

consistent with a $C_6H_5COC=C$ system, the strong $C=C$ stretching band characteristic of this system was absent; (iii) its ultraviolet spectrum was consistent with the presence of either a simple benzoyl group or a benzoylcyclopropyl system, but not of a $C_6H_5COC=C$ system [cf.³ acetophenone, λ_{max}^{EtOH} 242 $m\mu$ (ϵ 12,300), benzoylcyclopropane, λ_{max}^{EtOH} 244 $m\mu$ (ϵ 14,100), and crotonophenone, λ_{max}^{EtOH} 256 $m\mu$ (ϵ 17,400)]; further, the ultraviolet maximum of its 2,4-dinitrophenylhydrazone lay at a wave length slightly higher than that usual for alkyl phenyl ketone 2,4-dinitrophenylhydrazones ($379 \pm 1 m\mu$ in $CHCl_3$)⁴; (iv) its n.m.r. spectrum, with peaks at 821, 944, 960, 1161, 1197 and 1225 cycles,^{5,6} was consistent with the structure I (cf. the n.m.r. spectrum of benzoylcyclopropane, peaks at 947, 964, 1160, and 1222 cycles); (v) treatment with zinc chloride, acetic anhydride and acetic acid followed by alkaline hydrolysis gave a salt, formulated as II, which was oxidized with chromium trioxide and pyridine to 4,7-dioxo-7-phenylheptanoic acid (III) identified by comparison with an authentic sample.⁷

The reaction is considered to proceed *via* the intermediates IV and V. Sodium borohydride reduction of III gave 4,7-dihydroxy-7-phenylheptanoic acid γ -lactone, n_D^{20} 1.5390, $\lambda_{max}^{liq.}$ 2.86, 5.64 μ (Anal. Calcd. for $C_{13}H_{16}O_3$: C, 70.89; H, 7.32. Found: C, 71.08; H, 7.16) which was oxidized with chromium trioxide and sulfuric acid in acetic acid to V, m.p. 75–76°, λ_{max}^{KBr} 5.59, 5.92 μ (Anal. Calcd. for $C_{13}H_{14}O_3$: C, 71.54; H, 6.46. Found: C, 71.71; H, 6.49); acidification of II also gave V. Treatment of V with potassium *t*-butoxide under the conditions used for the original isomerization gave I in 64% yield.

(3) R. P. Mariella and R. B. Raube, *THIS JOURNAL*, **74**, 521 (1952).

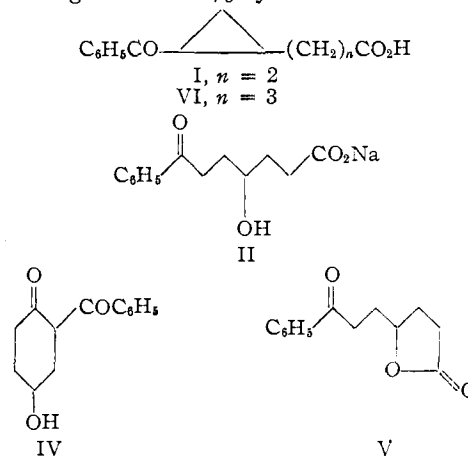
(4) F. Ramirez and A. F. Kirby, *ibid.*, **75**, 6026 (1953).

(5) On the Bothner-By scale, in which the aromatic and methyl proton resonance peaks of toluene are assigned values of 1000 and 1197 cycles, respectively.

(6) We thank Mr. Edwin A. Chandross for these measurements.

(7) E. A. Kehler, *Ber.*, **34**, 1263 (1901).

Similar treatment of 4-benzoyloxycycloheptanone, n_D^{20} 1.5363, $\lambda_{max}^{CCl_4}$ 5.80, 5.84 (shoulder) μ (Anal. Calcd. for $C_{14}H_{16}O_2$: C, 72.39; H, 6.94. Found: C, 72.12; H, 7.06), with potassium *t*-butoxide gave in 58% yield an *acidic isomer*,



as a liquid, molecularly distilled at 65–75° (bath temperature; 10^{-3} mm.), n_D^{20} 1.5416, $\lambda_{max}^{CCl_4}$ 3.0–3.5, 5.84, 5.96 μ , λ_{max}^{EtOH} 244 $m\mu$ (ϵ 14,700), n.m.r. peaks at 813, 944, 964, 1164, 1198 and 1225 cycles^{6,6} (Anal. Calcd. for $C_{14}H_{16}O_3$: C, 72.39; H, 6.94. Found: C, 72.43; H, 7.10), which gave a semicarbazone, m.p. 133.5–135° (Anal. Calcd. for $C_{15}H_{19}N_3O_3$: C, 62.27; H, 6.62; N, 14.52. Found: C, 62.51; H, 6.72; N, 14.53) and a 2,4-dinitrophenylhydrazone of the corresponding ethyl ester, m.p. 127.5–128.5°, $\lambda_{max}^{CHCl_3}$ 5.78, 6.18, 6.26 μ , λ_{max}^{EtOH} 377 $m\mu$ (ϵ 24,400). (Anal. Calcd. for $C_{22}H_{24}N_4O_6$: C, 59.99; H, 5.49; N, 12.72. Found: C, 59.79; H, 5.58; N, 12.91). This product is formulated as VI on the basis of the close similarity of its properties to those of I.

DEPARTMENT OF CHEMISTRY
HARVARD UNIVERSITY
CAMBRIDGE, MASSACHUSETTS

PETER YATES
CHARLES D. ANDERSON

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BOOK REVIEWS

Bacterial Fermentations. CIBA Lectures in Microbial Chemistry. 1956. By H. A. BARKER, Professor of Microbial Biochemistry, University of California, Berkeley, California. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1957. vii + 95 pp. 13 × 19 cm. Price, \$3.00.

This is the first book in the series: CIBA Lectures in Microbial Biochemistry. These lectures were established in 1955 at the Institute of Microbiology, Rutgers, The State University of New Jersey, through the support of the CIBA Pharmaceutical Products, Inc., Summit, N. J. The lectures are delivered in the spring of each year at the Institute.

This little volume of ninety pages, plus index, is packed with a gratifying amount of factual material. The topics

covered in this volume are: Biological Formation of Methane (Chap. 1), The Chemistry of Butyric Acid–Butanol Fermentations (Chap. 2), and Fermentations of Nitrogenous Compounds (Chap. 3).

In the first chapter the taxonomy of the methane-producing bacteria is discussed together with a very useful account of the author's methods for isolating and culturing these organisms. Progress on this phase of the problem has been slow the author states since the isolation of pure cultures, "has been difficult and in many instances impossible to achieve." In the other two chapters the reader is referred to standard texts and the literature for information on classification and details of culture methods.

Primarily the emphasis is on the chemical pathways by which the various substrates are or appear to be broken down

to the simpler fermentation products. The author stresses the importance of those reactions capable of yielding free energy for bacterial growth. Assimilation of CO₂ and its reduction to CH₄ as proposed by Van Niel is discussed at some length in Chapter 1.

Each subject is introduced by an historical summary going back to the earliest recorded observations. Although the author disclaims any attempt at a complete bibliography he cites 162 references judiciously chosen so that the research worker wishing to pursue further study of the fields discussed could use the review as a starting point.

DEPARTMENT OF BACTERIOLOGY
UNIVERSITY OF FLORIDA
GAINESVILLE, FLORIDA

A. M. BUSWELL

Radioaktive Isotope ihre Herstellung und Anwendung.

By DR. KURT SCHMEISER, Knapsack-Griesheim A. G., Werk Knapsack Bei Köln, Früher Institut für Physik am Max-Planck-Institut für Med. Forschung, Heidelberg. Springer-Verlag, Reichpietschufer 20, Berlin W 35, Germany. 1957. xi + 246 pp. 17 × 25.5 cm. Price, DM 48.60.

The title of this book scarcely prepares the reader for the thorough treatise on radioactivity which the volume contains. Practically every topic conceivably pertinent to a discussion of radioactive processes from the experimental point of view is included. Beginning with an outline of the general features of nuclear structure, the author proceeds to give concise and easily comprehensible accounts of natural radioactivity, of artificially-induced nuclear transformations and the nuclear reactions by which radioactive isotopes are made. The principles governing the detection and measurement of radioactive radiations are developed with clarity and in detail. The application of these principles to actual detectors of the radiations is discussed with equal attention to the individual characteristics of each experimental device used in the measurement of radioactivity. No important method of measurement is overlooked.

It seems superfluous to give here a recapitulation of the contents of this book. The prospective reader can be assured that he will find in the pages of this volume the answer to practically any question which arises in the field of experimental radioactivity. A student could scarcely hope to find a better text from which to learn the elements of this important subject. A technician will find it a reliable guide in planning his work.

There is every evidence that the text has been prepared with great care. The information given is timely and accurate. Numerous clear and well-chosen illustrations and several extensive tables of data relating to nuclear processes enhance the value of the book.

NATIONAL BUREAU OF STANDARDS
WASHINGTON 25, D. C.

LEON F. CURTISS

Advances in Enzymology and Related Subjects of Biochemistry. Volume XVIII. Edited by F. F. NORD, Fordham University, New York, N. Y. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. v + 435 pp. 16 × 23.5 cm. Price, \$9.00.

This volume of the *Advances in Enzymology* appears to be of considerable interest to a number of areas of biochemistry and related fields. The authors selected to review these fields are particularly competent specialists in their areas. The chapter by Hartree on cytochrome in higher plants is an excellent review. An attempt is made not only to present information regarding plant cytochromes, but a comparison of these cytochromes to bacterial and animal cytochromes is discussed.

Singer, Kearney and Massey's article on succinic dehydrogenase reviews the authors' recent work and also attempts to reconcile information of past with present investigations. The discussion of the mechanism of succinic dehydrogenase action is of particular interest; an attempt is made by the authors to clarify the problem whether fumaric dehydrogenase and succinic dehydrogenase are one or two enzymes.

The section on the mechanism of toxicity of *Dichapetalum cymasum* by Sir Rudolph A. Peters deals with the action and properties of fluorinated compounds. The evidence

that the toxic action of fluoroacetate is due to the plant synthesis of fluorocitrate is reviewed in detail and it is well documented. This review is an excellent attempt to integrate the information from Peters' own laboratory as well as that from other laboratories. Butler and Davison have reviewed some of the newer aspects on deoxyribonucleoproteins. The authors take particular cognizance of the possible role of the nucleoproteins as genetic factors.

In a timely review Kornberg has attempted to summarize the significance of pyrophosphorylases and phosphorylases in synthetic reactions. Workers in this area of enzymology, which is particularly active at this time, will gain much from this review. Kornberg has made a valiant attempt to integrate and classify the various types of pyrophosphorylases and phosphorylases.

Wiame has reviewed the role of the tricarboxylic acid cycle in synthetic reactions. This review covers a good deal of information and should be useful to investigators. However, the review is somewhat complex because of the inclusion of some information which appears not to be essential. The review, however, does give an excellent summary of the synthetic reactions leading out of the citric acid cycle in microorganisms.

The review by James is quite a complete one on the respiration of higher plants. Here again the information quoted is of use and will be of value to workers in plant metabolism.

The active investigations of the last few years on the chemistry and function of lipoic acid are adequately reviewed by Reed. He has given a particularly good summary of the chemical properties of lipoic acid.

The complex problems involved in lignification are reviewed in the chapter by Schubert and Nord. A good deal of material has been summarized and this should be of value to workers in this particular area.

In general this volume is well written and well documented and should become a valuable contribution to biochemistry.

GRADUATE DEPARTMENT OF BIOCHEMISTRY

BRANDEIS UNIVERSITY
WALTHAM, MASSACHUSETTS

NATHAN O. KAPLAN

Annual Review of Physical Chemistry. Volume 8. H. EYRING, Editor, University of Utah, C. J. CHRISTENSEN, Associate Editor, University of Utah, and H. JOHNSTON, Associate Editor, University of California. Annual Reviews, Inc., Grant Avenue, Palo Alto, California. 1957. vii + 527 pp. 16 × 23 cm. Price, \$7.00 (U.S.A.), \$7.50 (elsewhere).

This volume is an excellent addition to an extremely useful, almost indispensable, series. The authors, as usual, are experts in their respective fields and represent a reasonably international selection. After the publication of seven previous volumes in the series there is little point in listing the more or less standard topics covered. Chapters included in the present volume on somewhat less conventional subjects are the following: High Polymers in Solution, Kinetics of Polymerization, Electrode Processes, Organic Reaction Mechanisms, Vibration-Rotation Spectroscopy, Combustion and Flames, The Physical Chemistry of Proteins, and Bond Energies.

Physical chemists owe a very considerable debt of gratitude to the editors and authors of this series. With the continued proliferation of the field of physical chemistry, these reviews become more valuable with each passing year.

DEPARTMENT OF CHEMISTRY

UNIVERSITY OF OREGON
EUGENE, OREGON

TERRELL L. HILL

Kinetics and Thermodynamics in Biochemistry. By H. GEOFFREY BRAY, D.Sc. (Birm.), and KENNETH WHITE, B.Sc. (Lond.), Ph.D. (Birm.), F.R.I.C., Lecturers in Biochemistry, Department of Physiology, University of Birmingham. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1957. xii + 343 pp. 16 × 24 cm. Price, \$7.50.

This rather small volume attempts to cover a large subject. According to the authors, the book is aimed at the honours' student of Biochemistry, biochemists unfamiliar