In general, the sites have tended to develop their own special methods for waste disposal, frequently depending on local restrictions and conditions and the economic advantages of one method over another. Since the cost of disposing of radioactive waste is relatively high, all sites have their eyes on ways to cut costs. Some sites in heavily populated areas may have severe public relations problems that will not permit local disposal of any radionuclides; other facilities may be able to use their favorable location to a great advantage. For example, at Lucas Heights, Australia, where the sun shines most of the year, solar evaporation has proved to be very effective and economical in reducing the volume of radioactive liquids. Other methods discussed in this publication are: first- and second-stage evaporators; natural, pressure, and vacuum filtration; centrifugation; and trapping in bitumen or vermiculite and cement.

I recommend this document to those who are not familiar with present practices of low- and intermediate-level waste disposal at the many representative atomic energy laboratories and plants. Others who are responsible for waste disposal may find many of the ideas interesting and helpful in improving their own present methods and procedures. I think the panel is to be congratulated for bringing together the experiences of such a wide variety of sites in this rather under-published technical field.

*Lee Gemmell, Associate Head of the Health Physics Division at Brookhaven National Laboratory and a certified Health Physicist, has been closely associated for almost 20 years with the Radioactive Waste Disposal Program. The BNL policy of disposing of only very low levels of radioactivity into the environment has been effective, by example, in promoting international restraint against indiscriminate disposal of radionuclides into local soil or waters. Through his efforts, Brookhaven has also been active in developing improved methods of treating, packaging, and shipping low and intermediate levels of radioactive wastes before final disposal at an approved burial site.*

## EXCELLENT, BUT DATED

*Title* The Effects of Radiation on Structural Materials

*Symposium Chairman* W. L. R. Rice

*Publisher* American Society for Testing and Materials, 1967

*Pages* vi + 713

*Price* $52.00

*Reviewer* J. J. Holmes

This volume, a collection of research papers, is concerned with neutron irradiation effects on the mechanical properties of metals and alloys. In general, the papers deal with alloys of importance in nuclear reactor applications. However, 2 of the 29 papers deal with irradiation effects in relatively pure iron. The subject matter spans a wide range of subjects including pressure vessel steels, austenitic stainless steels, refractory metals, irradiation damage mechanisms, heat treatment effects, and cryogenic effects. Mechanical properties discussed include brittle fracture, tensile, creep, and fatigue. Considerable emphasis is also given to correlation of microstructure with properties.

This collection is the record of the third in a series of biannual international symposiums sponsored jointly by the USAEC and ASTM. Papers from nearly every USAEC-sponsored laboratory dealing with irradiation effects in structural and cladding metals are present, together with a considerable contribution from the United Kingdom. Papers from Sweden, West Germany, and Italy are also included.

The caliber of research involved in the contributions is excellent with few exceptions. The subject matter will find greatest use among researchers in the field. However, much emphasis is placed on engineering applications, so the book will also be useful as a guide to reactor designers and engineers. It should be pointed out that the applications discussed deal with trends in irradiation effects rather than with specific design guides.

As a reference for researchers, the book's value has been severely reduced by the long delay between the call for papers and their publication; this being in excess of two years. In a rapidly moving technology, some of the work has become outdated. In addition, the book was almost too late to be useful as a reference source for the fourth biannual USAEC-ASTM symposium on radiation effects.

One apparent weakness of the collection is poor organization. In passing through the volume in sequence, one finds no relationship between the subject matter of the papers. It would seem that the volume could be reasonably divided into three major areas, namely, pressure vessel steels, stainless steels and nickel base alloys, and miscellaneous subjects which are not closely related. The lack of good organization may lead the uninitiated to the conclusion that there is only a casual relationship among the subject matter of the various papers.

An objective of the symposium was to complement the AIME radiation effects symposium held in Ashville in 1965. The Ashville conference was intended to "assess the degree of agreement between theory and experiment" while the purpose of this USAEC-ASTM symposium was to "show how selected properties . . . change as a function of reactor environment and exposure." This reviewer found only one reference to the Ashville conference in the entire book and this by an author referencing his own work. Thus, it would appear that in the sense of being complementary to the Ashville conference, this book has not fullfiled its objectives.

Probably the greatest contribution provided by this volume is an easily available and complete reference on research in nuclear structural and cladding materials as of 1966.

*Mr. Holmes, a Senior Research Engineer at Battelle-Northwest, received his BS in metallurgy in 1959 from the University of California and MS in metallurgy from the University of Washington in 1964. He was associated with the General Electric Company and Atomics International before joining Battelle in 1966. He has made contributions to the literature in the areas of in-reactor creep, dislocation dynamics, and irradiation effects. Currently, he is engaged in research on fast reactor materials.*