

at various points to the results of quantal investigations. The ideas as such, therefore, have to be judged by their success in interpreting known phenomena of molecular structure. Starting with simple systems, the author then leads the reader through the more complex areas of organic and inorganic chemistry, ending with a discussion of the structures of excited states of molecules. The mechanism of certain organic reactions is also described within the framework of the theory.

The position of the theory is clearly stated by the author in his final paragraph: "To summarize, it seems not unfair to conclude from the contents of the first half of this book, and from the examination of the simple systems considered in Chapters 3, 4 and 5, that there are sound reasons for believing that the hypothesis is firmly based and that there are advantages in making use of it for formulating at least some molecular electronic structures. This, together with the examples presented in Chapters 6, 7, 8 and 9, provide justification for also believing that the hypothesis deserves further study and investigation".

The book should appeal to a wide selection of readers, from the intelligent sixth-former to those concerned at all levels with the teaching and investigation of the structure of molecules.

ALLAN MACCOLL

Physics of Atomic Collisions

By Dr. J. B. Hasted. (Butterworths Advanced Physics Series: Monographs on Ionization and Electrical Discharges of Gases.) Pp. ix+536. (London: Butterworth and Co. (Publishers), Ltd., 1964.) 130s.

PHYSICS of Atomic Collisions, the author states, is intended to aid the young experimental physicist entering into the investigation of ionized gases, or of other phenomena involving atomic collisions. This aim will be achieved admirably, provided the young scientist is willing to study with some intensity the very comprehensive data and theory given by Dr. Hasted. Indeed, the book will be valuable to the young physicist for many years, and no less to the worker already established in the field.

In recent years there has been a considerably increased interest in the investigation of atomic collision processes and allied subjects, so that there exists a large amount of published research which requires collation and unified presentation. Dr. Hasted has attempted this task with success.

In the book the author presents first a brief but careful survey of the basic concepts of swarm phenomena in gases and of the classical and quantum theory of collisions. This is followed by an extensive survey of experimental techniques used in collision physics, and this section is particularly valuable. Sources of molecular and atomic beams are described, as also are electron, ion and photon sources. Velocity selection and particle detection methods are surveyed. The major portion of the book is concerned with the description of the experiments and data available on some important collision phenomena. Chapters are given on electronic excitation of atoms and molecules; ionization by electrons; positive ion recombination; electron attachment and detachment; photon emission and absorption; elastic collisions between atomic particles; ionization and excitation by atomic particles; charge transfer processes; collisions of excited atoms and particles; and ionization interchange. In all these chapters the author presents, in a lucid manner, an up-to-date review of the subject-matter, giving the reader clear guidance on the importance of the data under examination and indicating the theoretical implications. There are many useful diagrams of modern data on collision cross-sections, excitation functions, potential functions, etc. Extensive bibliographies are given and should prove most helpful. There is a useful appendix of tables of atomic constants, ionization and excitation levels, selection rules

and potential functions. In the text there are helpful review tables. The book can be recommended to all serious students of atomic collision processes and gas discharge physics.

H. EDELS

The Nucleon-Nucleon Interaction

Experimental and Phenomenological Aspects. By Prof. Richard Wilson. (Interscience Tracts of Physics and Astronomy.) Pp. ix+249. (New York and London: Interscience Publishers, a division of John Wiley and Sons, 1963.) 45s.

A STAGE has been reached in the study of the nucleon-nucleon interaction where it is possible to give a fairly complete picture of the interaction up to nucleon energies of 300 MeV. All the general features seem to fit together, and it is natural therefore to seek a comprehensive review which can at the same time point the way to future experiments. This book sets out to discuss the nucleon-nucleon interaction from the "experimenter's point of view". On the theoretical side, a companion volume by H. P. Noyes is promised, and one by M. J. Moravcsik has already appeared.

The author is in an advantageous position to present the experimental side, having been engaged for the past fourteen years both in research and teaching in this field. However, this familiarity has led in a few instances to the presentation of a personal point of view, to a neglect of material, and to a greater number of mistakes in text and references than is permissible in a book aimed at the teaching of graduate students. It would also have been better to restrict the book to energies below a few hundred MeV, since data in the GeV range are accumulating so rapidly and their interpretation is so tentative that their inclusion adds nothing to the main purpose of the book. The 50 pages of experimental values, most of which have appeared in graphical form, can only be aimed at those who wish to make their own computer (phase shift?) analysis of the data. Such serious students always refer to the original work and form their own independent assessments. This space could well have been devoted to a fuller development of the topics discussed, and in particular to a critical assessment of the points remaining to be resolved or tested, such as the application of charge independence.

In spite of these criticisms the book largely supplies a need in presenting the relevant data and its interpretation ranging from the ground state of the deuteron to the scattering of nucleons by light nuclei. It provides a useful starting point to be followed by reading the books stressing the theoretical side and the review talks given at annual conferences.

A. E. TAYLOR

The Theory of Rings

By Neal H. McCoy. Pp. x+161. (New York: The Macmillan Company; London: Collier-Macmillan, Ltd., 1964.) 25s.

THE Carus monograph, *Rings and Ideals* (1948), by N. H. McCoy, has served as a good introduction to this branch of modern algebra, but the purpose of the Carus Foundation was to present mathematical topics to non-specialists. *The Theory of Rings*, however, is strictly professional, though only a minimum amount of previous knowledge is assumed. The main properties of rings, ideals and radicals are set out lucidly but tersely, with a good supply of exercises for the reader. The young student will find the book an excellent introduction to, say, the more detailed Jacobson classic, *Structure of Rings* (1956), and some account is also given of the more recent advances. The honours undergraduate with a taste for abstract algebra has now a number of valuable texts available; but if he wishes to proceed from a broad survey to deeper penetration of this narrower field, he should profit from this somewhat austere, but invigorating and up-to-date, account.

T. A. A. BROADBENT