Perspective in Relation to X-Ray Interpretation (*A Study in Apperception*). COTTON, W. [A pamphlet. Bristol: 1925.]

This is the text for a lantern demonstration prepared for the recent International Congress of Radiology.

Dr. Cotton's thesis can be put in a very few words. It is that the X-ray image can only be seen in correct perspective from a view-point which is the same distance from the sensitive surface as the focus of the X-ray tube used, and on the same side of it. This is of course quite correct; it is the same proposition that arises in the case of a print made from a negative taken with a lens of which the focal length is short in comparison with the length of the plate or print. Here we must view the picture from a distance equal to the focal length of the taking lens, otherwise the perspective is wrong, for except in the optic axis, images are enlarged in two directions—vertical and horizontal—and the spaces between these images are similarly enlarged; this distortion increases outwards from the optic axis.

It has to be remembered that the laws of geometrical optics, and therefore of perspective, are only valid up to the retina, or probably to the visual cortex. What we do with the images received there is quite another matter, and fallacies of interpretation arise. Dr. Cotton deals with certain of the distortions. Experience shows the great importance of *attention* in visual judgments, and anything which makes attention easier tends to become more prominent. What Dr. Cotton calls by the name of "the visual prepotence of the opaque" is only the tendency to attach undue importance to a sharply defined, dense area as against a more diffused image of varying density.

If we look at a print from a negative from a distance equal to the focal length of the taking lens, we experience a sense of what is best termed a "plastic" effect, though some have gone so far as to call this a stereoscopic relief, which of course it is not. Similarly we may look at our X-ray picture through a lens of the focal length equal to the distance between the X-ray bulb and the sensitive surface when the exposure was made, when we shall again get correct perspective. Or we may do as suggested by Dr. Cotton—reduce the size of the picture and the viewing distance in the same proportion till we get a convenient distance to view the picture.

Dr. Cotton speaks of "conversion of relief." This cannot be obtained from a single two-dimensional picture except in the well-known case of simple geometrical diagrams. It is not possible to "convert" the relief in pictures of natural objects.

It is unnecessary to point out that the two successive exposures of a long bone for use in a stereoscope must be by a shift at right angles to the bone, and not parallel to it. As a matter of experiment, with an ordinary stereoscopic camera and natural objects with horizontal and vertical lines, it will be found that although the usual horizontal shift gives the greatest relief, any shift, even vertical, will give some degree of relief, which is certainly greater than the "plastic" effect referred to above. R. J. S. S.

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