

makes illuminating comments on the relation between such methods and the results of the conventional perturbation procedure.

Few details are given of the manipulative techniques involved, but a clear statement is presented of what has gone in to each calculation (the terms in the perturbation expansion that have been considered, the interatomic potential *etc.*). The sense in which results obtained can be compared with experiment is then simply described.

In places the terseness of the presentation will defeat the non-expert, but when one considers the difficulty of the task, Dr Cowley has done excellently.

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**Low energy neutron physics.** BY I. I. GUREVICH AND L. V. TARASOV. Translated by SCRIPTA TECHNICA LTD. (LONDON) and edited by R. I. SHARP AND S. CHOMET. Pp. xiv + 607. Amsterdam: North-Holland Publishing Co. 1968. Price f. 90.

This book is of much more interest to crystallographers than its title suggests, for it is very largely concerned with the use of thermal neutron beams for studies of the structures of solids and liquids. This concentration on the solid-state aspects of slow neutron physics is made clear in the authors' preface and they define their purpose even more closely as concentrating on nuclear scattering rather than magnetic scattering. Indeed they see their book as complementing that of R. P. Ozerov & Yu. A. Izyumov on *Magnetic neutron diffraction* which has not yet appeared in its English translation.

There is indeed one chapter which deals with such topics as neutron-proton and neutron-electron interactions, the magnetic moment and any possible electric dipole moment of the neutron, but by far the greater part of the book is of primary interest to the student of solids. The book will be of great value to those who are doing research in this field. Nevertheless it is particularly recommended for the notably successful accounts which it gives of the physics which underlie the topics which it describes, especially perhaps some of the techniques of inelastic scattering. The book is divided into five parts called respectively Fundamentals of Low Energy Neutron Physics and Atomic Dynamics of Matter, Slow Neutrons in Nuclear Studies, Studies of the Condensed State, Scattering by Chemically Bound Nuclei and Scattering by Magnetic Crystals and each part contains several chapters. This arrangement ensures very full coverage but at the expense of fragmenting some of the descriptions, which makes it difficult for the reader to find his way about the book. There is an index of nine pages but having tested it out on a number of topics the reviewer has concluded that its choice of entries is not very successful. For example, the word 'approximation' has eleven sub-entries, there is a whole page of entries under 'neutron' and a further page under 'scattering' but the

words absorption, fission and inelastic, to mention a few, do not appear.

In spite of these drawbacks the book is a very valuable contribution to the literature on this subject. It is well-written and translated and commendably readable; at the same time the research worker will find it a good work of reference.

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**Electron Paramagnetic Resonance.** BY J. W. ORTON. Pp. 240. London: Iliffe, 1968. Price 65s.

Dr Orton's book concentrates on the microwave spectroscopy of transition group ions in dielectric crystals. Thus it complements, rather than competes with, more general texts, such as those by Ingram & Pake, although the introductory chapters on the basic concepts of paramagnetic resonance spectroscopy enable the uninitiated reader to find his bearings. After a preparatory review of appropriate quantum mechanical operations, the reader is introduced to the concept of the spin Hamiltonian as a convenient and powerful way of expressing the energy of a paramagnetic ion in a crystal. Subsequent chapters deal with transition probabilities and crystal field theory. The author approaches these subjects from the experimentalist's point of view drawing repeatedly on particular examples to develop his arguments. Whilst this presentation lacks the elegance and rigour of a more abstract approach it does enable the reader to appreciate the physical and practical content of the theory. The discussion on crystal field theory is approached from the point charge model, with its simple pictorial representation, and from crystal field operators. No use is made of group theory, though the importance of symmetry is clearly indicated and refinements to the point charge model are discussed. The section on magnetic properties of ground states will be of particular value to experimentalists wishing to enter this field, since it painstakingly shows how such properties can be expressed in terms of standard coupling coefficients and crystal parameters which are convenient starting points for more detailed theoretical analysis. The final sections of the book are concerned with short discussions of spin-lattice relation, experimental techniques and of results (up to 1966) for the transition group elements. However, no mention is made of combined optical and microwave spectroscopy such as the work of Geschwind *et al.* on the e.p.r. spectra of optically excited states of Cr in ruby, *etc.*

In summary, this book is a valuable introductory or refresher manual on the interpretation of microwave spectra of paramagnetic ions in crystals. Not only does it provide the necessary theoretical background for a general understanding of the subject, but it also shows the experimentalist how to 'process' his results into standardized and theoretically useful forms.

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