

C. E. Stevenson (PhD, organic chemistry, Pennsylvania State, 1941) has been associated with research and development efforts on nuclear fuel reprocessing, and on related waste disposal problems, for the past 25 years. As associate director of the Chemical Engineering Division at Argonne, he was concerned for 6 years with the Redox, Purex, and fluoride volatility processes, following which he was for 6 years technical director for the Idaho Chemical Processing Plant, operated by Phillips Petroleum Company. The fluid bed calcination process for ICPP high level wastes was developed under his supervision during this period. He returned to Argonne in Idaho in 1960 as manager of the Fuel Cycle Facility, in which pyrometallurgical reprocessing and remote refabrication of EBR-II fuel was carried out, and in 1969 rejoined the ANL Chemical Engineering Division. He presently serves the American Nuclear Society as chairman of the Critical Reviews Committee and as an ICONS technical advisor, and is chairman of the American National Standards Institute committee N101, concerned with standards for atomic industry facilities other than power reactors.

#### New Energy Technology—Some Facts and Assessments

*Authors* H. C. Hottel and J. B. Howard  
*Publisher* MIT Press (1971)  
*Pages* 364  
*Price* \$2.95  
*Reviewer* M. R. Bottaccini

The material found in *New Energy Technology* appears in no other single secondary source. Any person who wishes to become familiar with the thinking of the power industry can do no better than read this book. The collection of references at the end of each chapter is worth the price of admission.

Unfortunately one of the least satisfactory parts of the book concerns nuclear power. The authors are chemical engineers and it is obvious that their principal interest is the utilization of fossil fuels. Their estimate of the speed with which nuclear power plants can be built in this nation is overly conservative.

It is the opinion of the reviewer that in the next 30 yr the demand for petrochemicals and coal by the plastic and chemical industry will become so large that it will force up the price of fossil materials. It is likely that atomic energy will rapidly become competitive with other forms of energy so that by the year 2000 the bulk of the power generated in the United States will come from nuclear power plants.

The obligatory discussion of the difficulty of cooling light-water reactor plants is found in a later chapter. Granted that nuclear plants are thermally inefficient, it is also true that no time is spent in the consideration of what to do with the excess heat in place of throwing it away. The possibility of greenhouses for the growth of plants in cold climates, or the piping of hot water into the buildings for heating and into sidewalk pipes for snow removal, is ignored.

It is difficult to write about power consumption in these ecological days without becoming somewhat emotional. The authors of this not exactly compendious volume have avoided the problem by tipping their hats lightly to ecology and social needs here and there, and then proceeding with the standard discussion of the technological and economic substrata of power generation. The result is a loosely organized collection of facts and assessments, tied together by the sort of economic considerations which are the stock in trade of the power companies.

The authors consider such things as cost of materials, labor, taxes, and amortization and then present, what is to them, the best comparative estimate per kWh. The authors are, however, unaware of their unspoken assumption that the power generation systems of the future will continue to be a collection of locally controlled organisms. Actually the trend is away from this. Localism is yielding to power regionalism, and regionalism will eventually be replaced by nationalism. The power system will become an integrated network in which power transmission, power tradeoff, and power costs will be considered on a national level. How long the capitalistically owned local public utilities can last under such conditions one would not hazard to guess.

The second thing which appears to be unnoticed (or at least unmen-

tioned) is that the cost of pollution control equipment should be offset by benefit valuation. It is possible to assign a dollar value to reduced insurance costs, reduced hospital costs, reduced medical costs, and reduced destruction of agricultural products. It is quite possible that tax rebates or government subsidies will be used throughout the nation to generate the socially desirable ecological protection systems.

To speed up communication, the publishers decided to print by offset directly from the authors' manuscript. As a result, this is possibly the most current book on power production. Unfortunately, the haste to make the printed pages available to the public had also prevented editing, and although there are almost no misprints and the tables are well put together, it appears that little thought has been given to the quality of writing. If a second edition is ever to be printed, this reviewer suggests that some attention be paid to the realities of the English language.

*M. R. Bottaccini is a professor at the University of Arizona where he teaches aerospace and mechanical engineering. He is a specialist in mathematical modeling of nonlinear systems. Currently he is working in applications of engineering science to biological systems and in the applications of nonlinear mechanics to modeling and prediction. He is a strong proponent of nuclear power generation and considers himself, in this respect, somewhat of a rarity among the fossil fuel enthusiasts who normally fill the mechanical engineering departments of the nation. He is the author of several books and many articles.*

#### Dynamics of Nuclear Systems

*Editor* David L. Hetrick  
*Publisher* University of Arizona Press (1972)  
*Pages* 606  
*Price* \$14.50  
*Reviewer* George H. Miley

This book is a collection of 33 papers on the dynamics of nuclear

systems originally presented at a symposium at the University of Arizona, March 23-25, 1970. The lengthy delay in publication (February 1972) might, on the surface, appear to seriously depreciate the worth of the volume. However, this reviewer found that the general quality of the papers was such that the book should still be of value to both practitioners and researchers in the dynamics area. An amazingly low price (\$14.50) in light of the very professional typeset, hardbound book is an added inducement. Further, for many of his admirers, the keynote address by the late Theos Thompson is worth the price alone.

Dr. Thompson suggested that a theme for the conference be: "Solve real problems and solve them correctly." While this may seem self-evident, those involved in reactor kinetics will recognize that certain areas of the field and some symposia have been prone to a rather academic approach which has had little impact on real reactor development. A strong point of the present collection is that it contains exceptionally good balance and thereby avoids this pitfall. Thus the reader finds papers ranging from pulse and wave propagation on to a discussion of disassembly in oxide-fueled fast reactors; he finds a paper which discusses industrial requirements and also one which outlines LMFBR safety analysis requirements, as well as a fairly extensive collection of papers on recent numerical and analytic analysis techniques. In fact, the author list reads like a condensed version of *Who's Who* in reactor dynamics. Further, contrary to what one might anticipate in such a situation, the authors, in general, do not rest on their laurels—a gratifying attempt to present new material as well as to review the state-of-the-art is found. The papers went through a galley stage, and the authors and editor are to be complimented on their obvious hard work to obtain an even style and reduce errors which often mar symposium collections.

On the negative side, as is typical of such proceedings, some unevenness in quality is observed. Perhaps more distressing is the lack of continuity. There is no real attempt at unification. Critical reviews or summary papers in each of the rather diverse areas included would have helped, along with an index. Such

additions should have been practical here in view of the lengthy delay in publication.

Overall, however, it is the reviewer's opinion that this collection should be a valuable addition to technical libraries as well as to the bookshelf of anyone specializing in reactor dynamics. I believe that the results would have met the expectations of Theos Thompson, and I sincerely hope that the University of Arizona can continue the tradition of symposia in reactor dynamics. This has been a real service to the reactor community over the years.

*George H. Miley, professor of nuclear and electrical engineering, University of Illinois, has been involved in the area of reactor dynamics since he reported the first reactor neutron pulse propagation experiments in 1962. In addition to his contributions in this area and pulsed research reactor studies, he has contributed heavily to research in both energy conversion and fusion technology. Author of the ANS monograph on Direct Conversion of Nuclear Radiation Energy, he has participated in the formation of both the Education Division and the Technical Group for Fusion of the American Nuclear Society, and has served as chairman of the American Society for Engineering Education Energy Conversion Committee.*

#### Radiation and Shielding in Space

<i>Author</i>	James W. Haffner
<i>Publisher</i>	Academic Press Inc. (1967)
<i>Pages</i>	347
<i>Price</i>	\$17.50
<i>Reviewer</i>	S. H. Turkel

This book represents a summary of the knowledge concerning space radiation and the technical disciplines of shielding against it as of the year 1966. In the specialized nature of this scientific field, the age of such information (about six years now) could frequently impose large questions of obsolescence due to rapid changes in knowledge, techniques,

and application. In this case, however, a firm foundation has been established for continued usefulness to both scientists and designers. New advances in understanding the environment of space and exploring its regions with manned and unmanned spacecraft should only bring enhancement of powerful tools already established. One must only suggest that a summary of this subject is highly desirable as a continuing progress report at least once every seven to ten years in order to bring the understandings and techniques up to date, and to provide current guides to more effective space exploration and spacecraft design. Hence, the time is soon approaching for another progress report.

The author has chosen a commendable division of subject matter for the summary, dividing it into four distinct sections. The first three chapters deal with the nuclear radiation environment in space, consisting of those regions dominated by solar particle radiation, galactic (cosmic) radiation, and the earth's trapped radiation belts. The next section consists of a chapter on the effects of nuclear radiation on men and materials. The third section has three chapters dealing with the techniques of measurement of dose and dose rates as a function of shield thickness and the methods of calculating the interactions of charged and uncharged particles and radiation with matter; scattering and attenuation problems are explored and some space radiation shielding computer codes are described. The final section consists of two chapters in which the results of several space radiation shielding studies are presented which integrate the subjects of the preceding sections and their effects on overall spacecraft design; these treat the influence of doses due to nuclear space radiation: of solar flares, trapped radiation, or galactic radiation on spacecraft shielding, and of atmospheric and magnetic effects on earth shielding; and finally the influences on mission analysis considerations for earth orbital and deep space missions. Tables and graphs are used to present a large part of the material and abundant references are provided for those desiring more detail on any section. Despite the apparent cutoff of material due to the extensive source bibliography covered for each subject, a com-