tis, fluidity of the vitreous or detachment of the retina are not applicable.

4. The dangers of operative interference are more than counterbalanced by the results to be achieved, which are mainly increase of visual acuity and of the visual field, and more extended use of the eyes, which accompany diminishment of the refraction.

The opportunities for observation of high degrees of myopia, particularly of operation for this by the American surgeon, are limited in proportion to those of ophthalmologists in the old world. By individual reports, however, we can add our evidence to the already proved value of surgical treatment for this class of cases⁵⁵.

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VERY HIGH ASTIGMATISM.*

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PROFESSOR OF DISEASES OF THE EYE IN THE
PHILADELPHIA POLYCLINIC.

PHILADELPHIA.

The purpose of this paper is to put on record a case of a rather uncommon but striking anomaly occasionally encountered in the refraction of the eye.

Since the subject of astigmatism has been brought into the domain of scientific and practical study, the principal questions referring to it, which have come under discussion, have related to its seat, frequency, variety, cause, effects on the visual acuity and comfort of seeing, the health of the eye and on the functions and disturbances of distant organs. Statistics bearing on the relative frequency of the different forms of astigmatism compared with one another and the refraction in general, are at hand, while the very highest forms have apparently not received the same attention. The trial cases appear to place the limit at 6 or 7 D.

The reason for this is obvious; astigmatism can only be adequately studied by the aid of reliable objective methods, and until such had been brought to such a degree of perfection as to be capable of the accurate determination of the direction of the principal meridians and the quantitative measurement of their refraction, the subject had remained one of uncertainty and surmise. Not only so, but the accumulation of statistics, which can only result from the published report of cases of individual observers, required time. We find, accordingly, that Donders makes the statement that at the time of the publication of his work, it was not yet possible to determine the limits of astigmatism; he recognized an error of 1-95 in one of his own eyes, and suggests that this may be an approximation to the limit on the side of the minimum while he was not prepared to fix a maximum, citing a case observed by himself in this direction of 1/5=8 D.

The scantiness of statistics and even of reports of individual cases appears to be rather striking, even at the present time. Thus, Galezowsky has reported three cases of astigmatism of from 12 to 15 D., which he appears to consider as well nigh unique—and even these seem to have belonged more properly under the rubric of conical cornea. He describes a conical lens with spherical and cylindrical surfaces, which he employed with satisfaction and recommended in similar ones. Fukala, the promoter of the operative treatment of high myopia, thinks that just as patients are unable to wear the strong spherical lenses, so high cylinders can not be borne.

As a matter of fact, instances of strong cylinders worn with comfort have been reported from time to time. No doubt many here present have personal knowledge of the beneficial effects of such lenses.

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The question of the highest forms of astigmatism reduces itself, after all, to a study of the optical conditions of so-called irregular astigmatism and conical cornea. It is well known that high degrees of corneal astigmatism result from operations—sections. An instance of 26 D. has been reported by Dr. Edward Jackson. Such astigmatism undergoes very considerable modification in the course of time, at first rapidly, afterward more slowly, so that an astigmatism of 10 D. or more may diminish to 2 or 3 or perhaps disappear entirely in the course of a few weeks or months.

When the presence of irregular astigmatism has been established by one of the usual methods for the discovery of this anomaly, for example, Placido's disc, which, of course, exhibits only corneal irregularity, the usual seat, however, the duty of the oculist is by no means accomplished. The means at our command for the study of such cases, besides the subjective method, are the ophthalmoscope, ophthalmometer, and the shadow test. When it is possible to obtain anything like a satisfactory view of the shape of the disc, even where the details can not be seen satisfactorily, the changes in the direction assumed by the principal axes of the elliptical nerve head, according as it is viewed in the direct and indirect images, will sometimes furnish a valuable clue to the direction of the axes and a surmise as to the amount of any element of regularity that may be present; the ophthalmometer may render similar service and more accurately indicate the amount of difference between the principal meridians; and skiascopy will give these indications, if present, with considerable certainty; in the midst of the broken reflex, the principal axes will be indicated, so to speak, by the general trend of the light, even if a distinct band is not present. Subjective examination is generally unsatisfactory if used alone. With the clues given by the objective findings, it may sometimes supplement the former with advantage, the general directions of the principal meridians once known.

Even cases of what are ordinarily considered as instances of rather high regular astigmatism, say from 3 to 6 D., are frequently accompanied by irregular astigmatism. Meridional astigmatism corresponding to spherical aberration of ordinary lenses—positive, if the peripheral portion of the pupil has the stronger refraction; negative, if the center is the more refractive; and the so-called "scissors movement,"—are often marked accompaniments of astigmatic eyes and a source of embarrassment in determining just what portion of the pupil is to be regarded as the visual zone and where the point of reversal for that zone is to be placed—circumstances too that frequently explain the uncertain and contradictory replies of the patient when under examination by the trial lenses, as well as certain statements and complaints in regard to the wearing of the glasses finally selected.

Very high astigmatism is, in fact, never purely regular—it is always accompanied by irregularity. The most important practical question in any case of marked irregularity is whether the refraction has a degree of regularity which is necessary to securing improvement. Painstaking examination will not infrequently accomplish this object after perhaps years of dissatisfaction and numerous disappointments on the part of the patient. To whatever degree the refracting optician may trench on the province of the oculist, we may be sure that cases of this nature will be left to the accomplished ophthalmologist to demonstrate his superiority over the spectacle vendor.

The argument for removal of the lens in high myopia is based largely on the alleged inability to wear the strong concave lenses required for its correction; it is evident that the disturbing defects of strong spherical lenses also inhere in strong cylinders; the latter possess additional inconveniences, as appear even in the weaker ones employed in daily practice. It must be admitted that such distortion will prove more or less annoying, but the question is not whether the full and entirely comfortable vision of the normal eye can be obtained, but whether the individual for whom no relief is possible in any other manner can not be aided in a marked degree; it is hardly necessary to refer to the operations which have been suggested on the cornea or iris, or to the conical or parabolic lenses which have been proposed for irregular astigmatism, but which have not made, and are not likely to make, their way.

These cases of high astigmatism resemble the ordinary form, in that they are congenital or, at least, usually acquired in early life, and hence come under notice in youthful individuals more capable of adapting themselves to their glasses, unlike the usual subjects of post-operative astigmatism. The amount of improvement which the correction of such errors is capable of effecting is not to be judged by any absolute standard. A glass which raises the visual acuity from, say 15/100 to 15/40 or only 15/70, may give greater benefit and satisfaction than, for example, increasing the vision from 15/30 to 15/10 in a case of myopia. Whatever improvement is effected is available for vision at all distances, both far and near, aided, if required, by the patient's age, by the requisite presbyopic correction.

As an instance of high astigmatism, I beg to report the following case:

E. L. S., aged 32, American, has always been healthy, and free from known disease of the eyes. He was first examined by me four years ago. The history he gave of his visual troubles is characteristic; he believed himself to be near-sighted all his life, but "not like other near-sighted people," seeing about equally badly for far and near, for, while he habitually held near objects very close to his eyes, like a high myope, he is unable even then to obtain satisfactory sight, e. g., he could not read the larger newspaper type; at the same time distant vision was not nearly so poor as was to have been anticipated from his manner of holding near work.

Quantitative examination gave the following results:

R.=12/100. L.=12/100.

Reads the 2 m. near type at about two inches from the eyes. He was employed as a general utility man about a country establishment, the only kind of work his impaired vision enabled him to perform. He did not complain of pain in the head nor eyes, nor of any symptoms of asthenopia. His parents and subsequently he himself had consulted opticians and oculists with a view to securing improvement by glasses, if possible. He was informed that he was near and "weak" sighted; the glasses he received gave little or no improvement.

When I saw him he was wearing:

+2 cyl., ax. 90 R. and L.

Externally the eyes presented nothing noteworthy, with the possible exception of rather large pupils, which, however, reacted to light and convergence; the external muscles were in good balance—slight exophoria was present—the media were clear; the details of the fundus could not be distinctly seen with any spherical lens. It was evident that myopic astigmatism was a dominant factor in the refraction, but there was evidently a high degree of irregularity also present. The shadow test showed that this was the case, and in the midst of the broken and irregular reflex a zone came out distinctly, showing the bands and movements of mixed astigmatism as follows:

R.=+2 —20 cyl., ax. 15°.

L.=+2 —20 cyl., ax. 178°.

With these lenses his vision was:

R.=12/30. L.=12/40

with near vision to correspond. This correction was prescribed and he has worn it constantly with comfort and satisfaction. With the correction before the eyes the fundi were seen quite

clearly; nothing of special interest was noted, beyond a rather extensive circular area of choroidal atrophy around the disc, extending somewhat irregularly outward. The measurement was made under homatropin mydriasis.

I have examined the man several times at intervals of about a year since giving him his correction, but have detected no material change in his refraction. He has worn the original lenses constantly since they were first prescribed.

DISCUSSION ON PAPERS OF DRs. RISLEY, JACKSON, CLARK, WÜRDEMANN AND SCHNEIDEMAN.*

DR. W. H. WILDER, Chicago.—In regard to the peculiar asthenopia that occurs in certain of these cases of anisometropia, and also in certain cases of astigmatism I wish to note that in some of them there is observed a peculiar and interesting change in the retina. Unfortunately, I did not arrive in time to hear all of Dr. Risley's paper and I dare say he alluded to this condition. My attention was first called to the changes in the neighborhood of the yellow spot, by Mr. Nettleship, and in some of them you will find, by very careful focusing, a peculiar granular change about the macula lutea, with possibly some degree of congestion of the vessels to the temporal side of the disc. It would seem, in some cases, almost as if a coat was forming. It is not sufficient to be called a granular appearance, but is rather a pepper and salt appearance, and it may be found in some where the astigmatism is so low as to be supposed not to be a prominent and active factor in the case. As far as my experience with anisometropia is concerned. I have observed, in quite a number, that if the patient has courage enough he will be able to wear a full correcting glass and overcome the difficulties that Dr. Jackson mentioned, such as seeing things distorted, "walking up hill," etc. I had a man under observation at one time, to whom I gave a full correction of a high degree of astigmatism, and he came back saying he had to hold on to the rail of the bridge as he attempted to cross the Chicago River, because everything seemed to rise up at an angle of 45 degrees. If the atropin mydriasis be kept up for a considerable time, or if the patient persist he can adapt himself to the new relations.

As for high degrees of myopia, I have been surprised at the small opportunities I have had of observing cases suitable for this operation. I have a large clinical experience and have had for perhaps eight or ten years, and yet I have seen but few cases, perhaps eight or ten, that would have been suitable for the operation. The dangers seems to overbalance the advantages, and I doubt if it has as large a field of usefulness as has been supposed.

DR. F. T. ROGERS, Providence, R. I.—I wish to emphasize but one point in Dr. Jackson's paper, and that is the plea for an attempt to correct these high degrees of anisometropia. If one seek for information in the text-books he will find it stated that these cases are not susceptible of relief by glasses. Landolt says that in the vast majority of cases our results will be nothing. It seems to me that if a man has a correct understanding of the laws governing these cases, and a knowledge of the relation between convergence and accommodation, he is not doing his whole duty by the patient without at least making an attempt to correct these errors. As Dr. Jackson said, frequent trials may have to be made before a successful result is obtained. If we tell the patient that he has a bad eye and no glass can be worn with comfort he will likely go elsewhere to seek a glass that does give relief. I can recall numerous cases seen within the last nine years, where great comfort has been derived from wearing glasses of great difference. In one case there was a -2 cylinder in the horizontal meridian of one eye and +5 cylinder vertical in the other. This man had been arrested on the street several times on the charge of drunkenness, because he was unable to walk steadily. By wearing his glasses he could walk with perfect steadiness. In another case, a child of 12 years had worn, for two years, a +2 for one and +12 for the other, and my experience has taught me that children do not wear glasses by preference, and if they keep them on it is because they give comfort. I wish simply to emphasize the point that each case should be a law unto itself, and we do a wrong to our patients and an injustice to ourselves if we allow them to go without an attempt to correct such errors.

DR. GEORGE M. GOULD, Philadelphia.—I wish simply to give a word of commendation to what Dr. Rogers has said, and to add that there is nothing more atrocious than the advice given in the text-books, that corresponds to the reference quoted from Landolt. Every case of anisometropia may be corrected; I do not think I have ever yet failed to secure glasses in such

cases that were satisfactory and that made both eyes participate in vision. The question goes back not only to the first effect of the glasses, but to several apparently minor and yet really major considerations. In many cases of anisometropia one will need to modify the single eye correction by the findings made with both eyes open. It is a strange fact that a highly amblyopic eye, even with both eyes fixing, will detect a slight turn or change in the axis in an astigmatic glass. By testing the axis of the amblyopic eye while both eyes are functional, one will find that the bad eye detects almost any inaccuracy of axis or strength of lens at once. By this means, slight changes may be required from what one has found by examining each eye alone, and in this way one may avoid some of these distortions complained of. I remember one patient who was greatly tormented by the distortion of objects with the best glasses I could give him. With both eyes open I twisted one axis a little and immediately the objects straightened up. A considerable help may be gained by the use of this method. Indeed, I am not sure that all tests may not be more accurately made with both eyes uncovered.

The very best prescription, moreover, filled by the best optician, may not correct the astigmatic error when mounted in the spectacle frames. I instruct all my opticians to fit glasses perfectly, and then to try them in place by merely twisting each lens separately, a little upward or downward, to see if there is any improvement by a slight change of axis. Another point is the closeness of the glass to the eye. In these cases with distortion I have secured good results by trimming the lashes and setting the glasses as close to the cornea as possible.

DR. G. C. SAVAGE, Nashville, Tenn.—More than ten years ago my friend, Dr. Lippincott, first pointed out the distortion of retinal images. A little later on I published an article, thinking I was the first to point this out, but, in spite of the fact that Dr. Lippincott explained it so clearly in 1889, at the meeting in San Francisco it was almost the unanimous opinion that there was no distortion of images in oblique astigmatism. The question of anisometropia so far as oblique astigmatism is concerned is one easy to master. There is now no question, in the first place, but that there is a distortion and there is a definite strain that falls largely on the oblique muscles. Astigmatism unequal and oblique, ought to be corrected, but it should be done in a way attended by the most comfort to the patient, and you ought to tell him beforehand the experiences through which he must pass. It is to the credit of Lippincott that he devised the means of carrying the patient through those troublesome times, that is, to give a part correction to-day and in a month or so make a change, until you gradually arrive at a full correction. The patients bear the slight change very nicely and, step by step, one gets the patient up to full correction without much annoyance.

Another method of doing this is a method which I take credit for myself, that is, by slightly turning the axis of the cylinders in the proper direction, which can easily be determined, so as to partly straighten the images and at intervals returning it to the right point until the vision is gradually freed from the distortions. It is the power of every man to tell the patient beforehand just what discomfort he will have. If he has an oblique astigmatism with the axis diverging above, we know that the patient is going to have to "climb hills," and to see the wall leaning from him at the top, and we know that when he takes a book in his hand it will appear broader at the bottom than at the top, and further we can say to that patient that in a short while, within a week, all the trouble will pass away. Suppose the meridians converge above, you give the full correction and the patient has the opposite condition of things—the wall will lean toward him at the top, and the top of the book will appear broader than the bottom. You must say then that it will require some time to get accustomed to lenses and that he will probably not get over the distortion in a month or two unless you adopt the plan suggested by Lippincott, or rotate the cylinders as I have suggested.

DR. A. A. HUBBELL, Buffalo, N. Y.—I have been deeply interested in Dr. Jackson's paper, and in the main I agree with him; but for many years I have corrected anisometropia with greater successes in young people and the younger the patient the more readily would a full correction be accepted. The consciousness of the individual is such that as years go on it does not yield readily to a change; it has become accustomed to certain retinal impressions and, when a change in them is produced in a person past 40 or 50 years of age, that person will, many times, repel any effort we may make to equalize the visual acuteness in both eyes. We can, therefore, with greater confidence correct anisometropia in the young than in older persons.

In regard to the distortion of images, Dr. Savage is, in the main, correct; but I do not believe that he is correct in at-

* The papers of Drs. Jackson and Clark appeared in the JOURNAL of December 2. An abstract of Dr. Risley's paper, which was published elsewhere in full, was printed in the JOURNAL of October 7, ¶ 69, p. 904.

tributing all of the metamorphosis to the action of the oblique muscles. The shape of the retinal image is changed when cylinders are placed before the eye, but such change can not possibly be produced by the action of the oblique muscles. Cylinders may be gradually increased in strength until the desired correction is reached, as Dr. Lippincott and Dr. Savage suggest, but the consciousness must be educated, so to speak, to the new impressions.

With regard to astigmatism after cataract operations, we all believe that the astigmatism is produced by the sliding of the flap; most of us are doing the flap operation, and, therefore, get astigmatism against the rule. I have in some instances attempted to avoid this sliding by using a narrow Graefe knife and making a shoulder for the flap by turning the knife a little forward as I finish the section. I have found that this lessens the amount of astigmatism. One of the main factors in the production of astigmatism is the pressure exerted on the eyeball, either by the dressings or by contraction of the orbicular muscle, and this should be avoided as much as possible. Furthermore, if the cut heals rapidly, we do not get as much sliding as when it heals slowly.

DR. A. B. HALE, Chicago—What appendicitis is to the surgeon, myopia must be to the ophthalmologist. We Americans do not have the opportunity the Germans have to study this condition, and even they are not by any means decided as to the best way to treat myopia. Perhaps I see more cases of myopia than most of you, because my clientèle is composed largely of Russian Jews, and I am therefore particularly interested in its treatment. I have operated in half a dozen cases, and while that is not many, it teaches me some points. I have been able to answer some questions which I had considered before I tried to operate. The first is, what to do after discission. Shall one wait for absorption to take place, repeating the discission from time to time, or shall the cortical matter be released as soon as the eye is quiet? In one case I allowed absorption to go on to completion, but, though the results were very good, they were not satisfactory to me because the patient had to remain in the hospital for a long time and there was considerable irritation. I see no reason why the lens should not be removed as soon as the first irritation is over.

The second question was what to do when I did get an irritative process. I shall hereafter always do an iridectomy. In one case I did not. The eye was quiet for a few days, then the old disturbance came back, after relieving the lens matter, and the man's vision was not any better after the operation than before.

The third question concerns the disposition of the capsule. I have found that it is not the same capsule that one meets with after a cataract operation. I have not answered that question yet.

In cases of anisometropia I have a series of fifty cases that I am studying by the stereoscope, and I find that practice with it gives good results, satisfactory both to the patient and to the physician. Asking Dr. Savage's pardon, I want to say that the question of oblique astigmatism and anisometropia are two different questions and can not be discussed in the same way.

In regard to the operative treatment of astigmatism I wish to call attention to an article by Mr. Carter. He made an incision in the faulty meridian and reduced the astigmatism from 5 D. to .5 D.

DR. F. J. BERNSTEIN, Baltimore, Md.—I am glad to find such a universal approval of a method I have been advocating ever since I began to practice, that is, the giving of full correction, but doing it gradually. It struck me that it was the only rational thing to do, and I have had nearly all my patients finally accept the full correction. I have had a number of patients consult me regarding their sight in supposed amblyopic eyes. Several were adults who had never made use of the one eye and had been told, by reputable oculists that nothing could be done for that eye. Yet by proper correction of their static or total refraction, and by gradually conducting them up to the acceptance of such glasses, I have brought about binocular vision and normal vision in such bad eyes. There was only one case in which I made a failure, and that was where, in an unguarded moment, I told the patient that I had given him a partial correction and that after he had worn it for a month or two I would make a change. He insisted that he could stand it at once, and I had to give it to him, with the result that he soon rejected the glasses. I have made my patients use a stereoscope, as recommended by Landolt of Paris, when they have any degree of anisometropia.

DR. J. A. LIPPINCOTT, Pittsburgh, Pa.—Dr. Jackson has covered the ground so well, as in fact he uniformly does, that I find it necessary to refer only to the principal points he spoke of, one of which is the division into two instead of three classes on the ground that cases in which the vision is suppressed in

one eye do not come under the category of anisometropia. In regard to the practical points he made, I agree with him in the main. The fact is that the subject is such a large one that it is difficult to decide where to begin. If I had time I would like to speak of the general subject of stereoscopic vision, especially with regard to some facts which are detailed in a paper I published ten years ago. However, I will content myself with emphasizing one point, that is, that metamorphopsia is produced not only by cylindrical but also by spherical lenses, for it depends on the difference in the images and the convergence of the optic axes. As to the leaning of the axes when the two eyes are tested together, there is no doubt they should be so tested, but my experience is that the axis very rarely varies in binocular vision from the position it occupies in single vision. To change the axis simply to do away with the metamorphopsia is wrong in principle and bad in practice. We should instruct the patient to persist in wearing his glasses, assuring him that the distortion of images will gradually disappear.

DR. LEARTUS CONNOR, Detroit, Mich.—One point has not been mentioned, yet I have no doubt all the gentlemen make use of it, viz., when the patient is going through this difficult experience send him off on a hunting or pleasure trip and when he comes back he will use the glasses. Dr. Risley's paper showing that the proper correction of the refractive error resulted in the removal of all the muscular error is important. All of us have seen operations done early in such cases, and afterward such steps had to be retraced. I can see that in an eye that was very defective its correction would help the other eye. That has been my observation and I have found it of great practical value to correct that as well as the better seeing one. One other point he made in connection with the work on very young children is extremely important. I am sure those of you who have watched such work have seen the eyes grow better and at times become nearly emmetropic. Too much emphasis can not be placed on the importance of this fact to the welfare of future generations.

DR. FRANK ALLPORT, Chicago—Several have spoken of the weight of the heavy lenses, and I desire to remind the Section of a useful device in the little films that the opticians call lenticulars, similar to what we see in the binoculars, except that they are round and are simply stuck on the center of a plane glass.

I am sure that I have the profoundest respect for anything Dr. Gould may say and I do not speak in a spirit of criticism about his method of changing the axis of the glass when examining with both eyes open, but I can not see why this should be done. The axis of the astigmatism must be the same whether one eye is open or both and as Dr. Gould will not have the opportunity to answer my question I hope Dr. Jackson, in closing the discussion, will explain it. I have no doubt it is true, if Dr. Gould says so, but I want to know why.

Our Philadelphia friends are expert refractionists but I can not quite get up to their exactitude in the full correction of hypermetropia, neither can I quite bring myself to the point of fully correcting these cases of anisometropia. I approach it as nearly as possible, but find myself unable as a rule to correct both eyes fully and give glasses that are satisfactory to the patient, and of course that is what we have to aim at. The same may be said of very high degrees of myopia.

DR. YOUNG—In speaking of post-operative astigmatism last year, at Denver, I called attention to some observations I had made to this effect, that in examining patients with incipient cataract I had been surprised at the number of cases of astigmatism against the rule which I had observed, and the question occurred to me whether astigmatism against the rule predisposed to cataract or whether it was a part of the cataractous process already begun. It may be that that would have some bearing on post-operative astigmatism. The highest degree I have had is 7 D., and in that case I secured 20/20 vision and Jaeger No. 1.

DR. L. J. LAUTENBACH, Philadelphia—The discussion seems to indicate the need of carefully studying the curvatures of the cornea by means of the ophthalmometer. In Dr. Risley's first case he absolutely proves that he was, by means of mydriatics, able to bring about results that other men are endeavoring to perform by means that must always fail; I do not think that a muscle operation would avail in such a case. Changes of the cornea and in its curvatures do undoubtedly occur, and are due to the action of the muscles enclosing the ball, and the lids. The condition that predisposes to it is anything that interferes with the nutrition of the cornea. In a paper presented to the Section three or four years ago, these were the lines I laid down as governing the corneal curvatures. I take the ground that if these corneal curves are carefully studied and corrected, and if invariably the astigmatism is all

corrected, operations on the muscles will be very few indeed.

With reference to Dr. Schneidemann's paper, I recall a case in which an astigmatism of 10 D. was reduced to 4.5 D. By full correction you put the eye in such a condition that the reflexes are lessened and the nerve and blood supply are restored more nearly to their normal condition.

DR. MILLER—I was very much interested in what Dr. Risley had to say about correcting muscle balance by proper glasses. Dr. Payne wrote an article that has always been of great value to me in this connection. He would always keep the eyes under atropin until the muscles were thoroughly paralyzed and then, correcting all the errors possible, left the same amount of ametropia uncorrected in each eye, thus balancing the muscles. This has served me very well in all cases of ametropia.

DR. TENNEY—I recall a case of a woodturner who had four diopeters of hypermetropia and one of hypermetropic astigmatism with the axis vertical. He came back to me in a few days, saying that the wood he turned did not seem round, and yet he knew it was impossible to turn it without its being round; everything that was round looked oblong to him. This distortion was produced by the cylinder and in about ten days it disappeared.

DR. S. D. RISLEY, Philadelphia—The papers presented in this symposium by my colleagues, and the remarks made in the discussion, have been so rich in suggestion that there is much difficulty in selecting points for special notice in closing. The statistics presented in Dr. Clark's paper are of great interest and importance as suggesting the need for an improved technic in the operation for the extraction of cataract and in the subsequent treatment. If the ultimate result can be modified or rendered less satisfactory, as measured by the acuity of vision through faulty technic even in successful cases, it should lead to a careful scrutiny of our methods. The grade of corneal astigmatism noted in the paper in Dr. Clark's experience, corresponds very closely with my own. It depends largely on the kind of section made in the cornea, and on the process of healing; tardy closing of the wound favoring the occurrence of high grades of astigmatism. Irregular or ragged sections of the cornea lead also to astigmatism, since such wounds do not permit the accurate coaptation of the edges of the wound. I believe that the section suggested by Mr. Teale, and described by Dr. Hubbell, should be placed in the category of irregular wounds, since the shoulder produced by turning the edge of the knife forward in completing the section rather favors the riding up of the anterior lip of the wound. Such a section must be made with a narrow knife, and perfectly smooth incisions can not be so readily made with such an instrument. I prefer a rather broad knife with which the section is made in the same plane from start to finish, in the limbus, and completed by making a small conjunctival flap. Such a wound shows no tendency to gap, and the conjunctival flap favors the rapid healing of the wound and prevents a faulty coaptation of the edges.

I was interested in the statistics of myopia presented in Dr. Würdemann's paper. I have taken occasion in my work on school hygiene to formulate the percentage of myopic eyes to all cases of refraction applying for treatment in Philadelphia, during twenty years, from 1874 to 1894. During the first six years there were 28.43 per cent. of myopia. In the succeeding period this percentage gradually fell to 16 per cent. At the same time the degree of myopia also fell 50 per cent. in cases of 7 D. or more. Nothing could afford stronger evidence of the value of the treatment and correction of the errors of refraction than these figures. The importance of the results they portray is manifest when we consider the dangers which cluster around the high degrees of myopia.

Closely allied to these considerations are the inquiries which underlie the removal by absorption or by the extraction of the lens in high myopia, as presented in the very interesting paper by Dr. Timberman.¹ Notwithstanding the admirable result he has reported, this Section of the Association should hesitate before it lends its unqualified sanction to this operation. The extraction of the lens is indicated only in the higher grades of the disease. I say "disease," thoughtfully, for we should never forget that these stretching eyeballs are critically diseased organs. There is in these eyes always present a chronic, progressing choroiditis which has impaired the nutrition of the ball and has already produced degeneration of the vitreous body, which is fluid and usually well filled with floating opacities. Surgical interference in such an organ can be undertaken only at great peril. I have had the opportunity of witnessing several most unfortunate results from attempts to remove the lens in high myopia, so that until a more extended experience has demonstrated its relative safety, this Section should withhold its unqualified approval. The case is some-

what different in the very rare instances of high congenital myopia. In the meantime, fortunately, our modern methods of treatment are diminishing the number of cases of so-called malignant myopia.

As to the interesting fact brought out by Dr. Gould, concerning the change in the direction of the cylinder axis on examination with both eyes fixing, and about which Dr. Allport asks for an explanation, while it may be accounted for in various ways I believe it is usually due to a faulty binocular balance. We must all have observed the wavering of the corneal meridians during examination with the ophthalmometer. This will often disappear promptly, or the direction of asymmetric meridians will be changed, if one eye is bandaged. I believe that this can be explained by the faulty attachment of the ocular muscles to the globe. For example, we can conceive of a vertically acting muscle being attached too far to the outer or inner side of the vertical meridian of the cornea, or that the internus is inserted too high or too low, a condition of affairs which must disturb the direction of the corneal meridians, and it is quite conceivable that with both eyes open they would assume that direction which experience had taught to be the least annoying for binocular vision, and which might be quite different from that assumed with one eye excluded from participation in the visual act.

DR. EDWARD JACKSON, Denver, Colo.—I only wish to take up two points; one is with reference to the distortion of the images in oblique astigmatism, or the same distortion in any astigmatism, for the distortion of the image is the same, except that in oblique astigmatism the direction of greatest distortion is such that it interferes with the vertical and horizontal lines that are more frequently the subject of our attention. There can be no doubt that this distortion does occur, especially if the astigmatism is situated in the cornea. The difference in the two curves of the cornea makes a difference in the position of the nodal points; that is we have a different nodal point for each principal meridian, and therefore one gives a larger image than the other. The correction of the astigmatism by a lens causes a much greater distortion in the other direction, because we have not only a difference in the curve but the lens is situated farther away from the nodal point and hence affects this more. The distortion produced by the cylindrical lens more than overbalances, and leaves a greater distortion than there was originally caused in the eye. But the amount of distortion is a very small matter; it is not the important factor in this trouble. The important feature is that an image is given to which the eye is not accustomed, and the eye must learn to see with this and the ability to learn is in inverse proportion to the patient's age.

The second point is that referred to by Dr. Gould, and for which Dr. Risley has already given a probable explanation. Another explanation occurs to me in this way: Put a convex lens at some distance from the eye and a concave one closer to the eye. You can thus double the size of the image for one eye, and still fuse the images of the two. I think perhaps we have in the disturbed shape of the image by the cylinder a very delicate test of the direction of the cylinder, but we can not use it until we have the two images to compare, when, by a slight twisting of the cylinder from its proper direction, it will be shown that the two eyes open can at once detect the change in shape of the images.

DR. C. F. CLARK, Columbus, Ohio—Dr. Hubbell spoke of pressure affecting the amount of astigmatism. My dressing for cataract cases has always consisted of gauze covered by cotton with strips of isinglass plaster and the Ring mask. The question of section is of great importance, and in my paper I have emphasized the point that we do not make our section to prevent astigmatism, but to avoid prolapse of the iris, which is more important. I have supposed that the nearer I approached the periphery, at the summit of the section, the greater the danger of prolapse, and I have adopted the plan of turning my knife forward when within 2 mm. of the superior border, so as to come out in a line perpendicular to the corneal surface.

DR. ANDREW TIMBERMAN, Columbus, Ohio—I have been very much interested in the position taken by the members of this Section on the question of the surgical treatment of high myopia, and rather surprised by the advice Dr. Risley gave us a few moments ago. If I had a case of progressive myopia that was doing badly in spite of my efforts to retard it by the usual means, I should desire the privilege of resorting to surgical procedures; if one or both of my own eyes were so affected, or the myopia so high that correcting lenses gave only very imperfect vision with troublesome asthenopia, I should want the operation done, and would be quite willing, in the light shed by a review of von Hippel's 114 cases, to take in exchange the probabilities of such a course for those of

¹ JOURNAL, November 4, p. 1128.

non-operative treatment. I think experience is teaching us that these eyes are in no greater danger than are those not so treated. If we take one thousand highly myopic eyes, just as many accidents may attend them as the same number operated on, provided the operations are done skillfully and with due regard to the proper technic.

If the eye shows irritation, a few days after discission has been made, and tension is increased, the lenticular masses should be removed, for they act as foreign bodies, and if large enough, hinder drainage from the anterior chamber. Their removal is therefore the proper thing to prevent simple glaucoma. The increase in visual acuity is due not alone to the increased size of the retinal images, but as well to the fact that these eyes, being amblyopic, have not developed their function, and with no lenses whatever they will become very much more useful. I saw Prof. v. Hippel operate on not a few cases, and never saw him do any iridectomy as part of the operation. One thing is determined, that the degree of myopia is not the crucial indication for the operation. The question is not merely one of sixteen or even twenty diopters of myopia, but rather whether such patients have progressive myopia, with troublesome asthenopia, and, even when glasses are worn, very poor vision.

DR. H. V. WÜRDEMAN, Milwaukee, Wis.—It is generally recognized that those cases of anisometropia on which experts have worked and failed have occurred in persons mentally exhausted or the subjects of nervous imbalance. The brain cells certainly learn to fuse images of different sizes, shapes and even different positions in the binocular field, especially in the young. I have within the last few years been observing a child with traumatic cataract, where I needled the lens after the blind eye had diverged. After the operation had been completed and the sight restored, there was diplopia, which was extremely annoying, accompanied by vertigo. I performed advancement and tenotomy, with the result that the more nearly normal eye, having a refraction of +1.25, and hyperopia of the other eye of more than 11 D. gave binocular vision.

We Americans certainly measure the refraction of the eye more closely, and have done more toward the study of it, than those abroad. It is not alone the opticians that are deficient; the fault often lies in the prescriptions themselves. Look at the record of von Hippel's cases; high myopia—any amount of it, but no mention of the astigmatism that certainly must have been present in many of those cases. As regards the removal of the lens for high myopia, it must be rare. The best results are obtained by removal of the cortex shortly after the discission. It is not necessary to do an iridectomy, and all those who have had much experience advise against it. There are many dangers connected with this operation; we may have less experience than the operators abroad yet we must consider that of those cases reported they have had 2.2 per cent. of loss by infection and 3.3 per cent. by detachment; but it is true that in cases of high myopia, 12 D. or more, there is nevertheless a loss of about 5 per cent. by detachment.

Therapeutics.

Treatment of Influenza.

Such an authority as Dr. J. F. Goodhart says, in Clifford Allbutt's "System of Medicine," that there is no specific yet at hand for this disease. This is quite certain from the number of drugs that have been regarded as almost infallible by one observer and another. All are agreed, however, that mildness of attack and speedy recovery are best insured by taking at once to bed, and that it is the worst folly to struggle on with work and to attempt to fight the disease—a plan that, although some came through successfully, was nevertheless the cause of the loss of many lives.

To go to bed, to take plenty of light liquid nourishment and some liquor ammoniæ acetatis every few hours, was sufficient in most cases to induce a quick recovery. Other remedies largely in request were salicylate of soda in ten-grain doses every three or four hours, antipyrin, alone or combined with the former, phenacetin and quinin. Upon a review of the whole epidemic, there appears in these drugs nothing of a specific action and in the control that these drugs have over the temperature they were productive of relief, and made for the return of health. For the rest it is necessary to combat symptoms as may seem best: the cough perhaps most readily with opium in some form; the aches and pains perhaps in a similar manner; and for the lasting after-effects some of the many good nerve tonics,

and the judicious use of alcohol, have been upon the whole the most successful.

We freely agree with Dr. Goodhart that there is no specific for influenza; there can be found throughout the extensive literature on the subject various prescriptions and valuable suggestions for treating the malady, cited by eminent authorities, to some of which the reader's attention is called.

Heming believes that salipyrin is the best remedy, and suggests the following formula:

R. Salipyrin 3iss
Glycerin 3iiss
Syrupi, rub. idæi..... 3i
Aquæ dest..... 3iss

M. Sig. Shake well, and give a tablespoonful every fifteen or thirty minutes.

The catarrhal element of influenza is very constant, says J. E. Atkinson, in the "American Text-Book of Applied Therapeutics," and he adds: catarrh of the nasal, buccal, pharyngeal, and laryngeal mucous membranes in most cases requires no special attention. The supraorbital pain so often resulting from catarrh extending to the frontal sinus, it is said, may promptly be relieved by pencilling the nasal mucous membrane with a 5 or a 10 per cent. solution of cocain. For actual catarrhal pharyngitis, gargles, sprays, and washes containing borax, boric acid, potassium chlorate, etc., are more useful; for example:

R. Acidi carbolici..... gr. xii
Sodii boratis..... 3ii
Sodii bicarbonatis..... 3i
Glycerini 3ss
Aquæ rosæ, q.s., ad..... 3viii

M. Sig. Use as a gargle, spray, or wash.

The bronchial catarrh—which, however, may be absent—demands simple treatment medicinally. As a rule, cough-syrups are inadvisable, as they tend to nauseate and to increase anorexia. A simple syrup that may prove useful is the following:

R. Morphine sulphatis..... gr. ss
Syrupi scillæ..... 3ii
Syrupi lactucarii..... 3ss
Aquæ 3vi

M. Sig. A teaspoonful every second, third, or fourth hour.

If nausea be present and cough troublesome, but the bronchitis not severe, the following combination is often effective.

R. Morphine sulphatis..... gr. ss
Acidi hydrocyanici dil..... m. viii
Spts. chloroformi..... 3iss
Aquæ menthæ virid. ad..... 3iss

M. Sig. A teaspoonful every third or fourth hour.

When bronchitis is pronounced, more stimulating agents will be required. Ammonium chlorid in varying combination will act with much advantage, thus:

R. Ammonii chloridi..... 3i
Mist. glycyrrhizæ comp..... 3vi

M. Sig. A tablespoonful every third or fourth hour.

Counterirritation should always be practiced. Sinapisms applied over many areas are useful, but the best results are afforded by turpentin, applied as stupes, or warm on flannel. Blistering can hardly be required. In most cases of influenza the bronchitis is mild and does not involve the smallest bronchial tubes.

As the symptoms of influenza subside and the patient passes into convalescence, very deep depression and prostration of both body and mind, often persist for a long time. Vigorous tonic treatment, medicinal, hygienic, and moral, will then be required. Protracted abstention from business and a change of scene may be necessary, and complete restitution is often long deferred.

Wood and Fitz recommend the following to reduce the fever and bring about free perspiration:

R. Antipyrin gr. xv
Pilocarpinæ hydrochlor..... gr. ss
Tinct. aconiti..... gtt. viii
Aquæ 3iss

M. Sig. One tablespoonful followed by a general hot bath or a foot-bath of ten minutes' duration, the patient being covered warmly in the bed; one dessertspoonful of hot toddy, repeated in