NUCLEAR SCIENCE AND ENGINEERING: **32**, 152-155 (1968)

Book Reviews

Molten Salts Handbook. By George J. Janz. Academic Press, New York and London (1967). xii and 588 pp. $25.00.

Research in molten salts, as in other fields, has doubtless increased exponentially in recent years and a flood of data has resulted. Professor Janz has made a valiant attempt to compile a guide to all of the published results, and he has been remarkably successful. The *Molten Salts Handbook* will be a necessity for every worker in the field and of great value to those in related fields, both pure and applied. Most scientists and engineers concerned with nuclear technology, fuel cells, extractive metallurgy, and industrial electrolysis, to name only the most obvious applications, will find very frequent use for it.

The *Handbook* consists almost entirely of tables of data, taken without much editing from the original publications. Except on a few topics, the data are not selective and are presented without value judgments. The great volume of material presented will probably come as a surprise even to the specialist. The presentation employs six heads: Physical Properties, Thermodynamic Properties, Electrochemical Properties, Spectroscopy and Structure, Practical Features, and Experimental Techniques. Of these, the first four have been very thoroughly covered, and this reviewer could think of no topic belonging under these heads that had been omitted. The last two are less encyclopedic but still useful. Throughout, numerical data are given wherever feasible. Where tables would be excessively long, as would be required, for instance, in the reporting of work on systems of many variables, the *Handbook* takes the form of an annotated bibliography.

Within a given topic, e.g., free energy of mixing, or halogen solubility, coverage of the literature is not always a hundred percent complete. Many workers in the field will be able to confront the author with papers that he has overlooked. He has surely included the great majority, however, and the omissions should not seriously detract from the book's usefulness.

The volume is well arranged and printed, and it is easy to find the information desired. The references are conveniently placed close to the tables of data. Minor typographical errors in the letterpress are not hard to find; one hopes they do not extend to the tables. An improvement in future editions would be to provide cross references to certain tables; e.g., vapor pressure data on fluorides appear in the Practical Features section and could be overlooked by a reader seeking them under Physical Properties. Literature references should be given for the diagrams of experimental apparatus. Under Nuclear Technology, more might have been given on the processing of liquid-metal phases with molten salts.

A number of other such minor faults might be cited, but to do so would give a wrong impression. The *Handbook*'s virtues are many, its defects few. It will find a place on many desks as a quick reference and guide, a springboard into the literature, and a backup to one's own card file. In time saved alone, it will soon repay its cost, which is moderate for a book of this kind.

Richard H. Wiswall, Jr.

Brookhaven National Laboratory
Upton, New York 11973

December 8, 1967

About the Reviewer: Dick Wiswall is a physical chemist at Brookhaven National Laboratory where he has been engaged in corrosion studies and fluorine chemistry since 1949. During the war years and immediately following, Dr. Wiswall contributed to the separation-by-gaseous-diffusion process both at Columbia University and with Union Carbide at Oak Ridge. His undergraduate studies were at Harvard and his doctor's degree, in chemistry, is from Princeton.

Electrons, Ions, and Waves. By William Phelps Allis. Edited by Sanborn C. Brown. MIT Press, Cambridge, Mass. (May 1967). 442 pp. $20.00.

The book, *Electrons, Ions, and Waves* by William Phelps Allis of MIT is a compilation of selected papers from his life's work. The book was edited by Sanborn C. Brown and was presented to Professor Allis as a surprise gift on the occasion of his being promoted to Professor Emeritus. Thus, although Professor Allis is responsible for the papers, the choice of the papers included in this collection, their arrangement, and the notes discussing them, are due to others.

The book is divided into seven sections, the titles of which give a good idea of the contents. These are as follows: Electrons and Their Interactions with Atoms, Diffusion and Mobility, Motions of Electrons and Ions, Microwave Discharges, Waves and Oscillations, Plasma Properties, and Special Type of Discharge. The last paper in the last section gives the casual browser a shock, as it does not carry Professor Allis' name as an author, but subsequent reading discovers justification for its inclusion.

The question for the reader now is "Why should I buy this book?" The reviewer finds three good reasons.

First, the book provides the reader with many useful papers that normally are difficult to obtain. They have been published in the twilight zone of conference proceedings, internal reports, and lecture notes. Thus, the reviewer finds the paper "Electron Plasma Oscillations," p. 269, reprinted from a symposium proceedings, to give a crisp, critical analysis of Landau damping. An unpublished set of lecture notes entitled "Plasma Theory," coauthored

by S. J. Buchsbaum, is found tucked between p. 127 and 222.

A second reason for buying the book is to obtain a reference collection of some of the basic papers in gaseous electronics. Professor Allis is a major contributor to the field, as the reader of this book soon finds. Any well-rounded scientist should be familiar with the theoretical analysis of the Ramsauer effect, coauthored with P. M. Morse on p. 19. (Unfortunately for English-speaking readers, the paper is in German). The papers on diffusion in gaseous discharges and on wave propagation in plasma, for example, also deserve to be widely read.

A third, nonscientific reason for buying this book is that one can study the evolution of Professor Allis' career. One sees the beginnings in quantum mechanical studies of electron-atom impacts, the move onward to gaseous discharges, and finally to the study of fully ionized plasmas. The cause-and-effect relationships in this development provide material for interesting speculation. Unfortunately, the papers in the book are not placed in chronological order, so a little effort is required to discover the proper time sequence.

Concerning the construction of the book, the printing is clear and the book is well bound. There are a few minor errors, but these detract little. One major complaint is the lack of a few photographs of Professor Allis inside, although his face appears on the dust cover. The price ($20) is a bit high for the student. The publisher is the MIT Press, Cambridge, Massachusetts, and London, England.

In short, this combination of papers plus the very useful interpretative notes makes the book a pleasant addition to the reviewer's library. Both the author, W. P. Allis, and the editor, Sanborn C. Brown, deserve our appreciation.

Igor Alexeff

Oak Ridge National Laboratory
Oak Ridge, Tennessee 37830

November 28, 1967

About the Reviewer: Igor Alexeff received his graduate training at Wisconsin following earlier studies at Harvard. In addition, Dr. Alexeff was with the Westinghouse Research Laboratories and was a National Science Foundation Research Fellow at Zurich before going to the Oak Ridge National Laboratory where he is presently a group leader in the Laboratory's Controlled Fusion research program. He is also an associate professor of electrical engineering at the University of Tennessee.

Experiments in Modern Physics. By Hans Mark and N. Thomas Olson. McGraw-Hill Book Company (1966). xii + 300 pp. $9.50.

This book represents a guide to selected laboratory experiments in modern physics. It is based on a laboratory course in modern physics given for junior and senior students in engineering science at the University of California in Berkeley. In their choice of experiments, the authors have succeeded in illustrating some of the most important fundamental concepts of modern physics while dealing with mundane topics of significance in practical applications. Thus, engineering students will find the contents of this laboratory course stimulating and useful. The course material is well suited to familiarize the student with modern laboratory techniques. This feature should prove beneficial in the students' advanced studies and future professional career.

The different experimental topics are discussed in 11 chapters titled as follows: 1) The measurement of atomic masses; 2) The passage of charged particles through matter; 3) Vacuum technology; 4) The detection and measurement of ionizing radiations; 5) X-ray spectroscopy and x-ray analysis; 6) Properties of neutrons and their interactions with matter; 7) Solid-state electronics; 8) Nuclear magnetic resonance; 9) The thermionic emission of electrons from metal surfaces; 10) Lasers and the stimulated emission of radiation; and 11) Ion accelerators. The scope of the material presented spans the wide range from the almost classic matters found in the cradle of modern physics to the most advanced and en-vogue subjects virtually at the forefront of present-day research.

In addition to the topics listed above, the book contains an introductory chapter with corollary information. This includes, among other items, a rather brief treatise on measurement methods and error analysis and a section dealing with important basic rules of safety and good laboratory practice. Finally, there are three appendixes dealing with: (I) Oscilloscopes; (II) Classical and Quantum Statistics; and (III) Physical Constants.

The overall ideas presented in the book are very well conceived, indeed. The approach taken by the authors to emphasize fundamental concepts resulted in a treatise on selected topics of modern physics that goes far beyond the genre of a "cookbook" manual. The book is designed to enhance the reader's insight and understanding of the structure of matter and to guide the reader in the application of this knowledge to the execution of typical experiments. From this point of view, the author's endeavor was certainly a successful one.

The aspect where the book does not measure up to expectations concerns the lack of formal rigor and meticulous care in presenting some details and fine points. Although these shortcomings, depending on the reader's opinion, may be considered as minor in nature, this reviewer feels they are nevertheless of significant consequence as a matter of principle. Moreover, they could have been avoided easily with little effort on part of the authors, the editor, and the publisher.

In the discussion on error analysis (Sec. 1.3), the conceptual difference between the standard deviation of a normal distribution and the limited-sample estimate of this standard deviation has not been clarified. A brief discussion of student's distribution would have provided a most helpful and elucidating addition concerning this matter.

Many symbols and abbreviations used throughout the book are at variance with the adopted usage of the American Institute of Physics. Particularly unfortunate in this regard in the use of "mev" in lieu of "MeV" because of the inherent ambiguity (the prefix "m" designates normally 10^{-3}, while 10^{6} should be indicated by the prefix "M"). Furthermore, the meaning of certain symbols is not always consistent throughout the book but changes from one chapter to another; there are also several instances where symbols are introduced without explanatory definition. Moreover, there are quite a few cases where the appropriate units for physical quantities have been omitted in equations and graphs.

A notable and potentially confusing misprint can be found in Eq. (II.8) of Appendix II, where multiplication signs are shown erroneously as lower-case "*x*."

The book contains several figures in half-tone reproduction on non-glossy paper. Understandably, these pictures are of very poor quality with many details of the original photographs undiscernible.