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Active Dynamics of Microtubule Bundles ASSAF ZEMEL, Department of Neurobiology, Physiology and Behavior, University of California, Davis 95616, USA, ALEX MOGILNER, Department of Mathematics and Department of Neurobiology, Physiology and Behavior, University of California, Davis 95616, USA
— Microtubule bundles play a central role in a variety of dynamical processes in cells such as cell division, neural growth and blood platelet formation. These processes are driven by the activity of molecular motors that exert sliding forces on the microtubules. In such bundles, motor proteins may crosslink two or more filaments, forming discrete clusters of microtubules whose dynamics is governed by a balance of the motor-generated forces. The connectivity of these microtubule-motor complexes is an essential property of the bundle and dictates its dynamics. We present a systematic computational study of these microtubule bundles based on force-balance computer simulations as well as a simplified analytical theory. This allows us to calculate the characteristic times of microtubule sorting and spreading, as well as the effective diffusion constants and drift coefficients as a function of the microtubule density and the polarity fraction of the microtubules. Application of our theory in the study of blood platelet formation is presented.

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