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Simulations of C. elegans locomotion through a structured medium ERIC KEAVENY, TRUSHANT MAJMUDAR, JUN ZHANG, MICHAEL SHEL-LEY, Courant Institute, New York University — The small nematode C. elegans serves as a model system with which to study low Reynolds number undulatory locomotion, particularly in fluids with an embedded microstructure that is comparable in size to the swimmer. Recent experimental observations of C. Elegans locomotion in a lattice of obstacles indicate that the worm can achieve speeds as much as an order of magnitude greater than its free-swimming value. In addition to a series of experimental studies of this phenomenon, we perform numerical simulations of a self-locomoting chain of beads in a lattice of spherical obstacles. We explore the dependence of the worm's speed on the frequency of undulation and lattice spacing and quantify the necessary conditions for enhanced locomotion. We also use the simulations to characterize the forces experienced by the worm in this regime. Further, by comparing the simulation results with our experimental data, we identify changes in worm locomotive behavior in response to imposed geometric conditions.

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