

# Investigative Workshop On Systems and Synthetic Microbiology

March 11-13, 2013, NIMBioS at the University of Tennessee, Knoxville

Co-organizers: Christopher Rao and Lingchong You

## March 11

8:00-9:15 Breakfast  
9:15-9:35 Introduction (Chris Welsh)

### Session 1 (Evolution and Ecology I)

Chair: Ilya Nemenman

9:35 -- 10:10 Wenying Shou, Fred Hutchinson Cancer Res. Ctr.  
*Evolution of incipient cooperation: pleiotropic mutations can confer "win - win" phenotypes directly benefiting both self and partner*

10:10-- 10:45 Jeff Gore, MIT  
*Anticipating tipping points in biological populations: cooperation, cheating, and collapse*

10:45 -- 11:05 Coffee Break

11:05 -- 11:40 Yu Tanouchi, Duke University  
*A synthetic-biology approach to understanding bacterial programmed death and implications for antibiotic treatment*

11:40 -- 12:00 Munehiro Asally, UCSD  
*Localized cell death focuses mechanical forces during biofilm formation*

**12 - 2pm Lunch, free discussion**

### Session 2 (Evolution and Ecology II)

Chair: Jin Wang

2:00 -- 2:35 Andre Levchenko, Johns Hopkins University  
*Adaptive collective responses of E. coli to spatial confinement*

2:35 -- 3:10 Josh Leonard, Northwestern University  
*Directed evolution of biosynthetic pathways using synthetic integrons*

3:10 -- 3:30 Coffee break

3:30 -- 4:05 Meta Kuehn, Duke University  
*Bacterial Surface Defense Against Environmental Threats*

4:05 -- 4:25 Babak Momeni, Fred Hutchinson Cancer Res. Ctr.  
*Compositional stability and spatial patterning driven by ecological interactions in microbial communities*

**4:25-6:30 pm NIMBioS reception/Poster session**

Dinner on your own

## March 12

8:00-9:15 Breakfast

### **Session 3 (Design principles of networks I)**

*Chair: Josh Leonard*

9:15 -- 9:50 Jin Wang, Stony Brook University  
*Landscape Theory and Cell Fate Decision Making*

9:50 -- 10:25 Oleg Igoshin, Rice University  
*Design principles of information processing in the Bacillus subtilis sporulation network*

10:25 -- 10:45 *Coffee Break*

10:45 -- 11:20 Xiao Wang, Arizona State University  
*Engineering Complex Dynamics Using Synthetic Gene Networks*

11:20 -- 11:40 Minsu Kim, Emory University  
*The gratuitous growth bistability of antibiotic resistant bacteria*

**11:40 -- 1:40pm lunch break; free discussion**

### **Session 4 (Evolution and Ecology III)**

*Chair: Jeff Gore*

1:40 -- 2:15 Lingchong You, Duke University  
*Art of war against quorum-sensing mediated cooperation -- lessons from synthetic gene circuits*

2:15 -- 2:50 Gabor Balazsi, UT MD Anderson Cancer Center  
*Evolution through the lens of synthetic biology*

2:50 -- 3:10 *Coffee break*

3:10 -- 3:45 Jie Xiao, Johns Hopkins  
*Gene regulation at the single molecule level*

3:45 -- 4:20 Ilya Nememan, Emory University  
*Adaptive virtues of bacterial suicide*

**4:20 -- 6:00pm Poster session/free discussion**

*Dinner on your own*

**March 13**

8:00-9:00 Breakfast

**Session 5 (Design principles of cellular networks II)**

*Chair: Gabor Balazsi*

9:00 -- 9:35 Domitilla Del Vecchio, MIT

*A Control Theory Approach to Engineering Biomolecular Networks*

9:35 -- 10:10 Chris Rao, University of Illinois

*Counting and control in bacterial motility*

*10:10 -- 10:30 Coffee Break*

10:30 -- 11:05 Sima Setayeshgar, Indiana University

*Time dependence of force development in a localized bacterial adhesin*

11:05 -- 11:40 Open

**11:40 -- 12:25 Panel Discussion**

**12:25 -- 12:50 Wrap up (Chris Rao/Lingchong You)**