
Department of Biomedical Engineering
Systems Cellular-Molecular Bioengineering Distinguished Speaker Series



Pak Kin Wong, Ph.D.

Professor, Departments of Biomedical Engineering,
Mechanical Engineering and Surgery,
The Pennsylvania State University
<http://www.bioe.psu.edu/labs/sbl/>

Friday, October 21, 2016 2:00 – 3:00 pm
UPC – Denney Research Center (DRB), Room 146

***"A Systems Bioengineering Framework for Probing
Collective Cell Migration"***

Collective cell migration is a fundamental multicellular activity that plays essential roles in numerous physiological and pathological processes, such as tissue development, 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 significance, the fundamental processes that drive collective cell migration, such as leader cell formation and multicellular cooperativity, remain poorly understood. To elucidate the molecular and cellular mechanisms governing collective cell migration, my laboratory is developing a single molecule biosensor for dynamic multigene analysis in complex tissue environments. By integrating the single molecule biosensor with microengineered 3D tissue models, single cell photothermal ablation, biomechanical analysis, and agent-based computational modeling, we establish a systems bioengineering framework for probing collective cell migration. Using the systems bioengineering framework, we reveal that the formation of leader cells during collective migration is dynamically regulated by Dll4 signaling through both Notch1 and intercellular tension. Our finding provides a molecular basis for the stochastic emergence of leader cells, which may enable novel approaches in regenerative medicine, wound healing and anti-metastasis therapy in the future.

Biography

Pak Kin Wong is a Professor of Biomedical Engineering, Mechanical Engineering and Surgery at the Pennsylvania State University. Prior to Penn State, Dr. Wong was an Associate Professor in the Departments of Aerospace and Mechanical Engineering and Biomedical Engineering and a member of the Southwest Environmental Health Sciences Center at the University of Arizona. He received his Ph.D. from the University of California, Los Angeles in 2005. He is an editor of Scientific Reports, IEEE Transaction on Nanotechnology, IEEE Nanotechnology Magazine, and Journal of Laboratory Automation. He organizes numerous international conferences, including serving as the General Co-Chair of IEEE NEMS 2017 in Los Angeles CA. His current research interest focuses on collective cell migration and clinical diagnostics. He has published 90 peer-reviewed journal articles in the area of nanotechnology and biomedical engineering, and is an inventor of two patents. 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 2015.

Hosted by: Keyue Shen