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.

E. J. Boyle
Metallurgy Division, Oak Ridge National Laboratory

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.

Edgar Anderson
Missouri Botanical Garden and *Washington University*

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 readibility.

The simpler applications of relaxation methods are

covered in detail, with a wealth of practical advice on procedure, accuracy, and so forth. A logical development leads gradually into topics of interest to the advanced relaxationist. Chapters on three-dimensional relaxation and nonelliptic boundary-value problems are significant contributions, since they have previously been available only in the periodical literature. Incidentally, the two chapters devoted to eigenvalue problems provide one of the best treatments of the topic known to me. Systematic organization and careful marking of subdivisions contribute to the clarity of the entire work.

The inclusion of problem exercises at the end of each chapter is an advantage. However, the provision of answers to the earlier problems that are not readily checked by substitution in the governing equations would probably have been helpful to the beginning student, who is not yet entirely confident of his powers.

It may be inferred that I am enthusiastic about this book. Such an inference would be entirely correct. I strongly recommend it to general reader, beginner, and advanced student alike.

CARL H. WALTHER

Civil Engineering Department,
The George Washington University

Applied Electronics. Truman S. Gray. Technology Press, Cambridge; Wiley, New York, and Chapman & Hall, London, ed. 2, 1954. xxviii + 881 pp. Illus. $9.

This is a large book, intended to provide a detailed first course in electronics. It leads the student through a great many details of electron ballistics, electron physics, vacuum tube characteristics, and basic circuits, and concludes with a chapter on modulation. A final chapter is added, almost as an appendix, to cover these same subjects insofar as they are related to the transistor. Thus the book ends at just about the point where it begins to cover the subject matter that might have been expected from its title.

A glance at the chapter headings would seem to indicate that the book is limited in scope. Actually, this is not true. The titles of the numerous "articles" into which each chapter is divided show that considerable material is included. Furthermore, on reading the text, one finds even more breadth, for many subsubjects are discussed briefly. The over-all final impression is that the book is really somewhere between a textbook and a handbook. The author seems to have had difficulty in reconciling our enormous knowledge of electronics fundamentals with his desire to discuss all their aspects.

The philosophy of the book is best described by a sentence in the preface:

> Attempt is made to point out all links in the chain of reasoning in order to avoid those gaps that are so easily spanned intuitively by experienced engineers, but are so disturbing to the careful but inexperienced student.

Some of my associates and I do not agree with this philosophy. Although it is some time since I was a student taking a first course in electronics, I remember that my interest was stimulated by just those gaps that I could not span intuitively.

The foregoing criticism does not mean that Gray has not written a very valuable book. It is certainly one that every professional man working in electronics or a related field should have on hand and should find extremely useful as a reference book. It should be particularly useful for clearing up those finer points of theory that arise in practical discussions, points that are often omitted from less complete textbooks.

The price is quite reasonable, considering its size and the number of diagrams included. On the other hand, it is a fairly substantial sum for a student to pay for a textbook. The printing, diagrams, and binding are up to Wiley's usual high standards.

JAMES HILLIER

Research Department, Melpar, Inc.

The Proteins. vol. II, pt. A. Hans Neurath and Kenneth Bailey, Eds. Academic Press, New York, 1954. ix + 661 pp. Illus. $14.

Unlike volumes IA and IB of *The Proteins,* which were concerned with the integration of general properties and methods, volume IIA deals with specific proteins grouped by natural occurrence, function, or chemical similarity. The aim remains "to present a comprehensive, integrated account of the chemical, physical, and biological properties of the proteins." This book contains nine chapters by 14 authors, most of whom are familiar because of their important contributions to research. Careful editing is shown by the restriction in subjects, the absence of duplication, and by cross reference to the preceding volume; but individuality in focus and treatment is not suppressed.

The first three chapters are at once among the best, of greatest general interest, and the lengthiest; they comprise half the book ("Nucleoproteins and viruses," by R. Markham and J. D. Smith, "Oxidizing enzymes," by T. P. Singer and E. B. Kearney, and "Respiratory proteins," by Felix Haurowitz and R. L. Hardin). These subjects afford latitude for development of the theme of the relationship among structure, function, and biological activity, which ineluctably is denied to authors on some group proteins. Recent advances in the study of nucleic acid structure are excellently described, and viruses are discussed critically from the physicochemical point of view. Oxidizing, but not iron-containing enzymes, are covered in a veritable monograph, with emphasis on the isolated enzymes rather than on metabolic pathways. The interrelationship between the physicochemical and physiological properties of respiratory proteins is thoroughly discussed with a notable appreciation of comparative biochemistry.

The fascinating subject of toxic proteins is considered by W. E. van Heyningen, whose greatest handi-