A small decrease of vision always accompanies the lessened accommodation. This condition is presumably responsible for a good deal of the lack of concentration and inability to do good work during study hours at home in preparing home lessons. Such an artificially produced accommodation fatigue of a child may be compared to the easily demonstrated tiring of adult eyes after a busy day. These tests are especially hard to perform, because the child soon lacks interest and then does not make the maximum effort required. The best method seems to be to take

a very small number of children and train them sufficiently to observe slight changes of visual acuity. If a series of tests made in the evening show a decrease, control examinations the following morning are necessary. My own observations have proved that my accuracy of observation was influenced often by mental conditions. If the mind is dulled by loss of sleep, nervous fatigue, etc., the test becomes proportionately more difficult. Brain fatigue more often caused a decrease of accommodation than physical exercise.

SOME OBSERVATIONS ON ASTIGMATISM.

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Remarks on the terminology of astigmatism especially direct and inverse, and on the frequency of the latter, with discussion of practical points in dealing with astigmatism. With three charts. Read before the American Academy of Ophthalmology and Oto-Laryngology, August 6th, 1918.

Astigmatism has generally been divided into direct, or astigmatism with the rule (meridian of greatest curvature vertical or nearly so), inverse, or astigmatism against the rule (meridian of greatest curvature horizontal or nearly so), and oblique astigmatism (meridian of greatest curvature in the vicinity of 45° or 135°). Some writers omit the third subdivision and classify these oblique astigmatisms with the first group. As we¹ have recently pointed out, this classification is purely arbitrary, as these cases might with equal reason be classified with astigmatism against the rule.

It is singular that an exact terminology has not been adopted for this most exact subdivision of ophthalmic science. One has only to peruse the chapters on refraction in our text books to learn that each writer has felt at liberty to make his own definitions, which are generally characterized by a vagueness incompatible with scientific precision. We note that even Jackson², whose careful study of changes in astigmatism is so illuminating, speaks of direct and inverse astigmatism with

meridians of greatest curvature "approximately" vertical and horizontal.

In order to eliminate any uncertainty in the future as to what are the boundary lines of the three groups, we propose the following definitions:

Astigmatism with the rule, or direct astigmatism, shall include all cases with meridian of greatest curvature at any point on the arc from 46° to 134° .

Astigmatism against the rule, or inverse astigmatism, shall include all cases with meridian of greatest curvature at any point on the arc from 0 to 44° and from 136° to 180° .

Oblique astigmatism shall include all cases of astigmatism with meridian of greatest curvature exactly at 135° and 45° .

It has been argued that there is no necessity for any subdivision, for the reason that practically every eye possessing an astigmatic error should wear a cylindrical correction and that it is immaterial whether the meridian of greatest curvature is in the vicinity of 90° or 180° . Theoretically, this contention has merit. But we are convinced that it is useful, on clinical

grounds alone, to differentiate at least between direct and inverse astigmatism, for the reason that the latter presents certain features of special interest and importance.

Our study indicates that inverse astigmatism is more frequent than is generally surmised (in 1024 eyes with regular astigmatism we found 283, or 27.7%, inverse). Furthermore, as Theobald³ has pointed out, an eye with this type of error is much more capable of "hiding it away" than is an eye with direct astigmatism. This observation accords with our own experience. We are convinced that prior to our systematic use of Lancaster's astigmatic charts many examples of low inverse astigmatism eluded us.

In our series, too, we determined by neutralization of spectacles prescribed by ophthalmologists who had preceded us that more than half of the men had failed to incorporate a cylinder to correct an inverse astigmatism. Glasses prescribed by refracting opticians only very rarely indicated any appreciation of the existence of this type of error. Low inverse astigmatism gives rise to especially annoying symptoms, such as headaches, blepharitis, congestion of the globe, etc. It is less well borne by the eye than an equal degree of perpendicular astigmatism.

One of the principal reasons for the greater degree of asthenopia in eyes with inverse astigmatism is the greater interference with the legibility of ordinary printed type. In direct astigmatism the vertical components of letters are distinct, whereas the opposite is the case in inverse astigmatism. Letters with vertical components distinct are more easily recognized than those with horizontal components distinct. One has only to render oneself artificially astigmatic with the rule and then artificially astigmatic against the rule (using the same cylinder) to appreciate the difference in distinctness of the same line of letters. This difference can also be beautifully demonstrated by the camera. In the illustration, the upper group of letters was photographed with an ordinary lens, the second group with a lens rendered

astigmatic with the rule, and the third group with a lens rendered astigmatic against the rule (using the same cylinder). No one will fail to appreciate the lessened legibility of the third group. See Fig. 1.

It is probably an accurate statement of fact that one finds frequently that for which one is on the lookout. This is exemplified in the search for astigmatism, and particularly for inverse astigmatism. That we all possess some amount of astigmatism is a truism; whether it be corneal or lenticular is beside the point. Having detected a small amount of astigmatism against the rule, it does not follow that it should be corrected in all instances. In the treatment of this condition the exercise of judgment is as necessary as in all refractive work.

In the correction of refractive errors there are two things to be subserved, viz., improvement of vision and the increased comfort of the patient. If clarity of vision be gained without comfort, or comfort obtained with no improvement in vision, the result has fallen short of the ideal. The average patient will greatly prefer a correction which yields fairly good vision with perfect comfort to that which gives the most acute vision with an aggravation of his discomfort. And occasionally this is just the effect of incorporating a cylinder in the correction. We feel, therefore, that for some patients, especially elderly ones, who for years have been completely comfortable with spheres, it is ill advised to prescribe an astigmatic correction which, theoretically, is indicated. The confusion and discomfort incident to the new order of things offset any increase in visual acuity. Many of us are creatures of habits, and even of bad habits.

On the other hand, when it is definitely demonstrated that both vision and comfort are increased by an astigmatic correction, it is incumbent upon us to determine with all possible accuracy the strength and axis of the cylinder. And this may necessitate the use of cycloplegics in certain individuals above the age when such drugs are usually used. We believe this to be

good practice. We do not believe that a drug like homatropin ever produces glaucoma. It may precipitate an attack, but does not cause the disease. It goes without saying that a careful ex-

der cycloplegia when the precycloplegic test has given unsatisfactory or conflicting results. It might appear superfluous to labor this point were it not for the fact that a large number of

Fig. 1. Test letters photographed: The upper set with spherical lens giving images like those of the normal eye. The second set through cylindric lens imitating direct astigmatism. The bottom set thru cylindric lens imitating inverse astigmatism.

amination of the fundus, tension and field should precede the use of the cycloplegic in these cases. Hence the presbyopic patient need not be deprived of the advantages of a test un-

prominent oculists are unalterably opposed to the use of cycloplegics in adults of whatever age.

The advice of Clarke⁴, that the full amount of astigmatism should be cor-

rected, cannot be followed in all cases with comfort to the patient. In numerous instances the postcycloplegic test reveals the fact that the patient is either made uncomfortable with the full cylinder or that the visual acuity is reduced. In either event a glass of less cylindric strength must be given. For instance, a plus 1.5 cyl. of a total of 2.5 may be all a patient will accept at the first test. Some time later plus 2 is accepted, and finally the full cylindrical correction is worn with comfort. It is not to be inferred that the astigmatism in such cases has changed. These facts have recently been emphasized by Col. Elliot⁵.

One must be careful not to overcorrect an astigmatic error even in the slightest degree. It is better to err in the opposite direction. Wipper⁶ has recently stated that a patient should be left with a quarter diopter of astigmatism with the rule uncorrected, as this is the normal condition and even essential for comfortable, if not perfect, vision.

Always a difficult problem is the management of cases of mixed astigmatism in which there is accommodative cramp. It is very disconcerting to prescribe a glass on the basis of a cycloplegic measurement, only to find that the patient complains bitterly of poor distant vision. Various measures, such as prolonged atropinization, rest of the eyes, change of occupation, sedatives, etc., often do not suffice to overcome the exalted tone of the ciliary muscle. It has seemed wise in some cases of this kind to yield to the demands of the patient for good distance acuity, by increasing the strength of the minus spherical element. We have not had cause to regret this departure from scientific accuracy.

Not rarely do we encounter cases in which one eye shows a low regular astigmatism, whereas the other eye presents a high degree. The cause for this discrepancy is often obscure. Without doubt a number of unilateral cases of high astigmatism are the result of trauma occurring at birth.

The following is an illustrative case:

In 1912 Baby, L. O., was seen by one of us four days after birth. The obstetrician stated that one blade of the forceps had pressed firmly over the child's left eye. The cornea was entirely opaque, but there were no inflammatory signs. Under dionin and hot applications, the cornea cleared.

A few days ago, this little girl, now six years old, was brought to us because the mother noticed that the child in looking at picture books had a tendency to close the left eye. Right vision 6/5. Left vision 6/40. The ophthalmometer showed: R. As. 1 mc, 90; L. As. 6 mc, 90. Both corneas were perfectly regular.

Oblique illumination showed the presence of three vertical striae situated in the deeper layers of the cornea, one coinciding with the inner pupillary margin, the second with the outer pupillary margin, the third midway between the latter and the outer limbus. A skiascopic examination disclosed a regular astigmatism plus 4.5 D with meridian of greatest curvature at 90°. With plus 4, cyl. axis 90°. V. 6/10.

Every one possesses a small amount of irregular astigmatism which is, of course, not perfectly correctable by any cylindrical lens. Whenever there is a deformation of the cornea from injury or inflammation, or when the lamellae of the lens are irregularly disposed or swollen, as in incipient cataract, there is bound to be more or less irregular astigmatism which may or may not be associated with the regular type.

In the presence of irregular astigmatism, whether of corneal or lenticular origin, it is thoroly worth while to determine with the greatest care the cylindrical or sphero-cylindrical combination which yields the highest vision. When the irregular astigmatism is a more or less fixed quantity, as, for example, in an eye with a cornea deformed by a long past keratitis, or injury, a painstaking correction with sphero-cylinders will often be highly acceptable to the patient, who is grateful for the heightened acuity thus

secured. But every case is a law unto itself; not rarely a simple sphere, which yields less vision, is preferred to any combination.

An eye with an incipient cataract which has previously rejected all cylinders, may often be made to see very well with a sphero-cylindrical combina-

tion. But here again it is often a case of "Love's labor lost"—the combination is soon found uncomfortable or visually unsatisfactory. We presume that the explanation lies in the fact that the irregular lenticular astigmatism is constantly changing with the progress of opacification.

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RECONSTRUCTION AND RE-EDUCATION OF DISABLED SOLDIERS AND SAILORS.

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Number of different disabling injuries and what is being done for them in this and other countries. Read before the American Academy of Ophthalmology and Oto-Laryngology, August 5th, 1918.

We all know what happened to the soldier and sailor disabled in our former wars. After a few brief weeks of hero worship, marked, perhaps, by a kindly tolerance of his oft-told tales of adventure in the army and on the battlefield, he was given a pension, and in some old soldiers' home or as a dependent upon the semi-charity of neighbors or relatives, eked out a half-forgotten existence, a bore to himself and useless to his country. It is true that a few of these returned invalids, in spite of their handicaps, resumed their former occupations or adopted some new industrial activity, but their number was so small as to be almost negligible.

As a matter of fact, the obstacles that lie in the way of a resumption of industry after the combatant has passed weary months in the field and in various hospitals, are to the sick or wounded man almost insurmountable. Unless prompt and continuous help is given, he lapses into a state of discouragement from which it is difficult to arouse him.

It has long been recognized that to be most effectual this mental and moral assistance, this "cheer up," this achievement of victory over wounds should begin at the earliest possible moment. It should be prearranged and definitely organized. All the belligerent countries have attacked the problem from this viewpoint and by conducting, chiefly through army nurses and medical officers, a campaign of education, early teaching the disabled man that his condition is not as hopeless as he probably thinks it is; and that the Surgeon General and other governmental agencies will see to it that his disablement will be reduced to the minimum, that he will be refitted for industry and that his family and he will be supported while he is undergoing reconstruction. He will be further assured that his war risk insurance compensation for disability will not be reduced as a result of his increased powers through reconstruction. Finally, a desirable job will be found that will enable him to become an independent, wage-earning