

to give the subject-matter of a series of lectures in a course of assaying. Every other leaf is blank for the purpose of making notes by the student. It contains nothing new, and the presentation of the subject is not always satisfactory, and sometimes misleading; for instance, on page 7 the very inaccurate method of Berthier is given "to obtain the heating power of coal," and on page 8 the author says, "clay may be recognized by stirring the finely powdered ore in water."

In the formulae for fire-assaying for gold and silver the quantity of ore to be used, in every case, is given in even numbers of grams, instead of so many assay tons or fractions thereof, as is now universally the practice, so that while this outline may be suggestive to those teaching the subject there seems nothing about it which particularly commands commendation. WM. HOSKINS.

THE CHEMICAL SYNTHESIS OF VITAL PRODUCTS, AND THE INTER-RELATIONS BETWEEN ORGANIC COMPOUNDS. BY RAPHAEL MELDOLA, F.R.S., V.P.C.S., F.I.C., etc., of the City and Guilds of London Technical College, Finsbury, etc. Volume I, Super Royal, 8vo. pp. xvi + 338. London: Edward Arnold. 1904. Price, \$6.00 net; by mail, \$6.22.

CONTENTS: Introductory. I, Historical. II, Nature of the Compounds Registered as Vital Products. III, Organic Chemistry from the Biocentric Standpoint. IV, Chemical Synthesis from the Biocentric Standpoint. V, Advantages of the Biocentric Treatment of Synthetical Chemistry. Hydrocarbons. Alcohols and Terpene Alcohols. Ketone Alcohols. Glycols and Polyhydric Alcohols. Aromatic Alcohols and Phenols. Aldehydes and Ketones: Fatty Group. Aromatic Aldehydes and Ketones. Carbohydrates and Glucosides. Sulphur Compounds. Cyanogen Compounds. Appendix: Camphor and Terpene Group; Flavone Group.

This work, upon which the author has been engaged for the past nine years, is a compilation of all those products of vital activity, which have been prepared synthetically. The natural sources and methods of synthesis are fully set forth, and, as the methods are given by which the generators of these vital products are obtained, the syntheses are in every case complete.

The author recognizes as "vital products" those "compounds of definite chemical composition which are known to be produced as the result of the vital activities of animals and plants, including micro-organisms," and the term "synthesis" is used to indicate both up-grade and down-grade processes. Reactions and schematic representations are omitted, to make the work more compact, but the arrangement of the substances is such that their genetic relations appear very clearly.

It is essentially a reference work, not merely a catalogue of synthetic products and processes, nor a laboratory guide for the preparation of organic compounds, nor is it, in any sense, a critical treatise. On examining its pages, the organic chemist will be surprised to see how many carbon compounds may properly be classed as vital products, 181 being described in the present volume, and the physiologist will be impressed by the number of vital products which have been synthesized by the chemist.

The author calls attention to the many points of interest brought out by this biocentric treatment of carbon compounds. Thus, while it is quite true that we can produce in the laboratory substances identical with those formed in the living organism, in the majority of cases we cannot maintain that the syntheses are identical in their mechanism, and those who would 'explain' the biochemical processes by a simple chemical equation should bear in mind the fact that "the sign connecting the two sides of the equation stands for the whole unexplored region of biochemical transmutations." We lack exact knowledge of the nature of the synthetic processes going on in the living organism, and there is little reason for believing that they have much analogy with our laboratory methods. In fact, we cannot duplicate in the laboratory the most fundamental of all these syntheses—the photosynthesis accomplished by plants, in which carbon dioxide is absorbed by an organic compound, and the product decomposed with liberation of oxygen. While the author does not at all intend to array himself on the side of the Vitalists, he concludes, from the summary of experimental results recorded in this book, that "the testimony of pure chemistry cannot, as it stands at present, be legitimately interpreted into a direct negation of Vitalism in any form. This negation may, and probably will, be made possible in the future, when our chemical methods have been made to approximate more closely to the vital methods."

Although many definite vital products have been isolated, identified, and synthesized in the laboratory, the manner in which these compounds are produced in the organism can hardly yet be said to have been satisfactorily traced in any single instance. Such a problem is for the physiologist to solve rather than the chemist, but the best results in investigations of this character would naturally be secured by the two working together, and the

author expresses the hope that his book may lead to some such co-operation.

A fact of historical importance, and one which has generally been overlooked by the authors of text-books and reference works is prominently set forth here, with the necessary documentary proof. This is that the Englishman Hennell synthesized alcohol from ethylene at about the same time that Wöhler prepared urea from ammonium isocyanate. Although Berthelot has disputed Hennell's claim, the evidence cited seems to show quite clearly that Hennell prepared alcohol synthetically several years before Berthelot.

The subject-matter is arranged on the page in double columns, and after every compound are given (a) Natural Sources and (b) Synthetical Processes. The references to the literature are complete up to the close of 1902, and the Index is very extensive. A second volume will complete the work. It should prove a very valuable compilation for all organic and physiological chemists:

MARSTON T. BOGERT.

THE CHEMISTRY OF GAS MANUFACTURE. BY W. J. A. BUTTERFIELD. Third Edition. Vol. I. 1904. 257 pp. Illustrated. London: Griffin; Philadelphia: Lippincott. Price, \$2.50.

This is the best of the smaller works on the subject of gas manufacture. The first edition appeared as a single volume in 1896.

The present volume treats of Materials and Processes, while the second will discuss Gas Analysis, Photometry, Calorimetry, and the Uses of Gas. In the chapter on raw materials the author describes the various substances used, and also gives some good methods for their valuation.

Coal-gas and its purification come in for nearly one-half of the volume, following which is a short chapter on water-gas and another on oil-gas.

Experience in a country where carburetted water-gas is more generally distributed than it is in England would lead the author to modify the statement that "the danger of accidental poisoning from carburetted water-gas is virtually confined to the works where it is made."

The book is well printed, and while it was intended primarily for the gas works laboratory, it will be found a useful addition to the library of every chemist.

E. G. LOVE.