

The book is divided into seven sections of unequal lengths. An introduction gives an account of the history of exploration—the initial discovery was signalled in *Nature* in 1964—and is followed by an account of the geological and geophysical setting. The hot brines occur within the volcanically active axial trough of the Red Sea which splits the main trough down the centre. Seismic refraction and drilling results indicate that the main trough is underlain by a thickness of about 4 km of largely Miocene evaporites. A section on water follows. (This section, and all the remainder of the book, relies heavily on the data collected by the research vessel RV Chain in 1966, during the first cruise planned solely as a study of the hot brines area. Both the editors and 25 per cent of the contributors appropriately hail from Woods Hole Oceanographic Institution, the owners of RV Chain). It is shown that the brines were formed, not by the evaporation of seawater, but from normal seawater circulating through the evaporites, warmed by the high geothermal heat flux, and collecting their heavy metal content from emanations associated with basalt volcanism. Turning to the sediments, under the heading "Organisms", we learn that the brines are sterile in spite of the fact that reducing bacteria are claimed to be responsible for availability of sulphide ions required to precipitate the metals as sulphides in the sediments, and that the chronology of several glacial stages has been recognized in the microfossils and dated by radiocarbon. The sediments themselves are discussed next; this section ends with an interesting paper in which H. L. James shows that the metalliferous deposits are not at present much like either the banded iron ores of the Pre-Cambrian or the oolitic iron ores. There follows a short but important section on the economic and legal implications of the deposits. The Atlantis II Deep deposits contain 29 per cent Fe, 3.4 per cent Zn, 1.3 per cent Cu, 0.1 per cent Pb, 54 p.p.m. Ag and 0.5 p.p.m. Au; their value to the smelter would be about 2.5 billion dollars, if they could be got there. Two academic authors think the deposits may be "attractive for exploitation"; two from the mining industry conclude they "are of more academic than economic value". If the nearest country owns the sea-floor, then the deposits belong to the Sudan. We are told that at least one group has applied thence for mining rights and another has incorporated in Lichtenstein on the theory that no country owns these deep water areas. The book ends with a summary chapter by Emery, Hunt and Hayes of Woods Hole. These authors have made a good job of pulling together the sometimes discordant conclusions of the preceding forty-nine papers.

The editors have obviously insisted that each paper be provided with an abstract, introduction and conclusion, thereby making my job more feasible. The abstracts vary from excellent to terrible: there are ten uninformative ones (The location of our holiday is described and our activities whilst away are enumerated), and forty useful ones (We spent our holiday at Brighton where we sat on the beach and ate winkles). This must mean something about the authors. The book is well produced and well indexed. Because "The editors will contribute all (their) royalties . . . to the libraries of the ships that have explored the hot brine region of the Red Sea" it is clearly in my interest to urge all departmental librarians to buy a copy. In any case this is a book that all sedimentary petrologists and most oceanographers will want to own.

D. H. MATTHEWS

GEMS FOR ALL

The Mineral Kingdom

By P. E. Desautels. Pp. 252. (Hamlyn: London, November 1969.) 63s.

To mineral collectors, whether amateur or professional geologists, there is perhaps nothing so satisfying as finding

a fine example of an uncommon or even a common mineral. It is to these people that this book is addressed.

Being American in origin, its bias is naturally towards the United States, where "rock hounds" and geological societies are much more common than in the United Kingdom. This book sets out to stimulate the beginner in the subject and to satiate the connoisseur, and in both respects it succeeds admirably. Part of its success must be attributed to the superb reproductions of the colour photographs of mineral species selected from international collections and not confined to the Smithsonian Institute collection where the author is curator. These plates are so good that, at the risk of speaking heresy, one could almost learn to recognize minerals from them.

The text of the book, while giving salient "textbook" facts about minerals, also contains a great deal of absorbing information not often included in mineralogy books. For example, a chapter is included on the relationship of minerals to other sciences, and there is also a short history of mineral discoveries which traces the progress from the earliest time to the present day evolution of the science of mineralogy. This leads into a discussion of the external appearance and crystallography of minerals—a branch of the subject often given scant treatment even in more formal educational works—thus providing a firm foundation for mineral identification techniques. But, surprisingly, there are no identification tables or properties of minerals included. A very useful account of gem minerals follows, the more so because it deals with the often overlooked semi-precious gems. The mining, not only of gemstones but of other economic ores, is then described, including the methods by which the "pay" metal is extracted. In this chapter, which really puts the subjective in perspective, the most important mineral localities are described. From an economic point of view minerals are of fundamental importance to industry and the chapter on the use to which minerals are put describes their very diverse applications. The book ends with a chapter devoted to the hobby of collecting, which explains collecting methods and includes some useful information for the lapidary as well.

In such a well produced book as this which has so obvious a general appeal, it is unfortunate that there has been no attempt to bring all the minerals together in a glossary with their properties. The absence of any further reading list to assist the much encouraged beginner is also a pity.

Nevertheless, anybody with any interest whatsoever in minerals and mineral collecting would find this a thoroughly fascinating volume, and even students might be tempted to afford it. Perhaps the highest compliment I can give is that it is the sort of book which one geologist or mineralogist might give another.

JOHN R. V. BROOKS

MINERAL CHEMISTRY

Mineralogical Applications of Crystal Field Theory

By Roger C. Burns. (Cambridge Earth Science Series.) Pp. xiii + 224. (Cambridge University Press: London, January 1970.) 80s; \$13.50.

DR BURNS's book arouses more than usual interest not only because it is the first of the "Cambridge Earth Science Series" but also because it is probably the first to deal with crystal field theory applied to mineralogy and geochemistry. There has been a steady flow of papers on this subject and one is glad to see many of them brought together here. Some of the material is covered in degree courses and there was a need for a text of this kind.

The subject matter of this slim volume ranges wide from causes of colour in minerals to enrichment of elements in manganese nodules, yet each topic is treated to an adequate depth. The book is very much a review and as up to date as the publishing time would allow, but it is a pity that no mention is made of the potentialities and