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Locomotion of C elegans in structured environments TRUSHANT MAJMUDAR, ERIC KEAVENY, MICHAEL SHELLEY, JUN ZHANG, Courant Institute, New York University — We have established a combined experimental and numerical platform to study the swimming dynamics of an undulating worm in structured environments (fluid-filled micro-pillar arrays). We have shown that the worm (C. elegans) swims with different velocity and frequency depending on the lattice spacing and our purely mechanistic simulations (elastically linked bead-chain) reproduce the experimental results qualitatively and quantitatively, including "life-like" trajectories the worm exhibits. We build upon this platform to investigate more complex environments, such as linear and radial lattices, with gradients in spacing. In addition, we study C. elegans mutants to investigate the role of length of the worm, frequency of undulations, and mechano-sensation on the resultant dynamics. We also examine the worm moving through a lattice with random distribution of obstacles - a model soil-like environment. Our combined experimental and simulations approach allows us to gain insights into the dynamics of locomotion of undulating microorganisms in realistic complex environments.

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