I commend the reading of this scientific gem to all who have interests, ranging from casual to penetrating, in color.

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Engineering for high energy

HIGH-VOLTAGE TECHNOLOGY. L. L. Alston, ed. 408 pp. Oxford Univ. Press, London, 1968. Cloth $14.40, paper $7.50

by L. MARTON

To introduce L. L. Alston's book, the easiest way is to quote from the preface: This book ". . .is based on a high-voltage course, which has been held annually at the Post-graduate Education Centre, Atomic Energy Research Establishment, Harwell, since 1965. It is intended as an introduction for graduate engineers and other scientists. . . ."

Alston, director of electrical research of the British Railway Board, served both as editor and as one of the authors of the 19 chapters written by 17 contributors. Roughly the first half of the book gives a fair, if sometimes rather condensed, presentation of the physical background of the relevant problems; the second half is straightforward classical electrical engineering. This is best illustrated by an indication of the main chapter contents: mechanism and characteristics of breakdown in gases or in high vacuum, electron emission from metals, conduction and breakdown in liquids and in solids, field-design problems, discussion of various high-voltage components and finally a short chapter about electrostatic generators.

Although the treatment varies throughout the book from undergraduate to postgraduate level, it contains a very useful compendium of engineering-type information for the use of the high-energy physicist. Sometimes the approach is too much on the engineering side and shows a lack of flow of information from the physicist to the engineer, or vice versa. For instance: I was quite surprised to learn that the electrical engineers are still using the semiempirical, qualitative method for electrostatic-field mapping, which was current in textbooks of engineering 40 or 50 years ago; nowadays when much more quantitative methods for the determination of field distribution are available I would have expected a little more than the otherwise excellent section on "Evaluation of electric stress by means of the electrolytic tank."

The book is recommended to those who are new to high-voltage technology or who, although familiar with the subject, want to have in one volume a useful survey of the different aspects of the subject.

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L. Marton is an electron physicist at the National Bureau of Standards. He is editor in chief of the well known series of books, Methods of Experimental Physics.

Sophomore plodders beware!

FUNDAMENTAL UNIVERSITY PHYSICS, VOL. 3: QUANTUM AND STATISTICAL PHYSICS. By Marcelo Alonso, Edward J. Finn. 598 pp. Addison-Wesley, Reading, Mass., 1968. $10.50

by FRED L. WILSON

Depending on your belief about what sophomore physics should be, you'll praise or damn this third volume in Alonso and Finn's series. The authors don't claim to have written an ideal textbook. Instead they have aimed at writing a series that would prepare a student for a higher level of understanding of physical concepts than the traditional undergraduate courses offer.

They have tried to do that by writing a calculus-level text, intended mainly for science and engineering students. Its organization and level are comparable to those of *The Berkeley Physics Course:* The treatment is extremely advanced.

An above-average number of problems (more than 525) and excellent references to modern literature that students can find, read, and use, all help to support the text material. Adequate and numerous illustrations combined with a good layout make an attractive volume.

Throughout the book the authors strip away the classical facade at every turn to leave undraped the subjects supposedly foremost in physicists' minds today. The usual classical fanfare is desiccated in the introduction to quantum physics. Max Planck and Niels Bohr get their due, but the tone for the book is clearly set when a Feynman graph pops up on page 19.

Chapter nine, "Fundamental Particles," is my favorite. Neutrinos, antineutrinos, helicity, magnetic moment of the lambda-zero hyperon, and all eight conservation laws are disclosed. The chapter ends by answering "What is a fundamental particle?" In an eightfold way, the superfundamental particle turns out to be the quark.

The authors explain that "quark" originated from an obscure passage in James Joyce's *Finnegan's Wake.* Joyce, the lover of multilingual puns and hater of wordiness, is considered by some to be the perfect novelist, if only a perfect reader could be found. There's an analogous situation in the book under review. The range and depth of material is certainly what's needed for the bright future graduate students, but plodders—beware!

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Fred Wilson, a nuclear physicist, is employed by an industrial laboratory in Houston, Texas. His major interest is nuclear reactions at low energies.

Dictionary of diamagnetics

LANDOLT-BORNSTEIN, ZAHLENWERTE UND FUNKTIONEN AUS PHYSIK, CHEMIE, ASTRONOMIE, GEOPHYSIK UND TECHNIK. (6th edition) Vol. 2: Eigenschaften der Materie in ihren Aggregatzuständen, Part 10: Magnetische Eigenschaften II. By W. R. Angus, J. Favède, J. Hoaru and A. Pacault. 173 pp. Springer-Verlag, Berlin, 1967. $26.50

by JOHN H. VAN VLECK

This is the second of two books of the well known Landolt–Börnstein handbook series that is devoted to magnetism. The first one (Vol. II/9), which appeared several years ago, was over five times larger and covered ferromagnetic and paramagnetic components and also nuclear magnetic resonance in diamagnetic compounds. This new volume can be regarded as a supplement to include diamagnetism. The first 135 pages document mean or powder diamagnetic susceptibilities. As most molecules are diamagnetic, an enormous number of exotic components are covered that the average physicist has never heard of, such as,

$C_{26}H_{23}NO$ and $C_{28}H_{16}$. An immense amount of labor must have been involved in combing the almost 1000 references that are cited. Because diamagnetism is usually almost independent of temperature, the measurements that are recorded are usually made at room temperatures; so each compound as a rule occupies a few lines at most, in contrast to the elaborate thermal data in the earlier book (which sometimes required a whole page for a particular ferromagnetic compound). As a result there is practically no commentary, and it is immaterial that the text is in English. No comparison is made with theory, although the calculation of the inert-gas diamagnetic susceptibilities furnishes one of the best tests of atomic wave functions.

27 pages are devoted to diamagnetic anisotropy. This requires more detail than the rest of the volume, as the experiments that are documented are more difficult and the directions of the principal axes must be specified.

The book closes with five pages of data on organic paramagnetic molecules. The data presentation would be clearer if it explicitly said that the molecule is either even or odd (thereby saving the reader some simple arithmetic) and if the "spin-only" value for odd molecules were listed on each page for comparison. Even molecules are generally only feebly magnetic, and so often times the experimenters simply report a susceptibility "greater than zero." The common paramagnetic gases O_2, NO and NO_2 are not included, as they are inorganic. Their susceptibilities were not covered in the earlier book either. The resulting omission from the generally very thorough Landolt–Börnstein tables is a curious one, for it was the study of oxygen that led Pierre Curie to formulate his famous law.

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J. H. Van Vleck, Hollis Professor of Mathematics and Natural Philosophy at Harvard University, is best known for his work in magnetism.

Magnetochemistry

ELECTRON PARAMAGNETISM. By Juan A. McMillan. 226 pp. Reinhold, New York, 1968. $14.50

by H. HOLLIS WICKMAN

This volume was written primarily for chemists, and as a text is intended for the advanced undergraduate. The author is former chairman of the chemistry department at the University of Cuyo at Bariloche, Argentina, and is in the solid-state division of Argonne National Laboratory. The contents include the basic information necessary for an appreciation of paramagnetism and crystal-field effects in solids. Generally the topics are restricted to ground-state paramagnetism of ions or free radicals. There are no exercises.

A short review of classical magnetism and atomic physics is provided in early chapters, but this is no substitute for a previous course in modern physics, which would be a prerequisite for this text. The treatment of magnetic susceptibilities and their measurement is generally complete, and representative examples of typical paramagnetic species are discussed. A section on symmetry and groups contains most of the useful finite-group-theoretical terminology appropriate to the level of the book; this chapter forms a basis for later development of ideas relating to crystal fields. The thermodynamics of magnetism is covered in a separate chapter, but this seems to stand somewhat apart from the main emphasis of the volume. The remainder of the book is devoted to electron paramagnetic resonance, with special emphasis on spin Hamiltonians representing magnetic anisotropy, hyperfine interactions and crystal fields. The discussion of these points is primarily descriptive and nonrigorous, but certainly would provide the reader with a feeling for the basic parameters characterizing a typical electron-paramagnetic-resonance spectrum. Examples of spectra are provided to illustrate the topics in the text, and a brief description of the experimental details involved in epr work is given.

The range of topics covered is rather broad, and not all subjects are given equally complete treatment. The discussions may therefore not always be sufficiently detailed for the more serious student or reader. However, references (through 1965) are provided at chapter endings, and these lead to more complete treatments. There are occasions in the book at which conventions and illustrations adopted by the author differ from general usage enough to be potentially disconcerting to the reader. These range from minor points such as use of luthecium for lutetium and term symbols $^2D_{1\frac{1}{2}}$ and $^2D_{2\frac{1}{2}}$ for $^2D_{3/2}$ and $^2D_{5/2}$, to decisions on emphasis in introducing a topic. In the second category, paramagnetic resonance is introduced without consideration of the resonance condition in the rotating frame; the Bloch equations are mentioned but do not explicitly appear. Also, the condition given for averaging anisotropic hyperfine interactions in the epr spectrum is a sufficient condition, but not the usual necessary condition; consequently the discussion would not readily apply to the case of spin labeling, which is currently of interest to chemists.

In summary, the usefulness of the book will depend largely on the depth with which the reader wishes to pursue paramagnetism and epr. The book would probably not appeal to physics students, especially those with a modern microscopic introduction to magnetic phenomena. It should serve its intended purpose of providing an introduction to several topics in magnetochemistry that may not generally be found in undergraduate chemistry courses.

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Review of nonmetallic compounds

EXPERIMENTAL MAGNETOCHEMISTRY: NONMETALLIC MAGNETIC MATERIALS, VOL. 8. By Michael M. Schieber. 572 pp. Wiley, New York, 1967.

by WERNER WOLF

The study of magnetic materials has been undergoing a remarkable development during the past 20 years. Starting from the esoteric and rather specialized work of just a few laboratories, it now constitutes one of the largest branches of solid-state physics, and it has been estimated that publications in magnetism currently amount to more than 2000 papers per year. Many of these deal with the preparation and properties of new magnetic materials, and it is clear that up-to-date reviews are badly needed by workers in the field. The present volume attempts to give such a review for the large class of nonmetallic compounds.

Given the enormous amount of pub-