

of the electron microscope will not find it here, but what he is given is almost all the information needed for interpreting electron images as to contrast and resolution.

Starting from the belief that 'the ultimate goal of electron microscopy is the elucidation of atomic and molecular structures', the author's aim has been to develop 'a coherent, physical approach to the understanding of contrast ... whether the objects are plant cell walls or crystals containing stacking faults', making clear that the basic processes of image formation are the same in both amorphous and crystalline specimens. In this aim he has largely been successful, although it may legitimately be doubted whether, as he hoped, the lesson will be intelligible to biologists and chemists as well as to physicists, at least unless they have had a good grounding in physical optics and the calculus. There is, however, one shortcoming of some importance in the treatment, in that he does not give a detailed account of the anomalous-absorption theory of electron transmission in crystals. In consequence he is unable to deal adequately with the contrast effects caused by lattice defects in thick films, and in regard to the intensity distribution in absorption bands, his alternative explanation by a three-beam theory does not account for the observed variation with thickness, as does the anomalous-absorption approach. However, Dr Heidenreich is frank about the personal nature of the treatment put forward; he states: 'The reader is referred to the original publications in this somewhat

controversial area', and he gives the main references, except for the important papers by Yoshioka.

Apart from this omission, the treatment is extremely thorough. The text is well planned and lucidly written. The mathematics, where sampled, proved to be commendably free of proof-reading lapses, despite its volume and complexity. There is a wealth of diagrams, many of them cleverly planned and beautifully executed to illustrate three-dimensional situations. On the other hand, the micrographs are not always reproduced with enough definition and contrast to convey the intended information. There are also fifty pages of appendices containing tables of crystallographic data and electron-scattering amplitudes, as well as a more detailed discussion of some topics mentioned in the text, such as the phase effects of electron-lens aberrations and the determination of Burgers vectors.

Very few could have conceived such a book and still fewer could hope to carry it out so successfully. In effect Dr Heidenreich has tried to do for electron microscopy what Pinsker's book did for electron diffraction some ten years ago, *i.e.* to expound clearly its quantitative basis. In doing so he helps to clarify those areas where understanding is still weak or inadequately tested, and incidentally provides an invaluable reference book by gathering between two covers a literature which is widely scattered. It is safe to predict that his book will quickly become the bible of all those working in quantitative electron microscopy.

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## Reports on progress in physics, Volume XXVII.

Ed. A. C. STICKLAND. Pp. iv+551. London: The Institute of Physics and the Physical Society, 1964. Price £6.

The present volume contains again a number of reviews of interest to the crystallographer and solid-state physicist. In the first place we have to mention A. F. Devonshire's *Some recent work on ferroelectrics*. It treats selected topics (among others the recently discovered SbSI), particularly if interesting from the theoretical viewpoint. R. E. Howard and A. B. Lidiard give a thorough and authoritative account of the transport of matter in solids (80 pages), emphasizing particularly the standpoint of the thermodynamical theory of irreversible processes, with numerous sidelights on the description of the transport phenomena in terms of crystal defects. H. K. Henisch discusses electroluminescence with a view for the limitations of our present understanding and pointing out the need for further investigations. He mentions briefly the modern topic of junction lasers, which, among numerous other subjects, is also treated in an 85-page contribution by J. E. Geusic and H. E. D. Scovil on microwave and optical masers.

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