

the basis of facts. Chapter XVII includes the elements of thermochemistry; Chapter XX, classification of the elements and the periodic system; and Chapter XXIV, solutions, electrolysis, and electrochemical theories. In this arrangement of the essential parts of chemical theory, and with this mode of treatment, it would seem that the author has kept well within the limits of what the average college student can readily comprehend and assimilate. As stated in the preface, the student becomes a clear logical thinker, and he does not look upon the atomic and molecular theories as something arbitrary, metaphysical and well-nigh incomprehensible; it is also mentioned that in principle this is the method of Bunsen and of many other successful teachers of chemistry. Historical connections are kept sufficiently in view by frequent allusions. The cuts are clear and well made, and the subject matter well printed.

The experimental and descriptive parts are well selected; the more important industrial processes are briefly described, and the chemical reactions involved are as fully explained as the scope of the work permits. There is an occasional omission of details in allusions to methods of preparation that perhaps could have been avoided without undue expansion of the text, such, for example, as in the Solvay process, saturation first with ammonia and then the clarified solution with carbon dioxide; the use of ferric oxide as a catalyzer in the Chance-Klaus process for recovery of sulphur; the Dow electrolytical processes in Michigan that supply a large part of the output of the bleach, bromine and potassium bromide in this country. The Kessler process for the concentration of sulphuric acid that is replacing platinum is not mentioned; Javelle water is mentioned as a solution of bleaching powder; it is stated that the hydrocarbons in American petroleum practically all belong to the so-called paraffin series, of which methane is the first member. But these points are of minor importance to be kept in mind in the more complete presentation by lectures.

A critical examination of this work gives the impression, I think, that the author has accomplished his purpose, and that he has given us one of the best books, and in some respects the best book that has been prepared on this subject.

CHARLES F. MABERY.

**Elementary Chemistry.** By FREDERIC B. EMERY, A.M., McKinley High School, St. Louis, Mo. xiii + 666 pages. Easton, Pa.: The Chemical Publishing Co. Price, \$1.50.

The method adopted by the author is practically the same as that followed in most of the widely used texts. The book is divided into four parts. Part I contains the introductory chapter (17 pages), a description of the non-metallic elements and their compounds (216 pages), a description of the metallic elements and their compounds (114 pages), and a short discussion of organic compounds (55 pages); Part II includes an extended

collection of problems (30 pages); Part III consists of the laboratory manual (184 pages). A number of pages of important data are appended. In the preface the author states in a commendable way the points that should be emphasized in the teaching of elementary chemistry. The following statements, if true, certainly represent an unfortunate condition: "Many who are called upon to teach the subject neither know it nor care for it." The author seems to have kept such teachers in mind in writing the text since he adds: "One aim of the author has been to make the descriptions so clear that the average teacher would not have any difficulty in explaining to the class the meanings." In carrying out this idea "the description of the mathematical portion is grouped in a single section so that teachers who have an aversion for this part of the work may omit it entirely without breaking the continuity of the text." It is doubtful whether in writing a text it is wise to keep in mind teachers who neither know nor care for the subject. Moreover, a teacher might well hesitate to use such a text for fear that thereby he might proclaim himself a member of that class.

The text gives abundant evidence that the author is an enthusiastic teacher. Unfortunately, however, it contains many statements that, if not erroneous, are certainly misleading or are so involved that the average student would fail to correctly interpret them. The author does not hesitate to use formulas and equations (even very complicated ones) before any explanation whatever is given of their significance. It is doubtful also whether in a discussion of organic chemistry, limited to 55 pages, such complicated structural formulas as those of camphor and secondary butyl alcohol or such figures as those representing a carbon atom and an organic molecule, should be included. Such statements as the following which may be taken as types, certainly do not add to the value of the text. "When combined hydrogen is very abundant, forming two-thirds of water by volume and occurs in a great many substances, being found, etc." (page 18). "If a mixture of known volumes of air and hydrogen are exploded in a eudiometer tube kept at a temperature of  $100^{\circ}$ , the volume of steam formed will be equal to the volume of hydrogen, while the volume of water formed on cooling is only a few drops" (page 43).

How many students would correctly interpret such a statement as the following: "According to the theory of electrolytic dissociation as spoken of under the chapter on solution, acids, bases, and salts, when dissolved in water, are partly dissociated into anions or ions that collect at the anode or positive electrode, because the anions themselves are charged negatively, and cations which collect at the cathode, or negative electrode, because they are charged positively when the electric current is passed through the solution" (page 82).

Nevertheless there is much in the book to be commended. The discussion of the metals and of the practical applications of chemistry is as a rule fairly satisfactory. A text on chemistry with preface dated January, 1909, however, should not contain the statement that helium has not been liquefied.

WILLIAM MCPHERSON.

**Die Härte der festen Körper und ihre physikalisch-chemische Bedeutung.** VICTOR PÖSCHL. Dresden: Theodore Steinkopff. 1909. 8vo., 85 pp., 4 fig. Price, M 2.50.

There are undoubtedly intimate relations between the chemical composition, the crystal form, hardness and density of bodies. Of these properties hardness presents the least satisfactory data because no really accurate and widely applicable method of measuring hardness has been agreed upon. The old scale of Mohs of ten minerals ranging from diamond to chalk is too indefinite. The object of the author in this book is to set forth a method of measuring hardness which appears to give an accurate numerical expression of it and to summarize some of the relations which may be pointed out between hardness and tenacity, frangibility, solubility, composition and crystal form.

He defines hardness as the force which must be overcome to tear a particle of a substance from its neighbors. He gives a summary of the methods used heretofore in measuring hardness—planing, bending, impressing and grinding. His own method consists in making a "scratch" with a diamond under definite load and estimating under the microscope the *volume* of substance removed. In comparison to the scale, 1, 2, 3–8 he obtains 5, 21, 50, 167, 122, 240, 667, 1000 for talc, rock salt, calcite, fluorite, apatite, orthoclase, quartz and topaz respectively. Such a scale obviously offers a chance to express small differences of hardness such as obtain on different crystal faces or between polymorphs. The author of course has difficulties when he attempts to predict the hardness of a compound from the hardness of its elements, but the discussion along this line is interesting.

The book is a brief but suggestive contribution to the study of hardness.

ROGER C. WELLS.

**A Text-book of Physics**, edited by A. WILMER DUFF. Second edition, revised, 525 illustrations, xi + 698 pp. Philadelphia: P. Blakiston's Son & Co., 1909. Price, \$2.75 net.

The first edition of this book was reviewed in *THIS JOURNAL*, 31, 429. In this edition "The part on wave motion has been entirely rewritten and numerous changes have been made in several other parts." That the book is a successful one is indicated by the appearance of a second edition after so brief an interval.

W. A. N.

**A Text-book of Physiological Chemistry, for Students of Medicine.** By JOHN H. LONG, M.S., Sc.D., Professor of Chemistry in Northwestern University Medical