

scribed [Woolley, *et al.*, *J. Biol. Chem.*, **125**, 715 (1938)]. Further investigation revealed that the activity of these concentrates is very readily destroyed by alkali. β -Alanine has been isolated from the alkali-inactivated concentrates. The acidic part of the alkali-inactivated concentrates can be reactivated by coupling with synthetic β -alanine in the following manner.

The alcohol-soluble barium salt fraction (Woolley, *et al.*) was dissolved in *N* sodium hydroxide and warmed for one hour. The solution was acidified and shaken with ethyl acetate, and the extracted material was acetylated with acetic anhydride. Volatile matter was removed under reduced pressure, and the residue was treated for one hour at room temperature with a large excess of SOCl_2 . After removal of the excess reagent under reduced pressure, the light brown, semi-solid residue was dissolved in dry pyridine, cooled in ice water, and slowly treated with an excess of β -alanine ethyl ester. The pyridine was removed under reduced pressure, and the residue was suspended in dilute hydrochloric acid (final pH of 2) and extracted with ethyl acetate. The extract was freed of solvent, and treated with cold, alcoholic sodium hydroxide in order to remove the acetyl and ester groups. After one hour the solution was carefully neutralized with alcoholic hydrochloric acid.

The β -alanine was isolated from the ethyl acetate extracted residue of the alkali-treated concentrate by continuous ether extraction for four days, extraction of the residual solution with butanol, and crystallization from the extract with

ethanol: yield, 9 mg. from 1300 g. of liver extract; m. p. 204–206°; found N, 15.8.

The assays of the untreated concentrate, the alkali-treated concentrate, and the above products are shown in Table I.

TABLE I

	Level fed, equiv. to liver extract	Av. gain in 4 wks. ^a	% of chicks showing symptoms
Untreated concentrate	10%	91, 106	0
NaOH treated	40%	34, ...	100
Synthesized mixture	40%	94, 95	0
β -Alanine	0.1% of ration	37, ...	100

^a Figures represent two independent runs.

The chick antidermatitis factor appears to be very similar in properties to pantothenic acid [Williams, *et al.*, *THIS JOURNAL* **60**, 2719 (1938); Snell, *et al.*, *ibid.*, **60**, 2825 (1938), and private communications]. Thus they both are heat and alkali labile hydroxy acids. The acetyl derivatives of both are heat stable and distill at approximately the same temperature and pressure. Furthermore, the solubilities of the free acid and of its metallic salts in various solvents are similar. Williams has shown that his preparations are composed of an hydroxy acid and β -alanine. The above experiments indicate that the chick antidermatitis factor is a hydroxy acid in amide linkage with β -alanine. Final proof of the identity of the two factors must await crystallization of the pure compound.

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RECEIVED MARCH 3, 1939

NEW BOOKS

Atomphysik. I. Allgemeine Grundlagen. II. Theorie des Atombaus. (Atomic Physics. I. General Principles. II. Theories of Atomic Structure.) By Dr. KARL BECHERT and Dr. CHRISTIAN GERTHSEN, Professors in the University of Giessen. Walter de Gruyter and Company, Woyrschstrasse 13, Berlin W 35, Germany, 1938. 11 × 16 cm. 149 + 176 pp. 52 + 23 figs. Price, RM. 1.62 each.

These volumes, part of the series of books on chemical and physical subjects published by Göschen, attempt in three hundred small pages to cover the general field of atomic physics from an experimental and theoretical

standpoint. Such an undertaking is an ambitious one; it is not surprising that complete success does not result.

Volume I deals mainly with the experimental and theoretical background of modern physics: kinetic theory, electronic theory, beta-particles and cathode rays, the periodic system, radioactivity, collisions of the second kind, and the duality of matter. Volume II is principally an introduction to the quantum mechanical treatment of the atom beginning with the uncertainty relation and ending with a short excursion into the application of quantum mechanics to molecular spectra.

The presentation in general is clear, but the require-

ments of brevity are so stringent that the treatment often becomes a summary rather than an exposition and frequently rigor must be sacrificed. A major deficiency of the volumes is their almost complete lack of references to the original literature. Consequently the usefulness of the books is seriously reduced. One unfamiliar with the field would find the books too sketchy for an introduction, one familiar would find them of little use because of the lack of references. Thus it would seem that their chief appeal will be to students desiring a concise review of the field. For this purpose they would be excellent.

W. H. AVERY

General Chemistry. An Introductory Course of Lessons and Exercises in Chemistry. By EUGENE P. SCHOCH and WILLIAM A. FELSING, Professors of Chemistry, The University of Texas. McGraw-Hill Book Company, Inc., 330 West 42d St., New York, N. Y., 1938. ix + 524 pp. 74 figs. 15 × 21 cm. Price, \$3.25.

In preparing this General Chemistry book the authors have deviated a little from the conventional choice, presentation and arrangement of the subject matter. Purely descriptive material has been minimized and much of the theory is approached and treated from the energy and reaction viewpoint. The ideas of equilibrium and electrolytic dissociation are introduced quite early in the text, as they should be, as also is a consideration of atomic structure. The extensive descriptions of less common elements, particularly the metals, found in many elementary books are absent, but the practical side of the subject and the industrial applications of chemistry have been emphasized whenever possible. An interesting feature of the book is the two well-written chapters devoted to the reactions of ions and their qualitative detection, an insertion which will benefit those students who do not continue in chemistry or whose course of study does not include Qualitative Analysis. Another departure from custom is the interspersing of the Laboratory work directions in the regular text, thus achieving a perfect coordination of theory with experiment and eliminating the otherwise ever-necessary laboratory manual. The skilled presentation deriving from the authors' long experience, and the innovations in method and arrangement, should win for this text a fair trial and numerous adoptions.

ALLEN D. BLISS

Polycyclic Aromatic Hydrocarbons. By CH. WEIZMANN AND E. BERGMANN. Scripta Academica Hierosolymitana. (Proceedings of the Jerusalem Academy.) Scientific Report I. Simon Velikovsky Foundation, P. O. B. 194, Tel. Aviv, Palestine, 1938. iii + 42 pp. 17 × 24.5 cm.

In this small brochure, which is Scientific Report I of the Proceedings of the Jerusalem Academy, the authors review work done with their collaborators at the Daniel Sieff Research Institute in the field of polycyclic aromatic compounds, particularly those resulting from the degradation of steroids and those of interest for their possible carcinogenic or oestrogenic activity. It is interesting that some of the recent work of this group on problems of current importance was inspired by discoveries made by

Dr. Weizmann over thirty years ago. This bridge with the past is indicated in the report, which includes, as well, some reference to observations which are as yet unpublished. In the brief discussions of the synthesis, formation, and properties of aromatic hydrocarbons one finds significant and often novel comments concerning such topics as the mechanism of the Elbs reaction, the phthaloylation of α -naphthol, cyclization reactions, the bond structures of polycyclic hydrocarbons, and the course of the dehydrogenation of various steroids.

LOUIS F. FIESER

Fluorescence and Phosphorescence. By E. Hirschlaff, Ph.D. Chemical Publishing Company of New York, Inc., 148 Lafayette Street, New York, N. Y., 1938 (exclusive agent for the Americas). 130 pp. 42 figs. 10.5 × 17 cm. Price, \$1.50.

A Methuen monograph is wont to achieve the impossible in the way of distilling the essence of a special subject into a hundred tiny pages.

A word about experimental methods, and a brief exposition of indispensable quantum considerations precede a treatment of fluorescent gases and liquids by no means superficial. The sections on quenching phenomena give a truly clear-cut idea of the mechanisms involved. Three subsequent chapters deal sanely with solid phosphors, including a rather full account of the alkali halide problem. The undersigned can find only one small pebble to throw. A more complete statement of the possibilities of fluorescence analysis should have appeared among "Technical Applications."

GEORGE S. FORBES

Problems in Organic Chemistry. By ERNEST HAMLIN HUNTRESS, Associate Professor of Organic Chemistry, Massachusetts Institute of Technology. McGraw-Hill Book Company, Inc., 330 West 42d Street, New York, N. Y., 1938. xi + 270 pp. 14.5 × 21 cm. Price, \$2.25.

This book of problems in organic chemistry is designed as a guide for the study of textbook and lecture material. It fills a definite need of the student who, meeting for the first time the myriad facts of organic chemistry, finds that simple memory work is not sufficient. The book offers extended drill on the material, presents it from a variety of angles and by encouraging practice in the use of the methods and habits of thought of organic chemists, greatly increases mastery of the subject. No descriptive matter is included, but following treatment of each new class of compounds there is a problem organized as a topical outline which is simply a brief summary of textbook matter. The questions as a whole are carefully chosen and well written and the book is considerably more comprehensive than other problem books. The organization is that of a conventional course in organic chemistry, but a final section (87 pages) of miscellaneous review and advanced problems deserves special mention for the wide variety of approaches which it offers. Emphasis is placed in turn upon nomenclature, characteristic reactions and tests, industrial applications, interrelationships between different classes, synthesis, definitions and methods, proof of structure, availability of starting materials, historical

aspects, and organization of the literature. A corresponding variety is found throughout the book, although a greater selection of questions on syntheses involving several steps could well be included. Furthermore, occasional questions of an experimental nature might serve more closely to correlate laboratory and lecture work. There is no good reason for segregating in laboratory manuals all questions on laboratory synthesis and the result is generally that the student fails to associate practice and theory. These are minor shortcomings, and the book is a distinct achievement in its field. It should be of great value to beginning students, advanced students preparing for comprehensive examinations and teachers.

THOMAS L. JACOBS

Gmelin's Handbuch der anorganischen Chemie. (Gmelin's Handbook of Inorganic Chemistry.) Edited by ERICH PIETSCH. Eighth edition. System-Number 66. Osmium, mit einem Anhang über Ekaosmium. (Osmium, with an Appendix on Ekaosmium.) Issued by the Deutsche Chemische Gesellschaft. Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 35, Germany, 1938. 100 pp. 17 × 25 cm. Price, RM. 14.25.

The history and occurrence of osmium and the preparation of metallic osmium have already been treated in connection with the other metals of the platinum group in the earlier volume of this Handbook, entitled Platinum, Part A.

This useful volume contains all the available usual information as to the properties of osmium and the properties and preparation of the compounds of osmium. In addition, there is an account of the recent studies of the relative abundance of the several isotopes of osmium. These studies indicate a decidedly smaller atomic weight than has been obtained by the most reliable of the determinations of atomic weights by chemical methods and make a repetition of such determinations desirable.

An account is also given in an appendix of the production and properties of the element *ekaosmium* (atomic number 94), one of the *transuranes* obtained by the bombardment of uranium with neutrons.

The literature of osmium has been covered up to August, 1938.

ARTHUR B. LAMB

Kurzes Lehrbuch der physikalischen Chemie. (Brief Textbook of Physical Chemistry.) By Dr. KARL JELLINEK, Emeritus Professor at the Technical Institute of Danzig. N. V. Uitgevers Maatschappij AE. E. Kluwer, Deventer, Holland, 1938. xv + 314 pp. 163 figs. 16 × 25 cm. Price, 8.50 Dutch fl.

Karl Jellinek's monumental 5-volume Lehrbuch of physical chemistry is well known, and finds a useful place in all good chemical libraries. The present book is Part 1 of a 4-part, much briefer, and more elementary textbook. All four parts are to be in paper covers so that they may be conveniently bound together into one (einbändiges) volume, if desired. Part 2 is already in press, and Parts 3 and 4 are promised by the author for 1939.

Professor Jellinek addresses this textbook not only to physical chemists who have already acquired some background, but also to beginners in the subject and to those

students and technicians in border-line fields who have need for a working knowledge of the fundamental principles of physical chemistry. The author dips to some extent into his famous 5-volume textbook as a source of material, and further calls upon his own very long teaching experience for a coherent outline of subject matter and for effective and successful methods of presentation. Special pains have been taken to explain with great care the usually difficult points, to take nothing for granted which cannot justifiably be so taken, and to avoid ambiguities. The exposition is remarkably clear.

A feature of the treatment is the working through of a great many very nice problems, in the body of the text, and an integration of the solution of these problems with the plan of description and exposition. Only an elementary acquaintance with differential and integral calculus is assumed, and the other mathematical techniques are developed and explained at the places where they are exploited.

Part 1 deals with physical chemical thermodynamics (pure substances, mixtures of non-electrolytes, and states of aggregation). The treatment develops in easy stages and, using the approach of reversible cycles and free energy, follows fairly closely the G. N. Lewis pattern in this field. Part 2 will treat electrochemistry, the phase rule, colloids and chemical kinetics; Part 3 will handle the structure of matter; and Part 4, photochemistry and wave mechanics. (Part 4 will be constructed so that it will be self-contained and may be used independently of the preceding three parts.)

The German is astonishingly easy to read and seems almost to have been written for the English speaking students who so often stumble through their German readings with such difficulty. Part 1 is strongly recommended, with much sincere pleasure on the part of the reviewer, to all students and teachers of physical chemistry. If we are to find that the forthcoming Parts 2, 3 and 4 maintain the same fine tone of extraordinarily logical, clear and appealing presentation of the subject, all modern workers in physical chemistry and related fields of science will owe Professor Jellinek a deep debt of gratitude.

EDWARD MACK, JR.

Physico Chemical Experiments. By ROBERT LIVINGSTON, Associate Professor of Physical Chemistry, University of Minnesota. The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1939. xi + 257 pp. 70 figs. 15 × 22 cm. Price, \$2.25.

This text follows in general the pattern set by the several standard well-known texts in this field. Following a Preface, Acknowledgment, and Table of Contents there is a comprehensive discussion of Measurements, Errors, and Computations. These are followed by a list of forty-one experiments divided into the following classifications in the Table of Contents: Gaseous State, Liquid State, Solid State, Structure of Atoms, Physical Properties and Molecular Constitution, Solutions, Thermochemistry, Equilibrium, Heterogeneous Equilibrium, Chemical Kinetics, Electrical Conductance, Equilibria Involving Ions, Electromotive Force, Electrolysis and Polarization, Photochemistry, and Colloidal State. An Appendix and Index are also included.

The directions are clearly written and each experiment includes an ample discussion of the theory involved, specific instructions for the laboratory work, and a careful discussion of the computations the student is to make. The text is well written and the drawings clear and understandable. An excellent feature is the system of references and cross references to some common standard texts and laboratory manuals in current use in the United States. The discussion of errors is one of the best that the reviewer has seen in any chemistry text available. It is indeed time that this valuable material, so necessary in the laboratory instruction of students in physical chemistry, should find the prominent place it deserves in laboratory manuals of that subject. That the author is well aware of this is substantiated by his devoting 50 pages of a 250-page book to this important subject.

A brief survey of the 41 experiments offered shows that some 16 may be classed as new or unusual procedures not heretofore available in laboratory manuals of physical chemistry. A serious drawback is that approximately 15 important and otherwise excellent experiments involve very special apparatus not readily available. The majority of the experiments are time-tried procedures familiar to all teachers of physical chemistry.

One or two minor criticisms may not be amiss. It would seem that a book published in 1939 should refer to the latest available tables of data and it seems incredible that such important tables as Landolt-Börnstein and the Tables Annuelles Internationales de Constantes receive no mention. A number of smaller tables in common use might also have been mentioned. The date 1933 is misleading for the International Critical Tables, as most of the data in these tables are older by some years. A more complete bibliography from the current literature to accompany each exercise would do much to enhance the teaching value of the book, particularly with more ambitious and advanced students. A notable omission is the failure to include the measurement of transference numbers by the method of moving boundaries except by reference.

The present book is an excellent one. It is one of the best the reviewer has seen in this field, and should find wide adoption and use. The author and publishers are to be congratulated for such a worth while addition to the current laboratory texts in physical chemistry.

CHARLES M. MASON

Lectures on Osmosis. By F. A. H. SCHREINEMAKERS, D.Sc., Emeritus Professor, University of Leyden. Nordemann Publishing Company, Inc., 215 Fourth Avenue, New York, N. Y., 1938. xi + 266 pp. 45 figs. 16 × 25 cm. Price, \$7.00.

In this book Dr. Schreinemakers summarizes and analyzes for the purpose of thermodynamic classification the experiments on osmosis and diffusion carried on at the University of Leyden during the past fifteen years. The experiments surveyed involve aqueous solutions of various inorganic salts and some organic acids, in a rather wide range of concentration, diffusing through membranes such as pig's bladder, parchment, cellophane, collodion and omentum. The possible paths for the approach to a final state, in the relative diffusion of liquids through various

actual and imaginary membranes are tabulated and discussed. The treatment is exhaustive and minute, but withal in great part formal and hypothetical. Some of the factors considered are: the pressure (constancy or variability, equality or inequality, on the two sides of the membrane), the volume, the elasticity of the walls, the number and concentration of components in the liquids, the presence of solid phases, anhydrous or hydrated, the selectivity of various imaginary membranes, and the combination of various, again mostly imaginary, membranes.

The book is entitled "Osmosis," but most of the discussion and all the experimental examples cited concern relative diffusion, or processes involving membranes through which all the components of the system can diffuse. This strictly is not osmosis, and there can be no question in these cases of osmotic pressure. There are actually no experiments cited with semipermeable membranes.

The entire discussion moreover, although elaborate in form and classification, does not touch the question of the mechanism of osmosis at all; and except for the final state, the thermodynamics here cannot predict the path a given system will follow with an untried membrane. The membrane is the *deus ex machina* of the process. The obvious thermodynamic possibilities ("Diffusion Types") are easily deduced; in fact Dr. Schreinemakers' exposition, in surprisingly lucid English, is so remarkably clear that they appear self-evident for the most part, like simple algebraic deductions. But as to which "Diffusion Type" will actually occur in any specific case, this "depends on the nature of the membrane," about which the author here offers no speculations or explanations, not even generalizations. The absorbing problem of why the same system of two liquids, with the same relation of potentials in every respect in each case, behaves differently according to the membrane, in its path to an ultimate equilibrium or steady state, is passed over as just another fact. One is not even sure that any of the experiments cited would be reproducible even using the same membranes since it is possible for the "nature" of the membrane to change during the diffusion.

One or two really interesting deductions, such as the number and type of paths and of "bundles of paths" possible for certain ternary complexes approaching equilibrium, are not explained but merely stated; while some very obvious deductions are elaborated in unnecessary detail, with diagrams, etc., such as that "all liquids saturated with solid S (under the same p and T) have the same O. S. A.,"—"O. S. A." being the "Osmotic S attraction," or the negative of the thermodynamic potential of the component S. A larger use of basic thermodynamic generalizations carried over for example from the principles of the phase rule might have saved some of this. Thus a combination of two variable liquids each in osmotic contact, through similar or different membranes, with an intervening "invariant" liquid (a limitless liquid of invariable composition) is treated as a single system, with certain conclusions which seem impressive only because it is not realized from the start that such a combination is not a single system, and that the two variable liquids are actually, under the conditions, not at all in any kind of contact or relation with each other.

One wonders many times during the study of this book

what may be the significance of so much imaginary tracing of imaginary systems.

JOHN E. RICCI

Organic and Bio-Chemistry. By R. H. A. PLIMMER, D.Sc., Professor of Chemistry in the University of London, at St. Thomas's Hospital Medical School. Longmans, Green and Company, 114 Fifth Avenue, New York, N. Y., 1938. x + 623 pp. Illustrated. 16 × 26 cm. Price, \$7.50.

This book is a classic in the field of biochemistry. It is designed for a course where organic chemistry is not a prerequisite. In its early editions it was chiefly a laboratory manual, but the theoretical sections for both the biochemistry and especially the organic chemistry have been increased during the recent editions. The laboratory directions are interspersed with the theoretical discussions. Continuity is obtained by marking the laboratory experiments with an asterisk. The author states that the sixth edition remains substantially the same as the last edition, which was published in 1933. Alterations were made where necessary and new material was added without greatly increasing the size.

It is regrettable that the publishers for Professor Plimmer, who is an international authority in biochemistry, have not given him better support. The typography of this edition does not meet the present day high standards as can be noted on pages 212, 358 and 380. In one of the very able reviews of the fifth edition the attention of the publishers was directed to this fact.

An enormous amount of material, from the practical and theoretical viewpoint, has been incorporated in this book. It should continue to appeal to individuals interested in either or both of these fields of chemistry as it has for almost one-third of a century.

BYRON RIEGEL

Outlines of Biochemistry. The Organic Chemistry and the Physicochemical Reactions of Biologically Important Compounds and Systems. By ROSS AIKEN GORTNER, Professor of Agricultural Biochemistry, University of Minnesota. Second edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1938. xxi + 1017 pp. 15.5 × 24 cm. Price, \$6.00.

This book is a revision of the author's valuable text which first appeared in 1929 [reviewed in *THIS JOURNAL*, 52, 3474 (1930)]. The plan and subject matter are unchanged except that each of the original thirty-five chapters is brought up to date and three new chapters are added: one by H. B. Bull on oxidation-reduction, one on flavins and one on hormones. The text is increased by 220 pages.

The contents and viewpoint are correctly indicated by the sub-title. The work is chemical and physico-chemical rather than biological, it treats phytochemistry more than zoöchemistry—and is the more valuable for that reason. No other book covers this ground.

Eleven chapters on the colloidal state occupy 350 pages or a third of the book, and provide a clear, reasoned and readable treatment of this important subject. The section on proteins is also extensive (224 pages) and is a rich source of detailed information. Carbohydrates including glucosides and pectins, tannins and plant pigments, lipids

and essential oils are adequately covered. The final section of three chapters on hormones, vitamins and enzymes presents an excellent summary of the very notable recent advances in chemical knowledge of these subjects.

As in the first edition, a valuable feature is the abundance of references to be found on nearly every page, giving complete titles which make easily available the original sources in a wide variety of journals. The substance of papers cited is usually explained at length in a clear and readable manner.

Although a few typographical errors have escaped the proofreader and several misleading statements pointed out in a review of the first edition appear unchanged, the book is clearly written and is well printed in type easy to read. It is a welcome addition to biochemical texts and may be highly recommended to serious students of this subject.

PHILIP A. SHAFFER

BOOKS RECEIVED

February 15, 1939-March 15, 1939

A. E. VAN ARKEL, Editor. "Reine Metalle. Herstellung—Eigenschaften—Verwendung." Verlag von Julius Springer, Linkstrasse 22-24, Berlin W 9, Germany. 574 pp. RM. 48; bound, RM. 49.80.

A. J. BERRY. "Volumetric Analysis, Including the Analysis of Gases." The Macmillan Company, 60 Fifth Ave., New York, N. Y. 196 pp.

TOBIAS DANTZIG. "Number. The Language of Science." Third edition. The Macmillan Company, 60 Fifth Ave., New York, N. Y. 320 pp. \$3.00.

ALEXANDER FINDLAY AND A. N. CAMPBELL. "The Phase Rule and its Application." Eighth edition. Longmans, Green and Co., 114 Fifth Ave., New York, N. Y. 327 pp. \$3.00.

FREDERICK GEORGE MANN AND BERNARD CHARLES SAUNDERS. "Practical Organic Chemistry." Longmans, Green and Co., 114 Fifth Ave., New York, N. Y. 418 pp. \$2.75.

J. F. McCLENDON. "Iodine and the Incidence of Goiter." The University of Minnesota Press. Minneapolis, Minn. 126 pp. \$5.00.

H. MIDDLETON. "Systematic Qualitative Analysis." Longmans, Green and Co., 114 Fifth Ave., New York, N. Y. 279 pp. \$2.50.

ERNST H. RIESENFELD. "Lehrbuch der anorganischen Chemie." Second edition. Verlagsbuchhandlung Franz Deuticke, Hefnerstorferstrasse 4, Wien, Germany. 706 pp. M. 14; bound, M. 16.

GERHARD K. ROLLEFSON AND MILTON BURTON. "Photochemistry and the Mechanism of Chemical Reactions." Prentice-Hall, Inc., 70 Fifth Ave., New York, N. Y. 445 pp. \$5.75.

THOMAS K. SHERWOOD AND CHARLES E. REED. "Applied Mathematics in Chemical Engineering." McGraw-Hill Book Co., Inc., 330 West 42d St., New York, N. Y. 403 pp. \$4.00.