Chemical & Physical Sciences
UNIVERSITY OF TORONTO
MISSISSAUGA

COLLOQUIUM

TUESDAY, FEBRUARY 12TH, 2013
12:00 P.M. (SHARP) – 1:00 P.M.
IB270

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Simon Fraser University

"Probing sequence-dependent mechanics of collagen"

Mechanical response is a key property of many types of materials, yet rational design of mechanical response as a function of chemical composition remains an enormous challenge. Collagen is the predominant protein in vertebrates; it plays a critical mechanical and structural role in the extracellular matrix and in connective tissues; and it is widely used as a biomaterial. We are studying how its chemical composition and local environment affect its mechanics at various stages in its hierarchical assembly pathway.

We use optical tweezers to manipulate and measure forces acting on microspheres, which we use either as handles to stretch single molecules of collagen, or as probes of the local mechanical environment in microrheology experiments. By altering the sequence of collagen, we find changes in the dynamics and strength of interactions between collagen proteins, and discuss how these relate to alterations in the kinetics of fibril formation. We furthermore demonstrate that our recombinant expression system for this protein produces collagen capable of self-assembling into classical well-ordered collagen fibrils, as seen by imaging with transmission electron microscopy.