Abstract Submitted
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Maneuverability and chemotaxis of *Caenorhabditis elegans* in three-dimensional environments[1] JERZY BLAWZDZIEWICZ, ALEJANDRO BILBAO, AMAR PATEL, SIVA VANAPALLI, Texas Tech University — Locomotion of the nematode *C. elegans* in water and complex fluids has recently been investigated to gain insight into neuromuscular control of locomotion and to shed light on nematode evolutionary adaptation to environments with varying mechanical properties. Previous studies focused mainly on locomotion efficiency and on adaptation of the nematode gait to the surrounding medium. Much less attention has been devoted to nematode maneuverability, in spite of its crucial role in the survival of the animal. Recently [Phys. Fluids 25, 081902 (2013)] we have provided a quantitative analysis of turning maneuvers of crawling and swimming nematodes on flat surfaces and in 2D fluid layers. Based on this work, we follow with the first full 3D description of how *C. elegans* moves in complex 3D environments. We show that by superposing body twist and 2D undulations, a burrowing or swimming nematode can rotate the undulation plane and change the direction of motion within that plane by varying undulation-wave parameters. A combination of these corkscrew maneuvers and 2D turns allows the nematode to explore 3D space. We conclude by analyzing 3D chemotaxis of nematodes burrowing in gel and swimming in water, which demonstrates an important application of our maneuverability model.

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