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Actin filament curvature biases branching direction
EVAN WANG, VIVIANA RISCA, UC Berkeley, OVIJIT CHAUDHURI, Harvard University, JIA-JUN CHIA, Johns Hopkins University, PHILLIP GEISSLER, DANIEL FLETCHER, UC Berkeley — Actin filaments are key components of the cellular machinery, vital for a wide range of processes ranging from cell motility to endocytosis. Actin filaments can branch, and essential in this process is a protein complex known as the Arp2/3 complex, which nucleate new "daughter" filaments from pre-existing "mother" filaments by attaching itself to the mother filament. Though much progress has been made in understanding the Arp2/3-actin junction, some very interesting questions remain. In particular, F-actin is a dynamic polymer that undergoes a wide range of fluctuations. Prior studies of the Arp2/3-actin junction provides a very static notion of Arp2/3 binding. The question we ask is how differently does the Arp2/3 complex interact with a straight filament compared to a bent filament? In this study, we used Monte Carlo simulations of a surface-tethered worm-like chain to explore possible mechanisms underlying the experimental observation that there exists preferential branch formation by the Arp2/3 complex on the convex face of a curved filament. We show that a fluctuation gating model in which Arp2/3 binding to the actin filament is dependent upon a rare high-local-curvature shape fluctuation of the filament is consistent with the experimental data.

[X] Prefer Oral Session
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