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Non-equilibrium States of Active Filament Networks[1] ROBERT A. BLACKWELL, MEREDITH D. BETTERTON, OLIVER M. SWEEZY, MATTHEW A. GLASER, Univ of Colorado - Boulder — Active networks of filamentous proteins and crosslinking motor proteins play a critical role in many cellular processes. Among the most important active networks is the mitotic spindle, an assembly of microtubules and crosslinking motor proteins that forms during cell division and that ultimately separates chromosomes into two daughter cells. To evolve a better understanding of spindle formation, structure, and dynamics, we have developed course-grained models of active networks composed of filaments, modeled as hard spherocylinders, in diffusive equilibrium with a reservoir of crosslinking motors, modeled as Hookean springs that can adsorb to microtubules and translocate at finite velocity along the microtubule axis. We explore the phase diagram and other characteristics of this model in two and three dimensions as a function of filament packing fraction, and of crosslink concentration, velocity, and adsorption and desorption rates. We observe a variety of interesting emergent behaviors including sorting of filaments into polar domains, generation of extensile stress, and superdiffusive transport.

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