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Swimming via size-change: High efficiency propulsion using resonant fluid-structure interactions GABRIEL WEYMOUTH, Gabriel Weymouth — Cephalopods use large-scale structural deformation to propel themselves underwater, changing their internal volume by 20-50%. In this work, the hydroelastic response of a swimmer comprised of a fluid-filled elastic-membrane is studied via analytic, numerical, and experimental methods. The self-propelled soft-body fluid and solid dynamics are shown to benefit greatly from the jet flow, the internal added-mass variation, and the pulsation in tune with the swimmer's immersed fundamental frequency. It is shown that even a simplistic size-changing structure can utilize these physical mechanisms to achieve quasi-propulsive power ratios of greater than 100%, i.e. self-propulsion for these swimmers requires less energy than towing at the same speed.

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