

Lakeland's oldest traditional industries. This has been an important but intermittent feature of the Caldbeck Fells from at least the 16th Century until the final closure of Carrock Fell Mine in 1981. After an introductory section, rather more detail is offered on the more important mines and mineralized sites. A chapter on the activities of mineral collectors and dealers gives a valuable insight into an important, but often neglected, aspect of mineralogy. It is interesting to learn here that for some reason Caldbeck Fells were largely ignored by scientists and collectors during the early years of mineralogy. Even in the 19th Century comparatively few dealers and collectors seemed to have been attracted to the area, in striking contrast to the over-collecting and damage caused to many sites in recent years.

In the second part of the book attention is turned to the minerals for which the area is famous. As the authors point out the area contains a greater abundance of mineral species than any other area of comparable size in Great Britain. For this section they opt for a descriptive catalogue in which all the vein minerals are listed: so called 'rock-forming' minerals are generally excluded, though listed in an appendix. Much of the information contained in this section is, of necessity, quoted more or less directly from the mineralogical literature and, although in large measure duplicating earlier compilations, the authors add numerous original observations drawn from both their own work and those of a small number of mainly amateur collectors. Within this section, and elsewhere in the book, some 61 mineral specimens are illustrated, all, except a handful of SEM pictures, in colour. Although the photography is of high technical quality there is a surprising dearth of illustrations of fine specimens from the national collections. Only 14 of the 61 are Natural History Museum specimens. The majority are specimens from private collections despite the authors' comment that for Caldbeck Fells minerals the collections of the Natural History Museum are 'without parallel'. An opportunity appears to have been missed to illustrate and discuss the history of some of the best specimens ever collected from the area as was done to great effect in 'Minerals of Devon and Cornwall'. Mineral species are listed by locality in a generally useful appendix which is, however, rather spoilt by the inclusion of the authors', apparently arbitrary, assessment of the 'importance' of certain occurrences. For example, it is difficult to understand why the occurrence of the recently described mattheddleite is accorded local importance at two sites, national importance at one and no particular significance at another. One

small error noted here and in the catalogue: Carrock Fell Mine is not the first published British occurrence of powellite.

Criticisms of this book are, however, minor and detract little from what is undoubtedly a valuable addition to the literature of British Mineralogy. It will appeal equally to both the amateur and professional mineralogist. Not only are the authors to be congratulated on a fine piece of work, but the Natural History Museum deserves praise for initiating what promises to be a splendid series of books on British Mineralogy.

B. YOUNG

Naldrett, A. J. *Magmatic Sulfide Deposits*. Oxford and New York (Oxford University Press), 1989. viii + 186 pp. Price £40.00.

The magmatic sulfide deposits, a major world source of a range of metals including nickel, cobalt, iron and the platinum group elements (Pt, Pd, Rh, Ru, Ir, Os), have been a subject of research since the discovery of such classic deposits as those of the Sudbury Basin nearly a century ago. The last thirty years have been a particularly active period, with the traditional field of geological and petrographic methods being supplemented by the full range of modern analytical techniques, and with both experimental and theoretical approaches. There is, therefore, a very large body of information and this has never been comprehensively reviewed. This volume by Tony Naldrett sets out to do just this and, in the words of the author, to 'freeze and preserve, at this instant in time . . . understanding of magmatic sulfide ores'.

'Magmatic Sulfide Deposits' is comprised of seven chapters. Following an introduction dealing with general aspects of the geochemistry of transition metals and the arguments for a magmatic origin of Ni-Cu-PGE ores, the structure of the book is explained so as to lead the reader into Chapter 2 which treats the problem of classification of mafic and ultramafic rocks and the related magmatic sulfide deposits. Chapter 3 deals with the experimental studies undertaken on the relevant sulfide, sulfide-oxide and sulfide-silicate systems, whereas in Chapters 4 and 5 (the 'heart of the book' as pointed out by the author) are presented descriptions of a wide range of Ni-Cu and PGE-rich deposits along with discussions of their modes of origin. The large body of analytical data on the compositions of magmatic sulfide ores is critically reviewed in Chapter 6, and the use of genetic concepts in exploration for magmatic sulfide ores is the subject matter of the final

chapter. An extensive bibliography (about 300 references) and index complete the text.

Tony Naldrett is the leading world authority on magmatic sulfide deposits. This book reflects that fact in being a well-balanced appraisal of our current understanding of these ores. In drawing upon a wealth of experience in all aspects of the study of magmatic sulfides, the author is also able to offer unique insights and thus create a work that goes well beyond being a mere review. It is also a very well written, illustrated and produced book that sets the standard for works dealing with major classes of ore deposit. It is highly recommended as an essential purchase for Earth Science libraries, and scientists with a professional interest in the magmatic sulfides.

D. J. VAUGHAN

De Brodtkorb, M.K. (editor). *Nonmetalliferous Stratabound Ore Fields*. New York (Van Nostrand Reinhold), 1989. xvi + 332 pp. Price £44.50.

One of the 'Evolution of Ore Fields Series', this book provides a structured series of fourteen chapters contributed by an international group of authors on the subject specifically of stratabound deposits of celestine, baryte, magnesite and fluorite. It combines descriptive accounts of the different ore fields with synthesis of the geological environments and processes of mineralization involved. Within the confines of a single volume, the breadth of subject matter has led to compromises resulting in a book that is neither a truly rounded textbook nor a rigorous set of technical descriptions. Nevertheless, the choice of subject is novel and has the virtue of bringing together diverse aspects of geology which blur the distinctions between hydrothermal, sedimentary and diagenetic processes of mineralization. Similarly, it can be said to bridge the conceptual gap between the metalliferous mineral deposits and those of the so-called 'industrial minerals'. A book which cuts across divisions in the earth sciences is to be welcomed.

The foreword, by the series editor the late Dr Wilfred Walker, seeks to set an underlying theme of relating mineral deposition to crustal evolution. The two short opening chapters which follow deal respectively with the use of Sr isotopes as natural tracers and with aspects of Ba geochemistry. That on isotopes is regrettably brief, and could usefully have incorporated sections on the application of S and O isotopes to genetic interpretations. The second says surprisingly little about the crucial question of baryte solubility, while devoting much

of its brief span to strontium concentrations and isotope ratios in baryte.

After the opening section, the book settles into descriptions of ore fields grouped by mineral commodity and then geography. An excellent chapter looks at celestine ore fields in several parts of the world, including the Bristol area of the UK, and discusses their relationship to evaporite deposition and diagenesis of carbonates. Then come eight chapters dealing chiefly with baryte deposits in different countries and of contrasting genetic types. Taken as a group, these are of considerable interest for the manner in which contrasting evaporitic, karstic, diagenetic, exhalative and epigenetic ore types are considered. The first two describe sedimentary and hydrothermal baryte (and celestine) from Precambrian to Jurassic age in Argentina and Brazil. They are well set out and of obvious interest to an English-speaking readership. Next comes a description of the widespread North American baryte ore fields, though excluding those in Arkansas. Here the great range in genetic type and tectonic environment of baryte deposition is again apparent. The following chapter deals specifically with Arkansas, and gives a detailed description of syngenetic baryte deposits in relation to sedimentary processes. Two chapters on European ore fields follow a similar pattern to those on North America in that one takes a broad geographical view, while the second is specifically about Sardinian ore fields. Both emphasize contrasting exhalative, unconformity-hosted and karstic ores. That on Sardinia also describes recent alluvial and placers deposits, and like that on Arkansas is able to give considerable detail on what is in effect a single broadly defined ore field. The next chapter looks at baryte in the Japanese Kuroko-type ore fields, thus turning to the high-temperature, volcanogenic, polymetallic style of baryte ores. The last chapter of this group returns to Argentina and Spain to discuss sedimentary-diagenetic baryte nodules and concretions, and aspects of their trace element geochemistry.

The final three chapters comprise one on magnesite ore fields, one on fluorite, and a brief summary which also adds details on areas neglected in the preceding body of the text. That on magnesite returns to the theme of contrasting origins, here between ores in ultramafic, evaporitic and lacustrine settings. The chapter on fluorite also emphasizes sedimentary and palaeogeographic factors in deposits varying from Cretaceous in Italy to Precambrian in the Transvaal.

Clearly, the book covers a great deal of ground. Besides filling a gap in the geological literature, it successfully brings out the great variety of pro-