

epoxidopregnene-17 α ,21-diol-3,20-dione,⁶ was not observed in these fermentations.^{13,14}

These studies would seem to preclude I as an in-

(13) In another experiment $\Delta^4,16$ -pregnadiene-3,20-dione was incubated with *Actinomyces* A.T.C.C. 11009, a 16 α -hydroxylating organism (D. Perlman, E. Titus and J. Fried, *THIS JOURNAL*, **74**, 2126 (1952)). The formation of $\Delta^4,16\alpha,17\alpha$ -epoxidopregnene-3,20-dione could not be demonstrated.

(14) Extension of these studies to include other types of microorganisms and additional substrates is in progress. A discussion of the mechanistic implications of microbiological epoxidation will appear elsewhere.

intermediate in the microbiological synthesis of hydrocortisone from Compound S. In this respect they complement the findings of Hayano and Dorfman¹⁵ with mammalian adrenal enzyme systems.

(15) M. Hayano and R. I. Dorfman, *J. Biol. Chem.*, **211**, 227 (1954). Rather contrary findings are described by K. Miescher, A. Wettstein and F. W. Kahnt, *Acta Physiologica Latino Americano*, **3**, 144 (1953).

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BOOK REVIEWS

An Advanced Treatise on Physical Chemistry. Volume V. Molecular Spectra and Structure. Dielectrics and Dipole Moments. By J. R. PARTINGTON, M.B.E., D.Sc., Emeritus Professor in the University of London. Longmans, Green and Co., 55 Fifth Avenue, New York 3, N. Y. 1955. x + 565 pp. 17 X 25.5 cm. Price, \$15.50.

The present volume of Professor Partington's treatise is concerned with molecular spectra, dielectric constants and dipole moments. Inclusion of these topics in one volume is appropriate, and results in a comprehensive survey of two important aspects of molecular structure. The treatise should be particularly valuable to the graduate student in physical chemistry who is preparing for examinations. At the same time it is a useful reference work for specialists. The style of writing is exceptionally clear, and should appeal both to specialist and non-specialist.

The form of presentation is unusual, and may be described as a mixture of experimental description, physical theory and pure mathematics. If the last component appears to be overemphasized, it must be admitted that the mathematical background is unusually complete for a text of this kind. Consequently there is less need for consultation of other texts. For example, applications of quantum mechanical theory to problems of molecular structure is accompanied by an unusually complete (60 page) treatment of spherical harmonics, and later by a 32 page discussion of symmetry and group theory. Many painful details are included which are frequently avoided by other writers, or relegated to appendices or footnotes. Similarly, the treatment of dielectrics begins with a full discussion of elementary theory of alternating current circuits. Mention should be made also of the large number of literature references (4056, according to the author) in the present volume. This feature should be particularly helpful to the serious student.

The discussion of experimental material is uneven. It is rather brief in connection with molecular spectra, but rather complete in connection with dielectric phenomena. Methods of dielectric measurements are described in some detail, and are well illustrated by numerous diagrams of apparatus and electrical circuits. Full tables are given of dielectric constants, Kerr effect data and of dipole moments. The relation of dipole moments to molecular structure is discussed fully.

The treatise is less satisfactory in some aspects of fundamental physical theory, particularly the theory of molecular spectra. Discussion of the origins and meaning of infrared and electronic spectra are brief, and perhaps inadequate. The "simple" theory of the Raman effect on page 28 is certainly unsatisfactory, although a more nearly correct discussion is given later on pages 48 and 54. It appears that a more straightforward explanation of molecular orbitals might have been given and more extensive discussion based on recent calculations might have been included.

This volume will certainly not appeal to hurried readers who seek a streamlined account of molecular structure. Others may reject it for aesthetic reasons, for when experimental details, physical theory and all necessary mathe-

matics are included in juxtaposition, some sense of logical development inevitably will be lost. This feature should not detract, however from its utility as a valuable reference work for the serious student of molecular structure.

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A. B. F. DUNCAN

Biochemistry of Nitrogen. Series A. II. Chemica Nr 60
A Collection of Papers on Biochemistry of Nitrogen and Related Subjects. Dedicated to Artturi Ilmari Virtanen. Editorial Board: N. J. TOIVONEN, E. TOMMILA, J. ERKAMA, P. ROINE, J. K. MIETTINEN. Suomalainen Tiedekatemia, Publishers, Helsinki, Finland. 1955. 535 pp. 17.5 X 25 cm. Price, 2300 Mk., Bound 2800 Mk.

"The contributions of this volume offer an international tribute to an esteemed scientist" . . . "who has laid the foundation for Finnish biochemistry."

The volume consists of forty-eight papers each of which bears a relationship to the past work of Virtanen. This evidence of intellectual ancestry is not surprising in view of the extensive investigative activity of the honoree and his profound influence upon knowledge in this field. Most of the papers report experiments in an amount of detail which characterizes journal articles. Some of the papers, however, are brief reviews. These latter include, "The Synthesis of Nucleotide Coenzymes," by A. R. Todd; "Nitrogen-Deficient Microorganisms: A New Technique in Microbiological Chemistry," by J. De Ley; "Mutations and Adaptations in Bacteria," by C. N. Hinshelwood; "Étude de l'action de quelques cations divalents sur les combinaisons acide phytique-protéine," by R. Barré, J. E. Courtois, and G. Wormser; "Application of the Symbiosis Phenomenon among Lactic Acid Bacteria to the Study of the Biosynthetic Pathways of Growth Factors," by Veikko Nurmikko; "Activity-pH-curve of Yeast Invertase and the Mechanism of Hydrolase Action," by Karl Myrbäck; "Gedanken über die Bedeutung der makromolekularen Chemie für die Biologie," by Hermann and Magda Staudinger; "Chromatographic Experiments with Proteins," by Arne Tiselius; "Recent Advances in the Chemistry of Some Natural Polymers Containing Amino Sugars," by M. Stacey; "Antibiotics and Nitrogen Excretion—With Special Reference to Penicillin," by W. H. Peterson; "Nitrogenous Compounds in Plants: Recent Knowledge Derived from Paper Partition Chromatography," by F. C. Steward, R. M. Zacharius, and J. K. Pollard; "The Energy Change in Organic Rearrangements and the Electronegativity Scale," by Linus Pauling; "Remarks on the Physiological Importance of the Nucleoside Phosphotransferases," by Erwin Chargaff; and "A Universal Definition of the Concept of \gg Buffer \ll , Founded on Brønsted's Acid-Base Definition," by Holger Jørgensen.

Representative articles describing primarily sets of experiments include, "Photoperiodism and Photosynthetic

CO₂ Assimilation," by L. Norris and M. Calvin; "The Purification of Pancreatic Lipase and the Estimation of its Activity," by Earl B. Herr, Jr., and James B. Sumner; "Kristallisiertes β -Carbonsäureamid-N⁷-D-xylisido-pyridiniumbromid," by P. Karrer, M. Viscontini and O. Leutenegger; "Nitrogen Fixation by *Aerobacter aerogenes*," by P. B. Hamilton and P. W. Wilson; "Reduktone, ihre Bildung und Stabilität," by Hans von Euler und Hans Hasselquist; "Bacterial Formation of Adenosine—Properties of the Cell-Free Enzyme System in *Escherichia coli*," by John L. Ott and C. H. Werkman; "The pN_2 and the pO_2 Function for Nitrogen Fixation by Excised Soybean Nodules," by R. H. Burris, Wayne E. Magee, and Michael K. Bach; "Synthese eines radioaktiv markierten Kynurenins (¹⁴C)," by Adolf Butenandt and Rüdiger Beckmann; "Reversible Splitting of Homogeneous Horse Myoglobin," by Hugo Theorell and Åke Åkeson; "Étude de quelques transaminations intervenant dans le métabolisme de l'acide cystéinsulfonique chez les animaux supérieurs," by Fernande Chatagner, Bernadette Bergeret, and Claude Fromageot; "Chaconin," by Richard Kuhn and Irmentraut Löw; and "Arsenolysis and Phosphorolysis of Citrulline," by H. A. Krebs and L. V. Eggleston. The other two dozen papers represent, as do these, a high average quality.

Printed critical consideration of four dozen papers would be prohibitively expensive; two will be considered. The paper by Hinshelwood on mutations and adaptations is particularly provocative inasmuch as it represents one more rebuttal in which workers such as Hinshelwood and Virtanen have differed with proponents of more orthodox ideas on these topics. This reviewer has admired the courage of these men in a period when many scientists allow avoidance of a reputation for association with unpopular or controversial concepts to take precedence over more worthy considerations. Unpopular concepts are, however, frequently something less than correct and it is of interest that a more defensive and integrative tone is now evident in Hinshelwood's article. With the unsettled knowledge of the gene-enzyme-reaction relationship it seems probable, however, to this reviewer that at least one basic link is missing from the chain of our understanding of adaptations and mutations, and that radically new insight is required.

The paper by Steward and co-workers presents many R_i coefficients of biochemical substances. These should be of much value to biochemists. It may be noted, however, that the Cornell workers report values to the third place following the decimal point although their standard deviations reveal uncertainties as great as ± 0.06 and in no case less than ± 0.01 .

As a tribute to Artturi L. Virtanen, the names of the authors and the quality of their work and interpretations in this scientific anthology have succeeded admirably. As a source of new seed crystals of knowledge and of perspective for specialists, the book offers value probably superior to that derivable from the same amount of time spent in several symposia. As instruction to the student or more casual reader, acquaintance with a cross-section of the current products of some of the ablest workers in the field is convenient. For this last type of reader, however, the book would have been considerably more valuable if the editorial board had arranged the papers in a more logical sequence.

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"The Nucleic Acids" Chemistry and Biology. Volume 1.

Edited by ERWIN CHARGAFF, Department of Biochemistry, Columbia University, New York, N. Y. and J. N. DAVIDSON, Department of Biochemistry, University of Glasgow, Glasgow, Scotland. Academic Press, Inc. Publishers, 125 East 23rd Street, New York 10, N. Y. 1955. xi + 626 pp. 16 × 23.2 cm. Price \$16.80.

Research in the field of nucleic acids has accumulated increasing evidence implicating nucleic acids as playing an important role in the fundamental processes of life. Over twenty years have elapsed since the appearance of the classic monograph of Levene and Bass, the last comprehensive treatment of this subject.

The first volume of this book builds up the topic logically, starting with a discussion of the chemistry of D-ribose and D-

deoxyribose by W. G. Overend and M. Stacey. This chapter includes tables describing a series of paper chromatographic systems and properties of ribose, deoxyribose and related compounds that will be useful in identifying the pentose components of new samples of nucleic acids.

The chemistry of purines and pyrimidines is discussed by A. Bendich, that of the nucleosides and nucleotides by J. Baddiley, and finally the chemistry of the bonds in the nucleic acids is reviewed by D. M. Brown and A. R. Todd. Methods of preparation, analysis and properties of nucleic acids are described by H. S. Loring, Z. Dische, G. R. Wyatt, E. Chargaff and B. Magasanik. The discussion of electrophoretic separations of nucleic acid derivatives by J. D. Smith is one of the most lucid descriptions of electrophoretic techniques in the literature. A chapter by W. E. Cohn describing ion-exchange chromatography is included as well as discussions of the physical and optical properties of nucleic acids by D. O. Jordan and G. H. Beaven, E. R. Holiday and E. A. Johnson.

The concluding chapter in this volume is a treatment of the enzymes attacking the nucleic acids and their components by G. Schmidt. This chapter is characterized by a thorough treatment and keen insight into the problems facing the investigator in this field.

There are several aspects of this book which the reviewer feels could be improved. The elimination of excess verbiage from various chapters was not done uniformly. The chapter dealing with the chemistry of nucleosides and nucleotides has unduly emphasized methods for proof of structure. The inclusion in this chapter of a section dealing with methods of preparing isotopically labeled compounds would be useful to biochemists. Although the significance of isobestic points is discussed in Chapter 3, this material more logically should have been given a thorough treatment in the chapter on optical properties. Although this book is rather expensive for its size, the costly footnote references add to its value. It also appears to have been comparatively slow in publication. The literature is covered thoroughly only through 1953; however, the addition of addenda summarizes the literature into the beginning of 1954.

The second volume of this series will include the more biological aspects of the topic.

Volume I has been well organized and edited so that it is a unit with little duplication, rather than a series of review articles. Cross references are frequent and helpful. There is a wealth of "hand book" data which will make this volume an essential tool in laboratories working in this field. It is highly recommended both for those active in the field as well as for those desiring to learn more about this fascinating subject.

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NEW YORK, NEW YORK

MILTON PAUL GORDON

Handbuch der mikrochemischen Methoden. Edited by

FRIEDRICH HECHT and MICHAEL K. ZACHERL, Wien, Austria. Volume 1, Part 1. *Preparative Mikromethoden in der organischen Chemie.* By H. LIEB and W. SCHÖENIGER, Graz, Austria. *Mikroskopische Methoden.* By L. and A. KOFLER, Innsbruck, Austria. Springer Verlag, Publishers, Moelkerbastei 5, Wien I, Austria. 1954. vi + 236 pp. 17.2 × 25 cm. Price—Ganzleinen, \$11.30; Subscribers to Handbuch, \$9.05.

The first section of the present volume entitled: "Preparative micromethods in organic chemistry" (88 pp., 139 fig., 6 tables) in nine out of its ten chapters, gives the methods and illustrations of apparatus for most microchemical laboratory operations such as: adsorption, centrifuging, crystallization and recrystallization, dialysis, distillations (ordinary, vacuum and molecular), drying, extraction, filtration, heating and cooling, stirring and sublimation.

The tenth chapter contains six tables, of which the first lists common organic solvents, the next two, heating baths and freezing mixtures, the remaining three are devoted to the evaluation of various microchemical apparatus for extractions, distillations and sublimations.

While the first section of the book is a collection of many, previously published methods by numerous authors, the second, entitled: "Microscopic Methods" (144 pp., 136 fig., 1 table) brings detailed discussions of the optical phenomena that take place, when a melting point or a mixed