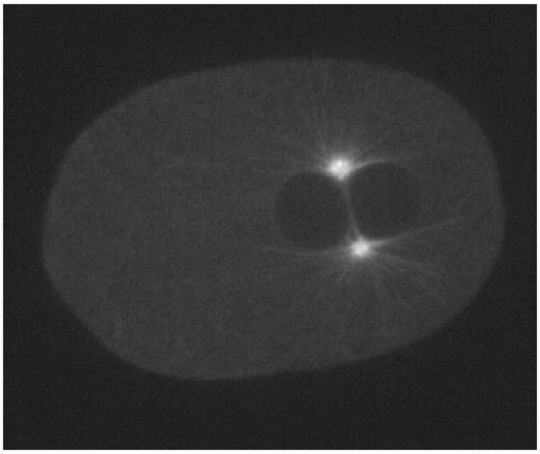
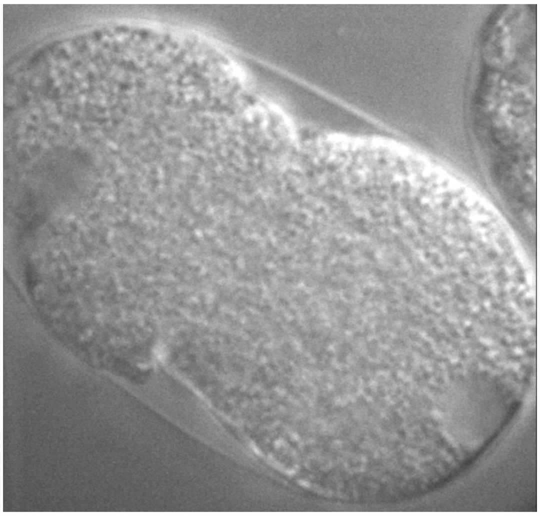
Supporting Information

Shinar et al. 10.1073/pnas.1017369108



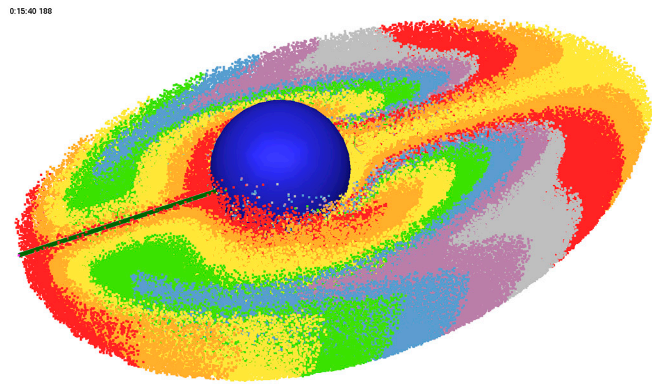
Movie S1. Microtubule (MT)-based dynamics in a live single-celled *Caenorhabditis elegans* embryo visualized with GFP-tagged β-tubulin. The pronuclei exhibit normal migration, meeting, centration, and rotation.

Movie S1 (AVI)



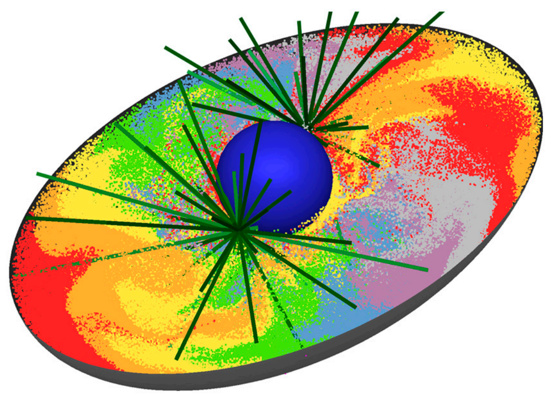
Movie S2. Differential interference contrast movie of a live WT *C. elegans* embryo. The pronuclei exhibit normal migration, meeting, centration, and rotation.

Movie S2 (AVI)



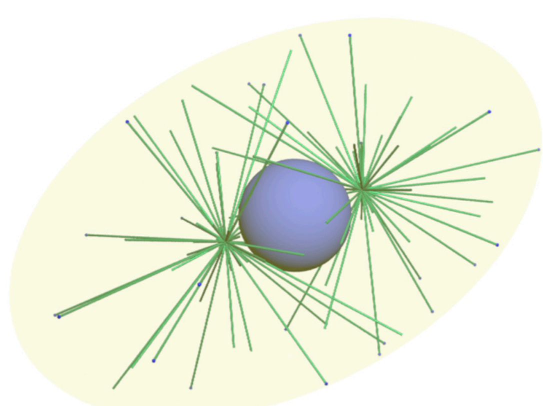
Movie S3. Simulation of a much simplified configuration of our model, illustrating that the pronucleus can be propelled by pulling directly on the viscous cytoplasm and that a counterflow of cytoplasm is generated. A slice through the three-dimensional volume is shown. The filament is pulled along its length by motor proteins embedded in the cytoplasm. The filament-bound pronucleus moves toward the anterior while the cytoplasm along the filament moves to the posterior. Colored passive tracer particles have been added for visualization.

Movie S3 (AVI)



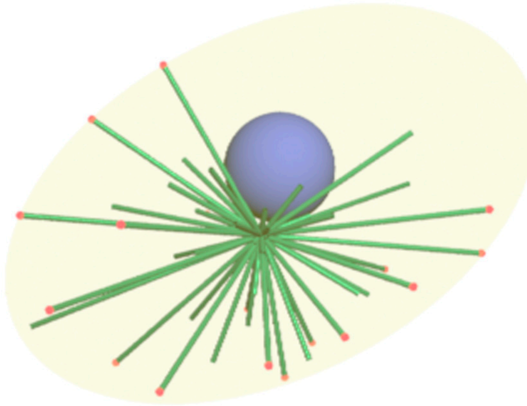
Movie S4. The simulation of the full WT model. A slice through the three-dimensional volume is shown. The nuclear centrosome complex (NCC) starts at the posterior. Asymmetric lengths of MTs due to cessation of MT growth at the cortex leads to centration of the NCC. The central NCC position is stable to continuing perturbations due to fluctuating MT-based forces. As the NCC nears the center, its orientation becomes unstable to perturbations. Fluctuations in the MT lengths initiate a rotation of the NCC, which continues until it is aligned with the anterior–posterior (AP) axis. The AP axis-aligned orientation is stable to continuing perturbations due to fluctuating MT-based forces. Colored passive tracer particles have been added for visualization.

Movie S4 (AVI)



Movie S5. The simulation of the full WT model. The NCC starts at the posterior. Asymmetric lengths of MTs due to cessation of MT growth at the cortex leads to centration of the NCC. The central NCC position is stable to continuing perturbations due to fluctuating MT-based forces. As the NCC nears the center, its orientation becomes unstable to perturbations. Fluctuations in the MT lengths initiate a rotation of the NCC, which continues until it is aligned with the AP axis. The AP axis-aligned orientation is stable to continuing perturbations due to fluctuating MT-based forces.

Movie S5 (AVI)



Movie S6. Simulation of a perturbation of the model, where the NCC has only a single centrosome, corresponding to a *zyg-1* mutant where centrosome duplication fails. The NCC begins to rotate immediately due to the MT asymmetry, exhibits altered dynamics, and assumes an altered final orientation.

Movie S6 (AVI)