

# Systems Approaches for Engineering Microbial Biocatalysts

## Dr. Jennifer L. Reed

Department of Chemical and Biological Engineering  
University of Wisconsin-Madison  
*Host: Dr. Rajib Saha*

**Friday, September 21, 2018**

10:00 a.m. – 11:00 a.m.

Othmer Hall Room 205

*\*Refreshments provided*

### Abstract

Microbes have been engineered to produce a variety of chemicals, including biofuels, commodity chemicals, specialty chemicals, and therapeutics. Chemical production can be enhanced by connecting synthesis pathways to host metabolism, re-wiring regulatory networks, improving precursor production, and optimizing gene expression. A number of computational systems biology approaches have been developed to facilitate metabolic engineering efforts by suggesting which combination of genetic changes would improve chemical production. Network analysis methods can be used to identify paths from renewable substrates to high-value chemical products and central metabolic precursors common to a variety of chemical products. Genome-scale metabolic models can be used to predict how gene deletions, gene additions, and gene expression changes would impact chemical product yields, growth rates, and/or productivities. Additionally, machine learning and active learning algorithms can be used to optimize gene expression constructs to efficiently convert metabolic precursors into desired products. Case studies will be presented that show how a variety of computational tools can guide development of strains with enhanced chemical production. This work will illustrate how integrating computational and experimental efforts can lead to the rapid development of microbial biocatalysts for renewable chemical production.



### Biography

Jennifer Reed is a Harvey D. Spangler Faculty Scholar in the College of Engineering and Professor in the Department of Chemical and Biological Engineering at the University of Wisconsin-Madison. She received her B.S in Bioengineering: Biotechnology and Ph.D. in Bioengineering from the University of California, San Diego. She has received a number of awards for her research including an NSF Career Award, DOE Early Career Award, and a Presidential Early Career Award for Scientists and Engineers (PECASE). She is an American Institute for Medical and Biological Engineering Fellow and a Kavli Fellow. Her group develops and applies systems biology approaches to study and engineer microbial metabolism and regulation for a variety of biotechnology applications.