Geology. — *Measurements on slickensides on planes of stratification in folded regions.* By W. Nieuwenkamp. (Communicated by Prof. L. Rutten.)

In folding the strata in the limbs of an anticline are pushed over each other. The younger strata push forward over the older ones toward the middle, toward the axis of the anticline. The truth of this statement is easily seen by every one who reproduces an anticline by means of a pack of cards. There is no reason why this movement should not in beds of suitable hardness, originate slickensides on the planes of stratification and as it is to be expected at right angles with the axis of the anticline the striae thereupon can furnish us an indication for the pitch of the latter. For when the axis of the fold is horizontal (parallel to the strike) the striae will follow the dip (Fig. A) when however the axis of the fold is inclined (when the fold has pitch) the striae will not follow the dip, deviating from it with an angle that increases with the amount of pitch (Fig. B).

This would enable us to infer the pitch of the axis of folding from the direction of the striae in these slickensides. For if we draw on a plane of stratification (the axis runs parallel to the planes of stratification) a line at right angles with the striae, this line must be parallel to the axis of folding ; so that by taking its inclination and azimuth we get pitch and direction of the latter.
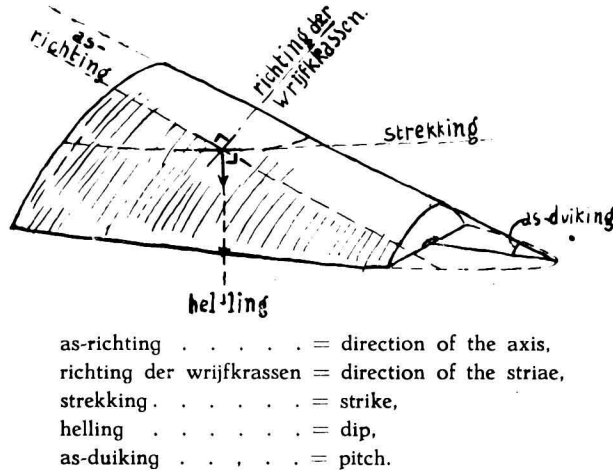
In practice there are of course a number of causes that give to the striae

A

Strekking = as -richting

hellingarichting
der wrijfkrassen
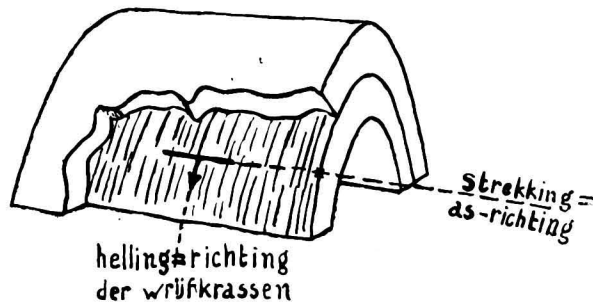
a direction differing from that required by this theory. Irregularities may engender a local deviation of the striae ; a fault just following the plane of

B

as-richting	= direction of the axis,
richting der wrijfkrassen	= direction of the striae,
strekking	= strike,
helling	= dip,
as-duiking . . , . .	= pitch.

stratification renders all our observations worthless for the object we have in view. Still it may be useful in our fieldwerk to have regard to the slickensides on the planes of stratification. An average of a number of observations of one and the same fold that do not differ too much, is surely to be relied upon.

This theory is to some extent verified by the students of geology of Utrecht, who have made in the Ardennes a fair number of observations of slickensides ; when several observations made in different parts of the same fold yielded the same result, this was always in complete accordance with the structural feature of the fold.

Mr. I. SWEMLE who worked out the geological structure of the broad strip of the Upper-Lower and Middle Devonian system between Ourthe and Lomme has on my request paid special regard to the slickensides on the planes of stratification, and has been so kind as to allow me to communicate some of his observations in this paper.

The first observation was made near the station of Jemelle in the sandstone of Co_1. The strata here strike N 65° E, and dip 75° S. The striae on the slickensides deviate eastward from the dip, the angle between the striae and the dip, measured here on four different slickensides, amounts to 9°. Hence a line on a plane of stratification at right angles with the striae has an azimuth of N 63° E. and dips westward at an angle of 9°.

South of Jemelle on the road to Forrières two slickensides have been measured with quite the same results on the southern limb of the same

anticline. The strike of the strata is here N 85° E, with a dip of 30° S. Again the striae deviate east of the direction of the dip at an angle of 30° ; thus giving for the axis an azimuth N 60° E, pitch 14° W.

Five hundred m. to the south of the preceding locality the beds strike N 75° E dip 40° S. The striae again deviate in the same direction at an angle of 17°, thus giving for the azimuth of the axis N 62° E, pitch 11° W.

These three observations all tend to show that the pitch of this anticline is about 11° in a direction S 60° W. This result is in complete agreement with the geological map.