aim of restoring a normal equilibrium to the muscles.

The next subject which I shall call your attention to, and which I have now only time to briefly touch upon, is the action of the relative accommodation in divergent squint and weakness of the interni, and, as it is in myopic eyes that these affections most frequently occur, my remarks will in a great measure be restricted to that condition.

In myopia the relative accommodation is displaced toward the near point, which is exactly the reverse of what it is in hypermetropia, or, what amounts to the same thing, the proportion of accommodative force actually used is always greater in myopia than in emmetropia; consequently the tension on the ciliary muscle is always less, while that on the interni is, from the shape of the eye, always greater for a given convergence than in the normal organ. From this it results that the abductive force is, as a rule, disproportionately great; and, as you are well aware, the first indication in the treatment of in-

ERRATUM.

Page 40, seventh line from bottom, for "greater," read "less."

sufficiency of the interni is to restore this want of adductive power, by lessening the load which the myopic formation necessarily imposes upon them. The different methods by which this is accomplished, such as tenotomy, the use of prisms and the carrying out the far point by concave glasses, are too familiar to you to need or even to permit any extended comment from me. Still I cannot help thinking that, in practice at least, the important service which suitable glasses may be made to render in preventing the tendency to deviation outward shown by myopic eyes has been much underrated; and in this connection I should like to say a word or two in regard to the effect which concave glasses have on the relative accommodation, through which, I think, their utility in a great measure depends.

As a tendency toward an abnormally great convergence is the chief characteristic of hypermetropic eyes, it must naturally follow that the nearer we reduce a pair of eyes to this condition the greater will be the tendency toward increased convergence of the optical axes; consequently if we have myopic eyes with a tendency toward divergence of the optical axes, we must reduce them to the conditions offered by hypermetropia. This is done in two ways. (1.) By altering the refractive and accommodative condition. (2.) By changing the anatomical ones.

If by means of concave glasses we neutralize myopic eyes, we have, as far as the refraction is concerned, reduced them to a condition of emmetropia, and if the accommodation was good it would be fair to suppose that such eyes would be equal also in muscular force. But this, as Donders proved long ago, is not the case, for in carrying out the far point we have also displaced the relative accommodation outward, and thus in reducing it by glasses to an emmetropic eye for the distance we have changed it for the near into a hypermetropic eye, as far as the accommodation is concerned; that is to say, an increased degree of tension of the ciliary muscle is demanded with small degrees of convergence, which is just the reverse of what it was before the M. was neutralized. Now allowing that the increased tension of the ciliary muscle in overcoming the glasses is propagated to the interni, in carrying out the far

point we have not only decreased the amount of tension demanded of them by lessening the convergence, but we have also increased their effective ability for that convergence.

This will be made clearer by an example. Suppose a myope of 1-7 habitually reads at his far point, that is, at 7 inches. Under these conditions he is using a considerable amount of the tension of the interni with the minimum amount of accommodation, or even with no accommodation at all (Donders). If now we carry out his far point by neutralizing completely or partially his myopia, but so that he can still read with ease at 15 or 16 inches (his near point being no longer at 3, but at about 6), we have by thus reducing the convergence reduced also the amount of tension on the interni to a very large degree. But beside this, by compelling the ciliary muscle, which was formerly idle, to exert its tension in overcoming the glasses, we have gained that amount of force which through its action is always transmitted to the interni. That this is true is proved from the clinical fact that the average adductive force of myopes, who from an early age have worn glasses sufficient to neutralize their myopia, is much greater at their point of near work, and the tendency to deviate outward much less than among those where the error in refraction has not been corrected. For this reason, when in myopia there is any insufficiency in the abductive power, I always make it a rule, whether a tenotomy has been performed or not, to neutralize the myopia, or to come as near this as circumstances, such as the state of the accommodation, amount of vision and age of patient, will permit.

In regard to the second method of relieving the overburdened interni, that by tenotomy, I should have something to say, both as to the indication for and performance of the operation, did not want of time compel me to postpone it till some future occasion.

In conclusion, I would say that the object of these I fear already too extended remarks has been to call attention to a part of the subject of strabismus which has not yet received the attention which I think it deserves. And it is in this connection that I would suggest that we have hitherto in our treatment of squint paid too much attention to the condition

of the recti interni and refraction, and not enough to that of the externi and accommodation.

TEST TYPES AND THE POWER OF PERCEPTION. By B. JOY JEFFRIES, of Boston.

I agree with Dr. Green in the correctness of the principle on which is based his new series of test letters, published in the Transactions of the Society, 1869. Either the printing or the lithographing of the sheet accompanying this number of our Transactions is so poor as to seriously affect its utility. I used one in the following experiments, which fact may have had an influence on *some* of my results. I do not agree with Dr. Green that it is a good plan to make the spaces between the lines proportionate to the height of the letters. I found, in carefully testing, that they should be wide apart, and their closeness on the card interfered with their being perceived. These causes rendered them not so distinctly perceived as Snellen's of the corresponding size. I would advise the last six lines of letters being cut apart and separated out on another card or the back of the same.

Visual perception is so much a mental act that, of course, all answers from test letters have elements of error in relation to the condition of retinal impression. Every thing which affects the two elements of sight, namely, retinal impression and mental perception, affects the distinguishing test types.

I have often felt a doubt whether the reading XX. at 20 feet in a fair light was a strict enough test. In general we should be satisfied if a patient, after choroiditis or iritis with syn. post., read for us XX. at 20 feet, and Jäger No. 1 at 10 inches. Yet this, for me, would be a reduction of vision to less than one-half. In comparing Dr. Green's with Snellen's test text, I endeavored to see how far above normal, or XX. at 20 feet, I could go. The following results were from three separate trials, on three several days, when not feeling below par in general sensation of health. My examination of recruits (not drafted men) during the late rebellion had taught me how much vision might vary in the same individual within a short time from mental or cerebral causes.

The same man who the day after a "spree" could not read my Snellen XL. or L., would come back the day following and read XX. fluently. Therefore I selected days when the eyes and body were, so to speak, normally used. In testing patients I employ the same Argand gas-burner and partly darken the room, generally using black on white. Standing at exactly 20 feet, and avoiding mental and physical interruption—I mean thinking of nothing else—holding the head still, the eyes carefully fixed and not irritated by side light, I succeeded in reading Snellen XV. H, R and U were not good letters to distinguish. I read Snellen XII., except S = N. I use the sign of equality to signify that they could not be distinguished from each other. Of Snellen X. I read V, Z, O, U, Y. A and B were bad, and P = F, also H = K = R. Snellen's VIII. was the lowest I could read any letters of at 20 feet. I read C, L, T, V = Y. If a cataract patient, after operation, read as many letters of XX. at 20 feet I should be satisfied.

Of Dr. Green's new card I read down to X. without much difficulty, at 20 feet; XVI., pretty fluently; XIII., O = C = G. P is bad. Some of the letters of X. I could make out, but none of VIII. The nearness of the lines to each other and the want of good printing, as also the numbering of the lines over the letters, interfered with my perception of them. The result, as is seen, was not so good as with Snellen's text.

Out of doors, with sunshine on the card and I myself in the shade, I found I could do better.

Snellen's VIII. I could mostly read at 20 feet. } I mean some letters
" X. " " " 23 " } bothered me
" XII. " " " 32 " } as before.
" XV. I could fluently read at 32 feet.
Green's X. at 23 feet.
" XVI. at 32 feet, not so easily as Snellen's XV. at same distance.
Snellen's XX. at 53 feet I could decipher.
" XXX. at 53 feet I could read easily.
Green's XX. at 32 feet.
" XXXII. fluently at 53 feet.
" XXV. just make out at 53 feet. They were confused.
" XX. not at all at 53 feet.

This gives me a varying V. of 20-8, 23-10, 32-12, 32-15 + by Snellen's card, and a varying V. of 23-10, 32-16, by Green's card.

My V. for Snellen's XX. and over was 53-20 —, 53-30 +.

My V. for Green's " " " 53-32.

Black letters on a white ground not only looked larger from irradiation, but were more distinctly perceived in detail in daylight, V. = 53-20. Dr. Green's plain Gothic letters were not so good as the finished letter—I mean L with a top to the perpendicular and upright to the horizontal line, E finished, so to speak, etc.

The colored XX. of Snellen I tried by gaslight, which gave, of course, a yellowish tinge. The red was most striking and seemed *at first* to be most readily perceived, but this was not the case. The yellow was most correctly and easily distinguished in detail. These letters are on a black ground.

In reference to my power of visual perception I should say I have not generally found it *much* above *practiced* emmetropes, and have regarded my eyes as normal. I have never perfectly paralyzed my accommodation to find Hl. At 20 feet I was conscious of a sensation of accommodation for the letters below XX. I was too busy to test this by total atropine paralysis of the ciliary muscles. Above these I perceived the letters readily with relaxed muscles, turning from looking at a distance. This amount of accommodation seemed difficult to hold to, as if it was so small that it was not sustained with steadiness. With complete relaxation and + 1-80 my vision was almost the same as without any glass; + 1-60 was too strong. My accommodation seemed, therefore, about = 1-80.

I had purposely avoided being, so to speak, mentally familiar with these letters from their constant presence to the eye in my office. I attempted no record when I had learned them, and could easily detect this familiarity.

Now, I would ask, is my vision very much above the average? If not, then these tests are not up to the requisite niceness. I do not mean by this that we are likely to make a gross error of diagnosis or prognosis by their use, but simply would warn against mistakes. In conclusion, I would say these experiments caused a degree of mental irritation as well as ocular fatigue, which will render me more lenient toward my unfortunate patients undergoing the extraction of astigmatism, for instance.

Monocular Glaucoma supervening on Binocular Retinitis Hemorrhagica. By D. B. St. John Roosa, M. D., of New York.

Mrs. R., æt. 60, a delicate but active lady, consulted me May 19, 1869, in regard to her vision, and gave the following history. About two years before, while riding in a very severe wind on a cool day, the patient suddenly experienced a blurring sensation before both eyes, accompanied by some pain. On getting home she found that she was unable to read or sew, and that her eyes would not tolerate a bright light. The condition of the eyes slowly improved, so that the patient was able to bear the light and engage in ordinary occupations not requiring much use of the eyes, but not to read or sew. On December 25, 1868, an exposure similar to the one above described occurred, followed by the same symptoms, viz., pain, loss of sight and photophobia, in an aggravated form. She has felt herself obliged to stay in a dark room since the last attack, although she has just made a journey of about 250 miles in reaching New York. The treatment pursued has been mainly the use of blisters behind the ear, alteratives, rest and avoidance of the light. On examination the eyes are found somewhat sensitive to light, but not excessively so. Right eye, V. = 1-20; left, 4-20. Tension slightly increased. Great venous engorgement and numerous traces of suffused blood in the retinal vessels. Nerve entrance excavated; a decided sense of fullness in this eye is complained of by the patient, while in the left no such feeling is experienced. The left eye showed the usual evidence of neuro-retinitis; no excavation of the optic nerve entrance.

I suggested to the patient that an iridectomy be performed on the right eye, and that a tonic course of treatment be adopted, with a return to the enjoyment of sunlight, having the eyes protected by blue glasses. I informed her that I only hoped to stay the progress of the disease in the right eye, which, without interference, must go on to absolute blindness.

I then sent the patient to Dr. H. Knapp for his opinion, which he gave as follows: "In the left eye, apart from

cataracta incipiens, I find the traces of neuro-retinitis being now on its progress to a certain degree of atrophy of the optic nerve; tension normal.

"In the right eye there is a high degree of venous engorgement of the retina, numerous retinal apoplexies, and excavation of the optic disk. F. normal, T_1; pupil perfectly responsive. My opinion is that apoplectic retinitis was caused in both eyes by a drive in the cold wind. In the left eye it ran its usual course; in the right it underwent the rather rare but very unlucky complication with glaucoma."

Dr. Knapp advised an iridectomy in the right eye, which I performed on the 21st, using an anæsthetic, and being assisted by Dr. C. E. Hackley. A broad segment of the iris was excised without difficulty, and very little reaction followed, the wound healing very well. The subjective sensation of fullness in the eye was immediately relieved by the operation and continues so. The vision remained the same; the eye was not examined by the ophthalmoscope after the operation. The patient returned to her home at Sacketts Harbor, N. Y., eleven days after the performance of the iridectomy.

A note from her son, in October, states that the vision had not decreased any; that the patient's general condition is much improved, so that she goes all about, to church, and so on, while at the date of the operation she felt that her sight was failing quite fast.

A Modification of the Ophthalmoscope. By Edw. G. Loring, M. D., of New York.

The modification of the ophthalmoscope which I now present to the Society is intended to facilitate examinations by the upright image, and to expedite the determination, by this method, of existing errors in refraction.

The principal feature of the modification is the substitution of detachable cylinders for the fixed Rekoss disk now common to a number of ophthalmoscopes. In the present case but three cylinders are employed, though these might be multiplied indefinitely was there any occasion for so doing. Each cylinder is pierced for eight glasses, forming in the aggregate the following series:

Convex..... 0, $\frac{1}{48}$, $\frac{1}{24}$, $\frac{1}{16}$, $\frac{1}{12}$, $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{7}$, $\frac{1}{6}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$.

Concave..... $\frac{1}{48}$, $\frac{1}{24}$, $\frac{1}{16}$, $\frac{1}{12}$, $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{7}$, $\frac{1}{6}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$.

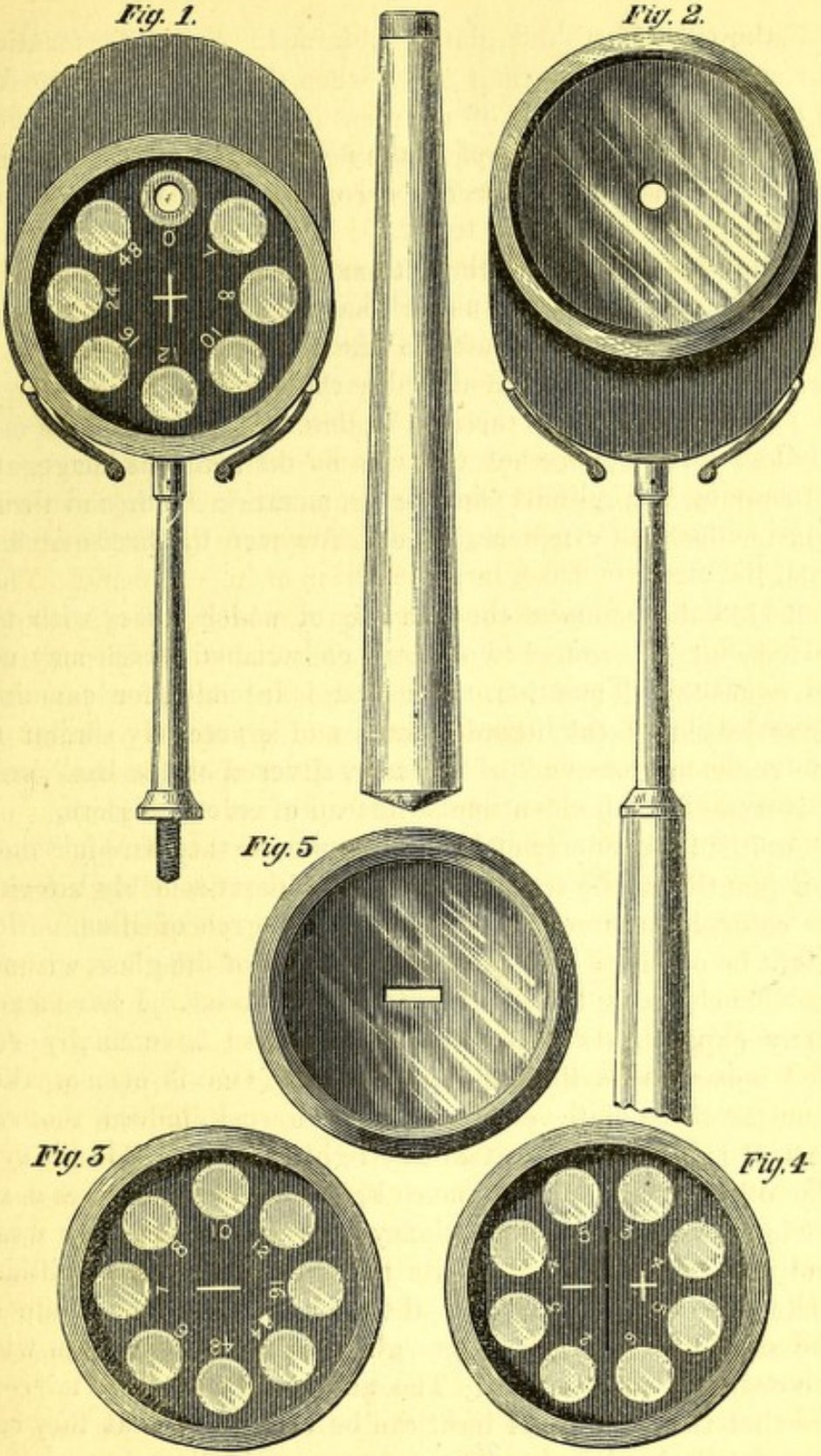
Thus we have a series of glasses extending, with but comparatively slight differences in focal value, from convex 1-48 to 1-3 and from concave 1-48 to 1-2.

The manner in which the glasses are divided among the cylinders will be readily understood from the accompanying drawings. The first cylinder is made up entirely of convex glasses, by means of which all ordinary degrees of hypermetropia can with sufficient exactness be determined. One hole (0) is left vacant to represent emmetropia, without the necessity of removing the cylinder, and for examination by the inverted image without an eye-piece; should, however, the latter be desired, the observer has a large selection at his command. The second cylinder contains the concaves of moderate focal power, and the third is composed of the high numbers, both positive and negative. These strong numbers are designed for the determination of the highest degrees of errors of refraction and for the measurement of the inequalities of the fundus, such as excavations and elevations of the optic nerve, projections of tumors, retinal detachments, membranes in the vitreous, etc. With the stronger convex, such as 1-3, opacities of the cornea and lens can be viewed under considerable enlargement.

The cylinders fit into a cell at the back of the instrument and are held firmly in their place by means of the two small springs shown in the engraving, which, projecting into a groove in the side of the cylinders, prevent these from falling out, yet do not interfere with their rotation. In turning, the centre of the glass comes opposite the centre of the hole in the mirror.

Great care was taken to have the mirror, which is concave, seven inches' focal distance, ground exceedingly thin—as thin almost as a metal mirror—while all the surrounding brass work is so beveled away that as little impediment as possible is offered to the passage of the rays, thus rendering the image perfectly distinct, and I think unusually brilliant.

The mirror being contained in a separate case of its own is made detachable from the rest of the instrument, which can then be used as an optometer, the patient himself revolving the



EXPLANATION OF DRAWING.

Fig. 1. Back of instrument with cylinder in position.
Fig. 2. Front view of instrument.
Figs. 3 and 4. Remaining cylinders detached.
Fig. 5. Astigmatic optometer and mirror.

cylinder till the suitable glass is obtained. As the perforation through which the patient looks when the mirror is removed is equal to the diameter of the glass (three lines), and is much larger than the normal pupil, the peripheral rays are not cut off, which is usually a source of error when smaller diaphrams are used.

The handle of the instrument has purposely been made unusually long, so that the observer's hand shall not interfere with an easy and close proximity to the observed eye, which is a great advantage in examination by the upright image.

The instrument, the three cylinders, and a convex two and one-half inch lens for examination by the inverted image, are all contained in a small pocket-case, measuring four and three-quarter inches by two and one-half square by three-quarters thick.

Beside the common concave mirror which comes with the instrument, I have had two others constructed which may not be unworthy of mention. The first is intended for examinations by the "weak illumination," and is precisely similar to the common concave 7-inch mirror, silvered on the back, only it is made from London smoke instead of colorless glass.

As it is the property of London smoke glass to simply reduce the quantity of the transmitted light without sensibly altering its color, it occurred to me that any degree of illumination might be obtained by using various shades of the glass, without sensibly changing the appearance of the fundus. I have made many experiments with these mirrors and have finally settled upon two as the most serviceable. One is even weaker than the three plates of plane glass—so weak, indeed, that the patient is hardly aware that any light is thrown into his eye. The other is made from a much lighter shade and gives a reflexion intermediate in brilliancy between the ordinary weak and strong reflectors. By its means a much more brilliant picture is obtained than with the plane glass mirror, while at the same time with much less glare to the patient than with the ordinary silvered one. The advantages of these mirrors are that the quantity of light can be varied and that they can be so easily kept clean. The common weak mirror, consisting of three plates of plane glass, could, however, be easily fitted to the instrument, should it be desired.

The remaining mirror mentioned above was originally designed for a stenopæic slit to be used with the instrument when employed as an optometer for the determination of astigmatism. It consisted of a thin plate with a slit in it, whose length was equal to the diameter of the perforations in the cylinder. This was mounted like the mirror, and made to fit in the mirror cell in which it revolved, so as to allow the slit to correspond with any given meridian of the cornea. The meridian once determined, the patient turned the cylinder till the suitable glass was obtained. This plate was subsequently made with a polished surface in front, and was thus made to serve also as a mirror for determining, by means of the ophthalmoscope, the amount of astigmatism in the principal meridians of the eye.

In conclusion, I would take this opportunity of informing those who are desirous of obtaining this instrument that it can be had of its maker, H. W. Hunter, Optician, 1132 Broadway, N. Y. City.

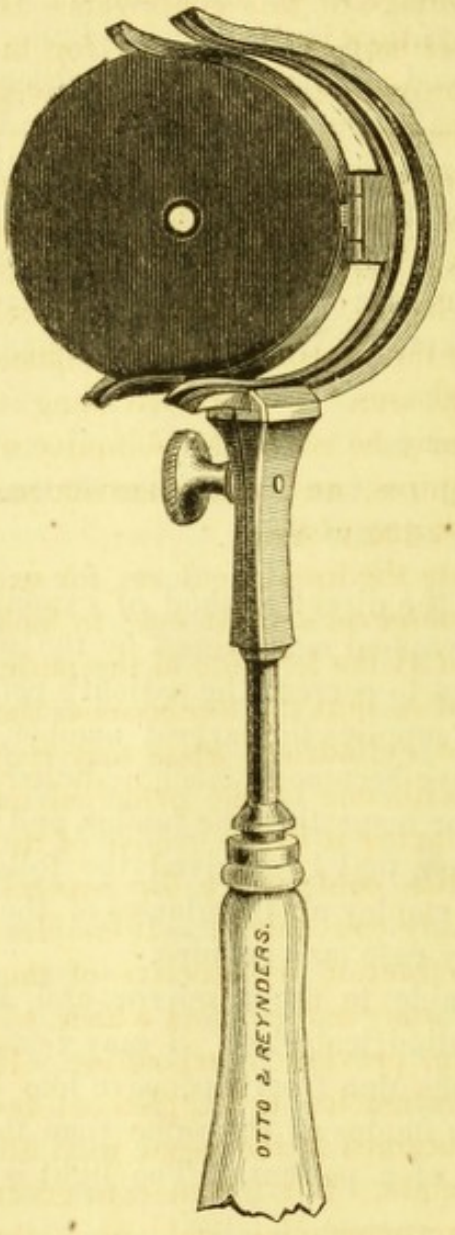
A Modification of the Ophthalmoscope. By Henry D. Noyes, M. D., of New York.

In employing the direct method of examining the fundus, I have been embarrassed many times by the want of a suitable number of glasses to correct the patient's refraction. Jaeger's ophthalmoscope supplies the largest number, but these are insufficient. I have become so much addicted to the use of the upright image for inspecting the fundus, and for estimating the state of refraction, that I contrived the following instrument to enable me to employ all the glasses of the trial-box, as the exigencies of any case may require.

I wish to be able to use a mirror, and, if needful, both a spherical and cylindrical glass. I may remark that, in many instances, the reflection from a concave lens is quite sufficient to illuminate the fundus at the same time that it corrects the possible myopia of a patient. The light is feeble, but sometimes adequate.

My contrivance consists of three forks, or clips, which make a little more than the semi-diameter of a circle, and are grooved for the reception of either a glass or the mirror. The

three clips are placed in a slot, which may be tightened or loosened by a screw; they may thus be turned around to the amount of a half circle. All move together, and are supported upon a handle, which should be $5\frac{1}{2}$ inches long. Two of the clips are precisely alike; in these the glasses are usually inserted. The front clip has at its middle a hinge, and is intended for the mirror.



I use a plane silvered mirror, the sight-hole being bored through the glass. Such a mirror, it has long since been shown, is eminently adapted to the employment of the direct

method, while for the indirect method a concave mirror of 7 to 10 inches' focus is more suitable. In this contrivance the mirror may be made virtually concave by putting it in the middle clip and setting in front of it a convex lens of 7 to 10 inches' focus. So far as this lens becomes an eyepiece, its influence may be modified at pleasure by putting behind the mirror a concave lens.

The chief advantage of this contrivance is in the fact that all the trial-glasses may be put in use for the upright image. The reason for providing the front clip with a hinge was to give greater accuracy to an examination for astigmatism. When no astigmatism exists it is most convenient to have the clips held at their middle by the slot; the opening of the forks is then upward, and the instrument may be used by either eye at will, without change. But if there be astigmatism the necessity of holding the mirror obliquely influences the effect of the correcting glasses. I therefore hang the mirror on a hinge, so that it may be set to the obliquity which the position of the lamp requires, and the observer may look straight through the correcting glasses.

The cut presents the instrument set for examination of the right eye by the observer's right eye; to look at the left eye, the lamp is placed at the left side of the patient, and the clips are turned around so that the top becomes the bottom. Whatever rotation the cylindrical glass may require to bring its axis to coincide with one of the principal meridians, may be done by simply moving it in the groove of its own clip.

Having used this contrivance for several months I have found it exceedingly convenient. It enables me to diagnosticate errors of refraction irrespective of the patient's amblyopia, with an accuracy and comfort which, with fewer glasses at my disposal, was previously impossible. How important is this kind of investigation to supplement and sometimes correct the results obtained in the usual way, all skilled ophthalmoscopists appreciate. For instance, in great hypermetropia, which often has accompanying amblyopia, the absolute H. it may be difficult to get without prolonged use of atropine. The observer's eye, armed with the trial-glasses, can soon tell by exploring the retina when the full correction is secured.

It is well known that the accommodation of hypermetropes is almost always relaxed, without atropine, during an ophthalmoscopic examination.

The simple contrivance which I present is properly an appurtenance of the box of trial-glasses. They are complementary to each other. I use the trial-glasses made by Nachet, which are set in frames, and each has a handle, so that the glass does not become soiled by the fingers. I do not now care to descant at large upon the great advantages of the upright image in ophthalmoscopy, but simply offer this instrument to facilitate this mode of examination, and know that it will soon commend itself to the hearty adoption of any who will give it a fair trial.

If the observer be emmetropic he needs no correcting glass for himself, if he will relax his own accommodation—and this is made much easier by looking with *both* eyes open and keeping one's visual lines parallel. On the other hand, if observer and patient both be emmetropic, I prefer to use a — 24 for the inspection of the optic nerve, because by relaxing accommodation the *lamina cribrosa* is sharply defined, and by using A 1-24 the retina and surface of the disk are perfectly seen. I am tempted to add that a true test of accurate perception of the fundus and estimation of the refraction is not to be found in the large retinal vessels, but in the very small ones, and still better in the stippling which is produced by the choroidal epithelium.

AN IMPROVED EYE SPECULUM. By HENRY D. NOYES, M. D., of New York.

I beg leave to exhibit to the Society a form of eye speculum which I have been using for several months. Before presenting it, I call attention to a considerable number of such instruments, which show the modifications which have been contrived for meeting the indications necessary to the full attainment of the purpose in view.

What is required in a speculum is to separate the lids to the fullest possible degree without causing injurious pressure, directly or indirectly, on the globe, and without becoming itself an embarrassment to the operator.

The first indication, the separation of the lids, is usually obtained by the action of a spring, separating the blades in a vertical plane. The movement of the upper lid is not of this kind, but describes the arc of a circle as it slides over the convexity of the globe. It is difficult to imitate this action in a speculum and obtain a sufficient extent of motion. An attempt of this kind is exemplified in an instrument which I had made in London, in 1866. The blades are connected with a curved bar made of aluminum, and the movable one travels upon the bar by means of a rachet and pinion. The bar is the arc of a circle of a radius of about two inches, and is placed at the inner canthus.

The chief objection to the instrument is, that it does not open the lids as widely as is desirable, especially when the eye is deep in the orbit. It is, however, an efficient instrument, and has the advantages of lifting the lids off the globe, of being out of the operator's way, and of holding the lids asunder at any desired point within its range. It seems to enjoy considerable popularity in London, judging from the remarks made upon it in Mr. Wells' treatise on the diseases of the eye, p. 258.

The second indication, to avoid direct or indirect pressure on the globe, is of the utmost importance in iridectomy and cataract extraction. In the first place the instrument must be light; in the second place the separation of the blades must be capable of restraint, so as not to press on the eye by dragging on the conjunctiva. The bar thrown across the arms of the speculum and set screw make a reliable check. In some cases the bar is single, in others it is cut in halves, which slide past each other. Another and simpler check is a flat loop of wire thrown across the arms, and which can be fixed at any point by means of notches cut in the arms. When the speculum expands most the loop is nearest the spring and least in the way.

The third important indication is that the instrument shall not be in any respect a hindrance to the operator. To fulfill this indication some have been made to work across the nose. The objections to them are that they must be of large size, and are consequently awkward to carry in a case; and, beside

this, they are not held in place by the eyelids as well as are those which have the spring on the temporal side. The reason for this is the anatomical fact that at the inner side of the globe the conjunctiva bulbi passes quickly over upon the lids and makes a shallow *cul de sac*, both above and below; on the other hand, at the outer canthus the *culs de sac* are deep, and retain the blades in place much more readily.

For these reasons it is better to have the spring on the temporal side. In this case the arms must be strongly bent so as to make them lie closely to the temple. This puts the transverse bar pretty well out of the way, but leaves the set screw standing up enough to interfere sometimes with the handle of the cataract knife when the section is being made. This objection I tried to obviate, as you see, by laying the set screw in a horizontal position. It then becomes a little troublesome to seize the head of it.

Without wearying you by showing any other rejected instruments, I exhibit the one which I venture to commend to your acceptance.

Fig. 1.

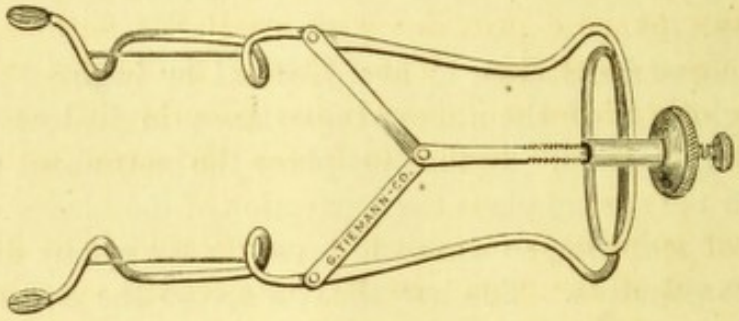
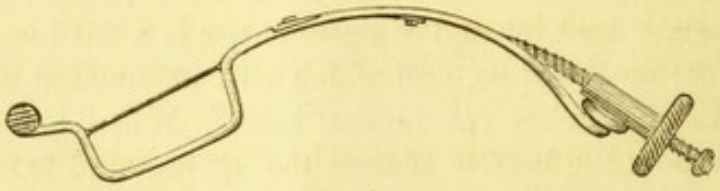


Fig. 2.



It is made of moderately tempered steel, electro-plated with either gold or nickel. It is both light and strong. Its blades open by a spring on the temporal side, which is so strong as to overcome the efforts of the orbicularis even when it contracts vigorously. The check to the expansion of the blades

is found in a Y-shaped attachment to the upper side of the arms. The extremities of the Y are pivoted to the arms and to the stem, so that it has three joints. The stem is prolonged backward beyond the spring, and runs through a short tube soldered to the spring. A triple thread is cut on the stem, upon which a milled head runs easily and quickly. The head may be set at any point of the screw and effectually stops the expansion of the blades, but does not hinder the closure of them by the fingers of the operator.

Working in this manner and occupying this position, this part of the apparatus is completely out of the way and is effectual in its purpose. I find myself in an operation subject to no embarrassment by reason of the interference of the speculum.

The chief indications I have mentioned are thus fulfilled, but some other advantages should be secured, if possible. It is important to be able to take the speculum out quickly, as, for instance, if when taking an anæsthetic the patient begins to vomit, or in case of loss of vitreous. This may be done without any delay by catching the extremities of the blades, which are for this purpose provided with small, flat buttons, roughened on their outer side. Thus closing the blades with one hand, the other hand will quickly and smoothly lift out the instrument. It is not needful to loosen the screw, as in other specula.

Another point to be attained, if practicable, is to keep the eyelashes out of the way. In Mr. Lawrence's speculum this is done by putting a thin metallic plate on the blades and making them solid. I have discarded this plate, because it takes up room and limits the area in which we are to operate. I keep the cilia aside by a small wire thrown across the blades from end to end.

I have lately observed that, when it is necessary to seize the globe below the cornea with the fixation forceps, the wire to keep back the cilia interferes with the forceps. The cilia of the lower lid almost never hinder an operation. I have therefore had the wires made movable, and to be inserted into holes so as to apply only to the cilia of the upper lid, and that for the lower lid may be taken out.

To introduce the speculum the blades should be pinched together by the fingers of one hand seizing the little knobs on the nasal extremities; it is adjusted in place by the other hand, and the screw set to the position at which it is desired to keep the blades open.

The one thing to be remembered in handling the instrument is to shut it by catching its inner extremities; by doing this it will not be liable to rotate in the fingers and make sudden pressure on the globe, as it might if caught by the arms at the outer portion.

I am able with this instrument to accomplish as much as can be expected from a speculum. It is adapted to almost all variations in the depth or prominence of the globe. A very few cases occur in which the globe has sunken to an extreme degree into the orbit and carried the eyelids with it. Inasmuch as a speculum always rests on the bony edge of the orbit and cannot enter far into its cavity, in cases of extreme marasmus and consequent retreat of the globe a pair of elevators may be shaped so as to expose the cornea more perfectly than can a speculum. On the other hand, if the globe is very prominent a speculum rests directly on it, and not on the edge of the orbit. Perhaps it will then be better to dispense with instruments and trust to the fingers of an assistant, because the cornea will be very easily exposed.

With these exceptions, I decidedly prefer to employ a speculum rather than to rely upon an assistant. The fingers of the most skillful assistant or the proximity of his person crowd the operator more or less. An unskillful assistant is constant cause of anxiety, and has too frequently damaged or ruined the result of an operation.

A New Form of Cataract Knife. By Henry D. Noyes, M. D., of New York.

At the last meeting of the Society I stated, in some remarks on the operation for cataract by Graefe's method, that I had some objections to the very narrow knife employed by Prof. Graefe, and had consequently adopted another. I still adhere to the opinion then expressed, and regard the matter of suffi-

cient value to bring it again to notice, and offer a woodcut of the knife.

The blade has a straight back and convex cutting edge for one-half the distance from the point. The convexity is the arc of a circle having a radius of four inches. In the back half of the blade the front and back are parallel, and the width is three millimeters. This maximum width is not attained until you go back from the point sixteen millimeters. The total length of the cutting edge is thirty millimeters. The blade is very thin, is double-edged for some distance from the point, and the latter is extremely sharp. When the counter-puncture is made, supposing the length of the wound in the sclera measured in a straight line to be twelve millimeters, the width of the blade at the puncture is two and a half millimeters.

The qualities which recommend the knife to my use are, that it penetrates with much more ease than any other which I have used; the cut is more smooth than by the narrower knife, because the blade cuts faster, and less tissue remains to be divided after counterpuncture has been effected; the width is not too great to prevent easy manipulation of the blade when in the anterior chamber—that is, rotation of the blade on its axis; there is very little tendency to escape of aqueous humor; the cut is completed with less of the pushing and withdrawing which I have found needful with Graefe's knives; in consequence of the great facility of penetration the fixation of the globe is easier, and the eye has less tendency to turn inward as the puncture and counterpuncture are being made.

I have had the handle made a little thicker than usual, and octagonal, being of about the form of the handle in Weiss's cataract needles.

An experience of sixteen months has confirmed my first impressions of the value of this form of blade, and some of my colleagues in the New York Eye and Ear Infirmary share my opinion. I am aware that at the late Ophthalmological Congress in Heidelberg some expressed a desire to make the

knife still narrower than Graefe at first proposed. There may be those whose difficulties, like my own, have been of a sort to require a remedy of a contrary character.

In the woodcut it may appear that the back of the blade has considerable thickness; this is not a correct representation, because it is extremely thin.

A New Method of Applying Pressure to the Eye. By E. Dyer, M. D., of Philadelphia, Pa.

The value of pressure on the eye in certain cases is so well recognized that I need make no excuse for offering the following paper. I think it may be more extensively used and more efficiently applied than has heretofore been generally supposed.

It was with the object of learning how far pressure could be used to advantage, and how it could be best employed, that I undertook the experiments which led to the construction of the instrument here described. The common compressory bandage, either flannel or knit, is open to many objections. Its elasticity varies with the quality of the stuff, and the manner in which it has been washed. It is liable to slip, and in most cases its readjustment must be left to an assistant.

To pack the orbit properly requires not only skill, but time and patience. Moreover, there are cases in which pressure is indicated, but in which the heat caused by the packing presents an insuperable objection to its employment. The necessity for frequently renewing the packing in cases where there is much discharge from the eye is also a serious objection.

The degree of pressure used cannot be accurately estimated, but will be at some times greater and at others less. In fact the surgeon never knows what pressure is exerted, but must depend entirely on his own sense of touch and on the sensibility and intelligence of his patient. Moreover, it is utterly impossible for him to convey to others an exact idea of the compression desired. Also in recording or reporting cases, no exact estimate can be made of the amount of pressure employed.

It is obvious that to possess its full value the pressure should be uniformly distributed over the eye. Now, there can be no

pressure so perfectly uniform as that exerted by a fluid. Suppose a man to be lying on his back, and a tube (the lower end of which is cut out so as exactly to fit the bony margins of the orbit) should be placed perpendicularly on the eye and then filled with water, there would be an equably distributed pressure on the eye equal to the weight of water in the tube. But it is not necessary that the whole tube should be of the same size as the opening at the base, as the amount of pressure at the bottom depends solely on the height of the column of water; consequently, a small tube attached to a cup-shaped reservoir will answer all the requirements.

As the area of the mouth of a tube which will fit the eye cannot be easily calculated exactly, I constructed such a tube about two and one-third inches in the longer diameter and one and two-tenths inches in the shorter, and found that when eleven inches long it held sixteen ounces of water, every inch in height representing nearly one and one-half ounces.[1] Consequently an eye with such a tube eleven inches high, filled with water applied to it as described, is subjected to an equable pressure of one pound.

So much for the theory of the apparatus, which is constructed simply on the principle of hydrostatic pressure.

It consists of a cup made of white metal or hard rubber, as light as possible, and so shaped as to fit the orbit. The figures as represented are the natural size, except No. 3, which is reduced. From the bottom of the cup extends a flexible gutta-percha tube as long as may be required, say three feet. In the end of this a glass tube six inches long is inserted, so that the height of the column of water can be seen. To the sides of the cup two inelastic straps are attached, to fasten the instrument to the head. If of leather, there should be a sliding buckle; with any other material the common buckle will answer.

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[1] The exact measurements are:

Length of opening	2.32 inches.
Width of opening	1.2 "
A column 11.111 inches high weighs	16 ounces.
A column 5.555 inches high weighs	8 "

Each inch represents 1.44 ounces.

Fig. 1 represents one form of the instrument, and Fig. 2 another. In Fig. 1 the mouth of the cup is covered with thin

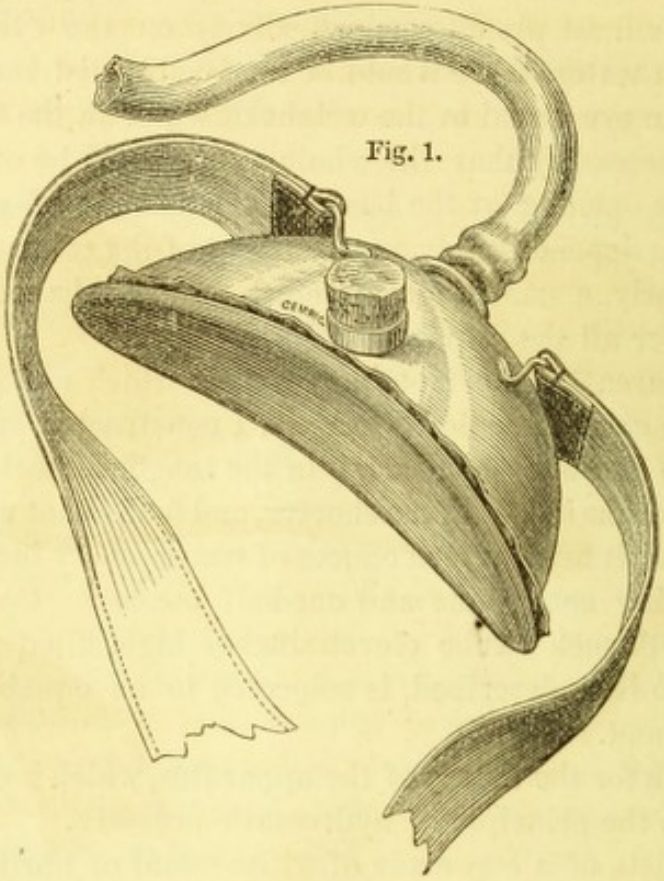


Fig. 1.

sheet india-rubber, tied securely with waxed saddler's silk; a groove in the edge of the cup prevents its slipping. The covering should not be stretched so tight as not to allow it to bulge out to conform to the shape of the eye when filled with water. An opening in the side of the cup, fitted with a cork, allows of its being filled with small pieces of ice when cold combined with pressure is desired. To fill the cup and tube it is necessary to remove the cork and lay the whole in water, and then insert the cork. The instrument is most easily used if the patient is in bed. After it is filled the cup is readily fitted to the eye, and then strapped closely to the head. The end of the tube is then fastened to the head of the bed or the wall behind it. The difference between the level of the patient's eye and the water in the glass tube will show at once the amount of pressure exercised, as each inch, as before said, rep-

resents about one and a half ounces. The length of the flexible tube allows free motion to the patient's head on the pillow. A socket in the side of the strap will allow of an upright support of cane or light wood, to which the tube may be tied, if it is desirable that the patient should not be confined to the bed.

Fig. 2 represents the instrument so arranged that direct

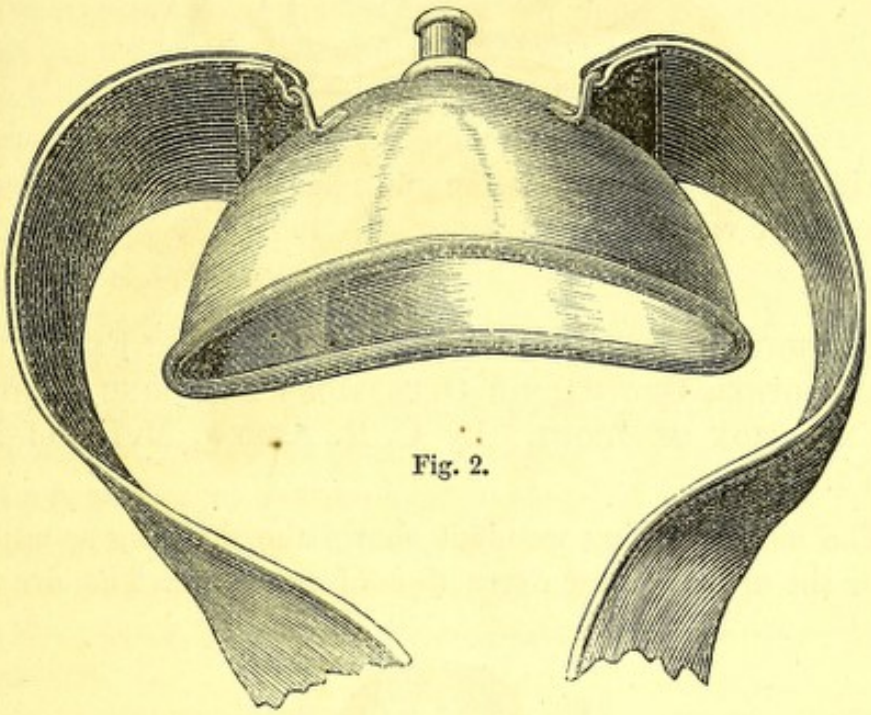


Fig. 2.

pressure may be applied to the eye without the intervention of the lids. The mouth of the cup is open and the edges guarded by soft gutta-percha, otherwise it is the same as Fig. 1. Though more difficult in application this form has this advantage: the cup can be filled with either hot or cold water, to which any drug desired may be added, and the patient, by opening the eye—which experience has proved is perfectly practicable—receives not only direct pressure on the eyeball, but the direct action of whatever medicament has been used. In using this form the end of the tube must be held on a level with the cup. The latter is then filled with the liquid, and, while the patient bends his head well forward, it is carefully fitted to the eye and securely strapped. But care must be taken that until this is accomplished the end of the tube is kept at exactly the same level as the cup. After this the tube can be fastened

above the head at whatever height may be desired (as in using Fig. 1), and the surgeon must exercise his own ingenuity in accomplishing this.

Fig. 3.

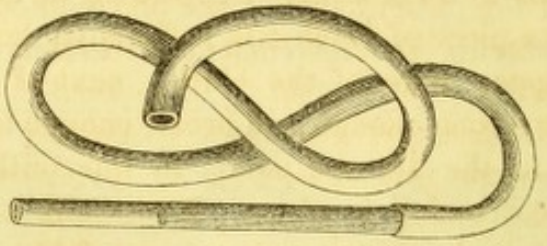


Fig. 3 simply represents the gutta-percha tube with the glass tube at the end.

A Method of Dressing Eyes after Cataract Extraction, and other Ophthalmic Operations requiring Rest by Exclusion of Light. By C. R. Agnew, M. D., of New York.

The accompanying woodcut shows the dressing as applied after the operation for extraction of cataract. The dressing

consists, first, of two strips of isinglass plaster, about two and one-half inches long by a quarter of an inch wide, applied

over the closed eyelids to keep them shut; next of a strip of soft, thin linen or cotton cloth, in the form of a parallelogram, large enough to extend laterally beyond the temporal edges of the orbital rims, upwards to clear the superciliary ridges, and downwards to a horizontal line drawn through the cheek-bones. Next a piece of black silk sufficiently large to overlap all but the upper edge of the cloth; next of some strips of isinglass plaster long enough and broad enough to attach themselves partly to the silk and partly to the contiguous skin, so as to hold the dressing in place. If the silk be so thin as to be translucent it should be made of two folds, otherwise one fold will suffice. A notch may be made in the centre of the lower edge of cloth and silk, so as to permit a close coaptation between the dressings and the skin in the angles formed by the intersection of the wings of the nostrils with the surface at the base of the upper lip.

It is claimed that this dressing, when carefully applied, is sufficiently permeable to permit the proper escape of heat and moisture, and is yet so opaque as to shut out light, and therefore to produce natural rest for the eyes, while it is free from weight, and incapable of making any other pressure than that which the natural coaptation of the eyelids and eye-ball makes.

It is a clinical desideratum to be able to treat a case of ophthalmic surgery in a well lighted room, without admitting light to the wounded organ. Such a dressing makes it easy to surround old and feeble subjects with an atmosphere chemically fitted by direct light for purposes of respiration, and thus to quicken the vital forces and lessen the dangers which spring from delayed or perverted reparative processes. It favors regular and easy care of the patient, and the performance of such offices as may pertain to his comfort or safety. It permits, at proper times, such entertainments as may tend to give pleasant occupation to the mind and banish the apprehension and dread which always exist, to a greater or less degree, in the case of those who are served in the dark by groping or stumbling attendants.

It is claimed, moreover, that this dressing does away with

the dangers arising from the use of pressure bandages, dangers much greater than some are now prepared to admit—but dangers proved to exist by the great variety of the bandages, and the attempt made to give formulæ for the measurement of the pressure made by a given bandage.

We believe that there would be fewer eyes lost by suppuration, after extraction, for example, if pressure bandages were entirely discarded from the surgical armamentarium, and eyes allowed to be shut and at rest unopened for a few days after severe operations.

It remains to be proved that pressure aids the union of wounds in the eyeball. We believe that the natural dressing of a wounded eye is the closed eyelids, and the only other local condition needed is the rest afforded by the exclusion of light by closure of eyes and repose of the facial muscles. Pressure enough from bandages to secure such desiderata is scarcely attainable, or, if obtained, becomes so soon intolerable as to provoke the surgeon to a speedy readjustment of his bandage—a readjustment often made necessary for the relief of symptoms which are found, on a candid examination, to have originated in the effects produced by accidental displacement of the bandage which, perhaps, twelve hours previously had been fastidiously applied.

This method may also be used after the abstraction of blood by Heurteloup's leech, giving the local rest afforded by darkness, and, when desirable, associated with gentle bodily exercise to keep up the play of the circulation, and thus help to discuss a choroidal or other ophthalmic congestion.

It is our common practice to apply this dressing immediately after an extraction, and not to remove it until the expiration of five days, when it can be easily detached by washing, and reapplied, if need be. A very little experience will enable a surgeon to post himself as to the progress of a case after extraction by the subjective symptoms, with the additional testimony obtained by gently passing the finger over the silk dressings to determine the question as to whether swelling of the lids exists.

Let a patient be placed after an extraction operation amid

such circumstances as will tend to increase gently and heathfully the activity of the nutritive forces; protect him against the meddlesome officiousness of a peeping pathologist, and less will be known of the small beginnings of morbid changes in wounds and fewer eyes lost. The *vis medicatrix naturæ* can nowhere play a more satisfactory part than in the healing of eye-wounds. To this end there must be a good supply of nourishing food, excluding alcohol, excepting in cases where you wish to retard the tissue-wasting of old age. There should be rest of the wounded and fellow eye insured by closure of eyelids and exclusion of light. There should be fresh air, influenced by the presence of sunlight, for the patient to breathe. There should be the cheerful presence of discreet attendants, not of persons given to restless meddling.

The dressings after an extraction or iridectomy should be allowed to remain upon the eyes until the afternoon of the fourth or fifth day, and the temptation to open the eyes met by the recollection of the fact that there is a struggle in every wound between the reparative and destructive forces, and that rest by exclusion of light and air aids the former and antagonizes the latter.

A Question in reference to Photographing the Interior of the Human Eye. By B. Joy Jeffries, of Boston, Mass.

At Dr. Algernon Coolidge's request I lately saw, in consultation at the Massachusetts General Hospital in Boston, a lad some fifteen years of age who had been kicked by a horse over the right frontal region, breaking in the outer table and involving the frontal nerve. The boy was totally blind of this, the right, eye. As atropine had been put in I could not say whether the pupil acted with the other eye, which was quite normal. I made an ophthalmoscopic examination by Jäger's strong mirror and full sunlight. The patient had no perception of light whatever, although the reflex was too strong for me to look at long. The sunlight, partly obscured by a thin white cloud, gave me the most beautiful view of the fundus oculi I ever remembered to have obtained. This was with

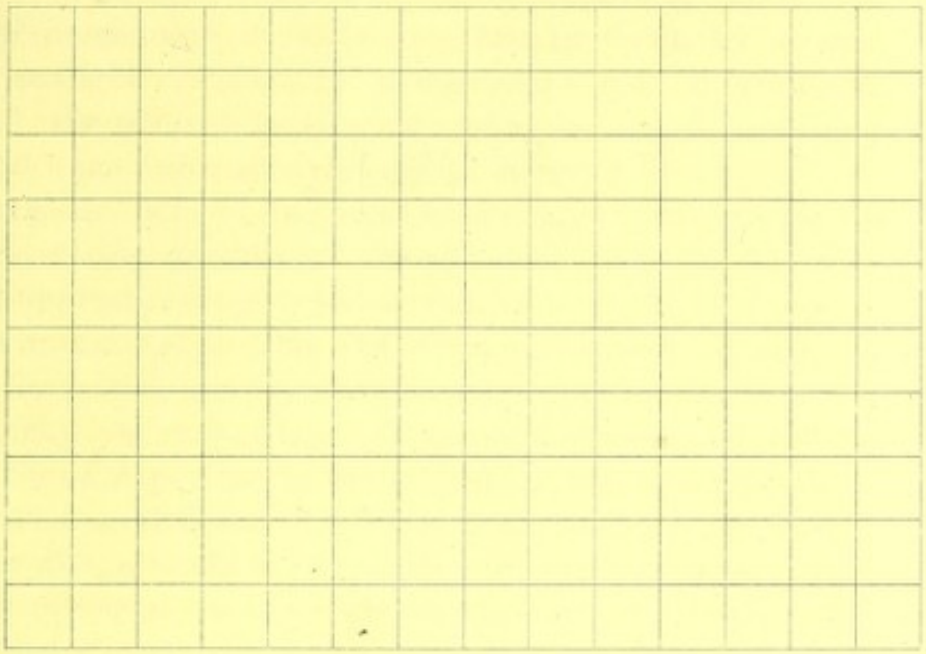
the upright image. The same with the reversed. The fundus looked *perfectly normal*, except a grayish tinge to about two-thirds of the papilla; as the same, however, existed in the other apparently normal eye, I could not regard it as indicative of any pathological change. A few weeks afterward both Dr. Coolidge and myself thought this grayish portion was less, or encroached upon by the encircling white outer ring of the papilla. My prognosis was that vision might return, in whole or in part, which time (some three months) has confirmed. There is a portion of the retina quite to the outside of the macula where visual impressions are transmitted through the nerve. Or, as no change can be seen by the ophthalmoscope in the retina, it may be more correct to say that some of the optic fibres now transmit impressions. The patient told me that he could begin to see a little, and, in sweeping the reflection from the ophthalmoscope over the retina, I found there was an eccentric spot so sensitive to light as to make him jerk back his head every time the light fell upon it. It was with difficulty that he could fix the chalked cross on my blackboard. He had to hunt some time to find it, and approach to about seven or eight inches. Whether there was less perception than normal through this small spot of the retina, or whether vision corresponded to its eccentric position, I could not determine. I, however, succeeded in mapping it out roughly, and it did not exceed a single square on my "Register of the Field of Vision." As the lad's other eye is perfect and he has no pain, it will of course be difficult to keep run of the case.

But that which is of special interest, and my reason for reporting this case, is, that we here had a perfectly normal fundus oculi entirely destitute of sensation to light, and with transparent media in front of it. From not being able to communicate in time with Dr. Noyes, of New York, who possesses the necessary skill and apparatus, an opportunity was lost to achieve a scientific triumph, namely, the photographing the interior of the normal human eye, which, I believe, has not yet been done. A question then arose as to whether the retina might be damaged by throwing on it an amount of light sufficient to obtain a photographic picture from its reflection, for I felt that vision might again return in this eye, and there-

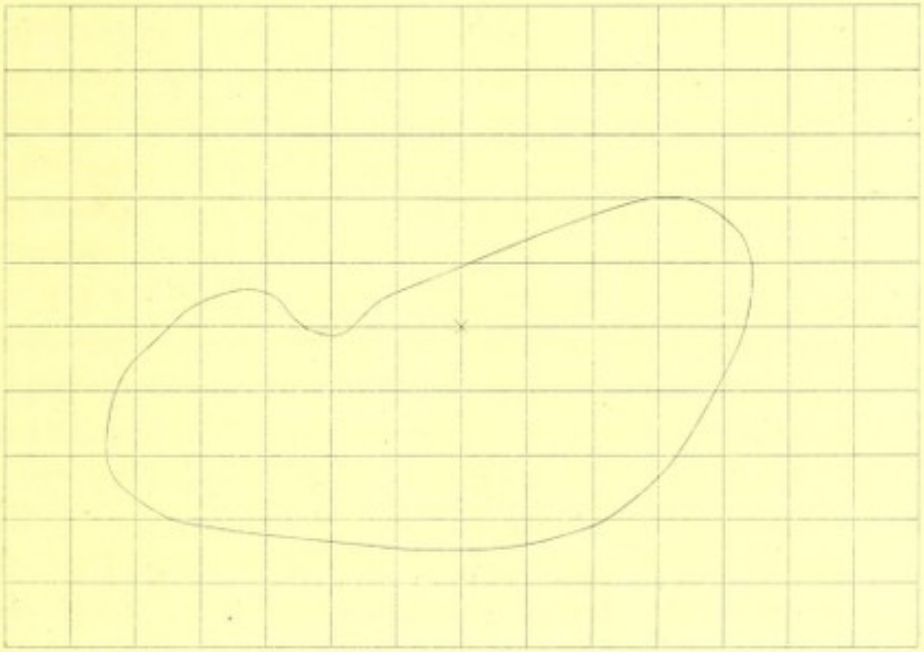
Register of the Field of Vision.

B. Joy Jeffries, M.D. Boston.

Right Eye.



Left Eye.



fore any risk of injury to the retina was unjustifiable. The only direct answer to this was some experiments I had read in the Vienna Academy Reports for 1867, by Dr. Vincenz Czerny, on the objective change in the eye, especially the retina, from the effect of light. Werneck reported in Ammon's Zeitschrift für Ophthalmologie, 1834, having broken down by concentrated sunlight cataract in animals, and seen it gradually absorb. He proposed doing the same in man. Cases have now and then been reported, by E. Jäger, Arlt, Coccius and Schirmer, of injury of the eyes from exposure to sunlight, for instance, during an eclipse. As Dr. Czerny says, it is rather curious that physiologists should not have sought for objective change in the retina from the effect of intense illumination, especially as it is practically important to know what degree of intensity we may safely use in ophthalmoscopic examination. These experiments, the results of which I will briefly give, were carried out by, in general terms, concentrating sunlight with a double convex glass through the pupil. The animals operated on were the dog, cat, rabbit, guinea pig, mouse, dove, duck, goose, hen and frog. Dr Czerny obtained no result by the spectral colors, light colored by absorption, or gaslight.

In the eye of a frog (*rana temporaria*), a few minutes after throwing into the pupil sunlight with a two-inch glass, there was nothing to be seen but a slightly colored spot on the bluish gray fundus. Gradually this spot became clearer and more defined from the rest of the field. After some three hours it was sharply defined, light gray, the edge reflecting a yellowish light. The retinal vessels ran in a gentle curve over the spot, showing by evident parallactic movement that the retina under them was raised above the normal level. This and further changes, visible by the ophthalmoscope, induced Dr. Czerny to ascertain what objective change took place in the retina. The effect on the crystalline lens was to produce cataractous opaqueness. I would refer to his article for the detail of his experiments and the proofs of his results.

He says: "There is no doubt, then, that we have a coagulation of the albuminous bodies in the retina, especially in the rods, as also in the lens. Hence the white spot on the pigment-

ed fundus, the cataract, and perhaps also the greater resistance to the effect of reagents by the portions not too coagulated. This last explains the greater resistance of the frog's blinded retina, the elements of the external granular layer retaining their spindle form, also the better preservation of the rod layer in the guinea pig. Finally, I think the contraction of the retinal vessels by blinding in animals some time dead, is due to the coagulation of the albuminous substance present in the circular fibres. There can be no doubt that under these conditions the production of heat in the *tapetum nigrum* is the cause of the coagulation."

By experiments Dr. Czerny proved that it was the light-rays of the sunlight and not the dark heat-rays which produced this warmth. I refer to his paper for the proof. He goes on to say—

"The coagulation caused by intense illumination proves the production of heat on the border of the layer of rods and cones of the retina, a heat, too, sufficient to coagulate the albumen of the retina. Further experiment must determine the requisite degree of this heat."

"This being settled, we may safely conclude that in ordinary vision the rays of light produce heat in the retina, in much less degree, of course. I do not, however, consider that having proved this fact, proves also the correctness of Draper's theory of vision, namely, that it is the rods feeling the heat of the *tapetum nigrum*, but simply that the theory of this hypothesis is proved—*i. e.*, that light produces heat in the *tapetum nigrum*."

"We have, therefore, an answer to the necessary physiological postulate, a material change in the perceptive nervous elements, a change which may destroy them by very intense action of the normal irritation."

It will be seen, therefore, that the photographing such an unimpressible retina as I had in this patient might be attended with some danger to its elements. Dr. Czerny found his focus on the retina must be quite perfect to produce the effect he did. If general illumination by dispersion circles will satisfy photographic demands, then there would be no danger of causing injury to the contents of the globe. Had I at the time

possessed the necessary apparatus and skill in photography, I should not have hesitated to have attempted a photographic picture of the interior of this patient's eye.

APPARENT MOVEMENT OF MUSCÆ. By DR. G. HAY, of Boston.

The occurrence of the same error in respect of the apparent movement of muscæ in three recent ophthalmic treatises seems worth noticing, notwithstanding that the subject-matter is of no great practical importance.

According to Wells,[1] p. 319, "The situation of the muscæ may be approximately ascertained, as was shown by Listing, by making the patient look through one of the minute apertures of the stenopaic apparatus, or a pinhole in a card. Now, if the card is moved in a certain direction (*e. g.*, upward) and the objects also move upward, they are situated behind the pupil, whereas," etc.

According to Wecker,[2] p. 287, "It results that the movements of the scotomata do not agree, in all the positions which they occupy, with those of the screen."

"If, for example, the opacities which cast a shadow are behind the pupil, they are displaced in the same direction as the orifice of the screen."

If this means that the shadows move *on the retina* in the direction stated, relatively to the portion of the retina illuminated by the rays from the aperture in the screen, or relatively to the shadow of an opacity in the pupil, it is correct; but the more obvious meaning of the passage is that the muscæ appear to the eye affected with them to move so and so.

Again, we read in Stellwag,[3] p. 645, "The scotomata themselves seem to move; but, * * * it is clear that the movements of the scotomata are not necessarily the same with those of the aperture in the screen, but that a coincidence in direction is only necessary if the entoptic bodies lie behind the pupil."

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[1] A Treatise on Diseases of the Eye. Phila., 1869.

[2] Études Ophth., Vol. ii., Paris, 1866.

[3] Treatise on the Diseases of the Eye, etc. New York, 1868.

Thus we have the same statement in these three books. Wells refers to Helmholtz, Phys. Optik, p. 150. On turning to the passage, however, we find the following :

"The entoptic field of vision is bounded by the circular shadow of the iris. If we successively look at different points of the field, the shadows of all bodies which are not in the plane of the pupil change their position in reference to the circular boundary of the field of vision. This movement of the shadows in the entoptic field of vision Listing calls the *relative entoptic parallax ;* he calls it positive, if the movement of the respective shadow has the like direction with that of the point looked at" (des visirpunktes), etc. The direction of movement of the point of fixation in the field of vision is just the opposite of that of the movement of the screen. "The relative entoptic parallax * * * is positive for objects behind the pupil," etc.

The expression, "If we successively look at different points of the field," would imply that by the "movement of the respective shadow" Helmholtz means its movement as it appears to the person affected with the muscæ or opacities, and not its real movement on the retina, relatively to the portion of the retina illuminated. If the latter were the meaning, the citation would support Wells' statement.

Fick[1] gives diagrams (p. 343) illustrative of the relations involved. In one of the diagrams the screen is represented as moved downward, the line of vision consequently upward relatively to the position of the aperture in the screen. In the explanation the following occurs: "The shadow of C" (an opacity behind the pupil) "has consequently undergone an apparent movement upward, in the same direction as the point of fixation."

Fracture of the Crystalline Lens in Persons executed by Hanging. By E. Dyer, M. D., of Philadelphia, Pa.

Three years ago I presented to the Society the result of the examination of the eyes of a man who was hanged, also some

[1] Die Med. Physik. Braunschweig 1856.

experiments on the effects of hanging on the crystalline lens of the dog.[1] In the case of the man the anterior capsule and the lens of the right eye were fractured. The direction of the fracture was horizontal and a line below the centre, extending as far back as the middle of the lens. In the left eye the anterior capsule only was involved. In one dog the same conditions were found, in another only one lens was fractured, and in a third no lesion was detected.

Since then I have experimented on rabbits. Two were hanged and four were strangulated. The trachea in two of the latter were laid bare and tied, but no fracture was detected in any case. Drs. S. W. Mitchell and W. W. Keen, who assisted me at the experiments on the dogs, were present.

The following are the notes of several executions at which I have been present since my report of the case already mentioned. I have been able to examine the eyes of the criminals both before and after death. Albert Tenfel, aet. 24, was executed at Doylestown, Penn., April 18, 1867. He attempted suicide by stryclinia six hours before execution, but the physician to the prison was early apprised of it, and by emetics and other means frustrated his attempt on his life. Vision in both eyes normal at an examination the day before execution. The fall was five feet; knot under left ear; the body was suspended twenty-five minutes; easy death; very slight convulsions; neck not dislocated.

First examination, five minutes after the body was cut down. In both eyes pupil well dilated; media perfectly clear; fundus normal.

Second examination, one hour and five minutes after execution. Left eye, horizontal fracture one and one-half lines below the centre of the lens, extending entirely across it. The line of fracture is not true, as if drawn by a ruler, but irregular, as if drawn by a person with an unsteady hand. At the external end a line runs upward, beginning at the margin of the pupil; at the internal end a line runs directly downward. These look exactly alike, and could not be better described

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[1] Trans. Amer. Ophth. Soc, Vol. iii., and N. Y. Med. Journal, Sept. 1866, Vol. iii., p. 416.

than by comparing them to a tear in a sheet of note paper. Right eye examined at the same time. Four very fine lines were seen running toward the centre of the lens in the lower nasal quarter. They seemed to be simply in the capsule, but were perfectly apparent. The left eye was extirpated, and on dissection the results of the ophthalmoscopic examination were fully verified; not only the capsule, but the substance of the lens was fractured.

Drs. G. R. McCoy, O. P. James, Wm. Stavely, and T. Swatzlander, physician to the prison, kindly assisted me in the examination and distinctly observed these lesions.

Gottlieb Williams, aet. 34, was executed in Philadelphia, June 4, 1867. Drop four and one-half feet; the knot slipped so as to be under the occiput; suspended thirty minutes; convulsive movements lasted five minutes; neck not dislocated.

Examination at 11.54 A. M., five minutes after the body was cut down. Appearance of eyes natural; no protrusion; no injection of conjunctival vessels; corneæ clear.

Right eye, pupil well dilated; media clear. Small point seen on the anterior capsule of the lens in the median line, just above the margin of the pupil. At 12, M., spot more distinct; at 12.26 P. M., spot still present, somewhat elongated. Optic nerve normal; retinal vessels small.

Left eye, pupil smaller than the right; cornea clear; lens in normal condition; optic nerve normal; arteries small. I was not allowed to remove the eyes.

Drs. H. Yale Smith, physician to the prison, W. W. Keen and J. Ewing Mears assisted me in the examination.

At Worcester, Mass., September 25, 1868, Silas James and Charles T. James were hanged at the same time. The drop was four feet. Silas James had a cataract in the left eye of several years' standing, probably the result of irido-choroiditis. The right eye was normal. Eyes examined thirty minutes after execution.

Right eye normal in every particular. Left eye, pupil well dilated; cataractous lens dislocated downward and outward; upper and inner third visible above the pupil. Remains of

the detached posterior synechiæ well marked.[1] The neck was dislocated; no struggle.

Charles T. James, hanged at the same time, had normal eyes. After the execution the pupils were moderately dilated. Left eye normal. Right showed small horizontal fissure in capsule of lens. Thirty minutes later this fissure was well marked and easily seen even by side-light illumination. It certainly extended into the substance of the lens. Unfortunately I was not permitted to remove the eyes from the bodies.

The physician to the prison, Dr. Rufus Woodward, and Dr. C. W. Whitcomb, of Barre, Mass., kindly assisted me in the examinations, and noticed the condition of the lenses as I have here described them. This unpleasant series of investigations has been pursued with the hope of throwing some light on the vexed question of the mechanism of the accommodation, but as yet without any satisfactory result.

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[1] It is to be regretted that no attempt was made to break these by atropine before execution, but no opportunity offered.

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TRANSACTIONS

OF THE

American Otological Society.

Second Annual Meeting,

Newport, R. I., July, 1869.

AMERICAN OTOLOGICAL SOCIETY.

The second annual meeting of the American Otological Society was held at the Atlantic Hotel, Newport, R. I., on Tuesday, July 20th, 1869.

The following members were present:

Dr. JOHN H. DIX.....Boston, Mass.
" J. ORNE GREEN ..... " "
" D. B. ST. JOHN ROOSA .....New York, N. Y.
" WM. F. HOLCOMB ..... " "
" R. F. WEIR ..... " "
" H. D. NOYES ..... " "
" JOHN GREEN .....St. Louis, Mo.
" E. L. HOLMES .....Chicago, Ills.
" C. E. Rider .....Rochester, N.Y.

In the absence of the President, Dr. John H. Dix was elected President, *pro tem.*

Dr. H. Knapp, of New York, was invited to take part in the scientific business of the Society.

The minutes of the last meeting were read and approved.

The following Committee of Membership was appointed by the President, viz., Drs. Holmes, Holcomb, Roosa, J. Orne Green and Rider. On recommendation of this commitee the following gentlemen were elected members, viz.:

Dr. C. J. BLAKE.....Boston.
" H. S. SHAW..... "
" H. KNAPP.....New York.
" H. G. NEWTON.....Brooklyn.
" J. S. PROUT ..... "
" W. W. SEELY..... .....Cincinnati.
" FRANK ABBOTT.....Buffalo.
" J. W. LAWTON .....Syracuse.

Dr. Knapp took his seat as a member of the Society.

On motion of Dr. Roosa, it was resolved that the President appoint a committee of three to present an order of business.

Drs. Weir, Roosa and J. Orne Green were appointed such committee, which was further instructed by the Society to nominate officers for the ensuing year.

The report of the Treasurer was read and accepted.

Acting on the report of the Committee on the Order of Business, the Society listened to the reading of (1) the Report on the Progress of Otology, by Dr. D. B. St. John Roosa.

Report on the Progress of Otology. By D. B. St. John Roosa, M. D., of New York.

Mr. President and Gentlemen:

The progress in otological science during the last year, although not marked by any grand discovery, has been substantial and far from insignificant. Here and there points have been opened up in the field which promise much from future investigation, while in some other instances subjects of importance have been fully investigated.

The new era of otology—for we may be said to be in a new era—dates from the introduction of a generally practicable mode of examining the membrana tympani (Tröltsch), and from the simplification and amplification of our means of opening the Eustachian tube (Politzer). We now stand, as regards the diagnosis and treatment of diseases of the outer and middle ear, on a position as fully advanced as that of any other department. We are still, however, sadly in need of more perfect means for the differential diagnosis of affections of the middle and internal ear, and of positive ideas as to the treatment of affections of the nervous apparatus. If it be true that he who appreciates his ignorance is not far from the path of knowledge, we may hope for speedy advancement in the latter named department of otology, since we are all in accord as to the direction in which it is to be made.

In discharging the duty which by your favor has devolved upon me, I may be permitted to go back a little further than the date of our organization in noting the advances made in

our knowledge, and thus include some of the noteworthy productions in otological literature which have appeared in the past eighteen months.

THE AURICLE.—Dr. Voltolini,[1] of Breslau, contributes an interesting article on the anatomy and physiology of the auricle. The auricle is to be considered as a reflector, condenser and conductor of the waves of sound. As a reflector it may be considered as composed of two parabolas, lying concentrically to each other. The outer parabola, the fossa of the concha, throws the undulations of sound against the inner, the tragus, whence they pass into the auditory canal. Where the auricle is small the concha is deep, in order to compensate for the loss. The auricle not only reflects, but also condenses the sound. It is also a conductor. If it were simply a reflector and condenser, it would be better adapted to its purpose if composed entirely of bone. Voltolini considers the auricle as an external membrana tympani. We know that the chief function of the true membrana tympani is to facilitate the conduction of the sound-waves from the air to certain fixed bodies. The change from one medium to another of course causes these waves to lose some of their intensity. The auricle is really a membrane, although a thick one. Muscular movement of the auricle is not made by human beings, because there is such a variety of convolutions in the part, that, come which way the waves of sound will, they fall perpendicularly to the tangent of one of those irregularities, and they are therefore well taken up. The auricle must be an important part of the auditory apparatus, because it is so well developed at birth.

The idea promulgated in the anatomical text-books, that the muscles become atrophied by wearing caps in childhood, must be incorrect, for those who observe children will see that the caps do not injure the ears at all, and, as Hyrtl says, the beasts cannot voluntarily move their ears any better. But if the voluntary movement be slight, the same cannot be said of the involuntary, which is the principal movement even in animals, as Schroeder van der Kolk has shown in his essay on the func-

[1] Monatsschrift für Ohrenheilkunde, Jahrgang ii., No. 7.

tions of the medulla oblongata. The author then proceeds to prove that the action of the muscular structure is chiefly of a reflex nature, just as the true membrana tympani is placed in different degrees of tension by the tensor tympani muscle. The reflex movements of the auricle may be seen in syringing the ear. We may also observe, in very many patients, that if we hold the watch on the outermost tip of the auricle it is heard; but if we remove it but one line, its tick is no longer perceived. The auricle is the sound receiver of a hearing trumpet, of which the external auditory canal is the tube, and since the muscle is very large in proportion to the breadth and length of the tube, we can see what nonsense it is to recommend hearing trumpets that are much smaller than the auricle.

Aspergillus.—The subject of the growth of vegetable parasites or fungi in the external auditory canal may now be said to be thoroughly worked up through the labors of Wreden,[1] Schwartze,[2] J. Orne Green,[3] of Boston, Mayer, and Hassenstein and Hillyer.[4] The aspergillus flavescens, glaucus and nigricans, as well as the stamphyllium polymorphum, have been found in the auditory passage, and are known to produce an obstinate external otitis and myringitis, which of course can only be cured by killing the parasite. The instillation of solutions of tannin, bi-chloride of mercury, lead, carbolic acid and similar agents, combined with faithful removal of the fungus by the syringe and forceps, have finally destroyed the growths and relieved the symptoms. Dr. Wreden's cases, with his remarks, form a monograph, with which the Society is undoubtedly familiar. In regard to the etiology Dr. Wreden says: "All these varieties of aspergillus, according to my view, are only varieties of the ordinary mould fungus." The origin of some of Dr. Wreden's cases could be traced to the damp walls of unventilated rooms, kept shut during the long Russian winter.

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[1] Die Myringomykosis Aspergillina, St. Petersburg, 1868.

[2] Archiv für Ohrenheilkunde, B. iv., Heft ii.

[3] Boston Medical and Surgical Journal, Nov. 19, 1868.

[4] Archiv für Ohrenheilkunde, Band iv., Heft iii., p. 162.

Exostosis.—Bonnafont[1] has recorded a case of true exostosis of the external auditory canal, not the result, so far as the history shows, of suppurative inflammation in the middle ear and subsequent periostitis, as previous investigations have proven these growths to be.[2] By the use of a small rat-tail file the tumor was broken off and a permanent opening made, which relieved the impairment of hearing which the obstruction caused. Laminaria was at one time used to dilate the opening, but it caused much pain, and it was very difficult to remove.

Diffuse Inflammation of Meatus.—Dr. Weber,[3] of Berlin, advises the use of cold compresses in the diffuse variety of inflammation of the external meatus. The use of such compresses should be continued from one to three hours. His experience is quite the reverse of nearly all that has been published on this subject, cold applications being usually considered as very injurious to the ear.

Rivinian Foramen.—In a discussion in one of the medical societies of Vienna,[4] Gesellschaft der Aertze, Prof. von Patruban, Drs. Gruber and Politzer unite in affirming the existence of the Rivinian foramen, as rediscovered by Bochdalek of Prague.

Membrana Tympani.—Dr. Moritz Popper[5] has recently made some investigations in regard to the vessels of the membrana tympani, with the advantage of a more thorough method of injection than that hitherto employed.

The membrane receives blood from two sources, the vessels ramifying on the walls of the external auditory canal and the vessels in the mucous membrane of the middle ear. The vessels from the former source ramify in the outer sub-epidermoidal layer, those of the latter in the inner sub-epithelial layer. The middle layer of the membrane contains no vessels except on the periphery, where there is an anastomosis

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[1] Archiv für Ohrenheilkunde, B. iv., No. 4. Monatsschrift, Band ii , No. 8.
[2] New York Medical Journal, Vol. ii , p. 424.
[3] Monatsschrift für Ohrenheilkunde, Jahrgang iii., No. 1.
[4] Ibid., iii. Band, No. 1.
[5] Ibid., iii. Band, No. 5.

between the vessels of the outer and inner layer. The vessels of the outer layer form long loops, which appear in the papillæ lying along the course of the handle of the malleus, beginning almost at the lower extremity, and passing into the papillary layer of the walls of the external auditory canal.

Eustachian Tube.—The much discussed question of the constant and normal patency of the Eustachian tube is again agitated by Weber,[1] of Berlin, who, supported by the investigations of Rudinger and Mayer, claims that the canal is constantly open in the upper portion of its caliber—that is to say, in the so-called hook cartilage portion.

Dr. Rebsamen,[2] of Zurich, concludes from his observations that the opening of the cartilaginous portion during the action of swallowing does not result from the force of one muscle alone—the variously called tensor palati, abductor tubæ, or dilator veli—but that it is the result of the combined action of a number of pharyngeal muscles.

Voltolini placed himself in the pneumatic cabinet of Lowenstein of Berlin, which is essentially a chamber in which the air is compressed by means of a pump, and he found, when the first stroke of the pump was made, that his hearing was greatly diminished, as shown by the watch, although the conduction of sound through the bones of the head was not interfered with. The pressure upon the membrana tympani became so great that the experimenter felt himself almost impelled to open the ventilator, but he restrained himself and swallowed, which relieved the sensation so that he was able to hold out for some time longer. The experiment reaffirmed Toynbee's discovery that at every action of swallowing the tube is opened, and that an equalization of the air in the cavity of the tympanum with that of the atmosphere takes place. Voltolini also believes that the air is pumped through the tube into the cavity at each opening of the pharyngeal orifice, the tube being, as it were, the barrel of the pump. The experimenter goes on to show, by experiments upon himself, that the soft palate not only lifts up on the motion of swallowing, but that it also makes a rotary

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[1] Monatsschrift für O., Band ii., No. vi. et seq.

[2] Ibid., Band ii., No. 2 et 3.

motion. It is this motion that pumps the air into the tube and through this into the tympanic cavity. If we observe the membrana tympani of a lizard, which is very much exposed in consequence of the absence of an auditory canal, we see, whenever the animal swallows, that the membrana tympani bulges outward, and just as quickly falls back again. On the human subject this same movement takes place, although it is so slight, in consequence of the membrane being tied down by the malleus, that it is not observed except in those cases where a new membrane has been formed after a perforation.

Dr. Rudinger[1] finds that the faucial orifice of the Eustachian tube in persons between the ages of seventy and eighty is much wider than in young subjects. The caliber of the canal is so great that the mucous surfaces do not come in contact. The fat is changed to a finely fibered connective tissue. He thinks that Jago's case of the patency of his own Eustachian tube, recorded in the British and Foreign Medico-Chirurgical Review, was perhaps due to a similar cause, that is, atrophy of the mucous membrane and muscles.

Petrosal Mastoid Canal.—Voltolini[2] describes a passage, which he calls the *petrosal mastoid canal*, leading from the skull cavity through the petrous portion of the temporal bone to the mastoid cells. It is of importance to the practitioner to know that this canal, although not usually mentioned in the text-books, forms a way by which dangerous morbid processes may pass from the middle ear to the brain and its membranes.

In the newly born child the superior semi-circular canal is, as it were, a gate or archway, under which there is a deep fossa, which runs outward, in the direction that the mastoid cells are afterward developed. This deep fossa, large enough to admit a large quill, is filled up by a consistent, gelatinous-like fold of dura mater. It does not lessen in size very rapidly after birth, for in a child one and a half years old it is still quite large. In adults this fossa has become a canal, which always exists and which is never closed. Its entrance is on

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[1] Monatsschrift für Ohrenheilkunde, Band iii., No. 2.

[2] Ibid., Band ii., No. 2.

the posterior and inner surface of the pyramid on the posterior portion of the temporal bone, between the meatus auditorius internus and the entrance to the aqueductus vestibuli, and either just beneath or in the sulcus in which runs the superior petrosal sinus. It passes from here under the arch of the superior semi-circular canal, from within outward, and is lost in the mastoid cells, and on recent preparations the dura mater is generally sunken in at the entrance of the canal.

The writer then records a case where pus found its way through the petrosal mastoid canal to the brain.

Paracentesis of Membrana Tympani.—Schwartz's brochure on paracentesis of the membrana tympani—in which the final conclusion was reached that this operation was chiefly useful in acute affections, although of some service in a limited number of chronic cases—where there is a bulging outward of the membrana tympani from accumulated mucus, blood or pus, has awakened discussion on this subject. Tenotomy of the tensor tympani, exsection of the malleus, perforation by a galvano-caustic apparatus, are procedures which may be said to be on trial, but which have not as yet been fully adopted as legitimate and successful means for the relief of chronic affections of the mucous membrane and ossicula of the tympanic cavity.

James Hinton[1] publishes seven interesting cases, in which mucus had been accumulated in the cavity of the tympanum for so long a time as to bring them out of the range of acute cases, and for which he performed paracentesis, and for the most part with a very favorable result. He also states that the late Mr. Toynbee had devised a syringe for the double purpose of perforating the membrana tympani and of withdrawing the accumulated secretion.

Dr. Blake,[2] of Boston, in a report of one of Politzer's clinics, has described an eyelet of hard rubber, used by Dr. Politzer, with which to maintain a perforation of the membrana tympani. This eyelet may be obtained in this country.

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[1] Guy's Hospital Reports, 1869.

[2] Boston Medical and Surgical Journal.

Affections of the Middle Ear.—Weber,[1] of Berlin, has introduced a new instrument for the treatment of the affections classed under the heads of chronic aural catarrh. By its use, as the inventor claims, the spray of concentrated solutions is carried into whatever portion of the cavity of the tympanum that may be desired. The great advantage of the instrument is that by its use we are able to localize the effect of an injection. The usual arguments against the idea that fluids may be injected into the middle ear are met and rebutted by the author, and he well shows the fallacy of experiments made on the dead subject, in which the aid of the muscles is necessarily dispensed with.

Dr. Weber's instrument is called the *pharmaco-koniantron*. It consists essentially of a long flexible catheter, which is inserted in one of metal. The former has a lateral opening in its beak, which may be turned in any direction desired. An india-rubber air-bag, or syringe, connected by a side piece to the catheter, is the means of sending in the fluid which becomes spray. It seems to be a modification of Bishop's nebulizer.

Schwartze,[2] in two articles, in English and German respectively, calls attention to the use of strong solutions of nitrate of silver in suppuration of the middle ear, unattended by the formation of granulations or the development of necrosis. As the Society is well aware, this treatment is by no means new, and yet it has probably never before been used with such precise indications as those laid down by Dr. Schwartze. Solutions of nitrate of silver of a strength of from xx. ad xl. gr. ad ℥i. aq. destillat are poured into the ear, and are repeated daily, *pro re nata*. A solution of salt is immediately used after the instillation, in order to neutralize the silver.

Dr. Schwartze[3] relates a case of hemorrhage into the cavity of the tympanum in Bright's disease. The patient also suffered from retinal hemorrhages. The first aural symptom was pain. The membrana tympani was of a bluish-red color; on the next day it was of a dark red. The membrane became perforated

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[1] Monatsschrift, Jahrgang ii., No. 4.

[2] Archiv für Ohrenheilkunde, iv. Band, i. Heft. London Medical Times and Gazette.

[3] Archiv für O., Bd. iv., No. 1.

and the blood coagulum escaped. The patient died. Post-mortem showed great hypertrophy and dilatation of the left ventricle, atrophied kidneys, retinitis apoplectica, with detachment of the retina. Right cavity of the tympanum, hemorrhagic inflammation of the mucous membrane; cavity filled with blood and pus; mucous membrane of the tube greatly injected, but the injection decreased as the pharyngeal opening was approached.

The left ear, about which the patient did not complain, on account of his very low condition during the latter days of his life, was similarly affected—*i. e.*, there was a dark red membrana tympani, the cavity of the tympanum containing blood and serum, without inflammation of the mucous membrane. Mucous membrane of the tube injected, and most at the pharyngeal orifice. The mucous membrane of the naso-pharyngeal cavity of a dark red, with numerous small echymoses.

Dr. G. M. Smith,[1] in a paper on the etiology of Bright's disease, calls attention to the aural symptoms sometimes arising in the course of this affection in the following language:

"Deafness is sometimes developed in the course of the disease. This symptom, when transient and accompanying a lethargic condition of the patient, has been properly attributed to uræmia. The same symptom, however, in conjunction with others, may be permanent, in which case I ascribe their occurrence to a peculiar lesion of the ear; a lesion peculiar in that it holds a relationship to the nephritic disorder, and is not, so to speak, of accidental origin. * * * It would seem desirable, when treating patients affected with obscure auditory diseases, to examine their urine both chemically and microscopically."

A case occurred in the practice of your committee, which was reported in a paper read before the New York Academy of Medicine, shortly to be published,[2] where the patient suffered for a long time from aural disease, suppuration of the drum membrane and pain, until finally the general symptoms of Bright's disease set in, adding to the importance of the case

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[1] Transactions New York Academy of Medicine, Vol. iii., Part 2.

[2] New York Medical Journal, Vol. ix., No. 5.

reported by Schwartze and the suggestion made to us by Dr. Smith.

Dr. Lucae[1] writes on occlusion of the nasal passages from catarrhal inflammation, which, as he says, places the cavity of the tympanum in the condition of that of a person practicing Toynbee's method of inflation. A form of impaired hearing comes from this cause, which is relieved by securing a free opening of the nostrils.

Otitis Neonatorum.—Your committee may perhaps assume that every practitioner who has seen much of aural disease has met with cases the history of which plainly showed that the subject, a little child, had suffered from otitis long before this affection was diagnosticated. Voltolini's first paper on inflammation of the membranous labyrinth erroneously supposed to be cerebo-spinal meningitis, has called out many verifications of this point, and it has done a great service in putting the practitioner on his guard as to the origin of a disease which, if it does not lead to death, places the patient in a condition of burial from the world of sound. Dr. Voltolini has continued his observations on this subject in various numbers of the Monatsschrift für Ohrenheilkunde.

Wreden,[2] following in the footsteps of Von Tröltsch, has reinvestigated the subject of infantile aural catarrh, by examining a number of dead bodies of infants taken from a foundling institute. The existence of the mucous cushion in the cavity of the tympanum discovered by Tröltsch is verified, but it is found that it is absorbed in forty-eight hours after birth. Inasmuch as quite a full synopsis of Dr. Wreden's article appears in the American translation of Tröltsch,[3] no further quotations are made from this very valuable paper.

Voluntary Contraction of the Tensor Tympani Muscle.—Politzer,[4] after some remarks on the various theories as to the action of the tensor tympani, writes that he has satisfied himself that on the contraction of the muscle the handle of the

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[1] Monatsschrift für Ohrenheilkunde, Bd. iii., No. 2.

[2] Ibid., Jahrgang ii., No. 8.

[3] Diseases of the Ear, second edition, p. 408.

[4] Archiv für Ohrenheilkunde, iv. Bd., i. Heft.

malleus is pressed inward, while the head, with a part of the neck, is pushed outward, and that at the same time the whole malleus with its movable axis is drawn inward. He did not observe any relaxation of the anterior portion of the membrana tympani on making traction on the tensor, but on drawing upon the belly of the muscle a tension of all the parts of the membrane was observed. Politzer then records the case of Dr. A., who communicated to him the fact that for a year he had been annoyed by the occasional involuntary occurrence of the contraction of the tensor tympani. For two or three years the patient had suffered from a slight rumbling noise in his ears—sometimes in one, sometimes in the other—which lasted for hours, and sometimes for days, occurring especially when he was actively engaged in intellectual employments. Independent of this symptom, Dr. A. experienced in the depth of his ears a short and quick motion or muscular contraction, not dependent upon the will, which lasted for several seconds, and which returned at irregular intervals. These contractions were very rapid, and compared by the patient to the stroke of of a hammer making twenty excursions in the second. He was able to excite these contractions at any time, either in one ear or the other, but then the motions were not so quick, and after five or six seconds they could not be produced, because a sensation of fatigue in the ear occurred, which disappeared in from half a minute to a minute, when the contractions could again be produced. A noise in the ears occurred during the contractions and a sensation of deafness, which was relieved as soon as the contractions ceased.

On examining the membrana tympani during these contractions, a sudden inward motion of the lower end of the handle of the malleus was observed, and a lessening in size of the triangular light spot. During the voluntary contraction the uvula was pushed forward. This movement was involuntary, and yet that of the tensor tympani and uvula could be made independently of each other. Respiratory movements had no influence upon the contractions. The hearing distance was greatly diminished, as tested by the watch during the contractions. When the watch was placed between the teeth it sounded much louder, as did a tuning fork placed on the fore-

head. The deep tones of a flute were heard indistinctly when the contraction lasted for any time. Such a change was not observed in the high notes. Similar results in the perception of tones were obtained on the piano. The deep tones were indistinct, the middle ones somewhat heavier and higher, while in the high tones the distinctness was unaltered, but during the contraction it was about a fourth of a tone higher.

Ossicula Auditus.—Professor Henke[1] has contributed to our knowledge of the mechanism of the *ossicula auditus*. According to the views of previous investigators, the base of the stapes has a to and fro or sort of rocking motion on the fenestra ovalis, since it was believed that the ossiculum lenticulare or os orbiculare moved in the direction of the crura of the stapes. According to Henke there is a swinging motion around a horizontal axis situated in the base of the stapes. The object of such a movement is to render possible an extensive change in position of the membrana tympani, and also to reduce that of the stapes to a minimum—to one of a very undisturbing variety—so that the peculiar vibrating movements may radiate into the fluid of the labyrinth through the ossicula.

The distinguished inventor of the ophthalmoscope, Helmholtz,[2] has added to the debt due him for his scientific investigations by a contribution to our knowledge of the mechanism of the ossicula auditus, which should find a translator into our tongue, but which will not admit of a condensation suitable for this report.

Otological Congress.—The first Otological Congress ever assembled met at Dresden on September 20, 21, 22, 23 and 24, 1868. Dr. Schwartze presided, and delegates were present from Great Britain, Germany, and one from the United States. The session seems to have been an informal one, and hence no papers especially prepared for the occasion were read.

The subject of sea-bathing in aural disease was the first subject discussed. Dr. Magnus considered the fear of such bath-

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[1] Monatsschrift für O., Bd. ii., No. 6.

[2] Die Mechanik der Gehörknochelchen, Bonn, 1869.

ing on account of aural disease to be unnecessary. Schwartze, Jones, Hinton, Lucae and others, however, considered sea-bathing as very dangerous to the ears, both from the entrance of the water and the mechanical force of the waves upon the ear.

The experience of the Society will be valuable on this point. I have seen very many cases of aural inflammation directly traceable to bathing with exposed ears.

The use of bougies in the Eustachian tube was also discussed. Drs. Schwartze, Wendt and Lucae did not think that narrowing of the tube was as frequent as stated by Kramer. Schwartze would use the bougie as a diagnostic means when the repeated use of the air-bath produced no result on auscultation.

Two cases of breaking of laminaria bougies in the tube were reported. Guye, of Amsterdam, used bougies in about fifty per cent. of the cases of catarrh of the middle ear, while Schwartze and Lucae found them seldom necessary.

Anderson, of Glasgow, thought bougies were used too often on the Continent and too seldom in England. They should be used as in the urethra, either to remove stricture or to stimulate the mucous membrane.

Paracentesis of the membrana tympani was also discussed, but no new facts other than those in Schwartze's paper were presented.

Parasitic growths in the ear and the treatment of simple non-purulent catarrh of the middle ear were also discussed.

Pagenstecher's nomenclature was adopted as the basis for discussion. 1. Hypersecretion; 2. Vascular ectasia; 3. Sclerosis.

In the first named form, the use of the catheter, with air, vapor of the muriate ammonia and injections, Politzer's method, internal use of quinine, iodide of potassium and iron, rubbing the skin, treatment of the naso-pharyngeal membrane by gargles and injections, paracentesis of the membrana tympani, were the remedies spoken of.

In the second form no irritants should be used. The internal use of acids and the application of the artificial leech were advised.

In the third form the injection of irritants was advised.

Lucae had used atropine poured into the ear with benefit in some cases (gr. ij. ad 3i.), as far as diminishing tinnitus was concerned.

Obturation of the canal, as suggested by Politzer, had been practiced; but one delegate, Hinton, had seen any benefit from the procedure.

The Congress adjourned to meet at Innspruck at the forty-third meeting of the German Naturforscher und Aertze, when the following subjects will be discussed:

1. Treatment of chronic suppurative catarrh of the middle ear.

2. Diagnosis and treatment of the diseases of the aural nervous system.

3. The influence of quinine on the ear.

It will thus be seen that our organization antedates that of our brethren across the sea, although we have not entered upon our discussions until this year.

(2.) A paper by Dr. Wm. W. Morland, of Boston (read by the Secretary), on Deafness in connection with Pregnancy and the Puerperal Condition.

DEAFNESS IN CONNECTION WITH PREGNANCY AND THE PUERPERAL CONDITION. By WM. W. MORLAND, M. D., of Boston.

Mrs. K., 38 years old, a stout, healthy looking woman, of strumous diathesis, although not very marked, consulted me some time since in relation to a deafness, which—with certain remissions, to be specified—had continued for thirteen years.

It first came on immediately after her first miscarriage, thirteen years since. She has since miscarried five times. On several of these occasions she flowed dangerously. The miscarriages have been at various periods, from six weeks to six months.

During her pregnancy she always hears perfectly—sometimes, indeed, *too acutely*. Immediately after miscarriage or delivery, the hearing is again almost completely lost. During menstrual periods she is more deaf than at other times. For the last four years she has grown much more deaf.

A noteworthy fact is that she had a sister affected in very much the same manner. Immediately after confinement with a child, at full term, she entirely lost her hearing. When the child was nine months old the mother died, so that no opportunity was afforded for observing whether the alternation of the presence and absence of the sense of hearing would occur, as in the patient's case. It is presumable, however, that it would have so occurred.

The ears, in this patient, are almost wholly normal. There was slight redness of the meatus observed, but nothing of consequence. The membrana tympani healthy in both ears. The bodily functions were all well performed. There was no headache.

The phenomena are interesting in themselves, and seemingly mainly dependent upon the different states of the circulation existing during the pregnant condition, at the miscarriages and at parturition. The nervous power was, of course, greatly affected by the above conditions; yet we hardly need resort to the undesirable and too often meaningless term "nervous deafness" to explain the circumstances. Anæmic deafness would, perhaps, be a more proper designation; yet the phenomena occurred several times when there had been no more than the ordinary loss of blood in labor.

Similar cases are noticed by standard authorities, although not precisely the same. The fact of the alternation mentioned, from *almost total* loss of hearing to recovery of the *full power* of the sense, is not, so far as I have been able to examine authorities, noted.

Tröltsch, it is true, refers to that "temporary deafness, which Von Scanzoni several times observed, after the application of leeches to the vagina, usually connected with a general vascular excitement and with the eruption of *urticaria* over the whole body."[1] He goes on to mention the "peculiar vacillations in the power of hearing" experienced by chlorotic and hysterical patients, and, noticing "the negative appearances" in the ears themselves, remarks upon the "singular sympathy"

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[1] Treatise on the Diseases of the Ear, etc. Translation by D. B. St. J. Roosa, M. D. Second Amer. edition, p. 499.

of the above phenomena "with the general health and the sexual functions," as justifying the appellation "nervous." Such are analogous cases with the one presented, but not identical.

Wilde, under the head of "Nervous Deafness," says: "Many deaf persons trace back the first accession of disease to grief, affliction, sudden mental emotion; to a shock, or to some great calamity. In many cases it first appears after child-birth, but it ordinarily comes on between twenty and thirty-five years of age." He notices the fact that both ears, sooner or later, become involved, but that the patient "almost always hears better on one side than the other." My own patient's left ear was the best. Toynbee, also, treating of "Nervous Deafness," says: "Patients have become totally deaf after the administration of too violent a purgative, or after an attack of diarrhœa or cholera, and after the nervous exhaustion attendant upon child-birth; in some instances of the latter, the deafness has begun with the birth of the first child and increased with each successive birth, until at last the nervous power was wholly lost."

I have not, moreover, seen reports of such phenomena occurring after miscarriage—only at the full term of pregnancy.

I have personally observed only one other case in which deafness was associated with the puerperal state. It occurred about six years ago, the deafness coming on immediately after the first confinement. Visible aural apparatus, healthy. Woman rather delicate, and occasionally has what she terms "rush of blood to the head," with flushing of the face. There is tinnitus aurium—sometimes a loud sound, as of working machinery, at others a sound as of waves on a beach. Both sounds disappear, or are unnoticed when in the crowded streets of a city, but become very annoying when she is much fatigued.

No other treatment was advised in these cases except general hygienic care, with tonics.

Dr. Dix remarked that he had observed cases where deafness occurred first at parturition and increased at each subsequent pregnancy.

Dr. Roosa and Dr. Weir had seen such cases, but the patients showed evidences of aural catarrh, and it was probable

that they were cases of aural catarrh increased by the puerperal state.

Dr. Knapp thought that there may be cases of deafness after parturition caused by anæmia, and analogous to anæmic amblyopia under like conditions.

(3.) A case of Acute Purulent Aural Catarrh, induced by the use of the Nasal Douche, was reported by Dr. Knapp.

A Case of Purulent Otitis Media caused by the Nasal Douche, and showing the Symptom of Double Hearing with both Ears. By H. Knapp, of New York.

The use of Weber's nasal douche for diseases of the naso-pharyngeal region has become pretty extensive. Only of late some observations came to my notice which show that there is a good deal of danger in this practice. Dr. D. B. St. John Roosa describes, in the Archives of Ophthalmology and Otology, I., 1, p. 259, etc., a case in which the origin of a purulent inflammation of the middle ear, of the very severest kind, could be traced to the use of the nasal douche. He adds that he saw, on two previous occasions, its employment causing considerable trouble in the ear, with rupture of the drum-head. He had seen few cases where the use of the douche could be tolerated for any length of time. Dr. S. Moos, of Heidelberg, in a note to the German translation of Dr. Roosa's paper, confirms the views of the latter author, by stating that he saw the fluid, injected into the nostril by Weber's douche, flow out of the ears in two cases of perforation of the membrana tympani. Although the application of the douche is not hurtful in such cases, they prove that water may penetrate through the tubes into the tympanic cavity. In one instance, Moos saw also a catarrhal inflammation of the middle ear arising from the employment of the douche.

The practical importance of these observations induces me to communicate to you the following case of a similar nature.

A merchant of New York, 32 years of age, was in the habit of injecting, by Weber's douche, warm water into his nose for chronic catarrh. He once took cold water, and felt, immediately after the injection, considerable pain in both ears, dis-

appearing, however, very soon. After that time he used warm water for six months without any unpleasant symptoms. Then he employed cold water again and experienced at once, in his left ear, a severe pain, which soon abated, but continued to be dull and annoying for a fortnight. Then suddenly it increased, was combined with headache, throbbing in the ear, loss of appetite, and deafness. Three days afterward an abundant purulent discharge from the left ear set in. He came to my office presenting all the symptoms of a very severe otitis media with perforation of the membrana tympani. He was under my treatment from the 6th of March until the 11th of April. Three weeks after his first presentation a great improvement had been obtained, the discharge was stopped, and the drumhead closed for four days. Then an exacerbation and a new perforation occurred. The discharge kept flowing for a fortnight, when again an improvement was obtained, and the patient left New York to complete his recovery under the care of his father, a physician in the neighborhood of Philadelphia.

Besides its origin this case was remarkable for an accompanying symptom, not much known yet, viz., *double hearing with both ears.* Tröltsch and Politzer mention its occurrence only with two lines; Moos records, in his *Klinik der Ohrenkrankheiten*, p. 319, what is known on it. He observed it twice, once in a patient suffering from acute aural catarrh, who heard simultaneously the third of each tone he was singing. The disease was very soon completely cured. The second patient suffered from impairment of hearing in consequence of chronic aural catarrh for ten years. One evening, to shorten a fit of his habitual asthma, he anesthetized himself by chloroform. On awaking, his deafness was very much worse, and he heard all sounds of the upper three octaves double. His hearing power diminished further until all musical sounds appeared to him perverse, and music in general, which he had liked passionately before, became a perfect horror to him. It is not stated in either case which ear perceived correctly the natural tone, nor whether the pseudo-tone was higher or lower in pitch.

The only well analyzed case of the few of double hearing on record is that of Prof. Von Wittich, on himself. The excellent physiologist of Königsberg observed, four weeks after

a severe acute purulent otitis, that he heard all tones of the middle octave of a piano *half a note higher* with the diseased ear than with the healthy one. His explanation is that exudation in the tympanic cavity had, by altering the pressure of the fluid in the labyrinth, changed the tuning of the terminal filaments of the auditory nerve.

When I examined the patient, whose history I have spoken of, three days after the discharge had set in, I found, in the diseased ear, the hearing power for noises very much diminished (watch of 6′ hearing distance heard from $\frac{1}{2}$″), whilst musical sounds were nearly as well perceived as in the normal state. A large tuning-fork, placed on the glabella, was heard *double*, namely, in the diseased ear more strongly and about two tones higher than in the sound ear. On trial with a piano I verified the same anomaly to exist for the middle and higher octaves, whilst it was not observed in the lower octaves. There was no distinct limit between single and double hearing. This phenomenon existed unchanged during the first week, when the perforation was well marked and the discharge abundant. Then both the sounds gradually differed less in pitch, until, three weeks later, they hardly differed by half a note. After the relapse, the double hearing still existed, but was no longer so marked as before.

The main difference between this case and that of Prof. Wittich is, *that in the latter the pseudo-tone of the diseased ear was higher, in the former it was lower*. The same disease had brought about in both cases a false tuning in Corti's organ. If we compare the latter with a stringed instrument, then the false tuning must have been caused in one case (Wittich's) by relaxing, in the other one by tightening the strings. Let us suppose, for example, that a string (or Corti's arc) which, in the normal condition, were so tuned as to perform three hundred vibrations per second, were now so much more tightened as to perform three hundred and fifty per second. If, then, a musical instrument—for instance, a tuning-fork—yielding three hundred and fifty vibrations per second, were sounded strongly enough to be perceived simultaneously by both ears, it would excite sympathetic undulations in that string (Corti's arc or fibre) of either ear which is so tuned as to

yield three hundred and fifty vibrations per second. In the healthy ear this would excite a nervous fibre which always conveyed to the brain the impression of three hundred and fifty vibrations per second; but in the diseased ear it would irritate a nervous fibre which always conveyed to the brain the impression of three hundred vibrations per second. Therefore two tones are perceived, and that of the diseased ear is the lower one.

I suppose this symptom, which, in analogy to diplopia, may best be termed *diplacusis binauricularis*, will be more frequently observed than has been the case hitherto, if our attention be turned to it. It may not only be of physiological interest, but guide our prognosis and treatment by demonstrating that, in the respective cases, the *labyrinth* is either primarily affected or participates in some other disease.

(4.) A paper was presented on Parasitic Growths in the External Auditory Meatus, by Dr. J. Orne Green.

Two Cases of Parasitic Growth (Aspergillus Glaucus) in the External Auditory Meatus. By J. Orne Green, M.D., of Boston.

The two specimens here shown are parasitic growths removed from the external auditory meatus. The case of the patient from whom the first was taken was reported in full in the Boston Medical and Surgical Journal of Nov. 19, 1868. The parasite had caused a marked increase in the subjective symptoms, and the deafness depending on a chronic simple inflammation of the tympanum; neither the history nor the examination revealed any previous suppuration.

The second case has never been published, and offers some points of interest, as I was myself the subject of the disease. Several times during my life I have suffered from furuncles in the meatus, the last time nearly two years before this trouble. I was treating the first case during the months of June and July, 1868, and was at the time perfect in health and ears.

In August I felt some ill defined irritation in the ears, attended by a slight serous discharge, just enough to be felt with the fingers; this, however, soon ceased without any treatment,

and was only recalled to mind on a return of the trouble in the next November, when I noticed in both ears the same slight serous discharge, with prickling, itching and occasional slight pain and feeling of fullness in the ears. The hearing was found by the watch to be somewhat impaired. Dr. E. H. Clarke, who kindly examined them, reported that each meatus showed patches of deep congestion and small white masses, which were pronounced from their appearance epidermis. A mild astringent instillation and syringing was used for a few days, when, not obtaining relief, I examined microscopically some of the small white flakes, which in gross appearance resembled epidermis, and found the parasite. An instillation of acid carbolic, gtt. v. ad ʒij., was then substituted, and the ears syringed daily for a week; but each syringing continued to bring away flakes of the parasite, and I changed to a solution of carbonate of soda, without, however, checking the growth. Every day small flakes would be syringed out, and the microscope showed that they contained great numbers of the fructifying heads of the aspergillus in early stages of development. A solution of calcaria hypochlorosa, gr. ij. ad ʒj., was then used, as recommended by Wreden, and the daily syringing continued. The sporangia became gradually less numerous, of a smaller size and earlier stage of development, and the epidermal cells mixed with them increased in number. After some six weeks of treatment the syringe ceased to bring away any thing, and the ears became normal in feeling and function, and have so remained.

It would be presumptuous to draw any general conclusions in regard to treatment from these two cases; but in my own case I am inclined to ascribe much more to the continued syringing than to the medicaments used. After their use the changes in the mycelium and sporangium described by Wreden certainly were not apparent, so that the only effect they could have had was to loosen the masses from the meatus, and the force of the syringe seems much more likely to have done this.

The subjective effect of the instillations was various: the carbolic acid solution was irritating, producing a feeling of warmth in the ear which in a few minutes increased to smart-

ing, burning and vertigo, which lasted for some ten minutes after the ear was dried. The effect of the carbonate of soda was not specially noted, but was indifferent. The hypochlorite of lime was very pleasant, seeming to soothe the irritation without producing any disagreeable symptoms; and if, as Wreden claims, it acts more powerfully than any other agent on the parasite, its mildness is an additional indication for its use.

The symptoms in my own case, showing themselves so soon after I had treated the first and only case I have seen, would seem to show that I had in some way transferred some of the spores, and that these subsequently developed; but how this was done I am unable to say. That they were transferred by the otoscope was impossible, for the end used by myself is of a different color from that used by the patient, and I am always very particular to preserve the distinction; but the spores having once obtained a resting place in one ear they could easily have been transferred to the other by this instrument, as I use it indifferently in the two ears. What particular condition favored their development after lodging in the meatus cannot be determined. I was not aware previously that the ears varied from the normal condition.

In the first case the parasitic growth had formed a thin, dark colored membrane, which covered the deeper parts of the meatus and membrana tympani, and after removal showed a perfect cast of these parts. The microscope showed a vast number of the sporangia of the aspergillus, of large size and of a slight yellow color, mixed with the stalks of the mycelium, which formed the body of the membrane. In my own case the growth had not reached such a degree of development; the pieces removed were all small, none larger than one-third of an inch square, all but one or two of a white color, and the sporangia not more than one-fourth the size of those in the first case. Nothing like a cast of any part of the meatus was discovered.

Wreden's articles are no doubt familiar to most of the members of the Society. The first appeared in the Archiv für Ohrenheilkunde, Vol. iii., and a synopsis of this is given in the Boston Medical and Surgical Journal above referred to. In the second, which appeared some months after in a pamphlet

form (Die Myringomykosis Aspergillina und ihre Bedeutung für das Gehörorgan), additional cases with remarks and experiments are given.

Wreden experimented by placing portions of the growth in solutions of medicaments considered destructive to parasites, and found, from eighteen different solutions, that those having the most destructive action on the aspergillus were the liquor calcis chloratæ and a solution of chlorinated lime (chemically pure), two grains to the ounce. From these experiments he concludes that the solutions of the subchlorides are the most destructive, and particularly recommends the chlorinated lime of the above strength, on account of its energetic action on the parasite and the slight irritation it produces in the meatus. The only caution he gives is to dissolve the salt fresh at each application, in order to obtain the benefit of the chemical action which is immediately set up, and by which chlorine and oxygen are set free, and the latter in *statu nascenti* (ozone) possesses the greatest oxidizing, *i. e.*, destructive property.

The portions of aspergillus submitted to the action of such a solution for six hours Wreden describes as converted into a homogeneous, amorphous mass, in which no sign of mycelium, sporangium or sporule was to be discovered.

The following addition to the By-Laws was made:

"An Executive Committee of three (3) shall be appointed by the Chair at each annual meeting, to nominate officers of the Society and the other committees, and to present an order of business."

Section 2 of the By-Laws was so amended that the officers of the Society shall consist of a Vice-President, in addition to the other officers mentioned.

On motion of Dr. John Green it was

Resolved, 1. That the By-Laws be so far suspended as to give to the Publishing Committee discretion to publish the Transactions of the present year in connection with the Transactions of the American Ophthalmological Society.

2. That all papers referred to the Publishing Committee be furnished to the Committee before September 1st.

3. That proofs be sent to the authors, and that they be returnable within one week of the date of their receipt; if not returned within

that time the paper may be left out, at the discretion of the Publishing Committee.

A tax of one dollar was assessed on each member.

The following subject was chosen for discussion next year, viz., Simple Chronic Inflammation of the Tympanum.

The following committees were appointed and officers elected for the ensuing year, viz.:

COMMITTEE ON PUBLICATION:

Dr. C. E. HACKLEY.
" R. F. WEIR.

COMMITTEE ON PROGRESS OF OTOLOGY:

Dr. J. ORNE GREEN.

OFFICERS FOR 1869-70:

President.....Dr. H. D. NOYES.
Vice-President..... " E. L. HOLMES.
Rec. Secretary and Treas..... " C. E. RIDER.
Cor. Secretary..... " H. L. SHAW.

The Society then adjourned to meet at the Atlantic Hotel, Newport, R. I., on Wednesday, July 22d, 1870.