

covers a digest of work on Japanese clays. Not only is this work very substantial in volume, but it is scattered through a wide range of journals, mineralogical, geological, geographical, pedological, and ceramic—and some of this is by no means easy to obtain in Europe.

The first chapter, which comprises nearly a third of the total text (by Sudo), is intended as a general introduction and begins with a short section on techniques of identification which is probably the weakest in the book; by limiting itself to descriptions of the use made by Japanese workers of the available methods it would be very difficult to understand by anyone not already familiar with the subject. The next section on modes of occurrence is a useful summary; it is then followed by a detailed description of each of the clay minerals.

Chapter 2 (by Nagasawa), on the weathering of pyroclastics, is a brief but succinct account of a subject little studied outside Japan. The following section (by Shirozu) deals with the Kuroko deposits, an area of much wider interest than simply clay mineralogy; by concentrating on the clay minerals, however, the author sheds new light on these intriguing formations.

The remainder of the book takes each individual group of clay minerals and describes their Japanese occurrences and mineralogy in great detail. There is a wealth of information here quite invaluable to the specialist who needs comparative data. Perhaps the major criticism of this book is that such a specialist, in order to find the data he needs, on, say, allophane, would need to search not only the chapter on this mineral, but also the long section in the introduction on it, and parts of other papers as well.

It is perhaps too much to hope that in a subject so large and incoherent as clay mineralogy, the editors could have provided more systematization; as it is, the work offers little to the non-specialist reader, except a general impression that clay minerals in Japan are very different from those of Western Europe. It also seems very strange that the book should appear in a series devoted to sedimentology; since the approach is almost purely mineralogical, and the majority of the minerals described are of hydrothermal origin.

J. E. PRENTICE

Williams, H., and McBirney, A. R. *Volcanology*. San Francisco (Freeman, Cooper & Co.), 1979. 398 pp., 233 figs. Price \$33.50.

In their preface the authors state that their intention is to summarize the present state of knowledge of volcanoes and to provide an advanced reference book. They have succeeded in this and have

produced a logically organized work that provides a readable account of volcanic processes and is also a source of detailed descriptions of volcanic activity and its products. The book does not pretend to provide the answers and part of its value is that the reader is left to decide for himself between the various proposals.

The introduction provides a brief historical background to the development of igneous petrology, marking some of the major landmarks. The point is fairly made that despite the strong accent on laboratory studies of volcanic rocks observation of eruptions still provides insights unobtainable in any other way.

Chapter Two, on the physical nature of magma, reviews what is known of the rheological, thermal, and other physical properties of magma. Here what could have been an uninspiring listing of properties is made both readable and relevant to geological problems.

The long and interesting Chapter Three on the generation, storage, and rise of magma leads one to wonder how magma is ever produced, let alone becomes lava. The manifestly self-evident fact that magma has been produced on a considerable scale throughout Earth history, coupled with the knowledge that temperature increases with depth, led geologists to the facile conclusion that melting readily occurs and that there is easily available adequate pressure to drive magma to the surface. Yet as Williams and McBirney show, it is not that simple. They briefly review three mechanisms by which the mantle may melt—local influx of extra heat, rapid uplift, and addition of volatiles. They clearly doubt the ability of these mechanisms to produce much basalt, but acknowledge the importance of volatiles in calc-alkaline volcanicity. From the inadequacies of the three obvious mechanisms they are thrown back on Daly's model of magma being kept in 'hot storage' in a vitreous substratum. While appreciating the lack of support from seismic evidence for a glassy layer the authors rightly imply that there is still much to be learned about the physical properties of rocks at elevated temperatures and pressures before it can be ruled out.

A similar approach is adopted to the problem of rise of magma. The treatment provides a judicious mixture of geological observation and physical objection. Because the book does not aim to have all the answers this reviewer now feels far less unhappy at the unconvincing replies he gave his first year when they wanted to know just how the Whin Sill was emplaced!

The section of the book devoted to processes of volcanism is completed by a useful chapter on the mechanics of eruption.

Chapters Five to Twelve are essentially descriptive and the chapter headings summarize their contents very well. This part of the book clearly draws heavily on the authors' own experience and observations and is an important addition to the literature on volcanology.

In keeping with the overall approach of the book Chapter Thirteen on volcanism and orogeny stresses the structural and geophysical aspects. The global distribution of modern volcanic activity is described in a plate tectonic framework and a non-mathematical approach is adopted for the discussion of local controls of the siting of vents. The section on the interpretation of palaeo-volcanism, which points out the inapplicability of some of the laws of stratigraphy to volcanic sequences, should be mandatory reading for visitors to North Wales or the Lake District. The final section in this chapter on the relationship between compositional variations and structural settings is of a very general nature and no analyses are presented. While the authors do not comment directly on the employment of geochemistry as a predictor of tectonic setting they do point out the extreme variations of chemistry that may be encountered along as well as across volcanic chains. This is one of the few places where the reviewer felt the book would have been strengthened by an expression of the authors' own views.

It is difficult to imagine a book on volcanology without a chapter on gases and hydrothermal phenomena, but it is very far from clear how much studies of gases have aided the interpretation of volcanological events. Chapter 14 makes the matter no clearer. The section on hydrothermal phenomena is interesting and provides a convenient summary of the workings of hydrothermal activity and its use as a supply of energy. However, it does not add significantly to the book as a whole.

The book is well produced and at £19.50 cannot be considered expensive. However, because a matt paper is used the details in the photographs are not as sharp as they would be on gloss. The line diagrams are heavily drawn, with a quasi-italo-gothic script for the notations, but notwithstanding most of them are very easy to read and illustrate the material well.

Overall the work achieves the objectives set out in the preface. The middle chapters provide a first-rate source of authoritatively written material for postgraduate students and others starting research in volcanology while the early chapters would give final year undergraduates a valuable insight into processes leading to intrusion and extrusion of magma.

R. M. F. PRESTON

Mitchell, A. G. H., and Garson, M. S. *Mineral Deposits and their Global Tectonic Settings*. London (Academic Press), 1981. xviii + 405 pp., 164 figs., 1 pl. Price £23.60.

This interesting book follows a series of papers by both authors discussing apparent relationships between mineral deposits and plate tectonic processes, of which some twenty-one by Dr Mitchell and others, and a further six by Dr Garson and co-workers, are cited in the reference list. Despite the prolific output of publications on the subject of metallogeny and plate tectonics during the last decade, the value of the resulting hypotheses as a practical aid to prospecting is still regarded by many exploration geologists with some scepticism. It is interesting, therefore, to note that Mr R. Rice, an eminent exploration geologist with Riofinex Ltd., should have written such an enthusiastic foreword.

The book is systematically structured and readable, and describes relationships between mineral deposits of various types and plate tectonic settings, in a logical arrangement. After an introduction in which global metallogeny is discussed in the context of geotectonic theory development, individual chapters are devoted to: deposits formed at continental hot spots, rifts and aulacogens; passive continental margins and interior basins; oceanic settings; subduction and collision related settings; transform faults and lineaments in continental crust. The book ends with a discussion of relationships between mineralization and the Wilson Orogenic Cycle, and possible uses of plate tectonic models as guides for mineral exploration. There is an interesting index summarizing the authors' interpretation of relationships between individual metallic elements and plate tectonic environments.

Inevitably, in writing about such a controversial aspect of earth sciences, the authors find themselves in strange company. The reference list of some 750 papers includes one of the privately published books of Mr J. H. Tatsch whose concept of the 'tectonospheric earth' appears to this structural geologist to approach the bizarre. Some of the illustrations purporting to show correlation between metal deposits and major crustal structure bear little relation to tectonic history and rock distribution as represented on geological maps. This is shown by fig. 158 from Kutina's work illustrating a postulated correlation between major hydrothermal ore deposits (large dots) across the entire width of North America, and the extrapolated projections, on shore, of the Mendocino, Pioneer, and other transform fault zones in the floor of the Eastern Pacific.