

## BOOK REVIEWS

### Classic text on small-scale structures

Wilson, G. 1982. *Introduction to Small-scale Geological Structures* (in collaboration with Cosgrove, J. W.). George Allen & Unwin, London. 128 pp. Price: hardcover £10.00; softcover £4.95.

Many structural geologists, particularly if trained in Britain, consider the structural analysis of deformed rocks as central to their discipline. It is therefore a paradox to admit that few if any of the standard textbooks on structural geology deal satisfactorily with this aspect of the subject. Indeed, while the modern approach to structural geology tends to experiment and mathematical analysis, it is the older texts such as C. K. Leith's *Structural Geology*, first published in 1923, which perhaps have more to offer the field geologist interested in the tectonic significance of small-scale structures. The publication of Gilbert Wilson's *Introduction to Small-scale Geological Structures* is therefore timely, following as it does a classic tradition in structural geology. It provides a broad survey of the various types of small-scale structures developed in deformed rocks, based in large measure on the well-known and oft-quoted paper originally published in 1961 by the author in the *Annals of the Geological Society of Belgium*.

The approach to small-scale structures is briefly surveyed in an introductory chapter to the book. This is followed by a short chapter dealing with stress and the mechanics of rock deformation, which is adequate for its purpose. The next chapter introduces the concept of structural symmetry as a prelude to describing the geometrical elements of cylindrical folds. In concentrating on such a concept, the text shows its age, for structural geology is now much more concerned with the detailed anatomy of deformed rocks, as described throughout the rest of the book, rather than such an abstract concept. This introductory part of the book concludes with a chapter on structure and stratigraphic succession.

The remainder of the book deals with particular types of small-scale structure, chapter by chapter, each dealing with mode of origin, nature of occurrence and structural significance on a larger scale, illustrated with field examples and historical references to the literature.

Brittle structures such as tension gashes and kink-bands are considered first. The following chapter deals with cleavage and schistosity in general, distinguishing between the different types of fracture cleavage, strain-slip or crenulation cleavage, flow or slaty cleavage, and schistosity, according to the British terminology. This chapter concludes with a detailed description of the structural relationships which are developed *vis-à-vis* bedding wherever cleavage forms as an axial-planar structure in folded rocks.

The next two chapters are devoted to a more detailed description of fracture cleavage, strain-slip cleavage and flow cleavage. While fracture cleavage is considered as a morphological variant to flow cleavage in more competent rocks, its association with fault-zones is also stressed. The nature and origin of strain-slip cleavage are briefly considered. The strain resulting in the development of flow cleavage is discussed in some detail, along with other topics of a more diverse nature generally coming under the heading of linear structures associated with cleavage and schistosity.

The nature of boudinage, and its association in the field with fold-structures and thrust-zones, is the subject of the next chapter. This is followed by a discussion on drag-folds and their relationship to differential movements. Here, again, the text shows its age as most 'drag-folds' would now be viewed, rightly or wrongly, as essentially the result of buckling mechanisms. This section of the book ends with a useful description of mullion and rodding structures, often lacking in other texts.

The final section of the book deals with the superposition of small-scale structures as the result of repeated deformation. The field evidence for such superposition is seen in the folding of early cleavages along with bedding, while the development of interference patterns as the result of refolding is alluded to briefly. Any more detailed description of the complex structural forms which develop in response to such deformation is evidently considered as beyond the scope of the present book. Instead, the author ends his treatment of small-scale

structures by discussing how such structures may be related on a larger scale to one another in the tectonic pattern of different regions with which he is particularly familiar. In conclusion, the author stresses the important contribution made by stratigraphic mapping in any region of structural complexity to the full understanding of its geological history. I would agree.

Although the text is somewhat dated, it benefits greatly not only from the author's wide experience in the field, on which he draws extensively, but also from his broad knowledge of the European and American literature. Indeed, the text is almost a commentary on the published literature, illuminated by his own field observations. There can be little doubt that the present strength of structural geology in Great Britain has emanated from Imperial College, and it was Gilbert Wilson who did much to influence the present generation of structural geologists through his teaching and research. This book is therefore a fitting testimony to his enthusiastic interest in structural geology over the years.

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### Reading geology

Skinner, B. J. (editor) 1982. *Earth's History, Structure and Materials*. (Readings from *American Scientist*), William Kaufmann Inc., Los Altos, California. 183 pp.

At first glance this book appears to be a further publication in the series 'Readings' from *Scientific American*. Closer inspection of the title and style of presentation reveals, however, that it belongs to a series of readings under the general title 'Earth and its Inhabitants' which were previously published in the journal *American Scientist*. This journal and the Readings are little known in the U.K., but may be well-known elsewhere.

The series contains seven volumes of which the present volume is said to cover the Earth's evolution, geological time, plate tectonics, drifting continents and special features such as chains of volcanoes. The book contains sixteen articles divided into four sections.

#### I. *Earth as a Planet.*

(1) J. W. Head, Wood, C. A. & Mutch, T. A. Geological evolution of the Terrestrial Planets (1977).

#### II. *Geologic Time and How it is Determined.*

(2) H. Faul. A History of Geologic Time (1978).

(3) A. E. J. Engel. Time and the Earth (1969).

(4) R. L. Fleischer. Where do Nuclear Tracks Lead? (1979).

(5) I. Friedman & Trembour, F. W. Obsidian: the Dating Stone (1978).

(6) E. K. Ralph and Michael, H. N. Twenty-five years of Radiocarbon Dating (1974).

#### III. *Plate Tectonics and Drifting Continents.*

(7) D. P. McKenzie. Plate Tectonics and Sea-Floor Spreading (1972).

(8) W. A. Nierenberg. The Deep Sea Drilling Project after Ten Years (1978).

(9) R. K. Bambach, Scotese, C. R. & Ziegler, A. M. Before Pangea: the Geographies of the Palaeozoic World (1980).

(10) B. D. Marsh. Island Arc Volcanism (1979).

(11) G. B. Dalrymple, Silver, E. A. & Jackson, E. D. Origin of the Hawaiian Islands (1973).

#### IV. *Igneous Activity.*

(12) C. L. Rosenfield. Observations on the Mount St. Helens Eruption (1980).

(13) J. C. Moore. Mechanisms of Formation of Pillow Lava (1975).

(14) J. R. Heirtzler, Taylor, P. T., Ballard, R. D. & Houghton, R. L. A visit to the New England Sea-Mounts (1977).

(15) G. Heiken. Pyroclastic Flow Deposits (1979).

(16) D. Hunter. The Bushveld Complex and Its Remarkable Rocks (1978).

The contents thus demonstrate that there is no general theme for the book, each title being a stand-alone article. There is a general introduction to the book and a brief statement of the main topic of each