BOOK REVIEWS

Selection of books for review is based on the editor's opinions regarding possible reader interest and on the availability of the book to the editor. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

Sunlight to Electricity (Photovoltaic Technology and Business Prospects), 2nd ed.

Author	Joseph A. Merrigan
Publisher	The M.I.T. Press (1982)
Pages	215
Price	$19.95
Reviewer	Chihiro Kikuchi

A hint of levity in the title sent me to the library to check the author's professional credentials. I am happy to report that he indeed is listed in the *American Men and Women of Science*, and furthermore, the level at which the popular subject of solar electricity is presented makes clear that the author is a respected member of the technical community. The monograph is recommended reading for all nuclear engineers, especially for those in public relations. The comments on p. 30, namely,

> . . . If this scenario is fulfilled over the next 20 years, the US electrical utility business will amount to $170 billion in 1980 dollars. Capture of a small fraction of this business is a considerable incentive for entrepeneurs in the solar cell business. . .

effectively set the tone for the discussion of a wide range of technical issues pertinent to photovoltaic technology. Although most nuclear engineers are familiar with the materials presented in Chap. 1 on "Energy Use in the United States," the contents of Chaps. 2 and 3 on "Solar Energy as a Resource" and "Principles of Photovoltaic Energy Conversion" should prove informative to those wanting to learn about the fundamentals of this technology.

The last three chapters, which give engineering details and the economics of photovoltaic devices and systems, are veritable gold mines of information, which otherwise would need to be gleaned from a great volume of technical literature. The chapter titles, "State of the Art in Photovoltaic Conversion Technology," "Projected Developments in Photovoltaic Solar Conversion Systems," and "Business Opportunities in Photovoltaic Energy Conversion Systems," are suggestive of the information that readers can expect to find. In the Bibliography, there are 19 pages of references; these are in addition to those indicated at the end of each chapter.

One minor criticism is that there is no discussion of energy costs, particularly of electricity, paralleling those of dollar costs. Those who know are aware that photovoltaics is an electricity-intensive technology; unfortunately this fact is too often overlooked by the nontechnical advocates. Possibly in the next edition, the author will see fit to include comments from such sources as the 1979 American Physical Society report on *Solar Photovoltaic Energy Conversion* and/or S. Baron's article on "Solar Energy—Will It Conserve Nonrenewable Resources?" in *Public Utilities Fortnightly* (Sep. 28, 1978).

Chihiro Kikuchi, Professor Emeritus of Nuclear Engineering at the University of Michigan, worked in research programs that focused on the use of electron spin resonance as a solid-state research tool, the R&D of the ruby maser, and radiation effects in insulators and semiconductors.

More recently, he has been active in the public acceptance of nuclear power and related energy issues.

Measurement and Detection of Radiation

Author	Nicholas Tsoulfanidis
Publisher	Hemisphere Publishing Corporation, New York (1983)
Pages	571
Price	$32.00
Reviewer	Gerald A. Schlapper

The purpose of this text, as stated by the author, is to provide an introduction to the subject of detection and measurement of ionizing radiation. While there is some introductory material, this book would be best utilized as a text

for courses at the junior-senior undergraduate level or first-year graduate level. It would also serve well as a state-of-the-art reference book for professionals. A background in calculus, differential equations, and basic atomic and nuclear physics is required. Thorough review of the material presented will enhance the reader's ability to use radiation safely, efficiently, and effectively in scientific research or on the job. This text addresses the use of radiation in fields ranging from medical diagnosis and medical therapy to industry and power production.

The first chapter defines the energy ranges of various radiation types, discusses sources of error, and provides a general description of a typical counting system. Chapter 2 provides more detailed information to include basic definitions of probability and statistics, distribution function errors, and error reduction and illustrates how these characteristics of the counting of radioactivity interact to limit minimum detectable activity levels. The third and fourth chapters provide a good review of atomic and nuclear physics. Basic facts, such as the concept of binding energy, radioactive decay laws, mechanisms of energy loss, and radiation interaction with matter, are reviewed in these final two chapters of the introductory material.

The next three chapters 5, 6, and 7 provide the reader with descriptions of different types of radiation detectors and include the desirable and undesirable characteristics of each design. The detection systems discussed range from simple ion chambers to semiconductor detectors and organic and inorganic scintillator systems. The effects of repeated exposure to radiation are also outlined, especially with respect to the damage of semiconductor material. Important considerations of source detector geometry are outlined in the eighth chapter.

Following the introduction and characterization of the detectors, the next six chapters (9 through 14) of the text deal with the electronic components of spectroscopic systems and include methods of analyzing experimental data obtained with these systems. Of special use to researchers are the discussions of differentiating and integrating circuits, pulse shaping, timing, preamplification, amplification, and analog-to-digital conversion. Photon, charged-particle, and neutron spectroscopy systems are discussed briefly. Chapter 11 expands the previous discussion of evaluation of data to include interpolation, smoothing, curve fitting, and folding and unfolding. This material provides a basis for extended discussions of the analysis of gamma and x-ray spectra (Chap. 12), charged-particle spectroscopy (Chap. 13), and neutron detection and spectroscopy (Chap. 14). These presentations outline the basic interactions with matter that allow for spectroscopic analysis of the detected radiation and in addition describe typical systems one might find in an on-the-job or research effort. Chapter 15 discusses techniques of activation analysis to include sample preparation, radiation sources, and subsequent data analysis.

The sixteenth chapter provides the reader with an introduction to the principles of health physics. Exposure limits and dosimetry of external and internal exposures are discussed along with a presentation of basic information on the effects of radiation. This chapter will also serve as a review chapter for professionals whose major background is in a field other than health physics.

The final chapter of this text contains important information about specialized, state-of-the-art detectors and spectrometry systems with emphasis on the use of these systems in various fields. Self-powered detectors, fission track detectors, compensated ion chambers, and position-sensitive detector systems are some of the many systems presented.

This text is appropriate for courses in nuclear and electrical engineering, health physics, and chemistry. It will also serve well as a source/reference book for professionals. The text includes a wealth of graphs and charts that summarize and further illustrate the written material. Photos of the equipment under discussion are included. Numerous sample problems are presented along with several "rules of thumb" that are frequently employed to simplify these calculations and/or design experiments. As with any "first edition" of a text, there are some misprints; for example, on p. 83 when discussing the unit used for measurement of nuclear mass, the text states $\frac{1}{12}$ of the mass of C-13. This error is corrected in the following equation. Fortunately, the number of errors is very limited and most, like the example cited, tend to be obvious.

In summary, this text is appropriate for courses in radiation measurement as presented in nuclear and electrical engineering, physics, and chemistry. It will also serve as a source book of practical know-how for on-the-job training programs and as a reference for practicing professionals.

After receiving his MS in nuclear engineering from the University of Missouri at Columbia in 1970, Gerald Schlapper joined the reactor operations staff of the University of Missouri Research Reactor Facility. During this time he served for five years as a reactor physicist and was responsible for core design and burnup calculations. Dr. Schlapper received his PhD in 1977 and remained on the staff of the Research Reactor Facility until January 1981, when he assumed his current position as a faculty member of the nuclear engineering department at Texas A&M University. During his career he has served as a consultant to various government and private organizations.

Nuclear Fission Reactors

Author	G. Kessler
Publisher	Springer Verlag, Vienna, New York (1983)
Pages	257
Price	$36.80
Reviewer	Karl Wirtz

This book gives an excellent description of the physics and technology of nuclear fission reactor types with their complete fuel cycles as well as their environmental impacts and risks. The structure of the book can best be seen from the different chapters: 1. "Introduction," 2. "Some Basic Physics of Converter and Breeder Reactors," 3. "Nuclear Fuel Supply," 4. "Converter Reactors with a Thermal Neutron Spectrum," 5. "Breeder Reactors with a Fast Neutron Spectrum," 6. "Nuclear Fuel Cycle Options," 7. "Technical Aspects of Nuclear Fuel Cycles," and 8. "Environmental Impacts and Risks of Nuclear Fission Energy."

The book does not contain an in-depth treatment of the basic physics as one might expect. It rather gives a complete