NUS National University of Singapore | Department of Mechanical Engineering
Faculty of Engineering

You are cordially invited to our:

Department Seminar

Topic: **Hydraulically Amplified Self-Healing ELectrostatic (HASEL) Actuators: High-Performance Muscle-Mimetic Transducers**

Speaker: **Dr. Christoph Keplinger**
University of Colorado Boulder, United States

Date: **22 June 2017, Thursday**

Time: **3.00pm to 4.00pm**

Venue: **Seminar Room E1-06-04 (Block E1, Level 6)**
(map of NUS can be found at http://map.nus.edu.sg/)

Host: **Asst. Prof. Adrian Koh and Asst. Prof. Zhu Jian**

Abstract

The emerging field of soft robotics promises to rapidly result in a range of practical applications, spanning from industrial automation to biomedical devices. Currently, soft robots predominantly rely on fluidic actuators, which limit speed and efficiency. Electrically powered muscle-mimetic actuators, such as dielectric elastomer actuators (DEAs) offer high performance actuation but they come with their own challenges. Being driven by high electric fields, DEAs are prone to failure by dielectric breakdown and electrical ageing. More importantly, DEAs are hard to scale up to deliver high forces, as large areas of dielectric are required (e.g. in stack actuators), which are much more likely to experience premature electrical failure, following the Weibull distribution for dielectric breakdown.

Here a new class of high-performance muscle-mimetic transducers is presented, termed Hydraulically Amplified Self-Healing ELectrostatic (HASEL) Actuators. HASEL actuators use an electro-hydraulic mechanism to combine the strengths of fluidic and electrostatic actuators. Additionally, HASEL actuators autonomously self-heal from electrical and mechanical damage, resulting in reliable performance. Specific geometries of HASEL are shown to linearly contract upon activation with voltage, thereby closely mimicking biological muscle.

About the Speaker

Christoph Keplinger is an Assistant Professor of Mechanical Engineering and a Fellow of the Materials Science and Engineering Program at the University of Colorado Boulder.

Prior to joining the Boulder faculty in 2015, he was a postdoc at Harvard University where he first worked with Zhigang Suo and then with George M. Whitesides. Supervised by Siegfried Bauer, he earned his Ph.D. degree in Physics (2011) from the Johannes Kepler University of Linz, Austria. Based upon his background in soft matter physics, mechanics and chemistry, he now leads an interdisciplinary research group at Boulder, with a current focus on (I) soft, muscle-mimetic actuators and sensors, (II) sustainable energy generation and energy harvesting for biomedical applications and (III) functional polymers. The high quality of his work has been recognized by the scientific community, as illustrated by publications in top journals including Science, PNAS, Advanced Materials and Nature Chemistry, and by international awards such as the EAPromising European Researcher Award (2013), from the European Scientific Network for Artificial Muscles.

Admission is free. All are welcome to attend.