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.

Advanced Converters and Near Breeders
(Proceedings of the Wingspread Conference on Advanced Converters and Near Breeders, May 14-16, 1975, Racine, Wisconsin)

Publisher	Pergamon Press, Ltd. (1975)
Pages	160
Price	$20.00
Reviewer	Bernard I. Spinrad

In May of 1975, at the invitation of Peter Auer of Cornell University, 37 participants and 2 observers met at the Johnson Foundation Wingspread Conference Center, near Racine, Wisconsin, to discuss the potential of various advanced converters and near-breeder reactors. The participants represented a cross section of "establishment types" (reactor manufacturers, fuel cycle corporations, the U.S. Energy Research and Development Administration, and the Electrical Power Research Institute) and "independent" nuclear experts from research and development organizations and universities. The choice of topic was specifically intended to stimulate thinking on alternatives to the official U.S. nuclear policy, which might be described as "light water reactors (LWRs) now, liquid-metal fast breeder reactor (LMFBRs) by 1995, and won't somebody close the fuel cycle?"

Of 18 position papers originally put forward, 14, plus an addendum, survived as documents worthy of publication. These papers, along with a section of comments by participants, have been collected into a volume entitled *Advanced Converters and Near Breeders*.

The volume is of considerable value for a number of reasons. First, it presents a set of clear and concise statements describing and justifiying the main line of U.S. nuclear strategy. These statements are those of J. J. Taylor (LMFBR development), J. R. Dietrich (resource requirements of and incentives for the LMFBR strategy), M. Levenson (arguments against alternates to the standard strategy), and R. L. Dickeman (an industry view of fuel cycle problems.)

A second group of papers provides input on a number of matters that must be considered in assessing changes in national strategy. The Canadian (CANDU) program was presented by J. S. Foster and E. Critoph, and its current performance data were summarized by L. W. Woodhead and L. J. Ingolsfrud. M. F. Searl and J. Platt offered a reasoned evaluation of uranium and thorium reserves and resources. P. Fortescue spoke for advanced high-temperature gas-cooled reactor systems, A. M. Perry for molten-salt converters, W. B. Lewis for high-performance organic-cooled CANDU reactors on the thorium cycle, and M. S. Edlund for the potential of high conversion through plutonium recycle in LWRs.

I found the papers of Perry and Edlund to be the most interesting in this group. Perhaps the reason lies in the rather poor "press" that the two concepts [molten-salt reactor (MSR) and plutonium recycle, respectively] have received in recent years. The lack of industry interest in the MSR is well known, and plutonium recycle has been damned by faint praise. "At best, it would only save 10% of our uranium" is a standard remark. Perry's paper, which is totally lacking in sales orientation, is nevertheless the presentation that convinced me (formerly a skeptic) that the MSR should be a major ingredient of an alternative nuclear strategy. Edlund's paper appealed to my prejudicial feeling that a good case for plutonium recycle exists and has been mishandled.

Three papers—by E. L. Zebroski on alternate converter strategies, H. A. Bethe on the case for the conventional strategy under alternative nuclear deployment schedules, and W. M. Pardue on evaluating alternative systems—represent the crux of the matter. As indicated, Bethe concludes that the conventional strategy is a robust one; Pardue presents the case for a diversified strategy, and seems to indicate that it need not detract from the success of the basic (conventional) strategy; and Zebroski indicates that a limited excursion into alternative reactor systems is useful insurance against hangups in the basic strategy.

The closing section of the book, consisting of second thoughts and comments by participants, is of interest primarily because nobody seems to have changed his mind (at least, significantly). Those who favored the conventional strategy indicated that the case for near breeders and advanced converters was marginal; those who favored new, specific reactors continued to advance

arguments for them. Canadian participants might be judged to be the least biased with regard to U.S. programs, and they seemed to feel that the weight of U.S. authority is against alternative systems, although there are cogent arguments for U.S. program diversification.

A major commentary is that of H. J. Larson, who seemed to be the only conferee who was willing to discuss the number one question of nuclear futures: ". . . whether the solution(s) to many of the problems . . . are really solvable by technical and management people. There are strong indicators that the solution has moved to the public and political arena."

Larson's comment really set the stage for my final, capsule review of the book. It is, as previously indicated, a useful summary of the rationale of the standard U.S. nuclear strategy, grouped together with some stimulating papers on alternative reactor systems. Yet, the discussion is largely irrelevant. The major issues today are issues of "whether" rather than "when" or "what": whether we will ever deploy the breeder (given that its deployment schedule under economic circumstances might be impacted by such alternative technologies as solar electricity); whether nuclear power is a transient (albeit vital) solution to the energy dilemma of our generation; whether we will ever return to a learning curve of decreasing real cost of construction; whether we will be permitted to close the fuel cycle.

Nuclear (and other) energy development in the U.S. is, unfortunately, now controlled by corporate policy and government decree. To be able to profit from the inventive genius of the sort of people who met at Wingspread, the public issues must be settled and the technological initiative must be returned to the laboratory. I feel that the Wingspread Conference's most significant result is that, by its failure to take these matters into account, it has illustrated just how important they are.

Bernard I. Spinrad (PhD, physical chemistry, Yale University, 1945) has been involved with the development of nuclear energy since 1946. At Oak Ridge National Laboratory and Argonne National Laboratory (ANL), between 1946 and 1972, he was a principal concept developer for research reactors (MTR, CP-5, Argonant), production reactors (the Savannah River system), and power reactors. As director of the Reactor Engineering Division at ANL, he was responsible for development and operation of boiling reactors (EBWR, SL-1, Borax) and fast reactors (EBR-II). He is best known for his research in reactor physics (multigroup calculations, fast effect, neutron transport, and integral experiment analysis) and in reactor concepts for unusual applications—high-flux research, rocket propulsion, submarine stations, total urban energy. From 1967 to 1970 he was director of the Division of Nuclear Power and Reactors at the International Atomic Energy Agency, and since 1972 he has been professor of nuclear engineering at Oregon State University. His major current research interests are shutdown heating of reactors and nuclear and energy economics.

Design of Radiotracer Experiments in Marine Biological Systems
(Technical Reports Series No. 167)

Publisher	International Atomic Energy Agency (1975) (Distributed by Unipub, Inc.)
Pages	289
Price	$18.00
Reviewer	T. G. Stinchcomb

This report consists of an introduction (6 pages), the report itself (25 pages), and ten supporting papers (255 pages) prepared by some of the members of the Panel on Reference Methods for Marine Radiobiological Studies prior to their meeting in Monaco, June 25-29, 1973. Although the Foreword stresses the need for establishing rational limits for disposal of radioactive wastes to the environment, the report deals with the problems involved in research in the radioecology of marine environments. Especially stressed are (a) the difficulties in understanding the significance of experimental results, (b) the difficulties in comparing results obtained using different experimental approaches, (c) the difficulties in extrapolating laboratory results to make predictions in the natural environment, (d) the need for documenting the physico-chemical forms of the radioactive tracer and the state of the isotopic equilibrium between the tracer and the stable physico-chemical forms of the element, (e) the need for measuring and controlling all the physiological parameters and physical and chemical conditions that could influence the experiments, (f) the importance of synergistic effects caused by the influence of other contaminants and effects (organic matter, heavy metals, increased siltation, elevated temperature), and (g) the desirability of utilizing as fully as possible all releases of radioactivity into the marine environment for studies on transport, distribution, and behavior of radionuclides to obtain information difficult to derive from laboratory experiments.

The body of the report does not go into any of the methodology of the measurements of the radioactivity in marine environments. It refers instead to the International Atomic Energy Agency Technical Reports Series No. 118, *Reference Methods for Marine Radioactivity Studies*. The report does go into detail on biological and chemical measurements and on precautions to take in carrying them out. The reader is made aware of the problems involved in the collection, transportation, and handling of organisms and the wide variations in specific requirements for the different types of biota. The supporting papers give further detailed examples dealing with phytoplankton, zooplankton, benthic algae, benthic invertebrates, mollusks, fish, subcellular studies, marine food chains, field and laboratory comparability, and modeling studies.

If there are readers of *Nuclear Technology* who are contemplating the possibility of beginning some experiments in marine radioecology, they will find this report of great value. Readers who are looking for information to aid in the establishment of rational limits for disposal of radioactive wastes to the environment will be disappointed unless they are looking for points upon which to criticize the possibly unrealistic limits based on measurements that may not have taken account of the many precautions and caveats described in the report and its supporting papers.