

solution from spent tans, if too weak by the official method of extraction, may be concentrated by boiling under reduced pressure, or in a flask whose neck is closed by a funnel. Proctor and Blockey (*J. Soc. Chem. Ind.*, 1903, p. 482) present data relating to the absorption of non-tanning substances by hide-powder, and its influence on tannin estimation. The tabulated results of some twenty-four analyses show that a serious error may result, which, however, is somewhat less by the "shake" method than by the filtration process. The superiority of chromed hide-powder for absorbing the tannin was also established, but it is admittedly very troublesome for occasional use, since it does not keep well when wet. Lepetit (*Chemische Industrie*, 26, 221 (1903)) found that sodium sulphites added to Quebracho extract, caused much of the sulphur to combine with the organic constituents, so that the addition of acids to the extract did not liberate sulphur dioxide; the sulphites had a modifying action on the tinctorial properties of the extract. Fahrion (*Ztschr. angew. Chem.*, 16, 665 (1903)), from a study of the various tanning processes, concludes that leather is to be considered as a salt, in which the hide plays the part of either an acid or a base; there must, however, be some oxidation of the hide in the tanning process, if good leather is to be made. Lamb (*J. Soc. Dyers and Colourists*, 1903, p. 251) finds that formic acid can be used in leather dyeing up to the maximum coloring effect, without danger of injuring the goods; it is better than sulphuric acid with certain dyes, but for removing iron stains the latter is more effective. Wood (*J. Soc. Chem. Ind.*, 1903, p. 1234) has reviewed the recent changes in the tanning industry; the use of titanium salts instead of chrome salts, and "formalin" has been taken up by some tanners, as also the Payne and Pullman indirect liming process, in which the hide is soaked in calcium chloride, and then passed into caustic soda, by which calcium hydroxide is produced among the fibers of the skin; but the hair is not loosened unless some bacterial action has begun in the preliminary soaks. Formic acid may also replace sulphuric acid to some extent in the tannery; extraction processes with naphtha are in use for removing grease from the skins. Koerner has published recent papers supporting the physical view of the tanning process, while Fahrion (see above) supports the chemical theory.

REVIEW.

HIGH SCHOOL CHEMISTRY IN ITS RELATION TO THE WORK OF A COLLEGE COURSE. By RUFUS P. WILLIAMS. A paper read before the National Educational Association at its Boston Meeting and published in *Science*, Vol. 18, pp. 330-336.

Inquiries sent by the author of the paper to twenty-three col-

leges have shown that almost all of them require students who have had elementary chemistry in the high school to repeat the subject in college, and that the main objections to the school course are, that too much ground is covered so that the work done is not thorough, that it imparts a knowledge of facts rather than general principles, and that reasoning power is not developed. In view of these facts, the author urges close and detailed co-operation between college professors and school-teachers, so as to avoid a repetition of the school work in the college course, and emphasizes the paramount importance of teaching more fully general principles and theory. He also makes the specific suggestions either that colleges require as preparation a high school course of five hours a week for not less than two years in a well-equipped laboratory, and then give the student advanced standing in chemistry; or better, that the high school work extend through only one year, and be confined to a thorough study of the non-metals (including salt-formation) and of chemical laws and theories.

The reviewer cannot unconditionally endorse the author's opinion that secondary school instruction in chemistry is defective largely through lack of emphasis on general principles and theories; for whether the more extensive introduction of these will be advantageous or harmful will depend on the manner in which they are presented and utilized. For this reason the forcing of instruction in them by college entrance requirements, and even the abstract urging of teachers to include them in their courses, is likely to be attended by unfortunate results. It is undoubtedly true that there is need of greater correlation of the isolated facts presented to the pupil, and that many opportunities are neglected of broadening his knowledge by laying stress on the general significance of the phenomena he observes; but these defects will not be remedied by an abstract or detached consideration of general principles and theories. Laws should be presented only after the pupil has been made familiar by laboratory work with the phenomena which they generalize; and theories should be introduced only in intimate connection with the experimental work of the student, and only in case they can be shown to be a substantial help in interpreting the specific facts already known or soon to be made known to him. A theory included for its own sake and without abundant applications to exemplify it, has no appro-

appropriate place in either a high-school or elementary college course of instruction; yet existing text-books give sufficient evidence that this is likely to be the way in which theories will be presented, if forced into an already overcrowded elementary course.

There is also a great danger of overappreciating the real value to a person with limited chemical knowledge of even those laws and theories which are fundamentally important from the point of view of the developed science; thus, at the conclusion of the high-school course the student will be much better equipped for his future study or for his work in life, if the knowledge he has acquired is that of the elementary composition of chemical substances and the quantitative laws pertaining to it, of the properties of acids, bases, and salts, and of the metallic and non-metallic elements, of the constitution of the atmosphere and the functions of its components, of the concrete character of processes like combustion, neutralization, and solution, and of many other such classes of facts, than if he has a familiarity, necessarily imperfect and therefore unutilizable, with Avogadro's Principle, the valence and structure theories, the quantitative expression of the Mass-Action Law, the molecular properties of solutions, and the physical conceptions underlying the Ionic Theory.

The reviewer does not, however, mean by this statement to imply that these theories and principles cannot be advantageously introduced by a teacher who understands how to make them a help in the interpretation of the facts studied by the pupil rather than additional subjects to be mastered; but he wishes to emphasize the idea that, from the point of view of elementary education, they are not of primary importance, and that they are to be used only as aids in acquiring knowledge and in awakening interest.

The main aim of the high school course should be, first, to give the pupil a concrete knowledge of the properties and behavior of the important chemical substances and of the character of the fundamental chemical processes; and secondly, and this is still more essential, to train him in scientific method—to experiment carefully, to observe accurately, to draw the logical inferences, to correlate new phenomena with those of his previous experience, to imagine possible explanations of them and ways of testing these, and to solve new problems of a suitable degree of simplicity,

whereby his interest and originality may be developed. The teaching of generalizations remote from the pupil's experience and of theories without immediate applicability to his store of knowledge must not be allowed to consume the time needed for a thorough training in the directions just mentioned.

To the author's plea for closer coördination between the chemical instruction in colleges and that in high schools, and to his contention that the attempt is made to cover too much ground in the course of the latter, the most cordial endorsement may be given.

A. A. NOYES.

NEW BOOKS.

PRAKTISCHE ÜBUNGEN ZUR EINFÜHRUNG IN DIE CHEMIE. VON DR. ALEXANDER SMITH. Nach einer vom Verfasser besorgten Umarbeitung der zweiten amerikanischen Auflage ins deutsche Übertragen von PROF. DR. F. HABER und DR. M. STOECKER. Karlsruhe. Druck und Verlag der G. Braunschen Hofbuchdruckerei.

This excellent laboratory manual, which is well known in this country, has been distinguished by translation into German. The translators in their preface point out that experimental courses for beginners, of a character outlined in this manual, are but little used in Germany, and that in this particular respect chemistry is much better developed on the didactic side in America than elsewhere. Among the many laboratory manuals in America, one more suitable for the introduction of work of this kind in Germany could scarcely be found.

W. A. N.

By an oversight, the publishers of "Sugar Cane in Egypt," which was reviewed in the December number, were not mentioned. The book is published in the offices of "Sugar Cane," Altringham, England.