Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

Quantum theory of the solid state (Parts *A* and *B*). By J. CALLAWAY. Pp. xi + 369 + 10 (part *A*) and xiii + 371–824 (part *B*). London: Academic Press, 1974. Price £20·95 each part (Student edition £13·85 parts *A* and *B* combined).

This pair of texts sets out to describe the concepts and methods of the quantum theory of solids but the reader will be faced at once with the problem of the resulting level of sophistication. The claim is made that the books can be used for students who have completed a one-year course in quantum mechanics and who are familiar with the basic experimental facts of solid-state physics, but it should be appreciated that this is a training book for the professional solid-state theoretician and that the quantum mechanics course ought to be at postgraduate level. As such, it stands in comparison with texts such as those by Harrison, *Solid State Theory*, Taylor, *A Quantum Approach to the Solid State*, Kittel, *Quantum Theory of Solids*, or, more recently, Ashcroft and Mermin, *Solid-State Physics*. With much of the sparseness of Kittel, in its hardback format it finds itself priced far beyond the sparse specificity of Taylor and furthermore, lacks the easy flow of the descriptiveness of Harrison or of Ashcroft and Mermin. Nonetheless, it does offer a valuable supplement to those texts in carrying an analysis of the phenomena of solid state in language that is much closer to that of the original research papers.

In that aspect, it calls for comparison with Jones and March, *Theoretical Solid State Physics*, also in two volumes and equally ludicrously expensive. Both these texts develop the application of theoretical techniques which the more introductory texts gloss over or frame in a fashion which is not directly that of the original papers; but the distinct difference between Jones and March and the text under review lies in the index. Frequently, in comparing them for coverage and level of treatment, I found myself assuming from the index that some particular topic was not included by Callaway, only to find that closer detailed study of the text threw up that apparently omitted topic. In addition to the training of theoretical solid-state physicists, one of the uses of books at this level of sophistication is to refresh one's understanding of some specific topic, as opposed to reviewing a general area of study. Precisely that is well-nigh impossible in the Callaway work, much to the disappointment of the reviewer. Apart from that, the book offers much the same coverage, with the Jones and March being slightly more discursive for the marginally lower cost of £37 for the pair. Callaway develops the formalism of solid-state physics in the first volume, treating lattice dynamics, magnetic ordering from a phenomenonological point of view, symmetry and its consequences, and energy bands in perfect solids. His second volume applies this formalism to the problems of impurities and of disordered systems, to the response of the solid to external fields and to electron–phonon and electron–electron interactions. The student paperback edition of Calloway brings it into direct competition with the other more introductory texts mentioned above but I, for one, would find them much more approachable sources for learning my advanced solid-state physics.

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Crystal form and structure. Edited by C. J. SCHNEER (Benchmark Papers in Geology, No. 34). Pp. xiii + 369. Chichester: John Wiley, 1977 (for Dowden, Hutchinson & Ross, Inc., Stroudsburg, Pennsylvania). Price £24·00, $38·00.

A benchmark, in surveyors' language, is an established point on the ground, recorded on our maps, and in accordance with the aim of the series of 'Benchmark' volumes, this book is a collection of papers regarded as significant contributions in the development of our ideas on the relation between the shapes of crystals and their internal structure. Beginning with an extract from an essay on snowflakes by Kepler, published in 1611, which may have been the first suggestion of the close packing of spheres as the basis of crystal morphology, the book includes many papers or extracts in which ideas were put forward in the attempt to understand why crystals found in the rocks or in chemical preparations have such remarkable shapes. The papers, all in English (translated where necessary from the originals), are not in chronological order but are arranged in groups, each dealing with a particular aspect of this very complex problem, or approaching it from a different standpoint.

This is a mineralogist's selection in which papers are only included if they discuss morphology explicitly. This definition of the scope of the collection explains what at first sight seems the most surprising omission from a book with this title: there is not a single Bragg paper. Surprising, because the whole history of the subject falls naturally into two parts: the pre-Bragg era in which we find speculations about internal structure based on crystal shapes, and the post-Bragg era in which atomic arrangements in many crystals were definitely settled by X-ray diffraction and provided the essential foundation for a real attack on the problems of crystal morphology. The early Bragg papers indeed could be said to constitute the outstanding 'benchmark' in the whole history of the subject. But the Braggs did not explicitly discuss morphology, so their papers are not included. It remains surprising that there is a section entitled *The first structures* which contains only papers by Barlow and Pope, published in the pre-Bragg era, in which suggestions, based on morphology, of atomic arrangements in simple structures were made.

To those interested in the history of science the early