Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

Scanning electron microscopy, 1976, Vol. 1. Edited by O. JOHARI. Pp. xviii + 782. Chicago Press, 1976. Price $28.00.

Proceedings of the Ninth Annual Symposium in Scanning Electron Microscopy are published in two volumes. The present review is concerned with the first of these, covering the symposium proper and workshops on physical applications of the scanning electron microscope and microelectronic device fabrication and quality control with the electron microscope. Finally, several tutorial papers are included, and a most valuable bibliography on cathodoluminescence, and a similar collection of information relevant in forensic applications of SEM. In all, the coverage embraces some 60 papers.

Reference to microscopy conjures in the minds of many a merely qualitative, even pictorial approach. However, the development of a wide range of quantitative techniques of elemental analysis, *e.g.* X-ray, cathodoluminescence, Auger, *etc.*, strongly represented in this volume, must dispel such a misconception about the now well-established status of scanning electron microscopy.

The opening papers testify to the still unresolved controversy about the exact nature of the interaction of electrons at the surface of solid matter and, in particular, the origin of contrast in SEM images.

The 'take-over' of scanning transmission electron microscopy (STEM) under the umbrella of the symposium must be considered as a valuable acquisition. As usual, papers from Cowley's laboratory form the highlight of these proceedings. He shows how electron diffraction information can be used to derive the position of atoms within large biological molecules, adding that the 'phase problem', familiar in X-ray diffraction, may be overcome in several ways. Moreover, Cowley correctly argues that such a method is capable of reducing electron damage below that involved when images of the atoms are sought directly, either by bright or dark-field techniques. One hopes that practical realization of this will provide a useful complementary adjunct to other methods of great importance in the study of crystalline and paracrystalline solids; the method has obvious advantages over labelling with heavier atoms, also represented in the symposium.

A few years after the inception of what, until now, one recognized as the Chicago Annual Symposia, views were heard that it might not be possible to sustain the enthusiasm felt at the beginning (in 1968), when the band of workers eagerly followed the pioneering investigators of the Cambridge school. Of course, the expansion in new directions and the numerical growth of users must be regarded as significant when one considers the scientific success of these symposia and the associated activities. Yet all involved, over a period of nearly ten years, in the work of these symposia will doubtless agree with this reviewer that without the faith and vision of the man who conceived the idea of an international gathering of this kind, the impetus would have waned. Dr Johari has been able to give us an example of what can be achieved by the widest possible consultations, calling on referees from all corners of the world (there are some 200 names given in the present volume) and by careful editing of the text, including the comments of its referees with each paper.

The question arises whether a volume listing 116 positions in the subject index, can represent uniform scientific standards. Clearly, 'tutorial' contributions inevitably lead to the inclusion of somewhat dated information. Moreover, looking carefully over the exchanges between the authors and the referees, one feels that the editor becomes too much involved, so that the original (not necessarily incorrect) ideas give way to the convictions of a selected few.

On the whole, the phenomena at the surface of solids due to the action of electrons are well covered: for example, progress in the understanding of electrostatic charging; temperature measurements in samples inside the electron microscope (using thin-film thermocouples); environmental cells (for the examination of water-containing specimens); advantages and disadvantages of low-temperature cells for biological specimens; the problems of fabrication of microelectronic devices and quality control – two enormous areas, well covered in the proceedings.

This reviewer, on this side of the Atlantic, found some of the recognized (?) terminology and, in particular, some of the abbreviations a little unnerving. However, the present volume will join publications from the previous symposia, as a standard reference in any laboratory engaged in the art of scanning electron microscopy.

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Intermediate quantum theory of solids. By A. O. E. ANIMALU. Pp. xi + 516. Englewood Cliffs, New Jersey: Prentice-Hall, 1977. Price £18·00.

In spite of the unassuming title, this is a rather good textbook of contemporary solid-state physics aimed at the good undergraduate, the postgraduate and the lecturer.

The text consists of 12 chapters and 516 pages with narrow margins resulting in a very high ratio of text area to page area – $\frac{5}{8}$ compared with a norm usually below $\frac{1}{2}$. The book is packed with information which is very up-to-date: as a quarry of appropriate examples, interesting exercises, references, beautifully-drawn diagrams and topical discussion it is a lecturer's dream. The topics covered are crystal lattices (perhaps the most rapid resumé I have ever seen), diffraction, interatomic forces, lattice vibrations, band theory, electronic properties of solids with and without a magnetic field, semiconductors and superconductors, mag-

netic properties and excitations of the electron gas. To bring one to the 1976 frontiers of research in all these topics in so short a space necessarily means that only the most hardy will survive, but the book is written in such a way that those bright students who get bored with the pedestrian and often superficial accounts of these subjects in the best-selling textbooks may well find their match with this one if they can afford its price – nearly 2% of a British student's grant.

The book does not have the maturity of style exhibited by the best of the 'grand masters' in that one is seldom persuaded of a difficult point by philosophical and pedagogical expertise; rather one is presented with a concept, fact or equation with practical rather than pedagogical comments and then led rapidly on. The grammar, too, is casual in places and among the unfortunate mis-spellings (which cannot all be printing errors) are Lamor for Larmor, Leonard-Jones for Lennard-Jones, Voight for Voigt, Shoenflies for Schönflies, Friedal for Friedel and Koopman's for Koopmans'. The indexes are incomplete, especially the author index which seems to be limited to those whose papers were actually quoted to the exclusion of those whose papers are so famous they are seldom quoted, *e.g.* Bravais, Miller and Voigt. More polish and accuracy would have made this book a classic in the field and perhaps the last attempt to describe the whole of solid-state physics in one manageable volume.

Crystallographic and chemical readers of *Acta Crystallographica* will find this book only of passing interest – it really is 'physics for physicists' though the inorganic chemist developing new materials may well find it a useful summary of modern calculational techniques. I would hope that libraries could afford a copy each: probably only a more adventurous pricing policy on the part of the publishers would give it any chance of capturing the student market. Certainly it will be a good book to look out for when 'remaindered'.

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Систематический анализ функции Патерсона на основе симметрии кристалла (Теоретические диаграммы ромбов пиков). Э. Л. Кузмин, С. В. Борисов, В. П. Головачев, В. В. Илюхин, Л. Н. Соловьева, А. Н. Чернов. Под редакцией академика Н. В. Белова. Стр. 352, Рис. 284, Таблици 7. Академия наук СССР, Хабаровск, 1974. Цена 1р. 40к.

Книга является монографической обработкой способа расшифровки функции Патерсона из известной пространственной группы структуры кристалла – метода ромбов пиков. Применением правил линейных и плоскостных концентраций, разработанных в известной книге М. Бюргера *Структура кристаллов и векторное пространство*, были выведены теоретические *a priori* диаграммы векторных систем пространственных групп низших и средних сингоний. Эти диаграммы даны в книге графическим способом в форме таблиц, приведенных в приложении. Изображение каждой диаграммы содержит чертёж пространственной группы с обозначением одного межатомного вектора в общем положении и чертёж соответствующей векторной системы в патерсоновской группе в смысле метода ромбов пиков. К каждой диаграмме приложен символ пространственной группы и символ соответствующей патерсоновской группы в скобках. Этот богатый материал рисунков вместе с инструкцией для его практического использования, придают книге и характер практического курса. Метод ромбов пиков позволяет осуществлять уточнение симметрии структуры кристалла и локализацию структурных фрагментов. Анализ функции Патерсона с помощью этого метода в книге демонстрирован на примерах структур соединений $K_2Cr_4O_{13}$, $KNiPO_4$ и $Na_2Cr_2O_7$.

Логическое строение и объём глав даёт хорошее введение для широкого круга структурщиков. Книга предназначена для научных сотрудников, аспирантов и студентов, специализирующихся в рентгеноструктурном анализе.

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Surface and defect properties of Solids. Vol. 5. Par M. W. ROBERTS et J. M. THOMAS (Senior Reporters). Pp. ix + 233. Londres: The Chemical Society, 1976. Prix £16·00.

La Société Chimique de Londres fait paraître des rapports périodiques spécialisés: le volume 5 de la série sur les propriétés des solides liées aux surfaces et aux défauts, publié sous la direction de M. W. Roberts et de J. M. Thomas, comprend huit chapitres de longueurs et d'esprits différents.

La structure électronique superficielle est présentée en 15 pages par S. J. Gurman et M. J. Kelly. Ce premier chapitre qui fait le lien entre la physique de l'état solide et le modèle chimique des liaisons, confronte les résultats théoriques et expérimentaux sur les états électroniques superficiels, en particulier dans le cas de la surface {111} du silicium; un paragraphe est ensuite consacré à la modification des états volumiques par la présence d'une surface.

Le chapitre 2, *Structures de disclination dans la mésophase carbonée et le graphite*, par J. L. White et J. E. Zimmer montre et interprète en 20 pages des structures de disclinations observées avec le microscope photonique et le microscope électronique à balayage; il étend ainsi aux cokes et au graphite le domaine d'application des disclinations présentées dans le volume 3 de la même série.

Le chapitre 3 par G. M. Rosenblatt traite en 29 pages *Le rôle des défauts dans l'évaporation*: *arsenic et antimoine.* Il montre comment les dislocations et autres défauts observés influent sur la cinétique de l'évaporation.

Dans le chapitre 4, *Interaction des électrons rapides avec les cristaux organiques dans le microscope électronique: difficultés associées à l'étude des défauts*, W. Jones montre