further data for heterocyclic compounds. This, together with a further twenty-four useful references, will ensure that chemists will, for a long time to come, continue to find this handy volume excellent value for money.

D. E. WEBSTER

HIGH MAGNETIC FIELDS

Physics of Solids in Intense Magnetic Fields

(Lectures presented at the First Chania Conference held at Chania, Crete, July 16–29, 1967.) Edited by E. D. Haidemenakis. Pp. xx + 483. (Plenum Press: New York, 1969.) $27·50.

THE production of high magnetic fields is a specialized branch of technological physics which has recently undergone a very dramatic change as a result of the discovery of very high field superconducting materials. Magnetic fields which previously required a megawatt or so of power to maintain them can now be matched or in some cases surpassed by winding the coil out of a high field superconductor which will then maintain a large magnetic field indefinitely at zero power cost. At the present time the fields produced by such coils tend to be limited to below 1×10^5 oersteds, although this number is gradually going up as the technology of producing the coils is improved and as new materials are developed. This is opening the way to a host of new technological developments in the direction of, for instance, superconducting electric motors. Research for improved materials and techniques means that studies of the basic physics of materials under high field conditions are becoming increasingly important for applications, in addition to their fundamental scientific interest.

Much of the work reported in this volume, which consists of twenty-five papers forming part of the proceedings of a conference held in Crete, July 1967, was carried out at the Francis Bitter National Magnet Laboratory at Massachusetts Institute of Technology. This laboratory uses water-cooled conventional electromagnets which provide facilities available to many scientists in the United States for the study of materials under high field conditions. These are now being supplemented by superconducting magnets. "Hybrid" systems are also being developed, in which the field of a conventional magnet can be boosted up to fields of the order of 3×10^5 oersteds by surrounding it with a superconducting magnet.

Unfortunately, although some attempts have been made to set up a high field facility in the United Kingdom, these have not so far met with ministerial approval, so that this particular branch of physics and technology has fallen somewhat behind in this country. Paradoxically, it seems likely that the first group to develop a large superconducting magnet facility in the United Kingdom will be the high energy physicists who use these magnets in connexion with bubble chambers for studying the collisions of high energy particles. This is yet another example of an area where materials physicists in the United Kingdom are losing out in the competition for Government support to the heavyweights of science politics—high energy physics and space and radio astronomy.

High magnetic fields, of the order of 1×10^5 oersteds or above, form a useful tool for the study of the basic electronic states in solid materials. Several of the papers in this book are in the nature of reviews of a fairly pedagogical character aimed at advanced graduate students or research workers in the field of solid state physics. These include reviews by E. Burstein on "The Interaction of Acoustic and Electromagnetic Waves ('Son et Lumière') with Plasma in a Magnetic Field", P. R. Wallace on "Interband Collective Effects and Magneto-optical Properties of Many Valley Semiconductors", B. Lax and K. J. Button on "Quantum Magneto-optics at High Fields", H. Hasegawa on "Effects of High Magnetic Fields on Electronic States in Semiconductors—the Rydberg Services and the Landau Levels", and W. A. Runciman on "The Zeeman Effect in Crystals". A number of other papers form more specialized reports of recent research interests of the authors.

Most of the articles in this book concern phenomena that can be discussed in terms of the motion of non-interacting electrons in the combined fields of the crystal lattice and the external magnetic field, together with the radiation used to study the materials. The techniques described have proved very successful for the elucidation of much information on the energy band structure of semiconductors and semimetals. Another field of interest is the propagation of electromagnetic waves through metals in high magnetic fields. Some of these are discussed in an article by W. L. McLean on "Helicon Propagation in Metals: Quantum Oscillations in Tin". Finally, there are a few articles on the properties of high field superconductors. The subject of the effect of high magnetic fields on cooperative phenomena such as magnetism is not discussed in this book.

For the novice to the field the usefulness of the book is perhaps limited by the absence of an introduction or survey article setting off the different topics in relation to each other. For the research worker in the field, however, it should form a useful source for recent developments in this particular branch of solid state physics.

S. DONIACH

BOLTZMANN EQUATIONS

Mathematical Methods in Kinetic Theory

By Carlo Cercignani. Pp. ix + 227. (Plenum Press: New York, 1969.) $15.

CERCIGNANI'S book has parts concerned with each of two recent developments in the theory of ideal monatomic gases. The first discusses the nature of the solutions of the Boltzmann equation, especially when conditions deviate far from the Maxwellian state. The second deals with models of this equation which replace the actual collision term by an approximate form, and with solutions of flow and heat transfer problems derived using these models. The two are linked by the use of the eigenvalue theory developed in the first to suggest and justify models used in the second. The emphasis throughout is mathematical, the chief methods used being those of functional analysis and the theory of integral equations.

The first section includes a derivation of the Boltzmann equation from Liouville's Theorem, a deduction of the macroscopic gas equations and the H-Theorem, the introduction of the linearized collision operator and an account of its properties (especially for cut-off potentials), and a critical account of what are described as the Hilbert and Chapman–Enskog methods of solution (though perhaps these authors would have disowned some of the statements attributed to them). Cercignani does not proceed to the actual calculation of transport coefficients. The account of cut-off potentials, made largely for definiteness, introduces an unwanted continuous spectrum of eigenvalues; however, some of the methods invoked to cope with these are also of value in the second section.

The chief of the models used in the latter section is the BGK model (introduced by Bhatnagar, Gross and Krook in 1954, though special cases of it have been used for about 50 years). This assumes a single collision frequency, independent of the molecular velocity, or equivalently a single eigenvalue of the collision operator. Generalized models refer to a collision operator with a finite number of eigenvalues, or to a collision frequency depending on the velocity (a continuous spectrum of eigenvalues). The BGK approximation is applied to studying the layers of slip or temperature-drop near a wall, and the structure of strong shocks, all concerned with effects that become