Stone wrote a successful chapter surveying the theory of intermolecular forces with emphasis on the orientational dependence of the potential. Luckhurst considers theories of nematics based on the long-range part of the anisotropic intermolecular potential. Theories on the short-range components are found in chapters 7 and 8.

Several chapters discuss the cholesteric–nematic structure (often called the cholesteric). The development of a molecular model is still evasive and there seems to be considerable controversy among theoreticians on the structural model of the cholesteric–nematic. These differences of opinion were evident at the time of the school and surface in chapters 5 and 6.

Martha Cotter does a nice job of discussing the hard-core model of the liquid-crystalline state. The theoretician is still looking for a better model. Computer simulations presented in the chapter written by Zannoni point out that the problem of calculating the thermodynamic observables of a fluid from a given intermolecular potential is complex and with a few exceptional cases only two possibilities are open: (1) use of approximate theories, and (2) resorting to computer simulation. The chapter consists of numerical solutions to the problem of many interacting particles.

Martire's chapters focus primarily on the equilibrium thermodynamics of first-order phase transitions and their bearing on molecular statistical theories of mesophases. These chapters are well prepared and cover interesting material.

The remainder of the book focuses on experimental methods used in the study of liquid crystals. Structural studies of nematic, smectic *A* and smectic *C* phases are presented by A. J. Leadbetter. Immediately following Leadbetter's chapter there is a chapter by Doucet on X-ray studies of the ordered smectic phases. Both of these chapters deserve to be read by people doing serious work on liquid crystals. There are three chapters devoted to NMR spectroscopy. Collectively, these chapters give a good survey on the 'state of-the-art'.

Raman studies of orientational order in liquid crystals is a convincing presentation with well-defined concepts. The book closes with a good summary of studies involving incoherent quasielastic neutron scattering by Leadbetter & Richardson. The book is highly recommended as a good reference on selected topics of liquid crystals. It is written by a selected group of scholars and edited by two persons who have established themselves as 'first-line' researchers in liquid crystals.

G. H. BROWN

Liquid Crystal Institute
Kent State University
Kent
Ohio 44242
USA

Acta Cryst. (1981). A**37**, 140–141

Röntgenbeugung am Realkristall. (X-ray diffraction in real crystals.) By E. BORN and G. PAUL. Pp. viii + 155. Munich: Verlag Karl Thiemig, 1979. Price DM 28.00.

The authors of this small book on X-ray diffraction (Thiemig-Verlag: *Taschenbücher*, Band 69) have attempted to give the reader a general insight into the interrelations between crystal-lattice defects and X-ray diffraction characteristics. Their theoretical treatment of X-ray diffraction by crystals is based on the kinematical theory.

In Section 1, the reciprocal lattice is introduced and the equation for the diffracted intensity by a perfect crystal is formulated. Section 2 (about one half of the book) deals with X-ray diffraction by a crystal with randomly distributed point defects (vacancies, foreign atoms in and out of the lattice points, *etc.*). This part is compiled according to Krivoglaz theory and completed by the Stokes correction method for measured diffraction profiles. Further, diffraction by crystals with superlattice and planar defects is discussed – the emphasis tending rather towards applications in mineralogy. In the next part, the existence of dislocations, as one further type of crystal-lattice defect, is mentioned without their influence on diffraction characteristics being examined. The conclusion of Section 2 is devoted to diffraction by polyatomic molecules and liquids (small-angle scattering). In the last section (Section 3) the reader's attention is directed to the fundamentals of X-ray experimental techniques as used in X-ray diffraction studies of real crystals, like the Laue method, the Weissenberg and precession methods, the powder focusing methods and the Lang and Berg–Barrett methods of X-ray topography. The treatment gives experimental details of X-ray filtration, monochromators for powder focusing cameras, X-ray detection and, for example, the X-ray diffractometer justifying procedure, too. The reviewer would have liked the above points of experimental method to have been illustrated by reproductions of the relevant X-ray diffraction photographs.

The conception of this book is based on the text of a course of lectures, as is mentioned by the authors in the *Preface*. The advantage of such a presentation is that one can easily obtain a good idea of the reasons for the diffraction phenomena that are discussed, without any use of complex mathematical formulae. In this respect, the authors have succeeded in pitching their book at the right level. A few trivial errors, for example, in equation (11), or the inconsistency in the symbols of the scalar product in equations (2) and (11), may be corrected by the reader himself. Unfortunately, however, the quality of the illustrations and diagrams does not correspond with the pedagogical approach to the theory. For instance, in Fig. 22 it is not clear whether the plotted interval of diffraction angles has the value of units, or of tenths of degrees; then, in the illustration of the spectra of X-ray tubes – see Figs. 28 and 32 – the doublet $K\alpha_{1,2}$ is not plotted; Fig. 33 does not contribute very much to an understanding of the Weissenberg method; and Fig. 52 does not give an exact scheme for the Lang topographic method.

The treatment adopted by this book partially idealizes the study of X-ray diffraction by crystals with defects. This may be because, in this book, the argument follows a path from the crystal with some defined type of defect to the diffraction effect, without illustrating the reverse path, by showing experimental results. Furthermore, in the reviewer's opinion, the omission of the dynamical theory of diffraction, in the case of diffraction by perfect crystals and for the consideration of X-ray topogram contrast, is disadvantageous.

From this brief outline, it should be clear that this pocket volume may serve as a first introduction to theoretical models of crystal-lattice defects, their influence on diffraction properties, and corresponding methods. For students and

general readers who are interested in applications of X-ray diffraction, especially, for example, to mineralogy rather than to metals or semiconductors, it may be helpful.

J. KUBĚNA

University of J. E. Purkyne
Brno
Czechoslovakia

Acta Cryst. (1981). A**37**, 141

Growth and properties of metal clusters: applications to catalysis and the photographic process. Edited by J. BOURDON. Pp. xviii + 549. Amsterdam, Oxford, New York: Elsevier, 1980. Price US $97.50, Dfl 200.00.

A conference with this title was held at Villeurbanne, France, in September 1979 in order to bring together research workers in various academic disciplines and from the different industries whose technology depends on the growth and properties of metal clusters. The book contains most of the papers presented at the conference, together with a record of the discussion after each paper and a more general panel discussion. The different papers are grouped under the titles: *Nucleation, growth, coalescence*; *Electrocrystallisation*; *Structures, physico-chemical properties, theory*; *Application to the photographic process*; *Structure and catalytic reactivity*; *Application to catalysis*.

The conference came at an appropriate time for photographic scientists since, at the previous year's International Congress held at Rochester, New York, thermodynamic theories of the formation of latent images had been established as alternatives to earlier atomistic theories. Moisar and Malinowski, the two leading exponents of this thermodynamic formalism, summarize their ideas in separate papers, that of Moisar extending the approach for the first time to consider photographic fog. Other interesting papers in the photographic section include those of Hamilton, which summarizes work on vacuum-deposited silver and gold nuclei and its relevance to latent-image theory, and Hoffman, who proposes that developability depends on the thermodynamic state of the silver halide microcrystal rather than on the size of the silver cluster (latent image).

One aspect of Malinowski's description of latent-image formation is the idea of a rapid diffusion of silver atoms on the silver halide surface. The growth and diffusion of metal clusters on substrate surfaces is described for two very different systems by Ehrlich & Stolt – rhenium on tungsten – and Wynblatt – platinum on alumina.

Other examples of physical phenomena being encountered in widely different fields are seen in the papers on electrocrystallization by Maurin & Budewski, Staikov and Bostanov. The formation of nuclei under high overpotential (high supersaturation) and their growth at an overpotential just below the critical, the tendency to form increasing numbers of twins at higher overpotential and the rapid growth of multiple twins are all familiar to those who have studied the growth from solution of inorganic crystals, including photographic silver halide emulsions.

A question which is touched upon in several different papers and examined in the panel discussion is the size at which a cluster ceases to be a cluster and adopts the properties of the bulk metal. There was general agreement that the transition size will depend on the property being measured, and the calculations of Hamilton and co-workers and Cyrot-Lackmann and the measurements by Kreibig on gold clusters in photosensitive glass all support a transition from 'cluster state' to bulk structure at a size of several hundred atoms.

The conference was a success in that it led to fruitful contact between scientists in many disciplines. In particular, papers were presented by Salem and by Cyrot-Lackmann which described two very different approaches to calculating metal-cluster–adsorbed-molecule structures, which provoked much stimulating discussion. The absence of Salem's paper in the book is a serious omission from an otherwise admirable recapture of the conference.

The book will be useful to specialists in the different fields who wish to obtain an appreciation of current work in the other fields. The paper by Moisar & Granzer may be particularly useful as an introduction to the photographic process for the non-specialist.

M. J. HARDING

Ilford Ltd
Research & Engineering Centre
The Drive
Warley
Brentwood
Essex CM13 3AT
England

Acta Cryst. (1981). A**37**, 141–142

Defects and diffusion in solids: an introduction. By S. MROWEC. Pp. 466. Amsterdam, Oxford, New York: Elsevier, and Warsaw: Polish Scientific Publishers, 1980. Price US$83.00, Dfl 170.00.

This is the fifth volume of a series in *Materials Science Monographs*. Professor Mrowec, a specialist in the study of defects and diffusion in solids, has made many contributions in the study of metals and their oxides and sulphides. The book is an excellent introduction to material science; it is divided into four chapters with strong emphasis on experimental aspects.

The first chapter describes briefly the most common structures of solids and their linear and planar defects. Thermodynamically reversible defects are extensively treated with an elegant discussion of point defects and their thermodynamic properties. In the section on extended defects, not included in the Polish edition, the author gives a fairly complete discussion on complexes and defect clusters. The first chapter ends with a small section on the electrical conductivity of ionic crystals that is too short to help the reader and is the weak point of the book.

The second chapter, *Diffusion in the solid state*, after a short introduction to Fick's laws, describes the basic mechanisms of lattice diffusion and the correlation effect. A short discussion on the relation between diffusion and ionic