but the material including the discussions provides useful material for continuing discussion and argument.

A. E. BENDER

Phase Transitions

Phase Transitions and Critical Phenomena. Edited by C. Domb and M. S. Green. Volume 1. *Exact Results.* Pp. xv + 506. (Academic: London and New York, December 1972.) £10; $31.

THIS is the first in a projected series of at least four volumes on the theory of phase transitions, intended to serve as a standard reference text for some time to come, particularly for graduate students. This intention sounds a little like trying to catch a rainbow, so rapidly is knowledge advancing in this area, but the book can stand on its merit as a set of high-quality review articles.

The book begins with two prefaces (one to the series, one to this volume) by the editors, and an introductory note by C. N. Yang. In only a few pages, they give a good overall view of the present state of the subject, how it got there, and how it might conceivably develop in the future.

The first of the review articles, by R. B. Griffiths, is about rigorous results and theorems. As we have come to expect from this author, it is a model of clarity. It also reveals his sure touch in dealing with the perennial dilemma facing all authors of such articles: whether to risk wearing out the reader by including too much mathematical detail, or risk losing conviction and coherence by not including enough. Connoisseurs will also enjoy this article for some entertaining misprints, such as "by purring bounds on the magnitude of the interaction energy" on page 24, and a real collector's item (too complicated to quote here) in equation (2.C2) on page 19.

There follow four shorter articles. First, J. Ginibre supplies some of the mathematical detail omitted from Griffiths's article, giving a clearly written and fairly complete account of the proof that infinite-volume correlation functions exist and are analytic for sufficiently dilute quantum systems. Next, G. G. Emch describes the C*-algebraic approach to phase transitions. This approach uses a great deal of special mathematical formalism, and it is often difficult for the uninitiated to understand either the meaning of the definitions and theorems or what purpose they serve. The great virtue of this article over most articles in this field is the effort that has gone into explaining these very points.

The next article, by C. J. Thompson, treates one-dimensional models with short-range interactions. Such systems never show phase transitions, but they do fit the secondary theme of this volume, exact results. The fourth article of this group, by H. N. V. Temperley, surveys the methods that have been devised for calculating exactly the thermodynamic properties of the two-dimensional Ising model (two-state "atoms" on each vertex of an infinite square lattice). Their variety and interest are a testimony to the vitality of this problem, first solved by Onsager (1944) in a *tour de force* of mathematical technique.

A slightly longer article, by I. Syozi, is a *tour de force* of a different kind; it shows how Ising models on an astonishing variety of two-dimensional lattices can be solved by transformations and extensions of Onsager's result. The most picturesquely named lattice is the "Asanoha, or hemp-leaf", lattice; the physically most surprising result is that some of the more complicated lattices treated can have three or even five transition temperatures.

The last article, by E. Lieb and F. Y. Wu, with insertions by E. Barouch, D. B. Abraham and R. J. Baxter, is almost a book in itself. It deals with the many variants and generalizations of the "two-dimensional square ice" model first solved by Lieb in 1967. Unlike the others in the book, this is an article for the specialist, going into great mathematical detail and presenting many results that seem to be new.

The volume can be strongly recommended to anyone with £10 to spare and an interest in recent research in the theory of phase transitions.

O. PENROSE

Semiconductors

Theory of Electrical Transport Semiconductors. By B. R. Nag. Pp. vii + 227. (Pergamon: Oxford and New York, December 1972.) £4.50.

THE theory of electron transport in semiconductors has made great strides forward over the last six or seven years. Monte Carlo and iterative computational methods have been developed and successfully applied to a large number of semiconductor problems. Most researchers feel that the way forward lies in the exploitation of these methods. It is to be regretted that Professor Nag is not of that company. The new methods are dismissed in a few lines on the last page of the text with the implication that they are inferior to approximate analytic methods and do not help to build up physical insight. It would be more correct to say that the new computation procedures provide exact solutions to the Boltzmann equation and leave the researcher free to concentrate on the physical processes involved. Moreover, it is hard to imagine a calculation more replete with shafts of physical insight than a Monte Carlo simulation which follows individual electron trajectories.

The book under review is concerned with electrical conductivity theory as it existed before the introduction of modern computational methods. Electron states are discussed in an elementary way in chapter 1 and phonons and electron-phonon interactions are similarly treated at the beginning of chapter 2. The last twenty pages of chapter 2 provide a useful summary of the significant scattering processes in semiconductors. The bulk of chapter 3 is concerned with the relaxation time approximation and the relaxation times for the various scattering mechanisms are calculated in chapter 4. Experimental techniques are briefly reviewed in chapters 5 and 6 and chapter 7 is devoted to the application of semi-analytic techniques to high-field transport problems.

The balance of the book is poor. Considerable space is devoted to elementary notions concerning electrons and phonons which are adequately treated in a number of well known texts. Basic transport theory, on the other hand, is skimmed over very lightly. No discussion is given of either thermal transport phenomena or the Onsager relations. Boltzmann's equation is never stated properly; both the time derivative of the distribution function and Liouville's theorem are omitted from the derivation of the equation and there is no discussion of the limits of its validity. Variational methods for solving the linearized Boltzmann equation are given just two pages of text with no derivation or discussion of the functional involved. There are also a number of worrying errors in the text. The first examples appear on page two with the statements that the momentum of an electron is given by $-i\hbar\nabla\psi$ and its energy is $i\hbar\partial\psi/\partial t$.

The book is aimed at graduate students and new entrants to the field of semiconductor transport theory. There is certainly scope for a new book for this audience which carefully presents the basic theory, deals with the recent advances and points the way forward. The text under review does none of these things and is altogether too slipshod to be recommended.

P. N. BUTCHER

Antibiotic Action

The Molecular Basis of Antibiotic Action. By E. F. Gale, E. Cundliffe, P. E. Reynolds, M. H. Richmond and M. J. Waring. Pp. xviii + 456. (Wiley: London and New York, 1972.) £8.

THIS book deals mainly with studies on the biochemical and molecular basis of antibiotic action. As indicated by the