Special MIE Seminar

Date: ***March 29, 2017 (Wednesday)***; **Time:** ***2:30 PM to 3:30 PM***; **Location:** ***MEC 224***

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

Daniel M. Harris
University of North Carolina at Chapel Hill

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. Potential 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 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 and ongoing work will be discussed.

Biography: Daniel M. Harris is a Postdoctoral Research Associate and Lecturer at the University of North Carolina at Chapel Hill. Dan received his B.S. in Mechanical Engineering from Cornell University and his Ph.D. in Applied Mathematics at MIT.

Dan's primary research interests are in interfacial fluid mechanics, transport phenomena, and nonlinear dynamics. His research involves an integrated experimental and theoretical approach that has led to over 20 peer-reviewed journal publications, in a wide range of journals including Science, the Journal of Fluid Mechanics, the Journal of Sound and Vibration, and Chaos.

Dan has received numerous awards for his scientific visualizations including being selected as the winner of the 2016 NSF/Popular Science Visualization Challenge in Photography, as well as being a five-time winner of the American Physical Society's Gallery of Fluid Motion. Dan has also been recognized for his dedication to teaching by receiving the Housman Award for Excellence in Teaching while at MIT. In his free time, Dan enjoys biking, volunteering in his community, and watching baseball.