Abstract Submitted
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Learning from jellyfish: Fluid transport in muscular pumps at intermediate Reynolds numbers[1] JANNA NAWROTH, JOHN DABIRI, Caltech — Biologically inspired hydrodynamic propulsion and maneuvering strategies promise the advancement of medical implants and minimally invasive clinical tools. We have chosen juvenile jellyfish as a model system for investigating fluid dynamics and morphological properties underlying fluid transport by a muscular pump at intermediate Reynolds numbers. Recently we have described how natural variations in viscous forces are balanced by changes in jellyfish body shape (phenotypic plasticity), to the effect of facilitating efficient body-fluid interaction. Complementing these studies in our live model organisms, we are also engaged in engineering an artificial jellyfish, that is, a jellyfish-inspired construct of a flexible plastic sheet actuated by a monolayer of rat cardiomyocytes. The main challenges here are (1) to derive a body shape and deformation suitable for effective fluid transport under physiological conditions, (2) to understand the mechanical properties of the muscular film and derive a design capable of the desired deformation, (3) to master the proper alignment and timely contraction of the muscle component needed to achieve the desired deformation, and (4) to evaluate the performance of the design.

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Janna Nawroth
Caltech

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