

and biological applications, including both X-ray analysis and electron microscopy.

The most outstanding feature of the treatment is its authority and extreme lucidity to the non-specialist.

Extensive reference to the original papers is given. One appreciates the critical warnings concerning 'limitations which are not always fully appreciated'. The initiator of the phthalocyanine synthesis rightly stresses the power of the heavy-atom technique and especially that of the isomorphous-substitution method. Perhaps the usefulness of the Patterson method could have been valued a little more optimistically. A chapter like that on the condensed hydrocarbons naturally gives evidence of the author's monumental work.

The Baker Lectures have been enriched by an excellent volume.

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Twinning and Diffusionless Transformations in Metals. By E. O. HALL. Pp. ix+181 with 97 figs. and many tables. London: Butterworths. 1954. Price 30s.

All the leading topics within the field of twinning in metals are surveyed in this monograph: geometrical aspects; the homogeneous twinning shear, and concomitant heterogeneous atomic movements, for the various metal structures; experimental methods for determining twinning elements, including Cahn's work on α -uranium; data relating to the formation of twins under stress and by heat treatment; dislocation mechanisms for the growth of deformation twins; the situation at grain boundaries; recent Russian work on the possibility of nucleation by classical elastic stress concentrations. There are preliminary sections on general crystallography, stereographic projection, techniques for the preparation of metal single crystals, and plastic deformation by slip and by kinking. Finally there is a long chapter devoted to martensite transformations (referred to by the author as diffusionless transformations), including Frank's dislocation analysis of the γ - α interface. The book includes several useful tables, in particular the three summarizing the crystallography of slip, twinning, and martensite reactions respectively; these would prove more convenient for reference and comparison if grouped at the end together with appendices. The author's extensive reading of the subject is reflected in the very full lists of both antique and modern references, some of them not readily accessible, which are provided at the end of each chapter.

The chapter on theories of twin formation, concerned almost wholly with dislocations, is something of a disappointment. Only two paragraphs each are devoted to the important papers by Cottrell & Bilby, and by Millard & Thompson; these papers make difficult reading, and could bear the clarification and critical exposition which one looks for in a specialized monograph. The earlier part of the chapter is taken up with an account of the theory of dislocations, beginning *ab initio* and moving rapidly through a variety of topics very indirectly connected with twinning. This material is not required by the research worker, is likely to prove indigestible to the

student, and is in any case treated much more satisfactorily elsewhere. Similar considerations are applicable to the first chapter, dealing with the structure of crystals and with the stereographic projection. No useful purpose can ever be served by a hurried treatment of standard material, and the book could be immensely strengthened by eliminating such material and concentrating more fully on later developments.

The various figures meant to illustrate atomic movements have been taken over directly from the literature, but it must be said that they are largely incomprehensible. This defect could have been to some extent remedied by cutting down the excessive number of atomic sites and projections included, and by distinguishing clearly between points arising from a lattice and those arising from its associated basis. People would do well to realize that very carefully thought-out methods of representation are required if twinning diagrams are to succeed in their object.

Compared with slip, or even with the martensite transformation, twinning is a comparatively mysterious phenomenon, and no definitive account of it can be given at the present time. In the circumstances any book on the subject can amount to little more than a loosely strung series of facts and speculations, awaiting the ideas which could render a more unified approach possible. Meanwhile the monograph by Dr Hall is to be welcomed as providing a compact review of our present state of knowledge, useful to the research worker as a book of reference and yet suitable for the post-graduate student as a gateway to a subject both difficult and fascinating.

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Bau und Bildung der Kristalle. By F. RAAZ and A. KÖHLER. Pp. iv+185 with 166 figs. Vienna: Springer. 1953. Price 31s.

It is very difficult to understand for whom this book is intended or what purpose is served by its publication. Within the short space of 180 pages an enormous field is covered, but so superficially that the treatment can be of no value to the trained crystallographer. On the other hand it can have little appeal to the general reader because specialized and relatively advanced ideas are freely introduced without adequate explanation or discussion, and in an order difficult to justify on any rational basis. Thus the book opens with an account of morphology and symmetry in which Miller indices are employed, although these are defined and explained only at a later stage. An account of lattice geometry follows and half a page is devoted to space-group theory (the Schoenflies notation is adopted and in the diagrams unconventional symbols are used for the symmetry elements). A brief introduction to X-ray diffraction is followed by an account of the crystal chemistry of the silicates; only after this are simpler structures such as rocksalt, diamond and fluorite considered. Then comes an account of crystal optics (6 pages) in which pleochroism, ray surfaces and dispersion are the topics selected for discussion. Piezoelectricity is considered next and the rest of the book