

Book Review

Radiation Detection and Measurement. By Glenn F. Knoll. John Wiley and Sons (1979). 816 pp.

Knoll has turned out an extremely comprehensive and useful book. As a long-time member of the teaching staff (and currently chairman) of the Department of Nuclear Engineering at the University of Michigan, he has written this book to fill the needs of students for use in courses in nuclear instrumentation and radiation measurements. He has also considered the needs of students in health physics, radiation biology, and nuclear chemistry, reflecting his heavy involvement in nuclear medical science (he is chairman of the Nuclear Medical Science Committee of the Institute of Electrical and Electronics Engineers Nuclear and Plasma Sciences Society).

As pointed out in the Preface, substantially more material is included than can be covered in the usual course, and the book thus serves as a useful reference and text for practicing scientists and engineers involved in radiation measurements.

Numerous practical problems are included at the end of nearly all the chapters. Besides enhancing the value of the book as a text in formal courses, the problems invite the non-student reader to check his grasp of the material and give him the satisfaction of learning that he is not so rusty after all, or that one can still teach an old dog new tricks.

The book begins with an introduction to the various types of radiation and radiation sources, and with radiation interactions. Radiation detectors (gas-filled, scintillation, and semiconductor) are discussed in considerable detail. An excellent discussion of counting statistics is also included. Analog and digital instrumentation are covered from the standpoint of the user.

Since the extremely good energy resolution of semiconductor detectors can be exploited only through the use of very low noise preamplifiers, the author gives attention to noise considerations for preamplifiers and detectors. The associated amplifiers are also examined, as well as the instrumentation for high resolution timing measurements. The book includes numerous radiation spectra obtained with various detectors under a variety of conditions.

A chapter is devoted to miscellaneous radiation detectors, both active and passive. Another chapter is concerned with detector shielding materials and with background from natural sources. (This reviewer can't resist the temptation to mention that the contamination of much of our steel resulted from the classic example of how not to use radioactive isotopes—⁶⁰Co

was inserted in blast furnace liners to monitor the liner erosion!)

The book includes a great number of valuable tables (they should be listed in the table of contents). Also, an extensive compilation of references appears after each chapter. The scope of the book is best indicated by listing the chapter headings below:

Radiation Sources	Lithium-Drifted Germanium Detectors
Radiation Interactions	Other Solid State Detectors
General Properties of Radiation Detectors	Slow Neutron Detection Methods
Counting Statistics and Error Prediction	Fast Neutron Detection and Spectroscopy
Ionization Chambers	Pulse Processing and Shaping
Proportional Counters	Linear and Logic Pulse Functions
Geiger-Muller Counters	Multichannel Pulse Analysis
Scintillation Detection Principles	Miscellaneous Detector Types
Photomultiplier Tubes	Background and Detector Shielding
Radiation Spectroscopy with Scintillators	Radiation Effects and Exposure Limits
Semiconductor Diode Detectors	

The author has managed to write a book current with the state-of-the-art, a rather difficult thing to do in a rapidly developing field, especially when considering that such a large and thorough volume must have taken some time to produce. Knoll has done an excellent job. His book will be a valuable addition to the libraries of persons engaged in radiation detection and measurement.

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About the Reviewer: Louis Costrell is presently chief of the Radiation Instrumentation Section of the U.S. National Bureau of Standards, where he has been located since 1946. Mr. Costrell, who received his academic training at the universities of Maine, Pittsburgh, and Maryland, was with the Bureau of Ships, U.S. Navy, during the World War II years. He is chairman of the U.S. NIM Committee and of the American National Standards Committee N-42 on Nuclear Instruments.