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Locomotion of C elegans in structured environments TRUSHANT MAJMUDAR, ERIC KEAVENY, MICHAEL SHELLEY, JUN ZHANG, Courant Institute, New York University — Undulatory locomotion of microorganisms like soil-dwelling worms and sperm, in structured environments, is ubiquitous in nature. They navigate complex environments consisting of fluids and obstacles, negotiating hydrodynamic effects and geometrical constraints. Here we report experimental observations on the locomotion of C elegans swimming in arrays of micro-pillars in square lattices, with different lattice spacing. We observe that the worm employs a number of different locomotion strategies depending on the lattice spacing. As observed previously in the literature, we uncover regimes of enhanced locomotion, where the velocity is much higher than the free-swimming velocity. In addition, we also observe changes in frequency, velocity, and the gait of the worm as a function of lattice spacing. We also track the worm over time and find that it exhibits super-diffusive behavior and covers a larger area by utilizing the obstacles. These results may have significant impact on the foraging behavior of the worm in its natural environment. Our experimental approach, in conjunction with modeling and simulations, allows us to disentangle the effects of structure and hydrodynamics for an undulating microorganism.

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