NUCLEAR SCIENCE AND ENGINEERING: **14**, 212–215 (1962)

Book Reviews

Plasticity and Creep of Metals. By J. D. LUBAHN AND R. P. FELGAR. Wiley, New York, 1961. 608 pp., $16.75.

Two different fields of engineering are represented by the authors of this book. Dr. Lubahn is a metallurgist, while Dr. Felgar's specialty is engineering mechanics. Both have had extensive industrial, as well as academic, experience. The former is presently Professor of Metallurgy at the Colorado School of Mines, but was previously at the General Electric Research Laboratory and the Case Institute of Technology. Dr. Felgar, who is now in charge of Mechanics of Materials at the space Technology Laboratories, has also had five years of teaching experience at the University of Texas.

These authors have produced a well-written and very readable book, covering in detail a very specialized viewpoint of the field of plasticity and creep in metals. The stated purpose of the authors is to place emphasis on those aspects of the subject which are of interest in engineering design. As a result they have eliminated all considerations of the mechanisms of creep and plastic flow. To the average metallurgist or solid state physicist, creep immediately implies the concept of thermal activation, and plasticity the subject of dislocations. Neither of these terms can be found in the index. This book also does not cover what might be considered the mathematical or theoretical aspects of the subject. As prerequisites, the authors recommend courses in strength of materials and simple differential equations.

Perhaps the best way to characterize the book is to say that it is an engineering experimentalist's approach to the subject, based primarily on data from mechanical tests. The first four chapters are essentially a review of strength of materials. Following this, there are good treatments of the factors involved in simple tensile tests and creep tests, as well as the inter-relations between the two types of tests. The completeness of the coverage of the subject of plasticity from the experimental viewpoint is demonstrated by the fact that separate chapters are devoted to such topics as anelastic creep and the Bauschinger effect. Controversial concepts, such as the mechanical equation of state, are covered rather well. Complex deformation resulting from multiaxial stresses, as well as deformation in anisotropic materials, are also treated.

In general, the reviewer believes that most metallurgists and engineers concerned with the testing of metals might be interested in purchasing this book. The large amount of experimental information which it contains makes it of value for this reason alone. In this regard, there are over 300 illustrations of which a great majority are curves based on empirical data. However, in the reviewer's opinion, it would be extremely unfortunate if the design of metal structures were to be based only on the accumulated data obtained from metals chosen at random, with no basic knowledge or understanding of the processes of plastic deformation. Thus, consider the subject of anisotropic plastic flow which receives an extensive treatment near the end of the volume. Here, as an illustrative example, the authors consider the plastic flow of Zircaloy-2 in the form of tubes under combined loading: tensile plus internal pressure. The analysis which they give corresponds to the observed results on one particular heat of this metal. The anisotropy of plastic deformation in a given metal, however, is a function of its texture, which can be radically altered by relatively minor variations in fabrication procedures during manufacture. The detailed analysis given in the book is thus of doubtful value for design purposes if metal from other heats of this material is to be used. In the reviewer's opinion what is obviously needed is a better understanding of the relationships of mechanical anisotropy to textures. This will never come from simple mechanical testing alone, but from a combination of mechanical testing and a study of the causes for the observed phenomena.

Problems are included at the ends of the chapters, but there is no appendix or general set of tables of physical constants applicable to the material which is treated in the book. The authors of quoted references are not indexed at the end of the book.

ROBERT E. REED-HILL
University of Florida
Gainesville, Florida

(About the Reviewer: R. E. Reed-Hill, is currently Associate Research Professor, Metallurgical Research Laboratory, University of Florida. He has over twenty years of teaching experience in metallurgy and engineering. Dr. Reed-Hill's primary interest is in mechanical metallurgy.)

Atomic Energy Waste, Its Nature, Use and Disposal. Edited by E. GLUECKAUF. Interscience, New York, 1961. 420 pp., 4 plates, 105 figures, 84 tables; $14.00.

The editor, Dr. E. Glueckauf, has brought together a volume in six parts concerned with the nature, use, and disposal of atomic energy waste. To accomplish this, he has drawn upon the experience and competence of 23 of his associates in the nuclear engineering field to prepare the 17 chapters that are included. About half the volume is devoted to the nature (sources) of atomic wastes (2 chapters), and to the effects of radiation on materials and living organisms (4 chapters). A single chapter is concerned with the legal aspects of the problem. The latter half of the book covers waste disposal practices (5 chapters—117 pages) and utilization of high level sources of radioactive materials (5 chapters—84 pages). In essence, the volume reviews much