Electron Tomography of Plant Organelles and the Outlook for Correlative Microscopic Approaches

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Structural analyses of organelles and localization of proteins in their confines are essential to investigate the inner workings of eukaryotic cells. Electron tomography (ET) is a three- dimensional electron microscopy method with which we can extract sliced views of organelles from any direction and quantify their structural parameters at nanometer-level resolution. This advanced electron microscopy tool is suited for the characterization of convoluted membrane compartments and of cellular constituents of dimensions smaller than 100 nm, such as vesicles and cytoskeleton elements. ET studies of plant cells fixed by rapid freezing have expanded our understanding of the biogenesis and functions of plant organelles. Correlative light and electron microscopy combines the merits of the two microscopy modes to decipher functional information about sub-cellular entities. Here we describe how the molecular imaging capacity of correlative light and electron microscopy can be integrated with ET in studies of plant organelles.