

GRAMS OF PHTHALIC ACID PER 100 G. OF THE SATURATED SOLUTION.

Temp. ° C.	Water.	10% Na ₂ SO ₄ .	15% Na ₂ SO ₄ .
25	0.7014	0.6440	0.5272
35	1.0125	0.9338	0.7575
45	1.446	1.341	1.080
55	2.168	1.858	1.639
65	3.246	3.018	2.455
75	4.926	4.373	3.748
85	7.687	6.461	5.533

Sr. Louis, Mo.

NEW BOOKS.

Applied Colloid Chemistry, General Theory. By WILDER D. BANCROFT, Professor of Physical Chemistry at Cornell University. International Chemical Series, H. P. Talbot, Ph.D., Consulting Editor. McGraw-Hill Book Company, Inc., New York, 370 Seventh Avenue. London, 6 and 8 Bouverie Street, E. C., 4, 1921. VIII + 345 pp., 14 × 21 cm. Price, \$3.

This book is just like Bancroft. It is not merely a walking encyclopedia of matters relevant to colloids. It is more. It is a romping enthusiast's collection of about every detail of the universe which, according to "Sir Wilder's" quick acting imagination, could be related, even temporarily, to the subject. Therefore, we are not surprised to read that a knowledge of colloid chemistry is essential to anybody who really wishes to understand about bricks, pharmacy, candles, leather, crayons, roads, coke, zinc, beer, butter, comets, wireless, physiology, and actually 47 other equally closely related subjects. But why did he omit farming and the movies? Even the starry heavens have colloidal properties, and psychology is a pure colloid subject. Colloids ought to be of interest to physicists, too, which he overlooked.

The title, "Applied Colloid Chemistry," in this case does not mean so much a study of technical processes or manufactures based on colloids, as it means all the known, miscellaneous recorded phenomena of Nature to which some part of the principles found in colloid reactions might apply.

Over a third of the book is on adsorption. About every separate item in the literature of this subject is represented by a word or two, so that the reader is led from fact to fancy at bewildering speed. He may fail to anticipate the frequent warnings, such as "the whole matter is up in the air at present," "the experiment should be repeated," "it is not clear why this should be so," "this cannot be true, because * * *," "this seems improbable," "this can hardly be so," "this does not follow at all." In other words, he has left exposed a lot of scientific work still to be done.

He writes just as interestingly, rapidly, and suggestively as he talks. Who but he would have seen, under Adsorption, the possibility of using

face powder as merely "a special case of a very fine powder adhering to a curved surface," or who else could have introduced the puzzling fly and the beaker on the balance pan into applied colloid chemistry? The same applies to the following quotation:

"It was suggested that the Zeppelins should be coated with a polished surface of metallic chromium so as to make them invisible. While it would be impossible to see such a surface, almost anybody would realize that something queer was going on if he should happen to see a reflected portion of the earth's surface apparently moving along in the sky. While this last might never happen, the reflection of light from the polished surface would more than counterbalance the advantages of the theoretical invisibility."

and to this:

"In order that hair may turn white in a single night, it is not necessary for the original pigment to disappear and for white pigment to develop. It is only necessary for a mass of minute air bubbles to be formed in the hair as a result of worry. While this accounts for the physical change, we are as much at a loss as ever to know why intense grief should develop air bubbles in the hair."

and again:

"In 1857 Gladstone pointed out that aqueous solutions of organic substances are apt to froth and he cited beer as a *then* familiar instance." (The italics are ours.)

Probably no other American writer has given the subjects of adsorption, emulsions, and foams so much attention as the author, and on almost every one of the countless cases which he cites, he makes some observation or conclusion of his own. These are frequently suggestive and interesting, and they add much to the pleasure of reading the book. Bancroft is never dull, and this is typical:

"There is one experiment which I always like to try, because it proves something whichever way it goes. A solution of iodine in water is shaken with boneblack, filtered, and tested with starch paste. If the colorless solution does not turn the starch blue, the experiment shows how completely charcoal extracts iodine from aqueous solution. If the starch turns blue, the experiment shows that the solution, though apparently colorless, still contains iodine which can be detected by means of the sensitive starch test."

The following chapter headings give an idea of the division of the work:

Adsorption of Gas or Vapor by Solid. Adsorption of Vapor by Liquid, and of Liquid and Solid by Solid and Liquid. Adsorption from Solution. Surface Tension—Brownian Movements. Coalescence. Preparation of Colloidal Solutions. Properties of Colloidal Solutions. Jellies and Gelatinous Precipitates. Emulsions and Foams. Non-Aqueous Colloidal Solutions. Fog and Smoke. Gases and Solids in Solids. Thickness or Surface Films.

A large part of the value of this eclectic treatment of the subject is to encourage scientists in widely different fields to take data and conceptions from one territory and attempt their application in another. This is a constructive work for which men in entirely different lines may well

thank this author. No one can read the book without being bitten by the suggestion-bug many times.

The physicist or chemist who wants to get new ideas on adsorption can find them here, and there are new thesis subjects on every page. The number of references to the literature is a most remarkable feature. There must be several thousand of them in the book. Evidently anyone who wants to know the subject would wish to own this book.

W. R. WHITNEY.

A Course of Instruction in the Qualitative Chemical Analysis of Inorganic Substances. 8th edition, entirely rewritten. By Arthur A. Noyes, Director of Chemical Research, California Institute of Technology. The Macmillan Co., New York and London, 1920. xi + 182 pp. 15 × 22.5 cm. Price, \$1.90.

"This System of Analysis is the result of many years' researches, during which the goal striven for * * * by no means yet fully attained * * * has been the development of the simplest possible methods that will provide for the reliable detection of a small quantity (1 mg.) of any constituent in the presence of a large quantity (500 mg.) of any other constituent * * *. The effort has also been made to avoid the use of tests * * * that do not enable the amounts of the various constituents to be approximately estimated." A careful examination of the 8th edition, and still more, experience with a large class in qualitative analysis, convince the reviewer that a notable advance has been registered toward the author's goal as stated above.

The basic analysis now provides, among other changes, a sharper separation of the copper and tin groups, and a short alternative method for the alkali group. The most numerous and fundamental improvements, however, are to be found in the acid analysis, where the detection of groups and of their individual members gains impressively in clearness of arrangement and in practicability. Limitations of space unfortunately forbid the critical discussion of these alterations.

The author should be urged to publish, in addition, a book providing for the detection of a dozen or so "rare" elements after the manner of his published articles,¹ perhaps including also additional acid radicals. The present volume might well contain a discussion of the numerous lines of evidence and experiment, many of them available in the qualitative laboratory, which prove just what combinations of basic and acid constituents were originally present in various mixtures of solids. Cases also where the constituents of such mixtures react with each other upon addition of water are common even in commercial analysis and might well be generalized. The significance of traces of impurities, as suggesting the method of manufacture, or the past history of materials, might also be mentioned. A complete index would be highly serviceable.

¹ THIS JOURNAL, 29, 137 (1907); 30, 481 (1908).

By diligent search a few minor errors and omissions may be discovered. Thus, on p. 138, six lines from the bottom, "oxidizing" should read "reducing." On p. 134, sulfur should be included among the non-metals occasionally found in metallic substances. No provision is made for the detection of sulfite in the presence of thiosulfate. On p. 164 it should be stated that hydrogen peroxide must not be used to oxidize sulfite, in testing for carbonate, when oxalate also is present.

The entire work is permeated with the spirit of scholarship and research, to the exclusion of empiricism. The notes make it impossible for the student to avoid the constant application of modern theories. These, in consequence, acquire a vitality and interest which would be entirely lacking if they were studied as disembodied abstractions.

G. S. FORBES

Scientific and Applied Pharmacognosy. By HENRY KRAEMER, PH.B., PH.M., PH.D.,
Dean of the College of Pharmacy and Professor of Pharmacognosy in the University of Michigan College of Pharmacy. 2nd edition. John Wiley and Sons, Inc., New York, 1920. xxviii + 741 pp. 313 figures. 15 × 23.5 cm. Price, \$6.00.

Although the work bearing the above title is so well and favorably known, especially in pharmaceutical circles, the appearance of a second, revised edition affords the opportunity of bringing it to the notice of those who may not be familiar with its plan and purpose. With regard to its contents, it may be stated that the author gives in a short introductory chapter an interesting exposition of the scope and problems of pharmacognosy, together with some general principles concerning the collection and preservation of drugs and the methods employed for their valuation. This is followed by the chief subject matter, which includes a consideration of the more important medicinal plants or drugs, arranged in accordance with their natural botanical classification. The final sections are devoted to drugs of animal origin and powdered drugs, the latter containing a key for the study or classification of powders, mostly by their general physical characters or by their structure as observed under the microscope, and a very good index is provided.

In attempting to present to the readers of *THIS JOURNAL* a more detailed description of the work by Professor Kraemer, it is naturally desirable that some indication should be given of its usefulness or interest to the chemist. The following excerpt from the preface to the second edition may therefore serve to illustrate the importance attached to its chemical features. "There are a great many subdivisions of Pharmacognosy and the two which are commanding greatest attention to-day are, the cultivation of medicinal plants and pharmaco-chemistry, the latter dealing with the study of the constituents of plants."

A somewhat general survey of the numerous subjects included in this work renders it evident that the author has made a laudable attempt to record more completely than is customary in similar compilations the most

recent investigations pertaining to the constituents of plants or of vegetable drugs. This field of chemistry, although contributing largely to the interest of the study of pharmacognosy, would seem to be more correctly, if not more comprehensively, designated as phytochemistry rather than "pharmaco-chemistry," since it really comprises nothing more than the employment of established chemical principles and methods for the study of the organic compounds which occur in such unlimited variety in the vegetable kingdom. In this connection the reviewer cannot refrain from expressing his regret that in a number of instances throughout the work his name has been attached to citations of the literature when credit should have been given to several of his former associates in the Wellcome Chemical Research Laboratories of London, by whom the respective investigations were conducted. Thus, on p. 156, the reference to the bark of *Salix discolor* should be followed by the names of Jowett and Potter, and a further error occurs in the statement that this bark contains both salicin and salinigrin, since only the latter is present.¹ Under Senna (p. 319) and *Oenanthe crocata*, the name of Tutin should be given; under *Calabar Bean* (p. 325) the name of Salway; under *Trifolium incarnatum* (p. 347) and *Lasiosiphon* (p. 460) the name of Rogerson; and under *Gelsemium* (p. 521) and *Apocynum* (p. 543) the name of Moore. It is hoped that in a subsequent revision these errors of inadvertence may be corrected.

As several of the latest chemical investigations pertaining to drugs or vegetable products appear to have been overlooked in the present work, it would seem desirable to note these omissions in order that references to them may be considered in a subsequent revision. There may thus be mentioned the subjects of Hops,² Sarsaparilla;³ Anthemis;⁴ Matricaria;⁵ Oil of Asarum canadense,⁶ Oil of American Pennyroyal;⁷ Essential Oil of Nutmeg;⁸ and Chrysarobin.⁹ The reference under Chaulmoogra Oil to a paper by Chattopadhyay is of doubtful utility, inasmuch as his statements regarding the composition of the oil have been shown to be entirely wrong. On the other hand, the admirable contribution to the pharmacognosy of strophanthus seed, by Perrédès, highly merits citation in the literature of the subject.¹⁰ A statement on p. 48 that the volatile oil of Thuja contains an inactive oxime obviously refers to a recorded observation that

¹ See also *J. Chem. Soc.*, **77**, 707 (1900).

² *Ibid.*, **103**, 1267 (1913).

³ *Ibid.*, **105**, 201 (1914).

⁴ *Ibid.*, **105**, 1829 (1914).

⁵ *Ibid.*, **105**, 2280 (1914).

⁶ *Ibid.*, **81**, 59 (1902).

⁷ *Ibid.*, **91**, 875 (1907).

⁸ *Ibid.*, **91**, 2037 (1907).

⁹ *Ibid.*, **101**, 290 (1912).

¹⁰ *Year Book of Pharmacy*, **1900**, p. 366.

one of the constituents of the oil yielded such an oxime, since it is well known that this class of compounds does not occur in essential oils.

In connection with the foregoing comments the reviewer desires to state that he would not wish them to be regarded as a disparagement of the work but rather as suggestions for its further possible improvement.

It not infrequently happens that the chemist requires to know the source and characters, as well as the constituents, of some medicinal plant or drug and to be assured of its genuineness or purity. In such cases the work under review will be found to contain much useful information and may be highly commended, although naturally not rendering unnecessary the consultation of current literature or reference to more specialized works. Attention may particularly be directed to the large number of illustrations provided for this work. These represent both crude drugs and their anatomical structure, and, being admirably executed, they constitute one of its most important and instructive features. F. B. POWER.

The Qualitative Analysis of Medicinal Preparations. By H. C. FULLER, B.S. In charge of Division of Drug and Food Products, Institute of Industrial Research, Washington, D. C. Second edition, rewritten. John Wiley and Sons, Inc., New York, and Chapman and Hall, Limited, London, 1920. VIII + 191 pages. 12.5 × 19.5 cm.

This second edition of a work which, when it originally appeared, was unique in its field, has been entirely rewritten and in so doing the author has enlarged it nearly 50%, besides correcting many errors and faults of the earlier edition.

The book is intended to be of assistance to those analysts who are familiar with chemical theory and analytical technique, but who have had little or no experience in the hitherto uncharted sea of the analysis of the thousand and one substances that are described under the general title "medicinal preparations."

The first portion of the book is concerned with a system of separating the substances into groups depending upon differences in solubility. This most difficult subject is handled in a very efficient manner and any inconsistencies and redundancies are attributable to the complexity of the task rather than to the inability of the author to present it more simply. "It simply cannot be done" satisfactorily, is a statement applicable to this section and correctly interpreted in either of two ways.

In the second portion of the book the subject is handled in a masterly manner in which the author's abundant and long experience has enabled him to assemble much indispensable information concerning the procedure needed in handling the various classes of pharmaceutical preparations, such as fluidextracts, tinctures, elixirs, wines, syrups, emulsions, pills, tablets, capsules, ointments, suppositories, and many others.

There is also presented a simple and satisfactory scheme for the rapid qualitative detection of prohibited harmful or narcotic drugs.

The book is valuable as an addition to the working library of the chemist who is occasionally called upon to solve some problem connected with drugs or medicines. Taken in conjunction with the larger book by the same author just issued (see the following review), it is an invaluable aid to the pharmaceutical chemist and analyst and should be found in every well-equipped library on pharmaceutical or chemical subjects.

C. H. LAWALL.

The Chemistry and Analysis of Drugs and Medicines. By HENRY C. FULLER, B.Sc. In charge of the Division of Drug and Food Products, Institute of Industrial Research, Washington, D. C. John Wiley and Sons, Inc., New York. 1072 pages. Price, \$10.

This book is intended to supplement and amplify the information contained in Dr. Fuller's smaller book (see preceding review).

It is a comprehensive and thorough presentation of a subject which has received little attention except in articles scattered through the chemical and pharmaceutical literature.

There are five major divisions of the work. These cover the following: (1) crude drug assays and general methods of procedure; (2) alkaloidal drugs and medicines and allied substances; (3) glucosidal and other non-alkaloidal drugs; (4) organic substances not included in (2) or (3); (5) inorganic substances frequently found in medicines.

The information and methods of analysis given under each of these heads are unusually complete and satisfying in their method of presentation to one who is called upon to identify and separate or to determine quantitatively the component parts of a medicinal preparation.

The book is best used in conjunction with the author's smaller book on the Qualitative Analysis of Medicinal Preparations, and one of the few criticisms which can be directed against the larger book is this incompleteness in elementary details of procedure and fundamental facts concerning certain group classes of preparations and their treatment. An analyst who has the larger book only would be seriously handicapped by this omission unless he had accumulated considerable experience beforehand, which is unlikely.

The completeness of the book, apart from this feature, is remarkable and the material is unusually up-to-date. The few omissions which have been noticed are of the constituents which occur in such classes of preparations as cosmetics, hair dyes, etc., which, while not strictly medicinal, are naturally sought for in such a work as this, and their omission seems to be an oversight or error which it is hoped will be corrected in future editions, for this is the type of book which is destined to be in perpetual demand in a frequently revised form.

The weakest portion of the book is found in the index, which is glaringly incomplete and woefully lacking in proper cross references. This, too, is a fault which may easily be remedied in future editions.

There is no book in the English language which covers the range of sub-

ject matter included in this book and some of the divisions are models of up-to-the-minute completeness. It is a book which will find a permanent place both in the reference and working libraries and is a welcome addition to the literature of pharmaceutical chemistry, in which American workers seem to have been holding their own for some years past.

C. H. LAWALL.

The Chemistry of Plant Life. By ROSCOE W. THATCHER, M.A., D.Agr., Dean of the Department of Agriculture and Director of the Agricultural Experiment Stations, University of Minnesota. Agricultural and Biological Publications, Charles V. Piper, Consulting Editor. McGraw-Hill Book Company, Inc., New York, 370 Seventh Avenue. London, 6 and 8 Bouverie Street, E. C., 4. 1921. XVI + 268 pp. 15 × 23.5 cm. Price, \$3.00.

The teacher of organic chemistry, at least before the war, has been rather fond of telling his students how the late Emil Fischer set out early in life to accomplish three things, *viz.*, the synthesis of a carbohydrate, of an alkaloid, and of a protein; and how, at the close of a most remarkable career as investigator, he could point to the accomplishment of each of these three tasks, one of which might have satisfied the ordinary man. It was in connection with the achievements of synthetic organic chemistry that this story was usually told. The teacher who was so fond of relating this story of Fischer's life work possibly never thought of quoting Fischer's own words which he penned toward the close of his remarkable career and which summed up, as it were, his own viewpoint after the task had been accomplished: "Die grossen und reizvollen Probleme der organischen Chemie wurzeln in ihren Beziehungen zur Biologie."

Fischer had started out as a "coal tar" synthetic chemist working on dye stuffs and ended as an appreciator of biochemistry. At the International Congress of Applied Chemistry in New York in 1912, an Italian chemist pointed out how one-sided has been the development of organic chemistry so far as its source materials are concerned. Kekulé's benzene theory made the study of so-called aromatic compounds so fruitful, that for a long time the study of other compounds was almost lost sight of. This was naturally reflected in the laboratory courses, more particularly the advanced courses, of our universities. Even in 1912 the Italian chemist was perfectly justified in criticizing the attitude of the organic chemist who thought much more of his coal tar products as first materials than of the plants and their products which nature produces for him every year. He pointed out that the general public, as well as some chemists, were more interested in the artificial synthesis of foodstuffs from coal-tar products than in the photosynthesis by plants. If instead of spending all of their energies in using a few per cent. of coal tar, which represents but a few per cent. of coal, which in turn represents but a few per cent. of prehistoric forests, they devoted their efforts to the utilization of the energy that goes to waste in the form of sunlight in the

desert of Sahara, he pointed out that almost unlimited quantities of food-stuffs, etc., could be produced annually with the aid of plants.

What such men as Wallach and others, too numerous to be mentioned, have done in fundamentally changing organic systematics, need but be alluded to. They have also prepared the way for the phytochemist and it is pleasing to note that this field of chemistry is slowly coming to its own once more. Pharmacy has always been interested in plant chemistry. The history of chemistry is replete with illustrations of valuable contributions that pharmacy has made. Suffice it to point out the discovery of plant acids by Scheele and the recognition of the "salifiable" basic properties of morphine by Sertuerner, which was supposed to complete the parallel between organic and inorganic chemistry at that time. Now, however, that agriculture is taking a new hold on plant chemistry, the importance of the latter subject will no doubt be more fully and more generally recognized.

The author has taken up his subject in truly a missionary spirit. It would be quite beside the mark, therefore, to emphasize what a reviewer might regard as shortcomings either as to scope or method of treatment. The specialist can always find little things to criticize if he is so disposed or if he is inclined to regard fault finding as a special function of the reviewer. The omission of some of the best modern works from the list of literary references at the end of the chapters, however, is something that should be corrected in the next edition. That such an edition will be called for there can be little doubt. We welcome Thatcher's "Chemistry of Plant Life" to our meager literature on this subject available in the English language and trust that the enthusiastic author may be rewarded for his efforts by finding that his enthusiasm has become contagious.

EDWARD KREMERS.

A Bibliography of Investigations Bearing on the Composition and Nutritive Value of Corn and Corn Products. By M. HELEN KEITH, A.M., First Assistant in Animal Nutrition in the Illinois Agricultural Experiment Station, Urbana. Issued in mimeographed form by the National Research Council. Washington, D. C. 1920. XIII + 178 pp.; price, \$2.00 (\$2.17 postpaid).

About three-fourths of the world's crop of corn (maize) is produced and consumed in the United States, but considerably less than one-tenth of this is used as human food. The corn fed to farm animals in the United States could furnish all the calories needed for over two hundred million people. This constitutes a food reserve quite without parallel in this or any other country and it is a resource which we must admit has up to the present time been rather prodigally used. More of the corn crop than at present should come directly into human consumption to augment the bread supply; and much of the corn which now goes into the production of meat should be converted into milk instead. In human food produced per unit of feed consumed the milch cow is several times more efficient

as a transformer of farm crops than is the animal fed merely for slaughter, and in this country an increased consumption of milk is needed on nutritional grounds, while we could eat less meat and be quite as well off. Gradually also a larger and larger part of that considerable share of the corn crop which goes to the feeding of draft animals will be freed for other uses as mechanical tractors are increasingly employed on farms. Hence the great importance of a bibliography of our present knowledge of the chemical composition and nutritive value of corn and its products. The arduous task of compiling, notating, and arranging such a bibliography has been completed in a most thorough, systematic, and scholarly manner by Miss Keith at the Illinois Agricultural Experiment Station, and has now been made available by the National Research Council. The volume is arranged in three sections; the first consists of a complete bibliography alphabetically by authors and chronologically under each author's name; in the second section these references have been classified very thoroughly by subjects with brief notations to aid in their location under section one; the third section lists books and articles of too general a nature to be included elsewhere. It constitutes a model bibliographical work and will be of the greatest value to all who may interest themselves in any phase of the problem of the best utilization of the corn crop either directly as human food or through the feeding of farm animals.

H. C. SHERMAN
