

## 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 Glycerinaldehyde-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.