Electronic energy bands in solids. By L. PINCHERLE. Edited by B. DONOVAN. Pp. ix+196. London: Macdonald, 1971. Price £4·00.

Over the last few years there have been many books on the theory and desciption of energy bands in solids. It is not too surprising that such a vast and important topic should have produced so many books aimed at such assorted audiences. Professor Pincherle's book is not a specialised account for theorists but is an introductory test directed primarily at final year undergraduates and first year post graduates.

Basic concepts such as reciprocal space, zone schemes, density of states and Wannier functions are clearly explained and the chapter on the dynamics of carriers is concise and useful. The details of how one carries out an actual calculation are not apparent. Although the authors mention the major techniques such as A.P.W., KKR and cellular methods, he does not derive the secular equations which one has to solve to obtain the band structure in any given problem. The last chapter on the classification of bands contains much sound, practical information but the reader would need some familiarity with elementary group theory.

The scope of the book is far too narrow and it does not bring the reader up to date with the literature. It could perhaps be useful for, say, an M.Sc. course solely devoted to band theory but for four pounds, one can buy much more meat than is contained here.

R. EVANS

H. H. Wills Physics Laboratory
Royal Fort
Tyndall Avenue
Bristol BS8 1TL
England

A review of the structure and physical properties of liquid crystals. By G. H. BROWN, J. W. DOANE & V. D. NEFF. Pp.94. London: Butterworths, 1971. Price £ 5·00.

This book provides a comprehensive and up to date review of the recent achievements in the liquid-crystal research field. The present state of knowledge of liquid crystals is discussed, documented and presented in a clear and authoritative form.

The properties of the liquid crystalline state are not yet clearly defined. For a thermotropic liquid crystal the mesophase between the solid and liquid phase has some properties of both the neighbouring phases – a long-range molecular order and a high motional freedom of the molecules. Liquid crystals are characterized by unusual physical properties, which are of importance in understanding both the liquid and the solid state. They are of significance in living systems and they offer new technological possibilities.

There has been a need for some time for a review of the considerable research activity in this field. This review is well planned and presented. Most of the basic theoretical approaches are included. Some models, although not plausible, have been included in order to present a complete picture. There is an enlightening chapter about the swarm and the presently accepted continuum theory which forms the bridge between the macroscopic observations and the microscopic molecular arrangements. Thermotropic as well as lyotropic liquid crystals are classified according to their molecular structure as well as their molecular arrangement. The influence of external magnetic and electric fields on the molecular orientation and hydrodynamic patterns is described. The power and limits of various experimental techniques are enumerated and the results obtained are compared with various theoretical models. Liquid crystals can be used as an anisotropic matrix for high resolution n.m.r. structural determination of dissolved molecules and an account of this activity is also included.

The book is an excellent guide to the different well documented approaches to liquid-crystal molecular organization and its value is enhanced by the expert commentary. This review is strongly recommended to any specialist in this or any related field. The well selected and important basic facts which are combined in this single work, represent a tremendous help for the non-specialist who wishes to learn about liquid crystals. There are nearly 300 selected references and the titles of the last Liquid Crystal conference – Berlin, 1971 – are also included.

M. SCHARA

Institut 'Jožef Stefan'
61001 *Ljubljana*
(P.O.B.) 199
Jamova 39
Yugoslavia

The Raman Effect. Vol. 1. Principles. Edited by ANTHONY ANDERSON. Pp.ix+404. New York: Dekker, 1971. Price $28.50.

This first volume of a two volume work contains six contributions. These include an historical introduction by R. S. Krishnan with a bibliography of general articles (dated as recently as 1971) on the Raman effect. The polarizability theory is reviewed by G. W. Chantry and Raman scattering from crystals by R. A. Cowley. The remaining chapters are concerned with instrumentation and techniques (C. E. Hathaway) including complete systems which are available commercially, the stimulated Raman effect (P. Lallemand) and Brillouin Scattering (R. S. Krishnan).

D. JACOBS

Department of Physics
University of York
Heslington
York YO1 5DD
England

New Developments in Electron Microscopy. Edited by H. E. HUXLEY and A. KLUG. Pp.230. London: The Royal Society, 1971. Price £10.50, U.S. $27.00

A Symposium on new developments in electron microscopy was held at the Royal Society in 1970. 22 papers presented at that time and originally published in the Philosophical Transactions of the Royal Society comprise this handsome volume.

Whilst several of the contributions do not add materially to the previously published work of their authors, this book serves the very valuable function of bringing this work together in one place and in eminently readable format. More importantly, it delineates the 1970 frontiers of activity and

thought regarding electron microscopic instrumentation, preparation of specimens and techniques of image analysis by Fourier methods. The publication is divided into three sections corresponding to these headings. Theoretical concepts underlying the new developments – and serving, as well, as the basis for standard techniques – are well covered.

Papers on scanning electron microscopy, high voltage electron microscopy and phase contrast electron microscopy comprise the bulk of the instrumentation section. Preparative techniques discussed include freeze etching, and special procedures for electron microscopy of DNA and electron microscopic auto-radiography. In application, the emphasis rests heavily on structures of biological interest; several of these are discussed in detail in the section on Fourier methods.

Provision of an index would have been most welcome and would have increased the utility of this book as a work of reference. However, as a source of 'food for thought' for innovative electron microscopists seeking a better tomorrow, this publication deserves full marks.

J. E. BERGER

Center for Crystallographic Research
Roswell Park Memorial Institute
666 *Elm Street*
Buffalo
New York 14203
U.S.A.

Group theory in solid-state physics. By H.W. STREITWOLF. Edited by B. DONOVAN. Pp.248. London: Macdonalds, 1971. Price £5.

Several of the standard texts on group theory and its application to solid state physics devote a chapter to space groups and energy band structures in solids. This book gives a detailed treatment of this aspect of group theory intended for specialized post-graduate study.

Originally produced in 1967, it has been meticulously translated by J. B. Sykes and well presented by Macdonalds in their University Physics Series under the editorship of Professor B. Donovan. A reasonably formal treatment of the mathematical principles of group theory is followed by a detailed coverage of space groups, their irreducible representations and basis functions. This is followed by chapters on the application of group theory to quantum mechanics, dealing in particular with electrons in periodic potentials and the calculation of band structures. The final sections deal with the application of group theory to the prediction of selection rules for both lattice absorption and Raman effects in solids.

There are however several applications of group theory to solid state physics which are omitted and which, by their inclusion, the reviewer feels would have made this a much more valuable volume in the University Physics Series.

For instance there is no mention of the application of group theory to the localised ion or defect in a solid matrix, the importance of group theory in crystal field, e.s.r. and n.m.r. studies. This book deals with only two of the 'solid-state particles' *viz.* Bloch electrons and phonons. For completeness mention could have been made of colour centres, excitons and magnons. There is also no specific mention of the magnetic symmetry groups, a subject of increasing importance to the solid-state research worker.

For a graduate course in group theory this volume is probably too specialist in its content and assumes a background knowledge of vector spaces not normally acquired in an undergraduate course. A greater use of diagrams could have been made to illustrate the reciprocal lattice, Brillouin zones and wave functions.

For the solid-state research physicist this is a useful book in the treatment of space groups and band structure calculations but the omissions which have been mentioned do limit its usefulness.

D. W. GOODWIN

Department of Physics
University of York
Heslington
York YO1 5DD
England