Although the subject of reactor safeguards is too broad to be treated in detail in a single volume of 390 pages, I believe the book will be useful to those looking for an introductory survey of the subject. In essence this book is a narrative account of the reactor safety review procedures as they have been developed by the U.S. Atomic Energy Commission. This aspect of the book is accurate and well prepared, drawing as it does on the author's experience as Secretary to the Advisory Committee on Reactor Safeguards. However, it does not describe in comparable detail the approaches to reactor safety analysis used by the U.K. Atomic Energy Authority, the French Commissariat A L'Energie Atomique, or other national agencies that are equally effective.

There are ten chapters dividing the subject into specific topics, but not all of these topics are treated with the same degree of detail (as stated in the preface). This disparity unavoidably creates an impression of relative importance which may not have been intended by the author. Chapter 2, after an introductory chapter describing the chronology of the development in safeguards for reactors, is an extended discussion of fission product yields, secular equations, chain lengths, decay heat, etc., without identifying the significant hazards or the problems introduced by individual considerations. The discussion on kinetics in Chapter 3 is adequate for an introductory text, but only an oblique reference is made in passing to the important subject of temperature effects of reactivity by Doppler broadening of resonances. Again there is only a limited amount of material relating the treatment of kinetics with reactor hazards. In Chapter 4, "Controls and Safety Systems," the author emphasizes the safety aspects of reactor design. The development of the subject is based on a mechanical or systems approach with no reference to the problems of materials. The description on containment in Chapter 5 is good as far as it goes, but it is unfortunate that no mention is made of containment techniques under development such as pressure suppression, independent double layers, and other engineered safeguards that offer a promise of alleviating the siting problems for future reactors. No distinction is made between containment by impenetrable barriers and confinement by filtration.

Chapter 6, dealing with the safety features of water reactors, is an overemphasis of a specific reactor design. It is true that more information exists on the details of excursion in boiling water reactors through the SPERT program than for other types, but it can be argued that a chapter heading of this type ought to be paralleled with others entitled "Safety Features of Gas-Cooled Reactors," ". . . of Sodium-Cooled Reactors," ". . . of Deuterium-Moderated Reactors," and other examples that each can supply from his own prejudice.

Chapter 7 on atmospheric dispersion is an example of detail in excess of that required for the treatment in this volume. Revealing this reviewer's bias, it is to be hoped that ultimately reactor designs and locations, through guaranteed reliable containment and intrinsic self-regulatory features, will not be subject to the statistical approach of atmospheric dispersion and population exposure. In any event, the detailed discussion in this chapter is not in balance with the other chapters.

Chapter 8, "Extent of Possible Damages," is a regurgitation of existing criteria in a more palpable form than is found in regulatory documents. It has a definite place in an introductory text to the problems to be encountered if reactors are not provided with reliable safeguards. Chapter 9, "Site Requirements," can be placed in the same category of offering no new information, but it serves a useful function of presenting site criteria within the same volume that develops the philosophical basis.

Chapter 10 is devoted to a verbatim reprinting of official accounts of selected reactor accidents. The effect of increased distribution of these accounts can only be positive, but in the description, no attempt is made to draw out lessons to be learned or illustrate the preceding lectures with examples.

There follows several appendices, A through E, which are of historical importance in the early considerations of the first United States Reactor Safeguard Committee to formulate siting criteria and reprints of letters by the successor committee, The Advisory Committee on Reactor Safeguards, giving advice to the U. S. Atomic Energy Commission on the specific problems that were presented for consideration.

The index is detailed but misleading. If one wishes to look up the subject of filters, for example, one finds five pages listed:

1. Page 24 contains a casual remark that the Windscale reactors is (was?) equipped with air filters.

2. Page 98 reports that the X-10 reactor has filtration of the discharge air; the Brookhaven reactor has inlet and exit air filtration.

3. Page 99 is a continuation of the last, giving performance specifications or test results (it is unclear which) of the filters used by BNL.

4. Page 300 reports on a Windscale incident wherein volatile fission products passed through the filters (item 1 above).

5. Page 302, same report, includes some particulate material as passing through the filter.

After looking up the five referenced pages, the reader knows very little, if any, more about the subject of filtration of fission products than he did before opening the book.

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(About the Reviewer: David B. Hall is currently chairman of the Advisory Committee on Reactor Safeguards. He has been a member since 1961. He is, in addition, the Division Leader for Reactor Development at the Los Alamos Scientific Laboratory, of which he has been a staff member since 1945. He is a fellow of the American Nuclear Society and of the American Physical Society.)

Uranium Metallurgy. By W. D. Wilkinson. Interscience, Division of Wiley, New York, 1962. Vol. I, Uranium Process Metallurgy, 775 pp., $18.00. Vol. II, Uranium Corrosion and Alloys, 733 pp., $16.00.

With relief, if not exhilaration, Dr. Walter Dunbar Wilkinson, Senior Metallurgist of the Argonne National Laboratory International Institute of Nuclear Science and Engineering recently completed some seven years of arduous labor on the two subject volumes. This the reader may surmise from the two prefaces, partially identical, neither very profound. The quest for a uranium mineral for each

letter of our Latin alphabet looms simple compared to its Cyrillic counterpart. The "biscuits," "derbies," etc. of the lexical digression create little stir. More provocative, for example, is the substitution of "hydrometallurgical" for the usual "aqueous" (fuel reprocessing) and the perpetuation of the incorrect "slagging" where "drossing" is implied.

Confirming the warning of the second preface, the volumes are riddled with errors. These will be taken up directly with the author. Some of the responsibility for this must be shared by the assistants mentioned in the vague acknowledgement, usually so meaningless, but here conveniently offering the protection of anonymity. Equally puzzling is the apparent equanimity of the publisher. Is this another manifestation of post-war complacency? Where is the pride of craftsmanship? In view of the availability of competent assistance, this is inexcusable. Paradoxically, some of the most difficult sections are freest from error; these apparently are the author's specialties which, incidentally, will have the smallest audience.

Volume I covers its field very thoroughly in six chapters: ore processing, reduction and purification, fabrication, powder metallurgy, fuel reprocessing, and safe practices.

Volume II consists of but two chapters: about 100 pages on uranium corrosion plus a whopping chapter on alloys. The latter accentuates the problem of the technical book living in the shadow of the novel. Breakdown into specific subtopics is minimized. Important generalizations lie inconspicuously within the pattern of the smooth-reading typographical monotone: no rude intrusion by boldface type or italics for emphasis of important generalizations.

The two volumes are essentially independent and could have been issued separately, with a few phase diagrams added to Volume I. In view of the rapid progress and concomitant obsolescence in various technological areas (added to rising publication costs) further breakdown into individual monographs would have advantages.

The writing is generally competent and as one reads along it becomes apparent that the author presumes in the reader the same broad background he happens to possess. The reader without metallurgical training in particular will face many problems. A strong glossary would be especially valuable for this large group.

The texts are well-provided with tables and figures and appropriate appendixes. Some of the tabulated data would be much more informative if plotted; for example, Table 103 on page 1306. The indexes could stand considerable reinforcement. Some page cross-referencing is used in the texts but a lot more would be a lot better. The print is quite legible even in the lower case of the superscripts, despite frequent type or ink defects.

A study of these volumes reveals something about the author as well as the topics covered. The handling of theoretical metallurgy, specifically structures, is outstanding. Again, one notes an added sparkle in areas in which the author has participated. In contrast, many sections cover a deluge of facts presented in an acceptable though hardly inspired fashion. The a-to-z reader is sure to experience many periods of "combat" fatigue.

Conspicuous to the reviewer in this regard (and for subjective reasons) is the chapter on fuel reprocessing. Here unfolds a challenging new area in separations via molten metals. The author achieves an orderly cookbook presentation of facts but the philosophy of reprocessing remains largely elusive.

Such, then, are the trials and tribulations of a courageous individual tackling the problem of documenting an important segment of a technological revolution in the steep portion of its growth curve. Perhaps uranium has outgrown the domain of the general expert and can be better handled in its documentation, as in its development, by selected specialists.

In view of the magnitude of the challenge, we might be inclined toward temperance in our criticism and generosity in our praises. After all, the corrected volumes can constitute a useful summary of our uranium technology as of this time. As the author intended, there is something there for everyone, even for those who would include the uranium tenor of page 2 in the category of pitch-blenders.

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Nuclear Graphite. Edited by Dr. R. E. Nightingale, Academic Press, 1962. 547 pp., $15.80.

During the past twenty years, much research and development work in graphite technology has been undertaken to meet the special requirements that have arisen from the use of graphite in nuclear reactors. Well established methods have been adapted to produce the large quantities of very pure material that are required for the moderators of nuclear reactors and much information has been obtained on the effects of nuclear radiations on graphite and on the reactions between graphite and various gas coolants. Recently, there has been interest in graphite as a high temperature material for use in advanced nuclear reactors and also for aeronautical and space applications. Various aspects of the work are described in this book by 21 authors.

Their contributions are coordinated by an editor with long experience of graphite work. He has, himself, contributed several chapters. The book describes, very fully, the state of the subject at the end of 1961, with some references to later work. This is probably a good point at which to take stock, as it marks the end of a period in which the successful construction and operation of a large nuclear reactor could be regarded as a noteworthy achievement in itself. The future objective will be the economic production of electrical energy; some of the steps towards it are described in the latter part of the book.

The book opens with a chapter on the use of graphite in the nuclear industry, in which a description of the construction of the first nuclear reactor in 1942 is of particular interest. Three chapters, which deal with the manufacture, machining, and nuclear properties of graphite, provide well established background information which is necessary for an understanding of the physical and chemical problems involved in the use of graphite in nuclear reactors. These are followed by chapters on the structure and properties of graphite which contain much information of general interest. The remaining, and larger, part of the book is concerned with topics specifically related to the material