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

this section, if the original volume were published later than 1959 (the book may have been written in 1958), the use of neutron activation and downstream analysis with a gamma-ray spectrometer would probably have been more adequately treated.

Finally, the authors present in Chapter IX, the concluding section, a short, but well written article on "Choice of the Minimum Source Activity for the Particular Dynamic Properties of the Instruments Where the Measured Material Varies Significantly with Time." It is in the constant increase in speed of technological processes that such considerations grow in significance.

The book is hard back, has excellent 11-point typography, and contains many clear and concise drawings. This presentation has the great advantage in that unlike volumes with photographs, the book will not readily become dated. The translation by R. F. Kelleher, formerly of Trinity College, Cambridge, is very readable with only an occasional 'hardly used at all nowadays' redundancy.

In cited literature, the author has 76 references of which ten are to references originally written in English. Again, a later work would have had references from France and Germany, as well as a number of other countries. While the introduction could have been lengthened (the book is written for the engineer who requires only calculus for understanding the subject), a cultural enrichment would have been achieved if the names of discoverers of nuclear particles and radiation, or of a principle, were named, with the date of the discovery. This humanizing addition would have indicated to the non-physicist the true internationality of physics. More references to standard works on ion chambers, gas discharge counters, and scintillation counters would have been valuable to the beginning engineer.

While the subject covered by the authors is valuable to anyone who contemplates the industrial control by radioisotopes, the volume would have been more catholic if references to products other than those available in the U.S.S.R. had been made.

The user and manufacturer of instruments in a capitalistic country, when reading this book, will undoubtedly wonder what force in the U.S.S.R. assumes the function of the market place. What feature in a country, where the state produces and consumes all instruments, encourages the development of new features and new instruments, which competitive forces bring forth in an acquisitive society. Further, what forces in a socialistic society determine the range in the price and complexity of an instrument? What method takes the place of advertising for an instrument, which, by broadening the usage of an instrument, reduces its price?

In conclusion the volume on *Radioactive Isotopes in Instrumentation and Control* belongs on the bookshelves of the serious student in this endeavor.

Ernest H. Wakefield

Linear, Inc.
823 Emerson Street
Evanston, Illinois

About the Reviewer: Ernest H. Wakefield joined the Metallurgical Project at the University of Chicago in 1943. In the Instrument Group of the Physics Division he edited the Nuclear Instrument Handbook, *later founded and operated a national company. In 1952 he received his Ph.D. in Electrical Engineering from the University of Michigan, and in 1954 edited* Nuclear Reactors for Universities and Industry. *Elected a Director of the Atomic Industrial Forum in 1959, Dr. Wakefield has travelled and lectured in nuclear centers in many parts of the world. Today he is president of Linear, Inc., of Evanston, Illinois, and Cleveland, Ohio.*

Desalination of Water Using Conventional and Nuclear Energy. International Atomic Energy Agency, 1964; (Technical Reports Series No. 24); 53 pages, $1.00.

In 1963 the International Atomic Energy Agency began preliminary surveys of the application of nuclear energy to water desalting. Interest in this field has developed so rapidly that the Agency has organized a major program and has held three conferences on the subject. The booklet reviewed here was published in February 1964 to give member nations who are not active in the field a brief survey of present technical status, potential trends and improvements, and some guidance on assessing whether nuclear desalination is worth their interest.

If one looks sufficiently far ahead, there is no doubt that immense desalting plants driven by integral nuclear reactors will play a major, or even dominant, role in man's increasing demands on the earth's resources. Only 9% of the earth's land surface is arable and sufficiently rain-fed for food production, and it is all in use; 36% is fertile, accessible and warm, but too dry. Increase in output can certainly be achieved, but we shall approach before long the day when it will be cheaper to bring arid land into use with desalted sea water than to force more yield from present cropland.