

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

apparent that some have only been mapped and investigated on a reconnaissance scale.

This well-produced volume is a tribute to the enormous amount of effort and coordination that must have been put into it by the four authors. Considering the variety of data sources, an admirable consistency of presentation has been achieved. In the case of maps, some attempt has been made to standardize ornament and the ornament is displayed in boxes on the map rather than, as on most Russian maps, explained in captions.

This book will inevitably alert the geological world outside the former USSR to the numerous exciting petrological problems in the Russian alkaline complexes and carbonatites; as such, it has the potential to be a stimulus for cooperation between Russian petrologists and their colleagues outside Russia. For this reason it is regrettable that the high cost of the book will deter most individual buyers. However, I can recommend it for purchase by institution libraries.

J. B. DAWSON

Griffen, D. T. *Silicate Crystal Chemistry*. New York and Oxford (Oxford University Press), 1992. x + 442 pp., 263 figs. Price hardback £45.00. ISBN 0-19-504442-8.

The author's intention in writing this book was to produce a one-semester graduate textbook in crystal chemistry. Its aim is to illustrate the principles that are important in modern crystal chemistry through a discussion of the eight mineral groups: the silica polymorphs, feldspars, micas, pyroxenes, amphiboles and non-classical biopyriboles, the aluminium silicate polymorphs, olivines, and garnets. This discussion comprises Part I of the book; the four chapters in Part II are concerned with crystal symmetry, instrumental methods, atomic bonding and phase diagrams. The book ends with a summary of crystallographic data for minerals in the groups covered in Part I.

Polymorphism and the characteristics of phase transitions are introduced in the first chapter on silica polymorphs and the α - β quartz transformation is used to illustrate the concepts of domains and incommensurate phases. The chapter ends with brief accounts of stuffed derivatives and bonding. Each of the chapters on the large mineral groups commences with an account of the general chemistry and ideal crystal structure. The manner in which the structure is modified to accommodate changes in temperature and composition allows discussion of various phenomena: polymorphism, site preference, cation and anion ordering, polytypism, exsolution and microstructure. Emphasis is placed on the use of relatively easily measured quantities, such as cell

parameters and refractive indices, to estimate the chemical composition and, in some cases, the structural state of a mineral. The author occasionally slips in an extraneous topic: the geophysical importance of the near-forsterite to spinel transformation is to be found in the olivine chapter and a discussion of mullite is included in the chapter on aluminium silicate polymorphs. The discussion of the crystal chemistry of garnets would be enhanced by the inclusion of synthetic garnets. Each chapter ends with a list of papers referred to in the chapter; readers are recommended to perform their own literature searches for additional material.

More than a third of the pages of the book are devoted to Part II which is entitled 'Supporting Concepts'. The reader is warned in the introduction to the book that the account is not comprehensive and it appears to reflect the author's interests. For instance, crystallographic point groups and space groups are treated in depth but no mention is made of the reciprocal lattice. Moreover the general equivalent positions of a space group are derived by cumbersome matrix methods suitable for computer programs rather than simple graphical methods that take just a few minutes to do by hand. This chapter also contains some errors and rather infelicitous phrases that might well confuse someone unfamiliar with the subject. Brief accounts of X-ray powder diffraction (including a clear account of least-squares procedures), electron micro-probe analysis, X-ray fluorescence spectrometry, Mössbauer and nuclear magnetic resonance spectroscopy, and electron microscopy include a theoretical overview. The chapter on atomic bonding models is uneven; there is a fairly detailed but simple account of ligand field theory but the brief section on molecular orbital theory gives wave functions for the hydrogen-like atom and an indication of how solutions of the molecular Schrödinger equation may be found. The last chapter on phase diagrams is the most satisfactory in this part; a student reading it carefully could achieve a good understanding of phase equilibria. An outline of the experimental and theoretical approach to phase stability prefaces a clear account of binary phase diagrams. The chapter ends with a discussion of the kinetics of phase transformations.

There are few errors in the book and it is well illustrated with clear diagrams. However, the text would be easier to follow if some of the many figures that show coordination polyhedra were replaced by plans showing the heights of atoms above the plane of projection. The directions of the crystallographic axes are often described in the caption; arrows indicating their direction on the diagram itself would be easier to follow. Smaller diagrams, printed on the page on which the relevant text is printed would