

Th(NO ₃) ₄ , cc.	F Calcd., mg.	F Found, mg.	Th(NO ₃) ₄ , cc.	F Calcd., mg.	F Found, mg.
0.260	0.050	0.052	0.990	0.200	0.198
.245		.049	1.020		.204
.520	.100	.104	1.000	.201*	.200
.505		.101	1.155	.230*	.231
.760	.150	.152	1.490	.300	.298
.865	.175*	.173	2.000	.400	.400

LABORATORY OF PHYSIOLOGICAL CHEMISTRY
UNIVERSITY OF MINNESOTA
MINNEAPOLIS, MINNESOTA

W. D. ARMSTRONG

RECEIVED MARCH 8, 1933

PUBLISHED APRIL 6, 1933

A NEW BAND IN THE WATER VAPOR DISCHARGE

Sir:

In a spectrographic study of the electrodeless discharge in water vapor the writers have observed a band of moderate intensity with a head of wave length 3564 Å. This band is degraded toward the red and appears to have the structure of a hydride. It does not belong to any known system of hydroxyl bands and may prove to be due to OH⁺. Other fainter bands were also observed which have not been measured accurately or identified. The analysis of these bands is being carried out under the direction of Professor F. W. Loomis of the Department of Physics.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS

W. H. RODEBUSH
M. H. WAHL

RECEIVED MARCH 20, 1933

PUBLISHED APRIL 6, 1933

NEW BOOKS

Tables Annuelles de Constantes et Données Numériques de Chimie, de Physique, de Biologie et de Technologie. (Annual Tables of Constants (A T C) and Numerical Data, Chemical, Physical, Biological and Technological.) Published under the Patronage of the International Research Council and of the International Union of Chemistry. American Agents, McGraw-Hill Book Co., Inc., 330 West 42d St., New York, 1931-1932. Vol. VIII, 2 parts (1927-1928), 2706 pp. Vol. IX (1929), 1607 pp.; Index to Vol. IX, 124 pp. 22 × 28 cm. Price, cloth, Vol. VIII, \$20.00; Vol. IX, \$16.00.

With the appearance of Volume IX for 1929 and of Volume VIII in two parts covering 1927-1928, Dr. Marie and the International Committee have finally completed the Herculean task of bringing the Annual Tables up to date, after the serious interruption and delay incident to the World War. Volume IX was issued at the end of 1931, and its Index a few months later. This resumption of prompt publication is of great importance to the scientific world, and Dr. Marie and the Committee are to be congratulated

on their success. Volume IX occupies a total of 1731 pages, many more than any of its predecessors, thus reflecting the great increase in the output of new data. Chapters have been added on the following subjects: Absorption Spectra; Photography; Geophysics; Radioactivity; Structure by X-Rays; and Explosions and Combustion of Gaseous Mixtures. The Index provided with this volume is a new feature and is certainly a great added convenience.

It should be emphasized that a knowledge of French is not necessary in the use of these Annual Tables. All headings, titles, names, explanatory statements and indeed everything except the numerals themselves are given both in English and in French.

These volumes constitute a further invaluable addition to any library of the exact sciences.

ARTHUR B. LAMB

Prout's Hypothesis. Papers by WILLIAM PROUT, M.D., J. S. STAS and C. MARIGNAC. Published by the Alembic Club, Edinburgh. Reprint No. 20. Gurney and Jackson, 33 Paternoster Row, London, E. C. 4, England, 1932. 58 pp. 12.5 × 19 cm. Price, \$0.65.

This little book may be recommended highly to all those interested in the development of chemistry as a science. The type is clear and the binding light but good.

Twenty-four pages are devoted to an historical introduction, author anonymous, which furnishes an excellent setting for the papers which follow. The question of Prout's priority in stating his hypothesis is adequately treated with quotations from contemporary literature. The brilliant forecasting by Sir William Crookes and C. Marignac of our modern explanations of the deviations of atomic weights from integral values is well presented, but "Obviously there is no room in this introduction for a detailed account of the rehabilitation of Prout's hypothesis as effected by these recent advances."

Two papers by Dr. Prout are reprinted from the *Annals of Philosophy*. They begin with the assumption that air represents a chemical combination of oxygen and nitrogen and a theoretical calculation of the density of hydrogen which comes within one-half of one per cent. of the truth. Then follow some naïve atomic weight determinations and finally the famous hypothesis.

From a long paper on atomic weights by J. S. Stas, the small portion dealing with the historical and the theoretical aspects of the subject is translated. Stas concluded that Prout's "law" was a pure illusion, that there was question whether even the atomic weight of oxygen was exactly an integral multiple of that of hydrogen.

Finally there is translated a commentary on Stas' paper by C. Marignac. In it Marignac makes a clear statement of what is now known as the packing effect. These last two papers illustrate the impossibility of overthrowing a theory with simple experimental evidence. In fact this reprint might be subtitled, the triumph of theory over experiment.

C. H. GREENE

Introductory General Chemistry. By STUART R. BRINKLEY, Associate Professor of Chemistry, Yale University. The Macmillan Co., 60 Fifth Ave., New York, 1932. x + 565 pp. Illustrated. 14.5 × 22.5 cm. Price, \$3.00.

The author of this excellent and very readable textbook has sought "to afford an insight into that method of thought known as the scientific method, which differentiates the civilization of today from all which have preceded it; to develop a basis for an understanding of the true significance of chemistry in the modern world; to coördinate the facts, laws and theories of chemistry in an orderly science; and to limit the amount of specific descriptive and theoretical material, and to arrange the order of the topics so

that the student may grasp the major development of the subject without becoming lost in a maze of minor details." This objective is accomplished in a manner which should appeal to teacher and student alike. Theories are presented only after the experimental facts upon which they are based have been strongly emphasized. Detailed facts of minor importance have been reduced to an agreeable minimum while fundamental principles are given a large amount of attention. The scientific method is always held in the foreground.

Each chapter carries a group of questions which should serve as a fruitful and stimulating source of thought to the student. The lists of supplementary readings which appear at the end of each chapter have been carefully selected.

Although the entire text seems very excellent, the first ten chapters seemed to the reviewer to be particularly well done. After all, it would appear that the first few chapters really "make" or "break" an elementary textbook—in the first ten chapters of this text the author has, it seems, given a very understandable presentation of the fundamentals, the thorough appreciation of which is essential to a grasp of the material that follows.

C. H. SORUM

Introductory College Chemistry. An Elementary Course Developed Historically. By HORACE G. DEMING, Professor of Chemistry, University of Nebraska. John Wiley and Sons, Inc., 440 Fourth Ave., New York, 1933. xii + 590 pp. 158 figs. 14 × 22.5 cm. Price, \$3.00.

Most, although not all, new textbooks in General Chemistry are new only in the sense that they reflect some new author's literary and pedagogical personality. The outstanding facts and fundamental principles that should be included in an introductory course are so generally recognized that they appear in all standard texts. However, the manner in which these facts and principles are presented, the amount of detail involved in their clarification and the degree to which their practical utility is emphasized, may differ markedly—and herein, it seems, lies the real distinctiveness of a new book.

"Introductory College Chemistry" by the author of the highly popular and widely used Deming's "General Chemistry" is new and distinctive. Carrying the stamp of excellence of the above-mentioned "General Chemistry" it is "simpler and easier, follows a different plan, has completely new exercises, and is written for readers who are less advanced and perhaps less interested in chemistry as a profession." An easy and graceful style combines with clearly presented and aptly illustrated general principles to make it both readable and teachable. Outstanding topics are first presented in simple form and then repeatedly referred to in later chapters, "developing each subject gradually by repetition and enlargement." The history of the development of many interesting phases of chemistry is interwoven in a fascinating manner.

The index is very complete; repeated cross references make for greater clarity of subject matter; an appendix of definitions summarizes important ideas; each chapter is concluded by a very complete and comprehensive list of reading references; each individual subject within a chapter is numbered, a detail which is particularly valuable in making assignments.

The outstanding feature of the book, however, is the large number of questions and exercises of a very original and unusual character which appear throughout and at the end of each chapter. "A great many details that textbooks commonly present as statements of fact, particularly concerning the applications of individual elements and compounds, are made to appear as questions to provoke thought." Such questions are of genuine value to the student in that they encourage him to learn to think, which, after all, is one of the primary aims in teaching chemistry.

C. H. SORUM

Gmelin Handbuch der anorganischen Chemie. (*Gmelin's Handbook of Inorganic Chemistry.*) Edited by R. J. MEYER. Eighth edition. System Number 30, Barium. Issued by the Deutsche Chemische Gesellschaft. Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany, 1932. 390 pp. 17 × 25 cm. Price, to subscribers, Mk. 56: singly, Mk. 64.

This volume constitutes another important instalment of this encyclopedia of inorganic chemistry. Eight authors collaborated in its preparation. The relevant literature has been covered up to the first of April, 1932.

There is in this volume a wealth of information as to the history, occurrence, preparation and properties of barium and of its compounds with the non-metals and with the alkali and alkaline earth metals. One is impressed, in comparing this volume with the corresponding instalment of the previous edition, with the great increase that has taken place in the amount of physicochemical data relative to this element, particularly in the fields of radiation and crystallography.

ARTHUR B. LAMB

Tables of Cubic Crystal Structure of Elements and Compounds. By I. E. KNAGGS AND B. KARLIK. With a Section on Alloys by C. F. Elam. Adam Hilger, Ltd., London, 1932. 90 pp. 16.5 × 25 cm. Price 11/6d.

This is a comprehensive uncritical summary of cubic structures of over 500 elements and compounds, and of about 150 alloys, reported up to August, 1931. The material is listed alphabetically and in order of increasing parameter, with numerous references.

C. D. WEST

Il Polarografo, sua Teoria e Applicazioni. (*The Polarograph, its Theory and Applications.*) By GIOVANNI SEMERANO. Libreria Editrice A. Draghi, Padova, Italy, 1932. vii + 207 pp. 13 × 19.5 cm. L. 16.

Professor J. Heyrovský's successful application of the dropping mercury cathode to the determination of the deposition and reduction potentials of ions in the aqueous solutions of their salts has resulted in a very exhaustive series of investigations by himself and his co-workers of the uses of this electrode in diverse chemical and related problems. The progress of these investigations became particularly rapid with the invention by Heyrovský and Shikata in 1925 of the "polarograph"—an apparatus for the automatic recording on photographic paper of the current-voltage curves obtained with a dropping mercury cathode—an invention affording a great economy of time and at the same time eliminating the personal element from the work. The extensive development during the last ten years of the method and of the practical applications by Heyrovský and his school led to the accumulation of a rich bibliography devoted entirely to the polarographic investigations.

Semerano believes that the method has passed the preliminary period of theoretical preparation and has definitely entered the field of practical utilization. He presents in his little book the theory and applications of the polarographic method, the aim of the monograph being "to offer to those who desire to occupy themselves with research of this type the possibility of acquiring the necessary theoretical and practical fundamentals."

After a concise and clear cut introduction, a discussion of the current-voltage curves is given, followed by a detailed description of the apparatus and the method, and a thorough presentation of the theory of deposition and reduction of ions at the dropping mercury cathode and of the maxima in the polarization curves.

The rest of the book is devoted to the practical applications. Data are given on reduction and deposition of the following ions: hydrogen, alkali and alkaline earth metals, metals of the iron group, zinc and manganese group, tin, arsenic, antimony, bis-

muth, lead, cadmium, mercury, gold, silver, gallium, indium, thallium, uranium, etc. This is followed by a discussion, with some experimental data, of the reduction of organic substances, and of the uses of the polarograph in determining solubility and equilibrium constants, mineral analysis, determination of impurities, titration of dilute solutions, and determination of oxygen dissolved in aqueous solutions. Finally a few pages are concerned with the biological, physiological, and industrial applications, such as analyses of sugar solutions, fermenting liquors and petroleum fractions.

The book is almost entirely in the nature of a compilation, Semerano himself having contributed but little to the subject. It seems that in his enthusiasm the author rather overestimates the practical usefulness of the method, which is inherently limited to work with very small concentrations, and to a permissible error of ten per cent.

However, the book will undoubtedly prove of interest not only to electrochemists, but also to all those workers in the fields bordering on chemistry who make use of electrochemical methods in their research. A complete bibliography of "Polarographic" literature is appended.

A. W. BOLDYREFF

Physical Chemistry for Students of Biology and Medicine. By DAVID INGERSOLL HITCHCOCK, Ph.D., Associate Professor of Physiology in the Yale University School of Medicine. Charles C. Thomas, Publisher, 220 East Monroe St., Springfield, Illinois, 1932. xi + 182 pp. 26 figs. 14.5 × 23.5 cm. Price, \$2.75.

Many students of biology and medicine feel increasingly the need of some knowledge of physical chemistry. To be of the greatest benefit, such knowledge should come early in the student's scientific training, whether or not he plans to take a more advanced course in the subject later on. This book is intended especially for such students. It deals successively with the gas laws, the theory of solutions, the law of mass action, buffer action, galvanic cells and *P_H* measurements, adsorption and the colloidal state, membrane equilibrium, reaction velocity and enzyme action, oxidation-reduction potentials, and (briefly) with the concepts of total energy and free energy. There is also a chapter on blood, setting forth the application of physico-chemical principles to this physiological system. The lucidity of the presentation is admirable throughout. As might be expected from the author, the treatment of membrane equilibrium is excellent, being decidedly the best presentation of this subject for elementary students of which the reviewer is aware. The often confusing subject of oxidation-reduction potentials is also set forth with great clarity. Inevitably some mathematical relations are assumed and must be taken on faith by most of the readers to whom the book is addressed; but Dr. Hitchcock has reduced this element nearly to the minimum possible under the circumstances.

As the author states in his preface, "the selection of topics has been guided by their past application in biological work." In the reviewer's opinion, it would be desirable to take the student further afield, and familiarize him with concepts which are likely to achieve biological significance in the years to come. The elements of the electronic theory of valence; the elements of electrostatics, especially dielectric constants and dipole moments; the orientation of molecules at interfaces and in fields of force—such topics as these are of real and rapidly growing importance to the biologist. They all furnish admirable opportunities for demonstrating the relation between the structure of molecules and their physico-chemical behavior: a relation which the biologist should be led to appreciate as early as possible because of the breadth and unity which it can give to his thinking. To take one example among many: if the student has some conception of the electrostatic forces which cause substances like sodium chloride and the amino acids to dissolve readily in water and hardly at all in fatty solvents, it will help to il-

illuminate his conception of the chemical organization of the cell. The fundamental concepts involved in such subjects as those here mentioned could, furthermore, be treated with primary emphasis on simple physical ideas, and with relatively little mathematical apparatus.

Such questionings should not obscure the great success with which Dr. Hitchcock has fulfilled the aims he set out to achieve. For that success the book is to be heartily commended, and it will be found of great value by many teachers and students.

JOHN T. EDSALL

Organic Chemistry. By G. ALBERT HILL, Professor of Organic Chemistry, Wesleyan University, and LOUISE KELLEY, Professor of Organic Chemistry, Goucher College. P. Blakiston's Son and Co., 1012 Walnut St., Philadelphia, Pa., 1932. viii + 564 pp. 14.5 × 22 cm. Price, \$3.00.

The authors planned this book as a text for "an elementary but comprehensive, one-year course in organic chemistry." It should be an excellent text for this purpose, for it is both well planned and well written. Of the 535 pages of text, 324 pages are devoted to aliphatic compounds and 168 pages to aromatic compounds. In addition to this material there are chapters on terpenes and camphors, heterocyclic compounds, alkaloids and plant and animal substances. The latter chapter, although comprising only 22 pages, is a concise and highly instructive introduction to the chemistry of hormones, enzymes, sterols, vitamins, lignin, rubber and natural pigments.

Besides its general high quality, certain features of this book particularly impressed the reviewer. The first is the sustained emphasis on the experimental side of organic chemistry. The importance and control of side reactions are brought to the reader's attention early in the book by the statement, "some unsympathetic soul has remarked that organic chemistry is the chemistry of side reactions and by-products. This statement is at least spiced with truth; however, by adjusting conditions the organic chemist can frequently cause the desired reaction, of several possible, to predominate, and in this necessary battle of wits against matter lies part of the charm of organic chemistry." Thereafter the authors take especial care to stress the dependence of the course upon the conditions of reaction. The inclusion of many of the recent developments in theoretical and applied chemistry is another striking feature of the book. The use of van Alphen's explanation of the formation of ether, the formulation of the Beckmann rearrangement as a transmigration of groups and the relation of structure to solubility and reactivity are examples of the type of discussion that will delight the teacher, while such recent developments as chloroprene and duprene, extraction of bromine from sea water, and the connection of tri-*o*-cresyl phosphate with Jamaica ginger paralysis should convince the student that organic chemistry is not a totally abstract science.

In addition to those mentioned above a few other features of the book may be noted, *viz.*, an introductory chapter on the historical background of organic chemistry, detailed discussions of the physiological action of many organic compounds, numerous tables listing the physical properties of members of various homologous series, and brief biographical notes concerning some of the contributors to organic chemistry.

Very few errors are to be found in the book. The incorrect formulas of quinine (p. 511) and guaiacol (p. 527) and the misstatement of the definition of saponification (p. 154) are evidently oversights in proof reading. However, the assertion that aniline is the chief basic constituent of coal tar (p. 363), the recommendation of acetyl chloride as a reagent for the separation of primary and secondary from tertiary amines (pp. 174, 370), and the statement (p. 510) that synthetic morphine is about to be produced commercially are examples of more fundamental errors and should be revised. These relatively few errors are the only faults which the reviewer can find in the book.

S. M. MCELVAIN

Laboratory Methods of Organic Chemistry. By L. GATTERMANN. Completely Revised by Heinrich Wieland. Translated from the Twenty-Second German Edition by W. McCartney. The Macmillan Company, 60 Fifth Ave., New York, 1932. xviii + 416 pp. Illustrated. 15 × 22,5 cm. Price, \$3.50.

When, in 1894, Ludwig Gattermann prepared a modest manual to fulfill his private requirements in giving instruction in organic laboratory work, he probably little dreamed that the "cook book," as he called it, would be so widely circulated as to require up to the present time no less than twenty-two editions. One reason why "Gattermann" has remained a classic of the organic chemist for nearly forty years is that the plan of providing the preparative directions with theoretical explanations has proved very satisfactory. It is also evident from the wide use of the various German editions and the translations that the preparations originally included were well chosen and adequately described. A further factor contributing to the success of the book is that the author was widely recognized as an experimentalist of experience and distinction.

It is thus particularly appropriate that a thoroughly up-to-date revision of Gattermann's manual was undertaken by one of the outstanding leaders in the field of modern organic research, and it will be generally agreed that Wieland has performed a distinct service to the science by preparing one revision in 1925 and another in 1930. In doing so he wisely adhered to the plan of weaving into the practical directions an extensive survey of the theory of the reactions involved. The re-writing and the amplifying of the theoretical parts of the book is indeed so well done that the new volume is not only a practical manual but serves also as an excellent and authoritative textbook of advanced organic chemistry. A knowledge of the principles of the subject being assumed, it is possible for the author to consider matters of theory in considerable detail and to cover a wide range of subjects in a volume which does not exceed a reasonable length. The book gains in importance in thus presenting Wieland's views and comments, particularly on the mechanisms of reactions.

The preparative directions also have been greatly improved and extended. Some idea of the novelty of the new preparations can be given by citing a few examples: experiments with triphenyl-methyl and diphenyl nitrogen, a synthesis of indigo, the extraction of nicotine, haemin and some of the bile acids; the saccharinification of potato starch, and the preparation of invertase from yeast. It will be evident that much of the new material has been chosen with a view to stimulating the student's interest in biochemistry, which in the author's opinion is "the most important branch of the subject." Throughout the descriptions of the various preparations and particularly in the chapters dealing with general laboratory operations, it is gratifying to find that the author has been careful to include some of the little devices and manipulative tricks which can add so much both to the success and the pleasure of laboratory work. The Nobel Prize laureate does not hesitate, for example, to recommend new uses for old playing cards!

It should be pointed out that "Gattermann-Wieland," even though it is now available in translation, is hardly suitable for use in the courses of elementary organic chemistry given in this country. In the German universities the student takes up his work in the organic laboratory only after he has completed a course of lectures on the subject, and watched the lecturer perform numerous experiments. The American student, on the other hand, usually performs his first distillation a few days after attending his first lecture on the compounds of carbon. It is obvious that it is necessary to supply him with much more detailed directions than a book designed for the more mature German student can offer, and that he is not yet in a position to appreciate the wealth of information presented in the volume under discussion. It is in our advanced courses and courses of research that "Gattermann-Wieland" will be of greatest value, and every student

who hopes to become an organic chemist should be encouraged to secure a copy as soon as he is able to use it intelligently.

The present translation requires little comment. For the most part it is accurate and clear, and, though the text lacks grace of expression, it must be declared adequate.

LOUIS F. FIESER

Alcohol and Man. The Effects of Alcohol on Man in Health and Disease. By HAVEN EMERSON, Editor. The Macmillan Company, 60 Fifth Ave., New York, 1932. 451 pp. Price, \$3.50.

According to the preface, this book was compiled with the intention of placing before the general reader the accepted facts concerning the use and abuse of alcohol by man both in health and in disease.

Every effort has been made to avoid taking sides on the prohibition question. The work represents a painstaking effort to present the known facts and to show how these facts have come to be accepted.

In their effort to avoid taking sides, the editors appear to have leaned over backward and in many instances leave the reader in doubt as to the importance of many of the facts stated.

The chemists must be impressed with the uncertainty of many of the methods by which some of the facts have been determined. It would seem desirable to have a summary based upon logical conclusions from the facts as stated, with careful consideration given to the importance of these facts.

The whole work leaves one with the impression that the authors were uncertain as to the amount of weight which should be placed upon the results of some of the experimenters.

It would appear that the use of alcohol by those in good health was likely, if not certain, to result in diminished mental and muscular ability, that many of the popular beliefs were not founded upon facts and that in general a healthy person would be better in general health if alcohol was taboo. The same thing could easily be said about tea, coffee and many other articles in everyday use and probably facts determined by experiments could be adduced to prove the case.

After all is said and done, one who has read this book will very likely reach the conclusion that the matter is still in an experimental and uncertain stage, and that every one will be forced to decide for himself.

The toxic properties of alcohol in large doses appear to be accepted by everyone. The degree of toxicity between *ethyl* and *methyl* alcohol is left somewhat in doubt, for while *methyl* alcohol appears to be *less* poisonous so far as the immediate results of overdoses are concerned, most of the facts point toward more serious effects from continued small doses than is the case with *ethyl* alcohol.

The food value of ethyl alcohol appears to be quite definitely established within certain limits, but as each individual possesses specific peculiarities and as the conditions under which the alcohol is taken vary greatly, no really definite conclusion appears as to how much alcohol may be taken and used as food without unhappy results.

Taken all together, it is an interesting but indefinite book.

JOHN A. SEAVERNS