

# Book Reviews

**The Proteins. Composition, Structure and Function. Volumes I and II. Second Edition.** Edited by HANS NEURATH, Department of Biochemistry, University of Washington, Seattle, Wash. Academic Press, Inc., 111 Fifth Ave., New York, N. Y. Vol. I: 1963. xi + 665 pp. 16.5 × 23.5 cm. \$22.00 (regular); \$19.50 (subscription). Vol. II: 1964. xiii + 840 pp. 16.5 × 23.5 cm. \$26.00 (regular); \$24.00 (subscription).

These two volumes of the second edition of the "The Proteins" are the first of four volumes planned. In the decade since the first edition was published, there has accumulated an enormous mass of excellent data on the amino acid composition, sequence, and the three-dimensional structure of proteins. New methods have been developed for the chemical synthesis of peptides, for studying the intramolecular bonds and interactions of proteins, and the relation of their structure to function. This new edition will be widely welcomed by all who are trying to keep well informed in these areas of protein and polypeptide chemistry.

The topics for this multi-authored treatise have been well selected and carefully integrated. This second edition is not a mere revision of the first edition. With only a single exception, all the chapters in both volumes were written by authors who did not contribute to the first edition. The first volume deals largely with methods of amino acid analysis, peptide and protein synthesis, sequence analysis, and intramolecular bonds of proteins. The second volume contains chapters on the conformation of polypeptide chains in proteins, the interaction of protein molecules with ions and other protein molecules, polyamino acids as protein models, and X-ray analysis of protein structure. In both volumes there is an emphasis on the relationship of the composition and structure of polypeptides or proteins to their specific activity or biological function.

Volume I contains six chapters. The first by A. Light and E. L. Smith is a critical review of amino acid analysis in which basic procedures are described and preferred methods for analysis of intact proteins, free amino acids, or protein hydrolysates are discussed. An addendum by G. R. Tristram and R. H. Smith lists the amino acid composition of 42 protein preparations. The second chapter by K. Hofmann and P. G. Katsoyannis is devoted to the synthesis and function of peptides of biological interest. Following an excellent critical discussion of the principles and reagents for peptide synthesis, there is a well-documented description of the synthesis of selected biologically active peptides and a stimulating discussion of structure-function relationships. The chemical aspects of protein synthesis are reviewed by J. S. Fruton in the third chapter. Emphasis is placed on the chemical and enzymatic aspects of protein biosynthesis rather than the coding problem. Concepts and experimental approaches for the determination of the primary structure or amino acid sequence of peptides and proteins are discussed in Chapter 4 by R. E. Canfield and C. B. Anfinsen in the order that they would present themselves to the investigator. Chapters 5 and 6 deal with intramolecular bonds in proteins. R. Cecil reviews the role of sulfur in proteins and the analytical methods used in its study. H. A. Scheraga discusses noncovalent bonds in proteins from a thermodynamic point of view.

The editor states that "the second volume should be contiguous with the first as it deals with fundamental properties of proteins, both in solution and in the solid state." In it are five chapters that deal with the conformation of polypeptide chains in proteins both in solution and in the solid state; the interaction of protein molecules with small ions or with other protein molecules; and the properties of polyamino acids as protein models.

The first chapter in Volume II, Chapter 7, by J. A. Schellman and C. Shellman deals with the possible conformations of polypeptide chains in proteins when in solution, experimental methods for determining conformation, and the results obtained from investigations with synthetic polypeptides. Chapter 8 by J. Steinhardt and S. Beychok treats the interactions of proteins with hydrogen ions, other small ions, and molecules. Acid-base dissociations of proteins and the bonding of small uncharged molecules, such as water, urea, undissociated organic acids, steroids, and alcohols, to protein molecules are considered from both a theoretical and an experimental point of view. Chapter 9 by J. W.

Nichol, J. L. Bethone, G. Kegeles, and E. L. Hess deals with interacting protein systems. The investigation of interaction between protein molecules and other macromolecules is of importance in providing a basis for biological processes such as protein polymerization, enzyme substrate, or antibody antigen combinations, and protein-nucleic acid complex formation. The authors discuss the physical chemistry of interacting systems and methods for obtaining characteristic parameters. The behavior of interacting systems in transport experiments and interaction effects in other physicochemical measurements is reviewed. Chapter 10 is an excellent review by E. Katchalski, M. Sela, J. I. Silman, and A. Berger on polyamino acids as protein models. Although these Israeli workers have written several reviews on polyamino acids, in this author's opinion this chapter is outstanding. It begins with a review of the synthesis and chemical properties of polyamino acids. This is followed by sections on the conformation of polyamino acids in the solid state and properties in solution. The last half of this chapter is a detailed summary of the biological properties of polyamino acids. The editors are to be complimented for including this chapter on polyamino acids, for the studies on amino acid polymers have contributed much to our knowledge of protein chemistry. The final chapter by R. E. Dickerson is on X-ray analysis and protein structure. The author states that the purpose of this chapter is to set forth the results which have been achieved by X-ray analysis and to show how the results were obtained. It includes discussions of the results obtained with a variety of both globular and fibrous proteins as well as of work in progress.

In this reviewer's opinion the second edition is well conceived and clearly executed. It exceeds the high standards set by the first edition. Many aspects of protein structure can be most easily seen from drawings or models and although this edition contains such illustrations, more would have been welcome. Literature citations are numerous and each chapter has a long list of references. The second edition is considered a comprehensive treatise on the composition, structure, and function of proteins which will be of real value to those advanced students and research scientists who want to keep well informed in these rapidly advancing fields of biochemistry, biophysics, physical chemistry and related areas.

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**Pteridine Chemistry. Proceedings of the Third International Symposium held at the Institut für Organische Chemie der Technischen Hochschule Stuttgart, September 1962.** Edited by WOLFGANG PFLEIDERER, Institut für Organische Chemie der Technischen Hochschule Stuttgart, and EDWARD C. TAYLOR, Department of Chemistry, Princeton University, Princeton, N. J. Pergamon Press, Ltd., The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. xx + 535 pp. 16 × 23.5 cm. \$15.00.

The Proceedings of the Third International Symposium on Pteridines has had a long gestation period (the meeting was held September 1962); however, the product has a polish unusual in publications of this sort. The symposium was bilingual, and the original German or English has been retained throughout the text; only the provision of English abstracts of all papers defers to the linguistic failings of the English-speaking world.

Unavoidably, the publication is dated, but it provides a substantial and comprehensive survey of the state of pteridine chemistry, biochemistry, and biology as of 1962. The role of the folate cycle in methionine biosynthesis (Buchanan), the origin and nature of the pteridine intermediate for folate biosynthesis (Jaenicke, Wood, Forrest, Wacker, and discussion by Buchanan), the biogenesis of riboflavin (Plaut), the reactions and pteridine coenzyme for the oxidation of phenylalanine (Kaufman), and the role of tetrahydrofolates as coenzymes (Huennekens) were presented so well that only a little supplementary reading in the current literature would be required for an up-to-date picture. On the other hand, the fine structures of the various pigments of the drosoperin and sepiapterin series seem as elusive as ever (Viscontini, Forrest).

One of the problems is the failure, so far, to provide model dihydropteridines of unequivocal structure. Taylor's "5,8-dihydropteridines," on the basis of subsequent information (as annotated in proof), now appear to possess the 4,8-dihydro structure, and Kaufman's dihydropteridine cofactor (somewhat mystifying at the Symposium), through careful enzymatic and tracer studies, now seems to have a quinoid arrangement of double bonds.

This Symposium introduced the first synthetic pteridines to have useful pharmacodynamic activities, the diuretics triamterene and related compounds. These were prepared in the main through modifications and extensions of the Timmis reaction of 5-nitrosopyrimidines with compounds possessing active methylene groups. The chemical papers by Weinstock, Pachter, and Osdene covered a lot of ground, but left unanswered a good many questions about structure-activity relationships. Other papers on synthesis included Schmidt's on new approaches to the formation of the pyrazine moiety, and Weygand's, Korte's, and Wood's contributions to the synthesis and structure of pteridines with polyol- and carbonyl-containing side chains. The alkylation of pteridines (Angier) and the rearrangements of alkylated pteridines (Brown) were interesting contributions. The covalent hydration of pteridines was discussed by Albert and similar addition reactions were mentioned frequently in other connections.

Physical properties received due attention in papers on proton resonance spectra (Phillipsborn) and polarography (Rembold, Komenda).

Finally, mention should be made of the charming peeps behind the scenes provided by Clemens Schöpf in the opening paper on the "Anfänge der Pterin-Chemie."

This volume provides a survey of the pteridine world which is likely to be less ephemeral than the circumstances might suggest.

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**Interpretation of the Ultraviolet Spectra of Natural Products**  
**International Series of Monographs on Organic Chemistry-**  
**Volume 7.** By A. I. SCOTT, Professor of Organic Chemistry, University of British Columbia, Vancouver. The Macmillan Co., 60 Fifth Ave., New York, N. Y. 1964. x + 433 pp. 17.5 × 25.5 cm. \$12.50.

Excellent books on the use of infrared and nuclear magnetic resonance spectroscopy in organic structure determination have been available for several years; and more recently some on the equally powerful technique of mass spectroscopy have appeared. However, the earliest of the spectroscopic methods to be used in organic structure determination, ultraviolet absorption, has been largely neglected as far as a coherent and complete discussion is concerned. Gillam and Stern's excellent introductory monograph has had to suffice, but it is largely restricted to correlations between structure and the ultraviolet spectra of dienes and unsaturated ketones; and there have always seemed to be a discouraging number of inexplicable exceptions to the rules for predicting the position of maximum absorption. Perhaps real systemization had to wait for the touch of one schooled in conformational analysis and sensitive to the nuances of vicinal effects as well as geometry on ultraviolet absorption. Whatever the reasons for the delay in having a truly comprehensive treatment of ultraviolet spectra and structure in natural products, the gap has been filled by Professor Scott's book.

Most organic chemists will experience a certain amount of shock at the oversimplified treatment of photoexcitation adopted by the author; e.g., " $\text{—C=C—C=O} (h\nu) \rightarrow \text{—C}^+ \text{—C=C—O}^-!$ " Spectroscopists will be horrified. But quick recovery follows as the utility of the simplifications becomes manifest. Once through the introduction, where spectroscopists are told they "need read no further" (they will make a mistake if they don't), the reader will be gratified to find a whole chapter devoted to single chromophores. Among these are several saturated types not ordinarily considered, but now becoming accessible as the familiar instrumental limit of about 200  $m\mu$  is breached. The absorptions of monoolefins, disulfides, peroxides, ozonides, alkyl halides, and alkynes are treated in addition to that of the familiar carbonyl group. Furthermore, nitrogen-containing simple chromophoric systems are discussed even though some of them are as yet to be found in natural products.

Conjugated chromophores, dienes and unsaturated ketones, aldehydes, lactones, and derived nitrogen analogs are next, and naturally constitute one of the most substantial chapters. Extensive use is made of tables of structures with their maxima and extinction coefficients. Solvent and vicinal effects as well as those of substitution in shifting maxima are thoroughly covered. The influence of single bond *cis-trans* isomerism is cataloged and explained, and interactions of nonconjugated chromophores to produce anomalous bands are not neglected.

Chapter 3 is a real treasure for anyone trying to make structural sense out of the ultraviolet absorption spectra of aromatic compounds. The author convincingly separates the benzenoid absorptions from electron-transfer bands involving substituents. He then provides substituent contributions and remarkably accurate rules for predicting the position of the electron-transfer bands of substituted phenyl alkyl ketones, benzaldehydes, benzoic acids, and benzonitriles. Polynuclear aromatics, aromatic amines, and quinones also receive treatment here.

In Chapters 4-6 are collected for the first time extensive data on all types of heterocyclic compounds. The range is from furans and thiophenes through all types of pyrilium compounds to pyrroles, indoles, carbolinium compounds, pyridines, and polyazines, among the latter being purines, pyrimidines, and pteridines.

Chapter 7 (contributed by Dr. C. J. W. Brooks) is devoted to spectrophotometry in the analysis of natural products and completes the catalog. It fulfills admirably its design of being a reference source for biochemical workers faced with knotty analytical problems. Tables are provided listing compounds, including enzymes, with brief descriptions of methods for their quantitative determination. Many references are provided.

In Chapter 8, the fun begins with the application of the catalog of chromophoric systems and their absorptions to selected natural products. Here the author strikes hard on the discrepancies between "model" and real compound. Steric inhibitions to planarity and "violations" of the rules get the full treatment. Steroids naturally occupy a significant part of the chapter but by no means do they crowd out other systems of interest. (Much of the routine analytical material on steroids is presented in an appendix.) The systems covered range from cyclopentenones (pyrethrolones) to natural quinones, through polycyclic alkaloids to pyrroles and porphyrins.

Chapter 9, the last, really is a continuation of 8, but the molecules are of much more complex structure and the spectra, as expected, more difficult to explain. Here the reader is introduced to and educated in the most sophisticated of interpretations. The discussion abounds with overlapping absorptions, vicinal effects, and the fine details of group interactions.

No chemist working with natural products in the large sense of the term can afford to be without this book. Every student whose work is concerned with organic structure determination in any sense should have it on his shelf; and all, including the spectroscopist, have much to learn from it. Organic chemists owe thanks to Professor Scott for this timely, and outstandingly comprehensive treatment of an important subject. Not only does he teach the use of ultraviolet spectroscopy in natural products work, he also provides a bibliography to most of the important work on natural products done during the last twenty years.

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**Fatty Acids. Their Chemistry, Properties, Production, and Uses.**  
Second completely revised and augmented edition. Part 3.  
Edited by KLARE S. MARKLEY. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. x + 993 pp. 16 × 23.5 cm. \$35.00.

The second edition of Dr. Klare S. Markley's "Fatty Acids" is being issued in four parts. Part 3 contains mostly new material. It covers the significant recent research on fatty acids and presents the status of existing problems. As in the preceding volumes, outstanding specialists discuss their areas of special interest.

In "Biological Oxidation of Fatty Acids," Dr. Mahler of Indiana University describes the great strides that have been made since 1947 in solving the riddle of fatty acid oxidation by careful study of the enzyme systems involved.

Dr. Sonntag of National Dairy Products Corporation presents a thorough discussion of nitrogen derivatives—a group that has