

Michael Shelley
New York University
Courant Institute of Mathematical Sciences

Microtubule and motor-protein assemblies

Abstract

Many important processes in the cell are mediated by stiff microtubule polymers and the active motor proteins moving upon them. This includes the transport of subcellular structures—nuclei, chromosomes, organelles—and the self-assembly and positioning of the mitotic spindle. Very little is yet understood of these processes but they all present fascinating problems in fluid/structure interactions. Microtubules and motor proteins are also the building blocks of new “bio-synthetic” active suspensions driven by motor-protein activity. These reduced systems can be probed—and modeled—more easily than the fully biological ones and show their own aspects of self-assembly and activity-driven defect dynamics. I will discuss recent work modeling and simulating such systems as geometrically complex fluid/structure interaction problems, and as multiscale complex fluids.