Center for Fluid Mechanics, Division of Applied Mathematics
Fluids, Thermal and Chemical Processes Group, School of Engineering
Joint Seminar Series

TUESDAY – March 6, 2012
3:00pm
Barus & Holley, Room 190
Refreshments will be served in the Lobby of Barus & Holley following the seminar

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Bacteria, Biofilms and Fluid Dynamics: Elementary Flows and Unexpected Phenomena

Bacterial biofilms have an enormous impact on medicine, industry and ecology. These microbial communities are generally considered to adhere to surfaces or interfaces. In most practical situations, the biofilms are exposed to flow. We investigate two features of such systems: (i) We examine the migration of bacteria along surfaces when exposed to a shear flow. In particular, we identify an unusual response where flow produces a directed motion of twitching bacteria in the upstream direction. (ii) We report the formation of biofilm streamers (threads of biofilm) suspended in the middle plane of curved microchannels under conditions of laminar flow. We use numerical simulations of the three-dimensional flow in curved channels to highlight the presence of a secondary vortical motion in the proximity of the corners, which suggests an underlying hydrodynamic mechanism responsible for the formation of the streamers. Thus, we bring together experiments, simulations, and models for the fluid-structure interaction to rationalize the spatial and temporal development of bacterial streamers.