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# Book Reviews

**Nuclear Engineering Fundamentals.** by Roy Weinstein, Alvin Boltax, and Giovanni Lanza. McGraw-Hill Book Company. 941 pages. $20.00.

The first paragraph of the Foreword of this book states "this text was written for the wide spectrum of people involved in nuclear physics and engineering who are not themselves physicists or nuclear engineers. The group includes mainly non-nuclear engineers and technicians, but has a definite component of sales-persons, medical doctors and administrative personnel."

When reviewing the book, one must keep the above stated purpose in mind and not expect the book to cover any one subject in great depth, but rather to cover many subjects in a clear, easy-to-read and concise manner.

The authors have chosen a very difficult assignment and have made an excellent effort to select, condense and present an array of subjects that does justice to the title.

The five books in one volume are captioned: I. *Atomic Physics*, II. *Nuclear Physics*, III. *Interaction of Radiation and Matter*, IV. *Nuclear Materials* and V. *Nuclear Reactor Theory*. Each book contains from 177 to 213 pages with a total of 941 pages. Because the book has five volumes, I think it would be desirable to review each volume separately.

Book I, *Atomic Physics* by Roy Weinstein is a fine, simplified presentation covering chemistry, mechanics, electromagnetism, relatively, atomic phenomena and the elements. It includes a fine appendix of conversion factors, chemical data, atomic masses, mathematics (including an introduction to calculus) and a dictionary of atomic terms. The book has examples that make the theory meaningful and easy to understand. Each chapter has a problem set and answers. Numerous well-done figures help to make a clear presentation. In short, this is a fine elementary physics book.

Book II, *Nuclear Physics* by Roy Weinstein, with chapters on "Controlled Thermonuclear Reactions" by Hans Mark and on "Radioactivity for Control" by L. A. Gould, is likewise a determined attempt to condense and compress the essentials with examples, problem sets and a fine selection of figures to make it all relatively easy to follow. Some readers will be bothered, others helped, by the lack of detail development of formulation. Many formulas are merely stated and used in examples, all in an effort to condense the text. Authors as well as readers know that this is a difficult task; it takes much effort to create such a publication and have it acceptable to any large spectrum of readers.

Book III, *Interaction of Radiation and Matter*, has six chapters by Roy Weinstein and one each by Bernard Gittelman, John Ehrenfeld and H. T. Epstein. In general, what is said about Book II above applies here also. The authors come up with a fine simplified presentation of difficult subjects.

Book IV, *Nuclear Materials* by Alvin Boltax is indeed a good fundamentally orientated presentation of metallurgy. It is well presented with an up-to-date scientific approach, not just tables and figures, but atomic explanations that are meaningful. It may be a little difficult for the uninitiated in metallurgy, but for those it would be rewarding to proceed through the chapters knowing that they are covering a subject in an up-to-date way.

Book V, *Nuclear Reactor Theory*, contains 10 chapters by Giovanni Lanza through the diffusion theory, criticality, shielding, reactor classifications and purification of foods by radiation; one chapter by Kenneth R. H. Head on "Sanitary Engineering"; and one by George P. Sutton on "Nuclear Reactors in Aviation." These are well presented. The nuclear reactor theory presented is good but somewhat difficult for the uninitiated to follow. The chapter on aviation reactors is clearly presented with good emphasis on the nuclear rocket. The chapter on sanitary engineering is an excellent choice. Many texts omit or treat too lightly this important subject.

The authors use a black diamond (◆) to indicate mathematically difficult sections. The plan will be quite helpful to some readers and the authors are to be complimented on their foresight in this matter.

The editor points out how a selection of certain chapters will make a course of instrumentation for

research technicians, ditto for engineers that need physics, and a sophomore course in physics from Books I and II. I agree that the five books in one volume present sufficient coverage of material so that one can select chapters for many different levels and subject courses if that is one's goal.

The book is beautifully bound in a black cover with gold lettering, the paper and printing are of fine quality, and it is easy on the eyes. The mat-type paper jacket is simple and anemic and does not do the book justice.

*Glen J. Schoessow*
Professor of Nuclear Engineering
University of Florida
Gainesville, Florida

*About the Reviewer: Glen Schoessow began his career in nuclear engineering starting with the Brookhaven reactor modification in 1947. Since that time he has accumulated experience in the submarine program, power reactors and research reactors. Since 1958 he has been teaching graduate courses, and directing research in the Nuclear Engineering Department at the University of Florida.*

**Radioactive Isotopes in Instrumentation and Control.** By N. N. Shumilovskii and L. V. Mel'ttser. (Pergamon Press), The MacMillan Company, N. Y. C. (1959). 198 pp. $10.00.

Anyone who viewed the Russian Exhibit at the 1958 Atoms for Peace Conference in Geneva has known that Soviet scientists and engineers have been particularly active in the use of radioactive isotopes in instrumentation and control. At this conference it was apparent that, relatively speaking, the Soviets had placed more emphasis in this field than had other countries with advanced technologies. However, in the development of nuclear spectrometers—which requires possibly a wider industrial base—the Soviet advance, at the same conference, was not so apparent.

Authors N. N. Shumilovskii and L. V. Mel'ttser are of the Institute of Automatics and Telemechanics, USSR Academy of Sciences. Their book in its 198 pages covers a broad range of measuring techniques, emphasizing the theoretical approach in the solution of problems involving controls by radiation.

After a foreword to the English edition by Paul C. Abersold, Director, Office of Isotopes Development of the USAEC, the authors present an elementary introductory chapter on nuclear radiation, which, while much simpler and less theoretical than the later chapters on measurement and control, is adequate. A brief discussion follows of the principle of operation of ionization chambers, gas discharge counters, scintillation counters and neutron detectors. (The date of the original Russian edition, 1959, explains the slight effort given to solid-state detectors.) Continuing with the importance of modulation of radiation, the authors then describe differential measuring circuits, dynamic compensating circuits, and measuring circuits with automatic stabilization. The introduction is concluded with a section covering errors in measurement, introducing the reader to the statistical nature of natural radioactivity, and the inherent errors of measurement itself. In a final paragraph comparing nuclear terminology with more widely understood radio engineering terminology the authors say:

> "If the analogy is made with radio engineering then the first approach (statistical fluctuation limit) is equivalent to obtaining the maximum signal-to-noise ratio at the output of a device, and the second (instrument error limit) to obtaining maximum sensitivity. When dealing with practical measuring circuits in the following chapters we will consider examples of the use of both these approaches in the analysis of different systems."

After the introduction, Chapter I, Measurement of Thickness and Density from the Absorption of Radioactive Radiation, is written from a theoretical viewpoint. Chapter II on the Measurement of the Thickness of Materials and Surface Layers by the Backscattering of Radiation is covered in 17 pages. Chapter III, which is entitled "Relay Devices," illustrates the use of the 'go no-go' concept of measurement. Measurements of Levels forms the subject of Chapter IV based first on the float technique, secondly on radiation attenuation, and finally on the relay type 'go no-go' concept.

For measuring flow of liquids, in Chapter V, the authors present the theoretical approach of measuring the volume of flow from the position of an elastic lamina, then cover the frequency-type flow-meter, wherein one blade of the propeller carries a radioactive source.

Chapter VI discusses measuring the flow of gases based on a transport of ions, by recombination of ions, by using the ion tracer method, and by the phase variant of the ion tracer method. This chapter probably presents most new concepts to workers in the field. In Chapter VII the authors discuss measurement of gas pressure, pointing out that pressure can be readily measured, for the current in the ion chamber, all else being equal, depends on the pressure of the gas within. The authors in Chapter VIII discuss means of "Composition Control" by making analysis of the fluid. In