Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Shape-Changing Bodies in Fluid: Ratcheting, Plummeting, and Bursting MICHAEL SHELLEY, Courant Institute, NYU, SAVERIO SPAGNOLIE, UC San Diego — We explore the dynamics of a shape-changing body in two-dimensions, and we examine a fluid-ratchet mechanism for locomotion in an oscillating fluid. Our study relates to the experimental work of Childress et al. (Phys. Fluids 2006) on a passive flexible body in an oscillating flow. We find that a shape-changing body can transport with a non-zero mean velocity, even in a direction opposing gravity. The body's transport can be understood in terms of vortex-body rearrangements whereby initially drag-type vortex dipoles are swept past the body to become thrust-type. We also consider the velocity burst experienced by a shape-changing body during an expansion in an initially seeded direction of motion. This phenomenon may contribute to the burst velocities of various aquatic organisms during evasive maneuvers, or predatory lunges.

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Date submitted: 28 Jul 2008 Electronic form version 1.4