BOOK REVIEWS

Mixtures—The Theory of the Equilibrium Properties of Some Simple Classes of Mixtures, Solutions and Alloys. By E. A. GUGGENHEIM, Professor of Chemistry at Reading University. Oxford University Press, 114 Fifth Avenue, New York 11, N. Y. 1952. x + 270 pp. 16.5 × 24 cm. Price, $8.50.

This book by Professor Guggenheim should be of very great value to all students whose interest in the theory of mixtures goes beyond the most elementary treatment. The author gives an illuminating account of the application of statistical thermodynamics to certain models of solid, liquid and gaseous solutions. Mixtures which contain electrolytes or highly polar molecules are not included in this discussion.

The prospective reader can obtain a good idea of the scope of the book from the following list of chapter headings: I. Classical Thermodynamics of Mixtures; II. Statistical Thermodynamics of Mixtures; III. Ideal Solutions; IV. Regular Solutions; V. Dilute Solutions; VI. Lattice Imperfections; VII. Superlattices; VIII. Gaseous Mixtures: IX. Surfaces of Simple Liquid Mixtures, X. Molecules of Different Sizes: Athermal Mixtures, XI. Molecules of Different Sizes: Mixtures Not Athermal; XII. Solutions of Macromolecules.

Comparison of theory and observation is undertaken whenever precise experimental data are available. Professor Guggenheim makes the statement: "There is a clear need for more extensive and precise measurements of all the equilibrium properties of the simplest mixtures. If such research work is stimulated by the theories described, then this book will have served a useful purpose." With these remarks, the reviewer is in complete agreement.

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Theoretical Nuclear Physics. By JOHN M. BLATT, Associate Professor of Physics, University of Illinois, and VICTOR F. WEISSKOPF, Professor of Physics, Massachusetts Institute of Technology. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1952. xiv + 864 pp. 16.5 × 23.5 cm. Price, $12.50.

It is rather exciting to see, in spite of the lack of any demonstrably adequate theory of nuclear forces, how a detailed and fairly coherent semi-empirical description of nuclei and nuclear interactions has become possible. The coherence attained in this book is achieved by strictly limiting the discussion to phenomena occurring below 50 Mev. and by omitting any reference to topics such as the stopping of charged particles, magnetic resonance, neutron deffraction, etc., which are not directly concerned with nuclear states. Within this field the only omission is any discussion of fission, since "too many relevant facts are unavailable."

This book is intended to be of use to advanced graduate students and experimental nuclear physicists, and not solely to theorists. It presupposes a graduate course in quantum mechanics and prior familiarity with nuclear physics on a lower level. In order to accomplish its aim of serving this audience continual use is made of the technique of introducing a subject by a simplified discussion that reproduces the qualitative features of the theoretical results correctly, followed by a more detailed quantitative treatment. Thus the emphasis throughout is on insight into the problem rather than on deductive rigor or calculational technique. Of necessity this often means that the reader will have to refer to the original literature if he wishes to learn precisely how to apply the theory in a specific instance; conversely this book should put him in a position to do this effectively. One unusual feature is an exhaustive index of symbols at the end of each chapter, which the reviewer, at least, found of little use.

After an introductory chapter on the general properties of the nucleus, the book takes up the phenomenological description of nuclear forces, treating two-body problems in detail and summarizing the work on three- and four-body problems. The short chapter on high energy (*i.e.*, greater than 50 Mev.) and nucleon–nucleon scattering reflects the unsatisfactory state of the phenomenological approach to this problem. True to the spirit of the book, the discussion of the systematics of stable nuclei and the various nuclear models goes to great lengths to avoid any mention of group theory and makes little use of the isotopic spin formalism. This does help to bring out the underlying physics of the situation but also means that this book does not serve as an introduction to a considerable portion of the literature on this subject. The central third of the book is devoted to a very thorough and detailed presentation of the theory of nuclear reactions, including a short chapter on spontaneous decay. Following this comes an excellent discussion of the interaction of nuclei with electromagnetic radiation. Both allowed and forbidden β-decay transitions are given a thorough non-relativistic treatment prior to the presentation of the respective relativistic theories. Unfortunately most of the book was written before many of the successes of the shell model became apparent, so only a brief concluding chapter is devoted to this topic. Taken as a whole the book should succeed in its intended aim, and undoubtedly will will occupy a prominent place on the shelves of nuclear physicists in coming years.

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Statistical Design and Analysis of Experiments for Development Research. By DONALD STATLER VILLARS, Research Scientist, U. S. Naval Ordnance Test Station, Inyokern, China Lake, California. Wm. C. Brown Company, 915 Main Street, Dubuque, Iowa. 1951. xvii + 455 pp. 15 × 22.5 cm. Price, $6.50.

In this book the author presents almost all of the statistical methodology which might be of interest to experimenters in science and technology. The material in Chapter 10 on control charts and in Chapter 11 on sequential analysis is almost too brief to warrant inclusion. The discussion in the rest of the book is adequate from the statistician's viewpoint, but it will not be easy reading for anyone not well versed in the technical language and methods of statistics.

Three features of the book deserve comment: 1. The discussion of variance components is the most extensive which has yet appeared in a textbook. Useful summary tables are given for the components in ten commonly used factorial designs. 2. The relationship between the interpretation of an experiment and the manner in which the experiment was replicated is repeatedly emphasized under the heading "replication degeneracy." 3. Charts are provided for determining the *a posteriori* odds that the treatments, in an experiment, produced an effect. These odds are based on a line of reasoning in fiducial probability which is subtle, not universally accepted, and not adequately explained anywhere in the book.

All of the methods are well illustrated with examples from industrial experimentation; and most of the chapters include a series of exercises and problems.

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