Advances in Nuclear Science and Technology, Vol. 4. Edited by P. Greebler and E. J. Henley. Academic Press, New York and London (1968).

The series, *Advances in Nuclear Science and Technology*, appears annually to bring together, in a timely fashion, reviews of significant topics and developments in the nuclear science and technology field. It can thus fulfill an important function in coping with the prolific outpouring of technical books, articles, and papers in this field, and help the reader to remain informed with relatively little effort. To be successful, it is of course, desirable that the selection of topics discussed be indeed timely, and that the review articles presented be authoritative and comprehensive.

The 1968 edition, Vol. 4, meets these requirements admirably. The editors have demonstrated a keen awareness of timely and important developments, and have been able to assemble a very impressive compilation of papers.

Volume 4 contains seven chapters. The first two chapters deal with important reactor concepts, the gas cooled reactor and the sodium cooled fast breeder reactor. Chapters 3 and 4 discuss safety problems in fast reactor technology. The last three chapters deal with more general topics: control theory, perturbation theory, and industrial applications of ionizing radiations, respectively.

The first chapter, "Gas-Cooled Reactor Technology", by H. B. Stewart, C. L. Rickard, and G. B. Melese, presents a useful historical summary of the development of the gas cooled reactor concept and a comprehensive discussion of the problems of using gas as a reactor coolant. The enthusiasm of the authors is quite apparent. At times, the article is perhaps a little too partisan in tone.

The second chapter, "Safety and Economic Characteristics of a 1000-MWe Fast Sodium-Cooled Reactor Design," by K. P. Cohen and G. L. O'Neill, covers the status of technology of large fast reactors as of the mid-sixties. Emphasis is placed on safety criteria and operating limits. The distinction between "credible" and "hypothetical" accidents is delineated. As the title implies, the chapter is primarily a discussion of a specific design, and thus it tends to be somewhat too restrictive in scope.

The third chapter, by R. B. Nicholson and E. A. Fischer, on "The Doppler Effect in Fast Reactors" summarizes the currently available derivations and discussions of the Doppler effect in fast reactors. It is a very careful exposition of this subject, and can serve as an excellent review paper.

R. A. Meyer's and B. Wolfe's article on "Fast Reactor Meltdown Accidents Using Bethe-Tait Analysis" (Chapter 4) is important reading for people working in this field. The energy release from a meltdown accident in a 1000-MWe fast ceramic reactor is discussed. The effects of different parameters and their impact on energy release are described in detail.

The fifth chapter, "Optimum Nuclear Reactor Control Theory," is by J. Lewins and A. L. Babb. The authors state that "This paper reviews the basic theory of Pontryagin's treatment of optimal control in a formalism that should be readily understandable to nuclear engineers, using examples drawn from problems in nuclear control to illustrate the main aspects of the theory." The paper does fulfill this objective. In fact, it may provide the necessary stimulus to search for applications of optimum control theory to more substantial problems in nuclear engineering.

Chapter 6, "Developments in Perturbation Theory," by J. Lewins, reviews recent developments which have increased the scope and importance of perturbation theory in reactor physics. By necessity, the paper is highly mathematical in content, and requires considerable mathematical skills on the part of the reader to appreciate it fully.

The last chapter, "Industrial Applications of Ionizing Radiations," by S. Jefferson, R. Roberts, F. J. Ley, and F. Rogers, is an excellent introductory article to this field. The review of industrial applications is confined to x rays, gamma rays, and high-energy electrons. Three topics are covered: ionizing radiations in the chemical industry, ionizing radiations in the medical product and food industries, and sources of ionizing radiations. In each case, the treatment is quite comprehensive and the presentation is interesting and very clearly written.

In summary, the 1968 Volume 4 of *Advances in Nuclear Science and Technology* is a worthwhile and useful contribution to the technical literature.

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Principles of Radiation Protection. Edited by K. Z. Morgan and J. E. Turner. John Wiley and Sons, Inc., New York, N.Y. (1967). 622 pp. $13.95.

This is the first definitive book in the field of health physics this reviewer has seen. Although it is an edited book, the two editors participate directly in the book as writers of certain sections, and it is obvious that the selected contributors are authorities in their individual fields.

As is common in edited books, there are differences in style and skill of presentation in the various chapters. The reviewer has used this book as a text in a Health Physics course this Spring Semester. It will require a year to cover the material presented in the book. It is most excellent as a reference book in a course or courses, but, as a textbook, it has some deficiencies. For example, some of the problems at the end of each chapter require mastery of material presented much later in the book. Its usefulness as a text would be improved if it contained more illustrative problems worked out in detail with particular emphasis on the careful handling of units. The definitions are given accurately, but frequently from a mathematical rather than a physical background which makes it difficult for a student to appreciate them.

The organization of the book is excellent. It starts with a history of harm done in the early days of man's experiences with ionizing radiation and a discussion of natural background radiation. Next, the physical details of the interaction of ionizing radiation with matter are discussed. There follow the official quantities and units