

Abstract Submitted  
for the DFD08 Meeting of  
The American Physical Society

**The microPIVOT: An Integrated Micron Resolution Particle Image Velocimeter and Optical Tweezers Instrument for Microscale Studies<sup>1</sup>**

DEREK TRETHERWAY, NATHALIE NEVE, JEREMIAH ZIMMERMAN, SEAN KOHLES, Dept. of Mechanical and Materials Engineering, Portland State University — An instrument to manipulate and characterize the mechanical environment around microscale objects has been developed by integrating two laser-based techniques: micron-resolution particle image velocimetry (microPIV) and optical tweezers (OT) [Meas. Sci. Technol. 19 (2008) 095403]. The integrated device, the microPIVOT, was validated by comparing computational flow predictions to the measured velocity profile around a trapped particle in either a uniform flow or an imposed, gravity driven microchannel flow. Interaction between both techniques is shown to be negligible for 15 to 35 micron diameter trapped particles subjected to fluid velocities from 50 to 500 microns/s even at the highest laser power. The integrated techniques will provide insight into microscale phenomena including single-cell biomechanics, non-Newtonian fluid mechanics, and single particle or particle-particle hydrodynamics.

<sup>1</sup>Funding provided by NSF MRI CBET-0521637, NIH AREA EB007077, and the Engineering Technology and Industry Council

Derek Tretheway  
Dept. of Mechanical and Materials Engineering, Portland State University

Date submitted: 04 Aug 2008

Electronic form version 1.4