Book Reviews

Introduction to atomic physics. (Rev. ed.) Henry Semat. New York: Rinehart, 1946. Pp. xi + 412. (Illustrated.) $4.50.

The increased need for training and understanding in atomic and nuclear physics brought about by the spectacular advances in "atomic energy" makes most timely this revised and enlarged edition of *Introduction to atomic physics*. The title refers to "atomic" not solely in the classical sense but in the modern sense in which the nucleus plays a major role.

The book is obviously written by a careful teacher with both the instructor's and the student's viewpoints in mind. The typography and illustrations are attractive, and there is at least one figure for every two pages of text. As a concise, one-semester, college-level introduction to the world of atomic physics, the book is admirable. It quickly leads the student into the realm of the infinitesimally small by an exposition that is attractive, yet surprisingly thorough. As a survey, the book is comprehensive and lends itself to self-study for the scientist in other fields. In each chapter there are problems which illustrate well the magnitudes of various factors involved and references to excellent texts which contain more subject detail. There is a nice balance between development of theory and illustration by experiment. Calculus is used in the theory only occasionally and then at an elementary level. When a mathematical proof is long, it is removed to the appendices.

The text does not unfold in the customary historical manner, which too often confuses the student, but breaks naturally into three general parts by category. "The Extranuclear Structure of the Atom" and "The Nucleus" are preceded by a section on "Foundations of Atomic Physics," which occupies roughly half the book. This section is logically divided into an essential short résumé of classical electricity and magnetism, which is immediately put to practical use to interpret both the wave and particle manifestations of atomic structure. These follow under the three headings: "Elementary Charged Particles," "Electromagnetic Radiation," and "Waves and Particles." Alpha particles, cathode rays, electrons, ions, and even the mass spectrograph and stable isotopes are discussed under the first heading; photoelectric effect, Zeeman effect, and X-rays are embraced under the second; and the duality concept of waves and particles, electron diffraction, Heisenberg's uncertainty principle, and Schrödinger's equation are masterfully treated in the third.

The hydrogen atom is discussed from the viewpoints of both quantum and wave mechanics, in the portion devoted to the extranuclear structure, and is followed by sections on atomic spectra and electron distribution.

Part III, "The Nucleus," consists of chapters on "Natural Radioactivity," "Disintegration of Nuclei," and "Nuclear Energy." This part has been brought up to date to include concise but adequate treatment of nuclear reactions produced by various bombarding particles, radioisotope production and properties, nuclear transitions, fission, photofission, transuranic elements, chain reactions, and even an atomic bomb! Future editions will no doubt contain an expanded Part III.

There is the unorthodox but effective separation of Rabi's magnetic resonance method from the Stern-Gerlach experiment. The theory of the betatron is not juxtaposed with that of the cyclotron and electrostatic generator but is included as a new and different type of X-ray source in the discussion on X-rays. The latter was done not without recognition of the development of the betatron as a means of nuclear and cosmic-ray study, but probably to introduce early in the book an application of electromagnetic principles in a useful modern device.

This reviewer found both the arrangement and the content stimulating. The book is recommended without reservation for starting the college-level student on his way to a technical understanding of the atomic age.

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Explosion and combustion processes in gases. Wilhelm Jost. (Trans. by Huber O. Croft.) New York-London: McGraw-Hill, 1946. Pp. xv + 621. (Illustrated.) $7.50.

For those unable to read German, the translation of this important work should serve a useful purpose. Those at home with German, or moderately so, will derive a distinct advantage from the German edition in an appreciation of the spirit behind the original documentation—something that the reviewer considers lacking in the translation. While the translator performed a faithful and creditable work, the worker in the field of flame and combustion must be disturbed by the awkwardness of expressions, which make reading and sometimes comprehension difficult. For example, the following sentence occurs on page 22: "According to whether the surface in question introduces or breaks off reaction chains especially vigorously, the surface will begin to be effective at particularly low or only at very high temperatures." If one substitutes the accustomed word usage of the field of chain reactions—"initiates" for "introduces," "terminates" for "breaks off," and "efficiently" for "especially vigorously"—the sentence then becomes meaningful. The usual term, "Faraday dark space," is translated as "Faraday dark section."

We again find incorrect translation in the definition of the auto-ignition process (p. 1). The translator has written: "Auto-ignition processes include all those phenomena based upon the fact that, in an explosive mixture heated to an infinitesimal degree, the rate of reaction as the result of the infinitesimal change increases beyond all bounds." Jost says (correctly): "Auto-ignition processes are all phenomena based on the principle that in an explosive mixture heated to onset of barely noticeable reaction, the reaction velocity ultimately increases beyond all limits as a consequence of this primary small chemical change."