The bulbar conjunctiva must be undermined to limbus and lifted with forceps while the scleral excision is made; during the iridectomy (basal as in Fig. 8, or complete) an assistant must draw the conjunctival incision down to the sclerectomy defect by means of a U-shaped blunt double hook (Fig. 9).

The small conjunctival incision ought to be closed by a suture: first half of the surgical knot; the suture is removed after 48 hours. In performing the different subconjunctival operations for glaucoma, the blades of the speculum ought to be short in transverse direction; by this means the palpebral fissure is well opened vertically, and thus plenty of space is obtained for the formation of the conjunctival flap or the subconjunctival tunnel.

The subconjunctival tunnel may be made with the keratome itself and completed to the limbus with scissors, or made with scissors only before the keratome incision. Dr. E. Lindgren makes only the short conjunctival incision with scissors; he makes the tunnel itself by a blunt detachment of the conjunctiva down to limbus, *e.g.*, with closed scissors. By this proceeding the vessels are probably less hurt, which must be considered an advantage. Elschnig (*Arch. f. Ophthalm.*, 1921, Vol. CV, p. 599) has shown that the conjunctival cover of the trephine aperture is devoid of vessels. Elschnig also believes that the aqueous has tissue-dissolving qualities, which, in his opinion, is proved by the fact that a loose scleral disc fallen into the anterior chamber during trephining, as a rule has completely disappeared in a relatively short time. The best possible vascularisation of the covering conjunctiva may counteract this hypothetical dissolving quality of the aqueous.

[Dr. HOLTH writes that the title of his paper in the last number of this Journal should have been: "A New Technic in Punch Forceps Sclerectomy for Chronic Glaucoma: Tangential and Extralimbal.—Iridencleisis Operations resumed 1915-1919."—ED.]

THE IMPORTANCE OF PSYCHICAL INHIBITION (NEUTRALIZATION) IN BINOCULAR SINGLE VISION

BY

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DR. JAVAL, of Paris, has published evidence of the existence of neutralization of part of the retinal image of a squinting eye in order to avoid diplopia. It has also been shown that diplopia is common in the early stage of the development of a squint. This diplopia is caused by the projection of the retinal images of an object to non-corresponding parts of the two retinae. In another series of experiments Javal has shown that diplopia does not occur even when the sizes of the two retinal images are very different. This question had been discussed in former times and was con-

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sidered to be a neutralization phenomenon. This explanation is not correct, and reference should be made to the experiments of Helmholtz, Hering and Parinaud.*

The following experiment shows that the neutralization of Javal is a *psychical inhibition* of one part of the retinal image of one eye made in the interest of the exact recognition of objects. If we hold a finger before one eye, after a few moments the finger seems to become transparent and objects can be seen through it. Previous observers of this phenomenon have failed to give a satisfactory explanation of it. If, however, we carry the observation a little further we get a clue to the correct explanation. If we observe, for example, a tree through the apparently transparent finger and then raise the finger so that it partly covers the sky the part of the finger covering the sky no longer appears transparent, but only the part that covers the tree. Similarly, if we observe a sketch on white paper the finger will appear transparent only on those parts of the sketch that delineate the object. We may, therefore, draw the conclusion from these experiments that the apparent transparency of the finger is due to *psychical suppression (inhibition) of one part of the retina of one eye so as to facilitate the recognition of the contours of objects.*

In this connection it is of interest to recall the discussion by Panum and Helmholtz on the relative importance of shadows and contours in the psychical recognition of objects. The contours are undoubtedly the more important.

The phenomena of psychical inhibition in the interests of binocular single vision can also be demonstrated by the aid of the stereoscopic cards for the determination of the central vision of amblyopic eyes devised by me and shown in 1910 by Dr. Weiss, Professor of Biological Physics at the University of Paris to the Paris Academy of Medicine. With these cards the fixation of the sound eye is directed by a black cross, while the defective eye is directed to a black spot of different sizes in the different cards. With normal eyes the cross is seen inside the black spot, but surrounded by a lighter area in the black background. This phenomenon is to be explained on the assumption that part of the retinal image of the eye which sees the spot is suppressed to enable the image of the cross to be clearly recognised. If we further elaborate the experiment by introducing a sketch containing fine contour lines into one part of the cross, then that part of the black spot which surrounds this area of the cross will appear much lighter than the rest.

The same explanation elucidates a stereoscopic experiment which has not been previously understood. If we draw in a

* "Leçons d'Optique Physiologique." M. Tscherning.

stereoscopic card on the right side a black vertical ray and on the left side a black horizontal ray, the stereoscopic fusion of both rays produces a black central square and we see the black ends of both rays, but the parts between the rays, which are joined to the central black square, are much lighter. The explanation is the following. For the recognition of the contours of the left ray the brain produces a suppression of two parts of the right ray, and the same phenomenon occurs for the recognition of the contours of the right ray.

Some, but not all, observers, on looking at a landscape with a red glass before one eye and a blue one before the other, see the lighter portions red and the darker ones blue. To some persons red appears as a light colour and blue as a dark one. To such observers the brain produces inhibition of the dark parts of the retinal image in one eye and of the light parts in the other.

In the use of the microscope, if the unemployed eye is kept open, as is usually recommended, the image of that eye is suppressed by psychical inhibition. *This psychical inhibition is not so harmless as it may appear to be*; for it has been shown that prolonged use of uniocular instruments (microscopes, watchmakers' lenses, etc.) may lead to the suppression of the image of the unemployed eye even when the instrument is not being used. I found great difficulty in the introduction into industrial plants of my binocular magnifiers (demonstrated by Professor Lippman to the Academy of Sciences of Paris, Comptes Rendus, November 23, 1899) on this account as the experts who tested them were often persons who had used uniocular instruments all their lives.

The phenomena of hysterical amblyopia and amaurosis described by Professor Charcot as "Crossed hysterical blindness" are quite analogous to the phenomena of psychical inhibition of the retinal image of one eye in the use of uniocular instruments.

On the assumption that hysteria is a disturbance of function of the cerebral cortex (Charcot) we may conclude that, as a result of the consideration of the phenomena of hysterical uniocular crossed blindness, the higher visual psychical functions (recognition) are localized in the cortex, the right cortical area being associated with the left eye and the left cortical area with the right eye.

It is not possible, at present, to draw any further conclusions on the localization of the higher psychical visual functions.