

Abstract Submitted
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Muscular Control of Turning and Maneuvering in Jellyfish Bells

ALEXANDER HOOVER, LAURA MILLER, BOYCE GRIFFITH, University of North Carolina at Chapel Hill — Jellyfish represent one of the earliest and simplest examples of swimming by a macroscopic organism. Contractions of an elastic bell that expels water are driven by coronal swimming muscles. The re-expansion of the bell is passively driven by stored elastic energy. A current question in jellyfish propulsion is how the underlying neuromuscular organization of their bell allows for maneuvering. Using an immersed boundary framework, we will examine the mechanics of swimming by incorporating material models that are informed by the musculature present in jellyfish into a model of the elastic jellyfish bell in three dimensions. The fully-coupled fluid structure interaction problem is solved using an adaptive and parallelized version of the immersed boundary method (IBAMR). We then use this model to understand how variability in the muscular activation patterns allows for complicated swimming behavior, such as steering. We will compare the results of the simulations with the actual turning maneuvers of several species of jellyfish. Numerical flow fields will also be compared to those produced by actual jellyfish using particle image velocimetry (PIV).

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