

Allyl-type esters of β -keto acids may be represented as rearranging through chelated enol forms.¹ It may be significant that in these cases in which enol forms exist either not at all or to a very small extent, the rearrangement does not proceed smoothly. The results could also be interpreted as resulting from weaker activation of the central methylene group by CN and COOR groups than by COR groups.

Carroll has heated ethyl malonate with allyl, crotyl and cinnamyl alcohols and phenylvinylcarbinol, in the

(1) Kimel and Cope, *THIS JOURNAL*, **65**, 1992 (1943).

presence of a small amount of sodium acetate, and observed that unsaturated acids are formed when the reaction mixtures are saponified.²

We are indebted to Mr. Saul Gottlieb for microanalyses.

(2) Carroll, *J. Chem. Soc.*, 507 (1941). See ref. 1 concerning the relation of Carroll's work to this investigation.

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NEW BOOK

Lectures on the Inorganic Nutrition of Plants. (Prather Lectures at Harvard University.) By D. R. HOAGLAND, Professor of Plant Nutrition, University of California. The Chronica Botanica Co., Waltham, Mass.; G. E. Stechert and Co., 31 East 10th Street, New York, N. Y., 1944. 226 pp. Illustrated, 15.5 × 23.5 cm. Price, \$4.00.

The seven lectures included in this volume comprise five Prather Lectures delivered at Harvard University and two supplementary lectures on allied topics. The introductory lecture deals with the main problems of plant nutrition, and with the trends of present-day research upon the relationship between the plant and the soil in which it normally grows. In the second lecture, the so-called micronutrient elements are considered. These include the ions of copper, zinc, manganese, boron, and possibly molybdenum, now fairly generally recognized as being essential, although only in minute amounts, for plant nutrition. Particular attention is devoted to zinc.

In the third lecture the absorption and accumulation of salts by plants is described with especial emphasis on the intimate relationship of these processes to the metabolism of the cells of the root tissue; in the fourth, the movement of inorganic ions within the plant, again with emphasis upon the essential share taken by the metabolism of the living cells. The fifth lecture describes the conditions that have been found to be necessary for the successful growth of plants in artificial culture media.

In the first of the two supplementary lectures, various problems having to do with the chemical composition of plant tissues, and with current hypotheses that have been advanced to account for the behavior of some of the more important components, are discussed, while the last lecture deals with the fundamentally important but little understood question of potassium nutrition in plants.

The numerous experiments mentioned are comprehensively illustrated by text figures and plates. Much of the material is derived from the wide experience of the Berkeley group, and, as might be anticipated, full advantage has been taken of the unique opportunities at the University of California for the use of radioactive isotopes to detect and follow the behavior of individual inorganic ions in plants. Although brief and, for the most part, non-

technical, the treatment is stimulating and suggestive, and great stress is laid upon the fact that our present-day knowledge is far from satisfactory and by no means comprehensive. To quote the distinguished author: "Plant nutrition is not of itself a science. Its study rests on the application of other sciences to a vastly complex system. Progress is slow and laborious. There does not usually exist the possibility of setting down in the precise and elegant terms of the physical scientist the course of events in the growing plant."

Students of the plant sciences and biochemists in general have reason to be grateful for this concise summary of the work of Professor Hoagland and his associates, and it is to be hoped that it may serve to attract attention to the innumerable problems awaiting solution and description in the "precise terms of the physical scientist."

H. B. VICKERY

BOOKS RECEIVED

July 10, 1944–August 10, 1944

JEROME ALEXANDER, Editor. "Colloid Chemistry, Theoretical and Applied." Volume V. Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y. 1256 pp. \$20.00.

LOUIS F. FIESER and MARY FIESER. "Organic Chemistry." D. C. Heath and Company, 285 Columbus Avenue, Boston, Mass. 1112 pp. \$8.00 (College edition, \$6.00).

SAMUEL GLASSTONE. "Theoretical Chemistry." D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 515 pp. \$5.00.

PASCUAL JORDAN. "Physics of the 20th Century." Philosophical Library, Inc., 15 East 40th Street, New York (16), N. Y. 185 pp. \$4.00.

F. F. NORD and C. H. WERKMAN, Editors. "Advances in Enzymology." Volume IV. Interscience Publishers, Inc., 215 Fourth Avenue, New York (3), N. Y. 332 pp. \$5.50.