



# Beyond 2D: Self-Organizing Patterns in Biomaterials and Cancer

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Biologically-inspired materials can be engineered with dynamic, information-rich functionality to mimic microfluidic systems and elucidate cancer biology. In this seminar, I will present recent results from my group to pattern microfluidic biomaterials and understand the epithelial-mesenchymal transition in cancer. First, we utilize 3D printing and ionic crosslinking to pattern stimuli-responsive hydrogels. We show that alginate-based biomaterials can be controllably patterned and erased, as well as augmented with graphene oxide. We also demonstrate double network hydrogels with self-adhesive properties as modular “LEGO” blocks for DIY microfluidics. Second, we investigate how mammary epithelial cells transition from a fluid-like “unjammed” phase to a solid-like “jammed” phase. We show that these collective behaviors exhibit striking analogies with a gelation-like mechanism during the diffusion limited aggregation of non-living colloidal particles. Finally, we analyze the disorganization and dissemination of multicellular clusters cultured in 3D matrix, which exhibit both collective and individual invasion phenotypes with distinct topological and traction signatures. These emergent phenomena in living and non-living systems exhibit striking analogies, which may enable new fundamental insights into the morphogenesis of tissues and tumors, as well as unconventional fabrication strategies to pattern biomaterials.

## ABOUT the SPEAKER

*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. 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.*

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