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This Week's Citation Classic

Frederick S E, Newcomb E H, Vigil E L & Wergin W P. Fine-structural characterization of plant microbodies. Planta 81:229-52, 1968. [Department of Botany, University of Wisconsin, Madison, WI]

This paper describes structural details of plant microbodies in glutaraldehyde-osmium tetroxide-fixed cells, examines their relationship to similar structures reported in the literature, and speculates on their possible functions. [The *SCI*® indicates that this paper has been cited over 125 times since 1968.]

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"The fine structure of plant microbodies, the last major plant organelle to be characterized, became my research interest during my first year of graduate studies, in the laboratory of Professor Eldon Newcomb at the University of Wisconsin. When I entered his laboratory in the fall of 1966, the term 'plant microbody' was about to appear for the first time in the literature, in a paper by Mollenhauer et al.[1] This important article introduced the idea that plant cells contain organelles morphologically similar to animal microbodies, whose biochemical properties and peroxisomal nature (in liver, kidney, and some protozoa) were just becoming apparent. In addition, the paper also presented an impressive list of plant cell types in which such structures could be observed, together with electron micrographs, mostly of material fixed in potassium permanganate.

"Virtually nothing was known at this time about the function of this widespread and structurally discrete class of organelles. Furthermore, many questions remained concerning their structural details, ontogeny, and relationship to organelles previously described in both electron and light microscopic literature. Almost my first week in graduate school (before I knew from which end of an electron microscope the beam originated!) I began searching through the hundreds of electrons micrographs already in the lab files,to see what new structural information might be uncovered. At the same time, I began my own fine structural and the more formidable task of searching the literature, which at that point was hopelessly confusing both as regarded terminology of organelles with this general structure and speculations about their functions. A major contributor to the confusion was the frequent attempt to equate the microbody type of organelle to animal lysosomes, in some cases on the basis of extrapolation of histochemicai staining at the light microscope level to electron microscopic observations.

"Dr. Newcomb and I felt that a paper which: a) described in more detail the fine structure of microbodies in glutaraldehyde-fixed cells and b) addressed some of the confusion regarding their terminology, might help focus attention on their probable importance and their possible functional similiarties to animal microbodies (peroxisomes). This paper, written the following year, made use of micrographs and observations from everyone in the laboratory, especially Gene Vigil, a postdoctoral fellow who had just joined the group, and Bill Wergin, a fellow graduate student. In retrospect, our perception of the usefulness of such a paper to plant physiologists and cell biologists seems to have been accurate. Its frequent citation no doubt derives in part from the interest generated in plant microbodies by reports, at about the same time, of their isolation from leaves[2] and from fatly endosperm and cotyledons.[3] These papers made clear that microbodies do, in fact carry out unique and important metabolic functions."

1. **Mollenhauer H H, Morre D J & Kelley A G.** The widespread occurrence of plant cytosomes resembling animal microbodies. Protoplasma **62:**44-52. 1966.
2. **Tolbert N E, Oeser A, Kisaki T, Hageman R H & Yamazaki R K.** Peroxisomes from spinach leaves containing enzyme:; related to glycolate metabolism. J. Biol. Chem. **243:** 5179-84. 1968.
3. **Breidenbach R W & Beevers H.** Association of the glyoxylate cycle enzymes in a novel subcellular particle from caslor bean endosperm. *Biochem. Biophys. Res. Commun.* **27:**462-9,1967.