Abstract Submitted
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New Proposed Mechanism for Actin-Polymerization-Mediated Propulsion[1] KUN-CHUN LEE, ANDREA LIU, University of Pennsylvania, Department of Physics and Astronomy — An important component of the cellular cytoskeleton is F-actin, a biopolymer whose non-equilibrium self-assembly is key to the process of cell crawling. We have reported previously how the polymerization and branching of F-actin near the cell membrane drives cell crawling using a physically-consistent Brownian Dynamics model. Here we show that the creation of new polymerizing filaments by the branching process leads to a steady-state concentration profile of actin away from the moving surface. This non-equilibrium concentration profile is associated with an osmotic pressure profile. The gradient of the osmotic pressure, evaluated at the surface, is the force density on the actin. This force pushes actin backwards, away from the surface. By Newton's third law, this force has a reaction force on the disk; this is the force pushing the disk forwards.

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