MANGANESE AND VITAMIN C

APPARENTLY a number of factors influence the ascorbic acid content of tomatoes. Kohman and Porter[1] showed that the ascorbic acid content of young tomato plants was increased by solar rays. Again it was demonstrated that potash fertilization[2] influenced the amount found in the ripe fruit and that this roughly correlated with the sugar content. Further, it was shown[3] that tomatoes grown upon certain soil types had a larger ascorbic acid content than tomatoes grown on other soil types.

In a discussion of this problem with Dr. E. F. Kohman it was suggested that manganese might be an influencing factor. Since the available manganese is known to vary in many soils, a survey of this problem was undertaken in 1939–40. The ascorbic acid content of the fruit from plants grown on twelve soils known to be low in available manganese averaged 200 milligrams per liter of pulp, whereas samples from twelve soils known to be higher in available manganese analyzed 269 milligrams.

In pot culture the application of 1 gram of $MnSO_4 \cdot 4\ H_2O$, in a localized area, to 15,000 grams of Sassafras sandy loam soil, testing pH 7.1, increased the ascorbic acid content in tomato pulp from 142 to 243 milligrams per liter. This is by no means all the information that leads us to believe that manganese is a factor in ascorbic acid formation but will serve to illustrate the point.

Since over a few pounds of soluble manganese per acre in the soil is known to be toxic to tomato plants, much work must be done to establish the optimum quantity, the proper method of application and the soil types requiring it. This problem is being investigated further, but owing to the nature of the problem it is reported at this time.

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CRYSTALLINE INSULIN DERIVATIVES

A NUMBER of various derivatives of insulin have been prepared, and attempts were made to obtain some of them in crystalline form, but without success.[1] We have recently described elsewhere[2] the preparation and physiological activity of several azo derivatives of insulin. Two of these derivatives, insulin-p-azophenylsulfonic acid and insulin-p-azobenzyltrimethylammonium chloride yielded perfectly shaped rhombohedral yellow crystals when not more than six groups were coupled to a single insulin molecule (mol. wt. taken to be 40,000). With insulin-p-azophenylsulfonic acids containing ten and fifteen groups only deformed ellipsoid shaped crystals were obtained, while attempts to crystallize insulin-p-azobenzyltrimethylammonium chloride containing fifteen groups failed. This suggests that in addition to the number of groups, there are other factors which affect the crystallization of such derivatives.

It is of interest that heavy atoms easily traced by x-ray analysis could be introduced by this method into the insulin molecule. Such compounds might be helpful in the x-ray analysis of insulin crystals. With this in view we prepared insulin-p-azoiodobenzene and insulin-p-azophenylarsonic acid in crystalline form.

The crystallization was carried out as suggested by Scott.[3] Most of the crystals obtained had edges of about 0.05 mm, although there were present a considerable number of very small crystals. A large amount of material remained amorphous and our yields were low. In several instances the crystals were tested for physiological activity and it could be demonstrated that the insulin action was maintained essentially to the same extent as it was in the amorphous insulin azo derivatives.[2]

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SCIENTIFIC BOOKS

ENGINEERING

Stress Analysis and Design of Elementary Structures. By JAMES H. CISSEL, professor of structural engineering, University of Michigan. x + 335 pp. Illustrated. New York: John Wiley and Sons, Inc. 1940. $4.00.

AN engineer engaged in general practice will find this book a valuable reference work with regard to branches of civil engineering other than the one with which he may have special familiarity. It frankly does not go far enough to meet the specialist's needs in any one field, but it is truly unusual to find within the covers of a single 335-page volume so much of practical utility in each of the various fields of structural steel, both riveted and welded, timber construction, reinforced concrete, masonry and foundations.

Many formulas of importance are given and, while economy of space has not permitted their derivation, footnote references enable one to find their source

[1] E. F. Kohman and D. R. Porter, SCIENCE, 92: 561, 1940.
[2] J. B. Hester, *Amer. Fert.*, 93, November, 1940.
[3] J. B. Hester, *Proc. Soil Sci. Soc. America*, 1940.

[1] C. R. Harington and A. Neuberger, *Biochem. Jour.*, 30: 809, 1936; R. F. Clutton, C. R. Harington and M. E. Yuill, *ibid.*, 32: 1111, 1938.
[2] L. Reiner and E. H. Lang, *Jour. Biol. Chem.*, in press.
[3] D. A. Scott, U. S. Pat. No. 2,143,590, January 10, 1939.

when necessary. While this procedure is not objectionable for the practicing engineer to whom the further references frequently mean merely a refreshing of his memory in the matters concerned, it is not considered a wise practice for the student, and therefore the value of the book for classroom work is open to question. The student should always be cautioned against accepting and using formulas of whose validity he has not personally assured himself, and it is too much to expect him continually to refer to the indicated sources in which demonstrations may be found.

The book contains an excellent body of fundamental material covering principles of statics and stress analysis with much up-to-date information regarding dead and live loads, wind forces, earthquake forces and lateral pressures on walls for guidance in the preparation or checking of designs. It is a little unfortunate that in expressing the Theorem of Three Moments, equation (76), the author did not follow the procedure employed by Timoshenko and McCullough, to whose book he refers in a footnote. If the concentrated loads in the two spans are located by their respective distances from the nearer end support, the result is a much simplified expression. Strangely enough, however, most writers upon this subject have followed the same procedure as the author.

The design section of the book is more complete in the fields of timber and reinforced concrete than in that of structural steel. With the exception of the plate girder, very little attention is given to the design of steel members. Perhaps this is well. The steel specialist frequently needs to inform himself regarding details of timber construction, but the timber specialist would probably be wise not to attempt the design of steel structures because of the highly developed technical practice involved.

The material covered is carefully and attractively presented and has been selected with wise discrimination in view of its necessarily abbreviated character. The book is to be highly recommended for a place convenient of access upon the shelf of the practicing engineer.

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EMBRYOLOGY OF AN ECHIUROID WORM

The Embryology of the Echiuroid Worm Urechis caupo. By W. W. NEWBY. 219 pp. American Philosophical Society, Memoir XVI. $2.00.

THIS memoir deals with the development of an echiuroid worm from the time of fertilization until the larva undergoes its metamorphosis and assumes the adult form. It is one of the most complete and accurate studies which has been made in the case of any invertebrate. Furthermore, the clearness of style, the accuracy of the illustrations and the lack of bias in the evaluation of the work of others and in the formulation of general conclusions places this study on a high plane indeed.

The work comprises ten main sections of which six are concerned primarily with the problem of development. The first of these is a running account of the changes which ensue from the stage of fertilization to the assumption of the adult form. In this process the history of each cell is accurately traced to the 148 cell stage, which marks the beginning of gastrulation. Beyond this point there is a detailed description of the various body regions, their ciliation and the shifting of the embryonic areas and axes. There likewise is a complete account of the series of changes which transform the archenteron into the complicated digestive system of the adult. The ecto- and entomesoblast also are traced from their point of origin to where, in certain cases, they have attained their final form. In this connection it is demonstrated that the term "larval mesenchyme" is a misnomer. At no stage have its cells been found to degenerate, and, on the other hand, there are numerous instances, where, as functional muscle fibers, they extend from the esophagus and stomach to the body wall.

The development of the nervous system and entomesoblast involves the problem of the extent to which metameric segmentation exists in the echiuroids. The brain and ventral cord develop as in annelids, and after their union the cord develops twelve enlargements, which correspond to an equal number of rows of ectodermal glands. These enlargements or "segments" later subdivide irregularly to form from two to three secondary subdivisions. During this process the entomesoblasts have formed a pair of coelomic cavities whose subsequent fusion results in the single cavity of the adult. At no stage is there any indication of metamerism of the coelom or of any other structure of entomesoblastic origin. In other words, this is a case of pseudometamerism of the same general type as the duplication of the shell plates of chitons.

In the concluding sections the author reviews the developmental history of the flatworms, annelids, mollusks and echiuroids. All these are characterized by the spiral type of cleavage, all pass through a trochophore stage, and conceivably, therefore, all may be the descendants of an ancestral trochozoon. These fundamental resemblances, however, are largely obscured by later evolutionary changes which are of phyletic rank in all but the echiuroids. The author is convinced that this last-named group likewise is entitled to rank as a distinct phylum.

While this study will be of the highest value to the systematist and the student of normal development, it also will serve, to an equal degree, the needs of the experimentalist. Urechis, at all stages of growth, is