Book Review

Basic Nuclear Physics for Medical Personnel. By Herbert L. Jackson. Charles C. Thomas, Publisher (1973). 152 pp. $9.50.

Although the author states that "this book is designed as a classroom text for student technicians in nuclear medicine and radiology," he broadens this usefulness to include not only physicians in nuclear medicine but all medical personnel who may be concerned with nuclear medicine, specifically mentioning janitors as perhaps needing a knowledge of health physics.

The book begins with a rapid review of classical concepts of force, work, and energy (both mechanical and electrical), and includes weak nuclear forces and relativity. Treatment of fundamental particles (including neutrinos and anti-particles) precedes such basic chemistry as elements and molecules. Along with the planetary model of the atom, including electron energy levels, the author presents a rather novel pictorial analogy between this model and the nuclear energy levels required by the nuclear shell model (which is then assumed correct). These nuclear energy levels are then used to "explain" the various types of radioactive emissions, which are mentioned along with such items as conversion electrons, metastable states, etc. In a section on interaction of radiation with matter, much more is made of the details of photoelectric absorption and pair production than is paid to simple attenuation; in fact, the principal description of absorption concerns protons, which are of minor practical importance, whereas beta particles and gamma rays receive minimal attention. No attempt is made to distinguish between x rays and gamma rays.

Material of interest in health physics or radiology, with only 12 pages being devoted thereto, is almost absent; however, a few comments concerning the use of some radioisotopes are scattered through the book. In this treatment of radioactivity, no mention is made of the health physics implications of decay chains with their different types of emissions.

From the above, it is perhaps obvious that the author attempts to cover much too much material for the space allotted. Further, not only is much of this coverage too sophisticated for the level at which he aims, but this complexity tends to result in omission of some useful simple material. From this reviewer's experience with physics for pre-meds, little nuclear information is usually covered, so this might be more than a review for physicians in nuclear medicine. For the student technician or other personnel "having a meager scientific background," the sketchy treatment, along with the matters receiving principal attention, severely inhibit the usefulness of the book as a text, although, of course, a *good* teacher might be able to provide adequate fill in. Actually, considerable background in this general subject is almost required of the user of this book, since one of its characteristics is the abrupt introduction of some topic, with little or no accompanying descriptive material, which is then treated as though the reader is well acquainted therewith. A minimum of mathematics is necessary, though radioactive decay is treated by the methods of calculus, and the method used to graph such decay appears to be unnecessarily difficult. In general, few scientific inaccuracies appear (although gold's *thermal*-neutron capture cross section is about 100 b, not the listed 26 000 b which is its capture cross section at the 5-V *resonance*), but such items as the author's ingenious interpretation of nuclear energy levels and its subsequent presentation as factual may not be desirable. The index is adequate.

At the level of this book, it seems appropriate to this reviewer that at least some mention should have been made of the wave-particle characteristics of nuclear (and atomic) particles, especially since this could help in describing the "orbitals" which are generally encountered in most high school chemistry courses; certainly, this is more generally known and probably less difficult to interpret than are many items that are mentioned.

All in all, this book is so sketchy, is so uneven and incomplete in treatment, and demands so much background information of its user that it is difficult to identify *any* group for whom it might profitably be recommended. There are much better treatments of this material available elsewhere—and at the level appropriate to those to whom the book is directed.

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January 25, 1974

About the Reviewer: Hugh F. Henry, professor and head of the Department of Physics at DePauw University, graduated from Emory and Henry College and received his PhD degree in physics from the University of Virginia. His work in nuclear energy dates back to 1949 when he became involved in the fields of criticality control and radiation protection at the Oak Ridge Gaseous Diffusion Plant. He has been with DePauw University since 1961 where he has originated courses and research involving biophysical aspects of radiation and neutron cross-section studies. He spent a sabbatical leave during the school year 1968-69 at the NRTS at Idaho Falls, Idaho, and his book, Fundamentals of Radiation Protection, *was published in 1969.*