Symmetry breaking in reconstituted actin cortices

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Abstract:

The actin cytoskeleton plays a central role in many cellular processes including polarization, cell shape determination, intracellular transport, cell division and movement. The structure and function of the cytoskeleton arise from the self-organized dynamics of numerous molecular building blocks. In spite of the progress in uncovering the molecular details underlying cytoskeletal organization, the principles governing large-scale coordination and polarization of the cytoskeleton are still not well-understood. Biomimetic systems allow us to investigate such complex biological phenomena detached from the complexity of the whole cell. To that end, we have developed a reconstituted model system that self-organizes into dynamic actin cortices at the inner interface of water-in-oil emulsions. This in vitro model system recapitulates the rich cortical dynamics observed in vivo. In particular, our artificial cortices are capable of spontaneous symmetry breaking, similar to the initial polarization observed in embryonic cells during development.

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