from the Pennsylvania State University. He is currently active in researching crystal defect interaction mechanisms and modeling irradiation effects in non-fuel metals and alloys.

AN-34 Experiments in Nuclear Science

Author Staff, ORTEC, Inc.

Publisher ORTEC, Inc., 203 Midland Road, Oak Ridge, Tennessee 37830 (1971)

Pages 129

Price $10.00

Reviewer Wallace H. Fuller

Reviewing the publication, *AN-34, Experiments in Nuclear Science*, has been a pleasant experience. The manual is well written and organized in a fashion which facilitates both the comprehension and fulfillment of the experimental objectives. Sufficient references are also given to permit the student to obtain a more comprehensive treatment of the theory.

There is, however, no treatment of the phenomena of radioactive equilibria. Although half-life determination is given in this manual, the equilibria phenomena, which are a direct result of the half-lives of both parent and daughter nuclides, are not considered. Most lab manuals treat parent-daughter equilibria in some manner. For this reason, I believe at least a mention of this phenomena should be included if the inclusion of another experiment is not possible. Inexpensive minigenerators are available from the Educational Aids Department of the Union Carbide Corporation, Tuxedo, New York, which are specifically designed for the experimental observation of radioactive equilibria.

I feel sure that this publication will be useful for students as well as faculty and is an important addition to the radioisotope research and teaching programs.

Wallace H. Fuller (BS, MS, soil chemistry, Washington State University, 1938 and 1939; PhD, soil chemistry and soil microbiology, 1942) was a research associate, Department of Agronomy, Iowa State University from 1940-45; biochemist and soil scientist, U. S. Department of Agriculture, Agricultural Research Service, 1945-48; associate professor and associate biochemist, University of Arizona, 1948-56; professor, biochemist and head of agricultural soils, 1956 to date. Professor Fuller's interests and areas of research have included many articles and papers on radioisotope fallout and instruction of advanced graduate course in radiotracer techniques. He has been a continuous researcher with radioisotopes since 1945.

Nuclear Data for Reactors

Conference Proceedings, Helsinki, 2nd International Conference on Nuclear Data for Reactors, June 15-19, 1970. Vols. 1 and 2

Editors IAEA

Publishers Unipub, Inc. (1970)

Pages Vol. 1, 741
Vol. 2, 958

Price Vol. 1, $21.00
Vol. 2, $24.00

Reviewer David Okrent

These two volumes comprise the Proceedings, including over 100 papers and discussions, of the Second International Conference on Nuclear Data for Reactors held in Helsinki on June 15-19, 1970. The first conference held by the International Atomic Energy Agency (IAEA) on this subject occurred in Paris in 1966. The scope and emphasis of this conference are well delineated by the section titles of the volumes:

- General Aspects of Needs and Uses for Nuclear Data
- Cross Sections and Techniques for High-Precision Neutron Nuclear Data Measurements
- Nuclear Data in the Thermal and Resonance Energy Region: $A > 220$
- Nuclear Data in the Thermal and Resonance Energy Region: $A < 220$
- Nuclear Data Above the Resonance Energy $A > 220$
- Nuclear Data Above the Resonance Energy $A < 220$
- Relationships of Microscopic and Integral Data
- Evaluation Problems and Methods.

The bulk of the papers and all of the discussion are in English; however, a considerable number of papers are in Russian or French, except for brief English abstracts. The major emphasis is on data of interest to fast reactors.

This conference represents an important landmark in the nuclear data aspects of reactor physics, and the proceedings are in the excellent tradition of IAEA conferences, including major technical contributions from throughout the world of nuclear reactors. There is very good balance between review papers and new contributions.

The review papers in the opening session deal with the cross-section needs for fission reactors, fusion reactors, and astrophysics, and include a report on the current status of theoretical understanding of neutron cross sections. Each of the succeeding sessions also includes one or two review papers, and most of the contributed papers carefully presented new data in the context of existing information, so that the reader is provided with perspective.

Because of the current world-wide emphasis on fast reactor development, major attention in both data measurement and evaluation is given to fast neutron fission in ^{235}U and ^{239}Pu, capture in ^{239}Pu and ^{238}U, and inelastic scattering in ^{238}U, as well as the absolute value and energy dependence of ν and the resonance structure of the actinides.

Relatively good agreement on higher values of alpha = $\sigma_{capture}/\sigma_{fission}$ for ^{239}Pu in the energy range 100 eV to 20 keV has now been obtained. On the other hand, despite extensive and careful work by several capable experimental groups, surprisingly large discrepancies continue to exist in the basic fission cross section for ^{235}U, relative to which most other fast fission cross sections are measured, and in the n,γ cross section for ^{238}U, which is very significant to criticality and reactivity prediction for large fast reactors. The difficulties of obtaining accurate absolute measurements, the interplay of factors involved in

comparison of sets of data, and the varying approaches taken in data evaluation and in the preparation of "consistent cross sections for various isotopes," all are examined in depth for these vital cross sections, as well as for other data such as resonance parameters and inelastic scattering levels.

The proceedings of this conference represent a valuable addition to the nuclear engineering or neutron physics section of any institutional library. For the active worker in the field, it is a major source of data and analytical results. For the newcomer to research in either neutron data measurement or evaluation, it provides not only an immediate introduction and review, but extensive yet selected bibliographical material. For the graduate student, a sense of appreciation of the uncertainties in both nuclear data measurement and evaluation can be developed.

Ideally, such a conference proceedings might, in the future, include written, post-conference summaries that would provide insight as to the significant technical information reported upon therein, and, more importantly, an evaluation of the impact of new developments on various interested segments of the nuclear community. The panels held at the close of such a conference are interesting, but written "post-mortem" papers, included as part of the proceedings, might prove to be valuable. Also, particularly to aid the relative newcomer or the rather narrow specialist, a rather longer paper which related cross section needs to reactor needs, qualitatively and quantitatively, might warrant consideration.

David Okrent has an ME from Stevens (1943) and a PhD in physics from Harvard (1951). He is currently professor of engineering and applied science at the University of California at Los Angeles after nearly 21 years with Argonne National Laboratory where he pioneered in fast reactor physics and safety, including multigroup methods, fast critical experiments and analyses (ZPR III), cross-section evaluation (Yiftah-Okrent-Moldauer monograph), the TREAT reactor and experimental program, and fast reactor accident analysis. He has been a delegate to the four Geneva Conferences and a Guggenheim Fellow. As recipient of the AUA Distinguished Appointment Award, he spent 1970-71 as a visiting professor at the University of Arizona. He is a Fellow of ANS and APS, a past chairman of the Math and Computations Division, and current chairman of the Technical Group for Nuclear Reactor Safety. He has been a member of the AEC Advisory Committee on Reactor Safeguards since 1963, serving as chairman in 1966.

Earthquake Engineering for Nuclear Reactor Facilities

Authors	John A. Blume, Roland L. Sharpe, and Garrison Kost
Publisher	John A. Blume & Associates (1971)
Pages	153
Price	$20.00
Reviewer	Craig Smith

I wish I could recommend this report (it is not a book) to the readers of *Nuclear Technology*, because there is a definite need for a comprehensive, up-to-date review of seismic design of nuclear facilities. Unfortunately, this work does not meet these requirements.

The report includes sections on site investigation and preparation of ground motion spectra, analysis of reactor buildings, dry wells, pressure vessels, equipment, piping systems, and hydrodynamics. Short sections dealing with damping and inelastic response are also included.

Chapter II discusses seismology and seismicity, and then describes several methods for estimating maximum ground accelerations and response spectra. In Chaps. III and IV these "inputs" and standard dynamic analysis techniques are used to compute the response of typical BWR and PWR reactor buildings and containment systems. Although the methods are only outlined, results of typical calculations are shown. Chapters V, VI, and VII provide brief discussions of the analysis of reactor vessels, equipment, and piping. Chapter VIII is a three-page treatment of damping; regrettably, no new information is provided on this important subject. Chapter IX is a good treatment of fluids vibrating in tanks. Chapter X is three pages devoted to inelastic response; again it is unfortunate that details of the authors' approach to this question are not included.

In the Foreword (p.iii) the authors state:

> "The authors' firm in mid-1967 prepared a draft summary of "Current Seismic Design Practice for Nuclear Reactor Facilities" which was published in 1969 as TID-25021. Since that time, however, much of the material presented therein has been outdated, inasmuch as the design and analysis of earthquake-resistant structures is a relatively new field which is still developing—and all of the present concepts are not completely defined and understood.
>
> The present book discusses state-of-the-art techniques and procedures, many of which are currently used by groups designing nuclear facilities. . . ."

Although the copyright date of the report is 1971, it actually summarizes the pre-1967 state-of-the-art. The Appendix lists 68 references and bibliographical entries but only three are more recent than 1967. Thus it would appear that the authors failed to achieve their objective (stated above) of updating their earlier work.

Another general comment is that the report has obviously been prepared for someone with knowledge of the field. It is impossible, in such a short work, to deal comprehensively with a field as broad as earthquake engineering. Thus the worker who is new to the field will find most of his questions unanswered after reading the report, while the more experienced reader will not be able to find answers to his more detailed questions either.

The authors do not reference any of the body of experimental work which has been done in recent years at nuclear facilities in the United States and Japan. Not only have vibration tests been made on components and full-scale nuclear power plants, but calculations and analytical models have been compared with actual data from half a dozen small earthquakes.

The report contains no information concerning the February 9,