

seed-coat is roughly constant during the same period of development of the nut. The compound ratio $\frac{K_1/F_1 \text{ ovule}}{K_1/F_1 \text{ seed-coat}}$ becomes unity on August 14th, which fact again makes that date a significant one.

6. The earliest history of the ovule would indicate a great preponderance of phosphatides over fats, which may be noted by an inspection of the backward extension of the phosphatide curve and that of fats in the ovule.

7. The phosphatides linger in the developing ovule until August 14th but their relative importance is insignificant after the fruit has changed from a limpid liquid to a jelly. This is the case with the seed-coat also, except that their importance seems to be nil after the June 28th sample.

8. By a back extension of the potassium curve, $K_1K_2K_3$, it will be seen that the early life of the ovule is conditioned by the presence of a relatively large content of potassium, which becomes less and less important as the fruit advances toward maturity but even on September 4th there is a content equal to 0.18% of the total solids.

9. The nature of the tissue of the seed-coat is such that it is either not penetrable by tannin or contains substances that disrupt the tannin molecule into fragments that under one form or another are able to penetrate the tissue. The line of limitation of tannin penetration in the seed-coat is so clearly marked and yet the premises for a definit conclusion are so fragmentary that this feature of the physiology of the plant life deserves a special study before one should speak finally in reference to the role that fats and tannins play with reference to one another.

The author wishes to express his sorrow on account of the death of the late Dr. Waldemar Koch, whose kindly advice did much to stimulate the effort of this paper, and to thank Dr. William Crocker of the University of Chicago, for his friendly aid and criticism.

MARYVILLE COLLEGE,
MARYVILLE, TENNESSEE.

CORRECTION.

On page 279 of the March number (4th line from the bottom) read 50 mm. instead of 50 cc.

On page 280 (last sentence on page) read: The value of K as calculated from its equation, $K = 1/t \log a/a - x$, points, as is seen, to a reaction of the first order with respect to the carbinol base.

NEW BOOKS.

Notes on Chemical Research. By W. P. DREAPER. 68 pp. P. Blakiston's Son & Co.

The work is reprinted from the *Chemical World*; of which the author is editor. In his words, it contains "an account of certain conditions which

apply to original investigation." The subject is treated academically. Two or three pages are devoted to defining research, a couple more treat of the distinction between "experiment" and "observation." The reviewer does not doubt the validity of the many extended conclusions, but the matter "reads heavy." When an occasional quotation from Crookes, Faraday or Newton is reached, one is reminded of an oasis. The book is particularly interesting when read with the works of Francis Bacon in mind. The successes of chemical research and the systematic development of the science into nearly sixty extensive fields since Bacon's time, attracts notice. The book contains much good practical advice to the chemist, and carries a lot of general information concerning successful research. It should be of help to any chemist.

W. R. WHITNEY.

Modern Inorganic Chemistry. By J. W. MELLOR, D.Sc. London: Longmans, Green & Co. 1912. pp. xx + 871. Price, \$2.20.

There is difficulty in determining for what sphere of usefulness this book was intended. The author's preface warrants the inference that he thought of it as a text-book for beginners. Beyond the preface there is little to show that it is adapted to such use. The quantity and selection of the matter included, the arrangement, and the style of presentation exclude the book from this category. Apparently the author has not really faced the problem of what to leave out, and has included about all the good things which occurred to him.

The general plan of the earlier part suggests a text-book of physical chemistry. At page 91 appears the first formal description of an element, hydrogen. Oxygen is introduced at page 128. In the theoretical discussions of the earlier pages, illustrations are drawn from numerous compounds and reactions of which the beginner cannot be expected to have any knowledge whatever. There is a general tendency to present each topic by itself, without sufficient regard to the state of the reader's mind in view of what has preceded. Careful study fails to reveal to the reviewer the guiding principle in the arrangement of the subject matter. It follows none of the traditional arrangements, neither does it follow the periodic classification. It certainly is not arranged with regard to progressive difficulty, or to secure unity, or for any other evident pedagogic end. The beginner is likely to be misled by some of the minor errors; and at certain critical points there is a looseness of statement which is likely to confuse a reader not familiar with the subject.

The author is apparently not in full sympathy with the prevailing practice of discussing reactions between electrolytes in terms of the theory of ions; for although he gives the theory a somewhat full and preëminently fair presentation, a very limited use is made of it in the subsequent treatment of reactions.

For teachers, however, especially those out of contact with university centers, this book should be of great value. In it they will find numerous topics admirably presented, very suggestive of methods useful in the classroom. There are also a few examples of how not to do it. Following the historical order is not always an advantage to the beginner. In first presenting the topic of molecular weights it would be better not to mention the erroneous inference, based on the work of Gay-Lussac, as to the relation between gas volumes and atomic weights. Nothing is gained by involving the beginner in the confusion which so delayed the development of chemical theories in the first half of the last century. The subject of liquefaction of gases, though exceptionally well presented as far as it goes, unfortunately does not include the latest and most important type of apparatus. It is worth while for the teacher to own the book for the sake of the collection of questions at the chapter ends. Even those too difficult for use with beginners will prove of use in more advanced classes, and the collection will certainly be to many a high-school teacher, a revelation of what he himself should know.

As usual, the making of the index has apparently been turned over to someone less familiar with the subject than the author. The result is full, but not good. But good indices are extremely rare, and he who turns to the index of a new book hoping to find something wholly commendable is doubtless an optimist.

CHARLES W. MOULTON.

Inorganic Chemistry. International Chemical Series. By HAMILTON P. CADY, PH.D., University of Kansas. xiv + 629. New York: McGraw-Hill Book Company. Price, \$2.50.

When examining a new text-book on a familiar portion of chemistry, one naturally seeks for any better avenues of approach to the subject than have heretofore been employed. The recent tendencies among writers have been towards those parts of chemistry and physics which are not separated by any sharp line of demarcation. In this excellent volume of Professor Cady's, an effort has been made to present to the student a general survey of the subject "from the standpoint of elementary physical chemistry." The choice of topics for a book of this character is a problem of the greatest importance and is to be solved largely out of the long experience of the author as a teacher of elementary students.

Throughout, the author has introduced laws and theories at points best adapted to a logical presentation of the course, applying the same frequently, "so that the student may acquire a familiarity and working facility with the fundamental principles of chemistry." Consequently, one finds constant use made of the Phase Rule, the Ionization Theory, The Law of Mass Action, the Principle of Movable Equilibrium, etc. The energy relationships in a chemical reaction are constantly emphasized, and as a result considerable use is made of thermochemical

and electrochemical data. The fundamental notions in reference to reversible reactions, chemical equilibrium, reaction velocity and the factors influencing it, are wisely introduced at an early stage and in a manner that should be easily grasped by the student.

A due regard has been given throughout to the applications of chemical principles to industrial operations, the processes described being those of modern practice. Especially commendable are the portions dealing with the metallurgy of iron, copper, lead, silver and gold. The reviewer is of the opinion that the introduction of more diagrams and cuts of experimental and industrial apparatus would increase the student's interest.

Conspicuous by their general absence are the terms "atomic weight" and "molecular weight," in place of which the author has very carefully developed the conceptions of "combining weight" and "molar weight." The literature of chemistry and that of the recent work in the fields of radioactivity necessitates, it would seem, some degree of familiarity with the terminology resting on Dalton's theory, and consequently these older terms must be taken up later by the student.

In the first edition of a book of this character, errors are likely to be found, such as the use of "aluminium" (pages 493, 553, 571) instead of the author's chosen "aluminum;" "strength" of acid for "concentration," on page 211; "normal" acid for "meta" acid on page 181; mercuric thiocyanate cannot be precipitated from solutions of all mercuric compounds (page 445). Strict adherence to the ionization theory would demand the same consideration of hydrogen sulfide (page 197) in aqueous solution, *i. e.*, hydrosulfuric acid, as of hydrogen chloride, *i. e.*, hydrochloric acid.

However, the author seems to have successfully accomplished the task which he placed before himself. After a careful reading of this volume, the reviewer is of the opinion that it is one that ought to be thoroughly teachable, and in the end, this would seem to be the final and convincing test of the value of a text-book which is to be placed in the hands of beginners in any science.

WM. LLOYD EVANS.

The Qualitative Analysis of Medicinal Preparations. By H. C. FULLER, B.S. ix + 132 pp. New York: John Wiley & Sons. 1912.

The rapid increase in the number of synthetic chemicals added to our materia medica has greatly increased the difficulty in systematic schemes of general identification. It was, of course, practically impossible to identify all the principles in the solid or fluid preparations of organic drugs of vegetable origin in the older mixtures familiar to physicians or pharmacists, and the difficulty is enormously increased by the inclusion of the rapidly swelling flood of "synthetics." Few chemists care to attack the problem of the analysis of medicines, except for the identifica-

tion of some especially potent or well-known substance. , But the problem is important, and with the growth of the proprietary medicine evil it becomes more and more necessary to develop methods for the protection of the public from the danger of dosage by potent drugs, not disclosed on the label.

The little book before us is an attempt to supply some of the deficiencies in this direction. It presents a systematic general scheme for the examination of solid or liquid mixtures of organic and inorganic substances and will doubtless be of value as a guide. It is not likely that the most complex mixtures possible could be successfully separated by this or any other scheme, but, as such mixtures occur in practice, with the number of constituents naturally limited, the directions seem full enough to afford a clue to identification in most cases. Besides the general outline, there are special methods applicable to such common cases as plasters, emulsions, tooth powders, liniments, etc. No attempts at quantitative separations are made.

The book contains many suggestions which will be appreciated by those who have occasion to deal with the complex problem of the analysis of proprietary and other mixtures which come under the provisions of the Food and Drugs Act, as well as those which are merely harmless cure-alls containing well-known but inert substances, praised as new discoveries.

J. H. LONG.

Organic Chemistry, Including Certain Portions of Physical Chemistry, for Medical, Pharmaceutical and Biological Students. By H. D. HASKINS, A.B., M.D. Second edition. vii + 430 pp. New York: John Wiley & Sons. 1913. Price, \$2.00.

Any one who has had experience in teaching large classes of medical students recognizes the increasing difficulty in making a proper presentation of the subject in the limited time available. In the main, it may be said, the organic chemistry for the medical student should be the same as for the student of general science. The fundamental principles deserve as full a treatment in the one case as in the other. But there are points of divergence and these are becoming of more and more importance as the trend of medicine toward the chemical side becomes more clearly recognized.

Modern medicine calls for a more, rather than a less, thorough training in organic chemistry than was formerly thought necessary, and this for the bacteriology, the pharmacology, and especially for the new pathology, as well as for the physiology and physiological chemistry. In the new pathology it is function rather than form, chemistry rather than histology, which is of the greatest importance, and the training must meet the requirement. The student must have, furthermore, a sufficient groundwork to be able to appreciate the relations of the more important

synthetic compounds which have so important a place in the new pharmacology.

Professor Haskins is well known as an investigator as well as a teacher and evidently has in mind the modern requirements. His book presents a very good outline of the most important facts in elementary organic chemistry, with a sufficient groundwork of theory to give connection to the whole. Much more than the usual attention is given to those compounds and groups which are of special importance as remedies. In the effort to make the composition of these clear to the student, very full use is made of structural formulas, perhaps in some cases more than the known facts would justify. The use of such formulas is often open to question, but it is a matter of experience that even beginners gain much from pictures of this kind. There is danger, however, of carrying the impression of positive knowledge too far, and that seems to the present writer to be the case in a few instances in the book in question. This is illustrated by some of the alkaloid formulas and in particular by the structure of morphine given on page 396.

The book gives the details for making a large number of illustrative experiments, including the preparation of many important compounds. It is therefore suitable for use in the laboratory as well as for a general text. It does not attempt more in the way of theory or experiment than the student should be expected to master in a properly arranged course, and on the whole must be recommended as a very excellent book, and an appreciative effort in a field of growing importance.

J. H. LONG.

Mineralchemie. By DOELTER, *et al.* Vol. II., Part. 1. Bogen (1-10.) Dresden and Leipsic: Theodor Steinkopff. Price, M. 6.50.

Contents: The dependence of physical, especially optical, properties on the composition of the silicates, F. Becke. Paragenesis of the natural silicates, J. Königsberger. Constitution of the silicates, C. Doelter. Analytical methods for quartz, chalcedony and opal, M. Dittrich. Silicon dioxide and quartz, C. Doelter. Chemical technical on quartz glass, H. Herschkowitsch. Königsberger has a hard task in the paragenesis of the silicates. Of precise knowledge on the subject we have almost none, so that it is a question whether it is worth while to devote so much space to it. Doelter in his consideration of the constitution of the silicates aptly remarks that the first question to decide is whether we have to do with chemical individuals or only solid solutions or mixtures. There is a great deal of modern experimental work on this subject which is usually neglected in deciding problems of constitution. While it is not to be denied that the eye of genius may discover new paths whose direction is not logically reasoned out, such for example as was Tschermak's hypothesis regarding the feldspars, the test of these hypotheses is their

fruitfulness, and judged by this standard most suggestions along this line have not been of great value. Lemberg and Thugutt, Clarke and Steiger have contributed valuable experimental data to this subject, but for the most part the constitutional formulas for the silicates suggest little of their chemical behavior or physical properties, even to the initiate.

E. T. ALLEN.

Annuaire pour l'an 1913. 16mo., 708 pages. Paris: Gauthier-Villars. Price, 1.50 francs.

This contains nothing of particular interest to the chemist. The 1914 volume will contain physical and chemical tables. J. W. RICHARDS.

Who's who in Science, International, 1913. Edited by H. H. STEPHENSON. London: J. & A. Churchill. Philadelphia: P. Blakiston's Son & Co. pp. xvi + 572.

In addition to brief biographical sketches of about 9,000 prominent scientific men, whose names have been selected from all countries of the world, the book contains a list of the principal universities of the world, giving the names of the men in charge of the various scientific departments of each. Also a list of the scientific societies of the world is given and an alphabetical list of scientific men arranged by subjects and by countries. Any one who knows something of the care which has been exercised in compiling *American Men of Science* and the uncertainty which always arises with regard to many names included and excluded will know how impossible it is to make a book which is wholly satisfactory when an attempt is made to cover the whole world. In spite of the inevitable fallibility of a book of this character, it will serve a very useful purpose.

W. A. N.

Das Erdöl. Seine Physik, Chemie, Geologie, Technologie und sein Wirtschaftsbetrieb. In fünf Bänden. Herausgegeben von C. ENGLER and H. v. HOEFER. Leipzig: Verlag von S. Hirzel. 1912.

The first volume of this work, edited by Dr. Engler, has just appeared, under the title "Die Chemie und Physik des Erdöls." It contains 855 pages with full index, and eighteen large plates, the latter giving complete analyses and optical refraction of petroleum from the principal fields. The scope of this work and its comprehensive magnitude as indicated by its title and fully substantiated by the first volume, promises the most thorough and complete compilation on petroleum and its products that has ever appeared. It is fortunate that its preparation was undertaken by two such well-known workers in this field. The name of Dr. Engler, especially, is familiar to every one who is interested in petroleum.

This volume is devoted to the varieties of bitumen as a generic term for solids and liquids, and to natural gas, their composition, genetics, occurrence, chemical and physical properties, optical characters, heats of combustion, fractional distillation, and lubrication. But much the

larger space in this volume is devoted to the composition of petroleum and its products, with a complete review of the series of hydrocarbons that have been found in petroleum, and the structural relations of the various series on the basis of the most recent classification of the hydrocarbons.

There is a full discussion of all investigations of petroleum from the beginning, and large space is given to the work on American Petroleum. The identity of the naphthenes first discovered by Markownikow in Russian petroleum with the same constituents in American Petroleum, and with the more recently synthetically prepared cyclo-hydrocarbons is fully set forth.

It is gratifying to observe that the proof of the absence in any appreciable quantities of ethylene hydrocarbons, especially from American petroleum, is comprehensively presented; for the erroneous statements on this subject in all works on petroleum have been grossly misleading. An interesting résumé is given of the facts and theories relating to the natural formation of petroleum from a chemical point of view. The behavior of petroleum and its products toward reagents, the action of atmospheric agencies and light are critically considered.

It was evidently the plan of the authors to include all that is known concerning petroleum, and one does not proceed far in the perusal of this volume to be convinced that their object is well attained.

It is safe to assert that this work will be found readily accessible for convenient consultation by the investigator, experimenter, and refiner, for it will be an indispensable aid to every one in any way interested in this subject.

The work is presented in regard to paper and printing with the characteristic skill and care of the German publisher, and with the patient thoughtfulness on the part of authors and publisher that we are led to expect in German publications.

CHARLES F. MABERY.