
THE USE OF COLOR SLIDES AS AN AID IN GEOLOGIC TEACHING

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During a year of sabbatical leave from the University of Illinois the writer had the opportunity to take a large number of 35 mm. Kodachrome photographs of geologic and physiographic subjects in the national parks and other interesting places in the United States, Canada and Mexico. Many of these slides have been used during the current school year in teaching courses in general geology, physiography, structural geology and sedimentation. The present paper describes briefly the procedure followed in taking the pictures, mounting the slides and projecting them, as well as some difficulties which may be encountered in obtaining satisfactory pictures, preserving them, and projecting them in daytime classes.

The equipment used by the writer consists of a Contax camera with f. 2.8 tessar lens, a Weston photometer and a Zeiss 135 mm. telephoto lens. The photometer is always used in determining the correct exposure as the latitude of color film is less than that of most black and white film. Most of the slides used in this talk were taken at 1/50 second exposure with stops ranging from f. 4 to f. 8. Strong contrast of light and shadow should be avoided when possible but if a partially shaded subject is to be photographed the light meter reading should be taken on the shaded rather than the lighter part of the subject. In the writer's experience all colors record satisfactorily except the blue violet shade found in such flowers

as the violet and wisteria. This color may photograph nearly white or a very pale reddish violet. Under-exposed pictures may have a purplish cast and late afternoon or early morning shots may show too much red. Color pictures may be taken in complete shade, on cloudy days, or even during rainstorms, but colors in them are generally less brilliant than in pictures taken on bright days. Color photographs may be taken of geologic maps but some difficulty will be found in exactly reproducing some delicate shades often used on such maps. Topographic maps may be satisfactorily copied but better results are obtained with a section of a quadrangle than with a whole map. There was some difficulty in securing even indoor illumination of a large map, and if outdoor illumination is used, care must be exercised to avoid even light shadows. Mineral and rock specimens may be photographed to $\frac{1}{2}$ natural size with a Zeiss proxar lens placed over a telephoto lens and may even be enlarged by the use of a long tube. Color microphotographs may be taken of thin sections with or without crossed nicols or of mounted sand grains, but the writer has not yet had experience with these procedures.

Although finished films are now cut, coated with a colorless varnish and returned in pasteboard mounts the author strongly urges that color slides be permanently mounted in 2 inch by 2 inch

glass slides with an adhesive binding tape as soon as possible, for while the chance of scratching the films is reduced by the varnish finger prints are too easily made on the film surface and are difficult to remove.

Colors do not show up to the best advantage in the presence of outside light filtering around the window shades unless a projector with strong illumination is used. At night a projector with 100 watt illumination is adequate for an audience as large as one hundred people but in the daytime even with heavy shades such a projector is adequate only for a group of about 30. The projector used in this talk is a Spencer with 300 watt bulb equipped with a fan which prevents overheating of the slides. A 750 watt projector made by Spencer is available with fan and will show pictures to 10 or 12 feet dimension before an audience of several hundred even in the daytime in a darkened room. A beaded screen gives a more brilliant

image in a zone about 25° wide on each side of the projector but the image is notably less brilliant when viewed from the front corners of a room. A white wall or screen gives a less brilliant but more uniform image in all parts of the room.

Little is yet known about the permanence of Kodachrome slides. Some of the earliest, taken more than four years ago, are said to have begun to fade, but the dyes used in their manufacture have been changed since that time and it is to be hoped that they will now endure for a longer time. Overheating slides or leaving them exposed to strong light for long intervals will probably hasten their fading.

About 40 Kodachrome slides of various kinds of geologic subjects were projected to demonstrate the advantages of natural color slides over black and white pictures for use in geologic instruction.
