# BOOK REVIEWS

**The Structure of Glass.** Proceedings of a Conference on the Structure of Glass, Leningrad, November 23–27, 1953. Translated by E. B. UVAROV. FRANCES COLEMAN, Editor-in-Chief, HOWARD STEENSEN, Executive Editor, and MARVIN SILVERBERG, Technical Editor. Consultants Bureau, Inc., 227 West 17th Street, New York 11, N. Y. 1958. 291 pp. 21.5 × 28 cm. Price, $20.00.

The foreword indicates that the translation was sponsored jointly by the Glass Division of the American Ceramic Society and the National Science Foundation. "Factual portions comprise a definite contribution to the knowledge commonly available to Western scientists, and the controversial portions will add zest to those concerned with the yet unsolved riddle of the structure of glass." Scientific and industrial workers from 28 towns in the Soviet Union (more than 500 delegates) met in Leningrad at the invitation of the Institute of Silicate Chemistry of the Academy of Sciences, USSR, the S. I. Vavilov State Optical Institute and the Leningrad Section of the All-Union Engineering-Technical Society of the Silicate Industry, November 23 to 27, 1953, to consider the theory of glass structure. "Many papers and communications on recent experimental investigations of the properties of different glasses and on existing theories of glass structure were presented and discussed in detail."

In his Introductory Address academician A. A. Lebedev refers to well known changes observed during toughening or tempering and assumes changes of glass structure without altering the composition. Effect of heat treatment of optical glass on properties of optical glass is mentioned. He points to the significance of spectroscopic methods in investigating the nature of bonds between individual atoms, and believes that the electron microscope "effects favorable prospects." Feels that if we could control silicate chain length and growth we might make "less brittle glasses" and "come nearer to . . . making unbreakable silicate glass."

Paper I is on "The Crystalline Theory of Glass Structure" by K. S. Evstropyev. II, "The Structure and Properties of Organic Glasses" by P. P. Kobeko. III, "The Structure of Glass" by O. K. Botvinkin. IV, Considers possibilities and results of X-ray methods and interpretation of patterns; author, E. A. Porai-Koshits. Is lengthy, generously illustrated with graphs and a bibliography of 38 references. V, "Structural Peculiarities of Vitreous and Liquid Silicates" by E. O. Esin and P. V. Geld; 84 references. VI, "Raman Spectra and the Structure of Glassy Substances" by E. F. Gross and V. A. Kolesova. VII, "The Quantum Theory of Heat Capacity and the Structure of Silicate Glasses" by V. V. Tarasov. VIII, "The Infrared Spectra of Simple Glasses and their Relationship to Glass Structure" by V. A. Florinskaya and R. S. Pechenkina. This chapter provides an abundance of significant curves. IX, "The Coördination Principle of Ion Distribution in Silicate Glasses" by A. A. Appen. X, "Concepts of the Internal Structure of Silicate Glasses which Follow from the Results of Studies of the Properties of Glasses in Certain Simple Systems," by L. I. Demkina. XI, "The Theoretical Views of D. I. Mendeleev on the Structure of Silicates and Glasses, and their Significance for Modern Sciences," by L. G. Melnichenko. XII, "The Views of D. I. Mendeleev on the Chemical Nature of Silicates" by V. P. Barzakovsky.

The reviewer has listed titles and authors of the first twelve papers (which are not numbered). The ensuing twenty papers deal with Sodium Borosilicate Glasses; Structure Based on Porous Glass and Films; State of Silica in Microporous Glass; Destructability of Vitreous Sodium and Aluminum Silicates by Aqueous Solutions; Definite Chemical Compounds in the Structure; Chemical Resistance; Refractive Index Changes below 300°C., Rayleigh Scattering; Light Scattering in Borosilicate Glasses; Luminescence Method of Study; Oriented Structures; Use of Electron Microscope; Electron Diffraction in Industrial Glasses; High-Alumina Properties; Compounds in Borate Glasses; Volatilization of Components; Visual Polythermal Studies; Solubility in Binary Silicates; Temperature–Viscosity Relationships and Structure; Viscosity Above and Below Liquidus Temperature; Dielectric Loss in Silicate Glasses; Electric Conductivity in Simple Borate Glasses; Electrical Conductivity in Strong Electric Fields and Wetting of Metals by Glass; Electrical Conductivity of Quartz Glass; Structure and Properties of Enamels; Oxygen Potential of Glass; Glassy State of Organic Polymers; Methodological Basis of Structure.

Next follow eight discussions of about one page each on the general nature of glassy substances; then seven on physical chemistry; ten comments, corrections, etc., on optical properties and structure; two on crystal chemistry and structure; three on further development.

In his concluding address A. A. Lebedev comments in part, "The main problem with which we were concerned was the structure of glass. It seems that all agree that there is some degree of order in the arrangement of atoms in glass, but opinions differ on the nature and degree of this order." He elaborates on the reasons.

The volume closes with a table of contents giving pages in the English translation and in the Russian volume. There is no subject or author index. Considering the American subsidization of the translation, the price of the bound volume, $20.00, seems high.

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**Cholesterol. Chemistry, Biochemistry, and Pathology.** Edited by ROBERT P. COOK, University of St. Andrews, Queen's College, Dundee, Scotland. Academic Press Inc., 111 Fifth, Avenue, New York 3, N. Y. 1958. xii + 542 pp. 16 × 23.5 cm. Price $15.00.

Considering the key position which cholesterol occupies in metabolism, many disciplines are involved in its study and each of them is technical in its own way. To ensure the widest possible coverage of this timely subject, the editor has enlisted the help of a number of experts, each well known for research achievements in his own field. Because of the overlapping of some of the aspects of this subject, there was danger of repetition and lack of integration. No such shortcomings apply to this treatise. Although each chapter represents a unit in itself, many helpful cross references to other chapters are given. The editor is to be congratulated on the excellence of the team work. The book may be regarded as reasonably "up to date" to the end of 1957.

The contributors and their chapters are as follows: I. Historical Introduction. By Hendrik Dam. Pp. 1–14. II. Chemistry. By Peter Bladon. Pp. 15–115. III. Methods of Isolation and Estimation of Sterols. By Robert P. Cook and James B. M. Rattray. Pp. 117–143. IV. Distribution of Sterols in Organisms and in Tissues. By Robert P. Cook. Pp. 145–180. V. The Physiology of the Circulating Cholesterol and Lipoproteins. By George G. Boyd and Michael F. Oliver. Pp. 181–208. VI. Biosynthesis of Cholesterol. By R. Gordon Gould. Pp. 209–235. VII. The Metabolism of Cholesterol and Other Sterols in the Animal Organism. By R. Gordon Gould and Robert P. Cook. Pp. 237–307. VIII. Conversion of Cholesterol to Steroid Hormones. By Oscar Hechter. Pp. 309–347. IX. Microscopical Localization of Cholesterol in Cells and Tissues. By Geoffrey H. Bourne. Pp. 349–374. X. Pathological Manifestations of Abnormal Cholesterol Metabolism. By David Adlersberg and Harry Sobotka. Pp. 375–425. XI. Treatment of Disorders of Cholesterol Metabolism. By Irvine H. Page. Pp. 427–433. XII. Evolutionary Aspects of the Sterols. By Werner Bergmann. Pp. 435–444. XIII. The Sterol Requirements of Insects and of Protozoa. By Marjorie G. Horning. Pp. 445–455. XIV. The Microbial Metabolism of Steroids. By Thressa C. Stadtman. Pp. 457–463. XV. Some Relations of Cholesterol to Other Lipids. by Robert P. Cook. Pp. 465–479.

Considering the scope of this book, the reviewer does not feel qualified to pass critical judgment on all of the varied

aspects presented. Hence, only a few comments may be permitted: Chapter II contains a wealth of valuable information. The space saving device of presenting much of the chemical material in the form of charts makes the reading somewhat difficult. Not all of the errors appearing in this chapter have been corrected by the insertion of "Notes." The author of Chapter VIII, who has published similar review articles elsewhere, has once more succeeded in conveying a lucid picture of our present day concepts concerning the biogenesis of the steroid hormones, especially in its relationship to cholesterol. In Chapter XV the editor deals with some aspects which do not "fit in" with the foregoing chapter headings. Remarking on the whole book, he aptly states, "We have been presented to a molecule which can be synthesized from small units, metabolized to a variety of compounds, is interrelated structurally and metabolically with other constituents, and which in the myelin sheath remains apparently static." The book concludes with an "Appendix of Practical Methods" (pp. 481–498), which will be of value to the clinical chemist.

In view of the wide coverage of the subject matter and the excellence of its organization, this book will doubtless be appreciated by a variety of investigators, in particular organic, biological and clinical chemists, as well as by physiologists, pathologists and clinicians. It may be added that printing and binding of this monograph are up to standard

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**Handbook of Chemical Microscopy.** Volume I. Third Edition. Principles and Use of Microscopes and Accessories. Physical Methods for the Study of Chemical Problems. By ÉMILE MONNIN CHAMOT, B.S., Ph.D, Late Professor of Chemistry, Emeritus, Cornell University, and CLYDE WALTER MASON, A.B., Ph.D., Émile M. Chamot Professor, Chemical Microscopy and Professor of Metallography, Cornell University. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. xii + 502 pp. 15.5 × 23.5 cm. Price, $14.00.

For investigators and advanced students in diverse fields of science and technology, wherever a critical study of the structural and optical properties of microscopic objects are called for, this volume should prove a practical handbook and an extremely valuable reference source. The handbook starts with a survey of the optical system and the mechanical attributes of the light microscope, followed by a fairly detailed discussion of the important problem of illumination. The chapter on illumination of opaque objects is especially well written, although the chapter on trans-illumination could have incorporated more reference to recent theories of image formation. Also with respect to field brightness there is a confusion between the practical and theoretical effects of the size of the source (pp. 104, 105). Principles and applications of dark-field, phase contrast and fluorescence microscopy are described in this chapter. These are followed by descriptions of a wide variety of general and specific microscopic techniques—preparation of material (not conventional histological techniques), special methods for interpreting physical (form, color, mechanical, thermal) properties of objects, ultramicroscopy or study of colloidal phenomena, photomicrography and microprojection. Then follows a short chapter on electron microscopy which may serve to introduce the reader to some general reading material on this vast topic. The latter half of the book is mostly concerned with studies of crystals and aggregates with the polarizing microscope. In addition to a well-documented chapter on the polarizing microscope and its principal applications, there are chapters dealing with the quantitative determination of the optical properties of microscopic objects and the relation of optical properties to crystal and aggregate structure. These are followed by a chapter on special methods for preparing crystals for microscopic study. The final two chapters deal with methods of measurements (linear, of area and volume, and angular) and the determination of particle size. Appended is a Michel–Levy color scale for estimation of birefringence whose usefulness is likely to be primarily educational. Compared to the earlier edition, those portions of the text dealing with methods (but not so much on principles), the bibliography and diagrams were brought up to date and the quality of the paper improved. Very few typographical errors (page 101, page reference; page 262, particle size of polystyrene latex polymer should be in *microns* rather than in *millimicrons;* page 336, rods or plates with a dimension *about* the wave length of light should be *smaller than*) were noticed. In all, the handbook is filled with useful information not only with respect to techniques but also on such basic matters as sampling errors and problems on purity of crystals. It is, however, somewhat weak on optical theory. As in the earlier edition, the abundant source of reference material is extremely valuable, although in some chapters more reference to recent work could have been incorporated. Especially noticeable was a lack of mention of the application of the interference microscope in which Davies and others have succeeded in measuring dry mass of microscopic objects to better than $10^{-12}$ gram precision. Also it would have been helpful to advanced readers if initials were shown on all names of investigators referred to.

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**Chemical Constitution. An Introduction to the Theory of the Chemical Bond.** Second Revised Edition. By J. A. A. KETELAAR, Professor of Physical Chemistry, University of Amsterdam, The Netherlands. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, N. J. 1958. viii + 448 pp. 16× 23 cm. Price, $8.95.

J. A. A. Ketelaar is Professor of Physical Chemistry at the University of Amsterdam and is perhaps best known to American chemists for his elucidation of the structures of certain complex inorganic structures. He has written a splendid textbook of theoretical chemistry using as his Leitmotiv the four types of bonds of interest to chemists, namely, the ionic bond, the atomic bond (principally the electron pair bond), the metallic bond and the van der Waals bond (particularly of the London type).

The author recognizes at the outset that any chemical bond arises from coulombic interactions of outer electrons. After a short and rather conventional account of the periodic table (he could have discussed ionization potentials and approximate methods for many-electron atoms, for example) he launches into a superb chapter on the ionic bond. He applies elementary electrostatics to a wide variety of chemical problems including acid strengths and the solubility and hydration of salts. As the author points out, the approximations made in such problems are no worse than those made in quantum chemistry.

Nearly half the book is devoted to the covalent bond and its application to the properties of organic compounds. Quantum mechanics is neatly summarized without, as is unfortunately the common practice, devoting more time to the solutions of certain linear differential equations of early 19th century vintage than to the physical significance of the results. What few mathematical arguments are presented are confined to small type. The formalistic nature of resonance is explained in crystal clear terms. Among the features of this chapter is a very detailed account of the theory of color. Here one can successfully make reasonable predictions from rather simple theoretical arguments.

The section on the metallic bond contains a short but clear account of the Sommerfeld theory of electrons in metals and the Brillouin zone theory. There is a cursory treatment of semi-conductors which could have been considerably extended in view of the large interest which was developed in this subject in recent years.

The last section (van der Waals bonding) deals with a wide variety of phenomena including molecular compounds (clathrates, urea compounds, etc.), solubility and cohesive energies and the hydrogen bond. Although the electrostatic origin of the inverse sixth power of the distance for van der Waals forces is outlined, there is no derivation of London forces which, after all, is usually far greater than the Keesom and Debye contributions.

This book lies somewhere between Pauling's classic and the treatise of Syrkin and Dyatkina in that the physical arguments are better presented than in the former and the chemical arguments are better presented than in the latter.