to take account of experimental data which indicates that the pressures required for plagioclase elimination in different lithologies vary by as much as 16 kilobars or of the crucial influence of water activity on the stability of eclogite relative to amphibolite and blueschist. Whilst Smith validly criticizes the much favoured Groups A, B and C eclogite classification scheme of Coleman *et al.*, his proposed alternative classification scheme is scarcely adhered to in this book and certainly does not adequately define the geological environment for the formation of most eclogites.

Overall this book falls well short of presenting a balanced and comprehensive account of 'Eclogites and Eclogite Facies Rocks'. However, this reviewer must confess to being not unbiased in reaching this conclusion having just completed the editing of a separate review text on such rocks.

D. A. CARSWELL

Latter, J. H., ed. *Volcanic Hazards: Assessment and Monitoring.* Berlin, Heidelberg and New York (Springer-Verlag), 1988. viii + 625 pp., 284 figs. Price DM 178.00.

During the last decade or so, there has developed within the volcanological community a heightened awareness of the social implications associated with volcanic studies. The need for this awareness was probably first highlighted by the eruption of Soufriere in Guadaloupe during 1976 when controversies between scientists were utilized by the media in a way that did not enhance scientific credibility, and lines of communication between scientists and governmental authorities were not clearly established. More extensive monitoring of active volcanoes was an urgent requirement, as well as the development of better predictive ability, procedures for the interface between volcanologists and civil defence authorities, and a code of conduct for scientists working on volcanoes. Considerable endeavours on all these fronts have been and are being made.

It is thus appropriate that the first volume in the IAVCEI Proceedings in Volcanology should be devoted to the assessment and monitoring of volcanic hazards. This volume is the outcome of a symposium held at the International Volcanological Congress in New Zealand during February 1986. The book contains thirty-five of the papers that were presented orally or as posters as part of the Symposium, including two that were given in a symposium on pyroclastic flow deposits.

The Editor has divided the book into two parts, the first covering hazard assessment and the second monitoring. Within each of these sections he has attempted to order the papers logically, keeping works on particular regions or volcanoes grouped together. Inevitably with a book of this type, the contributions are variable in quality and interest. The topics covered are wide-ranging and the geographical coverage of volcanoes good; but, as the editor regrets in his preface, there are no sections dealing with volcanoes of Africa, the Atlantic Islands (except Iceland), Hawaii, Central America (except Mexico), or South America. [All the papers have been abstracted in *Mineralogical Abstracts* M.A. 90M/1048-1082].

Although this publication is presented as typed camera-ready copy, there is at least uniformity, all the papers being typed to a standard style. There is also a measure of uniformity in the written English, presumably as a result of a heavy editorial pen. The result is a good record of the presentations given at this symposium. As such it will be a useful reference in Earth Science libraries.

Having said that, there is a feeling that something is missing. An important aspect of any meeting such as the one represented here is the cross-fertilization of ideas. The book could have been so much better if there had been one or two stimulating chapters by authors invited to present ideas developed by discussion as the conference progressed. The Editor's Preface goes some way towards this especially in pointing out that only a few Quaternary volcanoes are known well enough for estimates to be made of mean intervals between eruptions of a given magnitude. Thus emphasis is often given to those volcanoes known to have had large eruptions in the recent past, whereas real danger may be present at centres that have been long dormant. He argues that a future thrust of research should be detailed chronological studies of potentially destructive volcanoes including those currently dormant. While this is not entirely a new idea it is one that is certainly worthy of emphasis.

Perhaps for future volumes in this series the publishers will consider a format that will record these symposia not just as a collection of papers presented, but adding contributions that reflect the intellectually stimulating outcome of a group of scientists coming together to discuss their subject.

J. E. GUEST

Young, T. P. and Taylor, W. E. G. (Editors) *Phanerozoic Ironstones.* (Geological Society: Special Publication No. 46), 1989. xxv + 251 pp. Price £66.00.

An International Symposium on Phanerozoic

Ironstones was held at the University of Sheffield in April 1987. It came to be largely because of the enthusiasm of the two editors and their timely anticipation of a resurgence of interest in these unusual rocks. Topical questions concern the special depositional environments which they record, relationships to changes in sea-level and climate and stratigraphic significance. Other good reasons for holding the meeting were perceived to be in recording advances in technology and in geochemical understanding of the particular mineral assemblages developed in ironstones. A very nice note was struck with the frontispiece; a thin section of an ooidal grain-ironstone from the Cleveland Ironstone Formation prepared by Henry Clifton Sorby in 1856. It is sometimes proper to pause and celebrate both the quality of technology and interpretations recorded in the literature so long ago yet which are still so relevant today. Sorby's pioneering work was all undertaken within a kilometre or so of the site of the conference; another good reason, perhaps, for holding it.

The volume starts with a combined introduction and review by Tim Young. This was written after the meeting and partly in response to one of the discussion sessions there. It includes a summary of current terminological practice and a glossary. Both are extremely useful yet concise. Equally, there is a very sharply focused literature review which provides an excellent introduction (by way of its reference list) for any student wishing to start a serious study of these rocks.

The body of the text is then split into four sections: 'Geochemical and Mineralogical Framework', 'Stratigraphic Patterns', 'Fabrics' and 'Case Studies'. The first of these contains three papers; by Velde, Harder and Spears. The first is a short contribution but one which presents pertinent electron microprobe data for berthierine peloids and iron oolites. The importance of a kaolinite precursor for early berthierine is stressed but chlorite (1.4 nm) formed by deeper burial processes may have more variable Al/Si ratios. Harder reviews laboratory synthesis of iron-rich clays and discusses findings in terms of what is known about both depositional and post-depositional processes. Spears then reviews recent thermochemical discussions and also findings from modern sediment studies. He puts together a very plausible explanation for the composition and mineralogy of a number of Phanerozoic examples and, incidentally, draws attention again to Sorby's original work. It stands the test of time.

The second section brings together a fascinating group of papers. Van Houten and Arther open with a global review of ironstone occurrences and observed links with extensive epicontinental seas and ineffective deep water oxygenation. On a somewhat smaller scale, Young then examines eustatic control of ironstone deposition in the Ordovician of Western Europe. Similar ideas are discussed by Dreesen, this time in the context of the Upper Devonian of the Ardenno-Rhennish Massif. Sedimentological controls are then discussed in more detail by Teyssen (Liassic Minette ironstones of Luxemburg and France) and by Bhattacharyya (Late Cretaceous, Egypt) and a useful conceptual discussion by Bayer brings this section to a close.

The section on fabrics focuses in part on new kinds of data emerging as a result of technological advances. Hughes presents textural, crystallographic and chemical data obtained by transmission electron microscopy from both berthierine and chamosite-rich ironstones. Berthierines are extremely fine-grained (also goethite) and crystal orientation appears not to reflect the original oolith-forming process. Chamosites are much more coarse-grained, consistent with a genetic link. Similar approaches are utilized by Gehring in a discussion of the formation of goethitic ooids. In a beautifully illustrated paper, Kearsley then demonstrates the value of scanning electron microscopy (including chemical and back-scatter image data) for the description and classification of ooides and how these can be linked to growth processes. Similar data are then used by Chauvel and Guerrak as a basis for discussing oolitization processes in Palaeozoic ironstones from France, Algeria and Libya. The section is completed by a rather different paper from Siehl and Thein. These authors argue that erosion and sedimentation of pedogenic ooidal material is the principal process responsible for minette-type ores.

The fourth and final section consists of four regional case studies. Guerrek describes the temporal and spatial distribution of Palaeozoic oolitic ironstones from the Tindouf Basin in the Algerian Sahara. Two British examples are described by Trythall (Mid-Ordovician ironstones of North Wales) and Myers (Cleveland Ironstone Formation of Northeast England). In the latter paper, the value of portable gamma-ray spectrometry is indicated—both for fieldwork and for certain process interpretations. The last paper, by Garzanti, Haas and Jadool, describes Mesozoic ironstones from the Tethys Himalaya (Zanskar, Northern India).

I must confess here to have been at the original meeting and to have enjoyed it. An interesting group of scientists was brought together from many countries, all of whom seemed to be real

enthusiasts. The editors should be congratulated on imposing reasonably consistent style and, more difficult, nomenclature. The flavour of the original meeting is captured in the volume. Most significantly, a new IGCP project was conceived (277: Phanerozoic Oolitic Ironstones) and I suspect this collection of papers will serve as the base from which many new and exciting projects develop. In this sense, I suspect the volume will become 'required reading' for anyone interested in these fascinating rocks.

C. CURTIS

Bell, K. ed. *Carbonatites: Genesis and Evolution.* London (Unwin Hyman), 1989, xix + 618 pp., 235 figs, 57 tables. Price £85.

This book is timely. Much petrological interest is focussed on the geochemistry of partial melting processes in the mantle, and carbonatites feature strongly in such processes. The book stems from a carbonatite symposium held in Ottawa in 1986.

Of the 23 chapters which comprise the book, five examine the melting processes of variably metasomatized mantle and the nature of the carbonate melts produced, their Mg-rich character and whether they are related to kimberlites and lamproites: Ch. 18 (A. Jones), Ch. 19 (Meen, Ayers and Fregeau), Ch. 20 (Wyllie), Ch. 21 (Haggerty) and Ch. 22 (Eggler). Isotopes, particularly those of Sr and Nd (Ch. 12 by Bell and Blenkinsop) and Pb (Ch. 14 by Kwon, Tilton and Grunenfelder) are used to estimate the metasomatic state of the source mantle and its antiquity (*c.* 2000 m.y.).

Useful tools for modelling carbonatite magmas are provided by the new silicate–carbonate liquid immiscibility phase equilibria data and the silicate/carbonate distribution coefficients of *RE* and other elements determined by Hamilton and colleagues (Chs 15, 16), and by Treiman's new thermochemical and thermophysical properties of carbonate melts (Ch. 5). The chemical and physical characters of extrusive carbonatite lavas and pyroclastic deposits are graphically described by Barker (Ch. 3), Keller (Ch. 4) and Dawson (Ch. 11). Keller's photomicrographs of carbonatite lapilli, shards, spatter and flow textures illustrate well how carbonatite magmas behave.

Carbonatites are now almost commonplace with some 330 occurrences in both continents and oceans; and the Cape Verde occurrences are truly oceanic, being floored by oceanic crust (cf. p. 294). Woolley (Ch. 2) reveals many more in the U.S.S.R. than I had hitherto realized. Woolley and Kempe (Ch. 1) show that nowadays it is necessary to say what sort of carbonatite one is talking about and to give its mineralogy or chemistry. This inevitably leads to identifying carbonatite fractionation sequences. Useful chemical averages are given for calciocarbonatites, magnesiocarbonatites and ferrocarbonatites, which dispel Gold's old 'average carbonatite'.

The origin of carbonatites remains a controversial subject. Almost no support is expressed for the generation of carbonatite magma as a residue from crystallization fractionation of alkali silicate magma. Gittins (Ch. 23) prefers direct melting of partially carbonated mantle, the production of olivine sovite in the crust without the intervention of liquid immiscibility and an increase in the alkali content during carbonatite fractionation. My chapter (no. 17) argues to the contrary: that alkali silicate and carbonate magmas are commonly associated, that experiment shows these two magmas, which can be matched in the field, are related by liquid immiscibility (Ch. 15), and that the carbonate magma so produced could be Na, K-rich and be the source of the fenitization observed around the least fractionated carbonatites. It is also shown how diverse the many paths of carbonatite fractionation can be. Hogarth's chapter (no. 16) is particularly useful. He digests a vast amount of mineralogical data on pyrochlore, apatite and amphibole, much of it in Russian, and produces an invaluable resource for modelling carbonatite fractionation.

Bell has made an excellent job of bringing together so many disparate views into a readable text. However, as he says, not enough is said about fenitization and the role of alkalis, and these to me are among the 'hallmarks' of carbonatite magmatism. Nor are fenite data as sparse as he suggests. The book also fails to do justice to the other half of the carbonatite story, that is the associated alkaline silicate rocks.

Using single column rather than double column format by the printers is unfortunate, but it has forced use of a large print size which is good for those with poor eyesight. Even carbonatitologists will find the £85 excessively expensive. Every Earth Science library will need to buy a copy, as all petrologists, mineralogists and geochemists must consult this book.

M. J. LE BAS

Crawford, A. V., ed. *Boninites and Related Rocks.* London (Unwin Hyman), 1989. xxiv + 465 pp. Price £60.00.

Twice in the last twenty years petrologists have had to come to grips with a new addition to the familiar trilogy of tholeiitic, alkaline and calc-alkaline rock series. Komatiites are now familiar