

most of the book, there are good worked examples and discussion of uncertainties.

As implied above, the book takes a practical rather than theoretical approach to the subject and is thus most suitable for advanced students and researchers with an interest in applying thermodynamics to specific petrological problems. When viewed in this light it is successful and merits extensive use.

B. J. WOOD

Eberhart, J. P. *Structural and Chemical Analysis of Materials—X-ray, electron and neutron diffraction—X-ray, electron and ion spectroscopy—Electron microscopy*. (Translated by J. P. Eberhart), Chichester and New York (J. Wiley and Sons), 1991, xxx + 545 pp. Price £95.00.

The first, French language, version of this book was published in 1989 by Bordas, Paris. The English translation, by the author, is a specially welcome addition to the relatively few books that introduce the non-specialist to techniques currently used in investigations of the microstructure and chemical composition of the interiors and surfaces of materials. It is essentially a textbook, rather than a laboratory handbook. The book provides an excellent and readily comprehensible account of both the basis for and equipment used in the most important imaging, diffraction and microanalytical methods. It does not specifically address minerals or indeed any particular group of materials.

In Part 1 (Chapters 1 to 8) the author presents elementary, largely unmathematical, but nevertheless fairly rigorous explanations of interactions between various forms of radiation and solids, thus giving the physical basis of modern instrumentation. A foundation of knowledge about crystallography and optics is assumed and the coverage is otherwise fairly comprehensive. (An organisational choice made here is to leave the discussion of irradiation damage processes until later: pp. 448–451, 490). Part 2 (two chapters) is concerned with the production and measurement of radiation, i.e. with sources, detectors and spectrometers; basic designs are described and illustrated. Part 3 (two chapters) covers the application of diffraction techniques to materials analysis; a bare minimum of theory is reproduced (some topics are summarised in appendices, e.g. reciprocal lattices, Fourier transforms). Much of the content of Parts 1, 2 and 3 will be familiar to graduates in the physical sciences.

The six chapters that form Part 4 cover various X-ray, electron and ion spectrometric methods

(XRF, EPMA, XPS/ESCA, Auger, X-ray absorption methods, EELS, SIMS, etc.). Part 5 consists of four chapters that address the various types of electron microscopy (TEM, HVEM, SEM, STEM, AEM, STM). The advantages and limitations of the various techniques are presented, together with specimen requirements, analysis correction methods, sources of errors, etc. Here also are briefly mentioned both the processes and practical effects of irradiation damage by electrons and ions.

The book is nicely produced and has an attractive format. The use of many sub-headings, italicised keywords, bold face definitions, boxed summary statements, etc., give clarity and make for easy relocating of particular topics. The book does not go into great practical detail; indeed the author stresses that readers are expected to seek review papers and specialist texts for greater technical information. It is adequately illustrated with line drawings, but has very few half-tones considering the inclusion of subject matter like imaging. For such a textbook, the selling price (£95 for 545 pages, including six appendices) seems high, and this will surely severely limit purchase by individuals.

D. J. BARBER

Hambrey, M. J., Fairchild, I. J., Glover, B. W., Stewart, A. D., Treagus, J. E. and Winchester, J. A. *The Late Precambrian Geology of the Scottish Highlands and Islands*. London (Geologists' Association), 1991. vii + 130 pp., 25 sketch maps. Price £8.50.

The Geologists' Association has been publishing field guides to classic areas of British Geology ever since the International Geological Congress was held in London in 1948. These guides have traditionally detailed the geology of a limited area through a series of itineraries designed to illustrate the regional geology. The latest GA Guide, prepared by Hambrey and his associates, represents a departure from this well-tried formula. This guide illustrates rocks of a particular age, the late Precambrian (Proterozoic), as they are represented in Scotland. Itineraries included in the guide cover classic localities for the study of the Dalradian Supergroup, the Moine Assemblage and the Torridonian Complex, extending from Islay to the Grampian Highlands and northwards to the Assynt District in the Northwest Highlands. Road improvements in recent years have made much of this area accessible within 2–3 hours of Edinburgh, Glasgow or Inverness.

The present guide has been conceived on a grander scale than many of its predecessors. Its

130 pages include general advice on travel, accommodation and weather in the Highlands, with available maps and other relevant guides. This is followed by a general comprehensive account of current knowledge and interpretation of the environments of sedimentation and the tectonic setting of the Dalradian, Moinian and Torridonian rocks of Scotland. In this account, and in the field guide which follows, emphasis is placed on the sedimentary features of the rocks, with accounts of the structure where this is necessary for an understanding of their distribution and structural relationships.

Completion of the 12 itineraries included in the guide would require 14 days of strenuous field-work, without allowing for travelling time. The itineraries cover: The Garvellach Islands, Port Askaig and Bonahaven, Islay, Loch Leven and Schiehallion—Dalradian; Pitlochry to Fort William and Fort William to Mallaig—Moinian; and Sleat of Skye, Loch Torridon, Gruinard Bay and Achiltibuie, and Stoer—Torridonian. A comprehensive reference list and an index are also included.

Each itinerary is introduced by an explanation of the context and significance of the localities to be visited. Available topographic and geological maps covering the area are listed and an estimate is given for the amount of time which should be allowed for each outcrop. Details of access are given (to hire a boat for the Garvellachs, ring Lachlan Maclachlan at Luig!) and whether permission is required for access to quarries, or to open moorland during the stalking season (August–February). Each itinerary is profusely illustrated by maps, cross sections, explanatory diagrams and half-tone photographs.

The guide is attractively presented in the traditional pale green GA cover, with a coloured photograph of Slioch and Loch Maree. The A5 size fits comfortably in an anorak pocket and the binding appears robust enough to survive a year or two's exposure to Scottish weather.

Very few enthusiasts could be expected to complete all these itineraries at one time, but the guide will provide a valuable resource for party leaders planning field excursions, for independent professional geologists, especially visitors from overseas, and the knowledgeable amateur, who requires guidance to the best of the classic geological localities in Scotland. Unfortunately the guide presupposes too broad a background in geology to be of use to the beginner.

Both the authors and the publishers may be congratulated on having set a new standard for the presentation of GA Guides. However, an overall excellent job is marred by slipshod

editing and proof reading and by a too indulgent attitude towards field photographs which do not illustrate clearly the features described in the captions.

Anyone who has used a field guide will have experienced the frustration of having inadequate information to locate a key outcrop or to recognise outcrop features from written descriptions. From personal experience I know how difficult it is to write unambiguous directions to enable other people to find your prize outcrops. How far the present authors have succeeded (variously?) in this difficult task will be for the users to judge. For my part I look forward to putting some of these itineraries to the test on my next visit to the Highlands.

A. J. BARBER

Hughes, F. E. (Ed.). *Geology of the Mineral Deposits of Australia and Papua New Guinea* (2 volumes). Parkville, Victoria, (Australasian Institute of Mining and Metallurgy: Monograph 14, 1990. xxiv + 1818 pp., 2 coloured geological maps (1:5 000 000). Price \$A 250.00.

This huge 1818 page, A4 size, two volume monograph on the geology of ore deposits in Australia and Papua New Guinea has no equal. It is the fourth publication in the Australasian Institute's 'Geology of Ore Deposits' series and supersedes and surpasses Monograph 5 (Economic Geology of Australia and New Zealand—1. Metals; 1975). It is dedicated to the memory of Haddon King of CRA who played such an important role in the discovery and exploitation of mineral deposits in Australia.

As in previous monographs, this compilation describes deposits in relation to the tectonostratigraphic terranes in which they occur, for example in the Yilgarn craton or the Mount Isa inlier, and in order of ascending stratigraphic age within that terrane. Geographically the monograph proceeds from west to east across Australia and from north to south. The mineral deposits of Papua New Guinea are described in a separate section at the end of the monograph. Unlike monograph 5 the deposits of New Zealand are not covered in this work. Volume one contains 135 papers mainly on gold deposits in Western Australia and deposits in northern Australia including the Mount Isa inlier. Volume two, with a similar emphasis on gold, contains 126 papers covering the Precambrian terranes of southern Australia, the eastern Australian orogenic province (Tasmania, the Lachlan and Tasman fold belts), and the deposits of Papua New Guinea. Most papers are short (around six to