

Electrical Properties

Organic Semiconductors. FELIX GUTMANN and LAWRENCE E. LYONS. Wiley, New York, 1967. 876 pp., illus. \$27.95. Wiley Series on the Science and Technology of Materials.

The abrupt increase in research activity related to the electrical properties of organic solids during the middle and late 1950's was due, at least in part, to intense activity in industrial laboratories. So far, the hope of joining the potent capabilities of inorganic semiconductors with the infinite variety of synthetic organic chemistry has not been realized. Low carrier mobilities and difficult contact problems have limited the development of useful devices.

Perhaps it was the lack of commercial success which stimulated the wide range of exploratory studies of electrical and electro-optical phenomena in a great many different materials. This monograph by Gutmann and Lyons is a timely and important effort to record and organize the literature of this field.

The authors have chosen to offer complete coverage and ready accessibility to the literature rather than a selective or critical analysis. The heart of the book is really the 1677 references given at the ends of the 11 chapters, the 146 pages of tabulated data, the 695 references to these tables, and the 47-page index. The remaining, narrative parts of the book provide a guided tour through this vast literature, which extends from 1888 to 1966. The tour is well done. Chapters are arranged around central topics such as sample preparation and ionized states. References are given, in order of appearance, at the end of each chapter, and awkward page shuffling is minimized by the repetition of references at the end of each chapter in which they appear. The tables summarize experimental results obtained on hundreds of different compounds, and they frequently contain detailed information about experimental conditions of purification, electrode preparation, and so on. The very complete subject and author index provides an indispensable cross reference to this vast compilation. (Anthracene, as might be suspected, is the longest entry in the index, occupying more than half a page.)

For this exhaustive collection and organization of the literature alone, the book would be indispensable to anyone engaged in research related to organic semiconductors. Students de-

siring a casual insight into this large and growing field will similarly find this a useful, if somewhat lengthy, volume. The material is presented in a most lucid and well-organized fashion.

The researcher desiring a critical or discriminating survey of an unfamiliar field, or the student looking for more than a casual introduction, will be somewhat less well served. Advances in experimental techniques and in theoretical understanding have shown much of the early literature to be quite meaningless, yet for the most part the authors refrain from making such judgments. This same rather flat approach is evident in the expository sections of the book. Semi-empirical equations are sometimes presented with no more qualifications than are given to rigorously derived equations of statistical mechanics.

The authors were right in opting for completeness, but their own broad competence would have justified a more critical and selective analysis of that material.

All in all, this is a distinguished addition to the Wiley series on the Science and Technology of Materials. It presents a much more coherent and better-organized survey than the two volumes *Physics and Chemistry of the Organic Solid State*, edited by Fox, Labes, and Weissberger (Interscience, 1963). The Gutmann and Lyons review will remain the definitive work covering the past half-century.

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Plasma Physics

Photoionization Processes in Gases. GEOFFREY V. MARR. Academic Press, New York, 1967. 296 pp., illus. \$12.50.

Many aspects of ionization phenomena in gases have been summarized in general books on the subject or in handbooks. However, the volume of literature has reached such a point that books summarizing fairly narrow fields have become increasingly important additions to the scientific literature. This volume on photoionization processes in gases is an excellent example of such a book. Marr, who is a physicist at the J. J. Thomson Physical Laboratory at the University of Reading in England, has produced a useful

and carefully prepared work that treats the interaction of photons and visible radiation with gases and ionized media. The largest area of plasma physics not covered is that of the interaction of laser beams with gases, and I was sorry not to have any discussion of laser-induced ionization phenomena. Nevertheless, Marr's treatment of the general subject will be useful not only for the teacher of gaseous electronics and plasma physics, but for those who are involved in research in these areas as well.

If there is a weakness in the book, it comes from the inclusion of a chapter entitled "The plasma state," in which Marr gives a superficial summary of standard gas-discharge effects, the operation of Geiger counters, proportional counters, the nature of streamers, and other phenomena controlled by photoionization. These are treated much more adequately in many other books on ionization physics, and mixing these details with the more fundamental treatment of the rest of the book tends to weaken the impact of the author's specific contributions.

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A Compendium of Creatures

The History of Four-Footed Beasts and Serpents and Insects. Vol. 1, *The History of Four-Footed Beasts* (620 pp., illus.), and Vol. 2, *The History of Serpents* (246 pp., illus.), by EDWARD TOPSELL. Vol. 3, *The Theater of Insects* (270 pp., illus.) by T. MUFFET. Facsimile reprint of the 1658 (London) edition, with an introduction by Willy Ley. Da Capo Press, New York, 1967. \$65.

This set of volumes is a lovely facsimile edition of the first animal book in English to be printed in Great Britain. As such, *The History of Four-Footed Beasts and Serpents and Insects* has some place in the history of printing.

Its zoological importance is entirely of a different character. The first two volumes, produced by Topsell, are little more than translations of Conrad Gesner's great assembly of Renaissance animal lore, the *Historiae Animalium*. Although Gesner's work may be thought of as a descendant, in arrangement and form, of the biological works

of Aristotle, the *Historia Naturalis* of Pliny the Elder (1st century A.D.), and the medieval encyclopedists—Albertus Magnus, Vincent of Beauvais, or Bartholomew Anglicus, to cite a few of the better known—it actually embraces the newer zoological work of Renaissance science. Included in this assembly are not only Gesner's own significant achievements but also those of such men as Guillaume Rondelet and Pierre Belon. Thus what was produced in English by Topsell was a less expensive, more accessible version (and a modified one—Gesner's vol. 1 was used for *The History of Four-Footed Beasts*, but Topsell's second volume contained new sections on bees, spiders, and earthworms never written by Gesner) of the latest scientific word in zoology.

Indebtedness to Gesner is again revealed in the third volume, which is the first English text of Theodore Muffet's (or Mouffet's or Moffet's) *Insectorum sive Minimorum Animalium Theatrum*. For, in fact, Muffet had drawn upon the manuscript sources derived from Gesner's entomological collections in producing the *Theater of Insects* now made available in this handsome reprint.

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Molecular Optical Activity

Optical Rotatory Dispersion and Circular Dichroism in Organic Chemistry. Including Applications from Inorganic Chemistry and Biochemistry. Proceedings of a NATO summer school, Bonn, Sept.–Oct. 1965. G. SNATZKE, Ed. Sadtler Research Laboratories, Philadelphia, 1967. 438 pp., illus. \$13.50.

This timely book brings together a significant fraction of the fruits of the recent renaissance in the field of molecular optical activity. Although the emphasis is upon application of the techniques of optical rotatory dispersion and circular dichroism to problems of organic chemistry, there are also substantial sections devoted to other areas of chemistry. The book will be useful both to graduate students and to research workers.

Two dominant themes are interwoven in the text. The first is the utility of optical activity for the establishment

of absolute configuration, conformation, and conformational equilibrium of organic and inorganic molecules in solution. The second is the physical origin of the magnitude, sign, and structural dependence of the optical activity of different chromophoric groups. Quadrant and octant rules provide the unifying framework within which absolute configuration and conformation are discussed. The respective rules for saturated ketones, α - β and β - γ unsaturated ketones, dienes, and lactones are examined and applied in chapters by Crabbé, Djerassi, Klyne, Mislow, Wolf, and others. A wealth of data which are of both spectroscopic and stereochemical interest is also given for carboxylic acids, episulfides, biaryls, and a variety of other chromophoric groups.

The molecular origins of the effects of solvent species and temperature upon optical activity, and the utilization of these effects for the illumination of conformational equilibria, are examined from several points of view in chapters by Djerassi, Klyne, Moscovitz, Rassat, and Snatzke. Regrettably, Weigang's work, which provides a rational explanation for the anomalous data obtained for some rigid ketones, is mentioned only by Snatzke.

Diverse topics that lie outside the domain of organic chemistry are also considered. Synthetic high polymers are discussed by Pino, who brings together the experimental results for a wide range of molecules, including recent stereo-regular species. The virtues of various methods for estimating α -helix contents of polypeptides and proteins from their rotatory-dispersion curves are the main subject of a chapter by Blout. Kronig-Kramers transforms and the electronic origins of optical activity are examined by Moscovitz; his pioneering work with Moffitt on the vibrational structure of ORD and CD curves is included in the book. Inorganic molecules are discussed briefly by Mason and by Woldbye. The latter author has also provided a succinct summary of the instrumentation available to carry out measurements of optical activity.

Somewhat more than one-third of the book consists of manuscripts already published but scattered about in journals. There are extensive references to the literature through 1965.

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The Chemical Senses

Olfaction and Taste II. Proceedings of the second international symposium, Tokyo, Sept. 1965. T. HAYASHI, Ed. Pergamon, New York, 1967. 843 pp., illus. \$30.

This collection of 53 papers presented at the symposium on olfaction and taste is a reasonably accurate reflection of both the character and the subjects of research currently being carried out on the chemical senses. In the organization of a symposium the program can be restricted or can be open to wide participation. In this instance, the latter course was followed. The papers range from brief scientific reports to comprehensive reviews. The single major area of emphasis is on studies employing electrophysiological recordings of neural activity correlated with the application of diverse chemical stimuli. There is limited consideration of the role of the chemical senses in the functioning animal.

The book has many of the characteristics of a scientific journal that lacks a precise editorial policy. There is no introduction except for a two-page salutatory message by Zotterman, and this is followed without interruption by the papers. Some of the authors acknowledge that their papers have received prior publication; however, many of the contributions constitute first publication of original work. In this category is Oakley's report on cross-regenerated taste nerves. In the rat, the relative responsiveness of the taste receptor cells to different chemicals is determined by inherent properties of the tissues from which the cells are formed rather than by the taste fibers (the chorda tympani and the glossopharyngeal nerve) which innervate them.

Since there is no index and the subjects, species, and techniques covered are numerous and diverse, specific information is not easily located even by those generally familiar with the field. In any event, the price may deter the casual student. For the specialist, the symposium on olfaction and taste was an important forum for the exchange of ideas and developments, and the encyclopedic nature of the proceedings volume makes it an essential reference.

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