



# Building a Synthetic Biology Discipline: Automated Design of Cellular Sensors, Circuits, and Pathways

**Event Type:** IBBR Seminar Series

**Contact Person:** Jennifer Tullman

## Event Info

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**Date:** Monday, October 15, 2018 - 11:00am to  
12:00pm

**Location:** Auditorium

## Details

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**Speaker/Presenter:** Howard Salis

**Speaker Title:** Associate  
Professor

### **Speaker Affiliation:**

Biological Engineering and Chemical Engineering, Penn State University

### **Event Description:**

DNA is Nature's programming language and its sequence determines how organisms sense their environment, perform decision-making, and catalytically produce valuable chemical products. The Salis lab develops sequence-to-function biophysical models of gene regulation, and conducts thousands of systematic and quantitative experiments to validate their predictions. We combine our predictive models with computational optimization to design non-natural genetic systems with targeted functions and capabilities. As examples of our design approach, we've engineered hundreds of cellular sensors, genetic circuits, and metabolic pathways with optimized performances, including riboswitches that detect 2,4-dinitrotoluene, signal amplifying genetic circuits, mixed feedback control circuits for portable cross-species expression, and multi-enzymes pathways for over-production of desired cofactors and chemicals. Beyond their practical applications, these examples critically test our understanding of the physical mechanisms governing sensor, circuit, and pathway function, and our ability to automatically design sensors, circuits, and pathway with desired capabilities. Through our web-based platform (<http://salislab.net/software>), over 8000 researchers have used

our algorithms to design over 500,000 DNA sequences for their own biotech applications. In this talk, we present specific models, algorithms, and experimentally validated examples that highlight how the automated design of genetic systems will continue to radically change the way we engineer biology in the future.

Biosketch: Prof. Howard Salis is an Associate Professor at Penn State University in the Biological Engineering and Chemical Engineering departments. He obtained his Ph.D. degree in Chemical Engineering from the University of Minnesota and completed a postdoctoral fellowship at UC San Francisco. He received the DARPA Young Faculty Award in 2010, the NSF Career Award in 2013, and founded De Novo DNA, a spin-off company that commercializes design algorithms for engineering genetic systems.

## Setup

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**IT Setup:** Projector  
Laptop  
Streaming on YouTube  
Podium  
Lavalier Microphone  
Wireless PPT Remote

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