FRONTIER FACULTY CANDIDATE

A Nanoengineered Systems Framework for Probing Collective Cell Migration

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Abstract:
Collective cell migration is a fundamental multicellular activity that plays essential roles in numerous physiological and pathological processes, such as angiogenesis, tissue regeneration, and cancer metastasis. Proper coordination of cells, for instance, is required to repair damaged tissues in which cells crawl collectively atop exposed extracellular matrix following injury. The collective migration mechanisms responsible for tissue development are also utilized in the invasion and metastasis of malignant tumors. Despite its importance, the fundamental processes that drive collective cell migration (e.g., leader cell formation and biomechanical coupling) remain poorly understood. To elucidate the collective migration process, my laboratory establishes a bionanotechnology framework, which combines biomanufacturing of organotypic and 3D tissue models, nanoengineered probes for single cell gene expression analysis and ablation, biomechanical analysis of cell-cell and cell-matrix interaction, and agent-based computational modeling. In this talk, I will discuss the application of this nanoengineered systems framework for probing the mechanoregulation of collective cell migration, including the dynamic regulation of leader cells via Notch1-Dll4 lateral inhibition and tip-stalk organization during angiogenic sprouting.

Bio:
Dr. Wong is an Associate Professor in the Department of Aerospace and Mechanical Engineering, Biomedical Engineering, Agricultural and Biosystems Engineering, Southwest Environmental Health Sciences Center and Bio5 Institute at the University of Arizona. He received his Ph.D. from the University of California, Los Angeles in 2005. He is an editor in IEEE Nanotechnology Magazine and an associate editor in IEEE Transaction on Nanotechnology. He has published 75 peer-reviewed journal articles in the area of nanotechnology and biomedical engineering, and is an inventor of two patents. His current research interest focuses on collective cell migration and point-of-care diagnostics. Among other honors, Dr. Wong was awarded the NIH Director’s New Innovator Award in 2010, Arizona Engineering Faculty Fellow in 2011, AAFSAA outstanding Faculty Award in 2013, and JALA 10 – A Top 10 Breakthrough in Innovation in 2014.