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**The Role of Actin Trails in Mediating Bulk Axonal Actin Transport** NILAJ CHAKRABARTY, Department of Physics and Astronomy, Ohio University, ARCHAN GANGULY, SUBHOJIT ROY, Department of Pathology, University of California, San Diego, PETER JUNG, Department of Physics and Astronomy, Ohio University — Actin is one of the key constituents of the neuronal cytoskeleton and is responsible for driving important cellular processes like axon elongation. Axonal actin is synthesized in the cell body and transported at rates of $0.25 - 3$ mm/day, as shown by in-vivo pulse-chase radiolabeling studies. However, the underlying transport mechanisms are unknown. Recent experiments in cultured neurons have revealed a dynamic network of metastable actin filaments ("actin trails"). Actin trails seem to originate from focal actin "hotspots" which colocalize with stationary endosomes. Interestingly, the number of actin trails extending anterogradely is higher than the ones extending retrogradely. We hypothesize that the bulk axonal transport of actin originates from this directional asymmetry of the number of actin trails. To test this, we constructed a computational model of actin trail growth and simulated the pulse-chase experiment. In our model, local, metastable trails, which grow with their barbed ends anchored to the hotspots, drive the bulk anterograde transport. Our results indicate that the observed bias of the nucleation probabilities and the elongation rate of actin trails are sufficient to drive the bulk transport of actin at rates that agree with in-vivo pulse chase experiments.

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