tions, solubility, thermodynamic properties, radioactive, magnetic and electrical properties of rocks and minerals, and atomic constants (1961).

The eight sponsoring industrial concerns and the Geological Society are to be commended for this useful and attractively printed handbook.

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Robert L. Weber is associate professor of physics at The Pennsylvania State University.

From first principles

THE PHYSICAL PRINCIPLES OF MAGNETISM. By Allan H. Morrish. 680 pp. Wiley, New York, 1965. $16.50

by Robert L. Weber

A scientist or engineer who desires an integrated knowledge of magnetism will be grateful for Morrish's extensive, modern treatment that starts from first principles. The author, now at the University of Manitoba, states that the text evolved from solid-state courses offered at the University of Minnesota and from a three-quarter graduate course in magnetism. First courses in solid-state physics and quantum physics are assumed as prerequisites.

Magnetic phenomena are introduced from an experimental point of view and interpreted in quantum-mechanical theories. More than half the book is devoted to strongly coupled dipole systems, where molecular field theory is stressed. The author's association with the *Magnetic Materials Digest* is reflected in his extensive references to the literature. One is struck by the number of new names cited in the work of the last two decades.

Diamagnetism, paramagnetism, ferromagnetism, ferrimagnetism and antiferromagnetism are covered in a way that unifies material from physics, chemistry, metallurgy and engineering. Work on alloys and superconductivity is not emphasized. Such topics as magnetohydrodynamics, group-theoretical analysis and the magnetoelectric effect are omitted.

Problem sets and bibliographies appear at the end of the chapter. A short appendix includes a convenient conversion table for Gaussian and rationalized mks units, demagnetization factors, and outer electronic configurations for the elements.

Semiconductor electronics series

INTRODUCTION TO SEMICONDUCTOR PHYSICS. By R. B. Adler, A. C. Smith, R. L. Longini. 247 pp. Wiley, New York, 1964. Cloth $4.50, paper $2.65

PHYSICAL ELECTRONICS AND CIRCUIT MODELS OF TRANSISTORS. By Paul E. Gray, David DeWitt, A. R. Boothroyd, James F. Gibbons. 262 pp. Wiley, New York, 1964. Cloth $4.50, paper $2.65

by H. J. Hagger

In 1960 the Semiconductor Electronics Education Committee (SEEC) undertook the preparation of a course in semiconductor electronics for use in universities at the third- or fourth-year undergraduate level. Seven books on semiconductor electronics are planned and shall—before publication—be produced in one or more preliminary editions for teaching trials at colleges or in industrial training courses. The volumes 1 and 2 of this series of 7 books have been published to date.

The first volume, *Introduction to Semiconductor Physics*, is a very general treatment of the fundamentals and shows little reference to specific semiconductor devices. The content of the book is divided into four main parts. The first chapter deals with the valence-bond model of a semiconductor. It discusses the intrinsic conduction of semiconductors, the role of impurities and the conduction process and finishes with the description of minority-carrier injection and recombination. Chapter 2 is a parallel and comparative treatment of the subject dealt with in chapter 1 by explaining the energy-band model approach. For these two chapters the authors are to be congratulated for they describe complicated relations in semiconductor materials with clarity and in a well balanced manner. Chapter 3 deals with the equilibrium distribution of electrons in the bands discussing quantum statistics and transition probabilities related to semiconductors. The last chapter describes nonequilibrium transport of charge carriers. To each chapter the authors have added some questions and problems on the material covered to provide practice on extending and clarifying the understanding of the material contained in the chapter. An appendix of about 20% of the total content is reserved to laboratory experiments that can be carried out during the course.

The authors of this first volume in a series have succeeded in writing a very complete discussion of the basics of semiconductor physics.

The second volume *Physical Electronics and Circuit Models of Transistors* is a logical continuation of the material contained in the first volume. The authors assume that the reader is familiar with elementary electronic circuits and is able to understand the mechanisms of electrical conduction in semiconductors. The latter can be assumed of the reader who has gone through volume 1 of this series. This second volume deals with the physical operation and the dc behavior of p-n junctions in chapters 1 through 3. In chapter 4 effects are described that show significant differences to the idealized p-n junction behavior (voltage drops, recombination, leakage across the surface of the junction and internal breakdown). In chapter 5 the dynamic behavior of p-n junction diodes is dealt with. In the next chapter lumped-constant models (due to Linvill-Gibbons) for junction diodes are discussed. The second half of the book (chapter 7 through 10) deals with transistors, starting with the structure and operation of transistors. In chapter 8 small-signal models for transistors are discussed and here even more complicated circuit models including space-charge capacitance are described. In the next chapter the large-signal behavior is dealt with by using the Ebers-Moll model for slow-speed conditions—that is, in the low-frequency region. The tenth chapter then is devoted to transistor models for dynamic switching with the aspect of providing a sufficiently accurate model which, however, is simplified in order to obtain a compromise between completeness and simplicity.

In two appendices p-n junction space-charge layers are more closely looked at and the electric field in the neutral regions of a p-n junction is discussed. Again we find some problems to each chapter for a better understanding of the material covered in each section. Both volumes show material extremely well presented, covering semiconductor physics in the first and diodes and transistors in the second volume. It is obvious that the authors have not only a profound knowledge of the field but also have gained from the preliminary editions combined with the experience of teaching the subject. It may be hoped that the remaining volumes of this series may hold the standard and level of the first two books. The books can be highly recommended as texts for undergraduate courses, for they show clarity, balance in presenting the matter and compactness in the subject covered.

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Surfaces in depth

SEMICONDUCTOR SURFACES. BY A. Manny, Y. Goldstein, N. B. Grover. 496 pp. Interscience, New York, 1965. $17.50

by H. J. Hagger

Surface effects in semiconductors play a prominent role in semiconductor research. During the past 15 years a vast number of publications reflect the intensive effort devoted to the study of semiconductor surfaces. The authors attempted to provide organized basic information both for the physicist and the chemist active in the field. The extensive references to the literature cover the period up to the end of 1964.

After some historical notes on surface effects the authors consider the semiconductor bulk, giving a very good introduction into the principles of semiconductor physics (band model, occupation statistics, carrier transport and nonequilibrium phenomena). In chapter 3 the lattice structure and chemical reactivity of the surface is treated. The authors start with discussions on studies of clean surfaces, their preparation and measurement, the structure of real surfaces; the chemical processes are then treated. In chapter 4 the surface space-charge