

to systems such as the plagioclase feldspars and spinels.

The basic ideas behind thermodynamics, which determine most aspects of mineral behaviour, are clearly presented, with discussions of entropy, phase equilibria and Landau theory. The nature of solid solutions is outlined, the processes of exsolution, spinodal decomposition and ordering are reviewed. Finally kinetics are introduced, and the book ends with some excellently presented case studies of transformation processes, including discussions of the incommensurate behaviour in quartz, unmixing in the pyroxene system, and other geologically and materials-relevant processes.

In short, this book is a tour de force, illustrating clearly the major advances which have taken place in our understanding of the complex behaviour of minerals and related phases. It could only have been written by a scientist who has an extensive and clear understanding of modern mineralogy. Andrew Putnis is to be congratulated on writing an outstanding book, which will not be surpassed for many years to come. Buy, read and enjoy this splendid book!

G. D. PRICE

Gribble, C. D. and Hall, A. J. *Optical Mineralogy: Principles and Practice*. London (UCL Press Ltd.), 1992. Price £50.00 (£17.95 paperback).

This book is a revised and extended successor to *A practical introduction to optical mineralogy* (by the same authors) published by George Allen and Unwin (1985; 249 pp). The latest book retains much the same style, content and organisation as its predecessor, from which it has inherited most of the illustrations. The book aims to provide an introduction to the theory and practice of the examination of rock-forming minerals under the microscope, including both transmitted- and reflected-light techniques, and is comprehensive enough to satisfy the requirements of most undergraduate geology courses.

The separation of the theory of both transmitted- and reflected-light optics (Chapters 4 and 5) from the first chapter on microscope techniques allows a simple 'recipe book'-type approach to mineral study, without encumbering the student with the need to initially wade through theoretical considerations. This arrangement, however, is not in practice entirely user-friendly, since there is a number of references in Chapter 1 to Figures and colour Plates (4 pages) positioned much later in the book.

The descriptions of silicate and non-silicate

minerals (Chapters 2 and 3) are presented in broad alphabetical order with related minerals kept together in groups. While the silicate mineral diagrams show optical orientations and give information such as cleavage and 2V, they do not indicate well the characteristic mineral forms, as presented for many of the non-silicates, and only a few selected silicates are illustrated by photomicrographs. The misidentification of a granophyric intergrowth of quartz and feldspar in a photomicrograph as a myrmekitic texture appears to be an isolated error, but could cause some minor confusion. Diagrams giving comparative extinction angles (e.g. for pyroxenes) are very useful.

Transmitted-light theory is dealt with in a straightforward manner, although the explanation of interference in crystals and the origin of interference colours may not be easy for students to assimilate. While crystal symmetry is very briefly dealt with in relation to reflectance of opaque minerals, no outline is given of the distribution of crystallographic axes in the individual crystal systems, which is an omission that students beginning the subject may find a disadvantage. The reflected-light theory provides a useful background to the study of opaque minerals, including reflectance measurement and observation of anisotropy.

Understanding the ways in which light interacts with minerals in the polarising microscope, and becoming competent in microscope techniques are aspects of geology courses that students frequently find very difficult. This textbook offers a sound, traditional approach to both transmitted- and reflected-light microscopy, and incorporates much useful reference data on the common minerals all in one relatively affordable volume, which is to be commended. It does not, however, seize the opportunity to adopt a markedly fresh approach to the presentation of the subject at student level.

R. KANARIS-SOTIRIOU

McBirney, A. *Igneous Petrology Second Edition*, (Jones and Bartlett Publishers Inc.), 1992. xii + 508 pp. Price \$52.50

These are exciting times in Igneous Petrology. The number of new approaches and techniques continues to increase, and there is a welcome trend towards much better integration of contributions from different subject areas. Radiogenic isotope analyses are now only rarely presented in isolation from major and trace element data on the same rocks; laboratory and computer models provide much needed constraints on the physical