

and upon the application of thermodynamics, especially of the Carnot-Clausius principle, to chemical problems. The theory of solutions and the dissociation theory of Arrhenius receive consideration in the first and third groups of the lectures, which give a good brief presentation of the theories and what is claimed for them, without, however, even suggesting that there are now many facts known that do not support these hypotheses. Concrete illustrations are given throughout the entire discourses, which are of the character of general outlines. The brief, concise presentation of the author's splendid researches on natural salt deposits is especially interesting and instructive, particularly so because the work was accomplished without the aid of the theory of solutions and the Arrhenius hypothesis. On the part of those readers who do not have an elementary knowledge of physical chemistry, these lectures will require careful study in order to be fully comprehended.

LOUIS KAHLBERG.

**THE CHEMISTRY OF THE TERPENES.** By DR. F. HEUSLER, Privat-docent of Chemistry in the University at Bonn. Authorized translation by DR. FRANCIS J. POND, Assistant Professor in the Pennsylvania State College. One vol., 457 pp. Carefully revised, enlarged, and corrected. Philadelphia : P. Blakiston's Son and Co. 1902. Price, \$4.00.

The word terpene seems first to have been used by Kekulé. Such words as terebentene, terebene, terpilene, etc., were coined by French chemists to designate the hydrocarbon now known as pinene and its isomers into which it could be converted, *e. g.*, by heat or acids. Some of these terms acquired a generic as well as a specific meaning. The advantage of a word without a double meaning must have been apparent when Kekulé suggested the word terpene, for it soon came into general use.

However, since Baeyer extended the principles of the Geneva Congress nomenclature to the terminology of the terpenes, the word terpene has also acquired a double meaning. On the one hand it is still used in its larger sense comprising all hydrocarbons  $C_{10}H_{16}$ ; on the other, its use has been specialized, restricting it to those hydrocarbons  $C_{10}H_{18}$  which are tetrahydro-derivatives of cymene. It is in the former, broader sense in which the term is used in the book before us.

Although substances containing all the way from one to twenty

and possibly more carbon atoms have been found in volatile oils, it is nevertheless remarkable that a large number of volatile plant substances are characterized by ten carbon atoms or a multiple thereof. Whatever significance may attach to this number, this much is true, that the "terpenes and camphors" have always received a larger share of attention than other volatile plant substances.

The secret of this seems to lie in the fact that the terpenes proper and their derivatives occupy places in that enormous field between the series of hydrocarbons and their derivatives belonging to the formula of saturation  $C_nH_{2n+2}$  on the one hand and the formula of saturation  $C_nH_{2n-6}$  on the other. The study of the terpenes and their derivatives has done fully as much as any one other subject, if not more, to make this vast *terra incognita* of a few decades ago better known. Incidentally these researches have thrown much new light on phyto-chemistry and the manufacture of volatile oils and of perfumes.

The arrangement of the book is that of the German original. The English edition, however, has been made much more valuable by the incorporation of the vast number of facts published since the appearance of Dr. Heusler's monograph. The number of terpenes described is twenty-two, the number of sesquiterpenes, fourteen.

The number of alcohols, ketones, amino derivatives, etc., has increased proportionately. To the same degree to which Dr. Heusler's monograph was indispensable to the investigator five years ago, to the same extent, and even more so, will Dr. Pond's larger work be indispensable to-day. Moreover, it will prove more satisfactory, for the type is larger, the page is better arranged, the references are more handy, and the book is provided with an index. Thus, while Heusler's work was indispensable to the specialist, the English work will prove useful also as a reference work to the non-specialist.

EDWARD KREMERS.

HANDBOOK OF TECHNICAL GAS ANALYSIS. BY CLEMENS WINKLER.

Translated from the third greatly enlarged German edition by GEORG LUNGE. London: Gurney and Jackson. 1902. 190 pp.

This book is more than the title indicates as it gives Professor Lunge's description of his own apparatus and in many cases his