M. S. PATERSON *Dept. Geophysics, Australian National University, Canberra, Australia*
L. E. WEISS *Dept. Geology and Geophysics, University of California, Berkeley, California*

Experimental Deformation and Folding in Phyllite

Abstract: A phyllite has been experimentally deformed in various orientations at room temperature and high confining pressure (mainly 5 kb). It glides easily on the foliation in favorable orientations. However, when the foliation is oriented nearly parallel to the direction of compression, folds of similar form are extensively developed, especially when the specimen is constrained in a thick metal jacket. The folds have axial planes of several orientations and include kinks, conjugate folds, and more tightly appressed similar folds. The latter have axial planes approximately perpendicular to the original orientation of the foliation and are shown to evolve from the interaction of oppositely inclined kink bands. Up to about 50 per cent shortening, the deformation proceeds by growth of the kinked regions, within which little further strain occurs, rather than by progressive deformation simultaneously in all regions. All the structures developed bear close resemblance to natural structures, suggesting geometrically similar evolution in spite of different conditions of pressure, temperature, and time.

The evolution of flexural slip folding is discussed in detail for a model in which the only fundamental mechanism of deformation is glide on a unique set of parallel planes ("ideal foliated body"), assuming that the body initially yields by kinking in a regular manner. The structural evolution observed experimentally is well fitted to a first approximation by this ideal model, although departures in detail indicate that some other mechanisms of deformation are effective locally. In considering various geological implications, it is suggested that kinklike flexural slip folding may play a more important part in the evolution of natural similar folds than has been hitherto recognized.

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