Chemical & Biological Engineering Seminar

February 18, 2019, 10 AM, Farris Engineering Center room 1000

Structure and Dynamics of Topological Defects in Active Liquid Crystals

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Abstract:
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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EDUCATION

PhD Physics, City University of New York — Sep 2013
Graduate Center & City College, with Prof. **Joel Koplik**
BS Physics, Fudan University (China) — Jul 2007
Department of Physics

PROFESSIONAL EXPERIENCE

Distinguished Research Associate — May 2018 - Present
Center for Autonomous Materials
The University of Chicago
Postdoctoral Scholar, with Prof. **Juan J. de Pablo** — Jan 2014 - May 2018
Institute for Molecular Engineering
The University of Chicago
Research Assistant & Adjunct Lecturer — Sep 2009 - Dec 2013
Levich Institute & Physics Department
City College of New York

RESEARCH INTERESTS

Theoretical & Computational Soft Matter Physics: Micro/Nanofluidics; Liquid Crystals; Active Matter; Polymers; Colloids; Mechanical Metamaterials.