

Systems Biology Research Symposium

Oral Presentation Session

Grand Ballroom
Tuesday, June 5th
7:00-8:30pm

An Engineering Approach to Characterizing Structure-Function Relationships in DNA Sequences

Jean Peccoud, David Ball, Yizhi Cai, Michael Czar, and Matthew Lux

Virginia Bioinformatics Institute, Virginia Tech, Washington St, MC 0477, Blacksburg VA 24061

Presenter's email address: peccoud@vt.edu

The rapid development of DNA synthesis technologies makes it urgent to refine our understanding of structure-function relationships in DNA sequences. When it is possible to chemically synthesize an entire bacterial genome, it becomes necessary to quantitatively characterize the function of the genome building blocks. Our group is approaching this problem using an integrated combination of modeling and experimental approaches. We have developed new computer languages to formalize biological functions. Using a high-throughput gene synthesis workflow, we can generate libraries of genetic constructs to rationally explore complex genetic spaces. Using custom imaging software, we can use time-lapse microscopy experiments to generate single cell gene expression data that can be compared to model predictions. It is expected that a framework integrating design, fabrication, measurement, and optimization will make it possible to refine our understanding of fundamental biological processes and engineer a new generation of biotechnology products.

Key words: synthetic biology, design automation, genotype to phenotype relationships, gene synthesis, imaging