

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.

George H. Hitchings

Wellcome Research Laboratories
Tuckahoe, New York

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.

Richard H. Eastman

Department of Chemistry
Stanford University, Stanford, California

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

experienced a particularly high rate of commercial development and production during the last 15 years. He gives special attention to amino acids, amides, nitriles, and amines. This chapter, which contains many reactions, tables of physical and chemical properties, and methods of preparation, also outlines industrial applications and production.

Dr. Markley, Research Consultant, Vegetable Oil Industry, Rio de Janeiro, Brazil, discusses the complicated subject of the organic sulfur derivatives, mainly the mono-, di-, and trithioacids, the sulfonic acids, and the sulfuric acid esters. Several other addition products and derivatives are covered briefly, such as sulfur chloride, thiocyanogen and thiophene additives, the sulfones, and thiuonium and mercaptoacetic acid derivatives.

Dr. Markley devotes a significant portion of this volume to chemical synthesis of fatty acids. Many methods and reactions are described for the synthesis of a wide variety of fatty acids.

Dr. Woodbine of the University of Nottingham, England, gives a historical perspective on the biosynthesis of fatty acids. He discusses progressive concepts since 1929, and develops the latest theories of biosynthesis dependent on the roles of "active" acetate and malonic acid. Mechanisms for the biosynthesis of unsaturated fatty acids are also presented.

Very thorough treatment is given to the techniques of separation. Since 1935 new and more efficient procedures for separating fatty acid mixtures have been developed, so that knowledge of the composition of fats and oils is more exact. Dr. Markley discusses the classical methods of separation by distillation, salt solubility, and low temperature crystallization. The techniques and principles of liquid chromatography are discussed by Professor Schlenk of the University of Minnesota. The newer technique of gas-liquid chromatography as applied to fatty acids is presented by Dr. Woodford, University of Leiden, The Netherlands. Dr. Scholfield of the U. S. Department of Agriculture describes the principles of countercurrent distribution. Equipment, operations, and mathematical treatment are discussed. Dr. Swern, also of the U. S. Department of Agriculture, reviews the subject of urea complexes, their properties and uses for purposes of separation.

Part 3 of "Fatty Acids" presents a broad survey of recent research. It is well edited and thoroughly documented. Special care has been taken to select references from sources that are readily available. Research workers in the field of fatty acid products and workers in related industries will find this volume an important source of information and a guide to significant references.

R. A. Swenson

Research and Development Department
American Oil Company, Whiting, Indiana

Spectroscopy and Photochemistry of Uranyl Compounds. By EUGENE RABINOWITCH, Department of Botany, University of Illinois, and R. LINN BELFORD, Department of Chemistry, University of Illinois, Urbana, Ill. The Macmillan Co., 60 Fifth Ave., New York, N. Y. 1964. x + 370 pp. 14.5 × 22.5 cm. \$12.50.

This book is lucid and informative. Anyone concerned with the spectroscopy and/or photochemistry of uranyl compounds would do well to have it on his bookshelf.

The book is simply a review of the literature on the effects of electromagnetic radiation on uranyl compounds. Particular attention is devoted to the history of the subject, and indeed this is one of the more delightful aspects of the whole treatment. The green luminescence of uranyl ion, observed as early as 1833, is a topic of intense interest even today; in consequence, the discussion of uranyl luminescence, spanning as it does the classical and quantum mechanical eras, provides a unique insight into changing ideas and attitudes.

Chapter 3, concerned with uranyl luminescence intensity and decay, provides an entertaining discussion of whether the uranyl luminescence is a "fluorescence" or "phosphorescence." Unfortunately, the authors seem to have cut their teeth on inorganic solid-state luminescence, and fail to appreciate that molecular luminescers, such as uranyl ion, might require a different terminology. To be specific, the literature of molecular luminescence of the last four years is rife with terms such as "delayed fluorescence," "slow fluorescence," "E-type fluorescence," "P-type fluorescence," "annihilative fluorescence," "delayed excimer fluorescence," etc.; these luminescences would have to be classified

as phosphorescences if we are to accept the definitions of Rabinowitch and Belford (R and B). Furthermore, consistent adherence to the definitions of R and B would force us to designate the triplet → singlet ($T_1 \rightarrow S_0$) emission of an organic molecule as a *phosphorescence* if excited by $S_1 \leftarrow S_0$ (or $S_1 \leftarrow S_0$) absorption and as a *fluorescence* if excited by $T_1 \leftarrow S_0$ absorption. It appears that regardless of excitation method, current practice dictates designation of $T_1 \rightarrow S_0$ luminescence as phosphorescence and $S_1 \rightarrow S_0$ luminescence as fluorescence. In this context, the question of the name to be used for the uranyl luminescence is still open and hinges not upon metastability or otherwise of the emitting level, but rather on its Russell-Saunders spin multiplicity.

Chapter 4 discusses the photochemistry of uranyl compounds and manages to induce some order in an otherwise confused topic. This chapter is also characterized by a willingness to criticize and to evaluate the work of others.

Chapter 5 is disappointing, not through any fault of the authors, but rather because our knowledge of the electronic states of the uranyl ion is so very poor.

The worth of this book lies in its careful delineation of what is known and what is not known. It could be considered a primer for research in uranyl spectroscopy and photochemistry. It is four years out of date, but nonetheless it should prove indispensable to the research worker interested in this area.

S. P. McGlynn

Coates Chemical Laboratories, The Louisiana State University
Baton Rouge, Louisiana 70803

Introduction to the Atomic Nucleus. By J. G. CUNINGHAME, Atomic Energy Research Establishment, Harwell, Didcot, Berks, Great Britain. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York, N. Y. 1964. xi + 220 pp. 14 × 22 cm. \$9.00.

"Introduction to the Atomic Nucleus" is intended as a survey of the characteristics of the nucleus for the scientific reader who is neither a nuclear physicist nor a nuclear chemist. After two introductory chapters concerned briefly with history, general definitions, and properties of radioactive materials, there are chapters dealing with nuclear forces, stable nuclides, unstable nuclides (radioactivity), nuclear models, nuclear reactions, fission, α -decay, β -decay, γ -emission, and interaction of particles with matter. Essential mathematical relations are given and explained, but not derived. The material has been carefully selected and is very well illustrated, as evidenced by 58 figures distributed rather uniformly over the 200-odd pages. Numerous references to the literature, including well-chosen reviews, are given for the benefit of those who wish to delve further into a particular topic.

The author has produced a lucid and readable monograph that meets the needs of the chemist, biochemist, biologist, etc., desiring a concise treatment of the subject.

Edwin O. Wiig

University of Rochester
Rochester, New York

Chelating Agents and Metal Chelates. Edited by F. P. DWYER, Australian National University, Canberra, A.C.T., Australia, and D. P. MELLOR, University of New South Wales, Kensington, N.S.W., Australia. Academic Press Inc., 111 Fifth Ave., New York, N. Y. 1964. 530 pp. 15.5 × 22.5 cm. \$18.00.

This discussion of metal chelate compounds is a collection of chapters on topics which reflect the main interests of the contributors. The variation in scope of these subjects is considerable, with one chapter, for example, dealing with the general subject of metal chelates in biological systems, while others are restricted to such topics as bidentate ligands, and the tetrapyrrole pigments. While the book offers interesting information on many phases of the subject that have not been brought together previously, it does not, nor do the authors intend that it should, provide coverage of all aspects of the chemistry of the metal chelate compounds. It also suffers from a common defect of multiple authorship, in that the various parts of the book are only loosely tied together and, in some cases, not at all.

The first chapter, by Professor D. P. Mellor, is a survey of historical developments, definitions of terms, and general properties of metal chelates. There is a short section which interprets stabilities of metal chelates in terms of the properties of the ligands,