

## UC SAN DIEGO NANOENGINEERING SEMINAR

Wednesday, February 7<sup>th</sup>, 2018 11:00am - 12:00pm

Faculty Recruitment Seminar Presentation

ASML Conference Center (SME 248)

### “Engineering Multienzyme Systems for the Next Generation of Biomanufacturing”

**Yifei Zhang**

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**Abstract:** Rational design of nanoscale biochemical factories is highly appealing for the next generation of biomanufacturing. Enzymes are the primary building blocks to assemble such molecular factories. Recent developments in materials science, nanotechnology, and synthetic biotechnology enable us to integrate multiple enzymes into desired architectures through various strategies. The understanding of the reaction kinetics and system dynamics of these complex systems thus becomes essential. I will discuss the origin of activity enhancements that have been observed in many enzyme cascades on nanoscaffolds over the last decade. My work suggested that the microenvironment of the scaffold rather than proximity channeling leads to the enhanced activity. I will then introduce some novel strategies for constructing multienzyme systems. Finally, I will present the smallest enzymatic reaction network that can generate spatiotemporal complex dynamics based on substrate competition without relying on activation and inhibition. Together, these findings will create promising opportunities to utilize multienzyme systems in biocatalysis, diagnostics, and adaptive biochemical devices.

**Biosketch:** Dr. Yifei Zhang is a postdoctoral research scientist in the Department of Biomedical Engineering at Columbia University. He earned his bachelor degree in 2010 and his Ph.D. degree in 2015 from Chemical Engineering Department of Tsinghua University, Beijing, China. His doctoral research focused on the engineering of nanostructured and stimulus-responsive enzyme catalysts. For his postdoctoral research, he studied enzyme cascades in the laboratory of Prof. Henry Hess at Columbia University. His current research interests include nanobiotechnology, biocatalysis, synthetic biology and adaptive biochemical systems. He has published 26 peer-reviewed journal papers including 2 ESI highly-cited papers, and filed 2 patents disclosures. He won the first prize of the Chinese Chemistry Olympiad in 2005 and the National Scholarship for Graduate Students in 2013. He graduated *Magna Cum Laude* in 2010 and was recognized with the Excellent Doctoral Dissertation Award of Tsinghua in 2015. Together with Prof. Henry Hess, he was nominated for the 2018 ACS Catalysis Lectureship.