

Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Taking the Pulse of Plants KAARE H. JENSEN, Technical University of Denmark, SIERRA BEECHER, Washington State University, N. MICHELE HOLBROOK, Harvard University, MICHAEL KNOBLAUCH, Washington State University — Many biological systems use complex networks of vascular conduits to distribute energy over great distances. Examples include sugar transport in the phloem tissue of vascular plants and cytoplasmic streaming in some slime molds. Detailed knowledge of transport patterns in these systems is important for our fundamental understanding of energy distribution during development and for engineering of more efficient crops. Current techniques for quantifying transport in these microfluidic systems, however, only allow for the determination of either the flow speed or the concentration of material. Here we demonstrate a new method, based on confocal microscopy, which allows us to simultaneously determine velocity and solute concentration by tracking the dispersion of a tracer dye. We attempt to rationalize the observed transport patterns through consideration of constrained optimization problems.

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Date submitted: 30 Jul 2014

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