

sten had a profound effect on the compressive creep behavior of UC. At 1300°C at a stress of 6000 lb/in.², a 50.5at.%C-U alloy showed a strain of less than 2% in 30 h, while a 49.5at.%C-U alloy showed a strain of over 24% in 30 h. These out-of-pile creep data were dramatized by a striking correlation with irradiation results reported by J. Crane and E. Gordon. After long-term irradiations at centerline temperatures estimated to be about 1060 to 1200°C, hypostoichiometric uranium carbide showed fission-gas releases an order of magnitude greater and density decreases four times greater than stoichiometric uranium carbide.

To a person interested in obtaining the views of the experts with regard to the technology of uranium, plutonium and thorium carbides, the record of this symposium will prove a gold mine. It will be many years before all the property data presented at this symposium are extracted and presented in handbooks; and it will probably take many additional years before the economic realities of actual production experience allow choices to be made between the various syntheses and fabrication techniques described in these volumes.

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About the Reviewer: Walston Chubb joined the Battelle staff in 1951 and is now a Fellow in the Materials Technology Division. For the past seven years he has been technical manager and consultant for a comprehensive research program to develop uranium carbide, its modifications, and associated structural materials as components for high-temperature nuclear reactors. In addition, he has been engaged in research on various other reactor materials including the alloys of zirconium, uranium, thorium, niobium, chromium and iron-chromium-aluminum, and a number of intermetallic compounds, including beryllides and nitrides, as well as carbides. Mr. Chubb is registered as a Professional Engineer in the State of Missouri and is a member of the American Society of Metals, the American Institute of Mining and Metallurgical Engineers and the American Ceramic Society. He received his technical training at Harvard and at the University of Missouri at Rolla.

This review by A. J. O'Donnell covers the following four books, which were published by McGraw Hill, New York (1964). They may be purchased as a set for \$62.50 or singly at \$18.00. **Radioisotopes and Radiation, Recent Advances in Medicine, Agriculture and Industry.** John H. Lawrence, Bernard Manowitz and Benjamin S. Loeb, 138 pages. **Research, U. S. A., Knowledge for the Future.** Albert V. Crewe and Joseph J. Katz, 215 pages. **Education and the Atom, An Evaluation of Government's Role in Science Education and Information, Especially as Applied to Nuclear Energy.** Glenn T. Seaborg and Daniel M. Wilkes, 150 pages. **Nuclear Power, U. S. A.,** Walter H. Zinn, Frank K. Pittman and John F. Hogerton, 90 pages.

These four volumes were written and their format designed especially for presentation by the United States at the Third Peaceful Uses Conference in 1964. The general reaction to the books: Attractive, colorful, modernistic designs on the dust jackets; drab covers; an illustrious array of authors; extravagant (or merely American?) titles;

unusual size (9 1/4 in. × 9 1/4 in.); generously and well illustrated; continuity of narrative frequently difficult to follow due to random distribution of illustrations with explanatory text set in similar type; an odd group of bedfellows for presentation to a sophisticated gathering of nuclear scientists and administrators.

The books are written with the general reader in mind, some more successfully than others. However, the expert in one field (e.g. nuclear power) may find the other three volumes valuable in gaining a better perspective of over-all progress in peaceful applications of nuclear energy.

The Third Peaceful Uses Conference had as its prime focus nuclear power, and without question the United States had most to say on this subject in terms of experience. The volume devoted to *Nuclear Power, U. S. A.* provides an interesting and informative history of developments in this field up to April 1964. Because of the rapid pace of development in nuclear power, such a book can, at best, provide only an instantaneous picture of the state of the industry as of the date of writing. Those having lived (or suffered) through this period of development may take exception to the authors' treatment of the subject as a smooth and orderly transition.

Appendix B provides an excellent chronology of events, and this reader was pleased to see frequent and appropriate reference to the International Atomic Energy Agency. Throughout the book the illustrations support the associated text most effectively.

Education and the Atom is the most unusual book of the four. It serves its senior author as a vehicle to analyze the general subject of Federal support of research and education, and to set forth several thought-provoking suggestions for future attention at the Executive and Legislative levels of the US Government. For example, the "... creation of a National Humanities Foundation" is suggested (p 18), as is an Institute for Communications Research (p 102). Questions are posed as to whether "... we should have some system of representative government for science," and should we not move toward a unified policy of federal support of research.

In considering further expansion of government-sponsored research the National Laboratories receive considerable attention, as does the general problem of wise selection of appropriate subjects and scientists for support. Of equal importance, but ignored in this (and too often in the administration of government-financed research) is the question "what subjects, what scientists, what laboratories should be phased out or dropped from the Federal Budget?"

That portion of the book in support of the title makes clear the important actions of the AEC in the field of information dissemination—both technical and nontechnical—through education, publications, films and conferences. In the context of East-West Exchange the role of the International Atomic Energy Agency is apparently not fully appreciated as the only organization extant in which the complex scientific, political and administrative interfaces are conducted on an effective, continuing, daily basis between East and West, as well as between industrialized and newly emerging nations.

Radioisotopes and Radiation presents an impressive story of the most widely realized peaceful application of nuclear energy. The pictures tell the story more effectively than does the text, which is burdened with some ponderous sentences. In contrast to the other volumes in the set the authors cite many individual contributors in the applications of radiation and radioisotopes. It is unfortunate that a consistent approach was not taken throughout the set;

having done so in one, certainly each reader would have his list of "favorite contributors" to suggest for the other volumes.

In "A Note about Savings" it was gratifying to note that the authors refrained from the once-popular pastime of one (hundred million dollar)-upmanship resulting from applications of radioisotopes and radiation in industry and agriculture.

Can any two authors really compress into one volume a subject as extensive as *Research, U. S. A.?* The preface to this book immediately set this reader's mind at rest when it limited the contents to basic, nuclear research since 1958, principally physics and chemistry, emphasizing Argonne National Laboratory, and other AEC National Labs. The text then makes clear the qualifications of the authors to deal with this subject. Each section depicts the problems, the challenges and the promise for further exciting discoveries in the various fields.

As a stimulus to college and high school (or junior high) students considering science for a career this book is recommended. For the nonscientist the book will provide some understanding of research and the researcher.

Another audience for this volume is the government body (or bodies) charged with the research, nuclear energy, or science policies and programs for the Major Tools of research. It is made abundantly clear that research tools such as a reactor are relatively useless without an extensive investment in supporting, peripheral equipment.

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About the Reviewer: Ashton J. O'Donnell, presently the manager of research and planning of the Bechtel Corporation's Scientific Development Department, has served his entire professional career in nuclear energy. Long association with the US Atomic Energy Commission and, more recently, with the International Atomic Energy Agency as scientific advisor to the US Mission has provided the background for a review spanning a wide variety of topics. He received his technical training at Whitman College, Walla Walla, Washington. From 1954 to 1961 he was associated with Stanford Research Institute in nuclear energy general research and development planning.

Low Level Radioactive Wastes; Their Handling, Treatment and Disposal. By Conrad P. Straub, Bureau of Technical Information, USAEC, available from Superintendent of Documents, Washington, D. C. (1964). 430 pp, \$1.50.

Conrad Straub has been active in the field of waste management for many years, and has been involved in the development of some of the most widely used methods for decontamination of low-level wastes. He has also played an active part in the propagation and coordination of knowledge in the international field. As chairman of a subcommittee of the International Commission on Radiological Protection, which has prepared a report on the management of wastes from hospitals and laboratories, he has had close contact with people from many countries with a wide variety of problems and points of view. Dr. Straub is therefore well qualified to write an authoritative book that will be a most valuable addition to the very small

number of works on this subject. The field is covered in great detail, and to achieve this the author has received the able cooperation of R. D. Coleman, B. Kahn, A. S. Goldin, M. I. Golman, H. L. Krieger, and A. G. Friend.

The book is well organized into fifteen chapters. The temptation to begin with a short course in radioactivity has been wisely resisted. Instead we have a brief statement of the 'philosophy' of waste management and a description of the standards governing the guides set up by the US and international bodies concerned with radiation safety. This is followed by a chapter on the sources, quantities and composition of low-level wastes, which would have been even more useful if it had not been restricted almost entirely to US establishments. Apart from a short chapter on Public Health implications, the remainder of the book is concerned with the technique of waste management.

A book of this kind must be judged from several points of view. It will be used as a reference source by people working in the field, as a text book by undergraduates, as a guide to the literature by research workers, and as an aid by administrators and reporters who want a quick and accurate collection of facts and a readable description of processes. Perhaps the most important group, however, are the newly recruited members of the staffs of nuclear energy establishments, who are so often compelled to 'learn on the job' because there are few books in plain English on their subject. This can be a serious problem, particularly in countries where the professionally qualified people are so overburdened with work that they can spare little time on instruction of junior staff. The clarity of exposition, the great store of information and the extensive bibliography to be found in this book are just what is needed in such a situation.

Straub has a pleasant style and writes with the minimum of jargon. The bibliographies, conveniently placed at the ends of chapters, are comprehensive up to 1961. The removal of radioactivity from solution by a "municipal-type" water-treatment process, flocculation, precipitation and ion exchange are described in great detail. This section—about one-third of the book—gives a good picture of the research effort that went into the development of the processes presently in use, but it may be a little difficult for the uninitiated to distinguish the practically successful techniques from the interesting research results. The value of the excellent chapter on ground disposal would have been enhanced if it had been more clearly stated that the ground behaves as a 'container,' because radionuclides usually move so much more slowly than the ground water that there is an opportunity for significant radioactive decay.

This is such a good book that it will get heavy use, and it deserves something better than paper covers. The extensive errata sheet suggests hasty revision, and it is to be hoped that the second edition will be more permanently bound. The printing and paper are excellent, and the numerous illustrations are well reproduced, adding greatly to the appearance of the work.

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About the Reviewer: Colin A. Mawson is head of the Environmental Research Branch of Atomic Energy of Canada Limited and, in that position, is responsible for the