

Systems Biology Research Symposium

Oral Presentation Session

Grand Ballroom
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7:00-8:30pm

Engineering Microbial Gene Networks: Integrating Synthetic Biology and Systems Biology

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Many fundamental cellular processes are governed by genetic programs which employ protein-DNA interactions in regulating function. Owing to recent technological advances, it is now possible to design synthetic gene regulatory networks, and the stage is set for the notion of engineered cellular control at the DNA level. In this talk, we describe how techniques from nonlinear dynamics and molecular biology can be utilized to model, design and construct synthetic gene regulatory networks. We present examples in which we integrate the development of a theoretical model with the construction of an experimental system. We also discuss the implications of synthetic gene networks for biotechnology, biomedicine and biocomputing. Additionally, we present integrated computational-experimental approaches that enable construction of quantitative models of gene-protein regulatory networks using expression measurements and no prior information on the network structure or function. We discuss how the reverse-engineered network models, coupled to experiments, can be used to gain insight into the regulatory role of individual genes and proteins in the network, and identify the pathways and gene products targeted by pharmaceutical compounds.

Key words: network biology, synthetic gene networks