Abstract Submitted
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Chemotaxis of C. elegans in 3D media: a model for navigation of undulatory microswimmers[1] AMAR PATEL, ALEJANDRO BILBAO, MIZANUR RAHMAN, SIVA VANAPALLI, JERZY BLAWZDZIEWICZ, Texas Tech University — While the natural environment of *C. elegans* consists of complex 3D media (e.g., decomposing organic matter and water), most studies of chemotactic behavior of this nematode are limited to 2D. We present a 3D chemotaxis model that combines a realistic geometrical representation of body movements associated with 3D maneuvers, an analysis of mechanical interactions of the nematode body with the surrounding medium to determine nematode trajectories, and a simple memory-function description of chemosensory apparatus that controls the frequency, magnitude, and timing of turning maneuvers. We show that two main chemotaxis strategies of *C. elegans* moving in 2D, i.e., the biased random walk and gradual turn, are effective also in 3D, provided that 2D turns are supplemented by the roll maneuvers that enable 3D reorientation. Optimal choices of chemosensing and gait-control parameters are discussed; we show that the nematode can maintain efficient chemotaxis in burrowing and swimming by adjusting the undulation frequency alone, without changing the chemotactic component of the body control. Understanding how *C. elegans* efficiently navigates in 3D media may help in developing self-navigating artificial microswimmers.

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