The work opens with an extensive bibliography of some 1600 items, and Part 1 continues with chapters presenting historical perspectives of the local iron mining and processing, which was under way in the 1740's (including the attempts at working the enigmatic franklinite which resembled magnetite but did not react in smelting as magnetite did), and local zinc mining which was first developed in the late nineteenth century. It is interesting to learn that Sterling Hill was purchased at a Sheriff's sale for £40. Part 2 deals with the quarries in the Franklin Marble, which is the host to all the ores, the beneficiation of the zinc ores, the regional and local geology of the area and, in particular, the gelogy and structure of the zinc deposits. The ores are Precambrian in age and it is considered that the metal content of the protores was in place in sediments before the complex later history of igneous intrusions (granites and pegmatites) and several episodes of regional metamorphism to the sillimanite grade (upper amphibolite to granulite facies). Various genetic theories for these orebodies are reviewed but no comprehensive solution to the various problems posed is yet available. This part of the work continues with details of the geochemistry of the orebodies and the distribution of the elements between the numerous host minerals; as noted earlier by Frondel and Baum (1974) there is a close correspondence between the suite of trace elements found in these deposits and those typical of marine and hot-spring deposits of manganese oxides. The discovery early in the twentieth century that electric arcs from switchgear caused fluorescence in nearby minerals led to the recognition of more than 80 fluorescent mineral species in this area. The paragenetic and textural aspects of the various mineral assemblages in the zinc ore units are considered; silicates are much more common in these ores than might be surmized from the literature.

The remaining three parts are concerned with the descriptive mineralogy of the deposits, starting with the silicates which include over 40 Mn silicates and some 20 Zn silicates, in addition to numerous silicates of Ca, Mg and Fe. In many cases, earlier data on morphology and physical properties are supplemented by new microprobe analyses, and by hand specimen photographs and numerous photomicrographs, together with details on the occurrence and paragenesis for all the major species represented. This style is followed also in giving the descriptive details of native elements, sulphides, arsenides, antimonides, sulphosalts, oxides, halides, carbonates, sulphates, borates, tungstates, molybdates, arsenates, arsenides, phosphates and vanadates, together with brief descriptions of eight unnamed species. The work concludes with appendices on obscure mineral names, a glossary of local terms (e.g. 'Cousin-Jack', a term for Cornish miners, many of whom were brought over to do underground mining), and a description by the mine management of the operations of the Sterling mine in 1966, followed by fairly full subject and mineral indexes.

This is the most important work on these deposits and their minerals since the classic U.S. Geological Survey Professional Paper **180**, by Palache in 1935 (*The Minerals of Franklin and Sterling Hill, Sussex County, New Jersey*) and represents over 20 years of research by the author and cooperation with other geologists, miners and mineralogists interested in Franklin and Sterling Hill. The photographs incorporated in the text are in black-and-white, and the reproduction of these is good, though some of the older but informative views of Franklin and of the underground mining operations are somewhat lacking in contrast but are nevertheless of considerable interest; the numerous maps and cross-sections are clear and helpful. These famous deposits have yielded some magnificent specimens to be seen in mineral museums all over the world and it is exciting to have an up to date record of all the mineralogical data pertaining to the many rare species represented in this unique assemblage. Libraries and others fortunate enough to possess a copy of Professional Paper **180**, will certainly need to obtain this latest production to supplement and expand the record of this classic locality. The Franklin mine closed in 1954 and the Sterling mine closed in 1986, but the Franklin Mineral Museum prospers and has been designated as a New Jersey Historical Site.

R. A. HOWIE

Mitchell, R. H. *Kimberlites, Orangeites, and Related Rocks*. New York and London (Plenum Press), 1995. xiv + 410 pp. Price $89.50. ISBN 0 306 45022 4.

Despite the title, this book focuses on the geographically restricted (to South Africa) group II or micaceous kimberlites (the 'orangeites' of Mitchell) and their lack of genetic relationship with the much more abundant group I or basaltic kimberlites ('archetypal' kimberlites of Mitchell). However, the book also provides a useful update on petrogenetic hypotheses of kimberlite and lamproite, the major primary source rocks of diamond.

Combining previously published mineral chemical characteristics of group II kimberlites with new data, notably those from the PhD thesis of K.M. Tainton, 'orangeites' are described as containing multi-compositional phlogopite and olivine, and some or all of the following: primary fine diopside, *REE*-Sr rich perovskite/phosphates, K-Ba titanates, Zr silicates and variable carbonates. They are characterized by a

lack of megacryst suite minerals, Mg ulvöspinels, and monticellite (which typify 'archetypal' kimberlites). The mineralogy of diamond is not discussed on the grounds that it is a xenocryst.

'Orangeites' are said to be "easily" distinguished from archetypal kimberlites on the basis of the different trends of groundmass micas, which evolve towards tetraferriphlogopite as in lamproites. In fact it may be not that easy since some archetypal kimberlites also contain groundmass TFP. Groundmass (microphenocrystal) olivine in both orangeites and lamproites tends to be more Mg-rich, than in kimberlites. Of the two dominant trends of spinel evolution found in kimberlites, only one (Al magnesian chromite – Ti magnesian chromite – ulvöspinel/magnetite) is found in both orangeites and lamproites.

Newcomers to kimberlite studies will therefore be struck by the fact that electron microprobe mineral analyses may be necessary to classify these rocks into their correct textural-genetic niche. Furthermore, field relationships with consanguineous rocks may be critical in distinguishing evolved 'orangeites' from lamproites!

Appraisal of bulk geochemical data suffers from the perennial kimberlite problem of alteration and xenocryst 'contamination'. In addition, since 'orangeites' show a range of evolved compositions, they cannot be differentiated as a group from 'archetypal' kimberlites using concentrations/ratios of Nb, Zr, Hf, Th, U, Sm, Ce, P, Cs, La/Yb, K/Rb. However, K, Rb and Pb are higher in 'orangeites' reflecting higher mica content.

From Nd–Sr isotopes, Craig Smith has shown that Group I kimberlites have an asthenospheric signature, whereas Group II kimberlites have been derived from ancient metasomatically enriched lithospheric mantle (as with lamproites). Since such continental lithospheres are compositionally varied, so are the potassic magmas derived therefrom. The so-called 'orangeites' are compositionally and genetically so close to lamproites, on the data presented by Mitchell, that one wonders why they should not be encompassed by that group without further unnecessary proliferation of alkaline rock nomenclature.

P. H. NIXON

Chang, L. L. Y., Howie, R. A. and Zussman, J. *Deer, Howie and Zussman, Rock Forming Minerals. Volume 5B: Non-silicates; sulphates, carbonates, phosphates and halides.* Harlow, (Longman), 1996, 383 pages, price (hardback) £115. ISBN 0-582-30093-2.

The Rock-Forming Minerals Series by Deer, Howie and Zussman, universally referred to by the initials DHZ have become standard mineralogy texts. Several generations of undergraduates have started with the Introduction to Rock Forming Minerals, "Students' edition", and the full versions with well-used black covers are a feature of most mineralogy laboratories. It is now nearly 35 years since the first edition, and when the first volume of the second edition appeared in 1978, Volume 2A on Pyroxenes. Great things were expected. The Orthosilicates volumes 1A and 1B arrived in 1982 and 86, but there has been a gap of nearly 10 years until this most recent volume. With that rate of production the authors would all be centenarians by the time the task was completed. It was perhaps with that in mind that extra specialist authors were recruited to help produce the new editions. This book sees the first of the new recruits, with the senior author Professor Chang, contributing nearly two-thirds of the content. Does this work? Should you change a winning team?

The general layout is much the same as the previous editions, with a chapter on each mineral, and with a few species in the carbonate section promoted to individual chapters (smithsonite, cerrusite, nyerereite, malachite and azurite). Each chapter starts with the familiar summary and diagram of crystallography and optical properties followed by detailed description of structure, chemistry, experimental work, optical and physical properties, distinguishing features and paragenesis. Comprehensive references up to 1994 complete each chapter. The use of subheadings is not always consistent, for instance some chapters have experimental work included in the chemistry section. What I found irritating was the font used for these subheadings, a spidery-thin specimen, easily missed when flicking through the book for a particular section and less prominent than the bold lower-order headings.

The old Volume 5 on Non-silicates has been split into two, with 5A on oxides, hydroxides and sulphides yet to appear. The number of pages in 5B devoted to sulphates, carbonates etc., is roughly twice as long as the previous edition, growing from less than 200 to nearly 400 pages. The sections on structure are fuller with recent information and modern diagrams of atomic structure. The sections on chemistry are a bit longer and include more modern analyses in many cases. The coverage of experimental work and mineral stability is much expanded and up to date and provides a most useful source of information. The discussion of paragenesis is much more extensive and has a wider geographic scope, with less reference to UK localities than the first edition. The chapters by Professor Chang include many more North American examples as might be expected. In several places data from new techniques such as Mössbauer and Raman spectro-