Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (R. F. Bryan, Department of Chemistry, University of Virginia, McCormick Road, Charlottesville, Virginia 22901, USA). As far as practicable, books will be reviewed in a country different from that of publication.

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Mathematical crystallography – an introduction to the mathematical foundations of crystallography. Reviews in mineralogy, Vol. 15 (revised). By M. B. Boisen and G. V. Gibbs. Pp. xii + 460. Washington, DC: The Mineralogical Society of America, 1992. Price (paper) US $20.00. ISBN 0-939950-26-X.

The scope of this monograph, which is a collaboration between a mathematician and a mineralogist, is much narrower than its very general title would seem to imply and considerably deeper than is suggested by the words 'an introduction to ...' in its subtitle. It is, in fact, a comprehensive treatment of group theory as it is applied to the symmetry of three-dimensional periodic structures. It begins by discussing the concept of symmetry in molecules and crystals and then introduces some mathematical tools for describing symmetry, including vector spaces and basis sets but not, curiously, in view of their fundamental importance, matrices, which are consigned to an appendix. Subsequent chapters discuss geometrical aspects of crystals and point isometries. The final four chapters give derivations from first principles of the 32 crystallographic point groups, the 14 Bravais lattices and the 230 space groups. A set of appendices includes discussion in greater detail of various group-theoretical concepts. Many excellent illustrations appear throughout the volume and there are numerous exercises, with answers added in this second edition.

I have great difficulty imagining what audience this book is intended to serve. A foreword states that it was first introduced as a short course in conjunction with annual meetings of the Mineralogical Society of America and the Geological Society of America, which suggests that it is aimed primarily at earth scientists whose backgrounds do not include structural crystallography, but it includes detail that has little utility for someone who wants to learn structure techniques and omits much that I would classify as mathematical crystallography and that is vitally important for such a person. For example, it gives derivations for many of the results that appear in Volume I of the older series and Volume A of the newer series of *International Tables for Crystallography*, but it gives little guidance for finding and interpreting the information that appears in these standard references. Furthermore, although it discusses the reciprocal lattice and mentions X-ray diffraction, it doesn't discuss the implications of glide planes and screw axes for systematic space-group absences, and there is no mention of Fourier transforms, Patterson functions, structure factors, refinement techniques or methods of phase determination.

The first edition of this book was published when the revolution in the technology of publication was just beginning, while the second, which differs from the first mainly through the addition of a large set of answers to the exercises in the text, appeared when the revolution was well advanced. This has the ironic result that the quality of reproduction of the answers is vastly superior to that of the main text, which is a typescript that is unattractive in appearance and not at all easy to read.

For someone who is interested in the mathematical underpinnings of the theory of symmetry, this book could be a useful self-study text. There is little in it that would interest anyone else.

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Solids far from equilibrium. Edited by C. Godrèche. Pp. xvi + 588. Cambridge: Cambridge University Press, 1992. Price £60.00. ISBN 0-521-41170-X.

The oddest and least informative thing about this book is its title. Fortunately, the flyleaf is more instructive and one learns that it contains six sets of pedagogical lectures, by internationally respected researchers into the statistical physics of crystal growth, given at a summer school in Beg-Rohu in 1989.

However, most crystal growth could be said to take place under local conditions of near-equilibrium. Only Chapter 5, by L. M. Sander (45 pp.), which treats fractals and diffusion-limited aggregation, covers situations that are really very far removed from local equilibrium.

The other chapters cover thermodynamic aspects of crystal shape and growth (Chapter 1, by P. Nozières, 154 pp.), instabilities of solidification (Chapter 2, by B. Caroli, C. Caroli & B. Roulet, 141 pp.) including dendritic growth (Chapter 4, by Y. Pomeau & M. Ben Amar, 67 pp.) and kinetic treatments of first-order phase transitions and kinetic roughening (Chapter 6, by J. Krug & H. Spohn, 93 pp.). The chapter by J. S. Langer (Chapter 3, 67 pp.) also covers spinodal decomposition.

This is a very authoritative book, but is limited in breadth of interest by a failure to make much, if any, attempt to relate to experiment. This criticism is not to be made against the chapter on 'Instabilities of planar solidification fronts' by the Carolis & Roulet, but, in contrast, the chapter on