child more resistant to the toxins absorbed from the local focus.

4. In cases that remain clear after a tonsillectomy and adenoidectomy, the tonsils and adenoids, by producing an intumescence of the soft parts above, have been the principal factors creating obstruction to sinus drainage.

5 and 6. Given hyperplasia of the middle turbinate and intrasinus tissues, which is constant in these cases, many constitutional toxemias will produce an intense local intumescence with obstruction to sinus drainage. The toxemia most frequently associated originates by absorption from the intestinal tract, and may be controlled by a proper regulation of the diet. This eliminates one element which may produce obstruction to sinus drainage, but cannot *cure* the phlyctenular tendency because the toxemia is only a contributing element.

7. The tendency usually disappears

at adolescence, so far as eye symptoms are concerned, because the development and widening of the nasal chambers has relieved the obstruction to sinus drainage.

CONCLUSION.

I wish to state that by following the procedure outlined herewith, we have practically eradicated the recurrence of these attacks in an orphanage caring for 1,300 children, to which I have been ophthalmologist for several years, the cases presenting usually being new, and especially following an epidemic in the institution of one of the acute infectious diseases.

I am aware that this course of reasoning may be considered heretical by some, but if the members of the section will study these cases along the lines I have indicated, in conjunction with a competent rhinologist, they will find that the same conclusions must inevitably be reached.

PERSPECTIVE FOR AVIATORS.

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This paper discusses the peculiar conditions under which aviators are compelled to judge of distance, and raises the question whether the tests that have been relied on to determine fitness for the aviation service are sufficient.

Perspective in its origin means to see thru, and in its usual application this term answers the purpose well enough, i. e., when applied to terrestrial objects; but when applied to objects floating in the air above the horizon, the conditions are so radically different, that it largely loses its significance. Hence, in contrast with terrestrial, I shall refer to aerial perspective; altho this term is often used with quite a different significance.

In an article appearing in this journal in the April number (1918), by Isadore Franklin (p. 236), discussing the general subject of perspective and stereoscopic vision, the author enumerates the various faculties brought into play in the ability to judge relative as well as positive distances, as: the in-

terpupillary distance, the sense of the play of the muscles, which he states can be of value only within a short distance, the play of the muscles of accommodation which he considers of the next importance; next he considers the blurring of objects out of focus, i. e., objects proximal to, as well as those beyond the point of fixation; but here again the effect is confined to a relatively short distance. Next he states that the apparent size of objects is of great value, and it is my opinion also, that in what might be called terrestrial perspective, these various functions, etc., are of great importance in judging relative as well as positive distances.

For the purpose of testing aerial perspective in candidates for the air service in the U. S. army, the war depart

ment of this country has adopted a method which I understand had been in use by the German government for this purpose for some time previous to the breaking out of the present hostilities; and upon the use of this instrument must depend all of our reasoning relating to the subject in hand. This instrument is simply an ordinary stereoscope provided with a card upon which has been photographed various objects in silhouette so arranged as to give the examinee, with proper aerial perspective the impression of decidedly varying distances from the observer of the objects on the card.

This effect is produced by placing the identical pictures on the two sides of the card at slightly varying distances from each other; those appearing in the foreground having a slightly shorter distance between them than those appearing farther away. This variation in the distance between the pictures on the two sides of the card may be exceedingly small, however, for it is stated that so small a variation as $1/100$ of a millimeter is sufficient to give perspective effect to one with aerial perspective.

On the card in use by the examiner of candidates for the air service, however, the variation between one set of pictures, and the set nearest is not less than $1/15$ to $1/10$ millimeter, and this produces an effect which is quite decided. The card furnished the examiners contains ten sets representing objects familiar to the Teutonic eye, such as castles, forts, lighthouses, cathedrals, battleships, etc., and over each object is placed a small number for identification. Much ingenuity has been used in the setting in order to deceive one who should depend upon anything but his perspective sense. For example, the largest picture on the card, a sailing vessel with all sails set, and placed at the bottom of the card, consequently in the foreground, is really the farthest in the setting, while the one next nearer is a small warship.

When taking up the work of examining candidates for the air service something over a year ago, the writer at once became much interested in this

particular part of the work, and with the hope of satisfying himself as to just which of the special elements of vision, etc., were the determining factors in aerial perspective, private notes were kept in several hundred cases as to (1) the pupil distances; (2) muscle balance; (3) power of convergence and divergence; (4) the accommodation, and (5) the acuity of vision. These, together with numerous cases with abnormalities of these conditions, have been made in the private office; and it may be stated here that the results of these studies have been to upset nearly all of his preconceived notions.

In reference to the pupil distance, it seemed at first that this must be influential in this perspective. Sometime in December, '17, someone in official position appeared to be thinking along similar lines, for we received notice to record this finding—which question was not included in the questions on the examination chart—tho the writer long before this had become satisfied that it had no influence in this kind of perspective, as quite often one with very narrow p. d. would call off the number on the stereoscopic card rapidly and correctly without error, while another with a wide p. d. and with other facilities well developed would make a bad mess of it.

It did seem, however, that accommodation must play an important part in this faculty, till we took occasion to try the test on those under complete cycloplegia when we found that they used the stereoscope fully as well as they did with the accommodation intact. Of the question of vision, it may be stated, so long as it was sufficient to make out details it has not appeared to effect the ability for proper perspective. The varying size of objects seen against the sky is very deceiving to one whose perspective is not good, and in the use of the stereoscope, as previously remarked, the candidate will be almost sure to place the large sailing vessel well in the foreground, while the candidate with this faculty well developed will seldom make a mistake.

The question of the play of the muscles of convergence, however, is not so easily disposed of. Somewhat early in my experience in these examinations, it seemed to me that at least the possession of convergence with somewhere near the standard relation of abduction to adduction, usually reckoned as one to three, must be necessary to be able to qualify in the examination in this test.

Our regulations provided that in case the musclebalance test shows exophoria or esophoria of more than two prism diopters, the relation of the convergence to divergence must equal three to one, in order to qualify. However, after going over several hundreds of these records, it seems that my conclusions will hardly stand.

In giving the details of some of these cases in regard to the muscle relationship which were selected out of many, the numbers must be understood to represent prism diopters of convergence and divergence, abbreviated to ad. and ab. It seems hardly necessary to give the ages of the individuals, as they were mostly between eighteen and thirty, and a careful review does not show that these conditions are especially influenced by age. Among those whose amount of positive and relative convergence was at least fair, and who in spite of this showed quite imperfect perspective, the following have been selected. I will state that these muscle examinations were all carefully made with Reimold's optometer, equipped with the rotary prism, which was used in the examinations.

No. 269: Orthophoric, ab. 8, ad. 19, great difficulty with the stereoscope, disqualified.

No. 552: Orthophoric, ab. 4, ad. 14, no perspective.

No. 785: Orthophoric, ab. 8, ad. 15, perspective bad, disqualified.

No. 173: Orthophoric, ab. 11, ad. 20, disqualified.

No. 126: Orthophoric, ab. 3, ad. 13, disqualified.

No. 548: Orthophoric, ab. 4, ad. 15, disqualified.

No. 179: Orthophoric, ab. 8, ad. 14,

disqualified. This record simply shows that these cases were apparently well supplied with sense of muscle play, tho it was not sufficient for proper aerial perspective; on the other hand, a series of cases with especially bad convergence, both positive and relative, proved well qualified with aerial perspective in the test. For example, No. 484: Orthophoric, had ab. 6, ad. 3, perspective satisfactory. No. 589: Orthophoric, ab. 6, ad. 6, perspective correct. No. 77: Orthophoric, ab. 6, ad. 4, qualified. No. 128: Orthophoric, ab. 8, ad. 8, qualified. No. 274: Orthophoric, ab. 10, ad. 4. (This man, tho qualifying in the perspective test, was disqualified by his 5° of exophoria.) No. 688: Orthophoric, ab. 11, ad. 9, qualified. No. 772: Orthophoric, ab. 12, ad. 8, qualified. No. 193: Orthophoric, ab. 12, ad. 10, qualified.

This shows that so far as our experience goes, in the examination of a large number of prospective aviators, supplemented by a good number of similar cases in the private office, none of the faculties possessed by our eyes and their adnexa appear, singly or collectively to be sufficient in certain cases to provide us with perspective, when we do not have terrestrial conditions to help us. On the other hand, quite a series of cases which appear particularly disqualifying, are able to present a perfect aerial perspective.

Taking into account these considerations, the question arises, upon what then must we depend for our ability to look into space and determine, aside from size, of two or more objects, which is nearer or farther from us. In Dr. Franklin's article, previously referred to, he makes the statement which appears to come very near my own conclusion when he states—"the sense of depth and solidity are neither essentially ocular, nor tactile, nor muscular in their nature; but are a psychic complex, outgrowing principally from three (previously mentioned), senses, but embracing other mental reactions to bodily experience. Or to put it another, briefer way: for our ability to determine perspective in space, the fac-

ulty now under consideration, there must be present some special cerebral center, probably closely associated with centers controlling muscle balance, and possibly some of our other ocular faculties, with which by the aid of binocular single vision we are able to exhibit this particular function.

Now a word in regard to the practical application of these muscle tests. The question has come to mind as to whether the simple examination for exophoria and esophoria in the lateral balance in all cases is sufficient. This precise method having been adopted by those in charge of the examination for the air service presupposes that it is; and yet it seems quite possible that with practically orthophoric conditions as found with the phorometer, it frequently occurs that the convergence is low, and in fact it may have its relation to divergence reversed as oc-

curred in some of the cases reported, and yet be given a passing mark.

The danger of this condition—weak convergence—under the trying conditions in which the eyes of the pilot are placed, Col. W. H. Wilmer has recently stated (*Arch. of Ophthalmol.* v. 47, p. 447). "After the strain of service the tendency of the weak muscle becomes a manifest error, a weak convergence becomes a dynamic divergent squint." From the fact that so many students in the air service die from accident—in many cases it seems an utter impossibility to determine the cause—it appears entirely possible that something of this nature may have occurred, that due to the heavy strain he is suddenly confronted with a double vision, which so confuses him, that he loses control of himself and likewise of the machine, and one more is added to the fatalities of the aviation field.

OPHTHALMOSCOPY WITH RED-FREE LIGHT OF VOGT.

Demonstration of Method with Normal Fundus

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This is a description of the effects of red-free light upon the ophthalmoscopic image and the method of obtaining such light which was presented to the Chicago Ophthalmological Society, November 18th, 1918.

Vogt, now of the University of Basle, published in 1913 his first reports on ophthalmoscopy with the red-free source of illumination. Since then he has done a great deal of research work in the application of this new method, and reported much of interest pertaining to the normal fundus. To this have been added of late some very important diagnostic observations in pathologic fundi.

Our usual illumination for the fundus, the old petroleum lamp—the Welsbach—as well as the electric bulbs, give a more or less yellowish white light dependent on the temperature to which the respective carbons are heated. A nerve head seen with a white light

will seem more pale and even "atrophic" when compared to one seen with a light more rich in yellow. Therefore the term white is a relative one and in a measure a matter of contrast. The yellow of the macula cannot be seen intravitaly with ordinary illumination on account of too little contrast and too much yellow in the light. The rich in red reflection returning from the sclera and choroid also aid in reducing its visibility.

This yellow coloration of the macula, a much disputed point especially studied and investigated by Dimmer and Gullstrand, is now certain, and can be seen in the living eye by the light filtration of Vogt. He says if we are