SEMTE

seminar

Systems Biology: Understanding the Physical Architecture of a Cell

School for Engineering of Matter, Transport and Energy

Dr. Siowling Soh

Post-Doctoral Fellow
Harvard University

abstract

Despite decades of extensive research, our knowledge of a cell as a complex chemical system remains far from complete. It is important to understand the microscopic properties of a cell, e.g., the mechanical structure and the machinery for cell migration, for human health, especially in the context of cancer. In particular, previous studies have found that metastatic cancer cells migrate through tissues and into bloodstreams more readily than non-metastatic cells due to their superior mechanical properties (e.g., higher deformability) and machinery for migration (e.g., higher velocity).

In this presentation, I will describe the physical architecture of a cell as a result of the interacting molecules in the cellular system. At the molecular level, it is necessary to take into account of the combination of reactions and transport of molecules, such as diffusion, across the cell for understanding microscopic behaviors of a cell. At the systems level, I will discuss: (1) the factors determining the size of a cell; (2) the components responsible for the mechanical structure of a cell through analyzing 3-dimensional shapes of cells reconstructed from confocal microscopy; and (3) the difference in migration strategy of a non-metastatic cancer cell and a metastatic cancer cell. Results from these studies highlight the need to bridge our understanding of a cell from a molecular to a microscopic level, especially for the development of cancer therapeutics and diagnosis.

biosketch

Siowling Soh is currently a post-doctoral fellow working with Professor George Whitesides at Harvard University. He obtained his Ph.D. in Chemical and Biological Engineering from Northwestern University (with Professor Bartosz Grzybowski). His main scientific interest and experience lie in studying the coupled process of reactions and transport (e.g., diffusion and convection) of molecules in complex chemical and biological systems. In particular, he is interested in understanding the microscopic behaviors of cells (e.g., mechanical structure, and motility) from a molecular level, which involves networks of reactions and transport of molecules in a cell.

Ira A. Fulton Schools of Engineering
ARIZONA STATE UNIVERSITY

February 19, 2013 at 10:00am in GWC 487