

**Fluids at Brown, Division of Applied Mathematics
Fluids and Thermal Sciences, School of Engineering
Joint Seminar Series**

**TUESDAY – May 16, 2017
3:00 PM
Barus & Holley, Room 190**

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Biophysical force regulation in cell migration



In native states, animal cells of most types are surrounded by biopolymer network. Cells are actively interacting with the surrounding fluids/matrices via physical forces. It is now clear that mechanical interactions between animal cells and their microenvironment critically regulate cell functions. In this talk, I will describe efforts in my lab in understanding how biophysical forces regulate cell-microenvironment interaction, and subsequently cell function. Two examples will be given. (1) *Tumor cell-ECM interaction*. We measure single cell generated force within collagen matrices using a newly developed 3D traction force microscopy. Our results revealed a mechanical crosstalk mechanism between the tumor cells and the ECM. Cells generate sufficient force to stiffen collagen fiber network, and stiffer matrix, in return promotes larger cell force generation. Our work highlights the importance of fibrous nonlinear elasticity in

regulating tumor cell-ECM interaction, and results may have implications in the rapid tissue stiffening commonly found in tumor progression and fibrosis. (2) *Sperm rheotaxis*. Using a microfluidic model, we demonstrated that fluid shear stress can guide sperm swimming against flow. In addition, the elastic component of the biological fluids promotes a collective sperm swimming pattern. Our work highlights the importance of biological materials in regulating cell migration.

Short Bio:

Mingming Wu directs the micro/nano/biofluidics lab in the department of biological and environmental engineering department at Cornell University. Her lab is best known for developing micro-scale devices for exploring cellular behaviour and their co-evolution with the microenvironment. The problems of choices are motivated by contemporary problems in health and environment. Current research projects include cancer metastasis, sperm cell migration and bacterial motility. Dr. Wu received B. S. and PhD in physics, in Nanjing University and the Ohio State University respectively. Prior to joining Cornell, she was a postdoctoral researcher at Ecole Polytechnique in France and University of California at Santa Barbara.