



# Mechanics and Organization of Cell Motility Myosins

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## Abstract:

A critical function for all living organisms is the ability to move when needed. Such directed movements, including intracellular trafficking, cell division, muscle contraction, and cell motility, are driven by a set of remarkable molecular machines. Here, I examine the mechanics of the nonmuscle myosins involved in cell motility, focusing on nonmuscle myosin IIB and myosin X. Nonmuscle myosin IIB is largely found at the trailing edge of cells, where it sets actin filament tension and may play a role in remodeling actin filament networks. Using optical tweezers, we find that this myosin moves processively for several short steps, following a spiral path down the actin filament that may apply torque to individual filaments. Myosin X appears to solve a different problem: how to navigate to a particular cellular address. Myosin X traffics cargoes to the tips of filopodia in migrating cells, even though very few actin filaments reach those filopodial tips. We find that myosin X walks along the fascin-actin bundles found in the filopodial core, but does not walk along single actin filaments found throughout the cell. Myosin X appears to straddle two filaments while walking along a bundle, which allows it to take shorter steps. Moreover, the myosin X tail is structured in a manner that favors steps along these bundles. To obtain further insight into how myosins navigate the actin cytoskeleton, I will also discuss approaches for following motor traffic along cellular actin filament networks.

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