treated in a series of separate 'boxes' which are cross-referenced with the normal text. In addition to worked examples through the text, most chapters end with a series of problems, the answers to which are given at the end of the book. As might be expected for such a book, some parts are treated too superficially, but overall the information is well balanced and students with little or no chemistry will find it a useful text. Nevertheless, it should be stressed that this is emphatically not a geochemistry textbook and, once students understand the basic principles, it will be necessary for them to consult more-specialised mineralogy, petrology and geochemistry books, many of which are recommended in 'Further reading' lists.

The production of the book is generally good; the figures are particularly well thought-out and clearly drawn and the print is clear with only a few typographical errors. There is one very surprising error on page 80. Due to a miscalculation in the molecular weight of $MgCO_3$ the mole fraction of $CaCO_3$ in dolomite is reported to be 0.514! A minor niggle in this section is that integral approximations are used for atomic weights without comment.

It is always possible with this type of introductory text to criticise particular omissions or oversimplifications but I have refrained from doing this. The author has prepared a comprehensive and very useful introductory chemistry text for Earth Science students and I can strongly recommend it—at £14.95 for the paperback version it is very good value.

C. M. HENDERSON

Brown, P. E., Editor. *The Origin of Granites.* Edinburgh (Trans. Roy. Soc. Edinburgh, vol. 79, parts 2 and 3), 1988. viii + 350 pp. Price £25.00.

In recent years there has been much debate on the genesis of granite. An international symposium entitled 'The Origin of Granites', held in Edinburgh in September 1987, brought together many researchers in this field and prompted much useful discussion. Most of the papers presented at this symposium are published in this Royal Society of Edinburgh volume.

The topics covered by the contributing authors may be grouped into three broad categories, which reflect the main areas that we have to consider in the investigation of granite origin. These are concerned with the nature of the source, the mechanism of production, and the subsequent evolution of the granite magma. Most controversial, perhaps, is the problem of source. The opening paper by Chappell and Stephens deals with the origin of infracrustal granites, with particular reference to the Lachlan and the Caledonian Fold Belts. This serves as a useful reminder, as well as an update of the much-used I-type and S-type granite classification of Chappell and White (1974). Now more descriptively termed infracrustal and supracrustal, the two groups are defined according to the non-weathered (igneous) or weathered (sedimentary) character of their source. Whilst rather dated, this simple classification is appropriate in certain provinces, several of which are described in this volume. For instance, of supracrustal affinity are the leucogranites of the Himalayan collision orogeny (France–Lanord and Le Fort). In contrast, Silver and Chappell discuss the Peninsular Ranges Batholith of California where all granites appear to be infracrustal. Unfortunately, only one paper (Pankhurst *et al.*) is concerned with the more complex (and more common?) situation of supracrustal and infracrustal source mixing. The important role of Sr, Nd and O isotopic techniques in the identification of granite source is adequately discussed, however, there is little mention of Pb isotopic data. An informative paper by Taylor deals more specifically with O isotope systematics, particularly with the role of $^{18}O/^{16}O$ studies in determining the origins of the aqueous fluids involved in producing granitic magmas.

Several of the papers that discuss the cause and method of granite genesis are especially useful in the context of this volume. In all of the contributions concerning infracrustal granites, basalt underplating is suggested as a mechanism that may have been involved in their generation. Of particular relevance, therefore, is the paper by Huppert and Sparks, in which they investigate the thermal role of basalt sill intrusion (a process that may occur during underplating) in the melting of the lower crust. Their experimental and theoretical studies support the effectiveness of this mechanism in the production of large volumes of silicic magmas. An interesting paper by Pichavant and Montel discusses the conditions rather than the means of crustal melting. Most important is the contribution by Miller *et al.* Here we are reminded that a large source region is almost inevitably heterogeneous, and, as such, is likely to pass on some degree of heterogeneity to any granites derived from it. Extent of pluton homogeneity may therefore be an effective indicator of the process of magma segregation and transport.

It is well understood that high-level silicic magma chambers may feed contemporaneous

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,