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Study of propulsion of microorganisms using viscous slender-body theory SRIKANTH TOPPALADODDI, Department of Geology and Geophysics, Yale University, CT - 06511, USA, NEIL BALMFORTH, Department of Mathematics, University of British Columbia, Vancouver, BC, V6T 1Z2, Canada —
In this study, we investigate the swimming of a slender axisymmetrical body in a Newtonian fluid in the Stokes' regime. The slender body propels itself by generating surface travelling waves. The mathematical framework to study this problem has been built using the slender-body theory of Keller and Rubinow (J. Fluid Mech., vol. 75, part 4, pp. 705-714, 1976). The motion of the body and the dilation of its surface are incorporated by having Stokeslet and source distributions along the body's axis, and the propulsion speed is determined by solving the resulting integral equation using an asymptotic expansion. For high wavenumbers, the propulsion speed for a cylinder is found to agree with results presented by Setter et al. (Phys. Rev. E 85, 066304, 2012) in the limit of vanishing cylinder radius and wave amplitude. We quantify the efficiency of the swimmer and explore its internal mechanics when the body is treated as a fluid-filled cavity with elastic fibres driving surface deformation.

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