

BOOK REVIEWS

Brown, P. E. and Chappell, B. W. (eds.) *The Second Hutton Symposium on the Origin of Granites and Rocks*. Edinburgh (Royal Society of Edinburgh), 1992, 507 pp. Price £55.00

This volume, which also constitutes volume 83 parts 1 and 2 of the *Transactions of the Royal Society of Edinburgh: Earth Sciences*, contains the proceedings of the Hutton symposium held at Canberra in September 1991. It comprises 43 papers and 70 abstracts, with a worldwide authorship representing a fair cross-section of the most active researchers on granites and related rocks. Naturally there is a strong emphasis on geochemical studies, but a few structural papers are also included.

Many of the authors describe particular granite complexes, and interpret their compositional variation in terms of more or less plausible genetic models. The I- and S-classification continues to be popular, particularly among the Australian authors, and the first paper in the volume is a review by Chappell and White of the I- and S-concept as applied to its type area, the Lachlan fold belt. As well as occasional references to A- and M-type granites, a new alphabetic category C-type, is introduced by Kilpatrick and Ellis to describe those magmas produced by dry melting at very high temperatures which give rise to igneous charnockites. Lower crustal orthopyroxene-bearing granites are also described in a paper by Shimura, Komatsu and Iiyama, who give the results of some high pressure melting and crystallisation experiments on these rocks. Other experimental phase equilibrium studies in a range of metaluminous to peraluminous compositions are reported in papers by Green and by Holtz, Johannes and Pichavant.

Several of the contributions are concerned with the relationship between magmas and restites. For example Ellis and Obata discuss the segregation of melt from migmatites on the basis of petrographic observations and phase equilibria, while Burnham presents geochemical arguments to support the restite unmixing hypothesis, i.e. the ideas that granites represent mixtures of melt and restite. A paper by Zeck gives further details of the Hoyazo dacite, a volcanic rock with apparently restitic inclusions.

Stable and radiogenic isotope studies are des-

cribed by many of the authors, but particularly interesting are several papers on the use of the SHRIMP ion microprobe at the Australian National University for U-Pb geochronology of zircons. The photomicrographs and isotopic data which accompany these papers reveal the complex history of zircon growth in granites, and the great potential of this technique for uncovering the history of their magmatic source regions. Another relatively new area of research is the study of oxidation state of granitic magmas, and the paper by Blevin and Chappell considers how oxidation state among other factors can influence the metallogenetic character of granites.

Although this is a most valuable collection of papers on recent granite research, and it is pleasing to see that unlike many symposium volumes the contributions are packed with detailed and often new information. The volume is very well produced and illustrated, although it is a pity that it has been priced beyond the reach of most researchers. Granite specialists will be indebted to Bruce Chappell for the organisation of the Second Hutton Symposium. The next meeting in the series will be held at the University of Maryland in 1995.

A. HALL.

Kerrick, D. M. (ed.) *Contact Metamorphism*. Washington D.C. (Mineralogical Society of America: Reviews in Mineralogy, Vol. 26), 1992, xvi + 847 pp. Price \$26.00.

My first thought while leafing through the contents of this sturdy volume was that the authors had left us with nothing else to do with thermal aureoles except apply the collected knowledge gathered together here. I began to fear that, by its very comprehensiveness, the volume might inadvertently secure the demise of its own subject through a public perception of a line ruled across the page and marked 'knowledge of this field is now complete'. Well, of course, by fourth thoughts I was beginning to see some glimmerings of things still left to think about, but Derrick Kerrick and his authors are really to be congratulated on a work that is awesome in its scope and completeness, and more than maintains the standards of its stable-mates.

Kerrick, in a succinct opening chapter, introduces many of the themes of the volume, and draws comparisons with regional metamorphism. I fail to see why he need be so tentative in suggesting that some areas of low-*P* regional metamorphism are intermediate in character, representing regional-scale contact metamorphism. The bulk of the chapters are in any case of broader scope than just contact metamorphism. A highlight is Labotka's summary of the properties and compositions of metamorphic fluids; not only do you get an instant reference of all the equilibrium constants and equations of state you need for C–O–H fluid calculations (no, I haven't checked for typographical errors), but for once the, often more abundant salt components are also taken into account.

P–T conditions for low-pressure rocks are dealt with in two chapters. Pattison and Tracy take on the metapelites, dividing them up into facies series with distinctive assemblages and developing a petrogenetic grid to illustrate phase relations between them. Use of geothermometers and geobarometers is also reviewed briefly and there is an exhaustive list of those aureoles which have been described in English, classified according to facies series. This may be galling for Welsh language enthusiasts and other anglophobes, but a godsend to anyone looking for a particular natural example to prove his latest inspired idea, or just wanting good teaching ideas. Tracy and Frost carry out a similar exercise on low-*P*–high-*T* phase equilibria in all the other rock types that do anything interesting during contact metamorphism. My edition has copious errata to the figure captions for this chapter.

The theme of metamorphic fluids returns with a review by Brenan of metamorphic permeability and its implications for how fluids move through crystalline rocks. This chapter considers both cracking and fracture permeability, and equilibrium fluid distributions along grain boundaries. Unfortunately, metamorphic secondary porosity, long predicted from stable isotope studies, and increasingly imaged by cathodoluminescence or back-scattered electron microscopy, does not get comparable billing.

Metasomatism in aureoles is described and summarised by Barton, Ilchik and Marikos, in a chapter which comes dangerously close to letting metamorphic petrologists know that some aureoles contain ore deposits. Their pragmatic recognition of a wide range of fluid types and sources in aureoles is sharply juxtaposed against a chapter by Ferry which takes a highly theoretical approach to a very simplified system.

Further chapters deal with several practical

approaches to aureole studies: Nabelek on stable isotopes, and Furlong, Hanson and Bowers on modelling thermal regimes. This chapter is a particularly important introduction to modern modelling methods that incorporate evaluating fluid flow. Kinetics of specific reactions in aureoles (although not necessarily the underlying processes) are discussed in chapters by Joesten and by Kerrick, Lasaga and Raeburn. The book concludes with chapters on aureole tectonics, by Paterson, Vernon and Fowler, and on 'aureole systematics' (the most extensive lists yet, of aureoles described in English) by Barton, Staude, Snow and Johnson.

With all this in 850 pages, what else can be said? The main omission that I felt was the emphasis in most chapters on contact metamorphism as a low pressure equivalent of regional metamorphism, where most of the same rules still apply (e.g. lithostatic pressure = fluid pressure), rather than as a deeper equivalent of geothermal field alteration, closely related in space and time but not always operating under the same constraints (e.g. fluid pressure = lithostatic pressure). There have been studies, notably the work of Fournier in Yellowstone, which attempt to link contact metamorphism to contemporary active processes rather than to our inferences of deeper, and still more obscure events and this must surely be an important direction in the future. That said, such criticism is offered primarily because it is obligatory to demonstrate that the reviewer has read the book and thought about it. The reality is that this is an outstanding volume that should be on the bookshelf of every researcher or graduate student concerned with metamorphism in any of its guises.

B. W. D. YARDLEY

Shelly, D. *Igneous and Metamorphic Rocks Under The Microscope. Classification, Textures, Microstructures and Mineral Preferred Orientations*. London (Chapman and Hall), 1992. xv + 445 pp. Price £24.95.

This book is about those parts of hard-rock petrology that use the optical microscope as the analytical tool. Features visible only with the scanning or transmission electron microscope are not included, and chemical petrology is not considered. The author intends that students use the book initially as a basic guide to petrography and then as a route into the research literature, once their interest in textures and rock fabrics has been kindled.

Part One deals with rock nomenclature and the