Yale Institute for Nanoscience and Quantum Engineering

Friday-September 22, 2017

12:00-1:00 PM

BECTON SEMINAR ROOM
Light lunch will be served at 11:45 a.m.

Yujun Xie

Department of Mechanical Engineering and Materials Science, Yale University

"Self-Healing of a Confined Phase Change Memory Device with a Metallic Surfactant Layer"

Self-healing, an essential attribute in biology to sustain life, has been demonstrated in several materials systems to autonomously extend their cycle life. Examples include polymers that can repair broken bonds or nanocapsules that release healing agents upon fracture at the micron scale**[1]**. For complex integrated circuits, self-healing has yet to be demonstrated although it could significantly improve endurance of a circuit while reducing the error correction budget. Here, we demonstrate self-healing in novel confined phase change memory (PCM) devices by controlling the electromigration of the phase change material at the nanoscale. In contrast to the current mushroom PCM, the confined PCM has a symmetric device structure, which enables polarity reversal of set and reset voltage pulses for device operation. *In situ* transmission electron microscope (TEM) movies show that the voltage polarity controls the electromigration direction of the phase change material, which can be used to fill nanoscale voids that form during set/reset cycles. Based on our finding, we demonstrate self-healing of a failed device. We thus propose bipolar switching as a new operation mode for the confined PCM to reduce the chemical segregation, which can extend its endurance significantly.

Ivan Surovtsev

Christine Jacobs-Wagner lab at Microbial Sciences Institute
Department of Molecular, Cellular, and Developmental Biology, Yale University

"Emergence of the Spatial Order from Random Forces: Lessons from the Bacterial ParA/B System"

In the this talk, I will describe how various spatial dynamics on a micrometer scale - propagating waves, oscillations and non-Turing patterning – emerge from molecular properties of a simple two-protein system. I will discuss how non-equilibrium dynamics of this system allows bacteria to utilize "noise" – random forces from the DNA - to generate a useful work such as an active translocation of intracellular cargos, and how collective interactions within a such system lead to dynamic intracellular patterning.

Host: Professor Corey O'Hern