elements have been given dynamic significance by comparisons between experimentally and naturally deformed rocks.

In the interpretive phase, the fabric elements are used to specify the nature of the deformation from two viewpoints, kinematic and dynamic (Fig. 1). Kinematic inferences concern the displacements that have transformed the initial fabric into the observed fabric. Dynamic inferences concern the nature of the stresses in the rocks at the time of deformation. In principle, all fabric elements that are significant criteria of deformation should lead to the same dynamic or kinematic interpretations even though they may be of different origin or scale.

The kinematic approach is favored by Sander and the Innsbruck school because "to correlate fabric with internal movements is less doubtful than is the more tenuous correlation with forces responsible for such movements" (Ref. 5, p. 2).* Symmetry is the basic criterion for correlating fabric with movement.** It is assumed that the symmetry of the rock fabric reflects the symmetry of the movement responsible for the evolution of that fabric. The principle is illustrated by the bending of wheat stalks and the rippling of the surface of water by wind. There is support for the validity of the principle in physics[4] and with regard to experimentally deformed rocks as discussed by Turner.[5] A second aspect of kinematic analysis involves unrolling ("Rückformungen") and levelling ("Horizontierung") proposed by Sander (Ref. 7, pp. 170-184) to derive an observed structure from an assumed earlier structure by the minimum amount and simplest possible kind of displacement consistent with the movement picture.

The kinematic viewpoint will not be considered further because it does not lead to the determination of the state of stress in rocks.***

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*The forces referred to here are those of the "general tectonic situation" (Fig. 1).

**See Refs. 1, 2, and 4-14.

***There are vast amounts of excellent descriptive data on a variety of fabric elements, which to date have been only kinematically interpreted. These may eventually be amenable to dynamic analysis as the genetic relationships between the fabric elements and stresses in the rocks become known.

Moreover, usually only intensely deformed rocks exhibit fabrics with sufficiently clear symmetry for kinematic analysis. This excludes slightly and moderately deformed rocks from this form of petrofabric analysis.

The dynamic approach is an outgrowth of experimental and theoretical studies of deformation. The mechanisms by which common fabric elements are formed are systematically worked out by study of experimentally deformed single crystals, of monomineralic aggregates of these, and finally of polymineralic rocks. In addition, the relationships between these elements and the known stresses across the boundaries of the laboratory specimens are established. These specimens are then compared with their naturally deformed counterparts to determine statistically the orientation and relative magnitudes of the principal stresses in rocks at the time of deformation. This procedure is based on the assumption that the mechanisms of deformation observed in the laboratory are identical to those in nature. The dynamic approach is applicable to all deformed rocks irrespective of the intensity of deformation.

The limitations of the dynamic approach are as follows: (1) At present the mechanisms of deformation are known for only a relatively few fabric elements. (2) The orientations and relative magnitudes of the principal stresses can be determined statistically in a given volume of rock, but absolute magnitudes cannot be estimated from data of short-time laboratory experiments. (3) Although in principle it is possible to distinguish between two or more stress systems reflected in a given fabric, in practice it is difficult and often ambiguous.

Certain difficulties arise in petrofabric analysis because of the cumulative aspect of rock fabrics, the heterogeneity of stress and strain in rocks, and the scale on which a given fabric element may be sampled. Since the fabric develops throughout the history of a rock, distinction between the initial fabric and the modifications superposed by subsequent deformation(s) is a serious problem. For example, in deformed sedimentary rock it may be difficult to determine whether a given dimensional orientation of the grains is relict from the initial sedimentation or is a stable configuration in the strain field of the