PHYSICAL MATH SEMINAR

Solute gradients, disorder, and elasticity shape transport in complex environments

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ABSTRACT:

In biological networks such as slime mold and fungi, the interplay of chemical signaling, mechanical deformation, and network morphology governs the transport of nutrients and biomacromolecules. To gain insight into how self-organized transport emerges in the absence of a central nervous system, here we focus on two complementary problems. First, we demonstrate how phoretic migration of colloids driven by solute gradients modulates the influence of geometric disorder on transport across microfluidic channels patterned with obstacle arrays. We then examine flow in a channel coated with soft, deformable fibers, where the coupling of flow, fiber elasticity, and geometric confinement gives rise to nonlinear dynamics, such as snapping and fluttering. Together, these studies highlight how chemo-mechanical coupling in disordered poroelastic media and biological networks modulate transport processes.

TUESDAY, DECEMBER 3, 2024

2:30 PM – 3:30 PM

Building 2, Room 449