Wave Mechanics of Crystalline Solids. R. A. SMITH. Pp. 473, John Wiley & Sons, Inc., New York, 1961. Price $13.00.

In a field as active and diversified as solid-state physics, there is a tendency for the literature to develop large gaps which make it increasingly difficult for a student to enter the field. On the one hand, we have the current research papers, each one highly specialized and intelligible only to the expert. On the other hand, if one attempts to write a textbook to cover the entire field in a volume of reasonable size, the result is that the treatment of each topic is so sketchy that the book amounts to little more than a glossary of terms and guide to the literature (the latter going out of date with a half-life of three or four years).

In the face of this difficulty, a different approach is needed. Certain areas of solid-state physics have attained a degree of maturity and permanence where it becomes worthwhile to produce a treatise covering one topic, starting at the textbook level where one presupposes only a knowledge of elementary quantum mechanics, but carrying the treatment much further, to the point where the reader is prepared to tackle current research papers. With this in mind, Professor Smith has produced this excellent work, which aims to treat the fundamental theory of wave motion in solids, both that of the lattice and of the electrons.

The first two chapters give general background material concerning wave motion in a homogeneous medium, and the free-electron theory of metals. The next two take up the one-dimensional treatment of lattice vibrations and motion of electrons in a periodic potential, carrying the former up to the case of any number of particles per unit cell, and to quantization of both standing and running waves. Following a chapter on crystal lattices, the analogous treatment is given for lattice vibrations in three dimensions, which includes a brief account of the beautiful neutron scattering experiments of B. N. Brockhouse and collaborators, which have yielded detailed $\omega(k)$ curves for several crystals.

The remaining seven chapters concern particular applications of this basic material, taking up vibrational specific heats, Bloch functions, band structure of metals and semiconductors, transport phenomena, effective mass theory, Wannier functions, magnetic phenomena due to free electrons and holes, and interaction of electrons and phonons.

Of the applications given, only the last mentioned is not carried quite far enough to make real contact with current literature, and a more advanced treatment such as *Electrons and Phonons*, by J. M. Ziman (Oxford University Press, 1960), is needed to bridge the gap that remains.

From a pedagogical standpoint, the book is paced exactly right, physical discussions alternating with mathematical derivations. As a teacher of solid-state physics, I can say only that I am sorry this book was not in my hands several years earlier. We spend a great deal of time on the topics covered here, and there has not been any really satisfactory reference. I will certainly use it to good advantage in the future.

The only unfortunate feature of the book is its price. In view of the somewhat specialized area covered, it is impractical to ask students to buy personal copies in addition to other works which would be needed for a survey of all the field. Although the nature of the book is such that it belongs in the student's personal library, I am afraid that the prohibitive price will place it out of reach of the students who could profit most from it. As a result, it will be found only in reference libraries, where it cannot serve its real purpose. After fixed costs of publication have been recovered by sale of the present edition, the publisher would be well advised to consider issuing a less expensive edition, possibly paper-bound, to sell for not more than half the present price. Unless this is done, the book will never reach the wide audience it deserves.

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