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

TUESDAY – APRIL 30, 2013

3:00pm

Barus & Holley, Room 190

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Philadelphia, PA

Motility of Ameoboid Cells of the Immune System

Cell motility is critical to the proper function of the immune system. We are interested in the ways ameoboid cells organize their internal architecture and exert forces against their environment to achieve directed motion. The challenge is that ameoboid cells crawl quickly but exert very weak forces, requiring sensitive devices to measure forces during motility. Using micromachined chemotaxis chambers to drive directed motion under gradients of chemokine and various different force spectroscopies, including traction microscopy (with Micah Dembo, Boston University) and post arrays (with Chris Chen, Boston University), we have measured the forces that neutrophils and dendritic cells exert during directed motion. We found that neutrophils organize punctate force centers in their rear, which drive directed motion through squeezing, whereas dendritic cells exert forces in the front by extending and contracting filopodia. We measure that forces of a single filopod are approximately 0.5 nN, which corresponds to the contraction of a small number (approximately a hundred) myosin II motors. We are currently extending our methods to both macrophages and T-cell, with the long range goal of developing a comprehensive map of force-velocity relationships across all cells of the immune system.