1139-92-41 **Xiaolin Wang*** (xiaolinwang@seas.harvard.edu) and **Silas Alben**. *Dynamics and Locomotion of Flexible Foils in a Frictional Environment.*

Over the past few decades, oscillating flexible foils have been used to study the physics of organismal propulsion in different fluid environments. In this work, we extend this idea to a study of flexible foils in a frictional environment. This model can be applied to study the snake locomotion as well as other locomotor systems when the Coulomb friction is valid. When the foil is oscillated by heaving at one end but is not free to locomote, the dynamics change from periodic to non-periodic and chaotic as the heaving amplitude increases or the bending rigidity decreases. Resonant peaks are damped and shifted by friction and large heaving amplitudes, leading to bistable states. When the foil is free to locomote, the horizontal motion smoothes the resonant behaviours. For moderate frictional coefficients, steady but slow locomotion is obtained. For large transverse friction and small tangential friction corresponding to wheeled snake robots, faster locomotion is obtained. Travelling wave motions arise spontaneously, and scaling laws are obtained for the moving speed and input power. These scalings are consistent with a boundary layer form of the solutions near the foil's leading edge. (Received January 18, 2018)