ments, there are about 20 articles of a general nature on related subjects such as "Periodic Law and Periodic Table," "Noble Gases," "Lanthanide Elements," "Transuranium Elements," "Isotopes," "Electronic Configurations," "Origin of the Elements," "Prevalence of the Elements," and "Electrode Potentials." A short reference list accompanies each article. An index facilitates the location of material not readily evident from the alphabetical arrangement of topics. The entries in the book have been prepared by 104 knowledgeable individuals of outstanding reputation in their respective fields.

Despite the large number of authors, there is a reasonable uniformity of treatment of each element. The book is recommended strongly.

W. Conard Fernelius is Associate Director of Research, Koppers Company, Inc., Monroeville, Pennsylvania. With a PhD degree (1928) from Stanford, he has taught in the chemistry departments at Ohio State, Purdue, Syracuse, and Pennsylvania State Universities and was department head at the last two institutions. He also served with the Monsanto Company as laboratory director of the forerunner of the Mound Laboratory during World War II. His research has been on various aspects of inorganic chemistry, including non-aqueous solvents, coordination compounds, and less-familiar elements.

EXPENSIVE EXPOSITION

Title Fast Breeder Reactors

Editor P. V. Evans

Publisher Pergamon Press, Inc., 1967

Pages vii + 951

Price $37.00

Reviewer Joel H. Ferziger

The volume under review is of a type which seems to be displaying the highest rate of population increase these days—the conference proceedings. In particular, it is the proceedings of the Conference on Fast Breeder Reactors held in London in May 1966.

The content is what might be expected: reviews of various national programs by officials in charge of the programs, experience with existing systems, systems planned for the future, and then detailed papers in the important problem areas, i.e., physics and fuel sodium technology. Reflecting, I suppose, the British bias for sodium cooled reactors, this reactor type receives much more attention than all others combined.

One question I have been unable to resolve is that of for whom a book of this type is intended. The price puts it out of the range of most potential individual purchasers, and the content is such that only a few academic libraries will find a need for it. This leaves then only the libraries of laboratories and industrial groups currently working with fast reactors. Furthermore, since fast reactors are currently progressing at something like the pace of thermal reactors ten years ago, the material will be out of date within a few years. One wonders whether such a book merits a printing job designed for a considerably longer lifetime, especially when this results in a price that destroys some of its current usefulness.

There are far too many papers to attempt a review of each here. Rather, I shall limit myself to a few general comments and, reflecting a personal bias, some specifics on the papers in the physics and design areas. All of the papers are reviews; most of them review progress in a given area made within the author's country, and several are written by authors from more than one laboratory (one has authors from five separate groups). The quality of the papers (and I will admit to not having read all of them) is generally very good, and, since in a short review one cannot give many details, I merely say that they are amply provided with references in which the interested reader can find further information.

In the physics papers, one finds a considerable amount of duplication in the various national programs. The topic of major current interest is the effect of fluctuations in the cross sections on a fine energy scale and heterogeneity on gross reactor behavior. Since the codes needed to handle this problem are rather expensive to develop (especially the cross-section libraries for them), greater emphasis on international cooperation would seem to be indicated. Perhaps conferences of this sort will promote the needed cooperation.

The impression that one gets is that the gross characteristics and design features of fast reactors are reasonably well understood and agreed upon and that work now centers on specific physics effects, detailed design, and hardware development. As with thermal reactors several years ago, fast reactor development is rapidly becoming a question of technology rather than physics.

Joel H. Ferziger (PhD, University of Michigan, 1962), is associate professor of nuclear engineering at Stanford University, where he has been since 1961. His main interests are in neutron transport theory nad the kinetic theory of gases. He has been involved with fast reactor physics and design through consulting work with General Electric.

BWR BURNUP METHODS

Title Fuel Burnup Predictions in Thermal Reactors

Publisher United Nations Educational, Scientific and Cultural Organization, 1968

Pages 243

Price $5.00

Reviewer George A. Sofer

Besides being the biggest collection of nuclear codes name dropping, the book offers the reader the broadest and deepest insight published to date on burnup calculation methods in thermal reactors. Of paramount interest to the American reader is the comprehensive dissertation by R. L. Crowther on large BWR burnup methods. This is perhaps the best that has been published on BWR core physics since the 1963 San Francisco Conference.

Unfortunately, a comparable presentation of PWR burnup methods is lacking. The paper by Spinrad covers burnup considerations in PWR's and refers to papers previously published by the International Atomic Energy Agency on the subject of burnup analysis of PWR's. However, none of these is comparable in depth and detail to Crowther's paper.

The book leaves few countries with water moderated (light or heavy) reactors unrepresented. The list includes the United States, the United Kingdom, France, Belgium, Italy, Canada, Czechoslovakia, Yugoslavia, Norway, Japan, Sweden, and the USSR. A paper by representatives of each of these countries is included.

Burnup code names sprinkled throughout the book embrace purely functional titles such as TREDA (tridimensional), tongue twisters such as SUBURV and SQUIFID, unpronounceable acronyms like LKDV and LKVS, inconsistent code designations like TRICYCLE I and TRICYCLE II, and biblical genealogy code names such as METHUSELAH, etc.

The uninitiated reader should not expect to learn how to calculate burnup from this book, and he will certainly be overwhelmed by the multiplicity of codes used in the art of reactivity and burnup calculations.

However, to the experienced reactor physicist, who has thought long long and hard about the complexity of the three-dimensional puzzle of burnup, reactivity, and power distribution, the book might well suggest a number of novel approaches, reconfirm a few suspicions, and offer reassurances, by revealing that the experts, too, have encountered difficulties in three-dimensional source convergence, or with prediction of power peaking above partially inserted control rods.

George A. Sofer, (ScD, MIT) is manager of the Nuclear Design Department, United Nuclear Corporation, Research and Enginerring Center, Elmsford, N.Y. After leading a series of conceptual design studies, which included steam-cooled and sodium-cooled fast breeders and fog-cooled light- and heavy-water moderated reactors for Nuclear Development Associates, he recently concentrated on compilation and development of BWR and PWR core physics methods. These methods are now used in the fuel management of the Dresden Unit 1 reactor and in nuclear design and fuel management of the Donald C. Cook 1050 MW(e) PWR and Con Edison's Unit 4 1100 MW(e) BWR.

MUCH ABOUT MUTAGENS

Title Neutron Irradiation of Seeds Technical Reports Series No. 76

Publisher International Atomic Energy Agency, 1967

Pages 112

Price $2.50

Reviewer W. Ralph Singleton

This is a report of a study-group meeting on coordination of research in the use of neutrons in seed irradiation (Vienna, July 25-29, 1966) and of a working group meeting on recommendations for a neutron seed irradiation program (Vienna, December 12-16, 1966).

This paperback booklet of ~100 pages sets forth principles and recommendations for seed irradiation. Although primarily concerned with neutron irradiation, it compares x rays, gamma rays, and such chemicals as EMS and DES. The main purpose of the meetings was to attempt to establish uniform procedures of radiation and uniform reporting of results. With many reactors of different types (>61 pool-type reactors operating in 31 countries) operating under different conditions and for many purposes, it is extremely difficult to obtain comparable dosages for different reactors. Neutron dosimetry is not as well established as that for x rays or gamma rays. Greater uniformity in reporting results should result from the two conferences held in Vienna.

The roster of participants of the conference contains persons well informed on the use of radiation in producing genetic changes for use in genetic studies and in plant breeding. Such persons on the IAEA staff were Bjorn Sigurbjornsson, Calvin Konzak, and Knut Mikaelsen. In addition, there were representatives from 16 countries.

The publication consists of the following divisions: 1) summaries and abstracts of papers, 2) reports, 3) recommendations, and 4) special reports. Users and potential users of radiation for mutation breeding will find the section on recommendations particularly helpful. This section mentions that the IAEA Mutation Advisory Group is preparing a "Manual of Mutation Breeding," This should be most useful.

One of the conclusions seems pertinent. "It is recognized that, as a general practice, no one mutagen should be used exclusively. Therefore, unless knowledge of mutagenic specificity dictates otherwise, chemical mutagens and physical mutagens, other than neutrons (such as x rays and gamma rays) should be investigated."

The IAEA is serving a useful function in holding conferences such as the one reported here and in furthering cooperation between researchers on the use of mutagens, including neutrons, in genetic and biological research.

W. Ralph Singleton (ScD, Harvard, 1930) is Miller professor of biology at the University of Virginia and Director of The National Colonial Farm of the Accokeek Foundation. His research in botany and plant genetics has included cytogenetics of maize, radiation-induced mutations, and the effects of inbreeding and crossing maize. He has been associated with the Harvard Botanical Garden, the Connecticut Experimental Station, Brookhaven National Laboratory, and a number of farm experiments during his distinguished career.