

(*About the Reviewer: Following completion of his academic training at Yale in 1950, A. F. Henry has been associated with the Bettis Plant of the Westinghouse Electric Corporation. He worked on the nuclear design of the NAUTILUS and first submarine fleet reactor cores and is currently Manager of the Reactor Theory Section of the Reactor Development and Analysis Department. Dr. Henry has helped shape the Society's publication policies as a member of its Program Committee and of this Journal's Editorial Advisory Committee.*)

Reactor Handbook, 2nd ed., Vol. 3, Part A (HARRY SOODAK, ed.). Interscience, division of Wiley, New York, 1962, 313 pp. \$10.75.

Reactor physics over the past five or six years has continued its steady growth, and is now a quite different subject from what it was in the early and mid fifties. Thus, there are current needs for texts and handbooks—the latter both of the German expository type and the data handbook.

The new edition of the *Reactor Handbook* does not fill these needs.

The preface to the volume states that the bulk of the work was completed in 1957. The material contained in it supports this statement; most of it is now obsolete. There are occasional references to publications as late as 1961, and a number of references to material published in the Proceedings of the 1958 Geneva Conference. This material appears almost exclusively in a small part of Chapter 4 (Reactor Statics, Theoretical) and in Chapter 6 (Critical Data).

One would think that in the five years between preparation and publication, time would permit excellent editing. However, the references in Chapter 5 are completely garbled.

The reviewer appreciates the difficulties of speedy publication, being now in the throes of trying to unjam a similar work (*Reactor Physics Constants*, second edition, put to bed in January 1962, and soon, I trust, to be published). Nevertheless, five years is much too long.

Chapter 1, "Nuclear Data," is well organized, presenting material on the fission process, radiation sources, range-energy relations, neutron cross-section theory and data, and integral resonance and neutron age data. The data are, for the most part, obsolete. The theoretical parts are well written, but they do not contain discussions of the more sophisticated optical models, and the discussion of inelastic scattering by condensed matter for neutrons of low energies is brief and qualitative. The data are for the most part archaic.

Chapter 2, "Experimental Methods," contains universally useful material. Again, it suffers by omission of modern material on: fast response circuitry; experimental methods for determining neutron spectrum; pulsed and oscillating source experiments; and lattice sample and substitution methods for determining k_{∞} , B^2 , and lattice constants. The section on critical experiments is an excellent summary of general principles. The data are obsolete.

Chapter 3, "Theory of Neutron Transport," leans heavily on the simple approximations. It is generally compact and correct. The spherical harmonics method is given too much space in terms of its general utility, and numerical methods too little. The Milne problem is treated in unnecessary detail, since its practical value is now nonexistent.

The best part of the chapter is the descriptive text explaining the Boltzmann equations. The much used S_n method is qualitatively described, very well. The codes cited for solving slowing down equations are uniformly obsolete.

Chapter 4, "Reactor Statics," is the one containing the most recent material, and by far the most interesting. It contains a modern approach to the "classical" description of a reactor in terms of the four factor formula, leakage, cell homogenization, void and control theory, and temperature effects. In many ways, I find the presentation of the material covered more satisfactory than "Wigner and Weinberg" which is animated by the same philosophy. There is however a purely sentimental attachment to diffusion theory, with many plots of B factors, F factors, and other mathematical formulas which are no longer used because they are in error on their basic physical assumptions. The Amouyal-Benoist method for computing thermal disadvantage factors, which is a very good approximation, could have been substituted with profit—that is, its tables, figures, etc., printed out instead. The thermal spectrum problem with its interaction with the transport problem is not presented, nor is the physics of burnup reactivity change. These related problems are the bone in the throat of classical theory, so that their omission makes the presentation appear undeservedly authoritative. Nevertheless, this is an interesting chapter.

Chapter 5 is on Reactor Dynamics. The first several references are from some other book. It almost looks as though a subsection on reactivity changes under long term irradiations was originally included, and then stricken. The chapter contains several standard charts. Its coverage does not reflect the same careful attention to historical priority as do the other chapters (for example, good early work on Nyquist stability criteria was performed by H. A. Strauss at Oak Ridge and J. Chernick at BNL). The chapter is not very good.

Chapter 6 contains critical calculations and data. It contains many curves from the Second Geneva Conference—72 figures and 12 tables, of which I estimate half to be from that source. If this book is all the reader has to work with, it must be admitted that the data are useful. On the other hand, most of the data presented were already included in the first edition of *Reactor Physics Constants*, and this reviewer feels that such data belong preferably in this latter work. It is clear that a better correlation between these two volumes will be necessary in the future.

In summary, as may be gathered from the foregoing, I do not recommend purchase of this book.

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(*About the Reviewer: Bernard Spinrad's interests have been in the fields of reactor physics and reactor engineering at Argonne National Laboratory since 1949. Until recently he was Director of its Reactor Engineering Division, a position he had occupied for the past six years. Preceding his tenure at ANL and following completion of his graduate studies at Yale he was associated with the Clinton Laboratories (Oak Ridge) for two years. Dr. Spinrad has served on several committees advisory to the U. S. Atomic Energy Commission on matters germane to basic reactor development, and is currently Chairman of the European-American Committee on Reactor Physics, an advisory body to the European Nuclear Energy Agency on matters of reactor physics.*)