

Abstract Submitted
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Symmetry breaking in actin gels - Implications for cellular motility¹ KARIN JOHN, PHILIPPE PEYLA, CHAOUQI MISBAH, UJF Grenoble, Laboratoire de Spectrométrie Physique — The physical origin of cell motility is not fully understood. Recently minimal model systems have shown, that polymerizing actin itself can produce a motile force, without the help of motor proteins. Pathogens like Shigella or Listeria use actin to propel themselves forward in their host cell. The same process can be mimicked with polystyrene beads covered with the activating protein ActA, which reside in a solution containing actin monomers. ActA induces the growth of an actin gel at the bead surface. Initially the gel grows symmetrically around the bead until a critical size is reached. Subsequently one observes a symmetry breaking and the gel starts to grow asymmetrically around the bead developing a tail of actin at one side. This symmetry breaking is accompanied by a directed movement of the bead, with the actin tail trailing behind the bead. Force generation relies on the combination of two properties: growth and elasticity of the actin gel. We study this phenomenon theoretically within the framework of a linear elasticity theory and linear flux-force relationships for the evolution of an elastic gel around a hard sphere. Conditions for a parity symmetry breaking are identified analytically and illustrated numerically with the help of a phasefield model.

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