Research Areas

- Biological Engineering
- Catalysis, Separations & Reaction Engineering

Research Interests

Our research program combines principles of chemistry, biology and engineering to achieve biosynthesis beyond nature. Why? Increasing petroleum consumption has caused oil depletion and climate change, thus we have to explore sustainable approaches to energy and chemical feedstocks. While biosynthesis is a promising green technology, biological systems produce only a limited set of natural metabolites. To overcome this barrier, we will expand the metabolic capabilities of bacteria to biosynthesize various nonnatural metabolites that are useful biofuels, bulk chemicals and pharmaceuticals.

To achieve high-level biosynthesis of non-natural metabolites, our research theme is divided into three steps: First, artificial metabolic pathways are designed; second, protein evolution is performed to realize and optimize the designed pathways; third, metabolic flux is driven to the production of target compounds. Our research integrates techniques from synthetic biology, synthetic chemistry, protein engineering, metabolic engineering and biochemical engineering.

Awards

- American Heart Association National Scientist Development Grant Award, 2013
- 3M Non-tenured Faculty Award, 2013
- Inaugural University of Minnesota Innovation Award, 2014
- McKnight Land-Grant Professor, 2015

Selected Publications


