

NEW BOOKS

Entstehung und Ausbreitung der Alchemie mit einem Anhang zur älteren Geschichte der Metalle. The Origin and Spread of Alchemy with a Review of the Early History of the Metals. A contribution to the history of civilization by Prof. Dr. Edmund O. von Lippmann. Julius Springer, Berlin, 1919. XVI + 742 pp. 17.5 × 26 cm. Price in America, M. 108; bound, M. 144.

Dr. von Lippmann, the director of the sugar refinery at Halle, who has just celebrated his sixty-fifth birthday, is the worthy successor of Kopp and Berthelot as the historian of Chemistry. He is the author of two volumes of "Abhandlungen und Vorträge zur Geschichte der Naturwissenschaften," and of many articles in the current journals.

The work in question, which is doubtless his *magnum opus*, is a history of the origin and spread of alchemy. As he says in the preface, "the history of alchemy is, according to Kopp, 'the history of an error,' but the strangeness of its nature, the greatness of its persistence and the significance of its results stamp it as one of the most remarkable episodes in the development of civilization."

The author's aim was to answer the question, whence and how arose the belief in the transmutation of base metals into gold and silver, and what were the conditions which favored its wide acceptance and gave it a living vitality through the centuries as an article of faith. In this study he has confined himself mainly to the older sources and has paid little attention to its history in Western Europe after the thirteenth century, since this has been covered by other writers.

The author discusses, in the first 110 pages, such fragments of alchemistic literature as have been preserved. This includes first the Leyden and Stockholm papyri, which are mainly receipts for imitating precious metals, for dyeing, etc.; then follows a résumé of technical and alchemistic lore from a long list of Greek and Alexandrian authors from the first to the tenth centuries.

The next chapter (pp. 118-260) which is on the sources of the alchemistic doctrines, takes up briefly the Greek philosophers from pre-Socratic times to the school of Athens, which was closed by Justinian in 529 A. D. He then traces the influence of "astrology" with its prehistoric sources in the valley of the Euphrates and shows the origin of many ideas perpetuated by the alchemist. Thus the circle, the symbol for the sun, used even in Dalton's time as a sign for gold, can be traced back for 4000 years. To this mass of legend were added ideas emanating from the late pagan and early Christian beliefs—from the Gnostics, from the religion of Mithras, etc.

The fourth chapter gives a valuable résumé of technical arts in Egypt with the first allusion to Chemistry and the origin of that name, together with a further amplification of the sources of alchemistic ideas, concep-

tions, dogmas and terms. The author then traces the history of alchemy in Arabia, Syria, India, Thibet and China, which is followed by an account of its early development in Europe.

To the general reader, one of the most interesting parts of the book will be the 130 pages devoted to the early history of the metals and their alloys, *viz.*, gold, silver, electrum, copper, bronze, brass, lead, tin, zinc, mercury, iron and antimony.

In reading the volume one is especially impressed by the minuteness of the search for all references that would throw light upon this difficult subject, so that the work is really a mass of citations with every author, book and page carefully noted. The scholarship displayed is so exhaustive that at times it is apt to discourage the casual reader. As a matter of fact it is a book for study and reference, and as such deserves the highest praise, since nowhere else can be found such a compilation of accurate information in this obscure field, and all carefully indexed.

In this very exhaustive quality of treatment might rest one criticism of the book, because it is difficult to get from it a proper realization of the high lights and shadows of the subject, and the relative importance of many of the data presented.

Berthelot's presentation of the same subject in his "Origines de l'Alchimie," etc., is far easier and more interesting reading in its literary form and appreciation of the subject. It seems a pity that Dr. von Lippmann could not have omitted the "Nachtrage, Berthelot als Historiker," which in spirit is really an aftermath of the war.

It would have been possible to point out some of the errors, which later scholarship has disclosed in the "Origines," without making so severe an attack upon the delightful French historian. This can well be forgotten, however, since it is but a minor appendix (a little inflamed) to a book which is a most valuable contribution to this field of Chemistry and a lasting tribute to the erudition of Dr. von Lippmann.

F. B. DAINS

Fluoreszenz und Phosphoreszenz im Lichte der neuen Atomtheorie. (Fluorescence and Phosphorescence in the Light of Modern Atomic Theory.) By PETER PRINGSHEIM. Julius Springer, Berlin, 1921. vii + 202 pp. 32 figs. 22 × 14.5 cm. Price M. 144.

At the outbreak of the war, the author found himself in Australia, at a meeting of the British Association. Wherefore "the Australian government, in spite of all protests, extended its guest-friendship over five full years." Adequate even if slow moving library facilities were happily forthcoming, and so the present work was undertaken.

From the preface, also, we infer that there was at first a struggle against the temptation, so insidious to the Teutonic mind, to write a ponderous "Handbuch" in many instalments. Fortunately the outcome was a most

timely little monograph, which fills acceptably a real gap in modern chemical literature. Reference is made to Kayser's "Spektroskopie" for all work up to 1908, and all discussion of the action of canal-rays, cathode-rays, and X-rays is omitted. An excellent bibliography of 266 titles, practically complete for the period between 1908 and July, 1921, affords full recognition of English and American research. The essential content of the field mentioned in the title, with the self-imposed limitations mentioned above, is presented in a clear, concise, and intelligent fashion. The treatment, while not for the most part mathematical, is consistently based upon the quantum theory and the Bohr-Sommerfeld radiation mechanism as it stood when the book went to press. Debatable questions and undeveloped topics are clearly indicated.

Whatever of change and amplification the future brings to this subject, with all its possibilities for growth, no one is likely to regret the acquisition of this valuable book.

G. S. FORBES

Introduction to Physical Chemistry. By Sir JAMES WALKER, LL. D., F. R. S., Professor of Chemistry in the University of Edinburgh. Ninth edition. Macmillan and Co., Limited, St. Martin's Street, London, 1922. xii + 438 pp. 64 figs. 22 × 14 cm. Price \$4.50.

"This book makes no pretension to give a complete or even systematic survey of Physical Chemistry. Its main object is to be explanatory* * * * by selecting certain chapters of Physical Chemistry, and treating the subjects contained in them at some length, with a constant view to their practical application."

In the ninth edition numerous passages have been revised; the chapters on the new atomic and subatomic chemistry have been entirely rewritten. The prefatory statement from the first edition, quoted above, disarms any criticism of the content of the book, or of the relative amounts of space assigned to the various topics. It may be stated as a fact, however, that actinocchemistry and concentrated solutions are not yet included.

The data given are admirably suited to illustrate the principles under discussion. Yet it might be well more frequently to revise and supplement the tables and the cuts. Cases in point are the values 120° and 115° for the melting points of sulfur (p. 102), 0.07 for the single potential of iron (p. 359), and the curve of atomic volumes (p. 37) which could include Benedicks' values for the rare earth metals.

The author's policy concerning the history of important generalizations, names, dates, and the like, still shows little uniformity. Thus the evolution of the atomic theory and of the electrolytic dissociation theory is given at length, while no treatment of this sort is accorded energy or electromotive force or radioactivity.

Whatever the possibilities for minor improvements, the author's purpose,

as stated 23 years ago, is still maintained and fulfilled in this, the latest edition of this excellent work. A more understandable and teachable text would be hard to find.

G. S. FORBES

A Textbook of Organic Chemistry. By JOSEPH SCUDDER CHAMBERLAIN, Ph. D., Professor of Organic Chemistry, Massachusetts Agricultural College. P. Blakiston's Son and Co., 1012 Walnut Street, Philadelphia, 1921. xliii + 959 pp. 1 fig. 14 × 20 cm. Price \$4.00 net.

This is a comprehensive discussion of the constitution of organic compounds—many pages of structural formulas, explicit and unmistakable, as the student needs them, with adequate explanation of the reasoning on which they are based. The reviewer would, however, call this an organic chemistry in the old style, the implication being not that this phase of organic chemistry has lost its importance, but rather that this is no longer the whole or organic chemistry, as it is assumed to be, in a strict sense, in this book.

The scope of the book is indicated by the inclusion of such syntheses as the following: the purines, isoprene, saccharine, vanilline and related compounds, triphenylmethane dyes, some of the diamine dyes, and cocaine substitutes, with a discussion of terpenes and of indigo and related compounds—all very clearly presented. It is the omissions that are surprising in a book of this scope.

The whole subject of stereo-isomerism is inadequately presented. Why should the author think that the deduction of the configuration of at least a part of the hexoses "would be out of place in this book?" In the discussion of the tartaric acids which provide, traditionally, the opportunity for making clear the principles relating to the asymmetric carbon atom, the projection formulas for *d*- and *l*-tartaric acids (p. 304) are entirely ambiguous, and in the drawings of these same molecules (p. 305) the writer can see only two molecules of mesotartaric acid placed in juxtaposition. The discussion of the maleic-fumaric tautomerism is also abridged—merely a brief list of the properties of the compounds. Surely the student should not be studying such complex constitutional problems without having heard of some of the advantages and difficulties of the usual explanation of this type of isomerism.

Triphenylmethyl and the related compounds are disposed of in 13 lines, with the statement: "A discussion of this compound in any detail would involve many new ideas, especially concerning the existence of compounds in equilibrium with each other; and as such a study is beyond the province of this text it will not be entered into here." The reviewer did not suppose there still existed anywhere a class of students who took up the study of advanced chemistry while still unable to understand reference to an equilibrium hardly differing in type from that between an electrolyte and its ions. The esterification equilibrium receives similar

treatment, with the same apology. The reversibility of the reaction receives the barest mention and the function of the mineral acid in the esterification of organic acids is disposed of with the remark that sulfuric acid is a dehydrating agent. Tautomerism is disposed of in a few words in connection with aceto-acetic ester, and is not mentioned in connection with the historic case of phenylnitromethane.

The author states that the substance NH_4OH has not been isolated, that isomeric oximes of aliphatic ketones are not known, that only one of the amyl alcohols has been separated into optical isomers; he mentions the existence of only 3 cinnamic acids, gives a formula for sucrose not in accordance with the notable work of Haworth and Law, and states that the oxidation products resulting from action of Fehling solution on sugars are probably unknown. The reviewer is not familiar with any work in which the hydrogen atoms of methane have been replaced separately and successively by chlorine, proving them all similar. He cannot agree with representing the reaction between ammonia and methyl iodide as a double decomposition, giving methyl amine and hydrogen iodide, with subsequent union of these products, nor is he familiar with a definition of basicity according to which the highly basic character of trimethylamine is proved by its reacting readily with methyl iodide.

The reviewer has been able to find only a slight allusion to the manufacture of ethyl alcohol from wood waste, no mention of that of acetaldehyde and acetic acid from acetylene, or of the catalytic preparation of ketones from acids, catalytic hydrogenation of aldehydes, ketones, and liquid fats, or the catalytic preparation of alkenes; no mention of aliphatic mercaptans and thio-ethers, except for a few complex ones; and no allusion to any sort of partial valence conception.

There is much good reading in the discussion of the practical interest of some classes of compounds—fats, proteins, essential oils, cellulose products, industrial alcohol and rubber, for example.

ROGER F. BRUNEL

The Popular Chemical Dictionary: A Compendious Encyclopedia. By C. T. KINGZETT, F. I. C., F. C. S. Second edition. D. Van Nostrand Company, 8 Warren Street, New York, 1921. viii + 539 pp. 20 × 13 cm. Price \$4.50.

In the preface to the first edition of this dictionary, the author states that it was his endeavor to produce a popular educational work that will also serve as a general work of reference, not only to "practical chemists" but to "that larger body of the public who, in the course of their various callings, have occasion to deal or take interest in the thousand and one subjects and substances of which descriptions are given." The field covered is indeed broad, and while no effort has been made toward completeness (obviously impossible in a work comprising less than 5000 terms in all) a great many of the important words and phrases in the less abstract and theoretical subjects related to chemistry have been assembled,

as well as the more frequently used terms of atomistics and similar fields in which popular interest has recently been aroused. It is evident that the selection has been made with considerable care, but with more reference to English than to extra-insular usage.

The style is clear and simple. Indeed, sometimes the meaning of a term in its relation to pure chemistry is slighted in order to emphasize its technical and popular phases, resulting in an interesting, stimulating though wholly elementary discussion, which is never overburdened with the complexities of modern theory. Although the need for brevity of expression is carefully observed as a rule, many of the "definitions" are long enough to be called discussions. Oxygen and Petroleum, for example, are given 2 entire pages or more; and such subjects as Heat and Chemical Compounds occupy more than 5 pages each. The author's bent toward the philosophical in his discussions is evidenced in the following sentences found under Chemical Changes.

" These chemical changes constitute a sort of adaptation of matter to environment, and in a sense are acts of creation, as every such change produces products which, although related, are quite distinct in character and properties from the original substances which give rise to them when subjected to the required influences. Thus, in a very literal sense, all matter—which, as will be seen in other places, appears to be essentially one in nature—is actuated by a spirit of life, being susceptible to change when the environment is appropriate. In other words, the liability to change is equivalent to life. All such changes are necessarily accompanied by a related redistribution of energy."

Empirical formulas, physical forms and properties and uses are given for the more important chemical substances. Materials used in commerce are often not so much defined as described, with mention of their common sources and brief reviews of technical processes concerned in their preparation and use. Probably of least value to other than English readers are the many proprietary and trade names of chemical products which are included and defined.

It would not be difficult to list many seemingly common scientific words which do not appear in the alphabetical arrangement; examples are: mole, equilibrium, albumen, residue, resistance, wave length, symmetry, liter and most of the common chemical symbols; on the other hand some very uncommon ones are given, such as pumiline, tension (of gases), amyllum, cocculus indicus, hollands, mundic, optophone, pollux, portland stone, sobrerol, reddle, zaratite.

The printing is clear, the type sufficiently large, and the binding of the usual kind. Few printers' mistakes are evident. Books such as this, even if not as complete as we should desire, are nevertheless of great value in popular education in the commoner ideas of chemistry, and so are to be welcomed. It is to be hoped that the author of this dictionary will be able in the third and subsequent editions to add markedly to the variety and the exactness of the definitions given.

WILLIS A. BOUGHTON