lae and [0001]-axes in grains with lamellae ('A' in figs. 2, 3, 4, 5) is the axis of maximum compression in the deformation which produced the lamellae. It is not the *a*-axis of the movement picture in this deformation, as claimed by Ingerson and Tuttle (1945). The patterns of preferred orientation of lamellae poles are not invariably small-circle girdles (Fairbairn, 1941; Ingerson and Tuttle, 1945; Riley, 1947) but in cases where this is not so, the axis A may be determined statistically as the intersection of the great-circles containing [0001] and the pole of lamellae in individual grains in the rock; in all the fabrics described in the literature, the pole of the lamellae in any grain is closer to the axis A than the [0001]-axis in the same grain (Ingerson and Tuttle, 1945). The orientation of the axis of compression (A) should be most easily determined in rocks showing little or no preferred orientation of the grain lattices, such as pure sedimentary quartzites and sandstones. But even in rocks with a strong preferred orientation of the quartz, such as schists and gneisses, it should be possible to identify the axis A using the above criteria.

By examining numerous specimens of quartzose rocks with deformation lamellae from an area it should be possible to obtain a reliable dynamic picture of the deformation which produced the lamellae. This should have more or less the same significance as the dynamic data obtained from studies of twinning in marble fabrics (e.g. Turner, 1953). For a terrane consisting of deformed crystalline rocks with strong preferred orientations of quartz, the inferred axes of compression will probably reflect only the last stage of the main deformation or some late imprint which has affected the rocks after the main phase of deformation and crystallization. However, for a terrane containing unrecrystallized quartz-rich sediments, the inferred axes of compression may reflect the main phase of deformation which has affected the rocks.

Certain precautions should be observed in the measurement and evaluation of data employed for such a dynamic interpretation:

1. Measurements should be made in two or three sections cut with different orientation from a specimen, to determine the real pattern of preferred orientation of lamellae.
2. The investigator should determine, if possible, that any lamellae found in sedimentary rocks are of post-diagenetic origin, and not relic structures which were present in the clastic grains of the sediment. The consistency of data, assessed by comparing successive samples of data from a single specimen, may indicate whether the lamellae are relics or have originated after the formation of the rock in which they are measured. Other criteria may also be found, such as the continuation of lamellae from a clastic grain in a quartzite into a peripheral region of secondary enlargement (Riley, 1947, p. 463).

Application to data from the Baraboo Quartzite.—The only regional study in which the orientation of deformation lamellae has been investigated is Riley's (1947) excellent study of the Baraboo Quartzite in Wisconsin. Riley made analyses of the orientation of [0001]-axes, deformation lamellae and other microstructures in the quartz grains of a large number of specimens from the Baraboo syncline. His detailed descriptions of the structures indicate that the deformation lamellae are identical with those described in the present work. The poles of deformation lamellae in most of the rocks define two strong

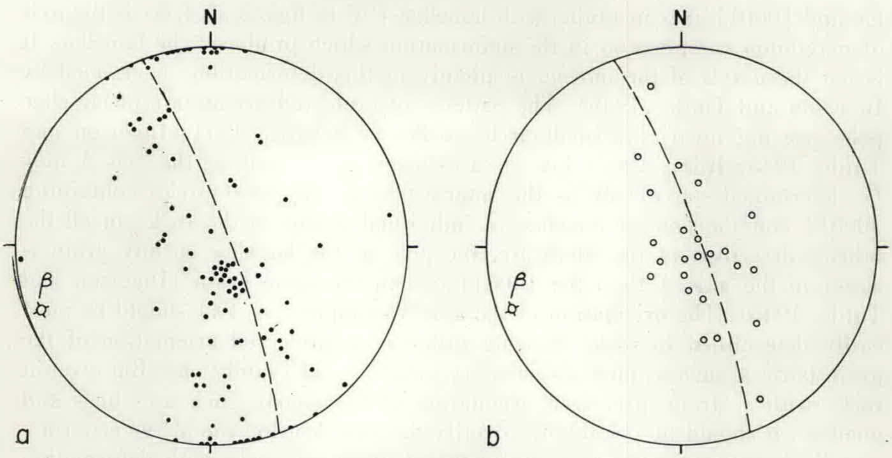

Fig. 8. Data from the Baraboo Quartzite (after Riley, 1947).
a. Poles of planar structures (bedding, shear-surfaces, etc.) in the Baraboo syncline. β represents the regional fold-axis.
b. Compression axes ("*a*-axes" of Riley) deduced from the orientation of deformation lamellae in specimens of the Baraboo Quartzite. In both diagrams the primitive circle is horizontal with north (N) at the top.

maxima but in a number of the specimens they are oriented in a small-circle girdle, similar to those illustrated above (figs., 2b, 3b, 4b, 5b). Riley determined, according to the method suggested by Ingerson and Tuttle (1945), *a*-, *b*- and *c*- fabric axes from the patterns of preferred orientation of lamellae. These axes, however, showed no consistent relationship to the fabric axes determined in the field from megascopic structures such as foliation and folds, nor was there any obvious regional consistency in the orientations of *a*-, *b*- and *c*- axes determined from the patterns of deformation lamellae (Riley, 1947, fig. 14). Riley considered that the fabric axes thus determined might be either a) strain axes of a different deformation from that which produced the megascopic structures, or b) local strain axes of the deformation, independent of the movement along bedding surfaces.

If the patterns of preferred orientation of deformation lamellae are interpreted according to the theory proposed by the present writers, the axes designated "*a*-axes" by Riley (after Ingerson and Tuttle) are no longer to be considered as the directions of slip in planar deformations, but as *axes of compression* during the deformation which produced the lamellae. Figure 8b shows the orientation of these "*a*-axes" (compression axes) reproduced from Riley (1947, fig. 14). These axes lie in a vertical plane with NNW strike and many of the axes plunge steeply. Figure 8a is a π-diagram, also constructed from Riley's data, showing the orientation of the bedding surfaces in the area. The diagram shows a well-developed π-circle about the regional fold-axis which trends ENE. The shear-surfaces, axial plane cleavages and small folds agree in symmetry with this picture. It is evident that the axes of compression, determined from the deformation lamellae, lie in the *ac*-plane of the regional structure and also, therefore, in the deformation plane of the large-scale move-