UCLA Engineering
HENRY SAMUELI SCHOOL OF ENGINEERING AND APPLIED SCIENCE

BIOENGINEERING

PRESENTS

Beyond 2D: Self-Organizing Patterns in Cancer and Nanomaterials

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12:00 – 1:00 PM
2101 ENGINEERING V

Ian Y. Wong, Ph.D.
Brown University
Assistant Professor, School of Engineering

ABSTRACT:

Living cells exhibit coordinated behaviors that drive interfacial form and function during 3D tumor progression and tissue morphogenesis. These emergent phenomena have inspired the patterning of artificial nanomaterials into higher dimensional architectures from the "bottom-up." In this seminar, I will present recent results from my group based on these two research themes: First, we explore cancer biology inspired by materials science. In particular, we investigate tumor cell invasion and heterogeneity using a combination of single cell tracking and engineered biomaterials. We are particularly interested in the scattering and dissemination of individual cells from a collective multicellular front, which has been associated with the epithelial-mesenchymal transition (EMT). We show that these complex behaviors have analogies with a phase transition that occurs during the solidification of binary mixtures. Second, we explore the patterning of 2D nanomaterials inspired by biological morphogenesis. We show that graphene oxide films deposited on polystyrene "shrink films" can be shaped into hierarchically wrinkled and crumpled architectures that span multiple length scales. Remarkably, distinct sequences of mechanical deformations generate unique structural features, suggestive of a mechanically encoded memory. We further demonstrate that these graphene oxide structures can be exactly replicated into metal oxides through metal ion intercalation. Overall, our biological research beyond 2D monolayer culture may enable fundamental insights into the tumor microenvironment, as well as physiologically relevant invasion assays for precision medicine. Moreover, we envision that large area patterning of 2D nanomaterials can be used for curved and stretchable multifunctional devices beyond wafer scale.

BIOGRAPHY:

Ian Wong engineers new miniaturized technologies based on BioMEMS and microfluidics to investigate cancer cell invasion, drug resistance, and heterogeneity. He is also interested in the unconventional fabrication of bio and nano materials using self-assembly and 3D printing. He received his A.B. magna cum laude in Applied Mathematics from Harvard University in 2003. He did his graduate work on the directed self-assembly of biomolecular materials with Nick Melosh, receiving a Ph.D. in Materials Science and Engineering from Stanford University in 2010. His postdoctoral training was with Mehmet Toner and Daniel Irimia at the Center for Engineering in Medicine at Massachusetts General Hospital from 2010-2013. He joined Brown University as assistant professor of engineering in July 2013. He is a recipient of an NSF Graduate Research Fellowship, the Damon Runyon Cancer Research Fellowship, and the Brown University Pierrepont Award for Outstanding Advising.