Book Reviews

Engineering Metallurgy. L. F. Mondolfo and Otto Zmeskal. McGraw-Hill, New York–London, 1955. ix + 397 pp. Illus. $7.50.

For some time there has been a need for a survey textbook in metallurgy for mechanical, chemical, and electrical engineers, because metallurgy has become such a dynamic field that the textbook writers have been unable to keep pace with the newest developments. Such a book is *Engineering Metallurgy,* which was written by two men who have had a great deal of personal experience with the subject matter while teaching at the Illinois Institute of Technology. The more recent developments have been worked in skillfully with the thoroughly understood fundamentals to produce a textbook that is a good guide for serious study as well as a survey of the science of metallurgy.

The presentation of the material is in logical sequence, beginning with a general discussion of the origin and extraction of metals from their ores that avoids getting lost in details about individual metals. The next three chapters take up the theory of alloys, giving special attention to phase diagrams in order to make easier a difficult subject for most beginning students. Both binary and ternary systems are discussed in detail. Two chapters cover some of the problems of melting and casting and are followed by two chapters on the principles of plastic deformation, work hardening, and recrystallization. A general discussion of phase transformations in the solid state and their effects on the properties of alloys is given, and four chapters are devoted to the more specialized topics of heat treatment, joining, powder metallurgy, and corrosion. The two final chapters briefly discuss commercial metals and alloys. Throughout the book emphasis is placed on principles rather than on descriptive details about specific metals.

There are obvious limitations on any book of this kind in that a choice must be made beween completeness and brevity. Although principles must often be stated without proof in a textbook such as this, these authors have given more than adequate references for further study where space prevented full explanation. In addition, a fine set of problems is given at the end of each chapter to challenge the student's ingenuity. This textbook should be helpful to anyone who wants a general knowledge of metallurgy and is certain to be widely used in engineering colleges everywhere.

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Basic Processes of Gaseous Electronics. Leonard B. Loeb. Univ. of California Press, Berkeley, 1955. xvii + 1012 pp. Illus. $13.50.

The stated purpose of this book is to present basic facts by which the properties of electric conductivity in gases can be understood. These properties include not only the conduction process and the breakdown process but also their relationship to all the environmental features that control these phenomena. The surface properties of the surroundings, including the electron emitters and collectors, are described and related to the conduction characteristics of the system. The flow of electrons through gases and, as the electron energy increases, the reactions and the results of this flow are described in considerable detail. The products of these reactions include excited and ionized atoms and molecules, which in turn react on other molecules or at surfaces to become neutralized and often generate additional electrons in the process.

This incomplete résumé is too brief to describe the range in subject matter dealt with in this book. It serves, however, to forewarn the reader that a comprehensive analysis of such a vast subject as gaseous electronics must of necessity cover so many intricate problems of physics that one person cannot expect to handle it adequately enough to meet present-day needs. L. B. Loeb did recognize this need for expert assistance in certain fields and obtained the very able cooperation of S. C. Brown of the Massachusetts Institute of Technology and G. H. Wannier, G. P. Molnar, and J. A. Hornbeck of the Bell Telephone Laboratories, who prepared limited sections of the book dealing with the subjects in which they are individually leading experts.

It was the intention of the author not only to present the basic facts but to do it in such a manner that the book could be used both as textbook material for instruction and as reference material for engineers and physicists. It was also assumed that such readers would not be well acquainted by advanced preparation with the necessary theoretical background required for a clear understanding of the complex phenomena involved. In my opinion that ambition to satisfy the needs of the readers is not realized.

A few specific points will serve to clarify the meaning of this criticism. Throughout the book there is considerable confusion of symbols, and at the same time there is no assembly of the definitions of symbols that will permit the reader to know with certainty the particular meaning intended on a particular page or in a particular equation in the text. For efficient use of a book as a reference it is necessary that the reader be able to obtain the correct definitions of symbols quickly. In general, the units used relate to the cgs system, and yet in some of the equations that involve such matters as work-function and the like there is such a mix-up of units that it would be extremely difficult for the uninitiated to use the equations for quantitative calculation. In addition to this confusion of units, there are an unusually large number of typographic and simple factual errors that have been overlooked because of inadequate editing as well as carelessness in proofreading.

Elementary results that come from classical kinetic theory are made unnecessarily mysterious by the relating of one average property of ideal gases to another average property, such as the average speed of the particles distributed in speed according to the Maxwell-Boltzmann distribution function. If the various averages had been related directly to the basic distribution function itself, the text would have been easier to understand and to teach. This fact may possibly explain why the treatment of probe theory is extremely weak. The discussion of space charge in its relation to probe theory and as it relates to the emission properties of heated cathodes is completely inadequate for the instruction of either the student or the engineer who wishes to apply the knowledge of these phenomena to problems of importance in gaseous electronics. The section on thermionic emission and field emission as it relates to the delivery of electrons into a gas discharge is poorly presented and therefore in many respects misleading.

The bibliography is extremely exten-

sive but not too easy to use. The method of putting it at the end of each chapter has both advantages and disadvantages. Unfortunately, one of the major advantages seems not to have been recognized. With the references at the end of the chapters, it is not necessary to enter them chronologically as the references appear in the text. It would therefore have been much better if the author had entered his references alphabetically with respect to the authors involved.

In spite of the serious drawbacks associated with the production of this extensive treatment on gaseous electronics, it brings together a review and an analysis of much information derived from many years of study, instruction, and research in this difficult branch of the general subject of physical electronics. Anyone who acquires the book and who has some knowledge of the subject will not deny that it represents a great effort to put in order the basic facts relating to a complex subject.

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Radio Astronomy. International monograph on radio. J. L. Pawsey and R. N. Bracewell. Oxford Univ. Press, New York–London, 1955. x + 361 pp. Illus. + plates. $8.80.

Radio astronomy is by now more than 20 years old, but until the appearance of the present volume there existed only a single semitechnical work on the subject, the book by Lovell and Clegg (1952). Some of us who have been teaching courses in the field have had our course notes mimeographed, but no printed textbook was available. The Pawsey-Bracewell volume is our first textbook and a good one it is. It has been written by the assistant chief and a member of the staff of the famous Radio Physics Laboratory in Sydney, Australia. Above all, it bears witness to the fruitfulness of the research in radio astronomy in Australia, which has provided a strong impetus to the postwar development of this new science.

After a brief, mostly historical, chapter, the book starts off in earnest with a very readable general survey of techniques of observation, a survey that will be especially appreciated by astronomical readers who need and desire such guidance. The sections on aerials, on calibration, and on interferometers (which includes the Mills pencil-beam radiometer) will be read and studied with care by many who are new in the field.

The book apparently has been directed primarily at the physicists and radio engineers, who are newcomers to the mysteries of astronomy. After a brief chapter on radio waves in ionized gases, there follows a lengthy one on aspects of optical solar physics relevant to radio astronomy, and a little later in the book we find a similar chapter on optical astrophysics and our own and other galaxies. At the present stage of development of radio astronomy this is probably all to the good.

The two chapters of greatest length are on solar radio waves and on cosmic radio waves. The first of these bears considerable similarity to the fine chapter on solar radio emission (by Pawsey and Smerd) in Kuiper's recent comprehensive volume on *The Sun,* but this in no way detracts from its value. The other chapter—on cosmic radio waves—is, alas, a little on the brief side, and here the book suffers markedly from a delay in prompt publication: whole sections are more or less out of date, in part because of more recent work by the authors and their associates. It is difficult to avoid this in a field that is still developing as rapidly as radio astronomy is. To take one glaring example of rapid "ageing": there is no reference in the sections dealing with 21-centimeter research to the recent spectacular results on the spiral structure of the galaxy, to the absorption features observed in the profiles of some discrete sources, or to studies relating optical and 21-centimeter features of details of the interstellar medium. In other words, the eager student of the subject will perforce have to depend on recent summarizing articles or volumes like the forthcoming one resulting from the August 1955 symposium held at Jodrell Bank, if he wishes to be up to date in the field. The same criticism applies to problems related to the radio continuum or the identification of discrete radio sources.

The concluding chapters of the book deal with thermal radiation from the moon, radio echo techniques and their application, and a brief survey of the field of radio studies of meteors. A brief chapter on effects of the earth's atmosphere completes the technical presentations.

The Pawsey-Bracewell volume is the first real textbook in radio astronomy, and the authors deserve the thanks of colleagues and students for their courage in attempting to write a textbook at a time when the field is still changing from month to month. Let us hope that the first edition may soon be sold out, that the authors may be persuaded to prepare an up-to-date second edition, and that the publishers will bring the next edition out with minimum delay.

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Nuclear and Radiochemistry. (Revised version of *Introduction to Radiochemistry.*) Gerhart Friedlander and Joseph W. Kennedy. Wiley, New York, 1955. ix + 468 pp. Illus. $7.50.

When this book appeared in 1949, it became deservedly one of the textbooks most widely used by teachers and students seeking a thorough but not overelaborate and expensive introduction to "radiochemistry." The authors stated that they included in this term the "reactions of nuclei and the properties of resulting nuclear species . . . the field of chemical studies with the use of isotopic (radioactive) tracers, including studies of essentially pure tracers at extremely low concentrations." The passage of 6 years has only served to emphasize the wisdom and skill of Friedlander and Kennedy in their choice and integration of subject matter. We are fortunate to have at hand a new edition, written to bring up to date the older material and to take cognizance of some changes in emphasis brought about by the rapid development of the fields just cited. These changes are evident in the new title distinguishing nuclear chemistry from radiochemistry.

The organization of the new volume follows rather closely that found so effective in the first edition. New material is skillfully woven into the fabric of the old. Essentially chemical material appears earlier in the new version. The problem sets have been supplemented effectively by others designed to give the student the increased understanding resulting from the incorporation of new material. An added feature is the inclusion at the end of the book of two new chapters dealing with nuclear energy, both in its civil and military applications, and cosmic aspects of nuclear chemistry.

The expansion of the text has been counteracted by using smaller type and employing a larger format, with no appreciable loss in legibility.

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The Negro in Science. Julius H. Taylor, Ed. Morgan State College Press, Baltimore, 1955. viii + 192 pp. $3.50.

In a more rational society there would be no need for a book on the Negro in science. But discrimination, poorer opportunity for education, and the absence of tradition and environment conducive to the development of research interests have combined to make the Negro in science a rarity—a rarity among Negroes and a rarity among scientists. Yet the