COMMUNICATION TO THE EDITOR

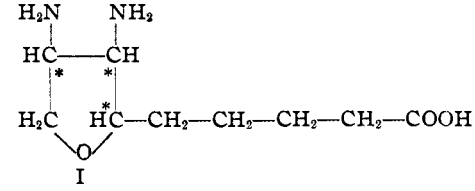
THE SYNTHESIS OF TWO STEREOISOMERIC 3,4-DIAMINO-2-TETRAHYDROFURAN-VALERIC ACIDS

Sir:

Recently[1] a convenient procedure has been described for the preparation of 3,4-dicarboxy-2-furan-valeric acid. These studies have been continued in order to develop synthetic procedures for the preparation of biotin analogs. The purpose of the present communication is to report the synthesis of two stereoisomeric 3,4-diamino-2-tetrahydrofuran-valeric acids.

3,4-Dicarbethoxy-2-furanpentanol was prepared from 2-furanpentanol[2] (α-naphthyl-urethan m. p. 58–59°; calcd.: C, 74.27; H, 6.55; N, 4.33. Found: C, 73.97; H, 6.46; N, 4.41) and diethylacetylene dicarboxylate by the procedure outlined in the aforesaid publication. This material was subjected to high pressure hydrogenation and the reduction products were treated with hydrazine to yield two crystalline hydrazides, $C_{11}H_{22}O_4N_4$, m. p. 208–211° (calcd. C, 48.16; H, 8.08; N, 20.41. Found: C, 48.15; H, 7.85; N, 20.18) and m. p. 177–180° (Found: C, 48.01; H, 7.95; N, 20.27). These two dihydrazides of the stereoisomeric 3,4-dicarboxy-2-tetrahydrofuranpentanols were degraded by the Curtius method to the corresponding 3,4-diaminocarbethoxy-2-tetrahydrofuranpentanols, $C_{15}H_{28}O_6N_2$, m. p. 110–113° (calcd.: C, 54.21; H, 8.49; N, 8.42. Found: C, 53.92; H, 8.09; N, 8.57) and m. p. 128–130° (Found: C, 53.84; H, 8.19; N, 8.64). The primary alcohol group at the end of the aliphatic side chain was then converted to a carboxyl group by oxidation with chromic acid in glacial acetic acid and the resulting 3,4-diaminocarbethoxy-2-tetrahydrofuran-valeric acids (m. p. 118–124° and 157–159°, respectively) were hydrolyzed with concentrated barium hydroxide to the corresponding 3,4-diamino-2-tetrahydrofuran-valeric acids. In order to characterize these compounds by means of sharply melting derivatives, the dibenzoyl methyl esters, m. p. 183–186° (calcd. C, 67.89; H, 6.64; N, 6.60. Found: C, 67.87; H, 6.38; N, 6.62) and m. p. 171–172° (Found: C, 67.62; H, 6.36; N, 6.68), respectively, were prepared, the higher melting isomer being derived from the higher melting hydrazide.

The molecule of 3,4-diamino-4-tetrahydrofuran-valeric acid I contains 3 asymmetric carbon atoms (denoted by means of asterisks).



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and may exist in eight optically active forms. Four racemic mixtures therefore may be expected, two of which contain the amino groups in the *cis* and two which contain the amino groups in the *trans* configuration. The above-described diamino-carboxylic acids undoubtedly represent two of the four possible racemic forms; further work in this connection is at present under way in this Laboratory.

RESEARCH LABORATORIES
CIBA PHARMACEUTICAL PRODUCTS, INC.
SUMMIT, NEW JERSEY KLAUS HOFMANN

RECEIVED DECEMBER 9, 1943

(1) Hofmann, THIS JOURNAL, **66**, 51 (1944).

(2) Hofmann, unpublished results.

NEW BOOKS

The Chemical Background for Engine Research. Editors, R. E. BURK, Director of Research, The Standard Oil Company, Cleveland, Ohio, and OLIVER GRUMMITT, Morley Chemistry Laboratory, Western Reserve University, Cleveland, Ohio. (Frontiers in Chemistry. Volume II.) Interscience Publishers, Inc., 215 Fourth Avenue, New York, N. Y., 1943. vii + 297 pp. Illustrated. 15.5 × 23.5 cm. Price, $3.50.

"Prominent scientists report on recent investigations and interpretations of combustion processes and lubrication":—this brief advertisement which appears on the front jacket page of the volume expresses its contents much better than does the overly ambitious title. Actually, the work is a group of lectures on particular topics by six leading authorities; it is the second successful course of this type given by Western Reserve University in a commendable effort to present both the student and the mature chemist with an intelligible—but by no means superficial—view of current knowledge in the field.

Of the six chapters, "A Survey of Combustion Research," by Ernest F. Fiock, presents a brief but excellent historical review and description of modern methods of studying flame travel. "Chemical Thermodynamics of Hydrocarbons," by Frederick D. Rossini, gives the calculation and best values of the entropy, heat and free energy of formation, and isomerization equilibria. "Synthetic Methods for Hydrocarbons," by Frank C. Whitmore, contains a survey of the typical laboratory Grignard reactions used, and a brief mention of some of the industrial methods of synthesis. "Kinetics of Flame and Combustion," by Guenther von Elbe, is restricted to the slow oxidaiton and self-ignition of hydrogen and the paraffin

hydrocarbons. "The Experimental Side of Combustion Research in Engines," by Bernard Lewis, explains the devices used to measure flame travel, pressure, and temperature in the automobile (Otto-cycle) engine, and reviews present knowledge of knocking combustion. Finally, "Some Physicochemical Aspects of Lubrication," by Otto Beeck, is a comprehensive survey covering engine ring sticking and bearing corrosion, oil oxidation and detergency studies, and boundary lubrication theory and testing.

As is perhaps inevitable in a collection of separate papers such as this, there are some conspicuous omissions. For example, the Diesel engine receives only a page and a half; safety fuels and their ignition are not mentioned nor are fuels of the non-hydrocarbon type; the effects of supercharging and of charge dilution (as by exhaust gas or by water injection) might have been noted; the chemical aspects of work on spark plugs, valves, and bearings is not described, despite its practical importance. Numerous other examples could be adduced but would only serve to illustrate further the obvious fact that the field as a whole is far too large to be completely covered in one small volume.

As a matter of fact, the authors are to be congratulated on having made a judicious selection of important topics and significant details from the mass of information available to them, and on having compressed these into the limited space available, in easily readable form withal. The collection as a whole should well serve its purpose of keeping its readers abreast with the forward movement of science, and it can be especially recommended for school libraries.

The reviewer noticed but few errors. In Dr. Whitmore's chapter, Tables III and IV both list "2-ethylpentane"; Table IV gives the knock ratings of the isomeric heptanes but lists only eight of them and omits the best one of all, triptane; the omission, like others in the book, may have been intentional, although the quality of triptane is surely no military secret.

The volume is printed in large type on high-quality paper, and contains numerous photographic illustrations including some excellent pictures of flame travel. A praiseworthy innovation is the inclusion of two pages giving photographs of the six authors and short biographical sketches about each of them.

HAROLD A. BEATTY

The Adsorption of Gases and Vapors. Volume I. Physical Adsorption. By STEPHEN BRUNAUER, Chemist, Bureau of Plant Industry, United States Department of Agriculture. Princeton University Press, Princeton, New Jersey, 1943. vii + 511 pp. 169 figs. 16.5 × 23.5 cm. Price, $7.50.

This is a very interesting and worth-while contribution to the literature of adsorption. The author has dealt with a great mass of heterogeneous and sometimes contradictory material, and has been markedly successful in achieving an orderly and logical presentation. A general description of the main phenomena and the methods of investigating them is followed by more detailed developments of particular topics such as the shape of the adsorption isotherms, the surface of the adsorbent, and the kinetics of the process. A certain amount of repetition is inevitable, but the net effect is satisfactory.

The author discusses a great many different theories connected with one or another aspect of the subject. Holding definite views of his own, he does not allow them to obtrude themselves unduly into his presentation and evaluation of the work of others. In fact, if fault must be found, it would be rather on the opposite grounds that the various theories are presented as put forth by their authors without sufficient analytical criticism by the author. However, the reviewer is not inclined to reproach the author for this. If the net impression after a forced march through the considerable bulk of this book is that of a mass of theories most of which are limited to the explanation of a few facts and many of which are mutually incompatible, the reasons are to be found in the complexities and difficulties inherent in the subject itself. The careful reader will likely be stimulated to try what he can do to improve the situation.

A. S. COOLIDGE

BOOKS RECEIVED

November 10, 1943–December 10, 1943

FRITZ EPHRAIM. "A Text-Book of Inorganic Chemistry." English Edition by P. C. L. Thorne and E. R. Roberts. Fourth Edition, Revised and Enlarged. 924 pp. Gurney and Jackson, 98 Great Russell Street, London, W.C.1, England (Oliver and Boyd, Ltd., Tweeddale Court, Edinburgh). 28/- net. Interscience Publishers, Inc., 215 Fourth Ave., New York, N. Y. $8.75.

O. A. HOUGEN AND K. M. WATSON. "Chemical Process Principles. Part I. Material and Energy Balances." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 452 pp. $4.50.

GEORGE S. JAMIESON. "Vegetable Fats and Oils." Second Edition. Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y. 508 pp. $6.75.

PAUL O. POWERS. "Synthetic Resins and Rubbers." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 296 pp. $3.00.

PETER PRINGSHEIM AND MARCEL VOGEL. "Luminescence of Liquids and Solids." Interscience Publishers, Inc., 215 Fourth Avenue, New York, N. Y. 201 pp. $4.00.

W. T. READ. "Industrial Chemistry." Third Edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 631 pp. $5.00.

G. W. WEINGART. "Pyrotechnics, Civil and Military." Chemical Publishing Company, Inc., 234 King Street, Brooklyn, New York. 220 pp. $5.00.

L. E. YOUNG AND C. W. PORTER. "General Chemistry." Revised Edition. Prentice-Hall, Inc., 70 Fifth Avenue, New York, N. Y. 527 pp. $3.75.