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Free swimming of an internally actuated elastic swimmer PETER YEH, ALPER ERTURK, ALEXANDER ALEXEEV, Georgia Institute of Technology — We use fully coupled three-dimensional simulations to examine the underwater locomotion of an internally powered elastic swimmer. The swimmer is modeled as a thin, rectangular, elastic plate with two sections. The first section is internally powered by an oscillating internal moment that produces bending. The second section, a passive fin, undergoes bending oscillations in response to the actuated section. We measure the forward swimming velocity and performance for our hybrid swimmer. We find that the hybrid swimmer with the passive component swims at a higher velocity than that of a fully actuated one. This is in agreement with experiments involving piezoelectric internally powered swimmers. The experiments have shown that thrust is increased when a passive fin is attached to a fully internally actuated swimmer. We investigate the details of the flow structures and bending pattern of the swimmer and show how they affect the forward motion. The results are useful for designing self-propelling bio-inspired robots with internally powered fins.

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