might be so, the equant grains in the other three specimens suggest that the orienting mechanism is the recrystallization. Weiss may have been dealing with a situation in which the effects of recrystallization and of gliding flow have both produced essentially the same c_v subfabric.

One could cite examples in which recrystallized grains have their c_v distributed in nearly complete girdles, which are related to $\sigma_1 > \sigma_2 = \sigma_3$ or $\sigma_1 = \sigma_2 > \sigma_3$ states of stress, but the technique should now be clear. It is important to point out, however, that if preferred orientations of calcite c_v arise from recrystallization under nonhydrostatic conditions, then nearly random patterns would probably imply recrystallization under essentially hydrostatic pressures. Although published accounts of random calcite c_v subfabrics are rare, random orientations are in fact common in recrystallized sedimentary rocks.[59,120,173] In undeformed rocks this might be evidence of an essentially hydrostatic state of stress due to simple overburden pressure.

Summary and Conclusions

Petrofabrics is the study of fabric elements that may range in size over 15 orders of magnitude from the crystal lattices to mountain ranges. It consists of a descriptive phase in which fabric elements are recognized, measured, and illustrated, and an interpretive phase in which the rock fabric serves as a basis of inference to the kinematic or dynamic aspects of the deformation. The kinematic approach, based on the symmetry argument of Sander,[1] provides no knowledge of the state of stress. The dynamic approach utilizes fabric elements to derive the orientations and relative magnitudes of the principal stresses in the rocks at the time of deformation. It is based on an understanding of the mechanisms of rock deformation gained largely through experiments.

The current physical understanding of fracturing and faulting, gliding flow, rotation, and recrystallization and of the corresponding fabric elements often enables one to determine the principal stress directions in rocks at the time of deformation. A review of the literature shows that laboratory observations on the fabric elements are compatible with those from the field and illustrates the types of dynamic interpretations that can be made from the fabric data.

Faults, shear fractures, and extension fractures are viewed as phenomena that are independent of scale (down to the microscopic field, i.e., >0.01 mm) and that exhibit predictable orientations to the principal stresses in the rock at the time of failure. In naturally deformed rocks, fractures and faults are distinguished and identified primarily from their combined orientation pattern. Derivation of the principal stress directions follows from the genetic relationships--extension fractures are normal to the least principal stress, and faults and shear fractures are inclined at less than 45 degrees to the greatest principal compressive stress. Studies of microfractures in individual grains of folded sandstones and of fracture and fault systems in the Ouachita Mountains and Central Plains of Oklahoma and in the Great Basin of the western United States demonstrate the dynamic interpretations of these elements and emphasize that the elements are independent of scale. Consistent fracture-fault trends over large portions of the earth's crust suggest that the stress pattern is homogeneous on a regional scale.

Intracrystalline gliding involves mechanical twinning and translation parallel to a definite gliding plane along a fixed direction with or without restricted sense of shear. As gliding flow is essentially independent of normal stress, the most favorable state of stress for gliding is that which gives the maximum shear stress along the gliding line (in the proper sense). That is, the greatest and least principal stresses are each oriented at 45 degrees to both the gliding plane and direction so as to yield the known sense of shear. Accordingly, if the gliding systems are known, the principal stresses in each crystal can be derived from the gliding evidence (e.g., twin lamellae or internally rotated lamellae). From laboratory experience it is reasonable to suppose that the stress orientation pattern determined from many grains will correspond to the orientation of the principal stresses in the rock at the time of deformation. The dynamic