recent geological environments are given greater coverage since this is where natural pigments can be found. Soils are highly rated as "a unique environment for iron oxide formation in terrestrial ecosystems." The formation of iron oxides by organisms merits a short chapter as do the products of iron metal corrosion. Chapters on the applications and synthesis of the iron oxides conclude the book. The descriptions of the methods of synthesis of individual minerals are particularly detailed and informative.

It is typical of this book that optical microscopy appears after spectroscopic and diffraction methods and is dismissed with the single sentence "Optical microscopy of various types is applied to mineralogical samples". After that opening sentence the section on microscopy lists TEM and SEM in slightly more detail. There is a tendency to mention a topic but to provide little information of substance. This set of values reflects the interest of the authors in the fine-grained iron oxides where optical microscopy has less application. The authors cover no aspect of examination in transmitted or reflected light nor the growth and alteration textures which are so informative in revealing the genesis of the naturally occurring and coarser-grained iron oxides. This limitation of the book should have been made more apparent in the title; a title such as "The Fine-grained Iron Oxides" or "Synthetic Iron Oxides and Natural Pigments" would be more appropriate and explicit. By omission and by some strange choices of emphasis this book misrepresents the occurrence and genesis of the important natural iron oxides. In similar style this book makes it sound as though the Munsell system was established primarily to describe soil colours. There is an inconsistent use of units so that 'mg g^{-1}' and the equivalent 'g kg^{-1}' are used randomly, 'mg kg^{-1}' expresses trace concentration and 'g g^{-1}' is used for major elements but seems not to have been understood since (p. 423) laterite appears to contain up to 154 g g^{-1} Fe!

It would not be appropriate to recommend this book as a primary text on iron oxides to those interested in the natural iron oxide minerals, although there is much extremely valuable detail for those prepared to restore the balance. As a text on the iron oxides for industrial producers and those interested in synthesizing iron oxides and hydroxides this book will undoubtedly form their standard reference.

J.F.W. BOWLES

O'Keefe M. and Hyde B.G. *Crystal Structures, Vol. 1, Patterns and Symmetry*. Washington, D.C. (Mineralogical Society of America Monograph), 1996. xvi + 453 pp. Price, hardback, $36. ISBN 0-939950-40-5.

This book is addressed to "serious students of solid state chemistry and related sciences (e.g. mineralogy, materials science and solid state physics)", and assumes that these are not "professional crystallographers"4; indeed it assumes that they do not wish to become professional crystallographers, and it does not seek to provide any information about methods for determining the structures with which it deals. The latter two thirds of the book are taken up by three chapters devoted respectively to systematic discussions of crystal structures in terms of polyhedral stackings, sphere packings, and 3-dimensional nets. However, these approaches are by no means kept artificially separated, and it is a great virtue of the book that it shows how much can be revealed not only by different approaches to the same structure, but also by comparing apparently very different structures that have an underlying relationship. The structures are profusely illustrated with well-drawn diagrams, and are usually described by giving explicitly the coordinates of the special and general space group positions that are occupied. As a preparation for this the first third of the book provides a thorough exposition of point group and space group symmetry in two and three dimensions, and also of lattice geometry.

The authors' enthusiasm for their subject is very apparent, especially in the 'notes' at the end of each chapter and in the appendices that "are 'notes' that became too long for inclusion in individual chapters". These may well lead the reader on to advanced topics beyond the general theme. A quirk of the book arises from the fact that it seems to assume that its readers never encounter crystals as objects in the real world; so point group symmetry is treated in the abstract without reference to crystal morphology, and lattice planes and zone axes do not appear until Chapter 4 (after the chapters on symmetry). The main potential value of the book for mineralogists would be to lead them to compare mineral structures with one another and with structures of other kinds, and to consider them from different points of view. New insights are most likely to be gained from the relatively minor cross references to a particular mineral, and it is therefore unfortunate that the index frequently fails to lead one to these. Perhaps the promised second volume will rectify this situation. Each chapter is followed by a series of excellent and challenging exercises, but it is a pity that answers are not generally provided. The benefit of exercises to the student is much reduced if he does not know whether his solutions are correct.

Misprints and errors are commendably rare, and seem to be virtually confined to the section on layer silicates. The worst is that a description of the chlorite structure is said to be that of vermiculite. Bentonite and Fuller's earth are not the names of

mineral species, and should not be assigned formulae as though they were. And in Figs. 5.57 and 5.58 contraction of the tetrahedral net by tetrahedral rotation leads to higher density, not lower density. A minor irritation is provided by the use of the word acentric instead of non-centrosymmetric as the opposite of centrosymmetric (centric and acentric having special meanings in X-ray crystallography). But these are trivial complaints about a book of this quality, which is undoubtedly excellent value.

E.J.W. WHITTAKER

O'Hanley, D.S. *Serpentinites: Records of Tectonic and Petrological History*, New York and Oxford (Oxford University Press). 1996, xiv + 277 pp. Price £70.00 hardback. ISBN 0-19-508254-0.

There are probably very few geologists who have visited SW England and not stopped for a day or so to examine the serpentinized peridotite of the Lizard Complex. Although the serpentinite provides a rewarding study of serpentine minerals and the processes involved, it also has a part to play in the local tectonic problems of the region. It is these twin themes – the intrinsic value of understanding the serpentization process, coupled with the awareness of serpentinites to help solve geologic and tectonic problems – that provide the thrust of this book. In this respect David O'Hanley has certainly succeeded, although the section on tectonic settings is more limited, perhaps reflecting neglect in this area even allowing for the association of serpentinites with ancient crust (ophiolites).

Although this monograph is aimed mainly at serpentinite specialists, many of the various chapters can be consulted individually and provide useful references over a wide range of topics. Much of the first part is concerned with mineralogy and petrography, and the nature of hydration/serpentinization processes, all well illustrated by both field photographs and annotated photomicrographs (reproduction here is good to excellent). This is followed by separate chapters on associated rocks formed by metasomatic processes (rodingites, etc.) and serpentine-related mineralization. One of the most comprehensive chapters deals with serpentinization 'events' via mineral paragenesis and field evidence rather than experimental data, and discusses the nature of fluids involved in both space and time. More integration with chemical and experimental systems might have been appropriate here, although this is counter-balanced by good field case studies. A chapter on geochemistry (with a tail-piece on geophysical properties) is largely concerned with stable isotope systematics (mainly O, H and C), fractionation factors related to temperature estimates, and fluid inclusions. Bulk geochemistry is somewhat limited to *REE* and a few other elements; unfortunately few data are tabulated here for comparative purposes. Phase equilibria ($T-X_{CO_2}$; $P-T$; activities) relating to serpentine minerals and assemblages (including sulphide systems at low$T$) are scattered throughout a number of chapters.

There is little doubt that this book is a well documented coverage of serpentinites, their composition, origin and geological importance, written in a concise, but readable style. There are some 700 references, of which about a third are post-1987, and thus provide coverage of most modern work in this area. there are very few typographical errors and differences of opinion are dealt with fairly, although the author makes his point of view clear in a final summary chapter. I would strongly recommend this book to both new workers and specialists in the light of its comprehensive cover of serpentinites, although the price might make some think twice.

P.A. FLOYD

Dimes, F.G. and Mitchell, M. *The Building Sone Heritage of Leeds*, Leeds (Leeds Philosophical and Literary Society), 1996, xii + 112 pp. Price £9.00.

The geology and topography of this part of Yorkshire are outlined in an early chapter. This is followed by a discussion on the nature and use of stone for building, before the reader is taken on a series of four walks around the city. There are 16 colour photographs, as well as numerous black-and-white photographs, maps and sketches. The book concludes with a brief rock classification, a useful glossary and indexes of buildings and building stones, as well as a general index.

R.A. HOWIE