Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (M. M. Woolfson, Physics Department, University of York, Heslington, York YO1 5DD, England). As far as practicable books will be reviewed in a country different from that of publication.

Theory of X-ray and thermal-neutron scattering by real crystals. By MIKHAIL A. KRIVOGLAZ. Pp.xix + 405. New York: Plenum Press, 1969. Price $25.

This book is divided into two parts. In the first the theory of the elastic diffraction of X-rays and neutrons in imperfect crystals is discussed in detail. The imperfections which are treated include solid solutions in which the atoms not only have different scattering factors but also are permitted to displace from their equilibrium positions and to be correlated with one another, the finite dimensions of the crystal, and severely distorted crystals containing many dislocations. In the second part of the book the inelastic scattering is described. This part discusses the scattering by phonons from harmonic crystals and then goes on to show how this scattering is modified by the anharmonicity and by the presence of defects in the crystal.

As will be seen from the list of contents the range of topics covered by the book is very large and they are all treated so as to bring the reader up to the last developments in the field by the time the book was written in 1967. Indeed in many places the book is even more up-to-date because it contains results which have only become common knowledge since that time. The book certainly contains a wealth of detailed results which are not readily available elsewhere.

The book suffers because it contains so much and little space is permitted to discuss the significance of the different results. Consequently it is very hard, unless the reader is very familiar with the field, to appreciate the significance of these results. Likewise the pace of development in the book is enormous. Unless the reader has a very sound background in solid state physics and familiarity with scattering theory he will find it difficult to follow. In short the work is a useful addition to the literature but could have been much more useful if more concessions had been made to the reader at the expense of not including as many detailed results.

The book is reasonably well produced and does not have too many misprints. The index could have been better.

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Wave mechanics of crystalline solids, BY R. A. SMITH London: Chapman & Hall, 1969. Pp.xx + 553. Price £6·30 U.K. only.

A second edition of R. A. Smith's successful introduction to the theory of the solid state has appeared. There is greater emphasis on presenting theory for three-dimensional situations than in the earlier edition, and a short chapter on many-body theory with applications to superconductivity has been added. While there have been criticisms, in some quarters, of omissions of some fundamental topics, and of excessive orientation towards semiconductors, the book is a very valuable bridge between descriptive treatments of the solid state and some more formal and formidable books on solid state theory that have appeared in the last few years.

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X-rays and their applications. By J. G. BROWN. Pp. 258. London: Iliffe, 1970. Price (soft back) £1·50, (hard back) £3·25.

The author justifies the publication of this book by claiming that there is no really suitable up-to-date textbook on X-rays for undergraduates; the last edition of Compton & Allison was published in 1935, and this is still a definitive work. X-ray tubes have changed a great deal since then. But one can see the difficulties facing anyone who wishes to bring the subject up-to-date; the basic theory has not changed, and the developments in X-ray tubes involve only technical improvements, so that descriptions of apparatus tend to be mere catalogues. The justification for the present book is therefore largely that it is a much smaller and therefore cheaper book than has existed up to now.

All the standard aspects of X-rays are dealt with – crystallography, diffraction, spectroscopy, health hazards, radiography and general applications. The writing is clear, but tends to be rather 'schoolmasterish'. The author reminds us that $\cos^2\theta + \sin^2\theta = 1$, that an X-ray tube presents hazards only when it is switched on, and that the anode has to be insulated from the cathode! The depth of some of the theoretical discussions is disappointing; often, when a crucial point is reached, the author refers the reader to another book. I believe that, for a textbook, treatments should be complete in themselves.

The section on crystallography is particularly disappointing; in an attempt to avoid excessive length, the treatment becomes misleading in parts. As examples, a well-formed crystal is said to have the form of a regular solid, and the centre of symmetry is said no longer to be used as a fundamental symmetry element (presumably because its symbol is that of a onefold inversion axis). The author makes use entirely of axes of symmetry, and thus the monoclinic system is said to be characterized by a twofold axis; the mirror plane is not included, again presumably because its symbol can be $\bar{2}$. The relationships between systems, classes and space groups are also not clearly set out.

The best parts of the book are those concerned with X-ray tubes and their operation, and the diffraction of X-rays; these are discussed in full detail. The Compton effect is also treated thoroughly. To my mind, it would have