

al symmetry." (The roto-reflection axis $6(S_6)$, like its roto-inversion equivalent $3(C_{3i})$, has rotation axis $3(C_3)$ as subgroup of index 2.) A few other slips and misprints, easily pinpointed, will confuse no one.

This book should prove useful to physicists, chemists, crystallographers (of course), but also to decorators and designers, from textiles to ceramics. It will be enjoyed, not only by mathematicians, but by all lovers of orderliness, logic and beauty.

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Electronic Processes in Non-Crystalline Materials

Nevill F. Mott, E. A. Davis
437 pp. Oxford U. P.,
New York, 1971. \$24.00

The appearance of a book on the physics of noncrystalline solids comes at a very timely moment in the development of the field. One of the virtues of the book by Nevill F. Mott and E. A. Davis is that it not only introduces the reader to the theoretical foundations of the field but that it also provides an excellent summary of most of the experimental data at the time of writing.

Amorphous solids pose a most interesting challenge to theoretical and experimental solid-state physicists. How does one explain the experimental fact that a band gap, or at least an energy range with a negligible density of states, exists in nonperiodic structures? How does one understand carrier transport in an electric field when the mean free path of the carriers becomes of the order of an interatomic distance? In the book the authors discuss these and related questions. In particular, they examine the consequences of the existence of both localized and extended states in these materials.

As the energy of a carrier increases, its character changes from localized to extended over a fairly narrow energy range and its mobility is believed to increase drastically. Such behavior may be expected in crystalline semiconductors as well, the localized states having been formed by the introduction of defects or impurities. In amorphous materials, however, not only are the localized states different, because they arise from potential fluctuations, but the extended states are no longer Bloch states with phase coherence over very many interatomic distances. The mobility of carriers in the extended states is therefore no longer determined by scattering by phonons or imperfections but rather by the fact that there is only short-range order. As a consequence,

phase coherence is lost after a few interatomic distances and a whole new diffusion theory of carrier mobility has to be developed.

The authors outline the approaches that lead to the theory of the existence of localized and extended states with a mobility shoulder separating them. They also venture to make estimates of mobility, extent of band-tailing and other parameters of the theory.

The experimental section of the book offers a very thorough compilation of the main experimental investigations—dc and ac conductivity, optical absorption, photoconductivity, drift mobility measurements—and the data are discussed in the light of the theory. Unfortunately, this is a very difficult task. In the first place, the theory presented in the first part of the book develops mainly basic concepts and makes order-of-magnitude estimates of some of the parameters involved. In other words, no attempt is made to take a specific crystalline material and to predict its properties in the amorphous state. Detailed comparison of theory and experiment is therefore impossible, and the most that can be expected is to see whether the main experimental facts agree with the broad predictions of the theory. The authors find that the general agreement is satisfactory, but they do not attempt to make a critical evaluation of all the experimental data. Some of the data—both those that show agreement with the theory and those that seem to contradict it—may well be suspect since control over materials preparation, contact effects and contamination still leaves much to be desired in this field.

Considering the state-of-the-art in the field the authors have done an admirable job in presenting the theoretical framework, summarizing the experimental data and attempting to relate theory and experiment. The book should be of interest to the general physics public and should be extremely valuable to researchers in the field.

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Applied Matrix and Tensor Analysis

J. A. Eisele, R. M. Mason
355 pp. Interscience,
New York, 1970. \$14.95

This book developed out of a series of lectures that were given (presumably by the authors) to graduate students under the Science Education Program of the Naval Research Laboratory. The authors have obviously drawn on their extensive prior experience in vari-

U. Fano & L. Fano

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