

Chemical Kinetics in Highly Dilute Solution. Bromo-acetate and Thiosulfate Ions in the Presence of Sodium Ion at 25°, by Victor K. La Mer.

Page 3341. The author writes as follows: "... An unfortunate error was made in computing the ionic strengths of the final solutions. The contribution of the sodium thiosulfate to the ionic strength was computed in terms of a normal solution of valence type (1, -2), whereas the normality employed was really in terms of iodine equivalents, *i. e.*, for thiosulfate $\mu = 3 N$ and not 1.5 N . The net result is that each value of μ given in the article must be multiplied by a factor $40/25 = 1.60$ and each $\sqrt{\mu}$ by $\sqrt{1.60}$ or 1.265. This correction distorts Fig. 1 slightly and thereby weakens but does not destroy the conclusions reached. Thus the limiting experimental slope $d \ln k/d \sqrt{\mu}$ for the lowest points is not equal to $0.93 Z_A Z_B$ but to about $0.75 Z_A Z_B$. In other words, the limiting theoretical slope $Z_A Z_B$ is being rapidly approached but has not been attained even for the region of dilution of $\mu = 0.002$ to 0.004 , for a reaction of such comparatively simple valence type as the one employed. The values given in Table I refer to $\sqrt{\mu}$ and not to μ ."—VICTOR K. LA MER.

NEW BOOKS

Lectures on Combustion. By JOSEPH PRIESTLEY, LL.D., F.R.S., and JOHN MACLEAN, M.D., Professor of Mathematics, Natural Philosophy and Chemistry in the College of New Jersey. Edited by WILLIAM FOSTER, Princeton University. Foreword by Professor Hugh S. Taylor. Princeton University Press, Princeton, N. J., 1929. vii + 116 pp. Illustrated. 13 × 21 cm.

This small volume contains, first, a brief, but interesting biography of John Maclean, M.D., the first professor of Chemistry at the College of New Jersey (Princeton) by Professor Foster; second, a reprint of Priestley's famous valedictory pamphlet published in "Northumberland in America" in defense of the doctrine of Phlogiston, and third, "Two Lectures on Combustion and an Examination of Dr. Priestley's Considerations on the Doctrine of Phlogiston" by Maclean in answer to this pamphlet.

Professor Foster's biography shows Maclean as an attractive figure;—practicing medicine successfully and a member of the Faculty of Physicians and Surgeons of Glasgow University at 21; Professor of Chemistry and Natural History at Princeton at 25; an enthusiast for the newest developments of the chemical science of his period.

Priestley's pamphlet displays the skill and clarity of presentation of the accomplished writer and also an appealing modesty; but Maclean in his two lectures points out with vigor and persistency the errors, chiefly of *fact*, on which Priestley's arguments were based.

A Foreword by Professor Taylor states that this volume was issued on the occasion of the dedication of the new chemical laboratory at Princeton. This is indeed most appropriate; the enthusiasm of Maclean for chemistry and his emphasis of the importance of experimental investigations in that science afford a splendid heritage and an inspiring tradition.

ARTHUR B. LAMB

Müller-Pouillet's Lehrbuch der Physik. (Müller-Pouillet's Textbook of Physics.) **Lehre von der strahlenden Energie (Optik).** (The Science of Radiant Energy. Optics.) Eleventh edition. Volume II, second half. Edited by KARL WILHELM MEISSNER. Collaborators: Part I, E. BUCHWALD, M. CZERNY, E. GEHRCKE, G. HETTNER, H. KOHN, R. MINKOWSKI, W. PAULI; Part II, E. BACK, D. COSTER, B. GUDDEN, G. HERTZ, A. KRATZER, R. LADENBURG, L. MEITNER, F. PASCHEN, W. PAULI, R. W. POHL. Friedrich Vieweg und Sohn, Akt.-Ges., Braunschweig, Germany, 1929. Part I, xvi + 799 pp. 498 figs. Part II, xv + 684 pp. 223 figs. 15.5 × 24.5 cm. Price, unbound, R. M. 87.50; bound, R. M. 95.

Three years later than the half-volume on geometrical optics, appears this collective work upon physical optics and related subjects. The decease of Otto Lummer, the original editor, together with the amazing development of the field, provided formidable difficulties for the new editor and for the contributors, as the preface duly explains. In particular a helpful introduction to the new quantum mechanics and to wave mechanics, by Pauli, was included, but time was lacking for revision of other sections which could have been profitably handled from this standpoint. In many cases, however, pertinent references have been provided.

The first part of the half-volume deals with reflection, refraction, dispersion, polarization, the laws of radiation, photometry, spectroscopic and radiometric methods. The section on photometry, together with that on the aims and limitations of technical light production, is highly suggestive and replete with practical applications. Nearly all the other sections reflect the detachment of the pure scientist. The average chemist will seldom feel the need of additional theory, but he could justly protest upon finding rotation of the plane of polarization dismissed with the views of Fresnel and of Airy, plus a very brief list of references to later work.

The second part takes up the structure of various types of spectra, and modern interpretations of the same. Those who have struggled to extract from current physical literature, with its perversely variable notation, a fragmentary knowledge of such interpretations will find here intelligibility, compactness, adequacy. Gratitude should even overbalance exasperation when at the end of the volume, luminescence, photochemistry and photography are found all occupying the Procrustean bed of sixty pages.

Undeniably these two books, at moderate cost, can make good a deficiency which inexcusably exists in many a chemical library.

G. S. FORBES

Gmelin's Handbuch der anorganischen Chemie. (Gmelin's Handbook of Inorganic Chemistry.) Edited by R. J. MEYER. Eighth edition. Iron. System number 59. Part A, Installment 1. Issued by the Deutsche Chemische Gesellschaft. Verlag Chemie G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany, 1929. 226 pp. 17 × 25 cm. Price, to subscribers, M. 26; singly, M. 33.

Iron has been of such outstanding importance in human affairs since the earliest times that it is not surprising that in this comprehensive hand-

book two large volumes are to be devoted to this element. One volume (Part A) will contain the sections dealing with the history and occurrence of iron, the metal itself and its alloys; the other (Part B) will cover the compounds of iron. The whole will run to about 1600 pages, and will be published in separate installments of about 200 pages each. The publishers assure us that these will appear in rapid succession.

The first installment, now in hand, contains the sections on the history of iron, on its occurrence and on the preparation of pure iron. As an indication of the magnitude of the field to be covered it may be remarked that the section on the history of iron, occupying 60 pages, is *exclusively and merely a tabulation of the literature of the subject*. The section on the occurrence of iron (120 pages) discusses the subject both from a geological and a geographical point of view.

These volumes on iron will indeed be welcome. This element was never reached in the seventh edition of the Gmelin handbook and has not yet been reached by the treatises of Mellor or of Abegg.

An imposing array of collaborators has been secured. Those concerned in the preparation of this first installment were H. Ehrenberg, O. Meyer, E. Pietsch, P. Ramdohr and R. Wasmuth.

ARTHUR B. LAMB

Proceedings of the Seventh International Congress of Photography. Edited by W. CLARK, T. SLATER PRICE and B. V. STORR. W. Heffer and Sons, Ltd., Cambridge, England, 1929. xiii + 571 pp. Various papers illustrated. 15.5 × 24.5 cm. 25/-net.

On July 9-14, 1928, the Seventh International Congress of Photography met in London. The proceedings of this meeting together with the papers and discussions there presented are now published in full. The meeting was divided into three sections, Section 1 being further subdivided into four subsections: (1a) *Theoretical Aspects of Photography*, in which sixteen papers were presented, ten papers were taken as read, and a report was made on the "Unit of Photographic Intensity." (1b and 1c) *Photographic Practice and Scientific Applications*, in which seven papers were presented and eleven taken as read. (1d) Photo-engraving—ten papers were presented. Only one paper was presented, as a general lecture, in Section 2, "Pictorial Photography: The Relation of Technical Advance to Further Artistic Achievement." In Section 3, *Bibliography, Record Photography, History, Patents, Copyrights and other Legal Questions*, eight papers were taken as read and discussed.

To review each individual paper and the discussions which follow them is not possible in the space allotted here. Suffice it to say that the subjects dealt with cover almost every phase of photographic science and practice. "Probably few people reflect," said Mr. Renwick in his opening

address, "on the vast changes which have taken place in the methods and in the applications of photography" since the first International Congress in 1899. Who can read these Proceedings, however, without realizing that tremendous strides have been made, and the very great importance of photography in our every-day life and its many connections and ramifications in the various fields of science?

Appendices are included giving the officers of the Congress, the organizing and other committees, regulations, and a list of members and associate members. The whole forms a compact and well arranged presentation of the Congress proceedings.

E. P. WIGHTMAN

Lumineszenz-Analyse im filtrierten ultravioletten Licht. (Analysis by Means of Luminescence in Filtered Ultraviolet Light.) By Professor Dr. P. W. DANCKWORTT, Hannover. Second, enlarged edition. Akademische Verlagsgesellschaft m. b. H., Leipzig, Germany, 1929. viii + 147 pp. 56 figs. 16 × 23.5 cm. Price, unbound, R. M. 8.40; bound, R. M. 9.50.

In his preface to the second edition the author emphasizes his continued self-restraint, evidenced by omission of all theoretical discussions. As a result, the thirty-two additional pages deal exclusively with new apparatus, methods and data. This estimate does not include new material replacing that which has become obsolete since July, 1928. No part of the book remains unchanged, but apparatus, organic compounds, oils and alkaloids receive the most attention. A detailed discussion of porphyrins is added to the biological section. The recording, by photographic methods, of ultraviolet fluorescence has now become important. Its possibilities are illustrated by exposures comparing various textiles and adhesives by reflected daylight, by visible fluorescence light and by ultraviolet fluorescence light. One hundred and twenty new references fortify the bibliography. In every respect the revision has been painstaking and successful.

G. S. FORBES

Die Korrosion, unter Berücksichtigung des Materialschutzes. Vol. I. **General and Theoretical Part.** (Corrosion, with a Consideration of the Protection of Materials.) By Professor Dr. O. KRÖHNKE, O., Professor Dr. E. MAASS and D. W. BECK. S. Hirzel, Königstrasse 2, Leipzig, Germany, 1929. viii + 208 pp. 43 figs. 15 × 22.5 cm. Price, unbound, M. 16; bound, M. 17.50.

This monograph is to consist of two volumes; the one now at hand, which discusses in general the theory of the corrosion of metals and the protective coatings of metals; and Volume II, which is to discuss in detail the corrosion of the most important *technical* metals and alloys.

The preparation of this monograph was prompted, according to the Preface, by the lack of such a treatise in the German language and by

the inadequate treatment in the English and American treatises of the German literature on corrosion.

The first hundred pages deal with the mechanism of the dissolution of metals, with passivity and with the external causes of corrosion. The presentation is relatively clear, straightforward and non-mathematical. It is particularly valuable for its full discussion of the German investigations in this field.

The next thirty pages contain an account of metallic and non-metallic protective coatings. It is difficult to see how so cursory and superficial a treatment of this subject can be of value to anyone.

The final sixty pages are occupied with indexes and a bibliography.

The book is open to criticism in that while it mentions meticulously the investigators responsible for the various researches, it does not give direct references to their publications. There is, to be sure, the bibliography, but this has no general index, so it is all but impossible to look up the specific research referred to in the text.

ARTHUR B. LAMB

Statistical Mechanics. The Theory of the Properties of Matter in Equilibrium. By R. H. FOWLER, M.A., Fellow and Lecturer of Trinity College and Stokes Lecturer in Mathematics in the University of Cambridge. The University Press, Cambridge, England, 1929. Sole American Agents, The Macmillan Company, 60 Fifth Avenue, New York City. viii + 570 pp. 28 figs. 18.5 × 27 cm. Price, \$10.50.

The volume contains a very clear and complete exposition of the equilibrium theory of Statistical Mechanics growing out of the author's study of the physical state of matter along the lines suggested by the announcement for the Adams Prize Essay for 1923.

Chemistry has hitherto been quite content to use thermodynamics as practically the sole basis for correlating its facts pertaining to the chemical equilibrium of substances. During the past two decades, however, there has been an increasing need of supplementing the purely thermodynamical treatment by the methods of the Kinetic or Statistical theory. It cannot, of course, be denied that in pre-quantum times there did not exist a sufficiently general theory adequate for the treatment of the somewhat complicated problems of chemical science. The development of the quantum theory has, however, already supplied, at least in principle, the elements needed to surmount many of the difficulties of the classical statistical theory. Professor Fowler in attempting a practically complete exposition of the theory under the trying conditions presented by the rapidly developing quantum theory, deserves special thanks from those devoted to chemistry. It is to be noted that the new quantum mechanics were established after the manuscript was completed but the changes introduced thereby are, on the whole, insignificant. The final chapter,

though terse, indicates sufficiently (perhaps only for the present) the nature of the modifications imposed by the most recent position of the quantum theory.

There have been two earlier expositions of statistical theory published, those by Herzfeld and Smekal following Ehrenfest and Trkal's 1920 paper. Professor Darwin and the author some years ago (1922) developed a new and elegant method of treating statistical problems which has been employed in the present systematic treatment. The method avoids the usual indiscriminate use of Stirling's formula for factorials and, moreover, permits an examination of the average state of an assembly. To be sure the "average state" and "the most probable state" are the same, but the average energy of the assembly may be evaluated by the new method and the partition related to temperature without using Boltzmann's theory relating entropy to probability. The latter process has always been somewhat unsatisfactory, and unconvincing.

The average state is calculated by the use of the multinomial expansion theorem together with a theorem from complex variable theory. In the more general applications multiple complex integrals appear but no special difficulty is created on this account. The new mathematical method has the advantage of precision, power and rigor, and in dealing with the relation of statistical mechanics to thermodynamical principles sheds new light on the nature of entropy. Especially illuminating is the author's criticism of that much mistreated concept "thermodynamical probability" which in the hands of many has sometimes been woefully twisted out of the shape into which it was originally cast by Boltzmann.

The first and second chapters set out and discuss the ideas and mathematical methods which are to be employed in the presentation. There follows a succinct chapter on the heat capacity of gases in which the author takes care to indicate the provisional nature of the theory of the specific heat of gases. The theory has complete quantitative success only in the case of hydrogen.

Before the treatment of chemical dissociation, and evaporation, the theory of the properties of crystals is given. The Born theory of the solid state is sketched and a generous amount of comparison between deduction and experiment is shown in the case of the heat capacity for solids. The equation of state for solids is derived on the basis of Born's "lattice theory."

The chapter on dissociation and evaporation, which will be of particular interest to chemists, is necessarily rather difficult reading. The treatment in its essential aspects is based on the 1920 work of Ehrenfest and Trkal with the restriction of "fully excited" or "completely unexcited" degrees of freedom removed. This chapter also includes the application of the theory to the vapor pressure of crystals.

The discussion of the relation of the statistical equilibrium theory to thermodynamics constitutes one of the most ably written sections of this noteworthy book. The proof that the laws of thermodynamics hold true for the assemblies is carried out by the use of analogies in pretty much the same manner as adopted by Gibbs in his "Elementary Principles of Statistical Mechanics." In the course of the discussion the fundamental basis of the statistical theory is critically reviewed, giving evidence of the painstaking thought that has been given to the difficult question of "weight" (*a priori* probability). The section of this chapter on entropy and Boltzmann's probability hypothesis is particularly well written.

Nernst's heat theorem and related topics, which can only be discussed in detail from the point of view of statistical mechanics, is sketched in an all too brief chapter. The theorem of Nernst, as originally derived, is wholly empirical and certainly "proves too much." The statement of the theorem by Lewis and Randall is drawn with the proper reservations. The author points out, however, that the extra hypothesis required to obtain the theorem (identity of weights of the lowest quantum states of all condensed systems) may not be true, as evidenced by the case of hydrogen.

The theory for imperfect gases represents a brave attempt but scarcely carries the problem beyond the old status. The limitations of the statistical method and the nature of the difficulties emerge clear-cut and definite, which in itself is a notable achievement in a field where an extraordinary amount of illusory theory has been written. When the need of considering the potential energy due to long range forces (case of ions in solution, for example) becomes important, difficulties arise due to the fact that the relative coördinates of the molecules or ions are insufficient to define the effects on the distribution expression. The problem has assumed much immediate importance since the papers of Debye and Hückel on ionic solutions. Professor Fowler's able discussion of the character of the theoretical pitfalls inherent in the latter theory will be all too brief for those interested in the properties of solutions. The further discussion of dilute solutions and comparisons with experiment are given in a later chapter.

Considerable space is given to the theory as worked out for assemblies of atoms, ions and electrons, a condition of matter at very high temperatures. The dissociation theory given earlier is revised here in order to introduce terms representing essentially corrections for the potential due to electrostatic forces. The theory is also compelled to give attention to many details of atomic structure in order to develop a plausible set of rules for assigning "weights." With these details settled the analysis proceeds to develop the partition functions and finally encounters the same difficulties that beset Debye and Hückel in the case of ionic solutions.

The development of the theory is of great importance and is carried as far as seems reasonably possible in view of the difficulties, mathematical and physical, inherent for the moment in the general situation. Applications of the equations (involving, as the author indicates frankly, certain speculative approximations) are made to the problems of stellar atmospheres and interiors. The theoretical side of the problem, it may be emphasized, is of pronounced interest in chemistry.

The general theory of molecular interaction or collision precedes a statement of the theory of gaseous chemical reaction velocity and radiative processes. The book ends with an excellent chapter on statistical mechanics based on the new quantum theory (wave mechanics).

The author makes gracious acknowledgment of the assistance of an unusually large number of very able collaborators who have contributed generously to the sustained excellence of this scholarly work. The book is really a masterpiece of critically presented scientific theory.

FREDERICK G. KEYES

Handbuch der biologischen Arbeitsmethoden. (Handbook of Biological Methods.)

Edited by Professor Dr. EMIL ABDERHALDEN. Section I. Chemical Methods, Part 2, 2d Half. Number 2. **Chemische Reaktionen organischer Körper im ultravioletten Licht und im Licht der Sonne. (Chemical Reactions of Organic Compounds in Ultraviolet Light and in Sunlight.)** By FRANZ BACHÉR, Rostock. Number 3. **Sulfonieren. (Sulfonation.)** By JOSEF HALBERKANN and FRITZ FRETWURST, Hamburg. **Biologisch wichtige Reaktionen und Reagenzien.** By EDUARD STRAUSS and KARL KOULEN, Frankfurt-on-Main. Number 4. **Darstellung metallorganischer Verbindungen. (Preparation of Organometallic Compounds.)** By EMIL KLARMANN, Bloomfield, New Jersey. Urban and Schwarzenberg, Friedrichstrasse 105B, Berlin N 24, Germany, 1928, 1929. No. 2, 630 pp. 25 figs. No. 3, 180 pp. No. 4, 159 pp. 3 figs. 17.5 × 25.5 cm. Price, No. 2, R. M. 32; No. 3, R. M. 10; No. 4, R. M. 8.

Aberalden's Manual of Biological Methods deals with so many and such diverse topics, fundamental as well as applied, is so ambitious in aim and so comprehensive in scope, that it ranks as a new phenomenon in scientific publication. In view of the great diversity of subjects and the number of collaborators—six hundred—it was to be expected that the various installments would be very dissimilar in character. They are. And they are also very unequal in quality.

The three installments that are reviewed here all belong to the sub-section dealing with general chemical methods. The earliest one—number 254—is, doubtless, the most extensive treatise on the photochemistry of organic compounds that is available. Beginning with excellent chapters on "the photochemical reaction," "experimental procedures," "reaction participants," and the treatment of the products of the reaction," it passes on to a survey of the behavior of all the various classes of organic com-

pounds that have been exposed to ultraviolet light or to direct sunlight and ends with a special section in which all known cases are tabulated with respect to: substances exposed, source of the light, nature of the process and character of the products. While the author here and there hints that a process is especially interesting to the biochemist, the text would probably be exactly the same if he had prepared it especially for the organic chemist.

This installment is invaluable to anyone who is interested in, or has occasion to examine, the photochemical behavior of an organic compound. The survey is complete, including references to the original literature; the material is well organized, and the judgments are critical. As a part of a larger volume the number has no separate index, but a very detailed table of contents in a great measure makes up for the lack of it.

The other two installments under review deal with similar subjects—the one the preparation of sulfonic and sulfuric acids, the other the preparation of organometallic compounds. These installments are very unequal in quality. The author of number 287 discusses the principles underlying the various methods of sulfonation, explains why methods that give admirable results with one class of substances must be modified before they are applicable to other closely related classes, and cites abundant examples for illustration. The author of number 294 contents himself with transcripts of the various directions that are to be found in the literature for preparing metal organic compounds. This method of treatment may be useful to an occasional biochemist to whom the sources are not accessible; the organic chemist will prefer the more critical and comprehensive treatises that are available.

E. P. KOHLER

Die Künstlichen Harze. (Artificial Resins.) By JOHANNES SCHEIBER, Dr. Phil., Professor at the University of Leipzig, and KURT SÄNDIG, Dr. phil. Wissenschaftliche Verlagsgesellschaft m. b. H., Stuttgart, Germany, 1929. xv + 376 pp. 29 figs. 16.5 × 25 cm. Price, unbound, M. 26; bound, M. 28.

This book is divided into three parts—general, theoretical and special. The general part contains a discussion of the nature of the resinous state and the molecular conditions responsible for its existence. The theoretical part contains a systematic discussion of the types of compounds and the kinds of reactions which lead to resin formation, together with a consideration of such information as is available concerning the structures of the molecules present in resins and the mechanisms by which they are formed. The third part is concerned with commercial methods of preparation, the properties, uses and the methods of testing the most important types of artificial resins. The authors have carefully surveyed the volumi-

nous literature of this difficult subject up to the middle of 1928. The book is provided with subject, author and patent indexes.

This monograph will be indispensable to chemists who are directly interested in artificial resins, and the theoretical part especially will be useful to all chemists who are interested in the broader field of natural and synthetic polymers of high molecular weight.

WALLACE H. CAROTHERS

Praktikum der Färberei und Druckerei. By Dr. KURT BRASS, Professor at the Technical High School of Prague. Second, revised edition. Julius Springer, Linkstrasse 23-24, Berlin W 9, Germany, 1929. viii + 104 pp. 5 figs. 14 × 21 cm. Price, R. M. 5.25.

This little work by Dr. Brass is an excellent example of what a laboratory manual should be. It presupposes a reasonably good knowledge of what dyestuffs are, and how divided into groups according to their generally most prominent chemical character, though it seems as though one who did not possess this preparatory knowledge to any great extent might work his way into the art of dyeing, so skilfully is the book constructed, and with such accommodation to the student "who did know, but has forgotten for the time being." It is not a mere set of directions for getting a piece of fabric or a lot of material dyed to a certain color, but a distinctively scientific introductory manual for the use of a serious student taking up training in dyeing operations for the first time.

Introductory sections cover such matters as the description of the different textile fibers, and their determination and distinction, the various classes of dyestuffs from both the practical and the structural side, the general methods of dyeing—preparation of the material, the solution, the bath, the apparatus, etc.—and pass into the main portion of the work—general methods of dyeing and practical examples in detail under each group of dyestuffs, with examples of after-treatment, when such exist. The final section deals in the same full way with the operations of printing. Appended to the section on dyeing is a chapter on the different standard methods for examining the fastness of the dyed material toward the various influences which affect it—light, washing, chlorine, etc.

The book is well printed, with arrangement and styles of type calculated to make instant reference to a particular point easy. It is properly bound instead of wired, and so will stay open and flat without one's having to bend and stretch the pages, or weight down each side of the open book as it lies upon the work-bench or desk. We wish very much that laboratory manuals of equally high excellence in all points were available for other branches of laboratory work, whether in German or English.

FREDERICK S. BEATTIE

Lehrbuch der Seifenfabrikation. (Textbook of Soap Manufacture.) By DR. J. DAVIDSOHN. Gebriider Borntraeger, W 35 Schöneberger Ufer 12 a, Berlin, Germany, 1928. xxiv + 731 pp. 105 figs. 16 × 24.5 cm. Price, unbound, M. 36.

This book is intended as a textbook of soap manufacture, addressed both to the academic chemist and to the practical soap chemist, showing the relation between theory and practice. It treats of the raw materials and methods of testing them (160 pages), plant commonly used (40 pages), theory (23 pages), practice of soap boiling (124 pages), manufacture of each of seven main classes of soap (236 pages), methods of testing and analysis (30 pages), and the by-products, lyes and glycerine (22 pages), with a brief Appendix devoted to statistics and governmental regulations.

The book describes German manufacturing usage but contains little or nothing that is new or original. It does not, of course, attempt to compete with standard reference works such as Ubbelohde-Goldschmidt or Hefter, and it will not be widely used by American readers who have access to such existing books in English as those of Lewkowitsch-Warburton, Webb or Lamborn. On the theoretical side the book is decidedly lacking, the author ignoring the work of several of the leading schools in Germany, not to mention those of other countries. On the other hand, the author's practical experience as a consultant is reflected in numerous details he gives as to methods of testing and analysis.

JAMES W. MCBAIN

Kraemer's Scientific and Applied Pharmacognosy. Third edition, revised by E. N. Gathercoal, morphology; E. B. Fischer, constituents; L. K. Darbaker, literature and index; E. L. Newcomb, editor-in-chief, supervision. John Wiley and Sons, Inc., 440 Fourth Ave., New York, 1928. 405 illustrations. xxxvii + 893 pp. 15.5 × 23.5 cm. Price, \$7.50.

The book is "intended for the use of students in pharmacy, as a handbook for the pharmacists and as a reference book for botanists, chemists, food and drug analysts, and pharmacologists."

Kraemer's undertaking was an ambitious attempt toward a comprehensive standard work for this country.

The revisers have evidently given most attention to the morphological descriptions and the book will continue to be very helpful in that respect.

Authoritative information on applied pharmacognosy, occurrence and especially on adulteration, requires such an intimate contact with the industry and thorough knowledge of present field and trade conditions that equal perfection is very difficult to attain.

Considerable further revision, addition and deletion are needed to bring the information given up to date. The same general suggestion is made in connection with statements referring to chemical composition, identification and evaluation, if the book is to serve as a "hand and reference book."

ARNO VIEHOEVER