by J. L. Baker and H. F. E. Hutton, whose work is mentioned by "H. F. E. H." But our own preliminary work bore out the statement of Brown and Glendinning that the curves of reaction velocity is sufficiently nearly rectilinear, up to the point of hydrolysis of 50% to 60% of the starch, "for all practical purposes of diastasimetry." We, therefore, did not hesitate to use the Kjeldahl "law of proportionality" as a basis for our study of the proposed method of extraction.

With regard to the supposed ignoring of the influence of substances in the material under examination upon the quantity of maltose produced from the starch in the sample, we may say that it was precisely in order to avoid this difficulty that we sought a method which would give an extract free from these disturbing substances. Our further investigations of the application of the proposed method to a study of the diastases of flour, which are now being prepared for publication, showed clearly that the accelerating effect of the extracts alone upon the conversion of starch to maltose is quite different from that of a dilute flour paste, exactly as indicated by the authorities cited by "H. F. E. H." Our investigations as to the causes of this phenomenon, while not yet complete, indicate that the difference is due to the presence in the flour paste of substances other than diastases which influence the rate of diastase action. This does not change in any way our conclusion that the diastases are quantitatively extracted at 0° by the proposed method. A discussion of this phenomenon belongs to the forthcoming paper, rather than to a description of the method of extraction, which was presented in our first paper. In the next paper, the work in question will not be "ignored."

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NEW BOOKS.

A Laboratory Outline of Elementary Chemistry. ALEXANDER SMITH. The Century Company, 1914.

This outline is intended to accompany the author's new Text-book of Elementary Chemistry published by the same company during the summer. His position as Examiner in Chemistry of the College Entrance Board puts him in close touch with the teaching of Elementary Chemistry and two paragraphs from the preface give an idea as to the plan of the work:

"The apparatus has been made as simple and small in amount as possible. The list of chemicals has also been restricted to the least expensive materials and the smallest number of items. The indispensable experiments which are less simple, have been left for classroom demonstrations.

All the experiments, and the wording of the directions, have been tried under the author's supervision with young pupils, and have been altered until found satisfactory."

The book differs from the stereotyped forms in several important particulars. In the study of "Substances" the pupil is given pieces of white cotton cloth, of white mixed goods, and of woolen yarn instead of bits of copper, pieces of sulfur, nitric acid, etc. Incidentally, the ability to detect cotton and wool separately or in mixtures is developed. Measuring, weighing, density, changes in metals heated in air, follow, and then come studies in oxygen, hydrogen and water in quite the orthodox way. One exercise is devoted to hydrates and another to the determination of water in hydrates. (The old, misleading "Water of Crystallization" is not even mentioned. Let us hope that it, Sulphuretted Hydrogen and some others are on the road to oblivion.)

Why reactions proceed to equilibrium or to completion, ionization, normal and standard solutions, titrations, valence, give further practice in quantitative work not too difficult for beginners. Gram-molecular volume, colloids, starch and sugars, how soap cleanses, and tests for food compounds are new in the way of laboratory work for young pupils. The recognition of negative radicals, analysis of baking powder, hydrolysis, esters and soap-making, colloidal suspensions, hard water, film-cobalt chloride- and match tests for metallic elements, displacement of metals and the making of white lead are new features, or old topics treated in a new way.

The manual will make for itself some such place in elementary chemistry as his laboratory guide to accompany his first college text made in that field of the work. C. M. WIRICK.

Collegiate Chemistry. By F. W. MARTIN, M.S., PH.D. J. P. Bell Co. Inc., Lynchburg, Va. 1914. 238 pp. Price, $1.30.

The author in this new text in General Chemistry has not introduced any strikingly new feature, and unfortunately leaves out some of the important old features. His work is based on the Periodic System and forms a very good introduction to Qualitative Chemistry. Although he particularly states in his preface that "it is probable that some who inspect it superficially may be misled by its size and simplicity of presentation into thinking that it is too brief in scope or too elementary in treatment to meet the needs of the college freshman," a very careful perusal leads one to the very conclusion to which the author objects. The sins of the book are more of omission than of commission. The brevity of the treatment is particularly apparent when the well known Frasch method for obtaining sulfur is not even mentioned—the lead chamber process for the manufacture of sulfuric acid is given only as a footnote. Catalytic agents are completely ignored, and while, in the prepara-

tion of oxygen, manganese dioxide is first used alone and then with potassium chlorate, the different role it plays in the two processes is not indicated. The only methods given for the preparation of ammonia are by treating ammonium chloride with lime and passing sparks through the gases hydrogen and nitrogen. Other illustrations could be given of the extremely brief treatment. Several chapters are devoted to the theories of chemistry, but there is no particular connection between the theories and the descriptive matter. The metallurgical processes given are not particularly good nor up to date. "Not-metal" is used in the place of the more euphonious "non-metal." Other unusual words such as acidigen and basidigen are used. The experiments embodied in the text are the usual standard ones. A good experimental illustration of the law of multiple proportions is given in the preparation of the two iodides of mercury. LILLIAN COHEN.

Collegiate Chemistry. Qualitative Analysis. By F. W. MARTIN, M.S., PH.D. Professor of Chemistry, Randolph-Macon (Women's) College. J. P. Bell Co., Inc., Lynchburg, Va. 1914. pp. 257–321. Price, $1.00.

The Qualitative Analysis is Part V of Martin's Collegiate Chemistry. It is a satisfactory manual for qualitative analysis and with interpolations by the instructor could be used as a text-book. However, it does not possess any greater merit than most of the manuals on the market and not as much as some. LILLIAN COHEN.

A Text-book of Quantitative Chemical Analysis. By ALEXANDER CHARLES CUMMING AND SIDNEY ALEXANDER KAY. John Wiley & Sons, New York, 1913. pp. xi + 382.

In the ten parts of this book are considered (I) General Principles; (II) Volumetric Analysis; (III) Gravimetric Analysis; (IV) Colorimetric Methods; (V) Systematic Quantitative Analysis; (VI) The Analysis of Simple Ores and Alloys; (VII) Gas Analysis; (VIII) Water Analysis; (IX) Quantitative Analysis of Organic Substances; (X) The Determination of Molecular Weights. An Appendix contains data of various kinds. It can be seen that the scope of the book is large. The processes selected are representative and the manipulative descriptions of the typical exercises are unusually complete and satisfactory.

Many teachers will not concur with the authors in their decision to allow volumetric analysis to precede gravimetric analysis. The reader is frequently left in the dark as to the reasons why various precautions are necessary. Furthermore, no application is made of the modern theory of solution, even in such subjects as the solubility of precipitates, and neutralization in the presence of indicators.

Many detailed criticisms may be made: Under titration with permanganate in the presence of chlorides no mention is made of the useful-

ness of manganous salts in preventing error (p. 65). Oxalic acid is condemned as a standard reducing substance on the basis of efflorescence (p. 67), whereas this phenomenon never occurs under any ordinary atmospheric conditions. Stannous chloride is stated to be applicable for iron reductions only when dichromate is used for oxidation (p. 76), yet this method of reduction is widely used in permanganate titrations with precautions suitable for avoiding error due to chlorides. The diminution of the colloidal solubility of silver chloride by nitric acid is apparently confused with that of true solubility (p. 133). One is startled by the statement that cadmium is precipitated electrolytically upon the *anode* from cyanide solution (pp. 149 and 150). In the determination of the silica in an insoluble silicate, filtration of the second precipitate upon the same filter as the first is recommended.

The reviewer can see few points of superiority in this book over many other standard texts. G. P. BAXTER.

Photo-chemistry. By S. E. SHEPPARD, D.Sc. London: Longmans, Green & Co., London and New York. 1914. pp. 446. (One of a Series of Text-Books of Physical Chemistry Edited by Sir William Ramsay, K.C.B., F.R.S.) Price, $3.50.

To those of us who have for a number of years been impatiently awaiting the promised appearance of a work on photo-chemistry, this latest addition to the Ramsay Series is especially welcome. One is struck at once by the appearance of thoroughness with which any one subject is discussed, and a closer study causes one to marvel at the amount of excellent material the author has succeeded in compressing into the 446 pages. An especially desirable feature of the book, and one which the reviewer feels it impossible to over-emphasize because of the unusually widely separated literature of photo-chemistry, is its excellent bibliography, the collection and verification of which must have been a Herculean task.

One must commend the author for his excellent judgment in greatly condensing the historical development of photo-chemistry, in spite of the fact that the history of this branch of physical chemistry is one of unusual interest and inspiration. Following the six or seven pages of history we find about forty pages devoted to a thorough discussion of the principles involved in the measurement of light quantities; different light sources; standard light sources; and a brief, but comprehensive, description of the various devices used for the measurement of the intensity of light, including spectro-photometry.

Under the heading "Energetics of Radiation" the author takes up Kirchhoff's law; the Stefan-Boltzmann law; Wien's displacement law; Planck's law for the distribution of energy in the spectrum; the methods for determining temperature; the radiation scale of temperature; the mechanical equivalent of light, etc. The fourth chapter deals with

"Economic and Energetic Relations of Actual Light Sources," in which are discussed: the Hefner lamp; incandescent gas; incandescent electric lamps; the electric arc; various sources of the ultra-violet; sunlight; diffused daylight; and the distribution of energy in the spectrum of each.

The next seventy-one pages, constituting the fifth chapter, are devoted to a study of the absorption of light. The various factors influencing absorption are discussed in considerable detail, then the question of the absorption of solutions is considered at length. The remainder of the chapter is given over to a discussion, necessarily somewhat limited,[1] of the interesting question of the relationship between absorption and chemical constitution.

Chapters six and seven are devoted to "Statics and Kinetics of Photochemical Change" and "Dynamics of Photochemical Change." The former consists of an excellent discussion of the measurement of the rate of photochemical reactions and the application of the mass law, illustrated by numerous well-chosen examples. In the latter the author takes up the factors influencing photochemical equilibria; endo- and exo-actinic reactions; photochemical change in the elements; chemical actinometry; photochemical reactions in gases and vapors; photochemical induction and deduction; photochemical catalysis; and photo-sensitization.

Chapter eight is devoted largely to the photo-chemistry of the halogens; the silver compounds; and the interesting question of phototropy. This is followed by a chapter on "Radiant Matter and Photochemical Change," being mainly a discussion of the photo-electric effect. In Chapter ten there is an interesting presentation of what we know concerning the various luminescence phenomena, and a discussion of their theoretical significance. The last chapter in the book constitutes a very meager and rather disappointing discussion of organic photosynthesis, a subject which, though perhaps not so spectacular, is undoubtedly the most important of all.

Nearly one-half of the book is devoted to what many will undoubtedly call photo-physics rather than photo-chemistry, but in the opinion of the reviewer this is one of its strongest points. The author well says in his preface that the neglect of the bearing of photo-physical phenomena and laws and "too narrow a circumspection of its domain can only lead to further delay in the discrimination of a definite body of laws for this science."

The author is to be congratulated on giving us a presentation of real photo-chemistry, rather than a book lop-sided from the inclusion of too much photography. Dr. Sheppard has done much to dispel the popular

[1] This question has been quite fully discussed in a previous volume in this series. See Smiles," "The Relations between Chemical Constitution and Some Physical Properties."

illusion (unfortunately current even among chemists) that *photo-chemistry* and *photography* are synonymous. Any such deluded person who will but look through this really excellent résumé of the field of photo-chemistry will never again be troubled by the vision of a camera rising before him whenever the word "photo-chemistry" is mentioned.

J. HOWARD MATHEWS.

Complex Ions in Aqueous Solutions. By ARTHUR JAQUES. London: Longmans, Green & Co., 1914. 151 pp. Price, $1.35 net.

The first part of this monograph, approximately one-quarter of it, is devoted to a description of various general methods of investigating complex formation; namely, the chemical method, the ionic migration method, the distribution method, the solubility method, and the electrical potential method. In considering each method the principles are first presented, and then illustrated by applying them to actual experimental data. Properties of solutions, such as freezing-point lowering and vapor pressure lowering, which are a measure of the total number of mols of solute in the solution offer another important method for studying complexes. This method, though not classified as one of the general methods, is mentioned and illustrated by some of the examples given later in the book.

In the last part of the book these general methods are illustrated by examples, which also serve to give a review of some of the more important experimental work on complex ions in aqueous solutions. Unfortunately, no reference is made to investigations on the subject which have been published in this country.

M. S. SHERRILL.

Handbuch der Mineral Chemie. DOELTER, *et al.* Bd. III Nos. 3 and 4. (Bogen 21–40.) Dresden and Leipzig: Th. Steinkopff. Price, M. 6.50 each.

The mineral phosphates here treated are most of them rare and of little interest to chemists in general; indeed the examination of much of the contents of these two hefts has revealed comparatively little of a chemical nature.

There is some modern work on the synthesis of apalite, and some on the chemical behavior of turquoise which the mineral chemist should know, while the section on monazite and the extraction of the rare earths from it will appeal to a wider circle of readers.

The last pages of No. 4 in which the arsenic minerals are begun treat the polymorphic forms of this element, and those of arsenious oxide in a more complete manner than a strictly chemical treatise.

E. T. ALLEN.

The Source, Chemistry and Use of Food Products. By E. H. S. BAILEY, PH.D. Philadelphia: P. Blakiston's Son & Co., 1914. pp. xiv + 517. Price, $1.60 net.

This is not intended as a reference book for experts or specialists, but

as a convenient manual for the use of students in colleges or high schools, and especially for those who are taking courses in dietetics or household economics. An unusually large amount of practical information, gleaned largely from original sources, is condensed in the book and the presentation is such that the student should be able to grasp readily the essential points. There is unquestionably a place for such a book and the author has succeeded in compiling something which is really needed.

Dogmatic statements on some controverted questions have been pretty well avoided. A few paragraphs, here and there, seem to the reviewer, however, somewhat wide of the mark, and in future editions should be modified or omitted. The author has occasionally gone out of his way, for example on page 295, in making statements which do not well accord with the facts. In discussing the use of preservatives in a well-known tomato product, the author discloses a somewhat uncertain prejudice, not in keeping with the scientific accuracy which should ever hold in a book for students.

While many foods, because of their limited use in this country, are but briefly discussed, other sections are much longer and full enough to form very interesting reading. The chapters on sugars and bread are examples of quite satisfactory treatment. Numerous illustrations add much to the practical value of the book, which, on the whole, can be cordially recommended to the readers for whom it is intended. J. H. LONG.

A Manual of Bacteriology for Agricultural and General Science Students. By HOWARD S. REED. Ginn & Co. 1914. Price, $1.25.

This volume consists essentially of a well-selected series of experiments designed to familiarize the student with principles underlying the activities of bacteria, yeasts, and molds. The majority of these experiments are devoted to bacteriological technique and the role of bacteria in nature; nevertheless, considerable space is occupied by a consideration of various fungi, particularly yeasts and molds. The scope of the volume, therefore, is greater than the title would indicate.

The viewpoint of this manual is essentially chemical. Attention is directed continually toward the nature and extent of microbic activity; but little space is devoted to their morphology and botanical identification. This omission of morphological details, however, is of little moment, for the practical importance of microbes in the last analysis centers around the results they accomplish rather than what they are. The essential morphological features can be readily supplied by collateral reading: a selected list of texts is appended for this purpose.

The arrangement of the book might be unified somewhat without seriously disturbing the sequence of the text by uniting Sections II and V, both of which deal essentially with the preparation of general and special media for the cultivation of microörganisms. Similarly, Experiments

27 and 28 of Section VI might well be contained in Section VIII, which is devoted to the isolation of a pure culture. It might be advantageous from the viewpoint of the student, furthermore, to amplify Section VIII by the addition of experiments illustrating the general methods of obtaining pure cultures of microörganisms from their mixtures.

Section XV, "Bacterial Disease in Man and Animals," is not impressive. The subject is inherently far beyond the scope of a volume the size of this manual, and it might be profitably omitted entirely, or, at most, dismissed with the most general statement.

Sections XI and XIII, dealing, respectively, with bacteria of water and sewage, and bacteria of milk, are worthy of special mention. Section XII, relating to the bacteria of the soil, taken together with the information contained in the appendix on the sterilization of soil, is excellent.

The appendix contains directions for the accurate determination of various products of microbic growth.

The student who successfully completes the experiments outlined in this manual should be well grounded in general mycology.

ARTHUR I. KENDALL.

A Text-book of Physiological Chemistry. By OLOF HAMMARSTEN with the collaboration of S. G. HEDIN. Authorized translation by John A. Mandel, from the enlarged and revised 8th German edition. New York: John Wiley & Sons. pp. viii + 1026. 1914. Price, $4.00 net.

This well-known work here appears in the 7th American edition. The preface of the 6th edition was dated April, 1911, while in the new edition the date is June, 1914, following closely the corresponding German dates. Former editions have been reviewed at length in the JOURNAL. The translater calls attention to the fact that the last German edition, from which this is taken, was revised by the author himself, who is now in his 73rd year. Every worker in the field of Physiological Chemistry will doubtless join heartily in the wish that the pioneer investigator and painstaking compiler may live in vigor to bring out many future editions of a hand-book which has long been a necessity in the library of the biochemical student.

This new edition shows a considerable number of changes to correspond to the rapid advances in the science. By a rearrangement of the matter the number of chapters has been reduced from eighteen to seventeen, and practically every chapter has received additions. In Chapter I, dealing with general physico-chemical relations of physiologically important bodies, the sections on osmotic pressure, colloids, catalysis, enzymes, and ions and salt action, the revision has brought important discoveries and theories down to date. In no field of physiological chemistry has the development been more rapid than just here and the fact is fittingly regarded in the compilation. For example, even some of the

latest determinations of the reaction of the blood by gas chain methods have received attention.

Notable changes have been made in other chapters, and especially in the work on the blood and the urine. The preliminary discussion on oxidation processes in the body, which in earlier editions came in the first chapter, now appears in the sixteenth chapter under respiration and oxidation. In some chapters the changes appear to be slight, for example, in the discussions of the carbohydrates and the animal fats and phosphatides.

The work of the translator must be again commended, as well as that of the publishers in keeping up the excellent appearance of the book.

J. H. LONG.

Preservatives and Other Chemicals in Foods. By OTTO FOLIN, PH.D. Hamilton Kuhn, Professor of Biological Chemistry, Harvard University. Cambridge: Harvard University Press, 1914. 60 pp. Price, $0.50.

This little volume is the outgrowth of one of the Harvard health talks by Dr. Folin. It is one of the best and fairest presentations of the question of chemical preservatives in foods that has thus far been published. Dr. Folin does not wholly condemn the use of preservatives in food products, but condemns their use as a substitute for sanitation or of the use of any of the more harmful ones.

The author says:

"Unfortunately, the application of these new methods for preserving food was not left where it belonged, with the critical and disinterested scientific investigators, but was seized upon by alert men whose chief interest was of the pecuniary kind. The outcome might have been foreseen. * * *

"By means of greater liberality with the antiseptics which are cheap, the enterprising manufacturer also succeeded in preparing food products for the market from materials already so decayed as to be unsalable. * * *

"In the absence of specific and adequate evidence to the contrary, it follows practically as a matter of course that chemicals which are effective in killing or preventing the development of bacteria must be injurious to the more highly organized and more sensitive living cells which go to make up the human body. * * * *

"Among all the preservatives of recent origin there is probably no one more likely to prove practically harmless to human beings than benzoic acid and benzoates.

"It is known that while certain chemicals may be taken in substantial quantities for a month or a year without producing demonstrably injurious effects, nevertheless, the continued use of the same substance, even in small quantities, will eventually undermine the health.

"It is perhaps not superfluous to state that the approval of a limited

use of benzoic acid or sodium benzoate for the preservation of good, but perishable food materials, does not imply approval of similar preservation of decayed materials; or of materials which are regularly consumed in large quantities, as for example milk; or, of foods which do not need any chemical preservatives."

"The substitution of benzoic acid for cleanliness in the preparation of food is doubtless a real and practical temptation to manufacturers of cheap foods, however much they may be disposed to deny it."

"It is, however, extremely difficult—in food almost impossible—to determine experimentally, in a short time, with any degree of certainty, whether a comparatively mild chemical is or is not injurious to health."

Dr. Folin does not hesitate to condemn the bleaching of flour. He says:

"The addition of dangerous chemicals to food products for no other purpose than to hide inferiority is a practice which, from the standpoint of the consumer, has nothing to recommend it. Take for example the notorious case of bleached flour."

He points out that the owners of the patent have worked for years and "the reward for their success was contributed by the consumers of the bleached flour at the rate of 50 cents to $1.00 extra per barrel."

"We are, in my judgment, bound to take the position that any substance known as a poison must be assumed to be injurious to health, even when taken in the smallest doses, unless we have definite and specific reasons for believing it fails to have *any* effect when the dose is minute. * * * In the case of most dangerous chemicals it is, I think, neither safe or sound public policy to assume that they may be made ingredients of our daily food even though the quantities used are small when compared with doses capable of producing demonstrable results. So long as failing health before old age is as common as it is we cannot afford to extend the benefits of reasonable doubts to any poisonous or deleterious ingredients added to our food. * * * In the interests of the public it should be enough to show that adulterated foods contain added poisonous or deleterious ingredients, and to insist that the presence of such admittedly injurious substances of necessity renders the product containing them injurious to health."

The author thinks that the courts may safely interpret the phrase "may render such article injurious to health" as throwing the burden of proof on the manufacturers of foods containing added chemicals.

This little volume may be read with much profit by all who are interested in food products as a sane presentation of facts sifted from the mass of controversial material forced upon the public during the past few years.

E. F. LADD.