

## PHYSICS AND ASTRONOMY COLLOQUIUM (In Person Only)

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"Dynamics of Active Bio-Inspired Materials: from Cytoskeleton Composites to Circadian Colloids"

## Abstract

Active dynamics and out-of-equilibrium reconfigurability, at the heart of diverse biological processes, are widely studied across disciplines in efforts to infuse such properties into next-generation autonomous materials, and to understand the physics underlying living systems that are far from equilibrium. In this talk, I will discuss two orthogonal paths we take, inspired by biology, to introduce active dynamics, restructuring and non-equilibrium rheological properties into soft matter systems. Our work on motor-driven composites of actin filaments and microtubules reveal that synergistic interactions between these two polymers confers emergent strength and reversibility into composites; while competition between their associated molecular motors, myosin and kinesin, gates composite restructuring and suppresses de-mixing and advection. In a very different approach to active matter design, we harness functionalized circadian clock proteins to drive oscillatory self-assembly of diffuse colloids into percolated networks of colloidal superstructures on a timescale programmed by the circadian rhythm. Throughout the talk, I will also highlight methods our lab has developed to study these systems, including advanced optical tweezers microrheology and differential dynamic microscopy.

> Wednesday, January 15, 2025 3:30pm PST BWC A104