TABLE IV (*Continued*).

Copper. Mg.	Cuprous oxide. Mg.	Cupric oxide. Mg.	Glucose. Mg. $C_6H_{12}O_6$.	Invert sugar. Mg. $C_6H_{12}O_6$.	Lactose. Mg. $C_{12}H_{22}O_{11}.H_2O$.	Maltose. Mg. $C_{12}H_{22}O_{11}.H_2O$.
425	478.5	532.0	152.	145.3	279.6	275.8
426	479.6	533.2	153.2	145.7	280.3	276.5
427	480.7	534.5	153.6	146.1	280.9	277.1
428	481.9	535.7	154.0	146.4	281.6	277.8
429	483.0	537.0	154.4	146.8	282.3	278.5
430	484.1	538.2	154.8	147.2	282.9	279.1
431	485.3	539.5	155.3	147.6	283.6	279.8
432	486.4	540.7	155.7	148.0	284.3	280.5
433	487.5	542.0	156.1	148.4	285.0	281.1
434	488.6	533.2	156.5	148.8	285.7	281.8
435	489.7	544.5	156.9	149.1	286.4	282.5
436	490.9	545.7	157.3	149.5	287.1	283.1
437	492.0	547.0	157.7	149.9	287.8	283.8
438	493.1	548.2	158.1	150.3	288.5	284.5
439	494.3	549.5	158.5	150.7	289.2	285.2
440	495.4	550.7	158.9	151.1	289.9	285.8
441	496.5	552.0	159.3	151.5	290.6	286.5
442	497.6	553.2	159.8	151.9	291.3	287.2
443	498.8	554.5	160.2	152.3	292.0	287.8
444	499.9	555.7	160.6	152.7	292.7	288.5
445	501.0	557.0	161.0	153.1	293.4	289.2
446	502.1	558.2	161.4	153.5	294.1	289.8
447	503.2	559.5	161.8	153.9	294.8	290.5
448	504.4	560.7	162.2	154.3	295.5	291.2
449	505.5	562.0	162.6	154.7	296.2	291.9
450	506.6	563.3	163.0	155.1	296.9	292.5

NEW BOOKS.

Famous Chemists. By E. ROBERTS, B.Sc. New York: The MacMillan Company. pp. 243. Price, $0.80 net.

The book contains very brief accounts of the lives and researches of Stahl, Boyle, Black, Cavendish, Priestley, Scheele, Lavoisier, Berthollet, Dalton, Davy, Gay-Lussac, Berzelius, Faraday, Dumas, Wöhler, Liebig, Graham, Bunsen, Hofmann, Pasteur, Williamson, Frankland, Kekulé, Mendeléeff, Perkin, and V. Meyer. The author says in the preface: "The object of this little book is to give an account of the chief work of the most famous chemists, and to indicate briefly the part played by each in the development of the science." While the names of a few of "the most famous chemists" are lacking in the list, the accounts which are given are in the main satisfactory. However, the book contains a few errors, the most serious of which are listed below.

P. 52, "Lavoisier showed that respiration is analogous to combustion." This fact had long been known. P. 59, "Chemists, up to the beginning of the nineteenth century, considered it a self-evident fact that sub-

stances combine in fixed proportions." On p. 81, it is stated that Davy established the elementary nature of iodine; it was Gay–Lussac who did this. And on p. 85, Gay–Lussac is given credit as the sole discoverer of the law which had previously been discovered by Charles. On p. 91, it is stated that Berzelius in his atomic weight work availed himself of Dulong and Petit's law. As a matter of fact, Berzelius was not well disposed towards this law. Late in his life (*Jahresbericht*, **1842**, p. 6) he discussed the changes in his atomic weights proposed in 1840 by Regnault, as the result of his specific heat determinations, and accepted the further halving of his atomic weight for silver; Berzelius' original atomic weight for silver had been halved by himself many years before on the basis of Mitscherlich's Law of Isomorphism. G. McP. SMITH.

Some Chemical Problems of To-day. By ROBERT KENNEDY DUNCAN. New York: Harper Brothers. 1911. pp. 254. Price, $2.00.

This book like the others by Professor Duncan is of a popular character; it is written in a lively style, gives an entertaining account of some of the problems in theoretical and industrial chemistry and makes a plea for a closer relationship between chemistry and manufacture in America. He calls attention in the first chapter to a number of practical problems that it would be desirable to solve, such as the utilization of metallic cobalt, tellurium, silicon and electrolytic iron. There is need of improvement in enamels, bleaching agents, substitutes for wood, in the refinishing and recoloring of leather, in inks and shoe-blacking. The residues from paper pulp ought to be utilized, cull oranges and lemons ought to be converted into valuable substances and the western oyster ought to be improved. A hard water soap is desirable. The author says: "The many and important actual opportunities that lie everywhere at hand for applying scientific knowledge and scientific method to the manufacturing needs of men make one frankly consider why trained and earnest men should devote laborious days to making diketotetrahydroquinazoline, or some equally academic substance, while on every side these men are needed for the accomplishment of real achievement in a world of manufacturing waste and ignorance." Nevertheless he cannot be seriously opposed to scientific research as distinguished from technical research for the next four chapters deal with such theoretical subjects as "the question of the atom," "the witherward of matter," "the chemical interpretation of life" and "the beginning of things."

In the sixth chapter he considers the trend of invention as shown by the records of the Patent Office in Washington. He points out that eminent European professors like Emil Fischer, Wilhelm Ostwald and certain English university professors have taken out American chemical patents and that instead of "giving his discoveries to the world," it is much better for the man of science as well as for the public that the

discovery be patented. Some of the subjects of recent chemical patents are here discussed, such as the fixation of atmospheric nitrogen, the synthesis of ammonia, the preparation of valuable compounds from natural gas, deflocculated graphite, electric osmosis and the welding of copper upon iron.

There are chapters upon the camphor and bread-baking industries, upon the relation between chemistry and manufacture in America, on the relation of the University of Wisconsin to the State and a final chapter on the industrial fellowships that have been established at the Universities of Kansas and Pittsburgh under Professor Duncan's direction.

EDWARD H. KEISER.

Traité de Chimie générale. Ouvrage Traduit sur la 6e Édition Allemende par A. CORVISY. Par s, 1912. Librarie Scientifique, A. Hermann et Fils. Two volumes, 20 francs each.

The comparison with the German original of a dozen pages taken here and there showed that the translation is accurate and faithful; it is also clear, direct and lucid, as we expect from the French of a master.

The invaluable work of Nernst can still be contained within the limits of a single volume, but by sacrificing something for compactness. This French edition appears in two volumes, allowing a somewhat clearer type and better spacing of lines, and presenting a very attractive page. A subject index is lacking.

The translator has added three very valuable notes: on the determination of molecular weights by measurements of osmotic pressure, on the list of radioactive elements with their constants, and on the absolute number of molecules in the unit volume of a gas.

EDWARD W. MORLEY.

Text-book of Inorganic Chemistry. By DR. A. F. HOLLEMAN. Issued in English in Coöperation with Herman Charles Cooper. Fourth English Edition, completely revised. John Wiley and Sons, New York. pp. viii + 505, 79 figures. Price, $2.50. Cloth.

This is a new edition of Holleman's well known and admirable text, the first edition of which appeared in English in 1902. In the preface it is stated to have been thoroughly revised, many parts having been rewritten, the chapter on metal-ammonia compounds as approved by Professor Werner.

It is a good example of the text-books presenting inorganic on a basis of physical chemistry from the beginning. To many it will probably seem too condensed for use with beginners, but it is a most interesting book for more advanced students.

The order of presentation of the descriptive part is oxygen, hydrogen, water, chlorine, hydrochloric acid, the halogens, the oxygen family, the nitrogen family, the carbon family, the alkali metals, etc. At ap-

propriate points more general topics are concisely presented, such as the atomic and molecular theories, catalysis, kinetic theory of gases, determination of molecular weights by freezing-point, boiling-point and osmotic pressure methods, chemical equilibrium and reaction velocity, electrolytic dissociation, the phase rule, valence, thermo-chemistry, determination of atomic weights, the periodic system, spectroscopy, the unity of matter, radioactivity, electro-chemistry and Werner's theory of valence.

In the opinion of the reviewer free oxygen should be represented by its formula O_2 whenever used, even before the derivation of the numeral has been explained, rather than O; on page 34 appears the equation $2HCl + O = H_2O + Cl_2$, referring to the "oxygen of the air"; if the reader is not prepared for O_2, the use of Cl_2 is surely illogical. The term "single decomposition" as opposed to "double decomposition" on page 40 is unusual and seems hardly justified—implying a distinction without a fundamental difference. The atomic weight of niton is given on page 405 as 2.22 instead of 222.4 as in the table of International Atomic Weights for 1912 on the inside of the end cover. Should we not distinguish between elementary substances and elements? Diamond, graphite, and amorphous carbon are elementary substances; carbon is an element.

The book offers little cause for adverse criticism, however. The language is clear, there are very few typographical errors, there is a good index, the print is good, the binding, when received by the reviewer, was defective, and became distinctly more so during inspection.

P. N. EVANS.

Handbuch der Mineral Chemie. Edited by DOELTER, *et al.* Theodor Steinkopf. Dresden. Vol. I, No. 4, Bogen 31–40. Price, M. 6.50.

The subject of the carbonate minerals is completed in this number. Those included herein are for the most part rare, and add but little to our knowledge of mineral synthesis or mineral genesis. More than half the total number of pages is devoted to silicon and the silicates. Silicate analysis by Dittrich takes up about 35 pages, and is probably as well done as could be expected in this limited space. Some important details are omitted; such, for example, as the necessity of burning the filter slowly in the silica determination to insure complete incineration, and the serious contamination of the iron-alumina ppt. by siliceous matter, if the ammoniacal solution is boiled in glass. The findings of Gooch and Austin in the magnesia determination are neither heeded nor referred to, though in the main the researches of Americans like Gooch, Hillebrand, Penfield, J. Lawrence Smith and Treadwell are given the place which their importance demands. Electric furnaces of both arc and resistance types are described by Herold. Among the types of gas furnaces in use, the Fletcher is spoken of as having the serious disadvantage of affording insufficiently high temperatures. As a matter of fact with

sufficient blast, the operator has to exercise care in working with high-melting silicates in the Fletcher furnace to avoid melting the platinum crucible! Prof. Doelter gives a few pages of general matter on the chemical peculiarities of the silicon compounds and a historical introduction to the subject of silicate synthesis, and then he proceeds to deal with bare hands with the determination of mineral melting points, to the importance of which he is thoroughly alive. The tendency to take somewhat contradictory views upon certain subjects which appear in some of his writings is here happily avoided. The statements are direct and unambiguous and as such deserve commendation. On page 629 we learn that *only a few silicates give sharp melting points*. This behavior is attributed to the peculiar viscosity of the silicates, which greatly retards the change from the crystalline to the amorphous condition, a characteristic which permits of their being overheated beyond the point at which melting begins before the process is complete. Undoubtedly there are examples of silicates like the sodium aluminium and potassium aluminium silicates (the alkali feldspars) to which should be added quartz, which present extraordinary phenomena of this sort. It is also quite possible that further study will reveal other cases of the same character, but without more knowledge than we now possess, the statement that "many other alumino-silicates belong in this class" is quite unwarranted. It is certainly preposterous to put anorthite in this class as Prof. Doelter apparently does. This phenomenon of overheating, to the possibility of which D. describes the higher points of other investigators, can be realized only to a very slight degree in the majority of silicates which have been carefully investigated. "The silicates, with some exceptions, like sodium, lithium and lead silicates do not show sharp melting points," says Prof. Doelter. True, the synthetic silicates, so far, do not melt with the same sharpness as the pure metals. It may also be true that the difference in viscosity has something to do with this, though the synthetic silicates have not yet been prepared so pure as copper, silver and a number of other metals. But the metasilicates of calcium and magnesium, diopside and anorthite (true chemical compounds) certainly melt within very narrow limits, *when pure*. Thus, Day and Sosman (*Am. J. Sci.*, **31**, 341 (1911)) have recently shown that the melting points of diopside and anorthite are reproducible within 2°, while by a process of chilling and microscopic examination they have proved that no melting takes place 5° below this point. Again, on page 637, we read: "The causes of these differences (in melting-point determinations), which are quite striking, lie (1) in the difference in conception of what one calls a melting point; (2) in the difference in the exactness of methods; (3) in the difference in the size of the grains of the material to be investigated; (4) in the difference in the rate of heating. Let us revise this as follows: Differences

in melting-point determinations are due (1) to differences in the purity of material. Prof. Doelter has had long experience in the determination of the melting point of minerals, but until recent years he has always used natural minerals, and indeed at one time scouted the investigation of synthetic substances. He heats his silicates, as a rule, in quartz beakers or porcelain crucibles, stating that the vessels are little corroded, though no analytical evidence has ever been presented to prove that the melts remain pure. Now he has turned to synthetic work, but is the fact that a mineral is synthetic any proof of its purity? Apparently we are to believe so, and if a double guarantee is demanded we are told that the synthetic mixture is compounded of Kahlbaum's chemicals. Alas, poor Kahlbaum, what a burden of responsibility is thrown upon his estimable shoulders! It is perhaps not generally known to what a degree *small quantities* of impurities may affect the thermal behavior of a substance. As an example of this we may cite magnesium metasilicate, which, when pure, melts quite sharply and when cooled at a moderate rate, undercools only about 10°. Yet if 0.5% of alumina be added, the silicate may be held for an hour 50° below the melting point with but little crystallization and that of an entirely other (unstable) crystal form. (2) The thermal methods should, of course, be exact. Subjective methods may be barred without comment. The portable galvanometer with calibrated scale so commonly used to-day is a very useful instrument, but not a very accurate one; it is totally inadequate for the location or even the detection of many heat changes, but much more important is the question of the thermocouple. In ordinary furnace work this is constantly liable to contaminations which greatly lower its electromotive force, so that a calibration which consists in the observation of its reading at a single point, especially a point remote from the temperature region to which the investigation has been confined, is not sufficient to standardize the element. When investigators bring themselves to rigid conformity with these two prime conditions, it will be time to consider such secondary matters as size of grain and rate of heating which are relatively negligible, though they have a place in exact work. We may then hope to see the differences of 150° (page 632) between the determinations of the Geophysical Laboratory and those of some other investigators narrowed down to respectable limits. The application of the eutectic principle to silicate melts by J. H. L. Vogt, Doelter endorses in so far as it has to do with the quartz-orthoclase rocks, because in nature the viscosity of the magmas was reduced by water so that equilibrium could assert itself. Quite otherwise, he maintains, are the facts pertaining to the more viscous melts of the laboratory. Undoubtedly, as all will agree, equilibrium sometimes (perhaps often) fails in the silicate systems of nature as well as those of the laboratory; so it does in systems of many other substances.

Certainly a comparatively rapid cooling of silicate melts is not the best way to reach it, but to say that the phase rule can not be applied to silicate melts (pages 632 and 633) is to reject practically all the best work that has been done on the subject. E. T. ALLEN.

Outlines of Quantitative Analysis. By W. R. LANG AND A. TINGLE. University Press, Toronto. 1911. 64 pp. Price, $1.00.

This book is intended to be used as a guide by students in the laboratory. Pages 7 to 10 are devoted to general explanations, and to instruments, methods, and solutions for volumetric analysis. Pages 11 to 26 give 36 examples of volumetric determinations. Pages 27 and 28 give general direction for gravimetric analysis. Pages 29 to 35 give 16 examples of gravimetric determinations. Pages 39 to 64 are devoted to the analysis of 11 simple minerals and mineral products. In the space given to each example it is not possible to do much more than indicate the method to be followed, without giving detailed directions for manipulation or discussion of methods or principles. The student must depend for these on the instructor or reference to larger works or original articles, some such references being given. No attempt is made to offer explanations based on modern physical chemistry. The methods are the standard ones and are up-to-date. The minerals and products chosen for analysis are substances which the analyst is likely to meet in ordinary practice, and vary sufficiently to give the student an acquaintance with the more important separations and determinations.

WARREN RUFUS SMITH.

Papers on Pyrimidines. Edited by HENRY L. WHEELER AND TREAT B. JOHNSON. Published by Treat B. Johnson, New Haven, Conn. Price, $2.50.

This book is a collection of the reprints of forty-eight papers giving an account of the work on pyrimidines done in the Sheffield Laboratory of Yale University prior to 1910. A twenty-four page bibliography of publications on pyrimidines, arranged chronologically, is appended. It is unnecessary to speak here of the importance of the work recorded in these papers. All who are interested in this field will find it a great convenience to have the papers collected in a single volume.

W. A. N.

Microbiology for Agricultural and Domestic Science Students. Edited by CHARLES E. MARSHALL. P. Blakiston's Son & Co., Philadelphia. 1911. pp. ix + 724, with 128 illustrations. Price, $2.50, net.

Although this volume is the result of the combined efforts of nearly a score of agricultural scientists of the United States and Canada, a very successful attempt has been made to preserve unity of thought and expression without repetition. The book is divided into three parts, *viz.*, Part 1—Morphology and Culture of Microörganisms. Part 2—Physiology

of Microörganisms. Part 3—Applied Microbiology. Particularly interesting are the chapters devoted to Part 3 in which is detailed the present knowledge of the microbiology of air, water and sewage, soil, milk and milk products, the special industries, diseases of plants, and diseases of man and animals. Taken as a whole the volume is carefully planned and well written. F. P. UNDERHILL.

The Soil Solution the Nutrient Medium for Plant Growth. By FRANK K. CAMERON. Easton, Pa.: The Chemical Publishing Co. pp. 136. Price, $1.25.

In the preface the author asserts that the chemical soil problems are among the most interesting in the domain of chemistry and offer rich opportunites for eminent service to mankind, but that they have been greatly neglected by the student of pure chemistry because of their complexity, also by the student of applied chemistry on account of their giving no promise of pecuniary reward.

It is the author's avowed purpose to point out problems deserving special study at this time, likewise methods for their solution; and also to bring together in convenient form what has been recently accomplished in this special field.

The book should be read with a full understanding of the fact that the Bureau of Soils of the U. S. Department of Agriculture, practically from its creation, has promulgated the view that fertilizers are not chiefly helpful on account of their supplying necessary plant food ingredients but by virtue of other functions performed by them in the soil. It was asserted in 1893 by Milton Whitney (*Bull.* **21,** Md. Agric. Expt. Sta., June, 1893; summary, Secs. 7 and 8) that they were beneficial chiefly by reason of improving the physical character of the soil. Their chief benefit is, however, now asserted to be due to their action in destroying and rendering innocuous, toxic substances produced in the soil in the decay of plant residues or thrown off as root excretions. Nevertheless, the use of lime and of other substances purely as soil amendments has long been practised in full recognition of the frequent presence of toxic substances in soils. Their presence was strikingly demonstrated by their extraction from a given soil and addition to another with toxic effect by Voelcker, at the Woburn Experiment Station in England, before the Bureau of Soils began work in this particular direction. The bureau itself has called attention to the previous work on root excretions acknowledging that it is a revival of an earlier idea. In pursuit of their ideas the bureau chemists have sought for years to transform this hypothesis into a theory and to convince agricultural chemists that at least the mineral fertilizers are not helpful by adding available plant food to the natural soil supply. In these efforts of the author and his co-workers they have brought together an interesting and valuable series of investigations, which are no doubt less appreciated than they deserve to be,

because of the impression that facts militating against their hypotheses have not been sought and studied with equal ardor.

Running through the whole work is a structural basis for the keystone to these ideas which appears in one of the closing chapters.

In the first chapter special emphasis is laid upon the importance of a study of the soil solution in arriving at the relation of the soil to plant growth. The next chapter, devoted to soil management and control, is essentially an exposition of the alleged failure of field experiments and of the usual methods of soil analysis to furnish a sound basis for dealing in particular with the older soils which have been much modified by very diverse previous treatment. Here some of the generalizations are far more sweeping than would seem to be warranted by a careful study of the results secured by the methods which are arraigned. The author asserts a little later the "*growing plants need certain mineral elements in order to maintain their metabolic functions and these mineral elements can be obtained under normal conditions from the soil.*" It would appear from this that the definition of "normal" in the mind of the author must have been somewhat different from that given by Webster's dictionary, or in other words it seems to be a begging of the question at the outset. It is then asserted that soils shown to be good by given methods of analysis may produce smaller crops than others, the analysis of which is poor; and hence the consequent insufficiency of the analytical soil methods of Hilgard, Dyer, Maxwell and others, because of their alleged failure to remove from the soil quantities of the respective fertilizer ingredients corresponding to those removed by crops, is supposed to be shown. It is, however, pointed out that very small quantities of fertilizers often exert marked effects upon crops but that their presence in the soil could never be detected by analysis, thus affording another reason for the failure of chemical analysis to show real deficiencies, if such exist. It is not made clear, however, that the inability to determine such small amounts in the soil should militate against their having acted as plant food any more than it should against their efficiency as destroyers of toxic substances, or as effective modifiers of the physical condition of the soil. The assertion next follows that the analysis of crops fails to indicate the deficiencies of the soil, on the ground that poor crops sometimes contain higher percentages of fertilizer ingredients than good ones. This general statement is correct, yet it deserves qualification especially in the light of recent results by Hall, and by Hartwell and Pember in connection with Swedish and Flat turnips.

Plot and pot experiments as means of arriving at the food deficiencies of soils, and likewise the whole plant food theory of fertilizers, are then successively relegated to the agricultural chemist's junk heap. The author recognizes that fertilizers increase crop yields, yet adds "but

that such a condition is general or that it can be associated generally with a decreased content in the soil of any particular mineral substance or substances is a conclusion not sustained by the available data." In fact, no one claims that the increase of yields by fertilizers is general, for many soils do not need them. It has also long been recognized that fertilizers produce many beneficial, and even sometimes injurious, effects entirely apart from their action as plant food, hence no one would think of claiming that their effect was always and entirely due to their action as plant food. The absolute claim is the one made by the author, that they do not function in the soil as necessary additional plant food.

A chapter is next devoted to the dynamic nature of the soil, another to a valuable and interesting discussion of the film water and the relation of surface tension to the soil problem. It is here pointed out that fertilizer salts when applied to the soil lower the vapor pressure of the water, whereby a distillation of moisture to the affected points takes place from the soil below and from the air above. Thus the hypothesis is supported by another contributing factor aside from food effects.

The author next asserts that "practically every soil contains all of the rock-forming minerals" and further that if soil water is removed by a powerful centrifuge and analyzed no correlation could be found between the results and the crop yields, and that the concentrations of the solutions thus secured from saturated soils varied but little with respect to potash and phosphoric acid, regardless of textures ranging between those of sand and clay. Nevertheless, the quantities of extract thus secured were too small to make it appear probable that such analyses, as were possible, were sufficiently accurate to justify very definite conclusions.

It is then further asserted that "the concentration with respect to those constituents derived from the soil minerals will be rapidly restored whenever disturbed through absorption by plants, leaching, or otherwise." This assertion seems to be based upon experience under laboratory conditions which, however, may not apply in the soil itself. In the chapter devoted to the relation of plant growth to concentration the statement is made that "There can be no doubt, therefore, that the soil solution is normally of a concentration amply sufficient to support ordinary crop plants and is maintained at a sufficient concentration so far as mineral plant nutrients are concerned." Yet it is admitted that variations in concentration do and can result and that they probably "produce effects" upon plants. In this case the author may refer to the effect upon the turgor of the plant cell rather than to food effects.

The succeeding chapter deals with the balance between the supply and renewal of mineral plant nutrients. Following this is a most interesting and instructive chapter on the organic constituents of the soil solution. A general discussion of fertilizers including their indirect action,

and the beneficial effects of salts of manganese, etc., which are supposed not to perform the office of plant nutrients, virtually closes the argument against the plant food effects of fertilizers. The book is then concluded with a review of certain work on alkali soils.

Certain points embraced in the premises would seem to require more satisfactory substantiation before the conclusion of the work can be generally accepted. The author also begs the question, to a certain extent, at the outset by the character of his reference to "normal" condition of soils. It is also important to establish beyond question that extra amounts of mineral plant food are not needed by plants, especially at certain early stages of growth. The fact that plants can be brought to maturity in tap-water and other dilute solutions, when the latter are frequently renewed, furnishes no conclusive evidence that the renewal of mineral matter in the limited volume of water in the soil is rapid enough and sufficiently complete to meet the plant needs, especially when the minimum of water in the soil is approached which is necessary to growth, and when the root development, as in the early stages of the plant's life, is still greatly limited. Even though relatively small applications of mineral fertilizers are made they are quickly "fixed," thus enriching certain points of contact far beyond what would result if they were uniformly distributed in the entire mass of the upper eight to ten inches of soil and they may thereby become especially effective. Furthermore, it is dangerous to infer from results secured in water-culture what would transpire in the soil where so many conditions are different and so many other factors come into play.

Though a destructive agent designed apparently to minimize and relegate to the junk heap many existing theories and many of the investigations made outside of the Bureau of Soils, the book nevertheless presents a large amount of most valuable material, both by way of a review of the subjects and by original contributions. The recent chemical researches of the Bureau of Soils on the nature of the soluble organic matter of the soil deserve in this connection especial commendation. The work, though controversial and based apparently upon too broad premises, is most valuable in its suggestiveness of lines of research and is indispensable to all who are engaged in soil investigations. It is, however, to be regretted that the views of the Bureau of Soils, which have been prematurely promulgated in popular Bulletins of the Department of Agriculture, could not have been withheld for presentation only in a scientific work of this character until the chief contentions shall have been more fully established and until the hypothesis has been shown to be capable of transformation into a well supported theory. H. J. WHEELER.

Chemisch-technisches Practikum. Uebungsbeispiele aus der chemisch-technischen Analyse für Studierende an technischen Hochschulen und Universitäten. By Dr.

Ing. Wilhelm Moldenhauer, Privatdozent für Chemie an der Technischen Hochschule zu Darmstadt. Berlin: Gebrüder Borntraeger. pp. vii + 206. Price, M. 6.

In the opinion of the author, the customary instruction in technical analysis fails in effectiveness because of lack of association with a knowledge of the technical processes or products to which the analytical work applies. He seeks to correct this difficulty by presenting a course of laboratory practice which includes the examination of typical substances of importance in the arts, and in connection with each analysis he attempts to give in outline an account of the technical processes for which the material under examination is of special importance or by which it is produced. The course is stated to represent substantially that given at the Technische Hochschule at Darmstadt and to represent an amount of work which it is claimed can be completed in a semester. The twenty-five procedures include those for the analysis of coal; drinking and feed waters; illuminating gas and that for use in balloons; spent material from gas purifiers; pyrite, nitro-sulfuric acid and fuming sulfuric acid; saltpeter; black ash; materials used in the ammonia-soda process and methods of control; fertilizers and some of their ingredients; irons and iron ores; zinc blend and zinc dust; galenite; oils, fats and waxes; soaps and glycerol; and lubricants. An introductory chapter deals with such general matters as sampling, weighing, determination of densities and the like, and an appendix contains useful tables.

The book is not one which will be of much service to the practising analyst, as it is not sufficiently comprehensive with respect either to the analytical procedures described or the discussions of the industrial applications. This is particularly true of American analysts, since many methods which are here regarded as standard methods are unmentioned. For the purposes of a course of instruction, for which it is primarily designed, the work is of considerable interest and the material and procedures are, in the main, well chosen. There is, however, an unfortunate air of finality in the treatment of the subject which would easily lead the student to suppose that the methods prescribed were practically the only ones entitled to consideration; the wet combustion method and the "color method" are, for example, the only ones mentioned for the determination of carbon. It would seem also that the author could have accomplished his purpose to give vitality to the analytical work through a knowledge of its applications more effectively if he had, in his discussions of the relevant, technical processes, pointed out more specifically why information regarding the ingredients determined was actually of significance at various points in these industrial operations. The two kinds of instructive material are presented a bit too much in layer-fashion. Nevertheless, the work is unique in its general aspects and will prove suggestive and helpful to teachers.

H. P. TALBOT.