STEVENS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING

Wednesday, September 12, 2007
Carnegie Room 315, Time 1:30 pm

Bacterial Actuation, Sensing and Transport in Micro/Nanoscale

Professor MinJun Kim
Department of Mechanical Engineering & Mechanics
School of Biomedical Engineering, Health and Science System
Drexel University
Philadelphia, PA 19104

Although micro/nanofabrication techniques are rapidly advancing it remains a challenge to fabricate separate individual nano-scale structures and actuators en masse. A possible resource for such tiny elements exists within microorganisms. Flagellated bacteria, such as Escherichia coli and Serratia marcescens, propel themselves using multiple flagella - long, thin helical filaments - that are rotated using nanoscale motors. We will discuss several aspects of the fluid mechanics associated with bacterial motility, studied using scale modeling and microscale experiments. The phenomena explored include the mechanics of bacterial flagellar bundling, in which several distinct filaments combine into a single helical bundle via viscous hydrodynamic interactions, the flow fields associated with viscous helical motions, and mechanisms for hydrodynamic synchronization of adjacent flagella motion. We will also show the practical integration of biomolecular motors for biologically-powered microfludic systems as well as the development of autonomous bacterial transportation systems.

Professor MinJun Kim is an assistant professor in Department of Mechanical Engineering & Mechanics and School of Biomedical Engineering, Health and Science Systems at Drexel University. Dr. Kim completed his M.S. and Ph.D degree at Texas A&M University and Brown University, respectively. He received his B.S. degree in Mechanical Engineering from Yonsei University in Korea. During his doctoral studies at Brown, he held the prestigious Simon Ostrach Fellowship and also spent one year working as a postdoctoral research fellow at the Rowland Institute at Harvard University. His research interests span the topics of bacterial actuations, nanopore sensors for single molecules, and optical diagnostics for bio/micro/nanofluidics. For the past several years, Dr. Kim has been experimentally investigating biological transport phenomena in micro/nanoscale fluidic devices to produce new types of bionanotechnology.

For more information, please contact Prof. Frank Fisher at Frank.Fisher@stevens.edu or 201-216-8913