



BIOEN 509 – DEPARTMENTAL SEMINAR SERIES

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Foege Bioengineering Building N130A

Gaining Traction on Traction Forces: the Role of Mechanical Factors on Cell Contractility

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Traction forces are central to a cell's ability to migrate, adhere, or contract. These forces are regulated by focal adhesion dynamics and actin and myosin interactions, but mechanical factors such as stiffness, cell shape, ligand density, and external stresses affect a cell's ability to generate traction forces. It has been difficult, however, to characterize how cells sense and respond to mechanical factors because of shortcomings in the current techniques to control the cellular microenvironment. I will present the engineering approaches my lab uses to study traction forces in response to mechanical factors. We focus on the mechanics of cells in the cardiovascular system and are specifically interested in the role that mechanical factors play in hemostasis, thrombosis, and atherosclerosis. We use 1) arrays of micro- or nanoscale cantilever posts to measure traction forces, 2) bio-functional materials to control the physiochemical presentation to cells, and 3) computational approaches for image analysis and cell mechanics models. We have found that stiffness and cell area are independent factors of traction forces and that applied forces can influence the regulation of these forces. Together these engineering approaches help advance a pathway towards understanding how cells operate in a physical world and how detection of mechanical changes can be early indicators of pathological conditions.

Dr. Sniadecki received his B.S. in Mechanical Engineering in 2000 from the University of Notre Dame and his Ph.D. in Mechanical Engineering in 2003 from the University of Maryland, College Park. He was a NIH NRSA post-doctoral fellow at Johns Hopkins University in 2004 and later at the University of Pennsylvania in 2005. He was a Hartwell fellow at the University of Pennsylvania in 2006. He is currently an Assistant Professor in Mechanical Engineering and adjunct in Bioengineering at the University of Washington since September 2007. Dr. Sniadecki is a recipient of the NSF CAREER award in 2009.



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