Chemical & Physical Sciences
UNIVERSITY OF TORONTO
MISSISSAUGA

COLLOQUIUM

TUESDAY, MARCH 13TH, 2012
12:00 P.M. (SHARP) – 1:00 P.M.
CCT 2150

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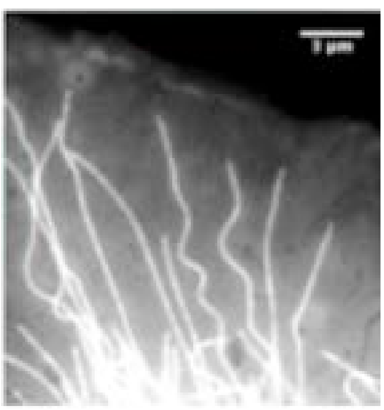
"The transport and deformations of cargo tracks in cells"



Organelle motility is essential for the functioning of the eukaryotic cell. Actively modifying intracellular structures allows cells to change and adapt to different conditions. One of these cellular structures is the microtubule cytoskeleton, which is comprised of polarized filaments that function as tracks to transport cargo via molecular motors. While there is a great deal of work on the cooperative motility of organelles over microtubules (MTs), less is known about the deformations and transport of the microtubules themselves.

Recent experiments on LLC-PK1 epithelial cells provide strong evidence for motor driven buckling of microtubules, suggesting that the cell is regulating the MT array via active force generators. The corresponding MT curvature distribution is non-Gaussian, with a pronounced exponential tail. Curvature distributions measured in gliding assays are similar to these in vivo distributions. This similarity is remarkable since in this simple in vitro system, only thermally fluctuating, non-growing MTs and MT-based motors are present. It turns out that in the gliding assays, non-functional molecular motors mimic the role of passive cross-linkers in living cells. In this talk, I will present coarse-grained simulations of MT deformation and buckling on gliding assays. Our extensive Brownian dynamics simulations yield curvature distributions which are consistent with those measured experimentally, and exhibit interesting scaling properties. I will also discuss the implications of our results for cargo transport in cells.