Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Unsteady swimming of small organisms[1] SHIYAN WANG, AREZOO ARDEKANI, University of Notre Dame — Small planktonic organisms ubiquitously display unsteady or impulsive motion to attack a prey or escape a predator in natural environments. Despite this, the role of unsteady hydrodynamic forces such as history and added mass forces on the low Reynolds number propulsion of small organisms is poorly understood. In this paper, we derive the fundamental equation of motion for an organism swimming by the means of surface distortion in a nonuniform flow at a low Reynolds number regime. We show that the history and added mass forces, that where traditionally neglected in the literature for small swimming organisms, cannot be neglected as the Stokes number increases above unity. For example, these unsteady inertial forces are of the same order as quasi-steady Stokes forces for *Paramecium.* Finally, we quantify the effects of convective inertial forces in the limit of small, but nonzero, Reynolds number regime.

[1]This work is supported by NSF grant CBET-1066545.

Arezoo Ardekani
University of Notre Dame

Date submitted: 25 Jul 2012 Electronic form version 1.4