# Book Reviews

## Atomic Physics

**Physics of Atomic Collisions**. J. B. Hasted. Butterworth, Washington, D.C., 1964. x + 536 pp. Illus. $26.

For several years the study of atomic collision phenomena has enjoyed a renaissance as a result of stimulation from astrophysics, aeronomy, plasma physics, and quantum chemistry. New experimental techniques have in large measure removed the earlier ambiguities attending the interpretation of experiments. New theoretical methods, taking advantage of the ubiquitous computer, have begun to close the gap which, in the thirties, restricted experiments to the noble gases and calculations to one-electron atoms.

The graduate student who is beginning research in atomic physics needs a guide to the new techniques and research that constitute the great progress made during the last 15 years. The plethora of conference proceedings contain little of value, because the papers are rarely critical reviews of the physics, nor are they critically reviewed by the editors. In the past 2 years, three new books of substantial scope have appeared, in English, to join the well-known and much used *Electronic and Ionic Impact Phenomena* by H. S. W. Massey and E. H. S. Burhop (Oxford University Press, 1952). These books are the volume reviewed here, *The Physics of Atomic Collisions; Atomic and Molecular Processes*, edited by D. R. Bates (Academic Press, New York, 1962); and E. W. McDaniel's *Collision Phenomena in Ionized Gases* (Wiley, New York, 1964). No one of these books is entirely satisfactory of itself. Bates's volume is a collection of chapters by different authors, and as such it lacks both comprehensiveness and cohesiveness; it is a collection of reviews. McDaniel's book is more like Hasted's in purpose and treatment. It is not our purpose to review it here, but those who are selecting a textbook for a graduate course in atomic collisions will want to compare the two closely.

Hasted's purpose, as given in the preface, is "to aid the young experimental physicist entering into the study of ionized gases, or of other phenomena involving atomic collisions." In an admirable effort to cover the subject as completely as possible, he organizes the book by collision process and treats some 19 classes of processes, involving electrons, ions, atoms, molecules, and photons, in about 500 pages of compact typography. The introduction provides a coherent symbolism for describing any imaginable collision process, along with a discussion of all the different units in which the probabilities of these processes are expressed. A unique innovation is a fold-out monograph for converting between these systems of units, for converting between systems for describing particle energies, and giving orders of magnitudes of different cross sections. In a way this useful chart sets the tone for the book, which is encyclopedic in its coverage but thin on physical discussions from which the student could gain deeper insight. As a guide to the recent literature, it is thorough and the references are well selected. The reader is led to papers that give details of experimental methods as well as results. But the price that has been paid for the coverage is the exclusion of the development of the physical ideas. For this the reader will probably prefer the book by Massey and Burhop, if the new edition lives up to the standard of the 1952 volume.

In some cases the desire for comprehensiveness has led the author into statements that are not merely unsupported but actually incorrect. One example (in which Hasted will find himself in the company of many otherwise well-informed physicists) is concerned with the phenomenon of spectral line reversal: "This phenomenon, in which the edges of the line appear intense whilst the centre is weak, is caused by the absorption and re-radiation of resonance wavelengths by atoms which are cooler than the primary emitters" (p. 85).

A few such errors are inevitable, of course, and since Hasted is quite well at home in his subject, by virtue of many years of active research at the place of its rebirth (University College, London), he has maintained a satisfactorily high standard of reliability in most of the text. The student's greatest complaint (after he has solved the problem of raising the equivalent of 10 quid for the American printing) will be about the lack of supporting and explanatory discussion of the physics involved. Thus, he will find himself constantly driven to the references for a full understanding, and he will find Hasted's book useful as a handbook and guide to the full literature.

LEWIS M. BRANSCOMB
*Joint Institute for Laboratory Astrophysics, Boulder, Colorado*

## Chemical Technology

**Imperfections and Active Centres in Semiconductors**. R. G. Rhodes. Pergamon, London; Macmillan, New York, 1964. xii + 373 pp. Illus. $12.50.

This is the sixth volume in the International Series of Monographs on Semiconductors edited by H. K. Henisch. The preceding volumes were mostly concerned with rather specialized topics in semiconductor science and were directed principally toward the interests of the physicist. Although this volume retains the same general excellence that characterized its predecessors, it encompasses a somewhat greater breadth in its appeal, with particular attraction for the metallurgist and the chemist. This is not to say, however, that it is not also profitable reading for the solid-state physicist. A more succinct characterization—involving an increasingly popular, albeit not necessarily precise, designation—is to state that the book can be expected to have interdisciplinary appeal for semiconductor scientists, engineers, and certain technicians.

To cover completely the subject of imperfections and active centers in crystals would be a stupendous task. Such consideration must be concerned not only with the nature of the de-