
A DEVICE FOR LABORATORY MEASUREMENT OF DIP DIRECTION OF SMALL-SCALE PLANAR STRUCTURES IN ROCKS

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ABSTRACT

Dip direction of inclined small-scale planar structures, not recognizable until rock specimens are sectioned in the laboratory, can be determined with an easily constructed device. The method is based on a rotating transparent compass suspended above a platform on which the sample is oriented. With at least two vertical cuts through the same structure in the sample, points of equal elevation can be measured. A line connecting these points represents the strike of the structure; therefore, when the sample is positioned so that this line parallels one pair of opposing horizontal support rods, the alternate horizontal rods indicate the azimuth of inclination, which can be read directly from the overlying compass.

INTRODUCTION

An inexpensive device can be constructed easily which will allow the rapid measurement of inclinations of small-scale planar structures in oriented rock samples. The device (fig. 1) has proved to be functional and accurate, well within the tolerances of field orientation-markings. The writers have found that the device is very useful for measuring inclined structures that are not recognizable in samples of known field orientation, until these samples are cut in the laboratory. It was found, in working with large bulk samples of carbonate rocks from the Upper Paleozoic of the Midcontinent, that numerous small-scale structures, which had not been noted previously, became evident only after sectioning requiring measurement in the laboratory.

Examination and measurement of many specimens indicated that these hidden small-scale structures were useful current indicators. In addition, it was possible to substantiate and refine the significance of larger scale cross-bedding measurements that had been recorded by standard field procedures (Griesemer, 1970). It is felt that a broader application of this device could be realized in the recording of small-scale planar structures in fine-grained clastic and metamorphic rocks as well. For simple handling convenience, the most satisfactory sample block size to be used with the device should be no larger than 10 x 10 x 8 inches.

PROCEDURE

The accuracy of any such laboratory procedure can only be as good as the accuracy of the original horizontal and directional field orientations themselves. If small-scale structures are revealed in the laboratory, their attitude can be measured with this device by making at least two intersecting near-vertical cuts (preferably at right angles) which include the structure to be measured.

The device (fig. 1) consists of an adjustable-height, rotating, transparent compass suspended over the sample on four horizontal rods, which meet at right angles beneath the compass center, where they are joined by a wooden block. The outer end of each horizontal rod slips over one of the four vertical guide rods positioned at the corners of the square base platform on which the sample rests. For specimen sizes of 10 x 10 x 8 inches or smaller, the rock platform should be approximately one and a half feet on a side, with an adjustable compass height of at least ten inches. After the sample block has been horizontally oriented with wedges, the strike of the structure can be determined by locating two points of equal elevation on the two vertical cuts.

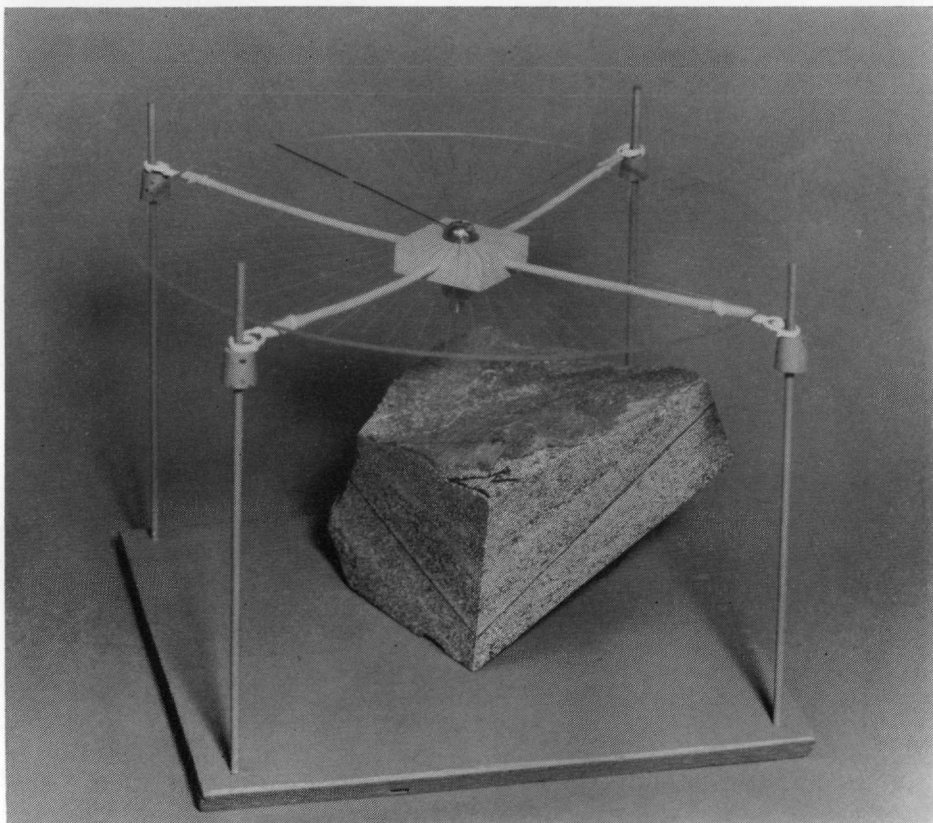


FIGURE 1. Device for measuring dip direction. Rock sample approximately 6x8x5 inches. The black line indicates north on the compass.

With the strike direction marked on the specimen's upper surface, the sample block is positioned beneath the compass so that north on both the compass and on the sample coincide, and the strike line passes beneath the compass center. The base of the device is then adjusted until one of the horizontal support rods parallels the line of strike. The direction of the adjacent support rod, therefore, indicates the true dip direction, which then can be read directly from the compass. The amount of dip can be determined trigonometrically.

When making the initial cuts, an effort should be made to have them reveal at least two points of equal elevation on the structure to be measured, so that a direct strike measurement is possible. However, if the planar structure dips at

such an angle that the initial cuts do not expose points of equal elevation, a third cut will be necessary. The positioning of the third cut can usually be visually determined by observing the attitude of the structure from the previous cuts. If the sample cannot be oriented properly to allow the necessary third cut, a trigonometric or graphic solution may be needed, using apparent dips and directions, to obtain the absolute values.

REFERENCE CITED

- Griesemer, A. D. 1970. Palaeoecology of the Ervine Creek Limestone (Late Pennsylvanian) in the Midcontinent Region. Unpub. Ph.D. Dissert., University of Nebraska. 248 p.
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