FLUIDS & THERMAL SCIENCES

Seminar

"Digital and continuous microfluidics: transport and manipulation on a small scale"

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Thursday, February 16, 2017
10:30 a.m.
Applied Math, 170 Hope Street, Room 108

Abstract:

Precision manipulation and control of small quantities of fluid is an essential and challenging task relevant to numerous biomedical and chemical technologies. In this seminar, I will discuss two examples in which boundaries and dynamic interfaces can be used to control fluid transport processes.

In the first portion of the talk, I will discuss the role of boundaries in the spreading of a solute in a laminar shear flow through a channel. In particular, I will present the results of a combined experimental, numerical, and theoretical investigation of pressure-driven flow in rectangular and elliptical channels, elucidating how the cross-sectional aspect ratio can be used to define the longitudinal asymmetry of the resulting solute distribution. Ongoing work, future directions, and applications to microfluidic technologies will be discussed.

The second part of the talk will focus on the motion of droplets at a vibrated free surface. A droplet can bounce indefinitely on the surface of a vibrating fluid bath and the localized field of waves excited by the bouncing droplet can cause it to propel itself laterally across the surface. I will detail the careful experimental and theoretical developments that allowed for an advanced understanding and characterization of this rich system that exhibits many behaviors once thought to be exclusive to the microscopic quantum realm. Future work will be discussed, with focus on engineering applications of vibrated fluids and soft materials.

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