Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Enhancing microscale particle deposition using actuated synthetic cilia MATTHEW S. BALLARD, ZACHARY G. MILLS, ALEXANDER ALEXEEV, George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, Georgia 30032 — We use three dimensional simulations to examine deposition of diffusive nanoscopic particles suspended in a viscous fluid onto the walls of a microchannel containing an array of actuated synthetic cilia. We model the cilia as elastic filaments attached to the channel walls and actuated by an external periodic force. We use a lattice Boltzmann model coupled with a lattice spring model to simulate the system and investigate the effects of the oscillating cilia on the rate of particle deposition. We consider the effects of variation of cilia properties and spacing, as well as the frequency and amplitude of the applied force on the deposition of particles with different diffusivity. Our findings are useful in understanding how active microscopic structures can be harnessed to design microfluidic devices and surfaces with controllable transport properties.

Matthew S. Ballard
George W. Woodruff School of Mechanical Engineering,
Georgia Institute of Technology, Atlanta, Georgia 30032

Date submitted: 28 Nov 2012 Electronic form version 1.4