

Third, the usefulness of the monograph to mineralogists is diminished for several reasons. The chemical formulae of several minerals are present in the Formula Index, but the mineral names are not listed in the Subject Index (e.g. cuprite, niccolite, osbornite); furthermore, obvious analogues like ringwoodite, majorite and wadsleyite are not listed, even though the type scientists come from Australian National University! Many important minerals, including apatite, sillimanite, and kyanite, are not listed, as well as a host of hydrates that are not amenable to ready description by the Hyde-Andersson procedures. Geophysicists may be amused by the description of continental drift on p. 65, and by the statement that spinel is believed to be the main constituent of the lower mantle. The monograph by Liu and Bassett should be consulted for high-pressure structures. It would have been so easy to fit perovskite $(\text{Mg,Fe})\text{SiO}_3$ and ferropericlase/magnesiowüstite $(\text{Mg,Fe})_{1-x}\text{O}$ into this monograph. The section on silicates is thin, and ignores most of the major research discoveries of the past twenty years—only a few structures of particular interest to the authors are listed. To summarize, this is an excellent monograph for many materials scientists, especially those involved in compact materials with interesting physical properties. However, mineralogists should cherish the old reliable (Bragg and Claringbull; Wells) and the host of new specialized monographs on the crystal structures of minerals, while taking as much benefit as possible from this gallant production by Bruce Hyde and Sten Andersson. It is an excellent memorial to David Wadsley.

J. V. SMITH

Butler, B. C. M. and Bell, J. D. *Interpretation of Geological Maps*. London (Longman) and New York (John Wiley), 1988. xii + 236 pp. Price £12.95.

This 236 page soft cover book is designed to explain the methods of map interpretation to those beginning to study geology for the first time, whether at school or university. It consists of ten chapters, together with 6 appendices, a list of symbols used on maps, references and an index. Chapters one to seven involve the step-by-step techniques used in map interpretation, from parallel-sided units to lithological units with less regular shapes, faults, folds, unconformities and *landforms* and *superficial deposits*. Chapter eight deals with ocean-floor geology, whereas chapters nine and ten describe the synthesis of the geology of an area from geometrical and geological stand-

points. The appendices include a summary of radiometric dating techniques and the geological time scale. The book is illustrated with 4 full-colour plates of selected geological maps, together with abundant two-colour (red and black) line tracings of geological maps and illustrative line diagrams. Limited and rather poorly reproduced half-tone photographs are used to illustrate various features. The maps used in this book are drawn from a wide range of sources including the Geological Surveys of Great Britain, the United States, South Australia, Canada, Japan, West Germany, Switzerland, and Italy.

The authors state that the aim of this book is to explain both the geometric and geologic interpretation of geological maps as the products of geological processes operating through geological time. They attempt to make use of modern geological concepts relating to environments of formation of structures and lithologies, and to illustrate the determination of rates of processes from the map interpretation. Chapter 1 is an introduction to the aims of actualistic map interpretation in terms of modern concepts and environments, processes, and rates. Tables 1.1 and 1.2 are useful summaries of Major Earth Environments and Rates of Present Day and Recent Earth Movements. Chapter 2 focuses upon the interpretation of parallel-sided lithological units and the analysis of dips in various topographic terrains. The construction of stratigraphic columns, thickness contours, and structure contours are briefly dealt with. Chapter 3 deals with lithological units with less regular shapes and principally covers igneous and metamorphic relationships. Discontinuous stratigraphic units are briefly dealt with and there appears to be little consideration of, or examples of fault controlled sedimentary units, e.g. wedges formed in half-graben environments. Chapter 4 deals with fault structures and how to recognize and analyse them. Unfortunately insufficient emphasis has been placed upon modern concepts of *linked fault systems and families of faults*—for example the interpretation and analysis of map patterns of linked thrust systems is somewhat limited. The analysis of fault displacement using piercing points is not mentioned and the classification of faults is somewhat limited. There appears to be no mention or analysis of either fault separation analysis, section balancing in faulted terrain or of fault-related folding, cf. roll-over anticlines in extensional fault systems or 'snakes head structures' in thrust terrains. Chapter 5 deals with fold structures in a fairly fundamental way. This section is limited in that it does not consider isogon analysis and classification of folds according to

thickness variations in profile section. It does not consider fault-related folding kink band style folding, polyphase fold patterns and the representation of foliations and schistosity on maps and sections. Chapter 6 comes somewhat late in the book and deals with unconformities. Chapter 7 deals with landforms but contains little on structural control of landforms. Chapter 8 deals with ocean-floor geology often ignored in other books. Chapters 9 and 10 are a detailed case history of the geometrical and geological interpretation and synthesis of BGS sheets 39° west and 39° east in the Midland Valleys of Scotland. These are well-argued analyses that conclude by comparing this area with modern-day environments. However, in general terms, the analysis of maps to produce cross-sections is not well covered, with little attention paid to the projection of data down plunge and the construction of true profile cross-sections and the construction of perspective and block diagrams. Some consideration is given to considering the compatibility of cross-sections but not to the modern concepts of balancing and restoring cross-sections.

In summary, whilst this book aims to guide a student through the processes of interpreting a geological map, it has a number of serious drawbacks that limit its usefulness. The areas dealing with structures and cross-sections are limited and do not deal with modern concepts of structural geology. I believe that these features (discussed above) can and should be introduced to students at an early stage. The maps analysed in detail are largely of similar style—i.e. BGS maps, and the methodology developed in the book largely relates to this. In other countries where maps may often just show the outcrops, this style of analysis may not be suitable.

K. R. McCLAY

Roberts, J. L. *The Macmillan Field Guide to Geological Structures*. London (Macmillan Press Ltd), 1989. 250 pp. Price £12.95.

This 14 × 18.5 cm hardcover field guide contains 254 illustrations (almost all of them high-quality colour photographs) of geological structures in the field. The features covered include sedimentary structure, igneous and metamorphic rocks, unconformities, tectonic structures (faults, folds, veins, joints, boudinage, shear zones and metamorphic fabrics), fold relationships, and structures in basement rocks. Each section consists of a brief descriptive introduction followed by colour photographs illustrating the structures as seen in the field. The photographs are usually three to a page, each with a detailed caption and

usually with a detailed field locality. Descriptive notes are on the facing page to the photographs. The superb quality of the colour photographs and that of the reproduction means that the features are very clearly illustrated. The book is completed by a brief appendix on guidelines for structural fieldwork, an appendix of field localities for the photographs, a glossary, selected references and an index.

John Roberts is to be congratulated on this superb compendium of small and mesoscale structures in the field. The majority of the examples are from the British Isles with the localities fully documented. The descriptive text is in places limited and does not include a full discussion of how various structures form. There is a lack of examples of large-scale structural features, e.g. faults and folds and their topographical expression, but this is a minor criticism. For the professional geologist this field guide is an enviable collection of photographs illustrating the beauty of structures in the field. For the serious student of geology the book provides classic text book examples of most of the structures that one would encounter in the outcrop. For the amateur this book provides an excellent compendium that enables identification and recognition structures seen in the field. The quality of the photographs and the reproduction will mean that most geologists will want to have this book.

K. R. McCLAY

Karato, S.-I. and Toriumi, M., eds. *Rheology of Solids and of the Earth*. Oxford (Oxford University Press), 1989. 440 pp. Price £60.00.

This text, edited by Shun-Ichiro Karato and Mitsuhiro Toriumi, is a translation of the original Japanese version of this book which was published by Tokai University Press in 1986. The text is a collection of review papers that were originally given at a symposium 'Plastic flow and microstructural development in solids: from crystals to Earth' which was held in Tokyo in November 1985. This English version of the book contains an additional paper by Mervyn Paterson on the role of water in quartz deformation.

The quality of the translation of the original papers is excellent, and the text is well organized. It is divided into four parts: Defects and plastic deformation in metals and oxides; Defects and plastic deformation in minerals; Deformation microstructures; Flow in the Earth.

The first section contains six papers dealing with a range of topics including dislocation motion, grain boundary behaviour, diffusion and creep in various metals and oxides. The treatments are