

layers in the *X* films as opposed to an electrical symmetry in the case of the *Y* films. In this connection it should be pointed out that Holley and Bernstein [*Phys. Rev.*, **52**, 525 (1937)] have shown that the X-ray grating space of *X* and *X* barium-copper-stearate films is approximately the same.

We wish to express our gratitude to Dr. Langmuir through whose kindness one of us was shown the technique of multimolecular film formation at his laboratory in Schenectady.

BIOLOGICAL LABORATORIES  
HARVARD UNIVERSITY  
CAMBRIDGE, MASS.

ELIOT F. PORTER  
JEFFRIES WYMAN, JR.

RECEIVED NOVEMBER 12, 1937

## NEW BOOKS

**The Biochemistry of Cellulose, the Polyuronides, Lignin, etc.** By A. G. NORMAN, Ph.D., D.Sc., Biochemist, Rothamsted Experimental Station. Oxford University Press, 114 Fifth Avenue, New York, N. Y., 1937. ix + 232 pp. 16 × 24.5 cm. Price, \$5.00.

Dr. Norman has brought together in one volume and discussed critically the most important results obtained during the past two decades on the biochemistry of cellulose and closely related cell wall compounds. He does not attempt to cite every publication in the field nor does he review the great mass of earlier publications.

The chapters dealing with cellulose, the polyuronide hemicelluloses, pectin, lignin, the gums and mucilages are excellently written and sufficiently complete. In these chapters the author discusses such general topics as the occurrence, preparation, properties, hydrolysis, biological decomposition, constitution and structure of the materials in question.

In the chapter on the metabolism of plant cell wall constituents he summarizes the work that has been done on the subject and discusses the various suggestions that have been made relative to the interrelation of these materials.

The last chapter deals with work that has been done on bacterial and fungal polysaccharides. The appendix is devoted to a brief discussion of the uronic acids and the quantitative determination of pentoses in the polyuronides.

The work has been carefully and critically prepared and will be a great help both to the general student of plant biochemistry and to investigators in this special field.

ERNEST ANDERSON

**The Structure and Composition of Foods.** Vol. III. Milk (Including Human), Butter, Cheese, Ice Cream, Eggs, Meat, Meat Extracts, Gelatin, Animal Fats, Poultry, Fish, Shellfish. By ANDREW L. WINTON, Ph.D. and KATE BARBER WINTON, Ph.D. John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y., 1937. xviii + 524 pp. 15.5 × 24 cm. Price, \$8.00.

This third volume of this series is divided into three principal parts: I, Milk and milk products; II, Eggs; and III, Animal products. In each instance there is an intro-

ductory section which covers the usual chemical constituents of the materials in question. This is followed by a series of sections in which the special types of animal food materials are described in detail. Thus in Part I the milks of different animals are covered separately, followed by an extensive discussion, under separate headings, of the numerous milk products including, for example, evaporated, condensed, dried, and malted milk, butter, cheese and ice cream as well as numerous other milk products. Part II dealing with eggs occupies fewer pages, but appears to be sufficiently extensive and is replete with information. Not only do the authors describe the average fresh egg, but they include references to the influence of breed of hen, feed, conditions of storage and other factors upon its composition and properties. Factors contributing to egg spoilage are discussed also.

Part III, Animal products, occupies about half of the volume. Not only are the ordinary forms of flesh meats included, but fish, shellfish, and various meat products such as sausages, fats, gelatin, meat extracts, and the like.

Unlike the two earlier volumes in this series covering: I, Cereals, nuts, oilseeds and forage plants; and II, Vegetables and fruits, respectively, the structure, including gross morphology and histology, occupies a very minor position in this third volume on animal products. The volume under review is concerned almost wholly with composition, using that term in the broad sense.

It is doubtless too much to expect that such an encyclopedic treatment as has been accorded food chemistry in these three volumes by the writers should be complete and balanced in every section. Certain inadequacies might be suggested, as in the discussion of the nature of milk fat globules (p. 32). This book should be of large service to all who are interested in animal products as foods, however, and particularly when supplemented with other specialized texts and monographs.

Errata and Addenda to Volumes I and II of the series are included in this volume. These chiefly comprise additions to the data recorded in the earlier volumes, with particular emphasis upon the chemical constitution of the vitamins, the vitamin content of fruits, the acid, and trace elements of fruits and vegetables.

C. H. BAILEY

**Hackh's Chemical Dictionary.** Second Edition. By INGO W. D. HACKH, A.M., F.A.I.C., F.R.S.A., with the collaboration of JULIUS GRANT, M.Sc., Ph.D., F.I.C. P. Blakiston's Son and Company, Inc., 1012 Walnut Street, Philadelphia, Pennsylvania, 1937. ix + 1020 pp. Illustrated. 17.5 × 25.5 cm. Price, \$12.00.

This new edition is larger by 230 pages than the first edition published in 1929. The increase in size is due partly to the inclusion of many new terms and partly to corrections and insertions of older terms omitted from the first edition. The definitions are brief; and elaborate or encyclopedic discussions are avoided, making the volume of value chiefly in reading. The style and format of the first edition are closely duplicated in the second.

It would be very easy for the reviewer of so compendious a work to become hypercritical if he should forget the extraordinary difficulties encountered in making such a compilation and the necessities imposed by limitations of space, so it should be understood at once that much praise is due Professor Hackh for the production of a monumental work of such general excellence. Nevertheless, the need for even greater completeness, and for still further broadening of the fields included, again must be urged. It is usually the word of unknown meaning the definition and uses of which are sought by a reader, rather than the commoner terms of the scientific idiom, for he is familiar enough with these. One wonders, therefore, why many more of the rarer terms should not also be included, in order that a book which is already so valuable might be made of still greater help to the reader of scientific literature. For example, in one very limited section, under lu-, the following terms are not among those found: Ludenscheidt's alloy, ludigol, Ludlum alloy, Ludwig's reagents, Luer syringe, luigite, lumachelle, lumbofebrin, lumen alloy, Lumière's process, lyo-luminescence, lunarine, lüneburgite, lupamaric acid, lupeol, lupeone, lupylene, etc.

Some of the definitions still show a tendency to be inaccurate or incomplete. Thus, that for molecule: "The chemical combination of two or more like or unlike atoms"; for process: "Any method used in the manufacture or treatment of substances"; for monel: "a native alloy . . ."; for lyophobic: "Repelling liquids . . . ." could be improved; and tetrahydro, which is an adjectival prefix, is defined as "a *compound* that contains . . . ." etc.

The spellings and usages of the American Chemical Society are in general followed, as indeed they should be.

Many names of well-known chemists are included, some of whom are now living. But if names of living chemists are to be given, it seems that some more obvious criterion of worth should be employed than is apparent, such as, in part at least, the number of references found in the name indexes of *Chemical Abstracts*. Similarly, the basis for selection of the less common trade names is not easily understood.

As stated above, it is easy to be meticulous and overcritical in commenting on a volume of this nature. Its value, however, to the reader of scientific literature related to chemistry definitely cannot possibly be overestimated. It is in the class of the most necessary and useful scientific literature, and should be as much a part of every library, public or private, as any other essential material.

WILLIS A. BOUGHTON

**Mikroanalytische Nachweise anorganischer Ionen. Ausführung und Reaktionsbilder.** By GERHARD KRAMER. With a Foreword by WILHELM BÖTTGER. Akademische Verlagsgesellschaft m. b. H., Leipzig, Germany, 1937. 35 pp. Illustrated. 16 × 23.5 cm. Price, RM. 5.60.

According to the Foreword, chemical microscopy is not a general substitute for the customary methods of qualitative analysis. Also, the inexperience of most chemists regarding the interpretation of microscopical observations is freely admitted. None the less, the appearance, under the microscope, of appropriate reaction products of a limited number of common ions is highly characteristic. With the help of the excellent microphotographs in the Appendix—so the author holds—there should be no possibility of error in making identifications. It is not difficult to imagine situations calling for qualitative tests involving fractions of milligrams. The simple manipulations required are clearly described, and the sensitivity of each test given in micrograms, though without reference to possible salt effects. Twenty cations and six anions are discussed.

GEORGE S. FORBES

**The Aromatic Diazo-Compounds and their Technical Application.** By K. H. SAUNDERS, M.C., M.A., B.Sc., F.I.C., Chemist, Imperial Chemical Industries, Ltd. Foreword by Professor A. G. GREEN. Longmans, Green and Company, 114 Fifth Avenue, New York, N. Y., 1937. xii + 224 pp. 15.5 × 23.5 cm. Price \$4.25.

Within recent years there has been a marked improvement in the technical manufacture of diazo-compounds and the application of the reaction has not only been intensified with respect to known classes but also has been broadened to include new fields. A voluminous literature has consequently been amassed and the need for an adequate but concise review of the subject was recognized by workers in this field.

The timely appearance of Saunders' "The Aromatic Diazo-Compounds and their Technical Applications" fills this void. The author has made a thorough survey of the technical and patent literature and in so far as the reader is concerned the subject matter has been remarkably condensed without omitting subjects or references of major importance.

Mr. Saunders is well qualified by years of experience in the field of dye chemistry to write with assurance on the subject of diazo-compounds. He has not only made a judicious selection of the published material, but has interpreted the literature out of his personal experience. The material is thoroughly digested and presented in a systematic, logical and readable manner.

The subject matter is discussed under the following headings: The Formation of Diazo-Compounds; Stabilized Diazo-Compounds; Elimination and Interchange of Groups in Diazo-Compounds; Theory of the Diazotization Reaction; Heterocyclic Diazo-Compounds; Stability; Analysis; Thermochemistry of Diazo-Compounds; Reaction of the Diazo-Compounds. Class A. Derivatives in which the Diazo-Group Remains Functionally Intact; Reactions of Diazo-Compounds. Class B. Derivatives in which the Diazo-Function Disappears, but the Diazo-

Nitrogen Atoms Remain in the New Molecule; Reactions of the Diazo-Compounds. Class C. Derivatives Formed by Replacement of the Diazo-Group; the Action of Light on Diazo-Compounds; Theories of the Constitution of the Diazo-Compounds.

A number of typographical errors in the first printing have escaped detection by the author and some of these are not included in the errata sheet. Those relating to formulas and equations will in all probability be apparent to the critical reader. Examples of others which are not so obvious are (1) the statement on page 110 that J-acid, 2,5-amino-7-sulfonic acid will couple only once. Reference to the graphic formulas shows that it is an aminonaphthol sulfonic acid. (2) The equation at the bottom of page 141 relating to diazobenzene sulfate fails to recognize the dibasicity of sulfuric acid. Both diazobenzene sulfate and the amino salt should contain the  $-\text{HSO}_4$  group.

Notwithstanding such lapses, the reader will find Saunders' book to be thoroughly reliable and stimulating. It is particularly recommended to the student, because the author, with assurance and skill, guides the reader through the intricacies of this complex subject directly to its real fundamentals.

P. H. GROGGINS

**Zwischenmolekulare Kräfte und Molekülstruktur.** (Intermolecular Forces and Molecular Structure.) By Dr. phil. habil. GÜNTHER BRIEGLEB, School of Physical Chemistry and Electrochemistry of the Technical Institute of Karlsruhe. Verlag von Ferdinand Enke, Hasenbergsteige 3, Stuttgart-W, Germany, 1937. x + 308 pp. 36 figs. 16 × 24.5 cm. Price, RM. 22; bound, RM. 23.80.

The book begins with a classification and description of interatomic and intermolecular forces. Particular attention is given to forces between chemically saturated molecules. The various approximation formulas for the calculation of van der Waals forces are stated, and their application to gases is discussed.

A large part of the book is devoted to the interpretation of molecular association phenomena in terms of dispersion, induction, and low frequency electric multipole forces between molecules. The hydrogen bond and structural resonance involving pairs of molecules come in for discussion. The structures of a large number of molecular association compounds are analysed in considerable detail. In certain cases, the author's conclusions scarcely can be accepted without reservation. On the other hand, this section of the book provides an interesting qualitative survey of that group of phenomena, often vaguely classified under the heading of secondary valence.

A discussion of the influence of intermolecular forces on

The author has assembled a large mass of descriptive material. The analysis of this material is for the most part qualitative and sometimes a little superficial. The book should prove useful as a means of introducing the unfamiliar reader to a large number of chemical problems, in which the role of intermolecular forces is of predominant importance.

JOHN G. KIRKWOOD

**Lehrbuch der organischen Chemie.** (Textbook of Organic Chemistry.) By PAUL KARRER, Professor at the University of Zürich. Fifth, revised and enlarged edition. Georg Thieme Verlag, Rossplatz 12, Leipzig C 1, Germany, 1937. xxiii + 973 pp. 17.5 × 26 cm. Price, RM. 34; bound, RM. 36.

Although this can properly be called a "revised and enlarged" edition of Prof. Karrer's well and favorably known textbook, the revision is slight and the enlargement is not great. The revision is confined almost entirely to the chapters dealing with certain groups of natural products (sterols, saponins, hormones, vitamins, etc.) which are under intensive investigation, and a new chapter describing the carbolin alkaloids has been added. For the most part the text is the same as that of the fourth edition which appeared little more than a year ago.

E. P. KOHLER

**A Commentary on the Scientific Writings of J. Willard Gibbs.** Vol. I. Thermodynamics. Edited by F. G. DONNAN and ARTHUR HAAS. Vol. II. Theoretical Physics. Edited by ARTHUR HAAS. Yale University Press, New Haven, Conn., 1936. I, xxiii + 742 pp. II, xx + 605 pp. 15.5 × 23.5 cm. Price, \$10.00.

At the initiative, and with the support, of one of the most eminent pupils of Willard Gibbs, there was set up at Yale University in 1927 the Committee on the Gibbs Commentary, which has been responsible for the production of this comprehensive work, somewhat larger than the collection of Gibbs' own scientific contributions, and constituting a worthy and a dignified memorial to that great and modest scientist. The Committee and its Editors are to be congratulated upon the list of collaborators, all of whom have worked with distinction in some of the regions of science illuminated by the genius of Willard Gibbs. As was to be expected, there is a certain amount of duplication, and, in particular, the first part of the paper, "On The Equilibrium of Heterogeneous Substances," has been reviewed independently by several of the authors. Considerable latitude has been shown in choosing the method of attack. Some have only restated and enlarged upon the original papers of Gibbs, others have

The book opens with a short note by F. G. Donnan on symbols and nomenclature, a matter which presumably was not regarded as so important by Gibbs as it has been by some of his followers. Undoubtedly there are cases where a well considered nomenclature adds greatly to the clarity and effectiveness of a scientific method. No better example can be offered than Gibbs' own work on vectors and dyadics, where his notation threw into such perspective the geometrical as well as the algebraic meaning of vectors and vector operators that this very notation was perhaps Gibbs' most eminent contribution to vector analysis. On the other hand, Gibbs' thermodynamic symbols seem to have been chosen somewhat at random and, from the pedagogic view, not too happily. For example, it is very important for the beginner to sense the symmetry of thermodynamic formulae and to trace that parallelism between the coordinated quantities, volume and entropy, which is obscured if one of these quantities is designated by a Roman and the other by a Greek character.

The second paper contains a short mathematical note by J. Rice on the method of variations in thermodynamic problems. Next follows Wilson's commentary on Gibbs' Papers One and Two, with reminiscent and critical notes. To J. A. V. Butler was assigned the task of commenting upon the general thermodynamic system of Gibbs. Closely adhering to the original, he nevertheless changes somewhat the order and method of presentation and introduces illustrations drawn from recent data and observations. The next paper, by E. A. Guggenheim on osmotic and membrane equilibria, traces the development of this subject, much of which is due to the work of Donnan and himself. Then follows a short paper by E. A. Milne, who once more discusses the criteria of equilibrium, with an extension of some of Gibbs' calculations to take account of second order terms. The great development of the field associated with the term phase rule could hardly be treated fully within the scope of this work, but in the two papers by G. W. Morey and F. A. H. Schreinemakers the theory is fully developed and applied to numerous systems. The paper by D. H. Andrews, dealing with gravity and centrifugal force, presents briefly a subject which once seemed of small practical importance but which is becoming more prominent with increasing use of powerful centrifugal apparatus. The equations of ideal gases and gas mixtures are developed by F. G. Keyes, together with a discussion of recent studies of imperfect gases, to which he has been an important contributor. In the next paper J. Rice treats in a very thorough manner the thermodynamics of strained elastic solids. For this perhaps thankless task the author was compensated by the additional assignment of that chapter in Gibbs which led directly to the development of the splendid field known as capillary or surface chemistry. The last paper in Volume One, by H. S. Harned, is on electrochemical thermodynamics. Here also the subject has developed so rapidly that volumes could have been written, but the author contents himself with the application of the thermodynamic method to such problems as the determination of activity coefficients from measurements of electromotive force.

Beginning the second volume of the Commentary, the thermodynamic principles are once more developed from

the beginning by Haas, this time for the benefit of students of physics. One does not see, however, that this differs from the expositions designed for chemists, or that it should differ. This paper, more than any of the preceding, emphasizes the Gibbs paradox. This famous paradox is of the greatest historical and logical importance since it showed an absolute discrepancy between the deductions of thermodynamics and the views which were then universally held regarding the physical continuum. If this discrepancy had been more widely discussed and its consequences more fully developed, quantum theory might have begun a generation earlier than it did. This second volume also contains commentaries on various contributions made by Gibbs to physics and mathematics, but is chiefly devoted to commentaries by Haas and Epstein on Gibbs' great contributions to statistical mechanics. In these papers, in which the whole statistical method is scrutinized critically, we note a striking contrast with the commentaries on thermodynamics, where none of the authors go behind the dictum of Clausius that entropy tends toward a maximum.

To attempt a restatement of the cardinal postulates of thermodynamics would have been no disloyalty to the memory of Gibbs, for of all men he was the first to recognize the necessity for such amendment. In that same monumental paragraph in which he announced his paradox, he stated "the impossibility of an uncompensated decrease of entropy seems to be reduced to improbability." Since this book was primarily designed to permit Gibbs to be read with better understanding by the beginning student, it seems unwise to leave it to the student to ascertain in what sense the entropy of a system *probably* moves toward a maximum. Indeed this same student, reading the papers on statistical mechanics, will become acquainted with the various forms of the ergodic hypothesis, according to which every system returns over and over to something like its original state, so that on the average no property, such as the entropy, has even the probability of changing in one direction rather than in another. Finally, to complete his mystification, the student learns that the entropy is determined completely by such variables as the energy, the volume, and the masses of the various constituents, so that, when these are fixed, the entropy cannot be considered to change at all, even in thought. It is not difficult to restate the definitions and postulates of thermodynamics so that these obstacles disappear, and when this is done, no material change need be made in Gibbs' whole system of thermodynamic equations, which then stands forth as a body of exact scientific truth from which nothing has to be subtracted and remarkably little has to be added to satisfy all the demands of modern thermodynamics.

GILBERT N. LEWIS

---

**Quantitative Analysis.** By WILLIS CONWAY PIERCE, Assistant Professor of Chemistry, University of Chicago, and EDWARD LAUTH HAENISCH, Assistant Professor of Chemistry, Villanova College. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1937. xi + 412 pp. 15.5 × 23.5 cm. Price, \$3.00.

This textbook is typical of several that have appeared in recent years in which the attempt is made to establish

a better balance between practice and theory by expanding the treatment of theory.

Part I, 45 pages, deals with preparation of equipment, use of the balance, and the general matters of precision, errors and significant figures. Part II, 180 pages, covers volumetric analysis under the three usual subdivisions: neutralization, oxidation-reduction, and volumetric precipitation. Part III, 106 pages, under the heading, Gravimetric Analysis, includes simple determinations (Cl, Fe, S, P) and the analysis of limestone (proximate analysis, followed by purification of  $\text{SiO}_2$ , and determinations of Fe in  $\text{R}_2\text{O}_3$ , of  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$ , and of  $\text{CO}_2$ ). Part IV, 42 pages, as special methods, treats of electrodeposition (analysis of brass), electrometric titration, colorimetric methods of analysis, use of analytical literature, and special methods of analysis.

Each larger topic is covered typically from three angles, (1) methods and calculations, (2) laboratory procedures, and (3) theory, with a generous and well selected set of questions and problems at the end of each chapter.

A number of minor points may be discovered that are open to criticism.

(1) On p. 17 the damping effect in weighing is shown as a constant, although ideally it varies with the amplitude of the swing and is usually somewhat erratic due to air currents in the balance case.

(2) In the directions for calibrating and using pipets and burets, some consideration of after-drainage in relation to outflow time would lead to a better appreciation of the importance of properly restricted tips, and thus the obsolete practice of allowing "uniform drainage time" as a poor correction for bad equipment would be abandoned.

(3) Some of the solubility products in the table on p. 379 are not in accord with the usual values; *e. g.*,  $\text{Cu}(\text{OH})_2 = 1.5 \times 10^{-29}$ ,  $\text{AgBr} = 1.2 \times 10^{-12}$ ,  $\text{Zn}(\text{OH})_2 = 2.0 \times 10^{-14}$ .

In spite of a number of points such as those cited, one feels that the book is well organized and the content ample to provide the student an excellent first course in quantitative analysis. And many teachers using other texts will find valuable pointers in the methods of presentation and in the problems and questions at the end of the various chapters.

R. K. MCALPINE

**Ions in Solution.** By R. W. GURNEY, M.A., Ph.D., Research Associate in the University of Bristol. The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1936. vi + 206 pp. 45 figs. 14.5 × 22.5 cm. Price, \$3.00.

This book is written in the English physicists' best tradition of clear, entertaining and thought-provoking exposition addressed to the intelligent and well-informed layman. Yet any chemist interested in electrolyte solutions will find it pleasant and profitable reading. After a consideration of the difference in energy of an ion in a vacuum and in an idealized dielectric medium, each process is considered first in a vacuum and then in solution, with very liberal use of diagrams of the mutual energy of two particles as a function of the distance of separation. There is a chapter on interionic attraction and a brief discussion

of the dissociation of weak electrolytes, but most of the book is concerned with the gain or loss of electrons, that is, with the simplest type of oxidation-reduction reactions.

There are two faults which may irritate the specialist and trouble the less expert. The author ignores the fact that the difference in electrostatic potential between two different media is not a fit subject for scientific discussion because the work of transferring an electric charge from one to the other does not depend upon its magnitude alone. Except in Chapter XIII, he ignores the fact that there is a heat effect whenever a charge is transferred to or from a medium whose dielectric constant varies with the temperature. The first fault becomes important only in the last chapter when the followers of Nernst are chided for finding an answer different from that of the author to a question for which there is no correct answer. The second fault causes serious error in the discussion of the Debye-Hückel theory, but it is not very important elsewhere, and the reader may compensate for it to a large extent by reading "free energy" for "energy" wherever it occurs.

Although the book does not convince this reader that it contains material for radical changes in the study of electrolyte solutions, its value lies, not in the rigor of its thinking, but in the freshness of its point of view. Its climax is the discussion of the small variety of ions in solution compared to those in a gas, for example the absence of univalent or bivalent aluminum ions. The approximate explanation in terms of the damping of electrostatic forces in a dielectric medium and the stability limits imposed by the possibility of reaction with the solvent should be familiar to every chemist.

GEORGE SCATCHARD

**Metallic Corrosion, Passivity and Protection.** By ULICK R. EVANS, M.A., Sc.D., King's College, Cambridge. Edward Arnold and Co.: Longmans, Green and Co., 114 Fifth Ave., New York, N. Y., 1937. xxiii + 720 pp. 93 figs. 15 × 24 cm. Price, \$15.00.

Apart from the difficulties inherent in the subject itself, the student of corrosion has had to contend with serious difficulties in obtaining either a broad view of what is already known or specific information on special points, because of the scarcity of books of reference adapted to his needs. Much of the necessary information is widely scattered in a very extensive journal literature, forming what the author of the present volume aptly terms "a vast nebula of diffuse knowledge," and is therefore more or less inaccessible to the ordinary reader.

This book, written by one of the foremost authorities and most active investigators in this field, represents the successful achievement of a truly prodigious task, that of bringing together, in a single volume of some 700 pages, a complete summary of existing knowledge of the phenomena, mechanism and prevention of corrosion. It is intended to meet the needs both of pure scientists and of those chiefly concerned with practical applications. To facilitate its use by readers of different types each chapter is divided into three sections, (A) dealing with the Scientific Basis, (B) discussing Practical Problems, while (C), which may be omitted without detriment to the continuity, contains the Quantitative Treatment together with

certain arguments which, "although not mathematical may prove difficult to the elementary reader."

The author has had the advantage of directing and actively participating in an exceedingly extensive series of researches on corrosion carried out at Cambridge University and subordinate stations. A good deal of space is very properly given to this Cambridge work, with which the author is personally familiar, but the important results of other groups and individuals have been very fully covered. In the matter of interpretation of phenomena the author obviously has tried to be fair to those who disagree with him. Views divergent from his own are frequently presented or, as an alternative, attention is called to them and the proper literature references given.

There is, however, one matter in which it seems to the reviewer that the author could, with advantage, have gone a little farther in this direction. Passivity is discussed in the text as a phenomenon due to the presence of protective films, and what little is said about alternative theories is confined to a few brief footnotes. Moreover, the literature references to such views hardly seem to be adequate in number and scope. Probably this has been due to the author's wish, mentioned in the Preface, to avoid controversy. But considering that passivity until recently has been the battle ground for a number of divergent theories, most of which probably still have their strong adherents, it is likely that many readers, irrespective of their personal views, will be disappointed not to find, in a book of this size and title, something approaching a critical discussion of the various theories.

However, there is no doubt that the protective film theory is the prevailing one today, and that recent evidence has tended to strengthen its position. The chapter on Thin Films is of special interest in this connection since it deals with the proof of the presence in many cases of invisible solid films (usually oxides) even when the film is only 20 Ångström units or less in thickness, also with the study of the properties of very thin films, both before and after stripping from the metal base. Optical methods of measuring film thickness are described in a ten-page Appendix to the volume.

Nine of the total of fifteen chapters are devoted to Corrosion in its dependence upon various specific factors, such as composition of the metal and the medium, effect of moving liquids, stress, etc. Two deal with Protection (by metallic coatings and by paints and enamels), and one with Testing. Literature references are very numerous, the Author Index containing nearly 1700 names.

The book is admirably adapted to fulfil the purpose for which it was intended. Clearly written, comprehensive in scope, well indexed and well printed, it will be almost indispensable to all who are interested in corrosion problems, or in the scientific principles underlying them.

R. G. VAN NAME

---

## BOOKS RECEIVED

October 15, 1937–November 15, 1937

ROBERT E. BURK, HOWARD E. THOMPSON, ARCHIE J. WEITH and IRA WILLIAMS. "Polymerization and its

Applications in the Fields of Rubber, Synthetic Resins and Petroleum." American Chemical Society Monograph. Reinhold Publishing Corp., 330 West 42d St., New York, N. Y. 312 pp. \$7.50.

M. B. ELLIOTT, Compiler. "Decennial Index of the *Analyst*." Vols. LI–LX (1926–1935)." W. Heffer and Sons, Ltd., 3 and 4 Petty Cury, Cambridge, England. 467 pp. 25s. net.

INGO W. D. HACKH and JULIUS GRANT. "Hackh's Chemical Dictionary." Second edition. P. Blakiston's Son and Co., Inc., 1012 Walnut St., Philadelphia, Pa. 1020 pp. \$12.00.

JOHN C. HOGG and CHARLES L. BICKEL. "Elementary Experimental Chemistry," Oxford University Press, 114 Fifth Ave., New York, N. Y. 288 pp. \$2.00.

EDWIN C. KEMBLE. "The Fundamental Principles of Quantum Mechanics, with Elementary Applications." McGraw-Hill Book Co., Inc., 330 West 42d St., New York, N. Y. 611 pp. \$6.00.

GERHARD KRAMER. "Mikroanalytische Nachweise anorganischer Ionen. Ausführung und Reaktionenbilder." Akademische Verlagsgesellschaft m. b. H., Sternwartenstrasse 8, Leipzig, C 1, Germany. 51 pp. RM. 5.60.

CARL OPPENHEIMER. "Die Fermente und ihre Wirkungen." Supplement, Lieferungen 7–8. W. Junk Verlag, Scheveningsche Weg 74, Den Haag, Holland. 160 + 160 pp. Dutch fl. 10 + 10.

IRVINE H. PAGE. "Chemistry of the Brain." Charles C. Thomas, 220 East Monroe St., Springfield, Ill. 444 pp.

ARTHUR I. VOGEL. "A Textbook of Qualitative Analysis." Longmans, Green and Co., 114 Fifth Ave., New York, N. Y. 383 pp. \$3.00.

MARK W. ZEMANSKY. "Heat and Thermodynamics. An Intermediate Textbook for Students of Physics, Chemistry and Engineering." McGraw-Hill Book Co., 330 West 42d St., New York, N. Y. 388 pp. \$4.00.

"Analyses of Colorado Coals." U. S. Bureau of Mines. Superintendent of Documents, Government Printing Office, Washington, D. C. 327 pp. \$0.25.

"Burning of Coal and Coke Treated with Small Quantities of Chemicals." U. S. Bureau of Mines. Superintendent of Documents, Government Printing Office, Washington, D. C. 158 pp. \$0.15.

"The Lovibond Comparator for Colorimetric Determinations." The Tintometer, Ltd., The Colour Laboratory, Milford, Salisbury, England. 37 pp.

"Mellon Institute. Dedication of the New Building to Science and Humanity, for Andrew W. Mellon and Richard B. Mellon." The Mellon Institute, 4400 Fifth Ave., Pittsburgh, Pa. 56 pp.

"Physikalischen Methoden im chemischen Laboratorium." Verlag Chemie G. m. b. H., Corneliusstrasse 3, Berlin W 35, Germany. 267 pp. RM. 2.70.