

**CALIBRATED OPTICAL TWEEZERS INTEGRATED IN A CONFOCAL
MICROSCOPE: A TOOL TO STUDY INTRACELLULAR ORGANIZATION OF
PLANT CELLS**

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ABSTRACT: Optical trapping is a technique that uses the radiation pressure of a focused laser beam to capture micron sized particles with high refractive index. We have integrated optical tweezers, an infra-red laser beam, in a Confocal Laser Scanning Microscope. This allows simultaneous optical trapping and confocal imaging. In addition, we have calibrated the optical tweezers with a quadrant photo detector (QPD), which detects the exact position of a particle within the optical trap with an accuracy of ~10 nm. Displacements from the centre of the trap can be converted to a direct force measurement.

Here, we will present the set-up of this system and examples of applications of this microscope. We are using the optical tweezers to optically trap organelles, such as mitochondria or spherosomes, in a live plant cell. These organelles can be held in position or can be displaced throughout a cell non-invasively. By slowly displacing an organelle from the cytoplasm to a position in the central vacuole with the optical tweezers, a new strand of cytoplasm is formed that connects the trapped organelle with the cytoplasm from which it originated. In future projects, we will study the cytoskeleton of microtubules and actin filaments in such newly formed transvacuolar strands over time, and physical aspects of this cytoskeleton in existing and optical-tweezers produced strands. The results of such measurements will be compared with stiffness measurements of actin filament and microtubule assemblages *in vitro*.