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A computational study of male pronuclear migration in the C. elegans embryo TAMAR SHINAR, Courant Institute, New York University, FABIO PIANO, Center for Genomics and Systems Biology and Department of Biology, New York University, MICHAEL SHELLEY, Courant Insitute, New York University — After fertilization the one-celled C. elegans embryo undergoes a series of complex but stereotyped dynamics that lead to proper progression of early development. This system offers a great opportunity to combine modeling and experimental approaches to learn about the biophysical properties underlying fundamental developmental events. In particular, we study the mechanisms underlying male pronuclear migration using a detailed computational model that captures important features of the system. We model the cytoplasmic flow as a Stokes fluid, accounting for the enclosing cell geometry. The fluid is two-way coupled to a rigid pronucleus that is subject to forces computed based on the dynamic instability model of microtubule dynamics. We use the computational model to study force models for microtubule based motility as well as the effects of the fluid drag and geometric confinement on the pronucleus and microtubules.

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