Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Internally-actuated flexible fins swim faster and more efficiently with a passive attachment PETER YEH, ALEXANDER ALEXEEV, Woodruff School of Mechanical Engineering, Georgia Institute of Technology — Using three dimensional computer simulations, we probe biomimetic free swimming of an internally-actuated flexible plate in the regime near the first natural frequency. The plate is driven by an oscillating internal moment approximating the actuation mechanism of a piezoelectric MFC bimorph. We show in our simulations that the addition of a passive attachment increases both swimming velocity and efficiency. Specifically, if the active and passive sections are of similar size, the overall performance is the best. We determine that this optimum is a result of two competing factors. If the passive section is too large, then the actuated portion is unable to generate substantial deflection to create sufficient thrust. On the other hand, a large actuated section leads to a bending pattern that is inefficient at generating thrust especially at higher frequencies.

Peter Yeh
Woodruff School of Mechanical Engineering, Georgia Institute of Technology

Date submitted: 01 Aug 2016 Electronic form version 1.4