Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Tracking bacterial dynamics in three dimensions[1] MINGMING WU, JOHN ROBERTS, QIAN LIAO, MATTHEW P. DELISA, School of Engineering, Cornell University — As we enter an era of quantitative biology, there is a clear need for innovative quantitative experimental tools to probe cellular dynamics at the micron-scale. We have developed a novel 3D micro DPTV (defocused particle tracking velocimetry) that is able to track multiple micron-scale particles in fluid flow simultaneously. Using this technique, we tracked multiple swimming *Escherichia coli* cells simultaneously and in three dimensions for the first time. Using the tracking data, we obtained a wealth of information about the motion of each individual cell as well as its group behavior. We identified different types of locomotion of swimming *E. coli* as a function of its genetic make-up using well-characterized mutant strains. The diffusion coefficient of the *E. coli* suspension was computed from the tracking data, and was found to be $\sim$200 times larger than that of a non-motile bacterial suspension. The average motor power of each bacteria is estimated to be $\sim 10^{-18}$ Watts. Finally, the role of cell-cell interactions was also explored via the evaluation of a pairwise correlation function.

[1]This work is supported by the National Science Foundation (CTS - 0514443), the Nanobiotechnology Center at Cornell, and The New York State Center for Life Science Enterprise.

Mingming Wu
Sibley School of Mechanical and Aerospace Engineering

Date submitted: 11 Aug 2005 Electronic form version 1.4