ABSORPTION OF WATER BY PLANTS AND THE FORCES INVOLVED

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The water relations of plants have long been recognized as of very great importance, and as a consequence, much attention has been given to them. In the very beginnings of experimental plant physiology after the Renaissance it was mainly water relations that were studied. The early experiments of Van Helmont (33), of Woodward (37), and of Hales (9) all centered about the intake and utilization of water by plants. Hales spent ten years in active investigation of absorption, sap pressure, sap rise, and the elimination of water from the leaves of plants. Two centuries have gone by. We have made great strides in our analyses of the problems, and the actual gain in knowledge has been considerable. Nevertheless, we are still deeply concerned with these fundamental life conditions and processes, in some phases baffled by their complexity, in others quite uncertain as to the correctness of our interpretations of the observed phenomena. New modes of attack are being sought, and new points of view brought forward. Some of the most widely accepted interpretations of root behavior are being challenged, and it is therefore necessary to keep our minds open to the flux of new ideas in this field.

In discussing the intake of water by the roots of plants, I am sensible of the fact that absorption is the final consequence of the disturbance of water equilibrium within the tissues of the organism. It would be more logical, therefore, to consider these features of the water relations in the final rather than in the opening section of this symposium. The development of a saturation deficit and its transmission from leaves to roots has been discussed more fully in an earlier paper (28), and will not be considered here. It will be assumed from the beginning that the water deficit already exists in the root

1Presented as part of a symposium on the "Water Relations of Plants" at the annual meeting of the Society held in Chicago, Ill., November 18, 1927. The symposia papers were never assembled for publication, and this paper is published at this time following requests from various sources that the material presented herein be made available in this form. The other papers presented at the symposium were as follows: "Cell Concentration in Relation to Absorption and Transpiration," by J. Arthur Harris; "Water in Growth and Activity," Charles F. Hottes; and "The Relation of Transpiration Loss to Atmospheric Conditions," by H. L. Shantz.

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3Reference by number is to "Literature Cited," p. 469.