1063-76-126 **Jeff D. Eldredge*** (eldredge@seas.ucla.edu), Mechanical and Aerospace Engineering, University of California, Los Angeles, Los Angeles, CA 90095, and **Chengjie Wang** (chengjie@seas.ucla.edu). *High-fidelity simulations and low-order modeling of vortex–body interactions in biomorphic locomotion.*

A prevailing challenge in understanding biological mechanisms for locomotion in fluids is describing, in a simplified manner, the important role of the unsteady nonlinear fluid dynamics in determining the forces on the control surfaces. Reduced-order modeling of these fluid–body interactions – for example, for use in vehicle control strategies – is therefore an important objective. Since the force generation in these bio-inspired mechanics is strongly coupled to the dynamics of the vortical structures, it is paramount for models to embody these dynamics. In this talk, we present techniques for high-fidelity simulation and low-order modeling of the Navier–Stokes equations in the context of these problems. In particular, we highlight the common basis of these techniques – the generation and transport of vorticity – and demonstrate their use on a canonical problem motivated by bird perching. This problem consists of a thin flat plate undergoing a rapid pitch-up maneuver in a steady free stream at Reynolds number 1000. The forces predicted by the low-order model are compared with the high-fidelity results, and good agreement is found. The forces are decomposed into inertial reaction and circulatory components, and their relative contributions are inspected. (Received August 12, 2010)