Abstract Submitted
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Propulsion of *C. elegans* crawling on a wet surface[1] A. BILBAO, Texas Tech University, A. ALAVALAPADU, Texas Tech HSC, Z.S. KHAN, Texas Tech University, D.E. SALOMON, Texas Tech Univeristy, S.A. VANAPALLI, Texas Tech University, K. RUMBAUGH, Texas Tech HSC, J. BLAWZDZIEWICZ, Texas Tech University — Nematodes, such as soil-dwelling worms C. elegans, propel themselves by producing undulatory body motion. An important requirement for effective propulsion is to have large transverse and small longitudinal friction forces acting on a crawling worm. Recently, Sauvage et al. have shown that soft-lubrication forces between the worm body and a moist supporting substrate can produce, at most, the transverse friction coefficient twice as large as the longitudinal friction coefficient (and this ratio is too small for efficient propulsion). Here we show that hydrodynamic resistance of the fluid in liquid film adjacent to the worm body can generate significantly larger transverse friction, which moreover, is wavelength dependent. By modeling the worm as a long chain of spheres in Hele–Shaw flow, we have determined the optimal wavelength and amplitude of the undulatory motion that optimizes propulsion efficiency for a given rate of energy dissipation. The optimal worm shape qualitatively agrees with our experimental observations of C. elegans crawling in moist environments.

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