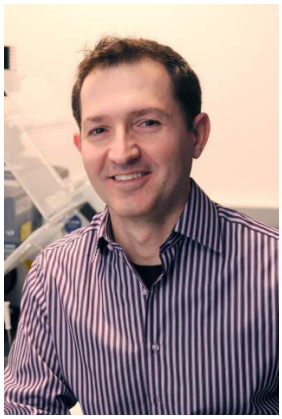
UCLA Engineering
HENRY SAMUELI SCHOOL OF ENGINEERING AND APPLIED SCIENCE

BIOENGINEERING

PRESENTS

Metabolic oscillations and electrical signaling in bacterial biofilms



THURSDAY, MARCH 10, 2016
12:00 PM – 1:00 PM
2101 ENGINEERING V

Gurol Suel, Ph.D.
University of California, San Diego
Associate Professor, Department of Molecular Biology

ABSTRACT:

Bacteria have been intensely studied for many decades and as a result we have gleaned many fundamental insights into biology. However, we are still relatively in the dark regarding bacterial behavior within densely packed communities known as biofilms. I will share our recent findings regarding biofilm communities. Specifically, I will show emergence of metabolically driven collective oscillations that resolve a social conflict between cooperation and competition and thereby increase biofilm fitness. I will also present the discovery of a new form of bacterial cell-cell communication within biofilms that is based on ion channel mediated electrical signaling.

BIOGRAPHY:

Dr. Gurol Suel received his PhD in Molecular Biophysics in 2003 and during his thesis work with Dr. Rama Ranganathan (UT Southwestern), he was part of a team that challenged the traditional view of protein function. Specifically, Dr. Suel applied a statistical thermodynamics approach to identify unknown allosteric regulation in many protein families. As a postdoc in the lab of Dr. Michael Elowitz (Caltech), he generated the first direct experimental evidence that molecular noise (randomness) can determine cell fate outcomes. After starting his independent laboratory in 2007, Dr. Suel continued to define a biological role for noise by integrating single cell measurements, synthetic biology and mathematical modeling. His laboratory then expanded its focus to study bacterial biofilm communities. The work uncovered a cell death pattern that emerges during biofilm development and determines colony morphology by channeling mechanical forces. His group used this insight to engineer the 3D organization of biofilms by controlling cell death. Dr. Suel's group also developed a microfluidics method to study biofilm growth and uncovered oscillations driven by spatio-temporal coordination of metabolic states among distant cells. These collective oscillations were shown to increase the resilience of biofilms against chemical attack by resolving the social conflict between cooperation and competition among bacteria. Most recently, the Suel laboratory discovered a new form of bacterial communication that arises in biofilms: Ion channel mediated electrical cell-to-cell signaling. This finding revealed an unexpected connection between micro and neurobiology with many fundamental implications.