DEPARTMENT OF MATHEMATICAL SCIENCES

Colloquium

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Small-Scale Fluid Dynamics: From Microfluidics to Microfiltration

Small-scale fluid dynamics concerns numerous phenomena that span a wide range of applications, from industrial, to engineering, to medical, and more. In this seminar, I will discuss two examples in which channel geometries and boundaries can be used to control and manipulate transport of solutes and particles in small-scale fluids systems.

In the first portion of the talk, I will discuss the role of boundaries in controlling the spreading of a passive solute in a laminar shear flow through a channel. In particular, I will present the results of a combined theoretical, experimental, and numerical study of pressure-driven flow in rectangular and elliptical channels, showcasing how the cross-sectional aspect ratio can be used to set the longitudinal asymmetry of the resulting solute distribution.

In the second part of the talk, I will discuss modeling of water filtration systems. Many municipal water treatment facilities in the United States utilize hollow-fiber microfiltration systems, with pipes made of bundles of hundreds of capped microtubes with permeable walls. As water flows through the filter, foulants are captured by the membraned walls allowing clean water to exit. Understanding the fluid dynamics is a fundamental step towards controlling the fouling process and enhancing the efficiency of microfiltration. Ongoing work and future directions will be discussed.

Wednesday, December 4, 2019
10:00AM- 11:00AM
Stratton Hall, room 202