

viscosity and light scattering, he explains the theories in physical terms but does not derive the formulas since this would require a much larger book.

The author is to be congratulated for the manner in which he has been able to distil the many complicated theories of high polymer solutions down to their essentials. His style is lucid, and his choice of subjects and the extent to which he discusses them is excellent. This book should be studied by everyone concerned with solutions of synthetic high polymers. Workers in the field are looking forward to the day when the properties of the final plastic can be explained in a thorough-going fashion as can now be done for solutions of polymers.

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Vacuum Deposition of Thin Films. By L. HOLLAND, Head of the Vacuum Coating Research Laboratory, Edwards High Vacuum Ltd. With a foreword by PROFESSOR S. TOLANSKY, F.R.S. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y., 1956. xix + 541 pp. + 25 plates. 15 × 23 cm. Price, \$10.00.

This book is long overdue. Today, vacuum coating is an important industry and no longer just a laboratory procedure, and Mr. Holland's volume will be useful to every worker in the field. It covers all phases of vacuum coating from the point of view of the technologist. This is not a theoretical treatise but a practical volume written by one with adequate theoretical background and wide experience.

The chapters each stand by themselves without any particular continuity or grouping. The first discusses general techniques and equipment used in the production of high vacuum. The many design sketches and detailed explanations will be of value to those designing their own vacuum evaporators and will increase the understanding of others who purchase commercial units. Sources and the thickness distribution of the deposited films are described in chapters 4 and 5. Distribution functions are derived mathematically and numerous graphs depict the experimental results obtained for different sources and receivers of various shapes.

Cleaning of surfaces prior to coating and the techniques for evaporating metals and alloys are discussed in chapters 3 and 6. Problems of reactions between charge and heater and selective evaporation of alloy components are detailed and tested solutions are given.

The difficulties of degassing plastic materials and coating them are treated in chapters 2 and 12. Systems for handling commercial quantities of materials are described and the vacuum properties of plastics and lacquers used for substrates are tabulated.

The properties of deposited films are discussed in detail and the influence of rate of evaporation, substrate temperature, gas pressure, angle of incidence, etc., is evaluated. This information is carried over into a chapter on the preparation of thin films for electrical purposes in the commercial production of resistors, capacitors and electrodes. Separate chapters are devoted to very detailed treatments of the preparation and properties of aluminum and oxide films.

Chapters 9 and 10 are concerned with optical coatings. Methods of preparing anti-reflection films, high reflection films and interference filters are described. Apparatus for controlling the deposition of optical films and the properties of these coatings is given in detail. In a related vein is a section on shadow-casting and surface replication as used in light and electron microscopy. The emphasis here is on the vacuum techniques and apparatus, not on the microscope applications.

The widely used and poorly understood process of cathodic sputtering is the subject of a complete chapter. The various theories are discussed and their disagreements are enumerated. Properties of films produced by sputtering are described and illustrated graphically, and apparatus for sputtering is shown.

The entire book is admirably documented and the bibliography of 557 references is invaluable. However, considering the large number of topics discussed, an expansion of the index would be very desirable. Also, this reviewer would have appreciated a more thorough discussion of the

formation and properties of metallic blacks which are treated only very briefly. Of more commercial interest is the aluminizing of television kinescopes which requires specialized apparatus that might well have been described.

It is to be hoped that subsequent printings will rectify the unusual number of misprints and other minor errors which exist throughout the book, but in no way detract from its value.

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R. G. PICARD

Advances in Carbohydrate Chemistry. Vol. 11. By MELVILLE L. WOLFROM, Editor, and R. STUART TIPSON, Associate Editor. Academic Press, Inc., Publishers, 111 Fifth Avenue, New York 3, N. Y., 1956. xviii + 465 pp. 15.5 × 23.5 cm. Price, \$11.00.

Readers of the previous volumes of this series need only be told that the editors, their board of advisors and the various contributors have joined forces to turn out a work of exceptional interest. This book amply demonstrates that the research worker will find those areas of science most rewarding where different fields of specialization overlap. Enzymology, microbiology, physical chemistry and organic chemistry supply the *leitmotif*.

The chapter dealing with the biosynthesis of the monosaccharides will be read by many grateful people. Sixty five tightly written pages cover all the significant work from Adolf von Baeyer's speculations about the polymerization of formaldehyde to the complex realities of enzyme systems and photochemistry currently under investigation. L. Hough and J. K. N. Jones take leave of their readers with a challenging statement:

"More than one hundred enzymes, and many of their coenzymes, have been recognized in animal mitochondria. Whether or not such an organization of enzymes is present in such a cell unit for performing a sequence of reactions with carbohydrates remains to be determined."

F. Shafizadeh's chapter dealing with branched-chain sugars of natural origin is an appropriate sequel. His system of naming these compounds is logical, and it could have been used advantageously in the preceding article.

J. M. Bobbitt focusses our attention on the periodate oxidation of carbohydrates, and he brings into relief the functioning of this analytically important reagent. References to other reviews dealing with periodic acid enhance the usefulness of this chapter. S. Bayne and J. A. Fewster supply a comprehensive survey of the chemistry and biochemistry of the osones, and Andrew Bečlik discusses the biosynthesis, chemical synthesis and properties of kojic acid. G. R. Barker's chapter on nucleic acids supplements and brings up to date the work published by the associate editor, R. Stuart Tipson, in *Volume I* of this series. Aspects of the Physical Chemistry of Starch, and an Addendum: The Size and Shape of Some Polysaccharide Molecules, by C. T. Greenwood point up the functions of physicochemical techniques in the study of the nature of polysaccharides. The descriptive chemistry of furan, pyrrole and other heterocyclic compounds obtained from condensation reactions of monosaccharides with β -ketonic esters is presented by F. García Gonzáles. A generalized cumulative author and subject index to *Volumes 1-10* is included.

There is an obituary of the late Kurt H. Meyer by R. W. Jeanloz. The current crop of students will find much inspiration in the personal life and achievements of the departed. The diversity of his scientific interests and his warm friendliness are movingly described by his former student.

The reviewer may be considered captious in pointing out a few little notes. Why didn't someone do something about: "Observation of mixed melting points is mandatory." Or, "General consensus of opinion"? There are ambivalent feelings toward the typographical pun in a statement dealing with the use of periodic acid: "Aliquots of the reaction mixture are periodically removed." The author who suggests a system for the naming of branched-chain sugars forgets to use it in a couple of places. Some of the charts would have been easier on the eyes if larger type and more space had been used. In the anniversary year of W. H.

Perkin, footnote 54 on page 277 as well as the author index refer to the son as W. H. Perkins, Jr. *Eheu fugaces*. . . .

College libraries are advised to chain down this volume or to see to it that they have a sufficient supply to meet the anticipated demand.

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LOUIS SATTLER

instructed by the necessarily brief and sketchy way in which the complex and rather abstruse principles are presented, and he would almost certainly be left with an incorrect idea of the methods currently employed in the approaches to many important problems.

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G. W. WHELAND

Elementary Wave Mechanics with Applications to Quantum Chemistry. Second Edition. By W. HEITLER, Professor of Theoretical Physics in the University of Zürich. Oxford University Press, 114 Fifth Avenue, New York 11, N. Y. 1956. viii + 193 pp. 12.5 × 19 cm. Price, \$2.90.

When a book that is as small as this one is deals with the entire field of "elementary quantum mechanics," and when it also considers the "applications to quantum chemistry," many important topics must unavoidably be slighted or entirely ignored. Consequently, the reader cannot expect here to find more than a general introduction to the basic concepts, and he cannot expect to be brought to the point where he is able to make original contributions to the field.

Even within these limitations, however, there is reason to question whether the author has been successful in presenting the material in such a form that it will be helpful to the "chemists and other non-mathematical readers" for whom, according to the Preface, it is designed. The earliest developments of the theory are expounded clearly and well, but almost nothing that has been added since about 1930 is discussed. Valence, for example, is treated entirely with the aid of first-order perturbation theory, and the variation principle is not mentioned at all. The states of the individual atoms in molecules are described in terms of the spectroscopic symbols that are strictly applicable only to isolated atoms. The concepts of resonance and of molecular orbitals are not explicitly mentioned, although some of the basic principles of these concepts are briefly suggested. The Preface gives the impression that the book should be intelligible to the "non-mathematical reader," but this impression is hardly borne out by the fact that a firm understanding of calculus and at least a bowing acquaintance with the theory of determinants are presupposed.

It is difficult to see for what group of readers this book would be valuable. The chemist or physicist who is already familiar with quantum mechanics might find the discussion of the historical background interesting and informative, but he would probably be disappointed by the inadequate way in which the more recent developments are treated. On the other hand, the reader who is encountering the subject for the first time might be more bewildered than

BOOKS RECEIVED

March 10, 1957—April 10, 1957

- D. H. DESTY, edited by. Assisted by C. L. A. HARBOURN. "Vapour Phase Chromatography." Proceedings of the Symposium sponsored by the Hydrocarbon Research Group of the Institute of Petroleum held at the Institution of Electrical Engineers, London, on 30th May-1st June, 1956. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1957. 436 pp. \$12.00.
- ROBERT C. ELDERFIELD, edited by. "Heterocyclic Compounds." Volume 6. "Six-Membered Heterocycles Containing Two Hetero Atoms and Their Benzo Derivatives." John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1957. 753 pp. \$25.00.
- T. J. GRAY, D. P. DETWILER, D. E. RASE, W. G. LAWRENCE, R. R. WEST AND T. J. JENNINGS. "The Defect Solid State." Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. 511 pp. \$11.00.
- KENZO HIRAYAMA, DOROTHY U. MIZOGUCHI AND YUICHI YAMAMOTO, Editors-in-Charge. "Nomenclature of Chemical Compounds." Nankôdô Publishing Co., Harukicho, Bunkyo-ku, Tokyo, Japan. 1957. 368 pp. \$4.00.
- G. W. C. MILNER. "The Principles and Applications of Polarography and Other Electroanalytical Processes." Longmans, Green and Co., Inc., 55 Fifth Avenue, New York 3, N. Y. 1957. 729 pp. \$17.50.
- E. G. RICHARDSON. "Relaxation Spectrometry." Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. 140 pp. \$5.75.
- D. R. STULL AND G. C. SINKE. "Thermodynamic Properties of the Elements." Number 18 of the Advances in Chemistry Series Edited by the Staff of *Industrial and Engineering Chemistry*. American Chemical Society, 1155 Sixteenth Street, N. W., Washington 6, D. C. 1956. 234 pp. \$5.00.
- A. H. WILSON. "Thermodynamics and Statistical Mechanics." Cambridge University Press, 32 East 57th Street, New York 22, N. Y. 1956. 495 pp. \$9.50.