(Bloomer, Evans, Shervais and Kimbrough) require either addition of a *LREE*, Ba, Sr, Zr-rich and Ti, Y *HREE*-poor component to the MORB lithosphere or variable degrees of melting of the same source *without* the need for metasomatism.

The book contains some very good data-based review papers, but the prologue is misleading as it includes discussion of all the meeting abstracts and not the volume. Also some organisation under thematic headings would have made reading more enjoyable.

M. MENZIES

McBirney, A. R. *Igneous Petrology*. San Francisco (Freeman, Cooper & Company) and Oxford (Oxford Univ. Press), 1984. 509 pp., 275 figs. Price £40.00.

Alex McBirney has for some long time been one of the most engaging and iconoclastic of igneous petrologists and an intermediate-level text book by him will be approached with a greater sense of expectation than most new arrivals in the field. In content the book does not disappoint; it is pre-eminently an extremely *interesting* book, full of thought-provoking points, very much concerned with processes in igneous petrogenesis, and providing a very good framework for Honours-level teaching. Almost all aspects of the subject which a well-rounded petrologist should have covered are treated, at least in outline, and the book is particularly effective at getting to the heart of the problems of igneous petrogenesis. Phase diagrams and quantitative modelling of processes are used to understand igneous rocks on the scale between different plate-tectonic settings, and the individual intrusion or volcano. It does not dwell greatly on nomenclature, and trace element and isotopic modelling are properly used only where they provide supporting evidence for models which are feasible in terms of major elements and mineral equilibria.

Chapter one introduces meteorites and the nature of the mantle. We immediately meet the first of many drawings of thin sections, in the time honoured (but rather unsatisfactory) format of overlapping circles. The drawings are reasonably good, but in most cases no scales are given, and the minerals are never labelled. Both features will cause problems (and bad habits) for students. Throughout the book all drawings are done with a free-hand style of lettering. They are generally clear and of high quality, but occasional mis-spelling of labels and a lack of rigour in certain lines in phase diagrams suggest that author and artist might have paid slightly more attention to detail. For example, an old hobby-horse of mine rears up on Fig. 4-6b—the line joining two feldspars to liquid in the alkali feldspar phase diagram at high water pressure is an isotherm and should be exactly horizontal and straight, not curved as shown. Features like this are non-trivial and will mislead students. Chapter two very briefly develops nomenclature, presenting the IUGS scheme, and then discusses water content and physical properties of magmas; as the preface says, the student is expected to have an elementary background in petrography and petrology, basic mineralogy and adequate chemistry, physics and maths, and I would judge the book well-pitched for British second-year students and onwards. Basic thermodynamics introduces Chapter 3. Although I found the text reasonably clear, there are some unfortunate signs of inadequate checking of manuscript and proofs (for example equation 3-26 contains 3 errors, and Fig. 3-7b has a caption but no figure; capitals and lower case are used inconsistently for symbols). There are also a few examples of less-than-rigorous use of terminology, such as the reference to the chemical potential of a liquid (rather than a component in the liquid phase) on p. 85. It is alarming, in Chapter 4, to find arfvedsonite consistently rendered without the 'v'. Phase diagrams, and their relationship to G–X diagrams are introduced in a general way at length, and then used more specifically in the following chapter which deals with the nomenclature and phase relationships of the main rock-forming minerals, and the textures of igneous rocks. Mechanisms of differentiation, and the use of trace elements to model magmatic evolution constitute Chapter 5.

From the half-way point on, the book is devoted to exploring the natural occurrence of igneous rocks, at a variety of scales, in the light of the principles and mechanisms established earlier. These remaining six chapters are excellent. I liked very much the way that field relations, petrography, phase relations, and processes are interwoven. Few existing textbooks have so successfully made the connection between field observations and theory, and the whole atmosphere is one of open-minded enquiry. The first topic is magmatic differentiation in basic intrusions; some photographs of layering are presented and various mechanisms of layer formation are discussed, but considering McBirney's controversial contributions in this field the treatment is surprisingly muted. Basalts and magma series form Chapter 7, and this leads in 8 to discussion of the origin of basalts and the nature of the mantle. Orogenic magmatism follows, then granitic plutons and siliceous ignimbrites. Starting from the relevant phase diagrams the chapter deals

with classic localities like Long Valley, the Andes, Donegal and Skye. The use of Sr, Nd and Pb isotopes in identifying sources, and of oxygen isotopes in distinguishing hydrothermal reworking, are all discussed, very much in outline, but nevertheless giving a fine overview of the resources available to the modern igneous petrologist. Finally we have a good chapter on alkaline rocks, firmly founded in 'petrogeny's residua system', and passing via carbonatites into kimberlites and ultrapotassic rocks. The book ends with appendices (in 'camera ready' style) starting with the methods of norm, density and viscosity calculations. These are written out in simple steps which could be easily rendered into computer code. Some further detail on radiogenic isotopes is provided, and 30 pp. of illustrative problems. Finally there is a glossary of rock names.

For coverage, balance and inspirational quality this book ranks very highly indeed. I would certainly recommend it to Honours students. It has some shortcomings in detail which detract slightly from the overall impression, and there are far too few references. Repeatedly I came across interesting asides and wanted to know the source but was left tantalized. There is, however, one unexpected bonus. Look closely at the drawings of thin sections and you will usually find, often in the groundmass, a little representation of McBirney himself, with a fringe of beard, pipe firmly clenched in his teeth, wide-eyed with the interest of it all.

I. PARSONS

Fitton, J. G. and Upton, B. G. J., eds. *Alkaline Igneous Rocks*. Oxford and Palo Alto (Geological Society Special Publication No. 30. Blackwell Scientific Publications), 1987. xiv + 568 pp., 273 figs. Price £65·00.

As noted in the Preface, thic collection of papers has been published just ten years after a similarly titled volume edited by Prof. H. Sørensen. This present volume contains invited papers presented at a symposium, sponsored by the Geological Society of London and the Royal Society of Edinburgh. The papers vary in length from four to eighty-seven pages and cover such a wide variety of topics that it is possible to comment on only a few of the contributions.

Alkaline rocks have been defined in a variety of ways but for the purposes of this volume the definition has been extended to include a variety of rock types which may be associated with alkaline rocks—particularly the carbonatites. In addition the lamprophyres are a group which was not treated by Sørensen but are here considered as alkaline rocks although many of them would not be considered alkaline by any criterion.

N. M. S. Rock considers that the lamprophyres have been neglected in the geological literature but since he believes that the term should be restricted to field use it is difficult to see how the neglect should be overcome. He divides the lamprophyre clan into five branches, two members of which are lamproites and kimberlites. However, S. C. Bergman in writing a chapter on lamproites, believes that the term lamprophyre 'should not be used to encompass such widely separated rock types as kimberlites and lamproites . . .'. J. B. Dawson deals with the relationship between kimberlites and some lamproites and shows that Group II (micaceous) kimberlites are chemically more closely related to the olivine lamproites than to the Group I kimberlites. He believes that the term kimberlite should be used for a clan rather than a rock type.

Bergman's chapter, on 'Lamproites and K-rich igneous rocks' contains a brief commentary on all the known major suites (21) of lamproites together with a review of their mineralogy, major and minor element chemistry and geological environment. With 17 pages of references this must be the most comprehensive review of this rock group available anywhere. It is a pity that most of the photomicrographs are too small to be of much value particularly since no other author has reproduced a photomicrograph of anything in this volume.

A. D. Edgar reviews some of the experimental work relevant to the genesis of alkaline rocks; M. J. Le Bas discusses the nephelinites, ijolites and carbonatites. Le Bas considers that a sodium carbonate magma similar to that of Oldoinyo Lengai is likely to be parented to the more normal carbonate rocks whereas J. D. Twyman and J. Gittins believe that sodium carbonate liquids are the residual fraction resulting from differentiation from an alkali-poor carbonate magma.

A series of papers describing alkaline volcanic rocks from oceanic and continental environments is followed by descriptions of some well known and some lesser known plutonic complexes. The coverage of different continents is very variable since there are only two papers (32 pages) on regions in North America, one by D. S. Barker on the Trans-Pecos area of west Texas and one by G. N. Eby on the Monteregian Hills and the White Mountains. On the other hand 128 pages are devoted to rocks from the African continent.

Interest in alkaline rocks is out of all proportion to their occurrence and it seems probable that they may hold many more clues to the evolution of the earth simply because of the variety of their compositions. It is a remarkable fact that nowhere in his