A normal urine tested at 21° at short intervals gave the following readings after finishing the shaking at 2 hours and 15 minutes:

Readings at.....	2:30	2:34	2:40	2:45	3:07	3:16	3:55
π.....	=0.5988	0.6476	0.6468	0.6475	0.6476	0.6476	0.6479

Constant potential values appear in about ten minutes. Slight compression of the pinchcock on the tube leading to the potassium chloride bridge has about the same effect as closing the glass stopcock in the other forms of apparatus. It is of advantage to insert a plug of washed cotton in the bent tube leading to the potassium chloride.

CHICAGO, ILL.

NEW BOOKS.

Elementos de Fisica Geral (Elements of General Physics). By F. J. SOUSA GOMEZ, Professor in the Faculty of Science in the University of Coimbra, and ALVARA R. MACHADO, Assistant Professor of Physics in the University of Porto. Livraria, Escolar de Cruz & Cie, Braga, Brazil.

As the title page states, this book of some 260 pages is "For use in the Portuguese Lyceums (6th and 7th grades), Gymnasia, and Normal Schools of Brazil."

It is the first part of a larger work, subsequent parts of which will presumably deal with the subjects of heat light, magnetism and electricity.

It differs from most similar works of American origin in the sequence of the arrangement of the subject matter, the order being:

(1) Generalities (28 pages), (2) Mechanics (91 pages), Gravity, not treated under Mechanics, but separately (40 pages), and (4) Properties of matter (100 pages).

The type is excellent as are the cuts, of which a liberal use is made. The treatment of the subjects discussed is distinctly mathematical. It is a book which is calculated to give a diligent student a good grasp of the fundamental laws and phenomena of the branches of physics which it embraces.

W. N. BERKELEY.

Quantitative Laws in Biological Chemistry. By SVANTE ARRHENIUS. London: G. Bell & Sons. 1915. Pp. vii + 173.

This interesting and stimulating book should be in the hands of every biologist, biological chemist and pathologist. It treats of many complex and obscure phenomena of biochemistry in a simple and illuminating fashion, showing how they are to be explained. Arrhenius, as is well known, has emphasized for some time the importance of physical chemistry conceptions in the elucidation of biochemical reactions, and he has made many contributions of value illustrating his point of view. A series of

lectures given before the Royal Institution in 1914 has been expanded into this book. He treats very simply of the method of representing graphically quantitative results, and how to interpret the curves. These general remarks are illustrated by many examples in biochemistry, such as the velocity of coagulation of egg-white and hemoglobin, the temperature coefficient of many vital processes, the rate of destruction of various lysins, toxins and antitoxins by heat and the body, the rate of killing of bacteria by antiseptics. He even shows how perfectly the absorption of food from the intestine can be quantitatively represented by a very simple expression. Schütz's rule and the laws of enzyme action are given a rather extensive treatment. But by far the most illuminating and delightful part of the book are the chapters on chemical equilibria and immunity. The complex facts of immunity are represented with a simplicity of statement as remarkable as it is rare, the uselessness of the complex explanations of Ehrlich and his school pointed out, and the processes brought into relation with very simple chemical reactions.

There is no doubt that this book, together with the biological portion of the Tables Annuelles Internationales de Constantes et Données Numériques mark the beginnings of a new era of precision and clarification greatly needed by all the biological sciences. It is, therefore, exceedingly welcome. ALBERT P. MATHEWS.

Representative Procedures in Quantitative Chemical Analysis. By FRANK AUSTIN GOOCH. viii + 250 pages, 35 figures. John Wiley & Sons, Inc. Price, $2.00.

One would expect from the pen of Gooch a distinctive work on quantitative chemical analysis and the expectation is amply realized in the present volume. A sentence in the preface states exactly the manner in which the subject matter is handled: "Procedures have been discussed in relation to their essential features, underlying principles and varied applications."

Throughout the book the procedure, that is, the chemistry of the precipitations, titrations, etc., is emphasized rather than physico-chemical theories or special applications. Everything is subordinated to these general discussions. The laboratory exercises are even printed in small type and written in a colloquial style as if to indicate that the main idea should be to understand general applications rather than to carry out a certain volume of laboratory work.

The strongest sections are the ones on general gravimetric and volumetric analysis. In the latter, iodometric processes are given special attention. In the treatment of normal solutions it is pleasing to note that the old and cumbersome available oxygen idea has been dropped in the description of oxidizing and reducing solutions and one depending upon the valence changes involved in the reaction introduced.

In the pages devoted to physico-chemical theory the familiar term solubility product is missing. The reviewer does not know whether to criticize this or not. The case is less doubtful on Page 31, where the old Ostwald calibrating pipette with its rubber tubes and pinchcocks is illustrated and the Morse and Blalock apparatus referred to in the footnote. A reversal of this would have been in the interests of accurate measurement.

It is possible that the subordination of laboratory exercises to general principles will make the book more difficult to use in teaching, especially with large classes, but this after all will depend upon the instructor and the reviewer wishes his last word to be, that Professor Gooch has produced a notable work on quantitative analysis and one to be recommended to every serious student of the subject. C. W. FOULK.

Manual of Quantitative Chemical Analysis. By J. O. FRANK and E. A. CLEMENS xii + 123 pp. Second Edition. Chicago and New York: Row, Peterson & Co. Price, 80 cents.

The first edition of this little book was reviewed in the January, 1915, number of THIS JOURNAL and it is a pleasure to note that there is great improvement in the second edition. The printer and binder have done their parts much better and the authors have also eliminated some of the errors that slipped by them before. It is a pity, however, that the English was not thoroughly revised, for the pages are still full of laboratory colloquialisms. C. W. FOULK.

Food Analysis, Typical Methods and the Interpretation of Results. By A. G. WOODMAN, Associate Professor of Food Analysis, Massachusetts Institute of Technology. McGraw-Hill Book Co., New York, 1915. Small octavo, x + 510 pp. Price, $3.00.

The following condensed outline of the contents of the book will indicate the sequence of topics and the assignment of space: General methods (specific gravity, index of refraction, moisture, ash, colorimetric determinations, extraction methods, determination of nitrogen, centrifugal methods), 30 pages; Microscopical examination of foods, 21 pages; Food colors, 35 pages; Preservatives, 19 pages; Milk and Cream, 41 pages; Edible fats and oils, 81 pages; Carbohydrate foods, 73 pages; Cocoa and chocolate, 31 pages; Spices, 31 pages; Vinegar, 16 pages; Flavoring extracts, 35 pages; Alcoholic liquors, 81 pages; Photomicrographs, 8 pages; Index, 8 pages.

It would seem that a general chapter on proteins (corresponding to those on carbohydrates and fats) should be included.

Within the limitations which the author has set for himself the book leaves little to be desired. As was to be expected in the work of one so favorably known as a teacher and expert in food analysis, the descrip-

tions of methods and discussions of results are clear, concise, authoritative and modern.

The purpose of the author, as explained in his preface, is to provide a book primarily suited to the needs of the undergraduate student of analytical chemistry, more concise than Leach's Food Analysis and affording more explanation and discussion than the bulletin of methods of the Association of Official Agricultural Chemists. The ground covered is amply sufficient to occupy the time that can usually be devoted to food analysis in a college course. Special attention is given to the suitability and limitations of methods and the interpretation of the analytical results. The author holds that the principal asset to be gained by the student from any detailed consideration of the methods employed to detect adulteration in foods, is the exercise of judgment and the training of the sense of discrimination derived from a critical balancing of the data obtained in an analysis against the natural variations in composition, to determine whether or not they imply artificial manipulation of the product. So consistently does the author adhere to this point of view that he professedly selects foods for discussion according as they illustrate methods of detecting adulteration and without reference to their importance either industrially or to the consumer. This will seem unfortunate to those who believe that students of food chemistry should not merely be trained to do the police work of detecting adulterations but should be equally prepared for more constructive service, whether in the employ of the food industries or of the consuming public.

Among teachers whose courses in food analysis are essentially devoted to the detection of adulterations and who desire a text-book of the character of the well-known work of Leach, but of size suitable for the use of undergraduate students, the present volume is sure of a cordial welcome. It will also be useful to professional chemists because of its convenient conciseness, its recognition of recent developments including those recorded in the foreign literature, its occasional citations of data from "Notices of Judgment" giving the analytical evidence on which successful prosecutions have been instituted under the Food and Drugs Act, and especially because of the incorporation of the experience of Professor Woodman's own laboratory as illustrated conspicuously in the section devoted to the detection of artificial colors in foods. H. C. SHERMAN.

Feeds and Feeding. A Handbook for the Student and the Stockman. By W. H. HENRY, D.Sc., D.AGR., Emeritus Professor of Agriculture, University of Wisconsin, and F. B. MORRISON, B.S., Assistant Professor of Animal Husbandry, University of Wisconsin. Fifteenth edition, revised and entirely rewritten. One volume of 691 pages, octavo. Madison, Wisconsin: The Henry-Morrison Company. Cloth, $2.25.

This book, which was originally published in 1898, has received wide-

spread favor by practical stockmen and students of animal husbandry This last revision includes the results of the most recent published and unpublished data of our experiment stations on the science and practices of livestock feeding. The book has been enlarged by the addition of 85 pages.

In Part I the fundamental principles of animal nutrition are first briefly presented, including the most recent discoveries in biological chemistry. The various feeding standards for the different classes of farm animals are fully discussed. To point out some of the more economical points which should be considered in the feeding of livestock, a new chapter—Economy in feeding livestock—has been added.

In Part II many new feedingstuffs are given full consideration along with the old, especial emphasis being placed upon the importance of combining the legume roughages with corn and other cereals for the economical feeding of farm animals and upon the great value of silage for the various classes of livestock. The vital relation of animal husbandry to the economical maintenance of soil fertility through the return to the soil of the manurial residue of feedingstuffs is emphasized.

In Part III there is presented the most important findings so far obtained by the experiment stations on the value of the different feedingstuffs for each class of livestock and on the effect of various methods of preparing feed, systems of feeding and care of livestock, etc.

This revised edition of Feeds and Feeding is even more valuable than the previous editions. It presents a large amount of fundamental information as to feeds and feeding in a clear, instructive and readable form. The revised tables in the appendix giving the average percentage composition of American feedingstuffs, the average digestibility of American feedingstuffs, and the digestible nutrients and fertilizing constituents in American feedingstuffs are valuable for general reference work.

H. S. GRINDLEY.

The Physiology of the Amino Acids. By FRANK P. UNDERHILL, PH.D., Professor of Physiological Chemistry, Yale University. One volume of 169 pages, crown octavo, illustrated by cuts, tables and diagrams. New Haven: Yale University Press, 1915. Cloth, $1.35.

Professor Underhill presents in this little book a clear, accurate and very readable account of the recent fundamental and important discoveries relating to the role of amino acids of proteins in the nutrition of the animal body. In this volume he presents the only compilation available at present of the results of the recent developments in the biochemistry of the amino acids. The nature of the contents of this book is evident from the following titles of the several chapters: The proteins and their derivatives, the amino acids; digestion and bacterial activity in relation

to the amino acids; the absorption of proteins and amino acids; in what form does ingested protein enter the circulation? theories of protein metabolism; the further fate of amino acids; the amino acids in relation to the special dynamic action of proteins; the amino acids and simpler nitrogenous compounds as foodstuffs; and the specific role of amino acids in nutrition and growth. A complete index is given. At the end of each chapter references are given in which all the important literature upon the topic considered is cited. Every chemist, biologist and every student in these fields of study should read this delightful little book.

H. S. GRINDLEY.

Soil Conditions and Plant Growth. By EDWARD J. RUSSELL. Pp. viii + 190. New edition. New York: Longmans, Green and Company. 1915. Price, $1.50 net.

The purpose of the author is "to give a concise account of our present knowledge of the soil as a medium for plant life," keeping in view "a critical examination of the foundations of our beliefs." The plan and scope of the book are indicated by the following chapter headings: (I) Historical and introductory; (II) The requirements of plants; (III) The constitution of the soil; (IV) The carbon and nitrogen cycles in the soil; (V) The biological conditions of the soil; (VI) The relationship between the microörganic population of the soil and the growth of plants; (VII) The soil in relation to plant growth; (VIII) Soil analysis and its interpretation.

In these days of personal bias and short perspective on the part of some workers in this field, the author shows admirable breadth of view, openness of mind and clear judgment. While every chapter is thoroughly interesting, Chapters V and VI are especially so. The book is a real addition to the literature of the subject.

L. L. VAN SLYKE.

An Introduction to the Principles of Physical Chemistry, from the Standpoint of Modern Atomistics and Thermodynamics. By EDWARD W. WASHBURN, Professor of Physical Chemistry in the Univeristy of Illinois. McGraw-Hill Book Company, New York, 1915. Pp. xxv, 445. Price, $3.50.

The preface gives a better idea of this interesting and valuable book than the title, for the treatment is by no means elementary in nature, and, as the author says, "Many portions of the book can scarcely be pursued to advantage by most beginners in the subject, except under the direction of a competent instructor." The book deals with the theoretical and not with the laboratory side of physical chemistry, and wisely makes use of the calculus without apology. To quote again from the preface: "Perhaps the most radical departure from the custom which under the leadership of Ostwald has prevailed heretofore in most textbooks of Physical Chemistry is in connection with the manner in which atomistics and molecular kinetics are treated. Instead of considering

these systems in a special chapter as interesting but unnecessary hypothetical explanations of observed facts, they are themselves in their most essential features treated as facts already established beyond the possibility of reasonable doubt, and together with thermodynamics, are made to serve as the framework for the development of the whole subject."

It is interesting thus to see the pendulum of thought swinging violently backwards and forwards within a generation. Twenty years ago, to many chosen spirits the atomic theory was anathema; here it is welcomed and even maintained as certain reality. The reviewer cannot help feeling that the position of equilibrium, although nearer the later than the earlier extreme, lies somewhere between the swings. Is there not a real distinction between "facts" perceived by the senses, and interpretations (however useful and vivid) conceived by thought and fancy?

Whatever opinion one may form upon this subject, everyone must agree that the book under discussion shows wide knowledge of Physical Chemistry (especially of the most recent developments) and scholarly thermodynamic treatment of its most important aspects. Even the beginner will be stimulated by some of the chapters; every advanced student of Physical Chemistry will find the book valuable and interesting; and every teacher of this subject will welcome it as a new and efficient aid in helping others over some of the harder parts of the way.

THEODORE W. RICHARDS.

Boden-Bakterien und Boden-Fruchtbarkeit. By DR. F. LÖHNIS. Published by Gebrüder Borntrager, Berlin, 1914. 70 pp. + vi. Price, M. 1.20.

This little volume contains a very illuminating discussion of soil bacteria as a factor in soil fertility. In writing the treatise the author was evidently guided by the wish to bring to the attention of the progressive farmer the more important developments in soil biology. Accordingly he points out in the preface that the average land owner, though he may be averse to reading massive treatises, should interest himself in soil bacteriological problems for they bear a direct relation to the productiveness of his fields.

A portion of the book is devoted to a rather compact review of the more striking facts in the history of soil biology from the time of Schwann and Ehrenberg down to our own day. Mention is made among other matters of the very suggestive pamphlet by Kette, published in 1862, and entitled "Die Fermentations-Theorie gegenüber der Humus—Mineral und Stickstoff-Theorie." The author also takes occasion to mention that soil bacteriology owes a real debt to practical landowners like Kette, von Rosenberg-Lipinsky, Schultz-Lupitz, Caron and Arndt.

The following paragraphs are given over to a consideration of the im-

portant factors of soil fertility including the reserves of mineral and organic plant-food constituents, the nature and functions of "humus," the gains and losses of soil nitrogen; the biological activities which affect the supply of available nitrogen compounds to crops, the transformation of the so-called mineral constituents of plant food as affected by the activities of microörganisms and the utilization of our knowledge of soil microörganisms in providing economically a more abundant supply of nitrogen to cultivated plants. JACOB G. LIPMAN.