

phenyl-1,2,3,4-tetrahydronaphthalene. This carbinol is identical with that made three years ago. The addition of a few drops of concentrated hydrochloric acid to a solution of the carbinol in ethanol caused the immediate precipitation of 1,2-diphenyl-3,4-dihydronaphthalene melting at 76°. After three weeks this material changed completely to the high melting form.

My explanation would be that these two forms are physical isomers, and Dr. Bergmann got the high melting form. I got the low melting, less stable form, both at Minnesota and at Vassar, and it is gradually changing to the more stable form after three years.

SANDERS LABORATORY OF CHEMISTRY  
VASSAR COLLEGE  
POUGHKEEPSIE, N. Y.

H. MARJORIE CRAWFORD

RECEIVED OCTOBER 8, 1941

#### THE INTRODUCTION OF TERTIARY BUTYL GROUP INTO ETHYL ACETOACETATE BY MEANS OF BORON TRIFLUORIDE

Sir:

It was shown recently<sup>1</sup> in this Laboratory that ethyl acetoacetate is alkylated by isopropyl alcohol or ether in the presence of boron trifluoride. Other alkylations effected by boron trifluoride were also described recently.<sup>2</sup> It has now been shown that ethyl acetoacetate is alkylated by

(1) Hauser and Breslow, *THIS JOURNAL*, **62**, 2389 (1940).

(2) Hauser and co-workers, Ninth National Organic Chemistry Symposium, December 29-31, 1941, Ann Arbor, Michigan.

*t*-butyl alcohol or *t*-butyl ethyl ether in the presence of boron trifluoride. This reaction should be of special value because of the well-known difficulty of introducing tertiary alkyl groups into active methylenic compounds by the common method in which a base is employed.

In a typical experiment, a mixture of 0.5 mole of *t*-butyl alcohol and 0.5 mole of ethyl acetoacetate was saturated with boron trifluoride at 0°. After standing for six hours at room temperature, the reaction mixture was worked up essentially as described previously.<sup>1</sup> Thirteen grams (14%) of alkylated  $\beta$ -keto ester boiling at 101-102° at 20 mm. was obtained. In this experiment an ester-alcohol exchange apparently occurred, the product analyzing for *t*-butyl  $\alpha$ -*t*-butylacetoacetate (*Anal.* Calcd. for C<sub>12</sub>H<sub>22</sub>O<sub>3</sub>: C, 67.25; H, 10.34. Found: C, 67.38; H, 10.40). The *t*-butyl derivative on ketonic hydrolysis yielded methyl neopentyl ketone which was identified as the semicarbazone and 2,4-dinitrophenylhydrazone.

These experiments will be described in greater detail later. It seems quite likely that the yield of the *t*-butyl derivative can be improved. Studies are now in progress on the introduction of various tertiary alkyl groups into various active hydrogen compounds by means of boron trifluoride or other acidic reagent.

DEPARTMENT OF CHEMISTRY  
DUKE UNIVERSITY  
DURHAM, NORTH CAROLINA

CHARLES R. HAUSER  
JOE T. ADAMS

RECEIVED FEBRUARY 19, 1942

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## NEW BOOKS

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**An Introduction to Organic Chemistry.** BY ROGER J. WILLIAMS, Ph.D., D.Sc., Professor of Chemistry, the University of Texas. Fourth edition. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y., 1941. xiii + 628 pp. Illustrated. 14 × 22.5 cm. Price, \$4.00.

Old friends of this time honored text will be pleased to note that it has been brought up to date without essential change either in the character of the subject matter or in its organization. Electronic structure has been stressed to a somewhat greater extent but aspects of the subject involving more advanced training in physical chemistry than the average student usually has, are omitted. Although considerable statistical information is given, detailed discussion of industrial processes is not included.

The work remains, then, neither an advanced theoretical treatise nor a compendium of information, but, true to its title, a well constructed and clearly presented introduction to organic chemistry.

C. E. BOLSER

**Industrial Instruments for Measurement and Control.** By THOMAS J. RHODES, Engineer, The Procter and Gamble Company. First edition. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York, N. Y., 1941. ix + 573 pp. 282b figs. 15.5 × 23.5 cm. Price, \$6.00.

This addition to the "Chemical Engineering Series" gives an excellent description of the design and a discussion of the theory of instruments for measuring, recording and

controlling the temperature, pressure, rate of fluid flow, and liquid level in chemical manufacturing equipment. The emphasis is on the theory and fundamental principles of design, rather than on the detailed description of the instruments available to the chemical engineer by purchase.

The mathematical theory of automatic control is given clearly and in detail and there are numerous more or less diagrammatic drawings which help to clarify the theory and mode of operation of the many varieties of these instruments. It is interesting to note that the great majority of the literature references cited are to the Transactions of the American Society of Mechanical Engineers, rather than to any of the periodicals specializing in Chemical Engineering.

The actual scope of the book is not as broad as the title seems to promise. There are numerous other quantities which the chemical engineer may be interested in, such as pH, electrical conductance of solutions, color, transparency, opacity, viscosity, weight, numerical count, and chemical composition. A discussion of the specialized instruments for measuring, recording and controlling these quantities is either omitted entirely or given a much less detailed and thorough treatment. However, this statement is not intended as a criticism, which would be ungracious in view of the high quality and great usefulness of the book, but merely as information to prospective buyers and as a suggestion that the coverage might well be extended in a supplementary volume or in the next edition.

GRINNELL JONES

**Torch and Crucible.** The Life and Death of Antoine Lavoisier. By SYDNEY J. FRENCH. Princeton University Press, Princeton, New Jersey, 1941. ix + 285 pp. 15.5 × 23.5 cm. Price, \$3.50.

The author, with commendable enthusiasm for his subject, has undertaken to portray not only the inspired rôle which Lavoisier played in laying the foundations of modern chemical theory, but also his important activities as a great public servant and as a leader of the enlightened but conservative intelligentsia of France during the Revolution. This he has accomplished in a lively, and what doubtless to some readers will be an agreeable, manner. An additional item of interest is the inclusion, for the first time in a biography of Lavoisier, of an account of the interesting and important friendship between the Lavoisier and the du Pont families as disclosed by the correspondence recently translated and presented by Mr. B. G. du Pont in "The Life of Eleuthère Irénée du Pont."

To me, however, the author's picture of Lavoisier and his achievements seems in many places to be palpably overdrawn and sentimental, and the language tiresomely flowery. The author evidently felt that his really unparalleled story required "jazzing up!" I must also add as perhaps the most important item in this review that to me the account of the classic researches of Lavoisier and his contemporaries on combustion and on the composition of the air is less thorough and satisfactory than the scholarly exposition of them by Douglas McKie in his "Antoine Lavoisier" (1935).

ARTHUR B. LAMB

**Glass: The Miracle Maker.** By C. J. PHILLIPS, Corning Glass Works, Corning, New York. Pitman Publishing Corporation, 2 West 45th St., New York, N. Y., 1941. xii + 424 pp. Illustrated. 15.5 × 23.5 cm. Price, \$4.50.

"Glass: The Miracle Maker" by C. J. Phillips of the Corning Glass Works is not a popular treatise as the title might imply. In the foreword the author states: "this book is intended primarily, but not exclusively, for the architect, the civil, mechanical, electrical or chemical engineer, the industrial designer, or other industrial executive—in short, for those who may see in glass a unique and versatile material, interesting in its own right, and full of unexplored possibilities for creating products and improving production methods."

The volume is in two parts. "Part One: History and Technology" contains: Chapter 1, a brief history including an outline of developments by periods; Chapter 2, preliminary fundamentals with statistics; Chapter 3, the chemical constitution with materials employed and the composition of the commercial glasses, including their durability; Chapter 4, the mechanical properties with tests for elasticity, brittleness, hardness, mechanical strength, thermal endurance: the effect of flaws; fracture systems; Chapter 5, a discussion of other physical properties such as density, coefficient of thermal expansion, specific heat and heat conductivity, viscosity, electrical properties and optical properties; Chapter 6, an outline of the handling of materials such as unloading, storage, weighing, mixing, transporting and charging; Chapter 7, covering fuels, refractories, furnaces, melting processes, and pyrometry; Chapter 8, covering the principles of glass working, off-hand blowing, the use of iron and paste molds, pressing, production of tubes and rods, the casting of glass, and lamp working; Chapter 9, describing and illustrating glass machinery as to gathering and feeding methods, pressing and blow machines, drawing and rolling; Chapter 10, giving methods for annealing, decorating, and inspecting glasses.

"Part Two: Applications" consists of seven chapters. In Chapter 11 glass is discussed as to architectural and building applications for its various forms: plate, pressed or cast glass, etc. In Chapter 12 one is taken into the home with its mirrors and glass furniture, cooking utensils, and table ware, glass containers of various types, and works of art. Chapter 13 applies to electrical transmission and communication with references to the use of glass in direct speech, the radio, and telephone; in correspondence, such as newspapers, books, magazines, the telegraph, and electrical signs; and, finally, in motion pictures and television. In Chapter 14 illumination is the topic, with the incandescent lamp, vapor-discharge sources, lighting control methods, commercial, architectural and residence lighting principles, and lighting for transportation as sub-topics. Chapter 15, "Glass in Manufacture," includes further uses of glass in industry as a cover for recording instruments, conduits in chemical production, pumping equipment, temperature measuring devices, analytical units, etc. Chapter 16 on "Glass in Science and Research" includes various optical devices, laboratory glassware, thermometers, containers for medicinals, etc. Chapter 17, the final chapter, is on fiber glass, giving its various forms, applications, properties, and uses.

"Glass: The Miracle Maker" is not a textbook or a handbook. It contains the information indicated in the foreword as quoted above. It is not for the layman. It will serve as a guide to the groups of individuals for whom Mr. Phillips planned it.

A fiber glass ribbon appropriately serves as a bookmark. Facing Chapter 1 is George J. Overmyer's beautiful tribute, "I Am Glass."

ALEXANDER SILVERMAN

**Physical Chemistry, An Introduction.** By E. A. MOELWYN-HUGHES, D.Sc. (Liverpool), D. Phil. (Oxon.), Ph.D. (Cantab.), Demonstrator of Physical Chemistry in the University of Cambridge. The Macmillan Co., 60 Fifth Avenue, New York, N. Y. (Cambridge: at the University Press.) viii + 660 pp. 18.5 × 27.5 cm. Price, \$9.50.

Dr. Moelwyn-Hughes' textbook is a treatment of the new physical chemistry. It is pitched at a graduate student level (for American universities) but could be used with great profit by undergraduate honor students who have a mathematical preparation through differential equations. The presentation is very clear. All proofs and derivations are given. There are many tables of pertinent data, and the basic experimental foundation of the science receives proper emphasis. To quote from the author's Preface:

"Facts come first. This book derives from the laboratory and expresses the views of one who regards himself as primarily an experimental physical chemist. Facts suggest hypotheses; hypotheses cohere into theories; theories require mathematical presentation; and finally, each theory must be subject to critical examination in the light of the facts it was intended to explain, and where possible, in the light of new experiments directed by theoretical implications. Throughout this work, this order of development, which alone has scientific sanction, is not only followed but is particularly stressed."

To give an idea of the scope of the book the table of contents is here listed: Part I, General Principles of Physical Chemistry. Chap. I, Experimental Foundations of the Kinetic Molecular Theory; Chap. II, Mathematical Formulation of the Kinetic Molecular Theory; Chap. III, Experimental Foundation of the Quantum Theory; Chap. IV, Mathematical Formulation of the Quantum Theory; Chap. V, The Chemical Elements; Chap. VI, Chemical Thermodynamics. Part II, Applications to Certain Simple Systems. Chap. VII, Monatomic Molecules; Chap. VIII, Diatomic Molecules; Chap. IX, Triatomic Molecules; Chap. X, Chemical Equilibria in the Homogeneous Gas Phase; Chap. XI, Chemical Kinetics in the Homogeneous Gas Phase; Chap. XII, Crystal Chemistry; Appendices, Author Index, and Subject Index.

Little or no attention is given to the physics and chemistry of surfaces, to heterogeneous equilibria, and to solutions. With regard to solutions, a subject to which the major part of the author's own research activities have been directed, the author states: "The treatment of solutions has not, in my view, been sufficiently elucidated to justify its inclusion in the present book."

The subject matter chosen for discussion has been better

organized and more logically and clearly presented than in any other treatise known to the reviewer. The book is highly recommended.

EDWARD MACK, JR.

## BOOKS RECEIVED

January 10, 1942—February 10, 1942

CARL J. ENGELDER. "A Textbook of Elementary Qualitative Analysis." Third edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 344 pp. \$2.50.

ALEXANDER FINDLAY. "Practical Physical Chemistry." Seventh edition, revised and enlarged. Longmans, Green and Co., 55 Fifth Avenue, New York, N. Y. 335 pp. \$3.00.

HENRY GILMAN, Editor-in-Chief. "Organic Syntheses. Collective Volume I." Second revised edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 580 pp. \$6.00.

ELMER O. KRAEMER, Editor, in Collaboration with Floyd E. Bartell and S. S. Kistler. "Advances in Colloid Science." Volume I. Interscience Publishers, Inc., 215 Fourth Avenue, New York, N. Y. 434 pp. \$5.50.

WARREN K. LEWIS, LOMBARD SQUIRES, and GEOFFREY BROUGHTON. "Industrial Chemistry of Colloidal and Amorphous Materials." The Macmillan Company, 60 Fifth Avenue, New York, N. Y. 540 pp. \$5.50.

EDWIN C. MARKHAM and SHERMAN SMITH. "General Chemistry Problems." Reynal and Hitchcock, Inc., 386 Fourth Avenue, New York, N. Y. 240 pp. \$1.25.

JOSEPH B. NIEDERL and VICTOR NIEDERL. "Micro-methods of Quantitative Organic Elementary Analysis." Second edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 347 pp. \$3.50.

W. G. PALMER. "Experimental Physical Chemistry." The Macmillan Company, 60 Fifth Avenue, New York, N. Y. (Cambridge: At the University Press.) 321 pp. \$2.75.

ROBERT N. PEASE. "Equilibrium and Kinetics of Gas Reactions." Princeton University Press, Princeton, N. J. 236 pp. \$3.75.

ATHERTON SEIDELL. "Solubilities of Organic Compounds." Third edition. Volume II. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 926 pp. \$10.00.

C. LILLIAN TEMKIN, GEORGE ROSEN, GREGORY ZILBOORG and HENRY E. SIGERIST. "Four Treatises of Theophrastus von Hohenheim called Paracelsus." Edited, with a Preface, by Henry E. Sigerist. The Johns Hopkins Press, Baltimore, Md. 256 pp. \$3.00.

FRANK WELCHER. "Chemical Solutions." D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 404 pp. \$4.75.

E. WERTHEIM. "Introductory Organic Chemistry." The Blakiston Company, 1012 Walnut Street, Philadelphia Pa. 482 pp. \$3.00.