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Biofilaments in assays of molecular motors: collective effects and the role of geometry

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Abstract content
   (Max 300 words)

Molecular motors when provided with appropriate chemical energy move along preferential directions on certain biological filaments. Examples are found in the cytoskeleton of cells and include kinesins moving on microtubules and myosins on actin filaments driven by ATP hydrolysis at the motor protein. Motility assays consist of molecular motors tethered to a planar substrate. Filaments in the assays are then propelled along the surface by the action of a number of these tethered motors acting along the length of the filament. These motors individually can attach to and detach from the filament stochastically and dependent on the force exerted by a motor. Naturally thermal fluctuations also influence the dynamics. We present a set of models for the stochastic and motor processes on filaments to derive effective motion of single semiflexible filaments, characterising the steady-state velocity, the effective diffusion and rotational diffusion constants. We shall derive properties of the collective behaviour of systems with many semiflexible filaments, where the filaments interact. In this latter context it is also interesting to investigate how geometric constraints (such as confinement to channels) influence the dynamics. We shall compare our model with other approaches from the recent scientific literature.

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