

NEW BOOKS.

James Cutbush: An American Chemist, 1788-1823. By EDGAR F. SMITH, Provost of the University of Pennsylvania. Printed by J. B. Lippincott Co., Philadelphia, 1919. 94 pp. 10 × 14.5 cm.

As a result of his investigations of chemical development in this country Dr. Smith has given us "Chemistry in America" (1914), "Life of Robert Hare, 1781-1858" (1917), "James Woodhouse, A Pioneer in Chemistry" (1918), "Chemistry in Old Philadelphia" (1918), and now "James Cutbush," through which he has perfected the record of early chemical achievements for his native country, for the State of Pennsylvania in which he was born, for the city of Philadelphia in which he has long resided, for the University he has served so well during upwards of four decades, and for the profession in which he occupies so distinguished a position.

There is a marked contrast in the treatment of Hare in the portly volume of 508 pages, 16 by 23.5 cm. in area, with a colored portrait, and of Cutbush in this modest little pocket edition, and yet the latter appears in some ways the more fascinating, since Dr. Smith has brought to our attention a man of mystery, and also an almost mythical colleague.

From the record we learn that in 1808, and when but 20 years of age, Cutbush published in the Philadelphia "Medical Museum" a paper on mercury fulminate, giving the results of his endeavor to produce this body by a method in which no alcohol was employed and announcing his discovery of a mercury oxalate that was exploded by percussion. Also he published in that year a book called the "Useful Cabinet" which appears to have been a compilation of useful scientific facts and formulas. Moreover, in the "Aurora," a Philadelphia daily paper, he published in that year fifteen articles dealing with the Application of Chemistry to Arts and Manufacture which covered a wide variety of topics. While writing this review there are before me two maps showing the location in the United States of establishments of certain selected chemical industries in 1900 and in 1915 in each of which it is apparent that these industries center about Philadelphia, and history records our earliest factories in that city. One may well believe that Cutbush's active propaganda continued by public lecture courses, investigations, and publications, throughout his brief life, materially contributed toward this consummation.

In the 15 years following his first appearance in print, besides many journal articles covering his investigations, which appeared in the *American Journal of Science* and other periodicals, Cutbush published in 1812 a book on "Hydrostatics," dealing with hydrometers and their applications, in which there appeared numerous tables as well as many interesting and serviceable problems; in 1813 his "Philosophy of Experimental Chemistry" in two volumes; in 1814 the "American Artists' Manual" in two volumes, of more than 600 pages each, which was a popular dictionary of chemical

technology; in 1821 a "Synopsis of Chemistry" arranged alphabetically, comprehending the names, synonyms and definitions in that science which seems in a manner to have been a forerunner of Couch's admirable "Dictionary of Chemical Terms;" and in 1823 "Lectures on the Adulteration of Food and Culinary Poisons. . . . with a means of discovering them and rules for determining the purity of substances." This book was published at Newburgh, N. Y. and from its title Cutbush appears at that date to have entered the field so actively developed later by Wiley. In 1825, two years after his death, there was published in Philadelphia his "System of Pyrotechny" comprehending the theory and practice, with the application of chemistry, and covering 612 pages, with 44 pages of introduction.

While thus actively engaged in investigation and publication Cutbush carried on the business of "Chemist and Apothecary" at 25 S. Fourth St., Philadelphia, where, by his advertisement in 1819, it appears "complete collections of chemical reagents are kept as usual" and where "bleaching liquor, artificial musk, phosphate of mercury and other chemical preparations are prepared and sold." He gave numerous courses of public lectures and was, at the age of 23, President of the Columbian Chemical Society. He became Vice President of the Linnean Society, a founder of the Society of Philadelphia for the Promotion of National Industry, a member of the American Philosophical Society, and Professor of Chemistry, Mineralogy and Natural Philosophy in St. John's College, Philadelphia, but beyond learning that Benj. Smith Barton was professor of natural history and botany in the college, a Mr. Greiner taught there, and that the Rev. Mr. Bachman was president, Dr. Smith was not able to gather by extended search any further information as to the existence or location of this institution.

In 1814 Cutbush was appointed to the U. S. Army, with the rank of assistant apothecary-general, serving first in Philadelphia and later in the Northern division. From May 1820, he was chief medical officer of the U. S. Military Academy and Post at West Point until, on the reorganization of the Army, he became, on September 1, 1820, Post Surgeon and Acting Professor in the newly created department of Chemistry, Mineralogy and Geology, which he held until his death in 1823. Among his successors in this professorship were Dr. John Torrey, widely known as a botanist, and J. W. Bailey, an authority on the infusoria and they together with Hassler, Ellicott, Weir, and others selected by Col. Sylvanus Thayer, the "Father of the U. S. Military Academy," who were investigators and producers, as well as teachers, gave the prestige to "West Point" as an educational institution it has long continued to enjoy. Of all those who have held the professorship of chemistry, mineralogy and geology at West Point up to the present Cutbush appears to have been the only one who was primarily a chemist, though Torrey held the professor-

ships of chemistry in the College of Physicians and Surgeons, Princeton College and the College of the City of New York, and served as U. S. Assayer at New York from 1853 to 1873.

Dr. Smith designates the "System of Pyrotechny" as "the real *magnum opus* of Cutbush;" it "bears the earmarks of much careful study. It is a most worthy contribution, and is strong proof of the dominating force in the mind of Cutbush, namely, to make his science as widely useful as possible. Chemists may justly take pride in this early contribution in the application of chemical principles." He might have added that the book is "good authority" to-day and that it is doubtful whether any later book on this subject is as valuable a guide to pyrotechny or so filled with erudition.

It is obvious that the development of the rocket as an implement of warfare by Congreve was an impelling motive in the writing of this Pyrotechny for, after successful use in the bombardments of Copenhagen and Boulogne, the siege of Flushing, and the battle of Leipzig, Congreve rockets assumed an importance in the Napoleonic Wars comparable with that of the drop bomb, depth bomb, and poison gases in the Great War. The preparation and publication of this Pyrotechny was opportune and of special value to our military services, and in its preparation Cutbush wisely obeyed the principle that an application in an art is best advanced by a scientific survey of the art as a whole.

Commenting on the Aurora articles published when Cutbush was a "lad of twenty years" Dr. Smith says, "they show a wide, general knowledge and also great familiarity with the science of chemistry." The "System of Pyrotechny" is replete with learning, and besides his knowledge of chemistry and physics it evidences a wide acquaintance with foreign literature, more especially that of France yet after extended search the biographer says "Indeed, it will probably remain a query as to where he was educated."

Provost Smith has produced a delightful little book which cannot fail to entertain and enlighten all who may have the good fortune to read it.

CHARLES E. MUNROE.

La Tension de Vapeur des Mélanges de Liquides: L'Azéotropisme. (The Vapor Pressure of Mixtures of Liquids: Azeotropism). By MAURICE LECAT. Vol. I, Experimental Results and Bibliography. Henri Lamertin, Brussels, 1918. xii + 319 pp., 200 figures. 19 × 25 cm. Price, 45 fr.

This admirable book is the first of a two-volume work devoted to a study of azeotropic liquids, that is, liquid mixtures which exhibit a maximum or a minimum boiling point.

Although the importance of this subject was evident from the researches of Roscoe in 1859-60, there has been surprisingly little advance in our knowledge regarding the prevalence of this phenomenon. In 1899,

Ryland out of 80 mixtures which he examined found no less than 45 instances of azeotropism. This led Lecat to a still wider exploration, with the result that 1050 new azeotropic mixtures were discovered.

In this volume the author first gives an introduction of 60 pages to the general theory of the vapor pressure of liquid mixtures. It is a thorough, competent, and quite the most up-to-date treatment of the subject extant. It is replete with interesting and provocative footnotes, and indicates a wide and careful study of the literature.

The second and principal part of this volume is devoted to tables of data having to do with some 2450 mixtures. In addition to the azeotropic constants, in cases where this phenomenon is shown, there are also given the density and the change of volume and of temperature on mixing. In addition boiling-point curves, total and partial vapor curves, and similar information are given whenever available. So far as possible, these data are arranged chronologically and provided with elaborate cross references to the bibliography. There are also three tables, two for binary systems showing either a maximum or a minimum vapor-pressure curve, and one for ternary systems.

These tables are followed by a list of some 1500 substances distilling at ordinary pressure and grouped under different classes such as alcohols, acids, esters, etc., arranged in order of decreasing volatility. In addition to the boiling point, the melting point, density, and critical constants are given when they are known with sufficient accuracy.

The third and last part of the volume (52 pages) contains a very excellent and valuable bibliography. In it are given first, an alphabetical list of authors with complete titles and references to their publications; second, a list of these publications (760) chronologically arranged; third, a list of the 118 periodicals or journals cited, indicating the volumes and pages where the articles appear. Each list is carefully cross referenced.

Added to the end of the book are some notes on the preparation of certain rather rare substances such as cyclohexene, isoprene, etc., in a high state of purity. There is also a rather irrelevant article by the author on the reaction of phenols, etc., with olefine hydrocarbons.

The author announces a second volume of some 400 pages devoted to a mathematical theoretical treatment of the subject.

This book merely as a compilation of our present information on this subject represents a notable achievement. If the author's experimental work proves to be as excellent as his bibliographic achievements, the completed volume will surely rank as a classic in this special field.

For this reason it is to be regretted that the author has not been able to keep certain personal grudges and animosities out of his footnotes. They certainly tend to undermine the confidence of the reader in the good judgment of the author. Perhaps they should be charitably forgotten

in consideration of the ill health which the author states he suffered, and the difficulty of doing intellectual work when his country (Belgium) was devastated by war which appeared to him as monstrous as it was insane. This situation is reflected in the dedication of the book which reads,

"To all victims of militarism, to all those, no matter to what nation they belong, who with DuBois-Reymond and Ch. Hermite condemn Chauvinism and place the interests of science above those of politics, I dedicate this work."

ARTHUR B. LAMB.

"Ammonia and the Nitrides." By DR. EDWARD B. MAXTED, J. and A. Churchill, London. P. Blakiston's Son and Company, Philadelphia, Pa. 114 pages, 16 illustrations, 18.5 × 12.5 cms. Price, \$2.00

This little book is an excellent summary of the information which can be gathered from the periodical literature relative to the so-called Haber Process and the reactions of free nitrogen.

In the first chapter, the author discusses the ammonia equilibrium, its calculation from the heat of formation of ammonia, and from specific-heat data. Experimental verification of this equilibrium is then presented. In the second chapter, the author describes at some length various types of pressure furnaces and the results which have been obtained with a few "classical" catalysts. The discussion of the synthesis of ammonia at very high temperatures and also by the silent discharge will prove of interest to many readers.

By far the most useful information contained in this book is found in the chapters describing the nitrides. A very fine list of references accompanies these chapters. The book closes with a chapter on active nitrogen.

Considering the great interest in nitrogen fixation this book comes at a very opportune time. However, it will disappoint anyone who expects to find in it anything new on the subject of ammonia synthesis. Had he wished, the author doubtless could have given an excellent discussion of ammonia catalysts, for example; but when we consider the jealous manner in which the different nationals have guarded their knowledge of this most important feature of the Haber Process, this omission is no doubt excusable.

ALFRED T. LARSON.

Die störenden Einflüsse auf das Eintreten und die Eindeutigkeit analytischer Reaktionen. By DR. W. STADLIN, Chemiker am kantonalen Laboratorium, St. Gallen. Georg Thieme, Leipzig, 1921. 70 pp. 19.5 × 13.5 cm. Price outside of Germany, M. 18.

This little book records very briefly, in catalog form, the cases in which various well-known qualitative reactions for the different inorganic and organic constituents of substance give unreliable results. Two typical

examples may be cited. Under "Aluminum," six tests are mentioned, of which the first reads as follows: "*I. Precipitation of $Al(OH)_3$* . Is prevented by alkali tartrates, malates, and citrates, in general by the presence of organic oxyacids and oxycompounds (sugars, starch, etc.)." Under "Benzoic Acid," three tests are given, of which the first reads: "*I. Detection by oxidation to salicylic acid. a. By means of potash*. Unreliable, because in the fusion process there is formed mainly *p*-oxybenzoic acid, which does not give the $FeCl_3$ reaction; moreover, the small quantities of possible salicylic acid run the risk of being destroyed by the progressing process of oxidation (Stadlin, *Chem., Ztg.*, 1916, 770). *b. By means of H_2O_2* : the delicacy of the reaction is dependent on the relation of the hydrogen peroxide to the benzoic acid. Neglect of this fact may lead." To the inorganic constituents are devoted 25 pages, and to organic substances 30 pages. In a 5-page appendix is included a similar treatment of the methods of testing blood and sperma.

A. A. NOYES.

The Chemistry and Technology of the Diazo Compounds. By JOHN CANNELL CAIN. Edward Arnold, London, 1920. xii + 199 pp. Price \$4.20.

This is a second edition of the well-known book which was first published in 1908. The treatment of the subject follows the same lines as in the first edition but the work has been brought up to date by the consideration of many recent investigations. A new chapter on the heterocyclic diazo compounds has been added. Altogether the book has been increased by some 30 pages. This revision of a monograph on one of the most important branches of aromatic chemistry will be welcomed by all organic chemists.

JAMES B. CONANT.

Organic Chemical Reagents II. By ROGER ADAMS, O. KAMM, C. S. MARVEL. University of Illinois Bulletin, Urbana, Illinois. October 11, 1920. 57 pp. 5 fig. 15 × 23 cm. Price 75 cents.

The undersigned had the opportunity a year ago¹ to call to the attention of his colleagues to the publication of the exceedingly useful pamphlet, "Organic Chemical Reagents," by Adams, Kamm and Marvel. The second pamphlet in the series has now appeared, describing in detail, as before, the directions for some 23 preparations which have been studied in the Chemical Laboratories of the University of Illinois. "It is desired," the authors say, "to make available to all the most satisfactory methods and reliable directions for producing various organic chemical reagents for which there is considerable demand by technical and university laboratories. A special endeavor has been made to choose wherever possible the method which may be adapted to larger scale work. Care has been

¹ THIS JOURNAL, 42, 1074 (1920).

taken to include all the necessary details so that there will be a minimum of difficulty in making the various substances."

The order of treatment is somewhat different from that in the first pamphlet. We have: (1) Procedure, *i. e.*, directions for the preparation of the substance; (2) Notes, giving the explanations of why it is essential to observe the conditions laid down in the directions; (3) Methods of preparation, listing the various methods in the literature, good and bad. The third caption corresponds nearer to what Beilstein calls B. (Bildung), in distinction from his D. (Darstellung). The following preparations are included in the new publication: nitroso- β -naphthol, hydrazine sulfate, phenylhydrazine, phenyl-isocyanate, alkyl and related bromides, camphor sulfonic acid, acetonitrile, benzoyl peroxide, benzyl cyanide, phenylacetic acid, ethylphenyl acetate, fumaric and succinic acids, succinic acid, pinacone hydrate, mesitylene, *p*-nitrobenzoic acid, methyl *m*-nitrobenzoate, *m*-nitrobenzoic acid, *n*-butyl cyanide, *n*-valeric acid, ethyl *n*-valerate, *n*-amyl alcohol, and *n*-amyl amine.

Equally explicit directions and as complete a bibliography characterize Part II of the "Organic Chemical Reagents" as were found in Part I. Every user of these books, and the users will be many,² will be thankful to the authors for these two essential features.

M. GOMBERG.

Vitamines: Essential Food Factors. By BENJAMIN HARROW, PH. D., Associate in Physiological Chemistry, College of Physicians and Surgeons, Columbia University. E. P. Dutton and Company, 681 Fifth Avenue, New York, 1921. x + 219 pp. 8 figures. 12.5 × 19.5 cm. Price \$2.50 net.

With general recognition of the importance of what may be called the Accessory Food Factors and the part which they play in the maintenance of health, this little volume may be regarded as a timely contribution.

The author has endeavored to present the most salient facts together with the best established theories in small compass and in a popular manner. The jocundly conversational style of the opening chapters will probably effect no hindrance to the fulfilment of the purpose of the book, and the later chapters present excellent summaries in a clear and terse manner. The arrangement of the subject matter is logical and good, and the description of the feeding experiments with the deficient proteins forms a most desirable introduction to the titular portion of the text.

In the historical development of the topic the emphasis would seem to be placed more on the studies of the fat-soluble A than on those of the water-soluble B vitamines. Such distribution of emphasis lies within the personal reaction of the writer and remains a matter of election.

In his concluding chapters the author urges certain dietary regulations which, so far as they recommend the universal adoption of liberal quantities of milk, present certain economic difficulties.

² "Annual Reports," *Chem. Soc.* (London), 1920, p. 54.

All in all, however, the book offers a simple, direct, and accurate presentation of facts and theories which are of interest and of importance to the laity. It should reach a large part of the community who are desirous of being informed but who are without the background to permit or desire extended consideration of the theoretical implications.

The press work of the book is excellent.

ALLAN WINTER ROWE.