

# Computation and Informatics in Biology and Medicine Training Program Retreat

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3:30 p.m. Presentation

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## ***Design Principles of Genetic Regulatory Networks***

### ***Abstract:***

A genetic regulatory circuit consists of the collection of genes and gene products involved in the response to a signal, which is often a metabolite. Discoveries of recurring sub-structures, or network motifs, in the genetic regulatory network of *Escherichia coli* (1) emphasize the importance of understanding structure-function relations in gene circuits. Theoretical studies to discover general principles that relate gene-circuit design to gene-circuit function already have provided insight into some of the ecological factors and performance criteria that might be important in evolution. In particular, the design principles of inducible and repressible elementary gene circuits, which involve just one transcription factor (TF), have been studied extensively (2-4). In this talk I will review design principles of elementary gene circuits, and I will describe recent studies to understand the structure and function of gene circuits that involve two TFs, such as the feed-forward-loop network motif (1). Results of these studies emphasize both the importance of considering signal interactions in studies of gene-circuit function and design and the importance of including the effects of signals when documenting genetic regulatory interactions (4, 5).

1. Shen-Orr, S. S., Milo, R., Mangan, S. & Alon, U. (2002) *Nat Genet* **31**, 64-8.
2. Hlavacek, W. S. & Savageau, M. A. (1996) *J Mol Biol* **255**, 121-39.
3. Wall, M. E., Hlavacek, W. S. & Savageau, M. A. (2003) *J Mol Biol* **332**, 861-876.
4. Wall, M. E., Hlavacek, W. S. & Savageau, M. A. (2004) *Nat Rev Genet* **5**, 34-42.
5. EcoTFs database. <http://ecotfs.lanl.gov>

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**Friday, October 15th**

Pyle Center, Room 325/326

702 Langdon Street

9:00 a.m. – 5:00 p.m.