zontal crystallographic axes of quartz in rocks of the type described above, but it is evident that the crystallographic orientation is highly restricted.

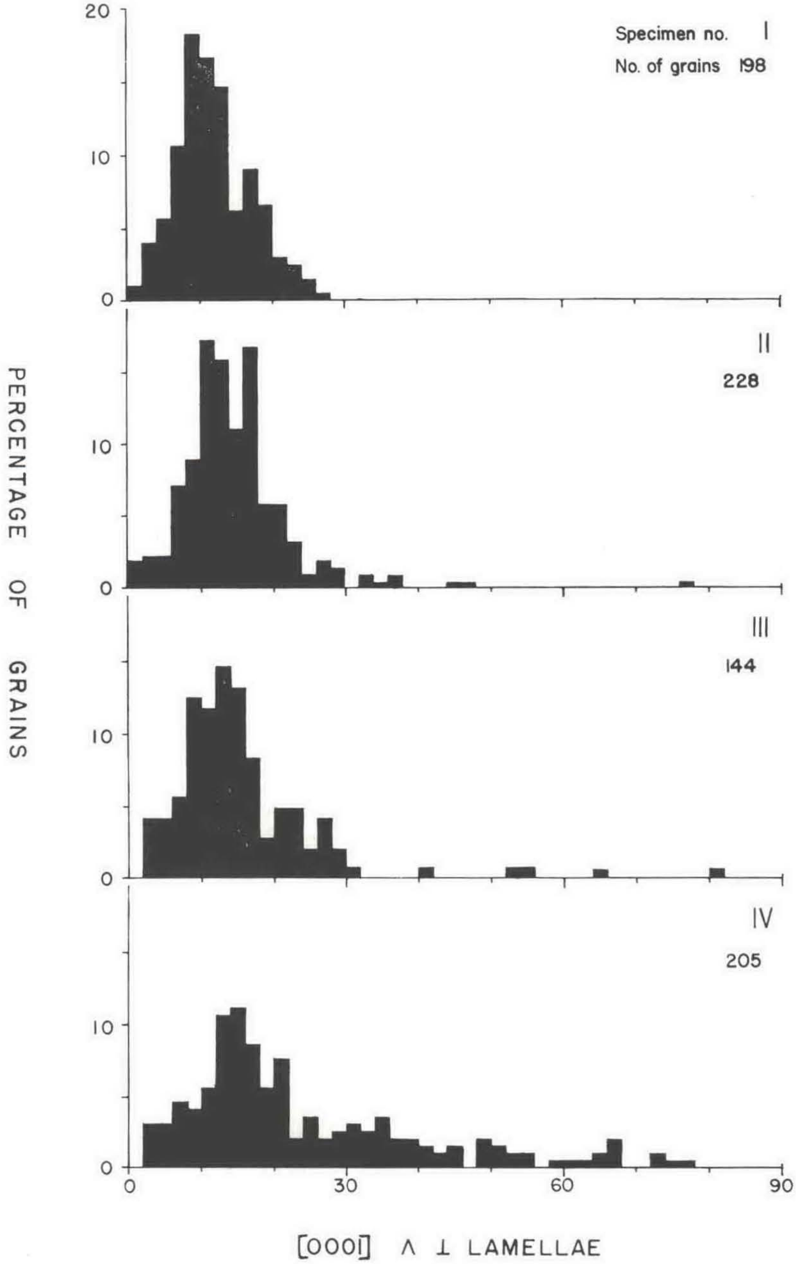

Fig. 6. Histograms showing the variation in the angle between [0001] and the pole of deformation lamellae in all the grains with lamellae in specimens I, II, III, IV.

Summary.—The orientation patterns of deformation lamellae in each of the four specimens described above are strikingly similar. In specimens II, III and IV, the poles of the lamellae from two distinct maxima 80° to 90° apart, indicating that the lamellae statistically define two surfaces; this is the type of pattern most commonly described in the literature (Turner, 1948). However, in all the specimens there is a more or less definite small-circle girdle containing the maxima. This distribution is also reflected by the [0001]-axes of the grains which contain the lamellae. The small-circle pattern of poles of lamellae was also noted by Riley (1947, fig. 8) in two samples of Baraboo quartzite. By comparison with the small-circle girdles, the maxima appear to be of minor importance.

The orientations of the great-circles containing the poles of the lamellae and the [0001]-axes in the quartz grains of all the specimens are similar. These great-circles (figs. 2d, 3d, 4d, 5d) intersect in, or close to, the axis A of the small-circle of lamellae-poles.

INTERPRETATION OF DATA

Discussion of fabrics.—The folds in specimens I and II are "homogeneous" with respect to the orientation of quartz and mica (Sander, 1930, p. 260-262) and are therefore not unrollable.

When the grain orientation in such folds is symmetrologically related to the axial-plane of the folds they are commonly interpreted as shearfolds in which the folded surfaces are mechanically insignificant and the grain orientation has been produced by shear or flow on surfaces parallel to the axial-plane foliation (Sander, 1930). But a homogeneous grain fabric, particularly in the case of quartz, may also be produced by a strong imprint imposed on a fold of any origin (Sander, 1934, p. 44).

The patterns of preferred orientation of [0001] in specimens I, II and III are triclinic, if considered in detail, but there is a close approach, especially in specimens I and III (figs. 2a, 4a), to symmetry of a higher order—monoclinic or even orthorhombic. The closely appressed, almost isoclinal form of the folding (specimens I, II) precludes the possibility that the folds were formed purely by inhomogeneous slip on surfaces parallel to the axial-planes. Their development would require considerable flattening perpendicular to the axial planes to rotate the limbs almost into parallelism. Furthermore, there is good independent evidence, from the twinning of calcite in the rocks, that the folds have undergone strong compression normal to the axial planes late in their development.

The foliation in the quartzites is defined by zonal concentrations of accessory minerals in a framework of quartz grains and was therefore probably quite passive throughout the deformation. But the quartzites are thin and surrounded by comparatively incompetent greenschists, so that the boundaries were mechanically significant and evidently functioned as slip surfaces. We consider that the folds originated by flexural-slip, the slip being concentrated along the boundaries of the quartzite layers, and developed subsequently by rotation of the limbs resulting from compression along an axis normal to the axial planes. The quartz was undergoing recrystallization and reorientation throughout this deformational sequence. The main features of the patterns of