

a distinct difference in PT conditions between the two areas. The serious reader will need to have the *supplement* volume in his possession, if he is to follow this discussion. The chapter (XIV) on ages of the Franciscan and Sanbagawa metamorphic terranes is now anachronistic as suggested by new radiometric dates produced since the manuscript was written. Clear evidence is emerging that both the Franciscan and Great Valley sequence were deposited on oceanic crust, whose igneous age is probably as young as 155 m.y., which puts a lower age limit on rocks that can be considered part of the Franciscan. The final chapter (XV) on tectonic implications is well written and develops a model for the production of blueschists compatible with the "new" global tectonics. I believe that this is the first successful attempt to provide a model for blueschist metamorphism that takes in the many geologic variables necessary to give it authority. However, one is surprised at how few of the geologic data presented early in the book are clearly necessary to validate the model. In the closing statement, the authors point out critical areas and types of research that deserve attention in order to further the tectonic analysis they presented. Notably lacking is a plea for structural studies on exposed terranes in the Circum-Pacific metamorphic belts. This oversight is common in many modern petrologic studies and points up the need for international and local cooperation between structural geologists and petrologists toward the solution of these problems.

There still remains a broad range of permissible geologic interpretation of the new global tectonic theory, where classical geologic data are used to reinforce the new concepts evolved mainly by geophysical techniques. As a reviewer, I cannot wholly subscribe to the geologic interpretations presented by the authors; nonetheless, the memoir represents a superior effort in international cooperative research. I would recommend it as required reading for any student or professional geologist who is involved in metamorphic petrology or who is playing the global tectonic game.

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*Strain Facies*; by EDWARD HANSEN. P. x, 207, 78 figs. 21 pl. New York, Heidelberg, Berlin, 1971 (Springer-Verlag, \$16.80).—This book presents an integrated and partially new system for description and kinematic interpretation of fold styles in layered rocks. Having defined the system, its validity is demonstrated in the multiple-folded Trollheimen region of Norway, where the distribution and characteristics of three distinct strain facies can be observed. The transition from system to practice is covered smoothly in the text by dividing it into three parts: first, three chapters dealing with description of folds, types of flow, and deduction of slip-line orientations; second, four chapters describing rock units and the three strain facies of the region; and third, one chapter including a summary and rationale for strain facies. Strain facies are assemblages of structural features (mainly folds) with common descriptive properties thought to have formed in similar strain environments.

Though the material covered is complex, the book is clearly written and well-illustrated with figures and excellent photographs, apparently all taken during the rare sunny days in the "home of the Trolls". I am less pleased with the Geologic Map (pl. 1), which should have been printed larger to allow differentiation of structure symbols of the several deformation phases in the western and southeastern parts of the map. Four field seasons and 207 pages of text deserve a more lucid map! Other minor criticisms include: (1) lack of agreement of the attitude of the nor-fold axial surface at 8 on figure 54 and those from presumably the same locality F plotted on figure 60b; (2) inclusion of the three-dimensional sketch of the "handfold" (fig. 47), which, though representing an abandoned interpretation, is more dramatic than figure 48 and may be uncritically remembered as THE structure of the Riar Basin; (3) scale differences between the sections (figs. 46, 48) and the Geologic Map (pl. 1).

*Strain Facies* should be useful to all geologists who have worked with unraveling several phases of deformation. Hansen's system includes a rigorous definition of terms to describe fold styles and symmetry, a summary and demonstration of previously known and new techniques for determining slip-line orientations in folded layers, and a thorough analysis of types of flow and how they might be determined from field data. More traditional geologists will search in vain for a type locality, or a genetic or geometric basis for the terms sahlfold, discfold, or norfold applied to the strain facies by Hansen—the terms are nonsense syllables (p. 26). Whatever the terms, Hansen has documented the fundamental geometric and kinematic differences between folds of different phases in one small area and has developed a model for the flow environment producing each. The strength of the book lies in its demonstration of an integrated system leading from the field to a qualitative understanding of strain in a flow environment.

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*Microtectonics along the western edge of the Blue Ridge, Maryland and Virginia*; by ERNST CLOOS. P. xiv, 234, 87 pls., 57 figs. Baltimore, Md., 1971 (The Johns Hopkins Press, Johns Hopkins University Studies in Geology, no. 20, \$12.50).—In 1947 Ernst Cloos published an article on deformed oöids and related structures in the Appalachian Great Valley and Blue Ridge of Maryland that quickly became a classic. From the data he had carefully assembled, he built up an overall picture of the deformation there—the South Mountain plan. In later years, he studied surrounding areas, showing that the plan can be carried in reconnaissance southward along strike as far as North Carolina but that it is replaced east and west by quite other types of deformation, for example, the brittle wedging, bedding slip, and related structures he has described so well in the Valley and Ridge folds at Roundtop and elsewhere in western Maryland. But finally he has returned to his South Mountain plan, refining his methods and applying them in detail over a large area in the Virginias. In the present book he has set out the results of these labors,