Cellular shapes driven by curved membrane proteins that recruit the actin cytoskeleton: lamellipodia, ruffles and motility

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How eukaryote cells control their shapes is an open puzzle, although many of the protein components involved in this process have been characterized. We explore theoretically the spontaneous formation of shape patterns and dynamics that are driven by the coupling of curved membrane proteins and the actin cytoskeleton that they recruit. When the proteins are convex and they recruit the protrusive forces aof actin polymerization this mechanism leads to symmetry-breaking and to the formation of lamellipodia-like structures [1,2]. In the presence of adhesion we find that the same mechanism provides a minimal model for polarized cell motility [3].

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