

the expanding application of the latter in nuclear energy. Adequate coverage is given to the production of zirconium metal in Chapters 5-7. The iodide process and the Kroll process are described in detail and improvements in the Kroll process are reviewed.

Four chapters are devoted to the structure and physical and mechanical properties of zirconium and zirconium alloys. Considerable emphasis is given in the next two chapters to those very important properties of zirconium that determine to a large extent its application and technology—that is, its reaction with the common gases and its corrosion resistance. The chapter dealing with alloying, theory, and a description of the binary-phase diagrams should be especially valuable to researchers in this field because of its completeness. Chapters containing information on fabrication by melting, mechanical working, and powder metallurgy are impressive, since they make clear that a great deal of information has been collected about the technology of a metal that was relatively unknown 10 years ago. The final chapter describes the compounds of zirconium that may become important in high temperature applications, such as the nitrides, carbides, borides, and silicides.

These two books appear to be a very creditable start on the rather ambitious series on the "Metallurgy of the Rarer Metals." They should prove to be adequate textbooks for the student and valuable reference works for the research worker. The first, *Chromium*, is of special interest for workers in the field of high-temperature metallurgy, and the second, *Zirconium*, to those engaged in nuclear-energy research and development.

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Basic Botany. An introduction to the science of botany. Fred W. Emerson. Blakiston, New York, ed. 2, 1954. xiii + 425 pp. Illus. \$5.

Basic Botany is attractively (though conservatively) bound, is printed in clear type on good paper, and has an index, a glossary, and a table of contents. From the opening words of the preface to the more than 20-page large-type glossary, this book is a living testimony to the man who wrote it. Somehow, most of modern botany has been woven into a clear coherent story. Survey though it is, the book has a wholeness about it. The illustrations suggest an ingenious teacher who has learned to use simple close-at-hand examples that will be remembered after technicalities are largely forgotten. The book is patiently put together to serve the needs of the average student, the better than average, and the very slow. Each chapter begins with a few pithy remarks, followed by an outline of the most important points. Each one closes with a clearly written summary, which frequently includes stimuli to further thought and observation.

The author has learned how to catch attention with a homely analogy or with a simple story that has a real point to it. He begins his preface, for instance:

A beginning student in the laboratory is learning to adjust his microscope. He turns his mirror until he has a clear white light; he mounts a small green object on a clean slide and places this on the stage; he sees only a greenish blur; he moves the coarse adjustment; the low-power objective begins to focus; and then, he sees something that is entirely new to him. The experiences of this young student rather closely parallel the history of botany.

No man can be all things; it is unfortunate that Emerson could not command the services of a better photographer. Many of the original illustrations are ingenious in conception, but few of them make as effective halftones as they should. It is one thing to get a clear photograph; it is quite another to produce crisp halftones that stand up off the page.

The book as a whole speaks of Emerson's familiarity with the material. It is too bad that his experience might not have been amplified at one or two points. The mentions of mitosis and meiosis sound as if the author had had long experience with prepared slides of onion root tips but had never been fortunate enough to observe fresh acetocarmine smears of *Tradescantia* at firsthand.

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Relaxation Methods. D. N. de G. Allen. McGraw-Hill, New York-London, 1954. ix + 257 pp. Illus. \$7.50.

Everyone who has comprehended the extent of the versatility and power of relaxation methods will be gratified by the appearance of a really first-rate textbook on the subject. The method of "systematic relaxation of constraints" ("relaxation," for short) is no longer new to engineers, mathematicians, and physicists; applications to many physical and mathematical problems have been described in the literature since 1935, and many students have been trained in the relaxation techniques. Nevertheless, most of the research has been concerned with extensions of relaxation techniques to new classes of problems, and the treatises on the method are devoted primarily to exposition of these extended applications. Teachers have felt a need for a book that concentrates on explanation of how to relax, in the sense of describing the basic operations and techniques and showing how to apply them in obtaining relaxation solutions.

This need is satisfied abundantly by Allen's book, which, although not lengthy (fewer than 250 pages of text), is the clearest exposition of relaxation methods to come to my attention. The author does not attempt to develop the theory leading to the particular physical problems used as examples or to make the book a complete reference but limits himself to explaining how to use relaxation techniques. Such singleness of purpose, combined with careful organization of material and considerable skill and grace in its exposition, results in a book of exceptional clarity and readability.

The simpler applications of relaxation methods are