This is a good survey and introduction to modern physics for professional engineers entering nuclear technology. The material is generally aimed toward subsequent courses in reactor analysis, radiation protection and isotope utilization. Of the nine chapters, the first two cover the elements of atomic structure, through the Bohr theory and wave nature of matter; the next three give the important characteristics of the nucleus, radioactivity and nuclear reactions; the material on nuclear structure provides a basis for fission; neutron diffusion and slowing are analysed; finally, there is a review of radiation interactions with matter.

The writer's style is much appreciated – direct, incisive, factual and brief. Only occasional reference to the history of the subject is made. Examples, numerical data and tables are slanted toward nuclear energy.

There is evidence that the author depended heavily on other references. This tends to lead to greater detail than necessary on certain subjects. Little is added by the derivations of working formulas for the Aston spectrograph or the hyperbolic path and differential cross section of alpha particles in the field of the nucleus. Too much detail is given on atomic spectra and the Bohr explanation of the hydrogen atom. The material on neutron physics is almost pure Glasstone and Edlund, including concepts such as extrapolation distance that are not important in a survey of this scope. On the other hand, the abbreviation of the Bateman radioactivity equations is well done. The sections on nuclear reactions and structure are very compact and to the point. Many deliberate omissions are appropriate, for instance elliptical electron orbits, spin theory and the Zeeman effect. The opportunity was missed however to introduce easily a few relevant topics, such as the Bainbridge mass spectrograph, neutron diffraction, and neutron shielding.

Dr. Raymond L. Murray
Department of Nuclear Engineering
University of North Carolina
Raleigh, North Carolina

(About the Reviewer: Dr. Raymond L. Murray, Burlington Professor of Physics and Head of the Department of Nuclear Engineering, N. C. State College of the University of N. C. at Raleigh, just returned from a year's lecture-consulting world trip to Europe, Africa and Asia. Fellow of the American Nuclear Society and former Chairman of the Education committee, author of two texts -- Introduction to Nuclear Engineering, Nuclear Reactor Physics.)

Nuclear Physics. By Robert A. Howard. Wadsworth Publishing Company, Belmont, California. 578 pages.

Professor Howard's sprightly new textbook of descriptive physics has a number of worthwhile virtues: a lucid style, an abundance of well-chosen graphs and illustrations, an uncommonly good chapter on collision dynamics, a notable list of references with each chapter, a careful avoidance of underived or unreferenced results, a painstaking relation of experiment to theory and what is the most effective use of the historical approach of any book in its field.

To my dismay, however, Howard appears to regard the subject of low-energy nuclear physics much as did the author of a 1955 text – as a mixed and overflowing bag of largely unrelated topics that defy organization into a cohesive whole. But nuclear physics *has* begun to emerge from the woods as was forcefully noted in Weisskopf's Retiring Presidential (APS) Address of February, 1961 (see *Physics Today,* July, 1961). Nuclear spectroscopy, a fantastic tangle before 1955, now seems to be falling, if somewhat reluctantly, a victim of the collective model. And Howard does not mention the collective model, let alone recount its successes.

Perhaps a more grievous lack is the absence of any cogent discussion of the status of, or even the nature of, the nuclear-force question. It is not until the final chapter (long after "nuclear structure" has been disposed of) that the author notes – in the midst of a description of high-energy-physics experiments – that mesons may be involved in nuclear forces.

The author assiduously eschews any quantum mechanical formalism and perhaps this is why he does not serve up the pedagogically useful deuteron problem. Surely this is his prerogative, but I would argue his choice. A text that relegates the only *mention* of potential wells to the third appendix would not seem to be taking advantage of the superior preparation of science and engineering students today.

A less serious shortcoming, although a most annoying one, is the brief and inadequate index. Before deciding to read the book through, I thought I would look up a short list of topics to see what the author had to say. I chose "Age, Auger, giant resonance, meson, Mössbauer, neutrino, shell model, stopping power and weak interaction." All of these topics are discussed in the text but only two were cited in the index and one of them was cited incorrectly.

In spite of the remarks above, on balance I found Howard's book superior in enough respects to its current competitors that I would recommend it to instructors who are willing to fill in the gaps with more perspective than is provided in the text. To those elderly nuclear engineers who would like to buy an up-to-date book for the shelf — keep hoping, but save your money for now.

Robert C. Axtmann
Princeton University
Princeton, New Jersey

(About the reviewer: Since 1959 Robert C. Axtmann has been Socony Mobil Associate Professor of Nuclear Studies in Princeton University's School of Engineering and Applied Science. He teaches nuclear physics (to engineers) and reactor theory (to anybody). Earlier assignments include two years in the Physics Division at ANL and seven years at Savannah River.)

Radiation Effects on Organic Materials. Edited by Robert O. Bolt and James G. Carroll. Academic Press, New York and London, 1963, 576 pp., $13.50.

Prepared under the auspices of the Division of Technical Information of the United States Atomic Energy Commission, this collection of essays is concerned with nuclear radiation and its effects on the properties of organic liquids, solids, and gases.

A broad gamut of subjects and materials are covered in the sixteen chapters by the thirteen contributing authors and co-authors. In sequence from Chapters 1-16, the titles of the chapters are: Introduction; Interaction of Radiation with Matter; Mechanisms of Chemical Effects of Ionizing Radiation; Radiation Chemistry of Pure Compounds; Polymers; Plastics; Elastomeric Materials; Coolants; Lubricants; Adhesives; Textiles; Coatings and Films; Dielectric Fluids; Fuels and Fluid Shield Materials; Coal, Wood and Explosives; and Potential Benefits.

Although the book is well written in general, special mention should be made of the clarity of presentation of the second and third chapters by Amos S. Newton on the Interaction of Radiation with Matter and the Mechanisms of Chemical Effects of Ionizing Radiation. Considerable thought and scholarly attention must have been devoted to these two chapters.

The editors have done a very commendable job. No really serious errors were detected, the book is well referenced, and the format and writing is very readable.

Perhaps the outstanding feature of the book is its extensive coverage of the literature. Although there are some definite errors of omission, a considerable amount of literature has been cited which is not too readily available.

About the only mildly negative reaction this reviewer underwent in perusing this volume was an apparent lack of coherence. However, this lack is somewhat inherent in any collection of essays by various authors.

In summary, this book is an excellent reference text, and it will prove very useful to any engineer who might have design or material problems involving radiation effects on organic materials.

Dr. Vincent P. Calkins
General Electric-Nuclear Materials
and Propulsion Operation
Cincinnati (Evandale), Ohio

(About the Reviewer: Dr. Vincent P. Calkins is currently Manager, Nuclear Materials at the General Electric-Nuclear Materials and Propulsion Operation in Cincinnati (Evandale), Ohio. He worked on the Manhattan Project at Iowa State University under Dr. F. H. Spedding and on the NEPA Project at Oak Ridge. His fields of interest include: selection of materials for nuclear reactors; the chemistry, ceramics, and metallurgy of high temperature materials; and basic phenomena of physics.)

Fabrication of Control Rods for Nuclear Reactors. By William E. Ray, Rowman and Littlefield, Inc., New York, (1963). $6.95.

This is one of a new monograph series on Metallurgy in Nuclear Technology produced by the American Society for Metals under sponsorship of the Atomic Energy Commission. According to the author's preface it is directed toward acquainting those "engaged in non-nuclear metallurgical work with the fabrication procedures for producing control rods for nuclear power reactors."

The sponsors could not have picked a more knowledgeable man to write this monograph than William E. Ray. Mr. Ray spent the years from 1955 to 1960 with the General Electric Co., at the Knolls Atomic Power Laboratory, and during this period a major part of his efforts were directed toward development of novel control/poison systems with a special effort directed toward improvement of fabrication technology. Subsequently, while with Dresser Products Inc., he retained this interest both in development and production. Rods for several of the current crop of new reactors, including the Experimental Gas Cooled Reactor and the Molten Salt Experiment at Oak Ridge as well as BONUS Reactor in Puerto Rico were built under his direction. In addition,