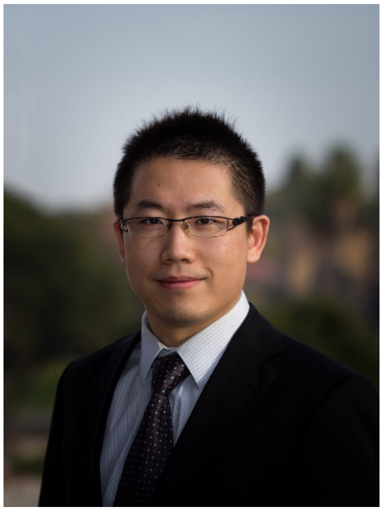
UCLA ENGINEERING
Chemical and Biomolecular Engineering

## SEMINARS IN CHEMICAL AND BIOMOLECULAR ENGINEERING



**Friday, January 12, 2018 | 10:00AM** **Boelter Hall 3400**

Presented by:
**Sihong Wang**
Postdoctoral Fellow
Department of Chemical Engineering
Stanford University

# "Merging Electronics with Living Systems: From Intrinsically Stretchable Materials and Devices to Mechanical Energy Harvesting"

The vast amount of biological mysteries and biomedical challenges faced by human provide a prominent drive for seamlessly merging electronics with biological living systems (e.g. human bodies) to achieve long-term stable functions. Towards this trend, the main bottlenecks are the huge mechanical mismatch between the current form of rigid electronics and the soft biological tissues, as well as the limited lifetimes of the battery-based power supplies. In this talk, I will first describe a new form of electronics with skin-like softness and stretchability, which is built upon a new class of intrinsically stretchable polymer materials and a new set of fabrication technology. As the core material basis, intrinsically stretchable polymer semiconductors have been developed through the physical engineering of polymer chain dynamics and crystallization based on the nanoconfinement effect. This fundamentally-new and universally-applicable methodology enables conjugated polymers to possess both high electrical-performance and extraordinary stretchability. Then, proceeding towards building electronics with this new class of polymer materials, the first polymer-friendly manufacturing process has been designed for large-scale intrinsically stretchable transistor arrays—the core device building-blocks for electronics. As a whole, these renovations in the material basis and technology foundation have led to the realization of circuit-level functionalities for the processing of biological signals, with unprecedented mechanical deformability and skin conformability. In the second part of the talk, I will introduce the invention and development of triboelectric nanogenerators as a new technology for mechanical energy harvesting, which provides a solution for sustainably powering electronics. The discussion will span from the establishment of basic operation mechanisms, the design strategies of material and device structure towards high energy conversion efficiency, to the hybridization with Li-ion batteries for effective energy storage. Equipping electronics with human-like form-factors and biomechanically-driven power supplies has opened a new paradigm for wearable and implantable bio-electronic tools for biological studies, personal healthcare, medical diagnosis and therapies.

Sihong Wang is a postdoctoral fellow in the Department of Chemical Engineering at Stanford University, working with Prof. Zhenan Bao. He received his PhD degree in Materials Science and Engineering from the Georgia Institute of Technology under the supervision of Prof. Zhong Lin (Z.L.) Wang, and his Bachelor's degree from Tsinghua University. Currently, he is working on intrinsically stretchable polymer materials and devices for wearable and biomedical electronics. His PhD research had focused on nanogenerators for mechanical energy harvesting and their integrated energy storage processes. He was awarded MRS Graduate Student Award, Chinese Government Award for Outstanding Students Abroad, Top 10 Breakthroughs of 2012 by Physics World, etc.