PHOTOGRAPHIC PERSPECTIVE.*

CHIEFLY IN REPLY TO MESSRS. EMERSON AND GOODALL.

BY W. E. DEBENHAM.

UNDER the title of "Notes on Perspective Drawing and Vision," Dr. P. H. Emerson and Mr. T. F. Goodall have just published a series of "propositions, experiments, proofs, and deductions," by which they claim to show that, for "scientific reasons," the accepted rules of monocular perspective are likely to mislead, and to prove the fallacy of photographic and all mechanical methods of measurement.

When it is attempted to be shown that accepted rules are wrong for "scientific reasons," we have a right to ask that the proofs by which it is claimed that the overthrow of these rules is accomplished shall be of as exact and definite a character as the cirumstances permit. I think it may be shown that the so-called proofs submitted are of so loose and indefinite a character as not to constitute proofs at all.

The first part of Proposition A sets out with a statement—which they do not support by any anatomical reasons—that objects seen below (which are here assumed to be foreground objects) are seen on a smaller scale than those which are above, and are assumed to be distant. That is (say the authors), "a perspective drawing surprises us by making the foreground objects look larger in proportion to the distance." It is added that we see a larger arc with the lower half of the eye than with the upper.

The second proposition, as to width of included angle, has nothing to do with the first, as to the relative sizes of upper to lower objects, and it is confusing to have the two placed in one proposition. The second one may, however, be disposed of at once by the fact that it has no bearing on perspective, or, generally speaking, even upon the amount of field included in a photographic view. The angle of view seen by the eye is considerably in excess of 45°, both above and below a horizontal axial line. I mention this angle because it represents the view on a photographic plate which is twice the height of the focal length of lens. It is evident that so long as the boundary of the field of vision is greater than that included on the photographic plate, any greater extension of the boundary in one or other direction has nothing to do with the photographic representation. What occurs within the limits of the photographic view is not affected in position by a variation in the limit of vision outside the area.

The "proof" is said to be "completed when we stand with our legs apart, and, standing with our back to the landscape, bend down and look between our legs. Here the fields are inverted, and consequently the distance appears small and far off," &c.

The effect on the disposition of the foreground obtained by choosing a lower point of sight, as by lowering the camera, is well known, and this, together with the confusion arising from seeing things in an unusual position, and perhaps from the rush of blood to the head, seems to afford a more rational explanation of real or fancied differences of aspect than the assumption of different proportions being rendered by the upper and lower halves of the retina.

Proposition B, assuming Proposition A to be established, attributes the result to the naturally selective action of the retinal nerves, and suggests that special functions have been developed by natural selection for the purpose of drawing distant objects nearer. Further on, in Proof 3, we gather that the amount of difference of size, as seen at an angle of 26° 26′ above and below the axial line respectively, is estimated at one-sixteenth of the total. Objects at these distances from the axis are considerably removed from the region of really distinct vision, and it is only objects much nearer to the axis that can be minutely examined, and, consequently, if any difference of scale were proved or admitted, the proportionate difference at such smaller angle would be much less than that at the larger one. Taking the estimate, however, at the angle given, the difference between fifteen and sixteen is so little that there are few, if any, occasions where an object distinguishable on the one scale would be noticeably less so on the other. The deduction, "that mathematical perspective gives quite a false impression of what we see when using either one of our eyes, or both," is supported by "proofs" of the same loose and inexact character as those given under Proposition A. The first three deal with a statement that objects having vertical sides appear wider at the top than the bottom. Proof 2 is that which is most easily tried, and, according to this, if we "look at the middle of a doorway or door, it will be felt that the door or doorway is wider at the top than at the bottom." Now, to an observer standing, the middle of an ordinary door is considerably below the height of the eye, and the line of vision will be directed downwards. The top of the door will, therefore, with regard to the axis of the eye, be in a plane in advance of the lower part, and will, consequently, appear to be larger. If the observer is seated at such a height as for the eye to be level with the centre of the door, and then that is looked at so that the line of vision is at a right angle to its surface, the top no longer appears broader than the bottom; at least, it does not to me, or to anyone else with whom I have compared notes.

Proof 3 directs us to cut two slips of paper 8 inches long, one 2 inches wide at each end, and the other slightly tapering, *i.e.*, from 2 inches to 1⅞ inches. It is asserted that if both are held at a distance of 8 inches from the centre of the eye, and looked at directly, the parallel piece will appear to be wider at top than bottom, and the tapering piece, if held with narrow end uppermost, will appear parallel. This is the sort of experiment with which anyone may easily deceive himself. A strip of paper does not readily maintain a strictly vertical position, or remain in one true plane. For the experiment to have any value, the material should be capable of being maintained in one unchanging position, and means—not indicated by the authors—taken for truly fixing its height and the position of the eye. Even then the indistinctness of vision over all but a small area near the axis of the eye is so great that if, as required by the proposition, the direction of the eye is not moved up or down, the extremities of the paper will be so much blurred that a little difference of width could probably not be distinguished at all, but a person having an expectancy of seeing either equality or difference could easily imagine that he did so see it.

According to Proof 4, a penny is to be placed "upright on a table, and a halfpenny eighteen inches behind it, and a little to the right or left of the penny. The eye must look over the penny, and at the halfpenny, so that the penny is a foreground object, and the halfpenny a distant object. If the observer now looks steadily at the halfpenny, at the same time seeing the penny, he will find the impression given is that the halfpenny looks nearly as large as the penny."

* A communication to the London and Provincial Photographic Association.