Interdisciplinary Center for the Study of Biocomplexity Colloquium

Brendan Harley

Department of Chemical and Biomolecular Engineering
University of Illinois

will give a lecture entitled:

Patterning Biomaterials for Regenerative Medicine and Stem Cell Engineering

Abstract

The extracellular matrix (ECM) is a complex organization of structural proteins, such as collagens and proteoglycans. Heterogeneous tissues with spatially and temporally modulated properties and their biomaterial mimics play an important role in organism physiology and regenerative medicine. With the understanding that the microstructure, mechanics, and composition of the ECM is dynamic and often spatially patterned or heterogeneous over the length-scale of traditional biomaterials, there has recently been significant effort aimed at moving away from static, monolithic biomaterials towards instructive biomaterials that provide specialized cell behavioral cues in spatially and temporally defined manners. We have been developing patterned, tunable biomaterial systems to explore the practical significance of how cell/matrix cues can be optimized to improve biomaterial regenerative potential and the mechanistic details of how individual (stem) cells sense, integrate, and respond to multiple microenvironmental signals. Here, I will present the development of biomaterials for traditional regenerative medicine applications, as well as stem cell fate engineering. We are integrating anisotropic and multi- compartment collagen scaffolds with photolithography-based biomolecule patterning tools for the regenerative repair of orthopedic defects. We are also creating multi-gradient and combinatorial biomaterials for rigorous investigation of fundamental questions regarding niche-mediated regulation of hematopoietic stem cell (HSC) behavior. Here, microfluidic tools aid our investigation of the role played by matrix elasticity, ligand presentation, and paracrine-mediated signaling on HSC fate.

Thursday, May 5th, 2011
4:00 p.m. to 5:00 p.m.
129 Hayes-Healy Center