studies in which experimental petrology has been used to elucidate the petrogenesis of peraluminous leucogranites. However, no mention is made here of similar studies on the more normal granitic to granodioritic rocks; these are found scattered through various other chapters. Perhaps the amount of attention paid to leucogranites reflects the emphasis on such rocks by the European petrological community. Such emphasis is wholly unjustified, given the relative scarcity and general unimportance of such rocks.

The effects of the presence of Fe and Mg in granitic systems is covered in chapter 5. This chapter begins with a section on the role and control of oxygen fugacity in experiments. Page 190 misattributes the invention of the $H_2$ diffusion membrane to Shaw who, apparently, adapted its use from the chemical industry. It then summarizes important results of experiments on synthetic granitic systems to which Fe and/or Mg have been added. Curiously, this chapter does not discuss the stability of epidote, a phase encountered in some of the work referred to. However, epidote is mentioned in the final pages of the next chapter. Experimental petrologists would do well to heed the warning on page 189 that "results from... studied performed with different pressure vessels in which $f_{O_2}$ inside the vessel ... is unknown cannot be compared,". Page 191 completely misinterprets the results of Clemens and Wall (*Canad. Mineral.*, **19**, p. 111–32, 1981), wrongly stating that their starting materials were metaluminous. As recognized later in the book, the rocks were actually peraluminous and the low-pressure stability of garnet in such magmas was a major finding of this early work. Five times in this chapter, the authors rather uncritically endorse a restite origin for the cores of zoned plagioclase crystals and the restite unmixing theory of the origin of chemical variation in granitic rock suites. The authors also mention the concept of mobilization of magmas with 50% entrained restitic crystals and seem to regard most tonalites as magmas, rather than cumulates from granodioritic magmas.

Thinking of tonalites in more detail, chapter 6 summarizes what is known about phase relations and kinetics in the system Qtz–Ab–An–$H_2O$, with and without excess $Al_2O_3$. There is plenty of comment on the formation of tonalites and their role in the Archaean crust. Fluid-absent partial melting of natural tonalitic rocks is also dealt with here.

The effects of addition of anorthite component to the haplogranite system are presented in chapter 7. Kinetic studies are also included, along with element partitioning data and the hypersolidus and subsolidus phase relations and kinetics.

Natural granite experiments are mostly dealt with in chapter 8, with the great variety of experimental techniques and conditions summarized. Here the reader will also find a discussion of partial melting experiments on greywackes and pelites. The Clemens *et al.* (*Amer. Mineral.*, **71**, p. 317–24, 1986) experiments on an A-type granite are misclassified here as carried out with various amounts of $H_2O$ added to the charges. In fact this work used $H_2O$-$CO_2$ fluids to indirectly control melt $H_2O$ content. However, this does not detract from a very useful and interesting chapter.

In the ninth and final chapter the authors discuss the formation of granitic magmas by fluid-absent (dehydration) melting. This is a thorough exploration of the various studies, but one might ask why the tonalite, greywacke and pelite work was not included here, instead of in chapters 6 and 8. The authors conclude that there is a need to more systematically investigate the compositional variables at work in these melting reactions. One could not agree more.

Each of the chapters contains a final section on the interpretation and geological applications of the experimental results, and suggestions as to how gaps in the knowledge may be filled. Overall, this is an extremely valuable reference work for the specialist granite petrologist. Basalt people and granulite petrologists could also profit by reading it. This book belongs in institutional libraries and on the bookshelves of those crazed individuals who dedicate their academic lives to solution of the greatest puzzle in crustal petrogenesis. J.D. CLEMENS

Craig, J.R. and Vaughan, D.J. *Ore Microscopy and Ore Petrography*, 2nd Edition, Chichester and New York (John Wiley and Sons, Ltd). 1995 xiv + 434 pp. Price £18.95. ISBN 0-471-115991.

Some geology textbooks prove to be invaluable as sources of information or handy reference books whereas others, for no apparent reason, lie in nearly mint condition on the bookshelf, read through once then consulted very occasionally for a very limited range of points. It is often not obvious why books fall into the former category; ease of use, logical layout of topics and information so that data may be found without recourse to the index may all contribute, or it may just be a personal response conditioned in the formative stages of one's training. Craig and Vaughan's *Ore Microscopy and Ore Petrography* has been in constant use, readily accessible for reference, lying beside my reflected light microscope. For a paperback book it has lasted very well considering the amount of use it has had. However, age and hard use have taken their toll and the cover has become raggy and, despite several running repairs with parcel tape, blocks of pages threaten to escape unless carefully looked after. The publishing

of a 2nd Edition has come just in time and allows comparison to be made with the edition it supersedes.

The first impressions are not particularly encouraging. It is smaller and thicker and the cover illustration in evolving shades of brown of concentric growth banding, showing sequential development of hematite and goethite in pisolitic iron ore, has given way to white lettering on plain black. Clear? Yes, but perhaps a trifle funereal. Opening the book the overall darker impression persists; narrower margins and more lines to the page make the print seem bigger and the layout more cramped. While some of the photomicrographs have been replaced with better examples others are less clearly illustrated in the 2nd Edition, leading to the impression that less care has been taken in the quality of the printing.

In content the book is reassuringly familiar, with the rewriting restricted largely to adding additional sentences and paragraphs to explain points more clearly and incorporating descriptions of newer techniques such as a semi-automated reflectance measurement or newer examples, including the paragenesis of the Mashan gold-base metal deposit, in new sub-sections. On the principle of 'if it ain't broke, don't fix it' the authors have maintained the best of the 1st Edition but, even so, reflected light optics seem just as difficult!

Perhaps the most obviously altered chapter covers ore mineral textures. The changes bring in numbering of the sub-sections in conformity with the rest of the book as well as modification of the layout of the sections on replacement textures and cooling textures. A new section covers the textures of placer grains which was a significant omission in the 1st Edition. Throughout this chapter are minor amendments, rewritten and enlarged introductions, additional explanatory sentences and some new diagrams.

Chapters 9 and 10 on ore mineral assemblages retain the same layout but have been generally updated bringing in newer examples and references. The reference lists are considerably more extensive and up to date but, in a less welcome change, are now lumped together at the end of each chapter rather than being given specifically at the end of each section. Though the occurrence of opaque minerals in coal remains much the same as in the 1st Edition, coal petrography itself has been expanded from a single short paragraph to cover four pages and has illustrations of various macerals.

The appendices remain as useful as before, with optical data clearly laid out. New values, particularly for reflectance, have been incorporated not just into the appendix listing reflectance values but the major table of the diagnostic properties of common minerals has also been amended. The chapter on ancillary techniques now extends far beyond X-ray diffraction and electron probe microanalysis. Outlines of SEM, scanning tunnelling microscopy and atomic force microscopy are given, together with microbeam methods of trace element and isotopic analysis and image analysis.

The 2nd Edition of *Ore Microscopy and Ore Petrography* remains the basic textbook for reflected light microscopy at both undergraduate and post-graduate level and a useful reference book at any level. The alterations to the 1st Edition represent significant improvements and updating of an already excellent text, making the book more complete. It is to be hoped that the cosmetic changes were made in order to keep the price of this invaluable book down. Will the 2nd Edition survive regular use as long as the 1st Edition did? Only time will tell, but it will certainly get as much use.

R. J. L. COLVINE