USE OF STEREOSCOPE WITH AERIAL PHOTOS IN ELEMENTARY GEOLOGY

CHARLES G. JOHNSON
University of Chicago, Chicago, Illinois

Recently the Department of Geology at the University of Chicago has adopted the study of aerial photographs by means of the stereoscope as an aid to the study of topographic maps in beginning geology classes. Aerial photographs are being employed more and more by the governmental surveys and private companies, and it is well that future geologists become familiar with them early in their careers.

The photos are taken looking vertically downward, with a single lens camera. Contact prints made from the negatives are 7x9 inches or 9x9 inches, and have a scale of approximately 1:20,000 or about three inches to the mile. Consecutive photos overlap about sixty percent, making them well adapted for use under the stereoscope.

The great advantage of viewing the photographs through a stereoscope lies in the fact that the features on the photo are made to appear as a three-dimensional or spacial model. This is helpful to students who are using topographic maps for the first time. By using topographic maps and aerial photos together, he can soon learn the meaning of contours and be able to read them critically.

A method of teaching the significance of contour lines is to introduce an exercise whereby the student makes a contour map from a stereoscopic pair of aerial photographs. Select a pair of photos that show well developed valleys and rounded hillsides with relief not over two hundred feet. Using drafting tape, fasten a clear piece of celluloid on one of the photos over the area that is to be mapped. Mark elevations of various points in ink on the celluloid, not over a half mile apart. Place the two photographs under the stereoscope and adjust them in fusion to suit the eyes. While viewing the photos through the stereoscope, draw in the contours with a wax pencil on the celluloid at their adjudged elevations along the hillsides.

Physiographic forms are well shown on aerial photos, but are much more impressive when viewed through a stereoscope. Such forms as dunes, drumlins, moraines, sinkholes, etc. are illustrated on topographic maps, but the beginning student can gain little or no idea as to how they actually appear in the field from the map alone. This difficulty is easily solved by stereoscopic observation of aerial photographs. Relative sizes of the different features are conveyed to the student through comparison to houses, trees, or other familiar objects present in nearly every photograph.

By the use of topographic maps and aerial photos together many problems in structural geology can be worked out in the laboratory. Where conditions are favorable, outcrops can be seen on the photos and the direction of dip of the beds detected. However, it must be remembered that slopes of hills and beds are in general, greatly exaggerated. Faults are often visible where none would be suspected from a study of the topographic sheet. Through the use of both topographic maps and aerial photos the student becomes aware of the underlying structural control which is responsible for many physiographic features.

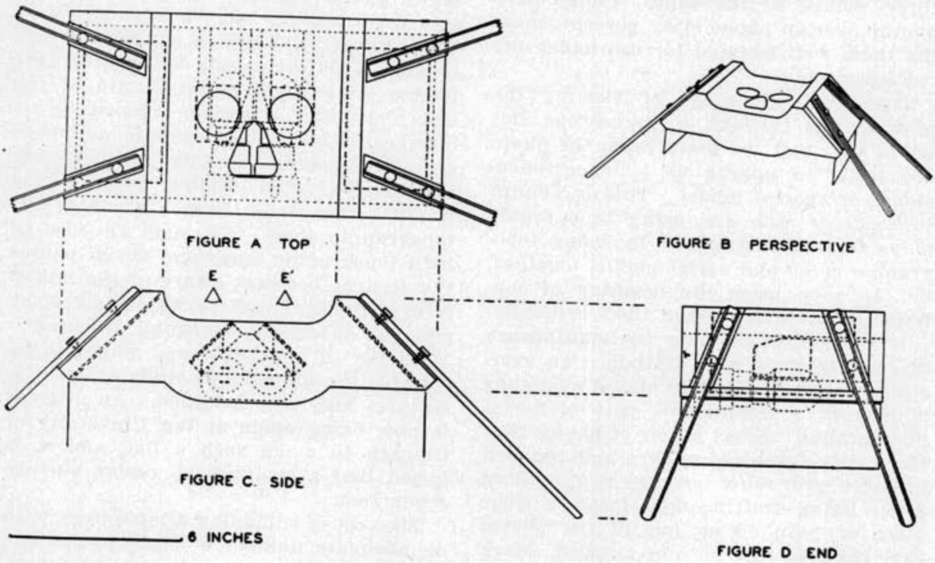
No list of selected aerial photographs suitable for stereoscopic study of geologic features has been compiled. An attempt is now being made at the University of Chicago to make such a list, and it is hoped that a preliminary report may be ready soon.

The cost of supplying a laboratory with an adequate number of stereoscopes and aerial photographs need not be great. Photographs can be purchased from the Department of Agriculture for twenty cents per print when ordered in lots of one hundred or more, or twenty-five cents per print when ordered in smaller quantities. The Department of Agriculture is the only national governmental agency authorized to sell aerial photographs. It publishes and distributes, free of charge, a monthly index map of the United States which shows the extent of aerial photography completed or in the process of completion. This map does not include areas photographed by agencies other than the Department of Agriculture.

Commercial stereoscopes suitable for study of aerial photographs sell for thirty-three dollars and more. However, a simple stereoscope constructed from four small mirrors and other readily available material, costing about a dollar, can be made as follows:

The frame is made of ½ inch lumber screwed together, and mounted on legs of ½x¼x⅛ inch channel iron. Each leg is held by two studs screwed into a ⅛x¾ inch strap-iron strip fastened to the end surfaces of the frame. (See fig. A) Extra holes may be drilled in the legs to make the height adjustable. The top of the frame is covered with sheet tin in which are cut eye holes 1½ inches in diameter on 2½ inch centers, and a triangular hole for the nose. (See fig. A.)

All of the mirrors are inclined 45 degrees as shown in fig. C. The two inner mirrors measure 2x2 inches and are placed with the centers of their reflecting surfaces 2½ inches apart (E-E′, fig. C). To allow room for the nose, a corner is cut from each of the inner mirrors as in fig. D, and from the inside edges of the wooden frame holding them. The two outer mirrors are 4x5 inches and placed with the long dimension horizontal. Their reflecting surfaces are 3½ inches, measured horizontally, from the reflecting surfaces of the inner pair. The tops of the outer mirrors are ¾ of an inch vertically above the tops of the inner mirrors. Each mirror is held in place by small copper cleats. Light is provided by two 110 volt bulbs with C-7 candelabra bases. Each is in a bakelite combination plug having a switch and a shade. The plugs are held in a double wall socket mounted under the two inner mirrors. To shut out extraneous light, tin flaps 7x2¾ inches are hung by small hinges at each end of the stereoscope (fig. C). Dull black enamel is used for the finish.



STEREOSCOPE FOR VIEWING
AERIAL PHOTOGRAPHS