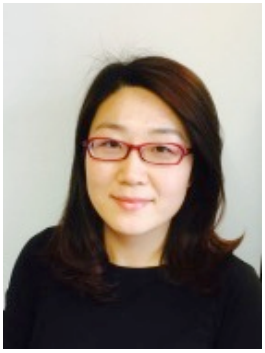
ELECTRICAL & COMPUTER ENGINEERING BIO-SEMINAR Fall 2018 ENGINEERING TEXAS A&M UNIVERSITY

When: **Friday 13:50 – 14:50**
Where: **ETB 1020**



Speaker: **Qing Sun**

Assistant Professor
Department of Chemical Engineering
Texas A&M University

Title: **Biomolecular Scaffolds for Enhanced Biomass Processing and Tumor Marker Detection**

Date: **9-28-2018**

Abstract: Proteins inherently are not standalone entities. They function cohesively in complex biochemical reaction pathways or signaling pathways. Nature has evolved to co-localize proteins of the same pathway to ensure efficient communication of signals or intermediates. Inspired by nature, a variety of artificial scaffolds has been used to enhance reaction yields, increase effectiveness of signaling cascades, and create multi-functional nano and bacterial systems. In this talk, I am going to highlight our efforts to utilize DNA, protein and bacteria communities as scaffolds for enhanced biomass processing and tumor marker detection. We first demonstrated the multi-enzyme co-localization onto DNA scaffolds. Enhanced cellulose hydrolysis was achieved by organizing multiple cellulases and cellulose binding modules onto DNA scaffolds. DNA scaffolds have potential to expand cellulosome into complex structures for higher cellulose hydrolysis efficiency, thus eliminating the limitations of protein scaffolds based cellulosome. Secondly, we extended the design to multi-component co-localization onto three-dimensional protein nanostructures to create biosensors. Using enzyme enabled post-translational modification, a protein nanoparticle was modified with purification tags, sensor input domains, and sensor output domains for cancer detection. Compared with traditional protein nanoparticle based biosensors, the sensors we constructed feature thermal-triggered easy purification, adjustable signal amplification levels and modular input-output domain decorations for context-driven sensor assembly. In the end, we functionally redesigned gut bacteria to rewire host nutritional phenotype. By taking advantage of microbiota-host interaction, we enabled host utilization of novel nutrition source, which was original ingestible for the host.

Bio: Dr. Sun joined The Artie McFerrin Department of Chemical Engineering in January 2018 as Assistant Professor. In 2015, she obtained her PhD from the Chemical and Biomolecular Engineering department at the University of Delaware, under the mentorship of Professor Wilfred Chen. Thereafter, she did postdoc training under the supervision of Professor Dr. Timothy K. Lu in Synthetic Biology Center at the Massachusetts Institute of Technology.

Her research interests are synthetic biology with advancing designs and applications. Using expertise in molecular engineering, protein engineering, and microbial consortia engineering, she aims to develop new techniques to reprogram gut microbiome, protein machinery and biomaterials for environmental and biomedical applications.