has the clarity essential in a laboratory manual and the possible pitfalls and possible misconceptions are exposed at each stage. It is well produced and well illustrated throughout. The sections on optical and thermometric analysis contains photographs of the full range of fluid inclusions likely to be encountered and the changes that occur during heating and freezing. The use of relevant diagrams (P-T, phase, etc.) to explain the observed changes during thermometric analysis prove very useful in the understanding of the data acquired.

There is some theoretical discussions of the data but this is used to provide an understanding of the data *senso stricto* rather than provide petrogenetic interpretations.

This book admirably achieves its aim of providing a usable laboratory manual for those involved in the study of fluid inclusions. It is highly recommended by the reviewer, especially to those entering this field. Users of the book will benefit greatly from the authors' practical experience and improve their chances of producing well qualified data efficiently.

R. A. D. PATTRICK

Berry, F., and Vaughan, D. J., *Chemical Bonding and Spectroscopy in Mineral Chemistry*. London and New York (Chapman and Hall), 1985. x + 325 pp., 129 figs. Price £35.

The editors of this book on spectroscopy and bonding present a welcome and most timely contribution to the mineralogical literature. In recent years there has been a rapid increase in the number of spectroscopic techniques used in the study of minerals, but because of the lack of suitable texts it has often proved difficult for the non-specialist to learn and appreciate the significance of the results obtained by these investigations. This book goes a long way towards solving the problems faced by non-spectroscopists in their attempt to incorporate the findings of spectroscopy into their larger understanding of mineral behaviour.

Almost inevitably a book attempting to cover the wide range that spectroscopy now encompasses must be a multi-author affair, and indeed this is both the strength and the weakness of this volume. The strength naturally derives from the expert knowledge that each author can bring to his chapter, while the weakness, although not strongly pronounced, must derive from the differences in styles, approach and thoroughness of each chapter. The uniting theme in all of the chapters, however, is how various spectroscopic observations shed light upon the nature of bonding in minerals. To this end, the introductory chapter by J. A. Tossell on the applications of quantum mechanics to bonding in minerals is both lucid and an essential part of the volume.

The three subsequent chapters by D. S. Urch, R. G. Burns and G. Walker deal with various aspects of the interaction of electromagnetic radiation with electrons in minerals. Although the three techniques discussed, X-ray spectroscopy, electronic spectra and luminescence techniques all provide insights into the distribution of electrons in minerals and their relative energetics, I feel that a chapter on infra-red and Raman spectroscopy would have strengthened this part of the text. Nevertheless, these three chapters all provide an excellent guide and introduction to the spectroscopic techniques to which they are dedicated.

The next two chapters are concerned with the interaction of radiation with atomic nucleii. A. G. Maddocks' chapter on Mössbauer spectroscopy is a fine review of a more familiar but underused mineralogical technique, while W. R. McWhinnie's chapter on resonance spectroscopy outlines the theory of an approach to mineralogical study which I am convinced is going to grow in importance in the next decade. Finally the editors each contribute more specialist, but equally informative, chapters on the nature of bonding in opaque minerals and on mineral surfaces. The study of opaque minerals is neglected in the main by mineralogists and petrologists, but as D. J. Vaughan's chapter reveals, much can be gained from investigation of these phases. F. J. Berry's chapter on surfaces addresses the least well known aspect of mineral behaviour, but one which is potentially the most important and challenging area of mineral physics. Despite our relatively extensive knowledge of the behaviour of single-crystal minerals, we are as yet unable to use that knowledge to predict the nature and properties of polycrystalline aggregates such as rock. Until we understand mineral surfaces and grain boundaries, we will be unable to apply our knowledge of the physics of minerals to describe the physics of the Earth, and as such the chapter by Berry may point the way to much future mineralogical research. This whole text is most worthwhile and thoroughly recommended.

G. D. PRICE

Maaløe, S. *Principles of Igneous Petrology*. Berlin, Heidelberg, New York and Tokyo (Springer Verlag), 1985, xiv + 374 pp., 291 figs. Price DM 138.00.

Petrology is both descriptive and interpretative. In the interpretative part the various observations made are synthesized into a plausible physical and chemical scheme of petrogenesis. Extending the