Fodder.	Saccharogenic power of 100 g.	Fodder.	Saccharogenic power of 100 g.
Alfalfa hay I	7.67	Timothy hay	0.77
Alfalfa hay II	8.50	Corn stover	0.26
Clover hay	4.88		

These figures represent of course minimal values, since a slight loss of enzyme might be expected to occur in each step of the process of preparation. The addition of sodium phosphate and sodium chloride as electrolytes failed to increase the activity, probably because electrolytes were abundantly present in the crude enzyme preparations. It is interesting to note, however, that the fodder retains some amylolytic activity after drying and that this activity is roughly proportional to the number of living cells in the plant at the time of cutting.

RAY E. NEIDIG.

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NEW BOOKS.

Chemistry in America. Chapters from the History of the Science in the United States. By EDGAR F. SMITH, Blanchard Professor of Chemistry, University of Pennsylvania. Illustrated. D. Appleton & Company: New York and London. 1914. pp. 356 + xiii. Price, $2.50.

The appearance of this book brings to mind an address by Professor Benjamin Silliman on "American Contributions to Chemistry," which was delivered in August, 1874, at Northumberland, Pa., on the occasion of the celebration of the Centennial of Chemistry, at the grave of Priestley. Dr. Smith has, however, brought to light much matter that was apparently not discovered by Silliman and, by quoting the authors whose work be describes, he is able to give a clearer idea of the nature and value of this work. It must be confessed that most of the chemical publications to which attention is called are of little value and have naturally been forgotten.

It is nevertheless interesting to learn that the earliest contribution to chemistry from this country appeared September 10, 1768, in the Transactions of the American Philosophical Society. The title is "An Analysis of the Chalybeate Waters of Bristol in Pennsylvania." The author is Dr. John de Normandie. Liberal quotations from the article are given which show that the author used the balance. Then follow quotations from an article by James Madison, who was Professor of Chemistry and Natural Philosophy at William and Mary College as early as 1774, and from an article by Dr. Robert McCauslin. The author of the book then remarks: "These communications testify to a spirit of inquiry, at least, on the part of our early devotees to science. They are, further, interesting in that they show the use of the balance as early as 1768 and indicate the steps of analysis."

In 1792 James Woodhouse founded the Chemical Society of Philadelphia. "As far as can be learned, Woodhouse was its first and only presi-

dent. This Society lived about seventeen years. Its members favored Lavoisier's doctrine of combustion." It appears that "every year an address was delivered before the Society." Two of these addresses are given in full—one by Thomas P. Smith, delivered in 1798, and one by Felix Pascalis in 1802.

"The arrival of Joseph Priestley in America, in 1794, and his frequent presence among the men of science of that day, greatly stimulated scientific studies." Considerable space is given to matters pertaining to him, including the eulogium delivered after his death.

Thomas Cooper, professor at Dickinson College, and afterwards at the University of Pennsylvania, was the first one to make metallic potassium in this country. He was also the editor of Thomas Thomson's "System of Chemistry."

In 1801 Robert Hare communicated to the Chemical Society of Philadelphia a description of the oxy-hydrogen blowpipe which afterwards came to be known as the compound blowpipe. His description of this valuable piece of apparatus is contained in his "Memoir of the Supply and Application of the Blowpipe, containing an account of the new method of supplying the Blowpipe either with common air or oxygen gas; and also of the effects of the intense heat produced by the combustion of the hydrogen and oxygen gases." Of this Dr. Smith justly remarks, "It is a real landmark in scientific discovery." Hare was only twenty when he invented the blowpipe. He later became professor in the University of Pennsylvania, which position he held until his resignation in 1847. He was without doubt the most influential chemist of that time in America.

Without going into further details, reference may next be made to James C. Booth, the first American to study analytical chemistry in Germany. "With an education probably unequalled at that time by any chemist in America, he returned to the United States, and, in 1836, established in Philadelphia a laboratory for instruction in chemical analysis and applied chemistry." A little later T. Sterry Hunt (1826–1892) appeared on the scene. In regard to him, Dr. Smith says: "An active participant in the upbuilding of chemistry in America was T. Sterry Hunt." J. Lawrence Smith (1818–1883) was active at about the same time. His paper on a method of analyzing silicates by the use of calcium carbonate and chloride "was a very valuable contribution to analytical methods." His principal work had to do with meteorites.

Frederick A. Genth (1820–1893) was a German. He came to this country in 1848. After "conducting a laboratory for commercial analysis and the instruction of special students in chemistry, he became Professor of Chemistry in the University of Pennsylvania, in 1872. "His earliest contributions were upon geological subjects. Later he devoted much time to mineralogical problems. The chemical research by which he is best

known to chemists relates to the ammonia cobalt bases (the cobalt-ammines) developed jointly with Wolcott Gibbs. His original memoir was published in 1851 and contained the first distinct recognition of the existence of perfectly well defined and crystallized salts of the ammonia cobalt bases. The joint monograph of Genth and Gibbs appeared in 1856. This elaborate and extended research has always stood among the finest chemical investigations ever made in this country."

"Wolcott Gibbs (1822–1908) for years held the most commanding position among the chemists of the United States."

"It was Gibbs' peculiar merit, that he, more than any other man, introduced into the United States the German conception of research as a means of chemical instruction." His investigations covered a wide range of subjects in inorganic, analytical, organic, and physical chemistry. "It was in the great research upon the ammonia cobalt bases, to which reference has already been made, that Gibbs finally found himself."

His most important contribution to analytical chemistry was the electrolytic determination of copper now universally used. "The entire field of electro-analysis was thus thrown open by him." His remarkable series of researches upon the complex inorganic acids, the publication of which began in 1877, continued well into the nineties.

Gibbs undoubtedly exerted a powerful influence upon the development of chemistry in this country. His sympathy with young men, his enthusiasm, his absolute fidelity to the highest ideals deeply affected many a young worker and helped to hold him on a true course.

Others whose work is discussed in the book before us are Albert Benjamin Prescott, Samuel W. Johnson (1830–1909) a pioneer in Agricultural Chemistry, John W. Mallet (1832–1912) of the Univeristy of Virginia, M. Carey Lea (1823–1907), and Josiah Parsons Cooke (1827–1894) of Harvard.

The book closes with some account of J. Williard Gibbs (1839–1903), of Yale, whose contributions to physical chemistry "are fundamental in nature and of broad application."

Dr. Smith has wisely refrained from speaking of those who are still living. In conclusion he says: "It is not the writer's purpose to discuss the investigations which have come from the many working centers of the United States during recent years, that story awaits another narrator; but, if only a desire, on the part of Americans to learn more concerning the place which American chemists occupy in the world's history of chemistry, is awakened, this compilation of facts will not only have been a pleasure but it will have served a worthy purpose."

The book is to be regarded as a "compilation" and not as a history. All American chemists should be thankful to the author for the pains he has taken to collect this material and for placing it before us. It furnishes

the basis for the history of chemistry in America which remains to be written. IRA REMSEN.

Chemical German. By FRANCIS C. PHILLIPS. The Chemical Publishing Co., Easton. London: Williams and Norgate. pp. xii + 241. Price, $2.00.

"The work is intended for students who have had at least a year of German and who have mastered the elements of chemistry" (preface). This is not a book of the old style on "Scientific German" in general, but a systematic work designed to give the student an apportunity thoroughly to master the German language of chemistry. The first fifty pages include reading exercises involving chemical nomenclature in the restricted sense, as well as the language used in discussing familiar laboratory operations. These are followed by quotations from various authors dealing with topics in the history of chemistry and with a multitude of specific subjects, both descriptive and theoretical. The book concludes with an excellent vocabulary, which, in addition to strictly technical words, includes also the exact English equivalents of *ordinary* German words when the latter are used in chemical connections (a case in which the dictionary often confuses instead of helping the student). The book is compiled with excellent judgment and will fulfil its purpose admirably.

ALEXANDER SMITH.

Annuaire pour l'An 1914. Published by the Bureau of Longitudes. Paris: Gauthier-Villars. 16mo. Price, $1\frac{1}{2}$ francs.

The physical and chemical tables of this yearly publication were described last year as fragmentary and unreliable. This year's installment is not as good as last year's. J. W. R.

"Introduction to Higher Mathematics for Scientists and Physicians." By DR. J. SALPETER. Jena: Gustav Fischer, 1913. pp. 336, with 147 figures and index. Price, 13 marks, bound.

Several attempts have been made in recent years to make higher mathematics more palatable for those who dislike the extreme logical rigor so highly prized by the present-day mathematician, and more attainable by those who need in their professional work some acquaintance with the methods and results of higher mathematics. While granting the unique quality of the mental discipline afforded by the rigorous treatment of mathematical problems, the average student feels that after a considerable practice in such discipline he is entitled to a broader and more descriptive presentation of many of the more advanced theorems of mathematics than is to be found in most text-books. Mathematics is to a large degree an experimental science, and the methods of exposition which are customary in other experimental sciences may be applied with profit in this. That man who claimed that no one should lose a logarithm table who could not make one might equally well demand that no one should use a balance who could not construct one.

Dr. Salpeter, after experience in teaching higher mathematics to men not intending to become professional mathematicians, offers the present book as a compromise in which he attempts to attain the highest degree of rigor compatible with *Anschaulichkeit*. His problems are only occasionally chosen with reference to their immediate application to physical science, but he introduces two interesting chapters, one on the general methods of treating scientific problems mathematically, and one on the second law of thermodynamics.

The real value of such a book can only be tested by its actual use as a text, but the originaity shown by the author both in the arrangement of the material and in the detalis of presentation, must render this book an important contribution to the mathematical pedagogics.

GILBERT N. LEWIS.

Outlines of Theoretical Chemistry. By FREDERICK H. GETMAN, Ph.D. (Johns Hopkins) Associate Professor of Chemistry in Bryn Mawr College. New York: John Wiley & Sons, 1913. ix + 467 pp. Price, $3.50 net.

In the preface, Professor Getman writes: "The present book is designed to meet the requirements of classes beginning the study of theoretical or physical chemistry. A working knowledge of elementary chemistry and physics has been presupposed in the presentation of the subject. * * * * * With the exception of a few paragraphs in which the application of the calculus is unavoidable, no use is made of the higher mathematics." The nineteen chapters bear the following titles: Fundamental Principles; Classification of the Elements; The Electron Theory; Gases; Liquids; Solids; Solutions; Dilute Solutions and Osmotic Pressure; Association, Dissociation and Solvation; Colloidal Solutions; Thermochemistry; Homogeneous Equilibrium; Heterogeneous Equilibrium; Chemical Kinetics; Electrical Conductance; Electrolytic Equilibrium and Hydrolysis; Electromotive Force; Electrolysis and Polarization; Actinochemistry. As this list shows, the field is well covered; in each chapter there is a good selection of topics with well chosen illustrative examples and references to original sources. A collection of problems designed to test the student's grasp of the subject is found at the end of each chapter. It has been the author's aim, as announced in the preface, "to present the more difficult portions of the subject * * * in a clear and logical manner;" and, on the whole, in the opinion of the reviewer, he has been successful. Misprints are rare; the figures, of which there are more than one hundred, are good and the press work and binding are first-class.

While the presentation of most topics is good, there are some cases such as combining and atomic weights, p. 8; deduction of Avogadro's Law from the kinetic theory, p. 55; and the deduction of the Phase Rule, p. 290, where the treatment is weak. There are a few topics where the

author seems to have forgotten that he is writing for beginners and that he should make the rough places smoother; thus on p. 72, in discussing the method of Clement and Desormes for the determination of the ratio of the two specific heats of a gas, the author speaks of an adiabatic expansion and uses the adiabatic equation relating pressure and volume, without a word of explanation regarding the nature of an adiabatic process or the derivation or significance of the equation he has used. On p. 195, in the deduction of the equation for the elevation of the boiling point, we read: "Applying the well known thermodynamic relation, that the ratio of the work done to the heat absorbed, is the same as the ratio of the difference in temperature to the absolute initial temperature of the system, we have," etc. While it is certainly proper in an advanced treatise or a journal paper to refer to the simplest statement of the second law as *well known*; it is equally certain that this fundamental relation is *not* well known to most students who are beginning the study of physical chemistry, nor will such find further light on this most important subject in this text, excepting in two places where the treatment is essentially the same as in the case mentioned.

While the author devotes a 13-page chapter very satisfactorily to the electron theory, there is nothing on radioactivity; but it does seem a pity that he did not take one page for one of the most brilliant, and to the chemists most interesting, of recent results of electron research, namely, the exact knowledge of the absolute weight of an atom, which follows at once from a knowledge of the charge of an electron. The value for the elementary electric charge given is the old one, 25% in error, which should be replaced by Millikan's new value, $e = 4.775 \times 10^{-10}$ E. S. U.

There are a number of loose, partial or erroneous statements which are open to criticism, as for example: p. 159, the definition of a saturated solution; p. 187, the statement of Babo's second law, which is meaningless as given; p. 274, the statement that the differential equation relating equilibrium constant and temperature can "only be integrated if Q is constant." The student does not learn from the book that the fundamental problem is to find Q as a function of the temperature and thus secure a general solution of the problem. On p. 329, we find the classic statement that "the equilibrium is not disturbed by the presence of a catalyst." In the light of the important work of Bredig, of Stieglitz and of Acree on catalysis, this dictum can no longer be considered as more than approximate in many cases. Contrary to the statement found on p. 209, an aqueous solution of chlorine does precipitate silver nitrate; according to Jakowin[1] this is due to the reaction: $Cl_2 + H_2O \rightleftarrows HCl + HClO$.

But these defects, which it is the duty of the reviewer to point out,

[1] *Z. phys. Chem.*, **29**, 613.

do not, by any means, spoil this carefully written book. *Ideal* text books are like ideal gases: very often discussed but never realized. Let us at least hope that as text follows text we are approaching *The Ideal* asymptotically! HERBERT N. MCCOY.

Monographs on Inorganic and Physical Chemistry. Edited by ALEXANDER FINDLAY. **The Viscosity of Liquids.** A. E. DUNSTAN AND F. B. THOLE. Longmans, Green & Co. vi + 91 pp. Price, 90 cents.

This volume brings together in compact and very readable form the results of a large amount of work on viscosity. To select material from the thousand or more papers on this subject, representing many thousands of pages of material for a volume of so small a compass, must have been a serious task. The working principle, Findlay states in his preface to the series, is to give "to those engaged in guiding the reading of advanced students of chemistry adequately summarized accounts of the progress made in recent years." The authors, therefore, discuss at length the problems now pressing for solution, stated in their preface, p. v., as follows: "In spite of a century of experimental work no very definite method has been set up for the measurement of viscosity, and no general agreement has been arrived at for the setting forth and interpretation of the results obtained." So clear a statement leaves no doubt as to the importance of the problems and in itself brings nearer the solution. The discussion of these problems is admirable.

However, in this method of presentation one wonders whether the student will be able to get the right perspective when the problems which have been satisfactorily solved in the past receive so slight attention. For example, the authors give considerable space to the discussion of the different instruments for measurement by transpiration. But they do not refer to the discussion which ran in the literature during the middle of the last century over the fact that the transpiration method of Poiseuille gave results which failed to agree with those obtained by the older method of Coulomb. It was finally satisfactorily proved that when the proper corrections are made both of the above methods, as well as other new methods, give concordant results, although the transpiration method is the most convenient and reliable. So the discussion today is after all merely as to the form of transpiration apparatus which will most conveniently give reliable results. It is important for the student to know that the absolute transpiration method is definite in the sense that its results are reproducible, the necessary corrections, the methods for obtaining the dimensions of the apparatus, as well as the nature of the flow being fairly well understood. The discussion at present arises from the fact that absolute measurements are not always convenient and relative measurements and are not always reliable.

The monograph is free from typographical errors and any other errors

are such as easily creep in. It has been repeatedly demonstrated that the expansion of a viscometer of uniform material brought about by changes in temperature is without effect upon the time of flow, yet the opposite impression is gained on p. 12. The authors state, on p. 44, "the equilibrium $C_4H_{10}O + CHCl_3 = C_4H_{10}O.CHCl_3$ is established and the percentage amount of the compound can be calculated by the application of the law of mass action." They have attributed this to Dolazalek and Schulze without noting that Bingham[1] had reported a similar result. On p. 4 we note "the flow of a liquid is influenced in a very marked way by the driving pressure. * * At pressures from 0.005 to 2 kg. per sq. cm. * * * very marked deviations (from Poiseuille's Law) are found when the pressure is increased and in some instances the relative rates are reversed." This might give one the impression that the viscosity of a liquid is quite susceptible to changes in the pressure. Of course the *apparent* viscosity is dependent upon the velocity of flow which is proportional to the driving force, for as the velocity of flow reaches a certain critical value for each liquid the character of flow changes, becoming turbulent, and therefore the flow no longer obeys the law of Poiseuille.

They clearly demonstrate the value of viscosity as a means for following the course of chemical reactions, such as for example the enol-keto tautomerism. This monograph should prove very useful in drawing the attention of workers to the importance of viscosity as a weapon in attacking physical chemical problems, and particularly it should show the need for an understanding of the strict physical meaning of viscosity in the hope that when this is obtained many of the relationships which are now qualitative at best may be made quantitative. EUGENE C. BINGHAM.

A Text-book of Elementary Chemistry. By ALEXANDER SMITH, Professor of Chemistry and Head of the Department of Chemistry in Columbia University. New York: The Century Co. 1914. pp. viii + 439. Price, $1.25.

This volume may fairly be regarded as representing the third generation of the intellectual offspring of the author. That the reputations of its ancestors are of the highest is a matter of common knowledge, and the strain has not yet suffered deterioration.

In a preface of some length (and on which much of what follows is based), Dr. Smith takes the reader frankly into his confidence. He states that in preparing the volume he has had particularly in mind the pupils who will not continue the study of chemistry beyond the elementary course. For them, in particular, he has attempted to present the elements of the science in a "rationalized form" as a basis for interpreting phenomena and incidents met with in every-day life, and associated with familiar industries. Since, however, the important principles are logically developed, the plan adopted equally fulfills the needs of those who after-

[1] *Physical Review*, [2] 1, 114 *et seq.* (1913).

ward continue the study of chemistry. For, as he says, "In general, any book supplies the material for several different kinds of courses. The difference is created by the teacher through the way he distributes the emphasis." A selection of materials, to meet variations in local conditions, maturity of pupils, or conventional requirement, is recommended, and made relatively easy of accomplishment. The differing interests and needs of the two sexes are also recognized, and discussions of explosives, metallurgy, mortars, cements and similar topics are provided for the boys, while plastics, starch, sugar, soap, the preparation and digestion of foods, and like topics, are included with special regard for the domestic instincts of the girls.

Much stress is laid upon adequate reviewing of the ground covered from time to time. This it is sought to accomplish, first, by questions at the end of the chapters, which, in turn, included such questions as call mainly for a recollection of facts and principles, and such as demand reasoning on the part of the pupil, and are not to be met by quotations from the text. Beside this form of review, the author seeks to give zest to the reviewing process, by including two chapters, dealing with the non-metals and the metals, respectively, which take the form of a plan for the recognition of unknown substances, without, however, introducing any of the formal systematic procedures of qualitative analysis.

The order of presentation of the material in general is based on what the author regards as sound pedagogical principles rather than conventional order. For example, he discusses such substances as ozone, hydrogen peroxide and hypochlorous acid together, and as oxidizing agents, rather than under the elements, oxygen, hydrogen and chlorine. Space does not permit of a detailed statement of the order of presentation. The titles of the chapters dealing with "Compounds Related to Petroleum," "Flame," "Starch and Substances made Therefrom," "Fats, Soaps and Related Compounds," Explosives and Plastics" and "Plants, Fuels and Foods" are indicative of the treatment of every-day topics. A "Laboratory Outline," to accompany the book, is announced as in preparation.

Although dealing largely with familiar objects and occurrences, the subject matter of this book is logically developed in a way generally similar to that which characterizes Professor Smith's larger books, a method which compels the interest and holds the mind of the more mature pupil, but is sometimes the despair of those who are not mentally well-endowed to follow close reasoning. The author seems to imply in a sentence in the preface that the more distinctly scientific aspects of the subject have possibly been subordinated to some degree, but the reader finds a discussion of all of the commonly taught principles and theories, even to the electron, with its relations to valence, and to oxidations and reductions,

the latter, however, presented in such a way that it may be readily omitted, if the teacher so elects.

Whether a book which affords so much opportunity for selection on the part of the teacher, and therefore some little selective reading on the part of the pupil, with its inevitable difficulties, is the best sort of book for pupils of secondary school age, may very well be a proper subject for argument; and one may possibly ask with fairness if Professor Smith has, in the first few chapters, always remembered his own statement (preface) that "the pupil should have time to become accustomed to using one set of ideas before another set is thrust upon him." No one will, however, contest the statement that the book under review is one of unusual value and interest. It should command the immediate attention of all thoughtful teachers. H. P. TALBOT.

Per-Acids and their Salts. By T. SLATER PRICE. London: Longmans, Green & Co., 1912. 123 pp. 15 × 22 cm. Price, $1.00 net.

This little book, forming one of the series of "Monographs on Inorganic and Physical Chemistry," covers completely the subject of the inorganic per-acids and their salts, including the elements sulfur, selenium, boron, carbon, nitrogen, phosphorus, titanium, zirconium, tin, vanadium, columbium, tantalum, chromium, molybdenum, tungsten and uranium. The methods of preparation of the acids and salts are described in detail when importance warrants it, and brief mention is made of some of their technical uses. The constitution of each acid or salt is very fully discussed, all the different arguments being concisely and logically presented. The analytical methods used are described.

The book is, in short, a compilation of all the work done on this subject up to 1912. The author has performed his task well, and has selected, from the great mass of material, the most important results, presenting them in a logical and interesting manner. The addition of a classified table of references to the literature furnishes a complete bibliography of the subject. H. H. WILLARD.

Introduction á la Chimie des Complexes. Théorie et systematique de la Chimie des complexes mineraux. G. URBAIN ET A. SÉNÉCHAL. Libraire Scientifique A. Hermann et Fils: Paris, 1913. pp. 477. Price, 15 francs.

This extremely interesting volume is the outgrowth of lectures delivered during the past four years at the Sorbonne. It does not profess to cover the entire field in encyclopedic manner, but rather to discuss critically, and most largely from the physico-chemical standpoint, the rapid developments of the past few years. The method of presentation is clear, stimulative in the pointing out of many unsolved problems, and suggestive in indicating lines along which successful solutions of these problems may be expected.

The authors classify complex inorganic compounds as "perfect complexes," "imperfect complexes" and "double salts."

The chemistry of perfect complexes is confined to those metals which are feebly electro-positive and whose compounds are metastable. In the formation of such complexes substitution, as in organic chemistry, is the chief process, and here the authors hold that ideas of valence and coordination are amply sufficient as interpreting guides. But the complexes of more electro-positive metals form stable systems, the study of which can be carried on successfully only by the methods resting upon the application of the laws deduced from the principles of thermodynamics. The imperfect complexes lie intermediate between the perfect complexes on the one hand and true double salts on the other.

While recognizing fully the great value of Werner's coördination ideas, the authors hold that these are applicable in their entirety only to "perfect complexes."

In view of the fairness both of statement and of point of view which characterizes the book it is strange that the authors are unwilling to accept the conductivity work of Werner and Miolati as establishing the fact that cobalt chloro-dinitro-triammine (p. 313) is nonionizable, for they do not hesitate to ascribe this condition to one of Colson's green sulfates of chromium (p. 379) on precipitation evidence, which, though not identical, is absolutely parallel.

It is particularly fortunate that this book has appeared just at a time when physical chemists are beginning to realize what an attractive field is here opened for their efforts, for they will find within its covers clear and concise discussions and expositions of subjects widely scattered through chemical literature. It is unfortunate for those who care to read the book critically that no literature references are to be found in the body of the text. Brief bibliographies of a few important articles are given at the end of each chapter. No attempt at an index is made, there being substituted under continuous pagination, strange to say, the table of contents.

CHAS. H. HERTY.

Ueber die Konstitution und Konfiguration von Verbindungen höherer Ordnung. Vortrag, gehalten in Stockholm am 11 Dezember, 1913, im Anschluss an die Entgegennahme des Nobelpreises, von PROFESSOR DR. ALFRED WERNER, Zurich. 21 pp. 6 figures. Price 1 Mark, 20 Pf. Verlag von Julius Springer, Berlin. 1914.

Into the brief period of time permitted for an address on the presentation of the Nobel prize for chemistry, Werner has condensed an account of the prodigal labors of twenty years and presented in striking outlines the chief points of interest and importance in the development of his work, a work which has converted an unattractive garbage lot into one of the most beautiful and productive fields of modern chemistry.

It is interesting that this address was made in that part of Europe from

whence came at one time such strenuous denunciations of his views and it is pleasant to note that in his reference to one of the chemists of the northern country, Jörgensen, no scars have been left from the bitter controversy which prevailed in the earlier days.

On pages 15 and 16 it is easy to see that Werner has not forgotten the objection to his stereochemical views raised by so many organic chemists, namely, that isomeric tetrammines could be prepared only when carbon was present in the molecule; nor can he yet conceal the joy which characterized his article in the *Berichte der Deutschen Chemischen Gesellschaft* announcing after so many years of fruitless effort the preparation of the violet cobalt *cis*-dichloro-tetrammine, containing no carbon atom and isomeric with the long known green *trans* compound.

That part of the address which will interest the greater number of readers, however, is the clear and simple presentation of the discovery in recent years of the large number of optically active inorganic compounds, to the preparation of which he was led by a logical development of his stereochemical views. Truly there is no dividing line between organic and inorganic chemistry.

What will come next? Werner promises more. Glück auf!

CHAS. H. HERTY.

Laboratory Experiments in General Chemistry. By H. B. NORTH, Ph.G., D.Sc. Associate Professor of Chemistry in Rutgers College. New York: D. Van Nostrand Co., 1913. pp. v + 205, 36 illustrations. Price, $1.00.

This manual contains 500 experiments, including a number of a quantitative character. They are numerous enough so that a selection could be made to accompany any text book of general chemistry. The choice of the experiments is good and they are well written. The book is well worth an examination on the part of those who contemplate the introduction of a new manual for the use of students in general chemistry.

C. W. BALKE.

A Laboratory Guide to the Study of Qualitative Analysis. By E. H. S. BAILEY, PH.D., and HAMILTON P. CADY, PH.D. Seventh Edition. Philadelphia: P. Blakiston's Son & Co. 1914. pp. 280. Price, $1.25 net.

This is one of that class of texts upon Qualitative Analysis in which a large portion of space is devoted to preliminary experiments on the metals. The subject is treated from the standpoint of the law of mass action and of the ionic theory, an exposition of the principles of which is given in the first twenty-two pages. Then follow the preliminary experiments just mentioned, and the remainder of the book, pp. 148–272, contains the analytical portion. There is, however, only one-half as much material as this would seem to indicate, as every other page is left blank for notes.

The portion devoted to the detection of the cations is concise, and in most cases the directions are clearly given. There are, however. excep-

tions to this. For example, one reads on p. 170: "By this treatment the greater part of the zinc and of the manganese will be removed but all of it must be eliminated." But no further directions are given as to how "it" can be eliminated. The method given for the identification of antimony and tin, p. 158, is simple, and therefore an improvement over many of those in general use. Nickel and cobalt are separated by the formation of colloidal nickel sulfide in an alkaline tartrate solution. This method has never worked well in the hands of students in this laboratory. But then, very few of the methods for effecting this separation are satisfactory when attempted by the inexperienced student.

The detection of the acid radicals is treated at considerable length and in a more systematic manner than in most texts. Dry tests and methods for getting substances into solution are treated very briefly, the latter in fact rather inadequately. For there are many substances which even students in an elementary course are apt to encounter, that could not be gotten into solution by the procedure described. Furthermore, the directions to fuse all residues insoluble in acids, whether salts of lead or silver are present or not, with sodium carbonate on platinum foil is hardly fair to students at the present price of platinum.

That the book is a useful one and fills a need is attested by the fact that it is now appearing in its seventh edition. It is well printed and has a good index. O. F. TOWER.

Modern Research in Organic Chemistry. By F. G. POPE. New York: D. Van Nostrand Company, 1913. pp. xi and 324. Price, $2.25 net.

A condensed review of modern advances in special fields of organic research. The author has confined himself to the discussion of the important developments in the following fields of organic chemistry: polymethylenes, terpenes and camphor, alkaloids, color and constitution, salt formation of pseudoacids and bases, pyrones, ketenes, ozonides and triphenylmethyl and the Grignard reactions.

A very complete bibliography is given at the end of each chapter. The introduction to the book has been contributed by Professor J. T. Hewitt. The work has been well presented. It is condensed into a readable form and is a valuable contribution to the organic literature. The book can be recommended to graduate students who are specializing in organic chemistry. T. B. JOHNSON.

Kurzes Handbuch der Kohlenhydrate. VON DR. B. TOLLENS, O. H. Professor an der Universität Göttingen, Geh. Reg. Rat. Dritte Auflage, mit 29 Abbildungen im Text. Leipzig: Verlag von Johann Ambrosius Barth, 1914. Price, bound, 23.50 marks.

It was just fifty years ago that the author of this work, in association with Fittig, announced to the world his first epoch-making discovery upon the synthesis of the aromatic hydrocarbons. The career of chemical

research, begun so auspiciously, was destined, however, to run in other channels; it was not in the field of hydrocarbons, but in that of the carbohydrates that Tollens was to accomplish his greatest work. The present volume, completing as it does a half-century of most active and fruitful research in every branch of sugar chemistry, is, in all respects, noteworthy; the classic motto "Quorum pars magna fui" might be inscribed most fittingly upon the title page.

This third edition of Prof. Tollens' well-known "Handbuch der Kohlenhydrate" has been entirely rewritten. The two volumes of the previous editions have been united into one and the result is an exceedingly convenient handbook of 816 pages.

The general plan of treatment, which was so favorably received in the previous editions, has been retained in the present work. There are five principal divisions of the subject matter. Division I (90 pages) takes up the general properties of the sugars and carbohydrates, such as occurrence, formation, classification, configuration, specific rotation, synthesis, fermentation, reactions, and methods of separation and identification. In Division II (378 pages) a clear and concise description is given of the physical and chemical properties of the individual sugars belonging to the mono-, di-, tri-, and tetra-saccharides. The same is done in Division III (140 pages) for the polysaccharides, or saccharo-colloids, such as the pentosans, pectins, gums, starch, cellulose, etc.; a similar description follows in Division IV (60 pages) for the sugar alcohols and cycloses, and in Division V (122 pages) for the sugar acids.

Those who have followed sugar chemistry in recent years know the almost unlimited number of contributions which have been made to the literature upon the subject. In the preparation of his book, Prof. Tollens has made a most careful and critical study of all this literature and his ripe experience in this special field has enabled him to select, for description, exactly the material of greatest value. Copious references are given in foot-notes to original authorities so that the subject matter can be studied further if desired.

The book is splendidly printed in clear roman type and the illustrations of apparatus, machinery, microscopical sections, etc., are all well executed. A full index, with the principal page references indicated in bold type, concludes the volume.

The work is warmly recommended to all who are interested in the chemistry of the carbohydrates, whether upon the theoretical or practical side.

The new volume will be welcomed especially by the large number of Prof. Tollens' former students, who will find, in its pages, much to remind them of the genial "Altmeister," whose reputation as a trainer of men has been no less remarkable than that as a chemist. They will be pleased

to know that their old teacher, since retiring from professorial duties, has devoted a part of his well-earned leisure to literary pursuits. It is the wish of all that his helpful pen may be active for many years to come.

C. A. BROWNE.

Kapillarchemie und Physiologie. By DR. H. FREUNDLICH, Professor Extraordinary at the Technical High School of Braunschweig. Second enlarged edition. With five figures. Published by Theodor Steinkopff, Dresden and Leipzig, 1914. 48 pp. Price, 1 mark, 50 pfennigs.

This little monograph divides itself into two parts, into a first half which is a mère reprint of the first edition of Freundlich's essay, and a second part in which are inserted additional references and notes occasioned by the developments of chemistry during the past six years. Freundlich's essay furnishes an excellent introduction to the principles of colloid-chemistry and points out some of the many applications which may be made of it to biology, physiology, pharmacology and medicine. After a discussion of what colloids are and their general properties, Freundlich takes up their classification and the problem of adsorption as observed in colloid systems. Processes of swelling and of colloid precipitation are touched upon, after which are listed biochemical problems for the interpretation of which the principles of colloid-chemistry may be used to advantage. The pamphlet will serve, therefore, to introduce the beginner to the problems with which colloid-chemistry deals in its scientific and technical aspects. As Freundlich's contributions to colloid-chemistry are of first order his views may be looked upon as the expressions of an authority.

The second half of the monograph represents, essentially, a series of footnotes to the main text. While one is perfectly in sympathy with Freundlich's desire to maintain the unity of his original thesis and not to weaken his main argument by numerous explanatory paragraphs, the effect in the end is just what he wished to avoid, for the more dogmatically stated truths of the first part need constantly to be modified by reference to the addenda. It remains a serious question whether this might not better have been done by the author than by the reader.

MARTIN H. FISCHER.

CORRECTION.

The price of "F. Lohnis, Vorlesungen über landwirtschaftliche Bakeriologie," given on page 616 of the March JOURNAL as $1.14, should have been Mk : 17.50.