volcanic activity. However, because our sampling is often constrained to the plutonic member of these systems, our understanding of their evolution is sometimes poor. A number of papers in this volume tackle this problem. Lipman describes a rare example from New Mexico of exposure of both plutonic and cogenetic volcanic members, whilst Druit and Bacon infer the history of the Mount Mazuma magma chamber from the vertically zoned calc-alkaline magmas erupted.

Similarly, Bussell discusses the structure and petrogenesis of a Peruvian Coastal Batholith ring dyke in relation to the evolution of the magma chamber from which it originated. The overall impression gained from these contributions is of the need to consider the upper crustal silicic magma chamber as an open system, subject to a complex evolution of differentiation, tapping and replenishment. Whole-rock trace element (particularly *REE*) data have long been considered important in the modelling of the granite fractionation process. However, an enlightening paper by Sawka illustrates the inherent difficulties of this technique. Here, he suggests that the large variations in hornblende and accessory mineral *REE* concentrations observed across the zoned McMurry Meadows pluton (California) are due both to changes in partition coefficients and crystallization sequence. Thus the geochemical modelling of granite fractionation is far from simple and must take into account these changes.

In summary, this volume covers a variety of current granite studies, mostly at an appropriate introductory level, and would therefore provide useful reading for the final year undergraduate and the new postgraduate alike, to whom I would particularly recommend it. When more depth is sought, the volume's long reference lists do not prove disappointing, and make for many a happy hour amongst the journals.

A. SHAW

Date, A. R. and Gray, A. L. (eds.) *Applications of Inductively Coupled Plasma Mass Spectrometry*. Glasgow (Blackie), 1988. xi + 254 pp. Price £45.00.

The successively linking of the ICP to the mass spectrometer has presented the analyst with a most valuable addition to the range of techniques available for elemental analysis. This book presents, in a concise, readable and informative manner, a summary of the development, principles and likely applications of the technique. It appears at a most opportune time. There is now sufficient practical experience of the use of ICP-MS over a range of routine applications to make a realistic evaluation. The increasing demands of elemental analysis has greatly concentrated attention on new methods of determination—especially at the lowest levels of measurement.

The book includes a series of contributions by experts in different application fields. It has been edited by Drs Date and Gray, who have themselves done so much to develop and establish the technique. The early death of Alan Date before the publication of this book is a matter of profound regret to all who knew him.

The first chapter of the book, by Alan Gray, describes the 'origins, realization and performance of ICP-MS'. It incorporates a wealth of experience and provides a revealing insight into what can be expected from an ICP-MS system. The outstanding detection limits and the comparative simplicity of the spectra from ICP-MS are documented. The chapter also presents a salutory account of the interferences encountered in ICP-MS, from oxide, doubly charged and polyatomic ions, isobaric overlaps and matrix suppression of the signal.

It is appropriate that the second chapter of the book should be on the applications of ICP-MS to the earth sciences—written by Alan Date and Kym Jarvis. In the UK much of the support for the development of ICP-MS has come from the Natural Environment Research Council (through the British Geological Survey). The successful determination of so many elements (rare earths, platinum group metals, etc.) in a difficult matrix like silicates demonstrate the potential of the technique.

Other chapters illustrate the rapid growth in 'real world' applications of ICP-MS. In water analysis the method offers exciting possibilities, including the measurement of many of the elements at ultra-trace level, which have hitherto not been determined. Chapters on the application of ICP-MS to such diverse materials as environmental samples, petroleum and metals will not only be a great use to those working in these fields, but give added conviction to the widespread acceptance of the technique. There are also chapters on isotope ratio measurements and stable isotope trace applications with a useful appendix listing the naturally-occurring isotopes.

This book should prove invaluable to the growing body of people actively engaged in ICP-MS analysis. It contains much information for the day-to-day operation of the ICP-MS. It will also be of value to those seeking advice and guidance on the suitability of ICP-MS in a particular application area. It is well presented and although multi-authored the text retains a common theme,

and repetition of material has generally been avoided. Overall it should be most strongly recommended.

J. N. WALSH

Brown, M. E. *Introduction to Thermal Analysis: Techniques and Applications.* London and New York (Chapman and Hall), 1988. viii + 211 pp., 113 figs. Price £17.50.

Most mineralogists are familiar with differential thermal analysis and thermogravimetry, and possibly with differential scanning calorimetry and evolved gas analysis, but what about thermomagnetometry, emanation thermal analysis and thermosonimetry? All is revealed in this fluently written book. Following a prominent definition of thermal analysis (the measurement of changes in physical properties of a substance as a function of temperature whilst the substance is subjected to a controlled temperature programme) and two introductory chapters, these techniques and many others are described systematically, starting with theory and principles, through relevant equipment, ending with well chosen examples of applications (a good number of these from the Earth Sciences). There are also chapters on the use of microcomputers in thermal analysis, derivation of reaction kinetics from thermal analysis data, and purity determinations of compounds from measurement of melting points, and guides are given to the literature of thermal analysis and to the main manufactures of thermal analysis equipment. Appendices list introductory experiments in thermal analysis and computer programs for data capture and processing.

This book is an excellent introduction to thermal analysis both at the undergraduate level and for established workers in other disciplines who might wish to apply these techniques in their research. It is also priced realistically!

D. J.MORGAN

Dyer, A. *An Introduction to Zeolite Molecular Sieves.* Chichester (John Wiley & Sons), 1988. xiii + 149 pp., 94 figs. Price £29.50.

This short but rather expensive book is intended as a general introduction to zeolite science and covers the geological occurrences of zeolites, structures of natural and synthetic forms, techniques used to characterize zeolite structures, their synthesis and stability, and the theoretical and practical background to the uses of zeolites as ion exchangers, catalysts, molecular sieves and drying agents. It concludes with a short account of recent research into the synthesis of zeolite-like compounds containing Ga, Ge or P substituting for Si and Al in framework sites.

Although useful and readable summaries are given of zeolite structures, synthesis and uses, the overall value of the book is marred—most certainly for a mineralogist—by a superficial account of the genesis of natural zeolites (one section heading reads 'hydrothermally treated' for hydrothermally-formed zeolites) and a very poorly organized account of methods for zeolite structure identification. Under 'X-ray methods', X-ray diffraction gets a very brief treatment and the reader is left in doubt as to exactly *how* diffraction data are used to determine structures; in this section the statement is also made that X-ray fluorescence analysis is normally limited to atoms of atomic number greater than 20. Scanning and transmission electron microscopy are dealt with under 'Other diffraction techniques' and the section on nuclear magnetic resonance spectroscopy fails to explain satisfactorily the principles of this powerful technique for determining atom distributions within zeolite frameworks. Techniques are not, in fact, a strong point of this book: a separate chapter on the relative stabilities of zeolite structures to heat makes extensive use of differential thermal analysis and thermogravimetry but is illustrated by very poor-quality curves—for instance, the DTA curve in Fig. 82 is featureless and shows marked baseline drift, yet is cited as an example of quantification of a dehydroxylation process.

There is no doubt that parts of this book should have been subject to a more critical pre-publication review than has obviously been the case. Unfortunately, there is also little evidence of serious proof checking—the old favourite 'mineralogist' and 'phosphorous' appear in Chapter 4, 'data' are often treated as singular, and the horizontal axis of Fig. 80 has 'tonic' for ionic radius. The idea for this book was a good one but the author has been badly served by his publishers.

D. J. MORGAN

Kalló, D. and Sherry, H. S. (editors). *Occurrence, Properties and Utilization of Natural Zeolites.* Budapest (Akadémiai Kiadó), 1988. xii + 857 pp., 256 figs. Price $69.00.

Synthetic zeolites are used extensively by the petrochemical industry as catalyst and as molecular sieves to separate, on the basis of size and/or shape, components of liquid or gaseous mixtures. They are also now important constituents of