mechanisms and phenomena. The chapters in this volume consist of largely unconnected reviews at an advanced level. Thus, the series is likely to be useful primarily as a reference work rather than as a textbook, although there is much tutorial material.

Chapter 1 (H. J. Scheel, 42 pp.) is an interesting historical review, beginning with Egyptian bronze casting in 1500 BC and containing 105 references dating from 1698 to 1991. Chapter 2 (R. F. Brebick, 60 pp.) covers the theory of phase equilibria, with applications to equilibria between two condensed phases, equilibria between a condensed phase and a vapor phase, compounds with a narrow homogeneity range and solid solutions. Chapter 3 (H. Wenzel, W. A. Oates and K. Mika, 84 pp.) emphasizes the equilibria between point defects in silicon and in gallium arsenide, particularly in relation to solidification processes. Chapter 4 (B. Mutaftschiev, 61 pp.) deals with the theory of nucleation, including bulk phases and new atomic layers on a growing crystal surface. The emphasis of Chapter 5 (A. S. Myerson and A. F. Ismailov, 56 pp.) is on the structure of supersaturated solutions, including the most recent experimental measurements of the strange behavior and properties of supersaturated aqueous solutions of inorganic salts and organic compounds. For example, the value of the diffusion coefficient drops dramatically with increasing concentration beyond solubility and continues to decline with time after several days. These results are attributed to the formation of clusters of solute molecules. Chapter 6 (J. P. van der Eerden, 169 pp.) is a clear and thorough exposition of crystal growth mechanisms, with emphasis on the atomic processes occurring at the crystal surface. Chapter 7 (P. Bennema, 101 pp.) treats the morphology of growing crystals. Although crystal morphology is determined by kinetics rather than thermodynamics, the predictions of the two frequently coincide because the slowest growing faces are often (but not always) those with the lowest energy. Bennema shows how crystallographic considerations can be used to predict crystal morphology and gives several experimental examples. Chapter 8 (G. H. Gilmer, 53 pp.) presents the results of numerical simulations of atomic processes at crystal surfaces. Molecular-dynamic and Monte Carlo methods successfully reproduce, and help in understanding, experimental observations. The last chapter (J. E. Greene, 41 pp.) in Vol. 1*a* presents experimental results and molecular-dynamics simulations of film growth from low-energy ion sources.

Vol. 1*b* begins with Chapter 10 (A. A. Wheeler, 55 pp.), an introduction to transport processes, including diffusion, heat transfer and fluid motion. Chapter 11 (H. E. Huppert, 41 pp.) deals primarily with heat transfer during solidification of mixtures, including the formation of a mushy zone between the bulk solid and the bulk melt. Chapter 12 (S. R. Coriell and G. B. McFadden, 71 pp.) covers the theory of morphological stability, primarily for solidification from convection-free melts. This theory successfully predicts the breakdown of a planar interface to a cellular one, which is very deleterious for single-crystal growth. Chapter 13 (S. H. Davis, 37 pp.) shows that convection in the melt can lead to complex morphological behavior and can either promote or retard interface breakdown. Chapter 14 (B. Billia and R. Trivedi, 173 pp.) is a thorough treatment of experimental results and theory on the cellular and dendritic patterns that form when an interface breaks down during directional solidification. Chapter 15 (M. E. Glicksman and S. P. Marsh, 46 pp.) deals primarily with the relationship between tip curvature, undercooling, freezing rate and side branching of a single growing dendrite. Chapter 16 (P. Ramasamay, 81 pp.) is largely unconnected with the preceding chapters and deals with the theory and phenomena of electrocrystallization.

Don Hurle is to be congratulated for masterful editing of these volumes. We did not discover a single error in spelling, grammar or equations. On the other hand, with page costs so astronomically high, we regret that he did not provide more detailed instructions on content to the authors. There is too much avoidable duplication of material between the chapters. For example, the subject index reveals that two-dimensional nucleation is covered in three different chapters and is mentioned in several others. The subject index itself does not reveal all of the duplication. Thus, for example, the differential equation for conservation of a component is referred to once as 'Fick's law' in the subject index and once as the 'diffusion equation'. The same equation appears, however, in four other locations, but without being referenced in the index. There is no author index.

This series promises to fulfill the editor's objective in a definitive way. It is recommended as an introduction for the novice and as a reference work for the experienced student of crystal growth. We learned a great deal while reviewing these first two volumes.

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Accuracy in powder diffraction II. National Institute of Standards and Technology Special Publication 846. Edited by E. O. PRINCE and J. K. STALICK. Pp. vi + 234. Washington: US Department of Commerce, 1992. Price US $14.00. SN 003.003.03186.1.

Some quiescent areas of science and technology experience a revolutionary rebirth by a sudden serendipitous discovery, as in the case of high-T_c materials, while others initiate such a renaissance through the advancement of new ideas, which may take longer to develop but whose cumulative effect results in revolutionary advances. In the field of X-ray crystallography we can point to many such milestones: the advent of direct methods for phase determination and the discovery of quasicrystals are just two instances. The advances in powder diffraction surely deserve to be ranked as another such milestone.

The first conference on Accuracy in Powder Diffraction organized in 1979 by the National Institute of Standards and Technology (NIST) (formerly the National Bureau of Standards) was a harbinger of this coming development. The sequel, the International Conference on Accuracy in Powder

Diffraction II, organized by NIST for 26–29 May 1992, brought together leading experts in diverse and developing areas of the field. The proceedings provide a valuable repository for these topics and are an excellent source for crystallographers planning to initiate work in powder diffraction. Twenty-five invited papers and 73 contributions are distributed over six topics: (1) phase identification and quantification; (2) accuracy and standards; (3) new developments in software and data analysis; (4) profile fitting, decomposition and microstructural effects; (5) novel applications and structural science; (6) new developments in hardware, including detectors, and studies under nonambient and time-resolved conditions.

Crystal structure refinement from powder diffraction data has become a familiar tool to crystallographers. It requires a model with which to begin the refinement process. In the last few years, enormous progress has been made in *ab initio* methods for crystal structure determinations from X-ray and neutron powder diffraction data. Single-crystal crystallographers may be particularly interested in four papers illustrating various procedures of this technique, although the absence of any discussion on the use of maximum entropy is unfortunate. The use of these techniques will become very widespread and perhaps even join black-box crystallography structure determinations, when a software package incorporating the various programs becomes available. Efforts along this line are now in progress. Some very interesting modifications of the well known Rietveld technique are presented in three papers that discuss coupling the method with high-resolution transmission electron microscopy images to provide starting models; the extraction of anharmonic displacement parameters from powder data that would be especially useful in studies of high-temperature phase transitions; and the use of anomalous-dispersion effects when powder data are obtained at a synchrotron source. In addition, there are the standard topics of concern to powder diffractionists: qualitative and quantitative analyses, outlining state-of-the-art procedures for gaining more precise information by improving the data-collection modes and subsequent processing. Several papers should be of interest to materials science workers concerned with stress measurements, high-pressure investigation and glasses. These topics, however, receive less emphasis.

This volume should be of interest to a wide audience of scientists working with single crystals, powders and amorphous materials. Experts in one field of X-ray diffraction entering a new application area will find a wealth of information not only in the formal papers but also in the appended references. A subject index would have been helpful; there is an author index and a list of participants. The foreword of the volume states that the papers published in the proceedings of the first symposium in 1979 are 'still widely quoted' and I believe that this volume will prove to be equally valuable.

I can't finish this review without remarking on the very touching opening tribute to Bill Parrish – given by T. C. Huang, his long-time associate at IBM – that briefly reviews his seminal contributions to the field of powder diffraction.

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Book-Review Editor's Note. This book may be purchased from the Superintendent of Documents, Government Printing Office, Washington, DC 20402, USA. Orders must include the stock number given above.