This Week's Citation Classic

Keegstra K, Talmadge K W, Bauer W D & Albersheim P. The structure of plant cell walls. III. A model of the walls of suspension-cultured sycamore cells based on the interconnections of the macromolecular components. *Plant Physiol.* **51**:188-96, 1973. [Dept. Chemistry, Univ. Colorado, Boulder, CO]

The primary wall of higher plant cells contains several kinds of polysaccharides. These had been viewed as an amorphous matrix around the plant cell. In this paper a new model was presented which depicted the wall in a more ordered arrangement with covalent connections between the various polymers. [The *SCI*® indicates that this paper has been cited over 145 times since 1973.]

Kenneth Keegstra
Department of Botany
University of Wisconsin
Madison, WI 53706

December 24, 1980

"The primary wall of young, growing plant cells has often been considered an amorphous mixture of polysaccharides, with no particular arrangement of the various components. When one considers the postulated functions of the cell wall, for example, controlled wall loosening to allow elongation growth, then this view of the wall seems inadequate. During the late 1960s, when Dietz Bauer, Ken Talmadge, and myself were graduate students with Albersheim at the University of Colorado, we had many interesting discussions about these and other aspects of wall structure. Albersheim was interested in many aspects of plant cell walls including their structure, synthesis, and function. But we all felt that understanding the structure of the cell wall was basic to advances in the other areas. Thus we initiated a series of studies aimed at increasing our knowledge of wall structure. Our thinking was greatly influenced by the advances which were being made in understanding bacterial cell wall structure. In particular, we were influenced by the role which bacteriolytic enzymes had played in determining bacterial wall structure,[1] since this approach seemed the most directly transferable to studies on plant cell walls.

"During the next three years a concerted effort was made to apply a similar approach to plant cell walls. Purified degradative enzymes were used to solubilize wall material. The solubilized material was purified and the structure of each component was studied. The results of these efforts were presented in a series of three manuscripts.[2]-[3] The third paper in this series, which is the cause for this essay, included a summary of our results in the form of a working model. It proposed very specific connections between the various polysaccharide components of the wall, viewing the wall as having a discrete organization rather than the amorphous mixture imagined before. I suspect the inclusion of this model is the reason that this paper has been highly cited.

"In the years since this publication, new studies have provided additional information about plant cell walls. Some of the new information supports our working model while some does not. For example, it has become clear that this model is not directly applicable to walls of monocotyledonous plants. However, our purpose in proposing the model was not to present a definitive picture of wall structure, but rather to allow the interpretation of existing data and to stimulate ideas for further work. The naming of this manuscript as a *Citation Classic* suggests that we were at least partially successful in this effort."

1. **Ghuysen J M.** Use of bacteriolytic enzymes in determination of wall structure and their role in cell metabolism. *Bacteriol. Rev.* **32**:425-64, 1968.
2. **Talmadge K W, Keegstra K, Bauer W D & Albersheim P.** The structure of plant cell walls. I. The macromolecular components of the walls of suspension-cultured sycamore cells with a detailed analysis of the peptic polysaccharides. *Plant Physiol.* **51**:158-73, 1973.
3. **Bauer W D, Talmadge K W, Keegstra K & Albersheim P.** The structure of plant cell walls. II. The hemicellulose of the walls of suspension-cultured sycamore cells. *Plant Physiol.* **51**:174-87, 1973.