

## BOOK REVIEWS

**Sulfur in Proteins.** Proceedings of a Symposium Held at Falmouth, Massachusetts, May, 1958. Organized and Edited by REINHOLD BENESCH, RUTH E. BENESCH, PAUL D. BOYER, IRVING M. KLOTZ, W. ROBERT MIDDLEBROOK, ANDREW G. SZENT-GYÖRGYI and DAVID R. SCHWARZ. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1959. xi + 469 pp. 15.5 × 23.5 cm. Price, \$14.00.

This volume is an account of a research conference held at Falmouth, Massachusetts, in May, 1958. The scope of the conference was more limited than the title indicates. Consideration of sulfur in proteins was confined to the role of sulfhydryl and disulfide groups in determining structural configuration, reactivity and functions of blood proteins, enzymes, muscle proteins and viruses. Participation of sulfhydryl groups in cell division also was discussed. Nevertheless, the editors have succeeded very well in their goal of reporting what transpired when some recent findings in the sulfur chemistry of a number of biological systems were discussed by a group of investigators prominent in their fields. The volume performs a valuable service in pointing out common problems of many scattered areas in biochemistry.

Some twenty-eight papers with discussion are reported in seven sections. The titles illustrate the breadth of the conference: I. *Protein Reactions Involving Sulfur: Chemical Modification of Thiol and Disulfide Groups in Proteins and Peptides*, J. M. Swan; *The Introduction of New Sulfhydryl Groups and Disulfide Bonds into Proteins*, R. Benesch and R. E. Benesch; *Disulfide Bonds in Proteins*, J. E. Turner, M. B. Kennedy and F. Haurowitz; *The Varying Reactivity of the Cystine of Wool*, H. Lindley; *A High-Sulfur Protein from Wool*, J. M. Gillespie; *The Decomposition of Keratin by Microorganisms*, J. J. Noval and W. J. Nickerson; and *The Supercontraction of Keratin-Fibers by Lithium Bromide*, A. E. Brown and L. G. Beauregard.

II. *Serum Proteins: Some Chemical Properties of the Sulfhydryl Group in Bovine Plasma Albumin*, E. V. Jensen; *Relative Probabilities of Isomers in Cystine-Containing Randomly Coiled Polypeptides*, W. Kauzmann; and *Biogenesis of Protein Fibers: The Clotting of Blood Plasma*, L. Lorand, A. Jacobsen and L. E. Fuchs.

III. *Iron and Copper Proteins: The Role of Sulfur in Some Metal Proteins*, I. M. Klotz and T. A. Klotz; *The Role of Sulfur in Cytochrome c*, H. Tuppy; *The Cystine/Cysteine Content of Hemoglobins*, T. H. J. Huisman; *Sulfhydryl Groups and the Oxygenation of Hemoglobin*, A. Riggs; and *Relation of Iron to Sulfhydryl Groups in Ferritin*, A. Mazur and S. Green.

IV. *Enzymes: Some Aspects of Protein Structure in Relation to the Role of -SH and -S-S- groups in Enzymic Catalysis*, P. D. Boyer and A. R. Schulz; *Mechanism of Action of Alcohol Dehydrogenases from Yeast and Liver and  $\beta$ -Galactosidase of *E. coli**, K. Wallenfels, H. Sund, J. L. Zarnitz, O. P. Malhotra and J. Fischer; *Determinations and Properties of Sulfhydryl Groups in Yeast Alcohol Dehydrogenase*, F. L. Hoch and B. L. Vallee; *Fluorometric Analysis of Coenzyme Binding and Thiol Interactions on Glyceraldehyde-3-phosphate and Lactic Dehydrogenases*, S. F. Velick; and *On the Order of Disulfide and Bond Reduction in Ribonuclease*, F. H. White, Jr. and C. B. Anfinsen.

V. *Muscle Proteins: Cysteine and Cystine Content of Muscle Protein Fractions*, A. C. Szent-Györgyi, R. E. Benesch and R. Benesch; *The Role of SH Groups in the Interaction of Myosin with Phosphate Compounds and with Actin*, J. Gergely, A. Martonosi and M. A. Gouvea; and *Studies on the Functional Sulfhydryl Groups of Myosin and Actin*, M. Barany.

VI. *Viruses: The Masked -SH Group in Tobacco Mosaic Virus Protein*, H. Frankel-Conrat; and *Structure and Function in T2 Bacteriophage*, L. M. Kozloff.

VII. *Cell Division: The Role of Thiol Groups in the Structure and Function of the Mitotic Apparatus; Multiple Functions of Sulfur in Mitosis; and Function of Protein Disulfide Reductase in Cellular Division of Yeasts*, W. J. Nickerson and G. Falcone.

An eighth section consists of a conference summary by J. T. Edsall. This is more than a summary; it represents a critical evaluation of the arguments which is both searching and provocative of wider considerations of the problems raised. Discussions held after each paper are recorded and add considerably to the value of the reports.

Readers of this collection will be impressed anew how progress in so many diverse fields is dependent upon the solution of a number of problems concerned with fundamental measurements upon basic structures. Foremost among the problems under discussion was the difficulty of assaying reactive sulfhydryl groups quantitatively. Some agreement on the reliability of the *p*-chloromercuribenzoate or silver titrations was reached. The problem of non-reacting sulfhydryl has been extant for a long time and considerable emphasis was given to this subject at the conference. The discussions also emphasized the difficulties which arise in interpreting the role of sulfhydryl groups in binding metals, and coenzymes, and in determining the structural configuration of protein surfaces of wool, hemoglobin, serum albumin and the viruses. The papers on cell division admirably apply molecular concepts to biology.

The volume represents thoughts on the subject current in May, 1958, and hence is evidently already out-of-date when issued one year later. From the viewpoint of reporting new results, it must be recognized that the publication rates of most journals are faster. Nevertheless, the papers contain more speculation which could not find space in the current serials and bringing the papers together in one volume serves an objective of the editors by stimulating scientists to investigate the techniques and findings of alien fields for assistance. As a service to science, editors and publishers might consider the feasibility of cutting delay in publishing, which has been accomplished elsewhere, by issuing such reports in paper-backed pamphlet form. The attendant speed and economy would make such volumes as this all the more valuable to the reader.

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**Encyclopedia of Chemical Reactions.** Volume VIII. Tungsten. Uranium. Vanadium. Ytterbium. Yttrium. Zinc. Zirconium. Addenda. Compiled by C. A. JACOBSON, Late Professor of Chemistry, West Virginia University. Edited by CLIFFORD A. HAMPBL, Consulting Chemical Engineer, Editor, "Rare Metals Handbook." Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1959. 533 pp. 16 × 23.5 cm. Price, \$14.00.

This final volume in the series inaugurated some years ago by the late Professor C. A. Jacobson follows the general practices characteristic of the earlier volumes except that entries are arranged in alphabetical order of chemical symbols rather than according to an arithmetical order of numbers of atoms in the formulas. Such a practice brings the presentation into better agreement with other reference sources and should aid in making the individual entries accessible to the reader.

The present volume has the advantages and disadvantages characteristic of its predecessors. Inasmuch as the approach is non-critical, the disadvantages commonly outweigh the advantages. The entire series should have limited use where preliminary literature searches are being made, but it is doubtful that a person seeking completely definitive information could depend upon it for much more. This is aptly expressed by the Editor in his preface as "it is believed that users of the 'Encyclopedia of Chemical Reactions' are more benefitted than hampered by its existence." It is unfortunate that the tremendous effort could not have been channeled into a critical summary where many duplications could have been avoided.

The book is well and clearly printed. Regardless of its merits, the book is a tribute to the energy and faithfulness of the many people who acted as compilers. It is proper that recognition be given to them.

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**A Short Guide to Chemical Literature.** Second Edition. By G. MALCOLM Dyson, M.A., D.Sc., Ph.D., F.R.I.C., M. I. Chem. E. Longmans, Green and Co., Inc., 119 West 40th Street, New York 18, N. Y. 1958. v + 157 pp. 14.5 × 21.5 cm. Price, \$3.25.

This new edition of a very useful, compact account of methods to examine the chemical literature so that nothing of importance may be overlooked is excellent. Any trained chemist can gain from this book an appreciation of the fundamental requisites for a thorough literature research. The clear directions, suggestions and illustrations are well designed to stimulate the ingenuity and imagination of a research man to investigate the published material in any chemical field.

The greater part of this guide is an annotated bibliography of the different types of chemical literature. This includes the primary and secondary sources which must be consulted to obtain sufficient background for intensive laboratory or theoretical study. The brief descriptions of the contents of the numerous publications will acquaint the reader with the extent and limitations of the material described. This bibliography, which is not intended to be complete, has a noticeable number of British authors and few items published since 1956. Special effort has been made to achieve greater completeness for the lists of treatises, encyclopedias and important journals. An unusual feature is a chapter on medical chemical publications.

The appendix contains valuable information about old and obsolete journals with their often unfamiliar abbreviations. It includes a series of tables to indicate the year and volume number of the most frequently consulted periodicals. A detailed example of an organic literature research problem which shows the many ramifications of such work which are often not realized by a beginner, is instructive. This small volume is likely to be a revelation even to an experienced chemist and a vital aid to the novice in the use of a chemical library.

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**Advances in Protein Chemistry.** Volume XIII. Edited by C. B. ANFINSEN, JR., Laboratory of Cellular Physiology, National Heart Institute, Bethesda, Maryland, M. L. ANSON, London, England, KENNETH BAILEY, University of Cambridge, Cambridge, England, and JOHN T. EDSALL, Biological Laboratories, Harvard University, Cambridge, Massachusetts. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. x + 524 pp. 16 × 23.5 cm. Price, \$13.80.

As pointed out by the editors in the preface this volume is unusual in that it contains only four review articles, three of them comprising some 440 pages. They take pains, however, to assure the reader that this type of issue does not represent a trend to be followed in the future. It is to be hoped that this is true, since one of the most appealing features of this series has been the incisive character of its reviews. Too great a length not only cuts down the variety of material which can be presented, but acts as a deterrent to the complete reading of individual articles.

The initial article on "Immunochemical Methods in Studies on Proteins" by P. Grabar is very short and has as its aim the suggestion of possible applications of immunochemical methods to important problems in protein structure as well as a means of identification and classification. Immunochemical methods and their limitations are briefly discussed.

Protein-carbohydrate complexes are discussed by F. R. Bettelhe m-Jevons. Loose and non-specific protein-carbohydrate complexes are included as well as mucoproteins and

mucopolysaccharides. The subject is first taken up in a general way with a discussion of methods and of the structure and chemistry of the carbohydrate ingredients of the protein-carbohydrate complexes. The latter two-thirds of the article are devoted to individual discussion of mucoproteins and mucopolysaccharides from a very wide variety of sources. Most of the work presented has appeared since the previous review of Meyer (*Adv. Prot. Chem.*, 2, 249 (1945)).

The third article on the silk fibroins is by Lucas, Shaw and Smith. It not only contains a comprehensive review of the chemistry, physico-chemical properties and structure of the fibroins themselves, but a considerable amount of material on the natural history and biology of silkworms, the spinning process and silk technology in general. Emphasis is given to the problem of degradation in the discussion of silk fibroin in solutions.

The last article deals with the synthesis and chemical properties of poly- $\alpha$ -amino acids. It is a measure of the advances which have been made in this field in the past ten years that, though Katchalski and Sela exclude at the outset a systematic discussion of either the physico-chemical or the biological properties of synthetic polypeptides, there is still material enough to provide one of the longest reviews in the series. Typical topics presented are the synthesis and properties of the N-carboxy acid anhydrides, the mechanism and kinetics of polymerization, and the purification and characterization of the resulting polypeptides. A large number of individual polypeptides are discussed as well as copolymers, multichain polyamino acids and polymers which utilize carboxyl and amino groups other than those on the  $\alpha$ -carbon atom. There is little doubt but that this will be the key reference in this subject for some time.

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**Steroids.** By LOUIS F. FIESER, Sheldon Emery Professor of Organic Chemistry, Harvard University, and MARY FIESER, Research Fellow in Chemistry, Harvard University. Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1959. xvii + 945 pp. 16.5 × 24 cm. Price, \$18.00.

The proverbial and rather overworked ending of book reviews "This book belongs on the shelf of every . . . chemist" applies to such an extent in this instance that I would like to start with this recommendation. I am not referring to the industrial or academic specialist in the steroid field, because he has almost certainly already purchased this book, but rather to the large number of chemical virgins in the steroid territory. I am addressing this recommendation to the physical-organic chemist who, out of laziness or fear, has not gone to the trouble of looking at the steroid literature and thus has missed a veritable gold mine of marvelous experimental substrates and challenging theoretical problems; to the synthetic organic chemist who can learn what stereospecificity and synthetic selectivity really mean; to the physical and instrumental chemist, who is interested in the general problem of applications of physical tools and measurements to organic chemistry—this being practiced to a wider and more refined extent with steroids than any other type of organic compound. Finally and perhaps most importantly, it is addressed to the chemistry student and his "non-steroid" professor because of the superb pedagogic value of steroid chemistry with all of its glamor and subtlety. The entire spectrum of organic chemistry—mechanism, stereochemistry, synthesis and structure proof—is placed before him in a unified whole with the additional bonus of extremely interesting biological and biochemical implications. This is what "Steroids" means and the Fiesers have painted this picture in the most brilliant colors possible. The question appearing in THIS JOURNAL, 80, 5007 (1958), "When is the next edition of Fieser and Fieser's steroid book coming out" has indeed been answered in triumphant fashion.

The presentation of the material differs considerably from that encountered in the usual steroid books including the third edition (1949) of "Natural Products Related to Phenanthrene" by the same authors. The new approach is best illustrated by listing the headings of the 22 chapters of the book: 1. Orienting Survey; 2. Investigation of Cho-