Chez Pierre

Presents ...

**Wednesday, February 11, 2015**
**12:00pm**
**MIT Room 4-331**

# Special Biophysics Chez Pierre Seminar


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## *"Cellular Forces Studied by DNA-based Molecular Force Sensor & Modulator"*


Mammalian cells are remarkable force processors. Cells adhere through membrane protein integrins and generate forces on integrins to probe the local environment. These forces regulate many fundamental cellular functions such as cell adhesion, proliferation, migration, and ultimately stem cell differentiation and cancer progression. Because of its critical importance, integrin force has long been a central topic in the field of cell mechanics. To study integrin forces at the molecular level, I developed a DNA-based force sensor and modulator termed tension gauge tether (TGT) which quantitatively reports and controls cellular forces on integrin molecules. Using TGT, I systematically studied the ranges and physiological roles of integrin forces and discovered two distinct force regimes: cell membrane generates ~40 pN molecular force on integrins to regulate cell adhesion and spreading, while cytoskeleton generates >54 pN molecular force on integrins to regulate cell polarization and migration. This work demonstrated the versatility of integrins and shed light on the mechanism how cells adjust integrin molecular tensions to regulate different cellular functions. TGT was also applied to study other mechano-sensitive proteins including cadherins and Notch receptors. Overall, TGT provides a novel avenue for the study of cell mechanics at the molecular level. In the future, I will apply TGT to study a series of mechanical–involved cellular processes such as kinase activation, durotaxis and endocytosis, and develop TGT-derived biomaterials for biomedical applications.