A GRAPH FOR DETERMINING ANGLE AND DIRECTION OF PITCH OF LINEATIONS IN THE FIELD

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Fisher[1] has outlined a field method of determining the direction and angle of pitch of lineations on steep-dipping surfaces. Dip and strike of the surface and the angle between the lineation and the strike in the *s*-plane are measured and a graphic solution is made with the aid of a combination stereographic net and protractor.[2] This projection protractor has the advantage of being much smaller than the stereographic net commonly used in a laboratory, but a photographic reproduction of a stereographic net can be made any size desired for inclusion in a field notebook. The ones in use at the Geophysical Laboratory are 50 to 100 mm. in diameter and are made on cut film.

These nets are not backed with white celluloid as suggested by Fisher, because it is convenient to be able to see through them for making measurements on diagrams on opaque paper.

If a lineation clinometer is not available, however, it is possible to use a graph[3] from which the direction and angle of pitch can be determined from dip and strike of the *s*-plane, and the angle that the lineation makes with the strike in the *s*-plane, with no construction at all. Such a graph (Fig. 1) has been constructed from the following formulae:—[4]

(1) $\sin P = \sin A \sin D$

(2) $\tan A' = \tan A \cos D$

where:

P = pitch of lineation

A'[5] = horizontal angle between strikes of *s*-plane and lineation

A = angle between lineation and strike of *s*-plane, measured in *s*

D = dip of plane containing lineation.

[1] Fisher, D. J., Measuring linear structure on steep-dipping surfaces: *Am. Mineral.*, **28,** 204–208 (1943).

[2] Fisher, D. J., A new projection protractor: *Jour. Geol.*, **49,** 292–323 and 419–442 (1941).

[3] Suggested and constructed by Tuttle.

[4] If a graph is not available, these formulae could be used in the field by carrying a condensed (1 page) table of the trigonometric functions (such as Appendix—Lahee, Field Geology, McGraw-Hill).

[5] This angle must be added to, or subtracted from, the strike of the *s*-plane, of course, in order to get the direction of pitch of the lineation.

Using the same example that has been employed to illustrate the other methods,—*s*-plane N. 56° W. 70° NE., with lineation/\strike 69° N.: Locate 70° on the horizontal coördinate and 69° on the vertical. Place a pencil on their intersection and read from the dashed curves 61°+ =pitch of lineation, and 42° from the solid curves. Direction of pitch is, therefore, N. 56° W. minus 42°= N. 14° W.

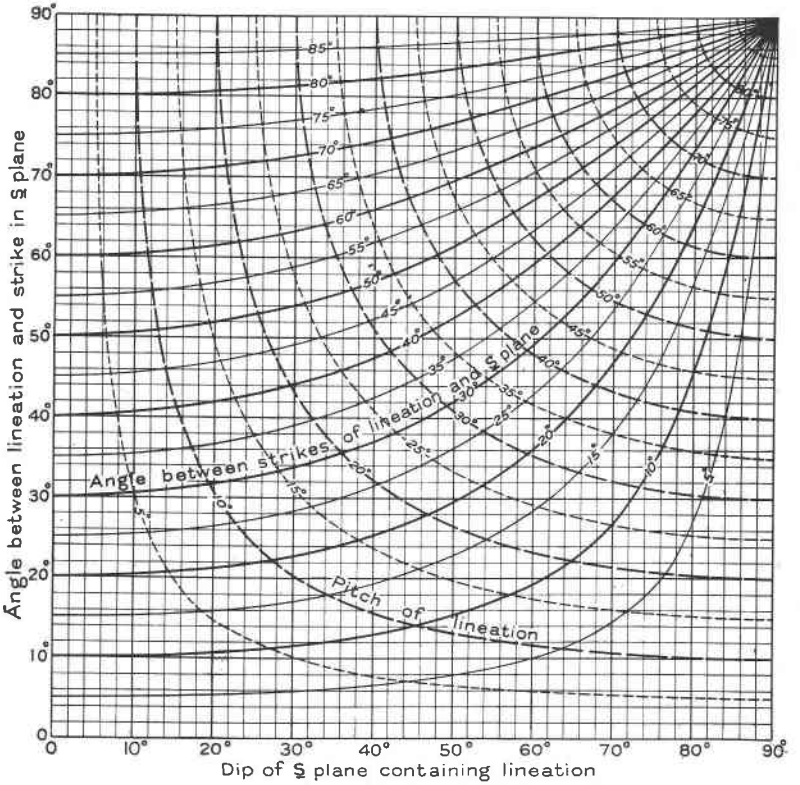

FIG. 1. Set of curves for determining direction and angle of pitch of a lineation from (1) dip and strike of an *s*-plane containing the lineation and (2) angle between strike and lineation in the *s*-plane. Dashed curves give angle of pitch, solid curves give horizontal angle between strike of the *s*-plane and direction of pitch of the lineation.

As pointed out in the description of the "lineation clinometer," when the dip of the *s*-plane is low, direct measurement with a Brunton compass is rapid and accurate enough for all practical purposes. When the *s*-plane and lineation are steep, however, the method using the graph described is much more accurate and takes very little more time.