

## REPLY TO COMMENTS ON THE MULTISCOPE\*

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MR. JOHNSON brings out several points that must be considered in the design of an orthogonal plotting device. He quite properly points out that in Figures 1 and 2 of our original paper,<sup>1</sup> the observer's eye does not occupy the perspective center of the photograph. The photographs should be placed so that the eye occupies the perspective center of each photograph. This is possible in the manufactured version of our instrument when it is used as an orthogonal plotter with photographs taken with a lens having a focal length of  $8\frac{1}{2}$  or 12 inches. If a wide angle lens was used in the original photography, there is a perspective error in all reflecting stereoscopes, as Van Camp has pointed out in his discussion of the Mahan plotter.<sup>2</sup>

The second point commented upon by Mr. Johnson deals with the use of coupled rotary prisms in the orthogonal multiscope. This device is not entirely accurate, as the coupled prisms raise and lower a point on the map surface along a radial line originating half way between the two prisms. If the point on the map surface is equidistant from the two principal points, it will be raised and lowered vertically and a true plot will result. If, however, the point is nearer one principal point, it will move slightly away from that principal point as it is raised and toward it as it is lowered. Complete calculations have not been made, but this source of error does not seem to be significant in mapping areas of low to moderate relief if the central portion of the field is used.

In discussing the use of coupled rotary prisms, two points should be made. First, the use of the prisms does not affect the spatial image in any way, but only the plane surface of the map beneath the device. The stereoscopic image, is formed by lines of sight which are reflected off the first surface of the eye mirrors, and nothing beneath these eye mirrors can influence that image in the slightest.

Second, the rotary prism assembly is an added accessory and is not an integral part of the multiscope. An orthogonal plot may be obtained in a number of other ways such as by the use of the conventional multiplex tracing table or by raising and lowering the multiscope stereoscope in a mechanical manner.

In discussing the multiscope, it is well to remember that it is a combination of various instruments within a single structure. Although it may be used as a mirror stereoscope, a duoscope, or a camera lucida, it is especially designed for use as a plotting stereoscope. This phase, moreover, has two forms.

When used with a single semi-transparent mirror, the instrument produces a non-orthogonal plot, and merely combines the features of the camera lucida with those of the mirror stereoscope in a design permitting unusual flexibility in change of scale. Such a device, as Mr. Johnson suggests, is used principally to fill in detail on the framework of a radial line plot, or on a base map already made. Since a great many people, including foresters, soil conservationists, agriculturalists, geologists, civil engineers, and public officials use aerial photographs principally in this way, the use of the multiscope as a non-orthogonal

\* The two preceding discussions of the multiscope are valuable in limiting the conditions under which the instrument produces a true orthogonal plot.

<sup>1</sup> Spurr, Stephen H. and Brown, C. T., Jr., *The Multiscope: a Simple Stereoscopic Plotter*. PHOTOGRAMMETRIC ENGINEERING 1945, Vol. XI, No. 3, pp. 171-178.

<sup>2</sup> Van Camp, C. P., *Mahan Plotter*. PHOTOGRAMMETRIC ENGINEERING, 1945, Vol. XI, No. 4, pp. 336-339.

plotter was envisaged by its builders as the most important application of the instrument.

When used as an orthogonal plotter, the multiscope has much less flexibility than when it is used as a non-orthogonal plotter. However, it is still as flexible

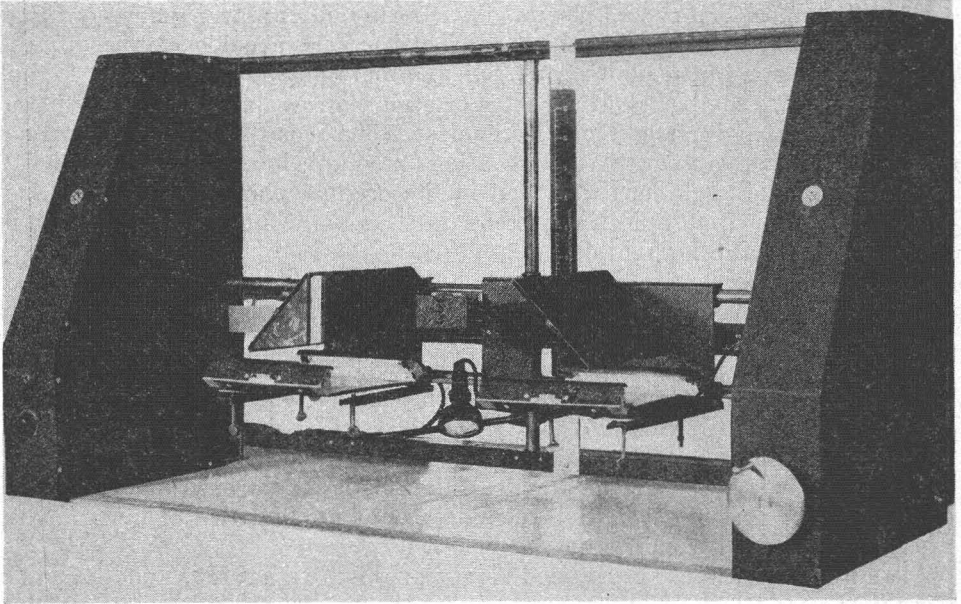


FIG. 1. The multiscope.

as most stereoscopic plotting instruments and a great deal simpler in construction. It avoids certain errors characteristic of other simple plotters and is exceptionally easy to use. While it has theoretical errors in plotting, these errors are only those which are common to all reflecting stereoscopic plotting instruments. Repeated tests have shown that it can be constructed to do accurate mapping work.