

on temperature, density, pressure, and humidity to 100 km.

This is intended as a textbook for undergraduate courses in physical meteorology. For this purpose it should succeed. The material is well organized in spite of the wide diversity of topics it covers and is written in a readable manner. Following each chapter adequate references and source books are listed as well as several thought-provoking problems. The many figures deserve a special note of praise for their simplicity, originality, and unusual clarity. A list of symbols and an index are included.

Johnson has presented in condensed form the fundamentals of a wide range of subjects bordering on meteorology. The book is highly recommended, not only as a textbook, but also as a useful reference for the professional meteorologist.

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Introduction to Chemistry. R. T. Sanderson. Wiley, New York; Chapman & Hall, London, 1954. 542 pp. Illus. \$5.50.

This book may find a clientele among those who gained their science in earlier years and would like a readable book with a minimum of mathematics and detailed material, to bring them up to the current concepts of atomic, nuclear, and molecular structure, ionic effects, and other basic concepts of chemistry. In addition to the suggested use as a self-review for those who have been through the elementary chemical education process, this book can obviously serve as a guide for an elementary course, provided that suitable lectures and experiments accompany it so as to provide an adequate background for comprehension.

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Organic Coating Technology. vol. I. Oils, resins, varnishes, and polymers. Henry Fleming Payne. Wiley, New York; Chapman & Hall, London, 1954. 674 pp. Illus. \$10.

The subject material in this book and in volume II, which is in preparation, is the chemistry, manufacture, and practical application of modern commercial coating materials. Volume I deals with fundamentals of film formation, plasticizers, test methods, and the basic chemistry and general use of coating materials such as vegetable and marine oils, varnish resins, alkyds, ureas, melamines, rubbers, celluloses, vinyls, acrylates, and silicones.

Payne's lucid discussion, which is on a theoretical basis, provides a solid foundation for students and technicians to delve deeper into their various fields. Reference is made in each topic to commercially available coating materials and suggested formulations. This type of information, which is a proper combina-

tion of the theoretical with the practical, is of great assistance to the technician who often is forced to work rather blindly with commercial coating materials of undisclosed chemical composition. Credit must be given to the manufacturers who have made it possible for the author to gain this clear understanding of the nature of their products. In a book of this scope, there naturally are unavoidable omissions under the various subjects discussed, but on the whole the necessary fundamental information is presented clearly and concisely.

In the preface, the author states that this book, together with volume II, is intended for students in paint courses and for new employees in the oil, pigment, and paint industries. In my opinion, this book, because of its broad theoretical and practical scope, is worth careful reading also by the experienced technician. Payne has written on this difficult and highly ramified subject with the skill and understanding of a highly successful teacher, which he has been for a considerable number of years at the Polytechnic Institute of Brooklyn.

It is hoped that the high standard and interesting presentation of this book will be continued in volume II.

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Chromium. A. H. Sully. Academic Press, New York; Butterworths, London, 1954. xii+272 pp. Illus. \$5.50.

Zirconium. G. L. Miller. Academic Press, New York; Butterworths, London, 1954. xviii+382 pp. Illus. \$7.50.

These two books are the first of a series on the metallurgy of the rarer metals. Future editions are planned for titanium, molybdenum, platinum and the metals allied with it, manganese and uranium.

The first of these, *Chromium*, describes the ores, production of ferro-alloys and pure chromium, physical properties, fabrication and mechanical properties, electroplating, chromizing, and the constitution and properties of chromium alloys. The chapters on physical and mechanical properties deal extensively with some of the problems associated with the development of room-temperature ductility in chromium—that is, impurity content and nature of applied stresses. The discussions of electroplating and chromizing are very complete with respect to both theory and practice. The last chapter, which deals with the constitution and properties of chromium alloys, is one of the best summaries of this subject that has appeared.

The second book, *Zirconium*, is a fairly complete collection of the latest information on this metal. The first three chapters describe the history, occurrence, consumption, use, and extraction from ores. The fourth chapter, dealing with the separation of hafnium and zirconium, is of special interest by virtue of

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

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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