



**BIOINFORMATICS 2015 SPRING SEMINAR SERIES**

Hosted by: Department of Computer and Information Sciences,  
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Center for Bioinformatics and Computational Biology  
<http://bioinformatics.udel.edu/seminars>

**MONDAY, March 23, 2015**

**3:30pm**

**DBI Room 102**

**Memory & Bacterial Growth  
in Fluctuating Environments**

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**Abstract:** Gene activation in bacteria is often accompanied by lag phases during which cell growth slows down while cells transition into adapted phenotypic states. In fluctuating conditions, gene regulation alone may not provide an optimal adaptation, as cells progress continually through lag phases. In this talk, I describe our experiments on bacterial growth in fluctuating environments, including fluctuating sugars & antibiotics. We identify two different types of phenotypic memory that accelerate growth under sugar fluctuations, and measure the system's response across a range of timescales. Using single-cell lineage tracking, we analyze the dynamics of a population exposed to antibiotic pulses, and identify rapidly forming persister phenotypes. A modeling approach is introduced to predict population-level behavior from single-cell statistics, and vice versa.

**Biosketch:** I received my Ph.D in Biophysics from Harvard University, where I worked with Eugene Shakhnovich on physical aspects of protein folding, including relaxation dynamics and packing of protein sidechains, high-resolution Monte Carlo simulation of folding, and theory related to protein evolution. I went on to do post-doctoral work with Stanislas Leibler at The Rockefeller University where, starting with simple models of antibiotic persistence in *E. coli*, we worked towards understanding in some generality the evolutionary advantage of stochastic phenotype switches in microorganisms. We eventually found that these mechanisms are intimately connected with information acquisition in a general sense, and that in certain cases the evolutionary advantage of phenotype switching can be expressed in purely information theoretic terms. I joined the NYU faculty in the Department of Biology in September 2006, where I am working on theory and modeling of evolution in microorganisms.