INSTITUTE OF MATERIALS SCIENCE & ENGINEERING

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SEMINAR SERIES

Improving and Exploiting "Disease-in-a-dish" with Engineered Niche

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Sanford Consortium for Regenerative Medicine

Monday, September 11, 2017
11:00-12:00pm, Crow Hall Room 206

After nearly a decade of recognition that extracellular matrix (ECM) properties can influence cell behavior to similar degree as growth factors, in particular ECM composition, topography, porosity, and elastic modulus (i.e. stiffness), biologists have come to recognize its importance. However matrix is highly dynamic, changing how much of it is secreted and assembled during development and disease. Most synthetic ECM mimics made initially to study this phenomenon were static but there is growing interest in making matrices that have tunable properties with time. Using several material systems in 2D and 3D, I will highlight how we have used matrix dynamics to study disease mechanisms in heart disease and cancer. First, I will employ the differentiated cardiac progeny of induced pluripotent stem cells (iPSCs) to understand how genomic variants that predispose progeny in an engineered niche to higher risk for coronary artery disease and myocardial infarction. While mechanisms in protein-coding loci are obvious, variants in non-coding loci are difficult to determine, and so I will use our materials-based approach to highlight methods that can induce disease-in-a-dish in order to study its mechanisms. In parallel, I will highlight our efforts to model the cancer niche and understand the molecular mechanisms of stiffness-mediated cancer. Significant heterogeneity within this system have lead us to further examine how to use cancer cell physical properties to isolate and understand the biology of the most metastatic cells within a population. Based on these exciting results, I will advocate that any *in vitro* culture system should employ 3D, dynamic materials that change as the niche does *in vivo*.

Adam J. Engler is an Associate Professor of Bioengineering at UC San Diego, where he has been on the faculty since 2008. He also is a resident scientist at the Sanford Consortium for Regenerative Medicine. Dr. Engler previously trained with Dr. Dennis Discher at the University of Pennsylvania, where he earned his PhD studying how ECM stiffness regulated stem cell fate. He performed his postdoctoral studies with Dr. Jean Schwarzbauer at Princeton University's Department of Molecular Biology. His current research focuses on how physical and chemical properties of the niche regulates and misregulates cell function during disease and aging, with particular applications to heart disease and cancer. His lab makes natural and synthetic matrices with unique spatiotemporal properties to mimic niche conditions to improve cell behavior and commitment in vitro for their therapeutic use in vivo. His lab also studies these processes in vivo with rapidly aging model systems including Drosophila. Dr. Engler was the 2008 recipient of the Rupert Timpl Award from the ISMB. He was also a recipient of an NIH Innovator Award, 2015 Y.C. Fung Award from ASME, 2008 Rita Schaeffer Award from BMES, and was the inaugural recipient of the Renato Iozzo Award from ASMB in 2014.

Faculty, students, and the general public are invited.

Hosted by Guy Genin