
NEW BOOKS

Textbook of Quantitative Inorganic Analysis. By I. M. KOLTHOFF, Ph.D., Professor of Analytical Chemistry, University of Minnesota, and E. B. SANDELL, Ph.D., Assistant Professor of Analytical Chemistry, University of Minnesota. Revised Edition. The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1943. xvii + 794 pp. 131 figs. 15 × 22 cm. Price, \$4.50.

The revision of this well-known text extends and modernizes what has come to be regarded, because of its complete coverage, as a minor treatise on analytical chemistry.

The authors retain the order of presentation used in the first edition. The theory and practice of gravimetric analysis precedes that of volumetric analysis; there follow sections devoted to a discussion of physico-chemical methods, and procedures for the analysis of brass, steel, and silicates.

Certain new topics have been introduced, and others more fully treated in the revised edition. A complete survey of the better organic reagents is given, and the mathematical theory of errors is considered in some detail. The chapter devoted to the physico-chemical determination of the end-point, formerly treating only potentiometric and conductometric methods, now includes a timely discussion of amperometric titrations. New material on spectrophotometry has been included, and is designed to familiarize the student with certain new types of commercial equipment. The teaching value of the book is enhanced by the inclusion of many new problems, including a liberal number of answers. The chapters on the formation of precipitates and coprecipitation remain unexcelled in any book.

The text is well suited for undergraduate instruction, particularly of science majors, at both elementary and advanced levels. It should likewise prove increasingly popular with graduate students and others interested in a brief yet adequate discussion of recent developments in analytical chemistry.

In the reviewer's opinion, the book is overly optimistic concerning the ease with which the average student masters the calculations of volumetric analysis. A few illustrative calculations in Chapter XXVIII would be helpful, and would tend to de-emphasize the use of formulas in solving problems. It also seems that the treatment of the activity concept and its importance in analytical processes is rather brief, and that the advanced student will be left with numerous unanswered questions. It is rather too much to expect, however, that any single book will combine all the features that everyone considers essential. Perhaps a few omissions in this one are the more noticeable because in most respects it offers so much.

JOHN F. FLAGG

Vitamins and Hormones. Advances in Research and Applications. Edited by ROBERT S. HARRIS, Associate Professor of Nutritional Biochemistry, Massachusetts Institute of Technology, and KENNETH V. THIMANN, Associate Professor of Plant Physiology, Harvard University. Volume I. Academic Press, Inc., 125 East 23rd Street, New York, N. Y., 1943. xvii + 452 pp. illus. 15.5 × 23.5 cm. Price, \$6.50.

The editors of this new series of publications have stated the purpose of their endeavor as follows: "The basic research on vitamins and hormones is conducted by investigators in the fields of organic chemistry, biochemistry, physiology, biophysics and medicine. The results of this research are published in a large number of medical, biological and chemical journals, many of which are not readily available to the scientist or clinician.

"To accumulate, correlate and digest the current literature in a field in which research is active and to point out

where knowledge is incomplete requires a thorough grasp of the subject. To indicate the directions in which future research would be most fruitful and useful one must have sound imagination. Each chapter in this volume was written by a well-qualified investigator who endeavored to evaluate the present status of his special subject and to indicate what knowledge is lacking.

"This volume contains a very complete subject and author index because it is intended primarily as a reference book. With each succeeding volume, 'Vitamins and Hormones' will rapidly become a complete reference on all active research in the vitamin and hormone field.

"It is our hope that this is the first of a succession of yearly volumes of 'Vitamins and Hormones' which will chronicle progress and point the way to new achievements."

The following ten topics were selected by the editors and the articles were prepared by fifteen investigators: Choline—Chemistry and Significance as a Dietary Factor, by C. H. Best and C. C. Lucas; The Appraisal of Nutritional States, by Norman Joliffe and Rita M. Most; Physical Methods for Identification and Assay of Vitamins and Hormones, by John R. Loofbouro; The Chemical and Physiological Relationship between Vitamins and Amino Acids, by H. H. Mitchell; The Photoreceptor Function of the Carotenoids and Vitamins A, by George Wald; The Significance of the Vitamin Content of Tissues, by Roger J. Williams; Growth-Factors for Protozoa, by Richard P. Hall; Physiology of Anti-Pernicious Anemia Material, by George R. Minot and Maurice B. Strauss; The Intermediate Metabolism of the Sex Hormones, by Gregory Pincus and William H. Pearlman; The Hormones of the Adrenal Cortex, by T. Reichstein and C. W. Shoppee.

From first to last the work has been well done. Except for a few historical references, the investigations under discussion have all been carried out in the past ten years. Five years ago this volume could not have been prepared. The contents of the volume are a fine gradation from classical organic chemistry, with the relationships found between the hormones of the gonads and of the adrenal cortex, to investigations with protozoa and the lower invertebrates, and finally, to work with experimental animals and the ultimate application to patients under the care of clinicians.

The first chapter, on choline, is absorbingly interesting, and, although 326 references are worked into the article, there is a free continuity and smoothness of style that make easy reading. In each chapter the subject matter has been thoroughly condensed and direct statements of fact create the impression that every effort has been made to save time for the reader and cover the essential contributions with accuracy and dispatch.

There is a wide difference in the permanent value of the individual chapters. Some are almost a finished record of achievement with but few apparent gaps to be completed, while others are a balance sheet as of today, and it is clear that this balance may be changed in the not distant future after more work has been completed.

The review of the adrenal cortex is a comprehensive statement of the relationships of the crystalline compounds which have been isolated from the adrenal cortex. It is now thirteen years since the demonstration that an extract could be prepared from the adrenal cortex which could be used in substitution therapy for adrenalectomized animals and for patients with Addison's disease. During this time other important hormones and vitamins have been isolated, identified and synthesized. The question may arise, why has it required so long to finish the similar sequence of steps for the hormones of the adrenal cortex? A satisfactory answer to this question is found in the many pages of structural formulas which show the relationships of the twenty-eight crystalline steroids that have been

separated from the adrenal cortex to each other and to other members of the constantly growing family of derivatives of cholesterol and the bile acids. Included in this discussion are 147 different compounds, almost all of which were unknown thirteen years ago.

Of the twenty-eight crystalline compounds separated from the adrenal cortex only one (adrenosterone) is mentioned as a possible degradation product formed after removal of the gland from the animal. It will be interesting to note whether any of the remaining compounds will be shown to be derived from a precursor during the process of isolation. The chapter is a most satisfactory review of the results which have been obtained by the only path that can yield final answers, namely, organic chemistry.

The authors stated that no review of the biologic investigations could be included. However, it is obviously necessary to include an outline of methods for bioassay and this has brought about reference to both the Everse de Fremery method for bioassay and Verzar's hypothesis that a major function of the adrenal cortex is concerned with phosphorylation. In the opinion of this reviewer, both of these aspects of the biologic activity of the adrenal cortex will occupy a progressively less conspicuous position in future chapters of "Vitamins and Hormones."

E. C. KENDALL

The Pharmacology of the Opium Alkaloids. Parts 1 and 2.

By HUGO KRÜBGER, Assistant Professor of Pharmacology, St. Louis University School of Medicine, NATHAN B. EDDY, Principal Pharmacologist, U. S. Public Health Service, and MARGARET SUMWALT, Associate Physiologist, U. S. Public Health Service. Supplement No. 165 to the Public Health Reports. 1448 pp., plus Bibliography, Subject Index and Author Index. United States Government Printing Office, Washington, 1943. For sale by the Superintendent of Documents, Washington, D. C. Price, \$1.50.

The Bureau of Social Hygiene some twenty years ago initiated a systematic study of the opium problem in all its aspects. This study was later supported by the Rockefeller Foundation and was taken over in 1939 and continued by the National Institute of Health. It includes chemical, pharmacological and clinical investigations.

The chemical investigations were carried out at the University of Virginia under the direction of Drs. Small and Mosettig. Accounts of this work have been published in the chemical journals and elsewhere. The pharmacological investigations have been carried out at the University of Michigan by Dr. Nathan B. Eddy and his collaborators. The clinical investigations have been carried out under the Federal Public Health Service in hospitals and institutions scattered widely throughout the country.

A study of the chemical literature dealing with the opium alkaloids was made by Dr. Small with the assistance of Professor Lutz, and was published by the Public Health Service in 1932 in a volume entitled "The Chemistry of the Opium Alkaloids," a review of which appeared in THIS JOURNAL. A survey of the pharmacological literature has now been completed by Dr. Eddy with the assistance particularly of Drs. Krueger and Sumwalt, and this constitutes the subject matter of the present two volumes. In their Preface the authors of this volume state:

"The number of articles on the opium alkaloids is enormous, especially if one includes the clinical literature. Nevertheless the survey has been very complete and it is believed that all papers which contain significant material have been covered. In the handling of this material the authors have attempted to do much more than prepare a composite picture of the effects of morphine as they have been established experimentally. They have described thoroughly the types of experimental work which have been done, have summarized the net results, and have indicated clearly the large gaps which still exist in our knowledge of this familiar substance.

"A feature of the book which is unique in pharmaco-

logical reviews and which should prove of great value to anyone interested in the field is a very complete subject index, covering not only the text of the monograph itself, but also the main features of all of the papers in the enormous bibliography, papers too numerous all to have received notice in the text. If this same task could be performed for other important alkaloidal groups it would be of inestimable value to medicine and to experimental pharmacology."

These volumes should be most welcome to all those planning any extensive work in the field.

ARTHUR B. LAMB

Willard Gibbs. By MURIEL RUKEYSER. Doubleday, Doran and Company, Inc., New York, N. Y., 1942. 465 pp. 5 illustrations. 15 × 23 cm. Price, \$3.50.

No form of literary production taxes the author's powers of analysis and interpretation more severely than does biography. Material that might throw light on the subject's thought processes and his relation to and reaction toward his environment is usually scanty. The time period of the subject's activities, against which background his thoughts and actions must be interpreted, is in the past and the author, in his interpretation, is dependent upon such published writings as happen to be available. When the subject of a biography is Willard Gibbs, a man who dealt with science in one of its most abstract forms and whose writings, aside from his scientific papers, are negligible in number, it is, perhaps, not surprising that Miss Rukeyser has produced a biography that will fail of commendation from many of the scientific fraternity.

Miss Rukeyser's style is anything but simple and, at times, it borders on the cryptic. She has collected, between the covers of one volume, a large amount of useful and interesting material but, at a sacrifice of coherence, she has interspersed this with a mass of irrelevant material which detracts greatly from the book's usefulness. Miss Rukeyser approaches her subject from the point of view of that school of popular scientific writers who ascribe the development of science to the pressure of social and economic forces. They confuse invention with scientific discovery. It is unfortunate that this should be so, for the lay public, to whom they are interpreting science, obtains an entirely false notion of the relation between pure and applied science.

Pure science furnishes, so to speak, the raw material which applied science processes for the benefit of mankind. In seeking to discover the laws of nature, scientists do not first inquire: "What benefits may we or our fellow men derive from the results of our investigations?" Scientists, rather, are concerned with devising means for searching out the laws governing natural phenomena; they seek to obtain results that shall be unambiguous and that shall be worth while and not trivial. The innumerable examples of great scientific contributions that have been made years before any application was even thought of should convince any unbiassed student that science is as little interested in applications as is poetry or art—perhaps, even less so.

Faraday could not conceive, nor could anyone at the time conceive, that his experiments relating to electromagnetic phenomena would ultimately lead to the great, modern electrical industry. Faraday, doubtless, realized that his fundamental discoveries would ultimately prove useful in a practical way but it was not this which induced Faraday to undertake and continue his investigations. There are hundreds of thousands of known chemical compounds but only a small fraction of these compounds has found any useful application up to this time. These compounds were discovered by scientists in investigating the laws governing chemical phenomena, quite without regard to possible applications.

There is a vast field of science known as mathematics. Only a minute fraction of this field of knowledge is practically useful, although that which has been found to be

useful is indispensable to other sciences. In the development of mathematical science, the mathematician has not inquired: "Has this investigation a possible industrial application?"

Miss Rukeyser, in interpreting Gibbs' work from the point of view of its practical application, misleads the reader into thinking that the value of Gibbs' contributions to science is to be measured by the material benefits that may have accrued to industry as a result of their practical applications. Nothing could be farther from the truth. Miss Rukeyser has failed to realize that science, while it deals with material things, is the product of the mind seeking the truth without regard to any possible material benefits.

The importance of applied science must, nevertheless, not be underrated. It not only provides man with the means for bettering the conditions under which he lives, it also contributes to pure science, in part, through the discovery of new and important facts and, in particular, through furnishing science with those new and improved tools of research without which science could not progress. Examples are innumerable: the cyclotron, the electron microscope, the 200-inch telescope, radio tubes, high and low temperatures, new materials of all kinds, pure metals, alloys, plastics, organic and inorganic compounds, and a host of other contrivances and products without which physics, chemistry and the biological sciences could not progress further.

Miss Rukeyser's biography of Gibbs is replete with inaccuracies and misleading statements. It would serve no useful purpose to itemize them here. One, however, is worthy of correction. On page 330, Miss Rukeyser writes: "In Washington, Henry Adams read Stallo, whose work has been considered as a theoretical anticipation of the work of Willard Gibbs." This statement is derived from Townsend ("Philosophical Ideas in the United States," American Book Company, 1934). Miss Rukeyser gives one reference to Stallo in her bibliography; an examination shows that this was a philosophical treatise, written in Stallo's earlier years, which he later repudiated (Stallo, "The Concepts and Theories of Modern Physics," Appleton and Company, N. Y., 1882). A careful examination of the pertinent literature shows that Stallo was a philosopher rather than a physicist and that he in nowise anticipated Gibbs' work.

One minor error may be mentioned because it brings to light the fundamental weakness underlying the whole of the present biography, namely, the lack of familiarity on the part of the author with the subject with which she is dealing.

In notes taken by Gibbs of Quincke's lectures, appears a list of recommended literature which, among others, contains the notation "—Beer not recommended—" Confusing the physicist Beer with a well known beverage, Miss Rukeyser introduces a human touch by writing (p. 156): "This is the first personal mention. Quincke undoubtedly had a word to say about drinking to all of his first classes, many of whom would go on to Weierstrass, who, among champion beer-drinkers—and Germany was populated with champions—still was famous."

CHARLES A. KRAUS

Elements of Food Biochemistry. By WILLIAM H. PETERSON, Ph.D., Professor of Biochemistry, University of Wisconsin, Madison, JOHN T. SKINNER, Ph.D., Assistant Chemist, Kentucky Agricultural Experiment Station, Lexington, and FRANK M. STRONG, Ph.D., Associate Professor of Biochemistry, University of Wisconsin, Madison. Prentice-Hall, Inc., 70 Fifth Avenue, New York, N. Y., 1943. xii + 291 pp. 34 figs. 15.5 × 23.5 cm. Price, \$3.00.

It is the purpose of this book to give an account in elementary terms of the nature and physiological behavior of each of the nutrients which make up the human dietary. The function of the volume is admirably indicated by its title, and readers without extensive chemical training should be able to gain an understanding of the chemical

and physiological relationships among the classes of compounds discussed. In addition to chapters entitled "Carbohydrates," "Lipides," "Proteins," "The Mineral Elements in Nutrition," "Water," "Vitamins," and "Enzymes," there is a section on "Fermentation Food-Products" as an adjunct to the carbohydrate discussion and a chapter on "Acidity" which includes brief reviews on stoichiometry and the concept of pH.

At the start of each of the three chapters on carbohydrates, fats, and proteins, the authors have included a discussion of the economic importance of these three classes of compounds and a tabulation of the economic value of products manufactured from carbohydrate, fat, or protein raw materials. The number of wage earners employed in such industries is also listed. These discussions provide an interesting manner in which to introduce the description of the chemistry of the energy-yielding foodstuffs.

As indicated in the preface, the material contained in this book was collected during more than thirty years of teaching the subject to undergraduates. The authors state, "Some teachers will doubtless question the advisability of including in an undergraduate text a formulation and discussion of the intermediary metabolism of carbohydrates. . . . Undergraduates should not be expected to learn such involved reactions as those of intermediary glucose metabolism or complicated formulas like those of the vitamins." Nevertheless the important compounds and chemical changes have been expressed by formulas and equations because the chemistry involved can be most accurately expressed through such a medium. It would seem unnecessary, on the other hand, to include such elementary material as a definition of the term ester and its illustration by the equation for the formation of ethyl acetate from alcohol and acetic acid. One would assume that students using the book as a text should be familiar with rudimentary organic chemistry.

In the reviewer's opinion the authors have been very successful in presenting in simple form the essential facts concerning the biochemistry of the calorogenic foodstuffs, the minerals, vitamins, and enzymes. Chapters concerning the latter two subjects are especially to be commended as clear and understandable presentations of subject material difficult to handle from an elementary viewpoint.

THOMAS R. WOOD

Semimicro Qualitative Analysis. A Brief Course. By ARTHUR R. MIDDLETON, Emeritus Professor of Chemistry, Purdue University, and JOHN W. WILLARD, Assistant Professor of Chemistry, Virginia Military Institute. Prentice-Hall, Inc., 70 Fifth Avenue, New York, N. Y., 1943. xi + 254 pp. Illustrated. 15.5 × 23.5 cm. Price, \$3.75. Special Edition for Schools, \$2.75.

This text, which is designed for a one-semester course, is a condensation of the authors' more comprehensive "Semimicro Qualitative Analysis." The authors have accomplished the difficult task of "writing down" to the compass of a short course remarkably well, and with such good didactic judgment that the product has relatively few of the faults that so often characterize abridged texts.

The subject matter is equally divided into Theory and Laboratory Work. The theoretical chapters include discussions of stoichiometry, elementary atomic theory and types of chemical bonds, the Periodic Classification of the elements, interpretation of chemical equations, factors which govern reaction rates and equilibria, ionization of acids, bases, and salts according to classical and modern views, and finally an entire chapter on the solution of problems involving various types of ionic equilibria. The theoretical topics covered are those of direct importance to qualitative analysis, and the method of treatment avoids unnecessary anticipation of material that the student will study in later courses in theoretical chemistry. An ample number of numerical illustrations and problems is provided. Among the relatively few "slips" that were noted in the otherwise well chosen problems are the problems on p. 108 involving the calculation of solubility products from molar solubilities for salts like barium and calcium carbonate

and lead phosphate without regard to the extensive hydrolysis of the anions.

The laboratory work employs the usual semi-micro technique (with centrifugal separation of precipitates), and it is designed to be completed in six laboratory hours per week during one semester. One of the novel features of the laboratory procedure is the use of simple "unknown solutions" for practice, instead of the classical "known solutions." Another interesting innovation is the imposition of a time limit of three hours for the analysis and reporting of unknowns. In the words of the authors, "This time limitation is of importance in teaching the student to plan before coming to the laboratory how he shall best economize time." Although this practice has much to commend it from a pedagogical standpoint, it has the disadvantage of limiting the unknowns to rather simple combinations of only a relatively few ions. The specimen unknowns listed on p. 112 contain only two to four cations. Certainly more than three hours would have to be allowed for the analysis of a general unknown containing any possible mixture of cations and anions, or for a solid unknown.

The "laboratory text" begins with a chapter on Semimicro Technique. This is followed by a chapter on Properties and Reactions of the Cations, in which analytically important properties and reactions of the traditional twenty-four metals are discussed. The next chapter on Introductory Study of the Cations introduces the student to the separation and identification of cations within the various groups and to the analysis of simple single-group unknowns. The complete systematic scheme for analyzing a general cation unknown is then presented in the chapter on Systematic Analysis of Cations. The group separations adhere fairly closely to classical macro schemes through the ammonium sulfide group, but a separation of the alkaline earth and alkali metal groups is dispensed with. The alkaline earths and magnesium are detected directly in the filtrate from the ammonium sulfide group, and sodium, potassium, and ammonium ions are detected in a separate portion of the original unknown.

The scheme of anion analysis is limited to borate, sulfate, phosphate, sulfide, chromate, nitrate, carbonate, and the halides, which is probably necessary in the short course for which the book is intended.

JAMES J. LINGANE

Semimicro Qualitative Analysis. By JAMES T. DOBINS, Ph.D., Chapel Hill, N. C. John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y., 1943. x + 418 pp. 1 fig. 13.8 × 21 cm. Price, \$3.00.

This text is adaptable to either a one or two semester course for second year college students; it is sufficiently comprehensive to serve in courses for chemistry concentrators, and yet it is elementary enough to be used by non-chemistry majors. The book is divided into six sections as follows: Introduction (5 pages devoted to the scope and technique of semi-micro qualitative analysis), Part I Fundamental Principles, Part II, The Reactions of the Cations, Part III, Systematic Analysis (for cations), Part IV, General Properties of the Anions, and Part V, Systematic Analysis of the Anions. The Appendix contains sections on "The Preparation of Sample for Analysis," "Removal of Phosphate," a qualitative solubility table of analytically important metal salts, a "Schedule of Work," tables of equilibrium constants for a few common ionic reactions, a table of standard oxidation potentials of some forty half-reactions, lists of apparatus, test solutions and reagents, and a section on "Use of Logarithms."

This book is unique among its contemporaries in this field in that, although it employs semi-micro methods, only four pages are devoted specifically to apparatus and technique and only one illustration is to be found in all of its four hundred odd pages! Yet the technical directions appear to be entirely adequate.

The discussions in the theoretical chapters cover the usual range of topics with emphasis on the various types of ionic equilibria that are of direct analytical importance. A novel and particularly good didactic feature of these

chapters is the inclusion, at strategic points in the body of the text, of numerous simple experiments which serve to illustrate fundamental theoretical points. Many of these experiments would serve admirably as lecture demonstrations, especially in one-semester courses where time is not available for their individual performance by the student. The treatment of theoretical principles is, in general, very well organized, and it reflects a wealth of teaching experience (and pedagogical patience!) on the part of the author. Calculations pertinent to various ionic equilibria are explained in exceptional detail and nothing is taken for granted about the student's ability (or lack thereof) to perform simple arithmetical or algebraical operations. Indeed, in a few places the author's attention is so closely riveted to "equilibrium arithmetic" that he strays considerably beyond the bounds of chemical reality. For example, on p. 127 the concentration of CN^- in a 0.1 M solution of pure $\text{K}_2\text{Cd}(\text{CN})_4$ is assumed to be four times the concentration of Cd^{++} , when in fact the very small amount of cyanide ion present is so completely hydrolyzed that its concentration is smaller than that of the cadmium ion, and a similar *faux pas* occurs in the treatment of the solubility equilibrium of silver phosphate on p. 60. Also on p. 127 appears the statement that the concentration of S^- in a solution prepared by passing hydrogen sulfide into a 0.1 M solution of pure $\text{K}_2\text{Cd}(\text{CN})_4$ is 0.09 M! These slips, which fortunately are few and far between, are rather surprising in view of the fact that an entire chapter of about 25 pages in another part of the text has been devoted to amphoterism and hydrolytic equilibria.

The discussions of factual inorganic chemistry and the properties and reactions of the metallic elements in Part II are excellent. Equations are supplied for virtually all reactions that are discussed, and happily these are written with careful attention to the actual molecular and ionic states of the substances concerned and without trying to oversimplify intrinsically complex equilibria. The scheme of analysis for the cations provides for the usual twenty odd metallic elements, and more or less classical procedures are employed with minor modifications to adapt them to semi-micro technique.

Considerable attention is devoted to anion analysis, and systematic schemes are provided for the detection of twenty-four common anions.

In the reviewer's opinion this book constitutes a real contribution to the literature of analytical chemistry, and it deserves the serious consideration of those few survivors of a rapidly disappearing company who, with the reviewer, still believe that the teaching of inorganic chemistry is the fundamental purpose of a course in qualitative analysis.

JAMES J. LINGANE

Advanced Quantitative Analysis. By HOBART H. WILLARD, Ph.D., Professor of Analytical Chemistry, University of Michigan, and HARVEY DIEHL, Ph.D., Associate Professor of Chemistry, Iowa State College. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y., 1943. xi + 457 pp. 40 figs. 14.5 × 22.5 cm. Price, \$4.75.

We are informed on its title page that this book has been designed as a companion volume to the well-known "Elementary Quantitative Analysis" of Professors Willard and Furman. This arrangement has enabled the authors to omit elementary material and to devote 457 pages exclusively to advanced topics. The book is thus sufficiently comprehensive to serve as a reference work as well as a text for advanced courses, and it should prove to be equally useful for both purposes. The general character of the text and its authors' purpose and viewpoint are revealed in the following quotations from the Preface. "The graduate training of chemists should involve advanced work in each of the fundamental fields of chemistry: inorganic, physical, organic, and analytical. This advanced analytical chemistry should be divided about equally between chemical methods of analysis and physico-chemical or instrumental methods of analysis. This book has been written as a text for that part of the work dealing with

chemical methods of analysis and the emphasis has been placed upon chemistry. The book is largely devoid of physico-chemical theory but it is rich in the factual inorganic chemistry useful to the practicing chemist and essential to the development of chemical intuition in the embryonic chemist. The authors feel that nowhere else can so thorough a knowledge of inorganic chemistry be acquired as by an extensive study of the analytical chemistry of the elements."

Chapter I on Notes to Students begins most appropriately with a full-page quotation from Dr. Lundell's well-known classical "The Chemical Analysis of Things as They Are," which engenders the proper mood for the following sections on the use of the literature, outline of laboratory work, keeping of records, the use and care of platinum ware, and the use of perchloric acid.

The second chapter is concerned with "The General Operations of Quantitative Analysis," and a fair idea of its scope may be gained from the fact that it occupies 118 pages. It includes thorough discussions of such important topics, among many others, as sampling and the preparation of samples for analysis (well illustrated), methods of concentrating minor constituents prior to their determination, methods of effecting separations of the metallic elements, electrogravimetric techniques (including the use of controlled cathode potential, the mercury cathode, and internal electrolysis apparatus and methods), the use of organic precipitants, and the applications of the Jones type of silver, zinc, and lead reducers. The authors then succumb slightly to the charms of physico-chemical methods as they describe the potentiometric determination of end-points, and the practice of colorimetric and spectrophotometric determinations, in 25 well written pages. The chapter closes with brief mention of some catalytic methods for trace constituents and advice on the reporting of analytical results. Ph.D. candidates preparing for qualifying examinations in analytical chemistry might well be advised to study this chapter!

Chapter III comprises 80 pages devoted to the analysis of iron ore, iron, and plain steels, and it contains methods for most of the elements commonly present in such materials, including silicon, phosphorus, sulfur, and carbon.

The analysis of alloy steels is taken up in Chapter IV, in which methods—in a number of instances those developed by the senior author and his colleagues—are presented for the determination of tungsten, molybdenum, chromium, and vanadium.

The fifth chapter is concerned entirely with the determination of the alkali metals, which, as any one who has ever persevered to the end of a complete silicate analysis will fervently attest, "is among the most difficult of the problems of chemical analysis."

Under the title "The Determination of the Elements" Chapter VI embodies in the space of 126 pages, and with considerable detail, the analytical chemistry of most of the elements arranged according to the Periodic Classification. Each element or group is discussed under the headings "General Chemistry," "Separation and Gravimetric Determination," and "Volumetric and Colorimetric Determination." The chapter ends with excellent tabular summaries of the principal methods used for the separation, and gravimetric and volumetric determination, of the elements. It is interesting to note from these tables that in the authors' opinion no satisfactory methods are available for the volumetric determination of Be, Cd, Ga, Zr, Bi, or W, which is true enough in the cases of Be, Zr, and perhaps W, but debatable in the other cases.

The senior author's early interests and association with the late Professor Richards are reflected in the final chapter on "The Determination of Atomic Weights." This chapter, and even more the Richardsian literature to which it provides a key, is of interest not only to analytical chemists but to any one who has occasion to prepare pure inorganic compounds.

The text is illustrated liberally with well-executed drawings and photo-reproductions, and it is replete with references to the original literature. Ample complete author and subject indexes are provided.

Among the very few misprints that were noted may be mentioned the specification on p. 125 of a galvanometer sensitivity of 0.02 amp. per mm. (apparently this should be 0.02 microamp per mm.), and the statement on p. 126 below the equation for the plumbite-stannite reaction that one notes the time of "disappearance" of the blackening ("appearance" was doubtless meant). The authors have chosen to disregard the existence of ions in writing reaction equations, which, although mortal in the case of an elementary text, is perhaps only a venial sin in an advanced treatise of this type.

The writer does not feel at all venturesome in predicting that this book will gather more reagent stains on its open pages than dust on its cover.

JAMES J. LINGANE

BOOKS RECEIVED

October 10, 1943–November 10, 1943

HENRY B. BULL. "Physical Biochemistry." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 347 pp. \$3.75.

H. JERMAIN CREIGHTON. "Principles and Applications of Electrochemistry." Volume I. "Principles." Fourth Edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 477 pp. \$5.00.

"Data on Chemicals for Ceramic Use." Bulletin of the National Research Council, Number 107, June, 1943. Published by the National Research Council, National Academy of Sciences, Washington, D. C. 94 pp. \$2.50.

MALCOLM DIXON. "Manometric Methods." Second Edition. The Macmillan Company, 60 Fifth Avenue, New York, N. Y. (Cambridge University Press.) 155 pp. \$1.75.

WILLIAMS HAYNES. "The Chemical Front." Alfred A. Knopf, New York, N. Y. 264 pp. \$3.00.

HERBERT LEADERMAN. "Elastic and Creep Properties of Filamentous Materials and Other High Polymers." The Textile Foundation, Industrial Bldg., National Bureau of Standards, Washington 25, D. C. 278 pp. \$2.00, postpaid.

MARTIN MEYER. "The Science of Explosives." Thomas Y. Crowell Company, 432 Fourth Avenue, New York, N. Y. 452 pp. \$4.50.

ALLEN L. OLSEN AND JOHN W. GREENE. "Laboratory Manual of Explosive Chemistry." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 106 pp. \$1.75.

C. W. PORTER AND T. D. STEWART. "Organic Chemistry." Ginn and Company, Statler Office Building, Park Square, Boston, Mass. 577 pp. \$4.00.

W. H. SCHOPFER. "Plants and Vitamins." (Authorized translation by Norbert L. Noecker.) The Chronica Botanica Company, Waltham, Mass. and G. E. Stechert and Company, New York, N. Y. 293 pp. \$4.75.

KURT STERN AND ROBERT WILLHEIM. "The Biochemistry of Malignant Tumors." The Chemical Publishing Company, Inc., 234 King Street, Brooklyn, New York. 951 pp. \$12.00.

GEORGE D. WESSINGER. "Experimental Biochemistry." The C. V. Mosby Company, 3525 Pine Boulevard, St. Louis, Mo. 102 pp. \$1.50.

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