

Abstract Submitted
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Why is Actin Patchy?¹ ANDERS CARLSSON, Washington University in St. Louis — The intracellular protein actin, by reversibly polymerizing into filaments, generates forces for motion and shape changes of many types of biological cells. Fluorescence imaging studies show that actin often occurs in the form of localized patches of size roughly one micrometer at the cell membrane. Patch formation is most prevalent when the free-actin concentration is low. I investigate possible mechanisms for the formation of actin patches by numerically simulating the “dendritic nucleation” model of actin network growth. The simulations include filament growth, capping, branching, severing, and debranching. The attachment of membrane-bound activators to actin filaments, and subsequent membrane diffusion of unattached activators, are also included. It is found that as the actin concentration increases from zero, the actin occurs in patches at lower actin concentrations, and the size of the patches increases with increasing actin concentration. At a critical value of the actin concentration, the system undergoes a transition to complete coverage. The results are interpreted within the framework of reaction-diffusion equations in two dimensions.

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