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Do resonating bells increase jellyfish swimming performance? ALEXANDER HOOVER, LAURA MILLER, University of North Carolina at Chapel Hill — A current question in swimming and flight is whether or not driving flexible appendages at their resonant frequency results in faster or more efficient locomotion. It has been suggested that jellyfish swim faster and/or more efficiently when the bell is driven at its resonant frequency. Previous work has modeled the jellyfish bell as a damped harmonic oscillator, and this simplified model suggests that work done by the bell is maximized when force is applied at the resonant frequency of the bell. We extend the idea of resonance phenomena of the jellyfish bell to a fluid structure interaction framework using the immersed boundary method. We first examine the effects of the bending stiffness of the bell on its resonant frequency. We then further our model with the inclusion of a "muscular" spring that connects the two sides of a 2D bell and drives it near its resonant frequency. We use this muscular spring to force the bell at varying frequencies and examine the work done by these springs and the resulting swimming speed. We finally augment our model with a flexible, passive bell margin to examine its role in propulsive efficiency.

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