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THE THIRD DIMENSION IN MONOCULAR VISION

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OWING to the fact that the retina is a cupped surface, every part of which is approximately at the focus of the lens, a fairly clear picture is obtained of all objects in the field surrounding the small part of it falling on the macula from the object which is used for fixation. There is thus formed a series of images at different planes on the retinal cup improving in definition as they approach the point of fixation. The depth of the landscape viewed is then estimated by the comparison of these images in the light of past experience. An experimental proof of this is readily made by viewing the landscape through a series of opaque tubes of increasing calibre. In proportion as the field viewed is made more extensive and more objects are seen in it so does the sense of depth become more evident. In this way animals possessing only monocular vision must be able to see objects in relief and not flat, as the depth of the picture can be estimated almost as well with one eye as with two.

I have often observed with interest the movements of a friend who has lost one eye from glaucoma and, although he has normal visual acuity in the remaining eye, has an extremely limited field of vision. He obviously has no idea of the relative position of objects, and has to grope his way about. This is, of course, due to the limitation of the field and not to the fact that there is only one eye. We are all familiar with the fact that persons who have only one eye can play a good game of tennis, cricket, or billiards, and are excellent game shots, in all of which sports an accurate knowledge of the relative position of objects is essential.

Binocular, or rather stereoscopic, vision can be of little or no use at a distance of more than a few yards in the estimation of the relative position of objects, since the rays of light entering the eyes are then practically parallel. The muscular sense of focussing is also of little use. Parallax movement is of the greatest value in giving the idea of depth. Birds may be noticed to make use of this as they move their heads from side to side and even up and down when looking intently at an object.