

Chapter 9. "Shielding"

The engineering aspects of shield design are well covered in this chapter. For data on attenuation, *Volume III Part B (Shielding)* should be consulted.

Chapter 10. "Reactor Operations"

This is a very short chapter (5 pages). Naturally reactor operations cannot be fully discussed in so few pages, and this chapter deals mainly with startup. The poor impression given by the statement, "It is based upon . . . operation of . . . reactors as reported in 1956" turns out to be unwarranted.

Chapter 11. "Reactor Safety"

The chapter contains a general discussion of safety regulations and associated studies that gives authoritative background information on this important topic.

Chapter 12. "Reactor Site and Plant Layout"

A short well-organized chapter on the safety and civil-engineering aspects of site selection and layout.

Chapter 13. "Plant Operation and Services"

This is a good essay on staffing, maintenance, radiation control, and procedures for the operation of reactors. It mentions various regulations and licensing procedures of the USA.

Chapter 14. "Remote Handling of Radioactive Materials"

The sixty pages give an excellent review of the many types of equipment from simple hoods to the large reactor-assembly Hot Shops. The design and choice of manipulators and viewing systems are discussed, as are many problems that arise in the field of remote handling.

Chapter 15. "Reactor Development Test Facilities"

Considering that a major expenditure on civilian nuclear energy (apart from power-reactor construction) is the provision of in-reactor loops for development tests, this chapter is completely inadequate, having only a page and a half of very elementary discussion devoted to in-reactor tests.

The remaining six chapters, on heterogeneous water-cooled reactors, liquid-metal cooled reactors, gas-cooled reactors, aqueous-fuel reactors, liquid-metal-fuel reactors and molten-salt reactors, are individually well handled and make interesting reading. The material might have been better coordinated with the rest of the book. This lack of coordination is perhaps most obvious in Chapter 21 because of the paucity of material that properly belongs in that chapter. Of its 40 pages, 16 discuss materials (12 of which describe the development of the alloy INOR-8) and 14 discuss pumps, leaving only 10 pages, or one-fourth of the chapter, for molten-salt reactors. (Volume I of the handbook is entitled *Material* and might be

the proper repository for the 16 pages; the 14 pages on pumps belong in Chapter 3 of the present volume.) The editorial preface of the 1955 edition made a statement that still holds: "greater unity of presentation should be possible in future editions."

The price of the book may make the purchase an institutional and not a personal matter; most institutions concerned with atomic energy will find the purchase worthwhile. The copy of the 1955 edition that I consulted was falling apart and some sections were dog-eared through constant use. I expect that many copies of the edition under review will suffer the same fate.

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About the Reviewer: D. G. Hurst is Director of the Reactor Research Division at Chalk River where he has served Canada's nuclear-energy program since 1945. He received his academic training, through the Ph.D., at McGill and did his research at the Radiation Laboratory (Berkeley) and at the Cavendish Laboratory (Cambridge). He is a Fellow of the Royal Society of Canada and of the American Nuclear Society, and is a member of this Journal's Editorial Advisory Committee. He will be on leave for the next two years to the IAEA as head of its Reactor Division.

Biological Effects of Neutron and Proton Irradiations. International Atomic Energy Agency, Vienna, 1964. (Available from International Publications, Inc., 317 East 34 Street, New York, N. Y., 10016.) Vol. I, 433 pages, \$9.00, Vol. II, 443 pages, \$9.00.

This book, in two volumes, contains the proceedings of a symposium on biological effects of neutron irradiations held at the Brookhaven National Laboratory. The proceedings were edited by the staff of the International Atomic Energy Agency and were printed by composition typing and photo-offset lithography. Most of the fifty-four papers are in the English language, but six are in Russian and four are in French. Each paper is preceded by an abstract in English, Russian, French, and Spanish.

Dosimetry, including estimation of absorbed dose in biological material, is discussed in the first fourteen papers. The second series of papers deals with the biological effects of high-energy protons. The third series of papers is on cellular and genetic effects. The first thirteen papers of

Volume II consider pathologic studies of neutron-irradiated animals. In the remainder of Volume II, the papers deal with relative biological effectiveness of neutrons as evaluated by different biologic tests, and discussions of a panel on biophysical considerations in neutron experimentation.

Biological effects of neutrons (and protons) are not as well understood as are effects of x and gamma rays. Neutron generators are not as numerous or accessible as are x and gamma sources; the dosimetry of neutrons is more complex and the entire field is a newer one. It is known that the mechanisms of energy transfer to tissues from neutrons may account for the greater biologic effectiveness of neutrons of certain energies and for their relative independence of oxygen, dose rate or frequency of exposure.

This symposium represents an up-to-date review of the field together with a few papers on application of neutron radiation to agriculture, genetics, and cancer therapy. The development of newer and more efficient neutron generators, the development of a more quantitative cellular radiobiology, and the recent interest in solar flares, etc. make this subject a very timely one. The book will be of interest to the experienced investigator as well as being a good guide for those who are contemplating research in this field.

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About the Reviewer: Titus C. Evans is Managing Editor of the journal Radiation Research and has had experience in research on biological effects of neutrons at the Radiological Research Laboratory of the College of Physicians and Surgeons, Columbia University; and at the Radiation Research Laboratory of the University of Iowa, Iowa City, Iowa.

Industrial Uses of Large Radiation Sources. Vols I and II, Conference Proceedings, Salzburg, 27-31 May 1963. IAEA Publication, available from National Agency for International Publications, Inc., New York, New York. Vol I, 420 pp. \$8.50; Vol II, 326 pp. \$7.00.

As a collection of papers presented at a conference, the subject work does not lend itself to a true book review. A summary of major topics and general background, however, is appropriate.

The International Atomic Energy Agency organized the conference as an extension to the first

international scientific meeting on the use of large radiation sources, held in Warsaw in 1959. Approximately 250 scientists from many countries attended to hear and discuss the 40 papers presented. The three headings under which papers were presented are: Research on applications of potential industry use; Radioisotope power sources; and Experience, operation and economics.

Vol I contains 25 papers presented as a part of the first group. Subjects include the synthesis of chemical compounds, copolymerization reactions, and applications of radiation in the textile industry and in the rubber industry. Papers were presented by representatives of the United States, France, Russia, Italy, Japan, Belgium, Federal Republic of Germany, United Kingdom, Poland and Hungary.

Vol II concludes those papers in group one, as well as those in groups two and three. The list of conference attendees, as well as various author indices, appear at the conclusion of the volume.

There are only two papers in group two, radioisotope power sources. Both are contributions of the United States.

Group three presentations are contributions from the United States, Russia, Denmark and the United Kingdom. Operations include both isotopic and machine sources of radiation. Apparently much interest was focused on this group, since actual operating experience with large-scale radiation sources, integrated in full-scale manufacturing processes, could be evaluated.

In general, papers are presented in the language of the country in which the work was sponsored. Each paper, however, is abstracted in English, French, Russian and Spanish.

The objective of the conference was to bring together scientists and information about radiation programs, in order to ultimately promote greater use of radiation in modern manufacturing processes. Making the printed proceedings available will certainly contribute further to that objective.

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About the Reviewer: Mr. Dietz has contributed the next review also, and his vital statistics follow his second review.

Massive Radiation Techniques. edited by Sidney Jefferson; John Wiley and Sons, Inc., New York, New York (1964), 324 + VII pp. \$11.50.

Dr. Jefferson and his associates at the Wantage Research Laboratory, UK, have done an exceptional job in assessing the potentials of large-scale