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Emergent structures in simulations of cytoskeletal networks[1] SIMON FREEDMAN, Univ of Chicago, SHILADITYA BANERJEE, Univ College London, GLEN HOCKY, AARON DINNER, Univ of Chicago — Within a cell, ensembles of cytoskeletal proteins with well understood microscopic interactions assemble into a wide variety of macroscopic structures that enable cell motility, division, and intracellular transport. We use our recently developed Active Filament Network Simulation (AFiNeS) software to explore the structure and dynamics of a minimal cytoskeletal system consisting of actin, crosslinkers, and myosin-II motors. By systematically varying the parameters of this model system, we find that we can tune between contractile networks which drive cell motility, bundled networks capable of propagating force large distances, and polarity sorted structures, which promote targeted intracellular transport. We show how these structures can emerge from varying both experimentally manipulatable parameters, such as myosin and crosslinker density, and varying parameters that are not readily accessible in experiments such as the affinity of a crosslinker to actin. These results can aid in understanding the stark mechanical diversity exhibited by cells with similar constituents, and the design of biomimetic active materials.

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