Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Investigation of fluid flow and pumping due to a bacterial flagellum in its various polymorphic forms rotating above a no-slip boundary JAMES MARTINDALE, HENRY FU, University of Nevada - Reno — Recently, the fabrication of magnetically actuated rotating bacterial flagella attached to a planar substrate has been achieved. An array of such flagella may have applications as a microscale pump. In order to understand pumping, velocity, and other flow properties of anchored bacterial flagella rotating above a no-slip plane in the Stokes flow regime, a model of a single flagellar filament under constant torque near a no-slip boundary is considered for various polymorphic forms. The method of regularized Stokeslets, whose code is verified by examining a classical problem, is employed to create a benchmark case which can in turn be used to justify a slender body theory approach that drastically decreases computational cost. We investigate the flow for all 11 polymorphic forms of bacterial flagella, as well as the effect of tilt on several flow metrics for the various polymorphic forms.

James Martindale
University of Nevada - Reno

Date submitted: 24 Jul 2014 Electronic form version 1.4