Colloquium

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Structure and Dynamics of Topological Defects in Active Liquid Crystals

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4:00pm—5:15pm

190 Goodwin Hall

Topological defects in nematic liquid crystals exhibit unique optical and physicochemical properties that have led to emerging applications in directed self-assembly of colloids and macromolecules. Recent experiments have demonstrated that active matter that consists of a dense collection of self-propelled rods can form an active nematic liquid crystal in which defects bind and unbind in a chaotic-like manner. Abundant examples of active nematics are found in different animate and inanimate systems, including flocking animals, bacteria, tissue cells, biopolymer suspensions, and even vibrating granular rods. However, the material properties of and seemingly chaotic-like defect dynamics in these non-equilibrium systems are poorly understood, limiting their applications. In this talk, I will discuss our recent work on unraveling defect behavior in active nematics. Specifically, we have adopted a hydrodynamic model to explain how the morphology, structure and dynamics of defects are determined by the interplay between elasticity and activity. Our model predictions are successfully confirmed by actomyosin-based experiments, shedding light on understanding and further control of topological defects in active liquid crystals.

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