

ture and to contain 92.2% C and 7.82% H in agreement with the calculated values 92.25% C and 7.75% H. The spectrum shows clearly that the material is not any substance, *e. g.*, styrene, for which Raman data are available and with which the material might be identified on the basis of its boiling point and elementary analysis.

As seen in Table I the number of Raman lines, and particularly of polarized lines, is small for any molecule of 16 atoms unless the molecule possesses considerable symmetry. The spectrum shows a strong carbon-carbon double bond frequency at a place which indicates that the double bond is not drastically affected by resonance, in contradistinction to the situation in benzene. The number of intense C-H stretching frequencies is small (three) and the spectral region over which

they extend is narrow (*ca.* 60 cm.^{-1}). Only one C-H stretching frequency appears to be polarized.

The following conclusions may reasonably be drawn from the Raman data alone: (1) The molecule cannot have cubic symmetry (O_h) or planar symmetry with an eight-fold axis (D_{8h}) because the number of polarized lines observed is too large. The location of the polarized C=C frequency at 1650 cm.^{-1} is consonant with this conclusion. (2) The molecule cannot have two different geometrical forms (space isomers analogous to "chair" and "boat" forms of cyclohexane) in equilibrium because the spectrum is too simple. (3) All the hydrogen atoms are equivalent. (4) The molecule contains no $-\text{C}\equiv\text{C}-$, $-\text{CH}_2-$ or $-\text{CH}_3$ groups nor a benzene ring with side groups or rings. (5) The molecule possesses a multiple axis of symmetry.

Detailed consideration of the Raman spectrum leads us to believe that it can best be interpreted on the basis of a D_4 structure (puckered 8-membered ring with alternate single and double bonds). This conclusion is of course less certain than the five listed above. At present we are studying the infrared spectrum of the vapor, making further measurements on the depolarization factors of the Raman lines and attempting the preparation of the isotopic molecule C_8D_8 . A thorough interpretation of the Raman spectrum will be deferred until these additional spectroscopic studies have been carried out.

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TABLE I
RAMAN SPECTRUM OF CYCLOÖCTATETRAENE

Frequency in cm.^{-1}	Intensity	Approximate depolarization	Frequency in cm.^{-1}	Intensity	Approximate depolarization
194	9	1/2	1410	0	...
249	4	6/7	1439	6	6/7
292	3	6/7	1461	0	...
366	7	6/7	1570	0	...
497	0	..	1601	3	6/7 ?
655	2	..	1631	5	6/7 ?
728	00	..	1650	10	1/5
758	0	..	1743	1	...
873	8	1/10	2793	1	...
905	0	..	2832	1	...
948	5	6/7	2853	1	...
964	1	..	2954	10	6/7
1202	7	6/7	3003	10	6/7
1221	2	..	3013	10	<6/7
1282	0	..	3048	1	...

NEW BOOKS

Catalytic Chemistry. By HENRY WILLIAM LOHSE, Ph.D., F.C.I.C., Consulting Chemist. Chemical Publishing Co., Inc., Brooklyn, New York, 1945. xiv + 471 pp. 30 illustrations. 14.5 × 22.5 cm. Price, \$8.50.

The author has aimed "to present a text which, when carefully studied, will permit a chemist with elementary training to obtain a concrete idea what catalytic chemistry deals with and what its working principles are." "Numerous references have been made to original treatises on specialized subjects and it is hoped it will be helpful to those who want to study any specific subject. Considerable stress has been laid on the subject of minor constituents (impurities) but, unfortunately, there are very few published data which can be included at this time." The four leading chapters of the book are entitled, Catalytic Theory (106 pp.); Nature and Properties of Catalysts (69 pp.); Specific Types of Catalytic Reactions (120 pp.) and Industrial Catalytic Reactions (120 pp.). In a foreword Dr. E. Emmet Reid states that "Sabatier covered the field

of organic catalysis; no mortal can do that now." "Dr. Lohse has brought together many facts, but his chief concern has been the significance of their relations. May this book catalyze further progress in catalysis." The reviewer is of the opinion that Dr. Lohse's book is a worthwhile addition to any library of chemistry since the statement by Dr. Reid quoted just above, is well justified.

HOMER ADKINS

On the Structure of the Protein Molecule. By N. TROENSEGAARD. Einer Munksgaard, Norregarde 6, Copenhagen, Denmark (Humphrey Milford, Oxford University Press, London), 1944. 126 pp. 16 × 24 cm. Price, Dan. Cr. 14,000.

This book summarizes the researches of Troensegaard in protein chemistry during the last twenty-five years. Some of the material has been previously published in

Hoppe-Seylers *Zeitschrift fuer physiologische Chemie*. Troensegaard dissolves dry proteins in anhydrous methanol-KOH, if necessary with boiling for two hours. After neutralization with anhydrous ethyl acetate, he acetylates by means of acetic anhydride. The acetylated protein is hydrogenated with sodium in amyl alcohol; ice is added, and, after a short, cold hydrolysis and the addition of ether, the hydrogenated protein is separated into different basic and acid fractions. From the countless fractions isolated by these procedures a few "compounds" were obtained, and these in extremely small yield; their structure was established by elementary analysis only. Since among the substances so isolated and so characterized are pyrroles and piperidines, Troensegaard comes to the conclusion that "proteins mainly are composed of heterocyclic rings which are easily split by acids, alkalies and enzymes, giving rise to the hydrogenated protein is separated into different basic and acid fractions." He rejects the polypeptide theory of protein structure, and the vast amount of evidence in the literature of the last 25 years which supports it.

The first edition of this book appeared in German and must have been rather severely criticized by some reviewers, whom the author accuses of being "too firmly rooted in the old ideas and not aware of the analytically proved facts that are incompatible with the Emil Fischer's polypeptide theory." It is of interest to note, as H. B. Vickery points out in the *Journal of Physical Chemistry* (May, 1946), that Troensegaard "is not a professional chemist; he is a business man who has made the chemistry of proteins his hobby, an amateur in the old sense of the term." This reviewer feels that although Troensegaard's experimental findings and deductions should not be taken too seriously, his work emphasizes the need for a thorough scientific study of the breakdown of proteins in non-aqueous media.

ERWIN BRAND

Water Bacteriology, with Special Reference to Sanitary Water Analysis. By SAMUEL CATE PRESCOTT, CHARLES EDWARD A. WINSLOW AND MAC HARVEY MCCRADY. Sixth Edition, John Wiley and Sons, Inc., New York, N. Y. 1946. ix + 368 pp. Price, \$4.50.

"Elements of Water Bacteriology" (1904) by the two senior authors of this work underlies the present volume. Mr. McCraday's association with these authors begins with the present edition.

As stated by the authors, "Water Bacteriology" is intended to serve a number of different purposes: to provide the historical and philosophical background for adequate comprehension of the meaning of the bacteriological methods included in "Standard Methods of Water Analysis of the American Public Health Association"; to be a source of reference for the laboratory worker who applies the techniques involved; and to be a source of reference for the investigator who, in the future, will further improve and extend those techniques. These purposes the book fulfills admirably, in particular the first.

Introductory chapters deal with bacteria in natural waters and the collection of samples for bacteriological analysis (34 pp.). Quantitative determination and interpretation of bacterial counts and coliform organisms constitute the heart of the book (172 pp.). There follow discussions of other bacterial indicators of pollution and of the significance and applicability of the bacteriological examination of water (54 pp.). The closing chapters treat of the bacteriology of sewage and the bacteriological examination of shellfish (33 pp.). An appendix presents tables for obtaining the "most probable number from dilution data," a subject to which the junior author has made significant contributions (7 pp.). An extensive bibliography (53 pp.) and an index (14 pp.) complete the book.

GORDON M. FAIR

Grundlagen der Stereochemie. By PAUL NIGGLI, Professor an der Eidg. Techn. Hochschule und der Universität Zürich. Druck von E. Birkhauser und Cie. AG., Basel, Switzerland, 1945. 283 pp. 15 × 24-25 cm. Price, S. Fr. 3250.

The author of this volume is a crystallographer who has contributed much to the systematization of the description and deduction of crystal structures. In the present work he applies symmetry theory and terminology to the structures of both crystals and molecules. In so doing he discusses such subjects as coordination numbers, covalent bonds, resonance, atomic and ionic radii, hydrogen bonds, metallic and van der Waals forces, etc.

These subjects and the structures used for illustration are adequately dealt with elsewhere—e. g., by Pauling in "The Nature of the Chemical Bond." Prof. Niggli's viewpoint, however, being that of a systematic crystallographer, is thought-provoking and hence interesting. Unfortunately, the chemical applications are all in the latter half of the book. In the reviewer's opinion few chemists will have the perseverance to wade through the detailed deduction and description of symmetry relationships and terminology in the first half of the book—a prerequisite for understanding the symbolism in the second half. Nevertheless, this work will find a definite place in the permanent literature of science, and a small number of workers, chiefly analysts of complex crystal structures, will find considerable material of interest and value in it.

MAURICE L. HUGGINS

BOOKS RECEIVED

July 10, 1946–August 10, 1946

RONALD BELCHER and CECIL L. WILSON. "Qualitative Inorganic Microanalysis. A Short Elementary Course." Longmans, Green and Co., Inc., 55 Fifth Ave., New York, N. Y. 68 pp. \$0.80.

FRANCIS CUSSET. "English-French and French-English Technical Dictionary." Chemical Publishing Co., Inc., 234 King Street, Brooklyn 31, N. Y. 591 pp. \$5.00.

G. F. D'ALELIO. "Experimental Plastics and Synthetic Resins." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 185 pp. \$3.00.

STANLEY B. ELLIOTT. "The Alkaline-Earth and Heavy-Metal Soaps." (A. C. S. Monograph Series.) Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y. 342 pp. \$7.50.

BENJAMIN HARROW. "A Textbook of Biochemistry." (Fourth Edition). W. B. Saunders Co., Philadelphia, Pa. 592 pp. \$4.25.

GUNNAR LINDGREN. "Autoxidation of Diethyl Ether and its Inhibition by Diphenylamine." P. A. Norstedt and Son, Stockholm, Sweden. 190 pp.

FREDERICK FIELD PURDON and VICTOR WALLACE SLATER. "Aqueous Solution and the Phase Diagram." Longmans, Green and Co., Inc., 55 Fifth Avenue, New York, N. Y. 167 pp. \$7.00.

JOSEPH ROSIN. "Reagent Chemicals and Standards." Second Edition. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y. 542 pp. \$7.50.

THEODORE VAN SCHELVEN. "Steroid Chains as Components of Protein and Carbon Molecules." Kosmos Publishing Co., Amsterdam, C, Holland. 62+ pp.

A. G. WARD. "Colloids, Their Properties and Applications." Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N. Y. 133 pp. \$1.75.