

BOOK REVIEWS

Pritchard, H. M., Alabaster, T., Harris, N. W. B. and Neary, C. R., Eds. *Magmatic Processes and Plate Tectonics*. London (Geological Society Special Publication No. 76), 1993. Price £65.00. x + 526 pp.

The title is slightly misleading in that this book is not a comprehensive treatment of the magmatic processes arising from, or related to, plate tectonics. It is a collection of papers by the friends, colleagues and co-workers of the late Ian Gass to commemorate his life and work and the title is an imaginative (and reasonably accurate) attempt to define a common theme relating the contributions.

I have to confess to a general dislike of books consisting of a collection of papers (as opposed to individually authored chapters written to an editorial brief) since they are often little better than conference proceedings with a mix of (too few) good and (too many) bad papers which the editors, having invited them, feel obliged to publish. While not without its weak spots, *Magmatic Processes and Plate Tectonics* rises above this criticism and that it does so must be due as much to the wide, but clearly focussed, research interests of Ian Gass himself as to the quality of papers, editorial skill and conscientious refereeing which have obviously gone into this volume. The book is divided into five sections (in reality, four plus a single paper) each of which reflects one of Gass's major interests.

The first section — *Mantle and magmatic processes* — contains four papers. Particularly interesting is the one on trace-element geochemistry by O'Hara. After contrasting the behaviour of trace-elements in equilibrium partial melting/crystallization with that in perfect fractional melting/crystallization, he argues that perfect fractionation is geologically implausible and goes on to demonstrate that even small departures from perfect fractionation dramatically reduce the contrast with equilibrium effects. Although conceptually difficult to follow it is worth the effort for the potential importance of the conclusion. Also in this section is an individualistic 'review' by Walker of various aspects of basaltic volcano systems which is an extremely useful source of information and commendable for the world-wide nature of its examples.

The second and, in my view, the best section of the book consists of eleven papers on *Ophiolites and*

oceanic crust. Perhaps not surprisingly, five of these deal with the Troodos ophiolite of Cyprus beginning with a fascinating, if rather long, historical review of the development of ideas on Troodos by Robertson & Xenophontas. Obviously space prohibits comment on every paper but four of the other contributions in this section merit special mention for various reasons. In a particularly well written and illustrated paper, Bartholomew gives a lucid explanation of how two coexisting foliations could arise in the tectonised harzburgites of ophiolite complexes through the interaction of two adjacent asthenospheric uprise systems such that the shear flow produced by one is subsequently deformed by flow from the other. Roberts and Neary give an otherwise excellent review of current thinking on the petrogenesis of ophiolitic chromite in which a little more space could have been devoted to the interesting genetic models of Lago *et al.* (1982) and Leblanc & Ceuleneer (1992). Elderfield *et al.* review the effects of hydrothermal plumes in adding to and, more importantly, subtracting from element concentrations in sea-water. Perhaps surprisingly, they conclude that hydrothermal plumes may be more of an element sink than a source. Menzies *et al.* report the results of experimental serpentinisation of MORB peridotite by sea-water. On the whole, these are straightforward but in some of the experiments the products have higher $^{87}\text{Sr}/^{86}\text{Sr}$ ratios than either of the starting materials (matching some natural serpentinites). The implication that Sr isotope fractionation can occur during a mineralogical/geochemical process with all this could mean for the geological use of such isotopes would seem to merit more attention than the authors' dismissal as 'undefined processes occurring in both nature and the laboratory'.

The section on *Tectonics and convergent margins* has six papers covering a wide range of topics from a discussion [Dewey *et al.*] of the interesting problem of how crustal rocks can ever reach depths appropriate to eclogite facies metamorphism to an attempt [Wyllie and Wolf] to resolve uncertainties over the position of the solidus and size of the melting interval for dehydration melting of amphibolite — a potentially important process in mantle wedge melting. Also in this section is a paper by Pearce and Parkinson in which they model the distributions of a large range of elements (from very highly incompatible to compatible) in a number

of mantle melting scenarios. These are then compared with actual MORB-normalised distributions for a range of basalts and 7 types of pattern recognised which the authors relate to the different melting models.

The fourth section on *Continental rifting* contains five papers, two of which deal with basalts originally studied by the 1964 expedition to the Red Sea area led by Ian Gass. In the first of these Cox *et al.* attribute compositional variations in the Shuqra basalts of Yemen to mixing of an evolved alkali basalt melt and restite, an interesting consequence of which is the need for an amphibole-bearing mantle source. In the second Rodgers interprets the basalts of the Red Sea islands as primitive mantle melts and demonstrates an interesting relationship with stretching factors when these lavas are compared with basalts from the Ethiopian Plateau, Afar and the Gulf of Aden.

In the final 'section' on *Analytical techniques* Potts *et al.* present a historically based review of the way in which the development of analytical techniques has influenced geochemical thinking.

Overall, the book is well presented with very few errors, although a couple of them caused me some confusion. It is produced in rather small print which means there is a lot of substance in the 526 pages but it can make some of the papers hard going, particularly the longer and more descriptive or involved ones, of which there are several. Perhaps the authors of these could take a lesson from Bartholomew who synthesizes a great deal of data to make his point concisely. Two criticisms, which are a consequence of the 'collection of papers' format, are (i) that the diagrams vary from too small, crowded and difficult to read, to excellent and (ii) the references are presented at the end of each paper. The latter is something that most readers will not find as irritating as I do but it would not have been difficult to have collated them into a single list at the end of the book thereby saving much repetition. Against this, the editors have compiled a short but useful subject index for the volume — not something often found with this format.

This book is a welcome blend of research papers and review articles which should ensure that it does not date too quickly. It is, of course, a must for those directly involved with ophiolites and oceanic crustal processes but it has considerable appeal for the less specialised reader and is exceptional value at the Geological Society member's price of £29.00. Notwithstanding the minor criticisms expressed above, it is indeed a fitting tribute to Ian Gass and the work which he initiated personally, by association and by proxy. I am sure he would have been pleased with it.

F. G. F. GIBB

Kogarko, L. N., Kononova, V. A., Orlova, M. P. and Woolley, A. R.. *Alkaline Rocks and Carbonatites of the World. Part 2: Former USSR*. London and New York (Chapman and Hall), 1995, vi + 226 pp., 249 sketch-maps and figs. Price £85.00. ISBN 0 412 61440 3.

To anyone interested in alkaline rocks and carbonatites, several of the chapters in 'The Alkaline Rocks' edited by Henning Sørensen, and the translations of the monographs by Vlasov and Gerasimosky on the Lovozero massif, gave a tantalizing glimpse of the wealth and variety of these rock types in the former USSR. Up till now, however, there has been no systematic description of the numerous alkaline complexes in this vast tract of territory, but this is now redressed by the volume reviewed here.

The scope of the catalogue is clearly stated at the beginning and contains a map showing the 23 provinces described in the text. As in Part 1 of the catalogue (confined to occurrences in North and South America and Greenland), alkaline rocks are defined as those characterized by the presence of feldspathoids and/or alkali pyroxenes and amphiboles, and hence cover ijolites, feldspathoidal gabbros, nepheline syenites, peralkaline quartz sycoites and granites, and their volcanic equivalents. Alkali basalt fields are included, as are lamproite occurrences but not kimberlites. Twenty three distinct provinces are recognized and described. The provinces vary considerably in size and the number of complexes within them, ranging from the Kola/Karelia and Kazakhstan provinces (34 and 53 complexes, respectively) to the small Chukotka and Sakhalin provinces (3 and 2 occurrences). The description of individual provinces begins with a simplified map showing the relative localities of each of the complexes within the province, and a brief statement on the regional geology. Information for the individual complexes is the latitude and longitude (information available for the first time for many of the complexes), a description of the complex, accompanied by a simplified (though clear and well-draughted) geological map for about two thirds of the complexes, economic aspects (if relevant), age (if known) and abbreviated references. It is worth emphasizing that the book is a catalogue of factual data about the location and geological relationships of the rocks within the complexes; whole-rock and mineral chemistry are not given, nor are petrogenetic schemes. These might be sought in the papers and books referenced in full at the end of each province section but, inevitably, much of the literature is in Russian and, again inevitably, not readily available to the Western reader. The amount of detail varies considerably from complex to complex, understandably linked to economic potential, and it is