9th Annual Research Symposium

Mechanical Engineering Graduate Student Association

University of California, Riverside

Bourns A265 | Friday, May 25th |8:30 am – 4:30 pm

MEGSA

DEPARTMENT OF MECHANICAL ENGINEERING

GS Graduate Student Association

Dr. Sharon Walker Ph.D.

Interim Dean
Bourns College of Engineering

Sharon Walker received her Ph.D. in Environmental Engineering, from the Department of Chemical Engineering at Yale University in 2004. She earned her M.S. in Chemical and Environmental Engineering from Yale in 2000 and two Bachelor of Science degrees from the University of Southern California in Environmental Engineering and Environmental Studies in 1998. Dr. Walker is a member of the American Chemical Society (ACS), Association for Environmental Engineering and Science Professors (AEESP), American Institute of Chemical Engineers (AIChE), Association of Women in Science (AWIS), and Society of Women Engineers (SWE). She is also a member of Chi Epsilon, Tau Beta Pi, and Golden Key honor societies. She is currently a faculty advisor to the UC Riverside Alpha Beta chapter of Tau Beta Pi and the Society of Women Engineers UCR chapter. She was awarded the 2008 Woman of Distinction Award by the Girl Scouts of San Gorgonio Council for her outreach efforts in Science Technology, Engineering, and Math (STEM) education and the 2011 Chancellor's Award for mentoring undergraduates in research. Other honors include her Fulbright Scholarship at Ben Gurion University in Israel (2009-2010) and an ELATE fellowship (2014-2015). Most recently, Dr. Walker served as the Associate Dean for Student Academic Affairs at BCOE (2015-2016) and Associate Dean of the Graduate Division at UCR (2014-2015).

Dr. Derek Dunn-Rankin

Professor and Chair
Department of Mechanical and Aerospace Engineering, University of California, Irvine

Electrical aspects of flames – experiments on the International Space Station

Abstract: This presentation shares one example of the potentially long arc of research projects by describing our investigations of flames under the influence of electric fields. Hydrocarbon flames have long been known to contain naturally a small quantity of charged species that allow them to act as weak plasmas. Electric fields can therefore influence these flames, including changing their shape and direction, their sooting behavior, and their ignition limits. Understanding the multi-physics involved in these effects started for us more than 20 years (and 5 Ph.D. Students) ago, culminating in unique microgravity experiments underway now on the International Space Station. This example shows the evolution of the research, as well as highlighting some of the remarkable challenges and opportunities of running experiments on a laboratory circling the earth 400 km above us at 7.7 km/sec.

About the speaker:

Dr. Derek Dunn-Rankin is Professor and Chair in the Department of Mechanical and Aerospace Engineering at the University of California, Irvine (UCI). He is co-Director for CAMP, the California Louis Stokes Alliance for Minority Participation, a program designed to increase minority representation in science and technology. Dr. Dunn-Rankin's research is in combustion and energy, droplet and sprays, and applications of laser diagnostic techniques to practical engineering systems. He has been faculty advisor for 30 Ph.D. and 66 M.S. graduates at UCI. He received a Japan Society for the Promotion of Science Fellowship in 2008 and the Oppenheim Prize of the Institute for the Dynamics of Explosions and Reactive Systems in 2013.

Dr. Timothy S. Fisher

Professor

Department of Mechanical and Aerospace Engineering, University of California, Los Angeles

Practice Your Scales! Thermal, Energy, and Bio Nanomaterials for Fast Processes

Abstract: The theory of energy and charge transport is a century old, yet classical and quantum size effects have been exploited usefully in practical materials only for the past two decades, and often with a modest level of success in practice. Many of the remaining challenges involve problems of time and length scales – e.g., faster energy transport processes enabled by new materials that can be manufactured economically at human scales. Success in the large-scale adoption of nanomaterials, with their prevalence of interfaces, will likely depend on deeper fundamental understanding of both interfacial transport in assemblies of nanomaterials over wider time scales and high-throughput manufacturing processes over larger length scales to tune their performance and engineer them for desired properties in real applications. For example, individual carbon nanotubes possess extremely high axial thermal conductivity, yet when placed in a composite matrix, the effective thermal properties are quite ordinary. For high-performance cooling applications, single-phase convection is a limited option because of its inability to dissipate ultra-high thermal loads, thus constraining the performance of the host system. With these challenges in mind, this presentation will consider how nanomaterials can be exploited at appropriate engineering scales to improve the performance of realistic thermal and energy storage technologies, particularly those requiring rapid transient response. Carbon nanomaterials for use in fast-charging and discharging electrochemical energy storage devices offer promise as scalable, high-performance electrodes, and similar structures show outstanding sensitivity to biological analytes. Moreover, the microstructure of granular assemblies of battery cathode materials will be shown to have a profound effect on charge/discharge speed. As another example, a tunable cooling technology befitting fast transient thermal events will be described. In this system, the rapid depressurization of the working fluid triggers coincident flash boiling and desorption events, thereby achieving very high cooling rates for short periods of time. We anticipate that this technology, when properly controlled, will achieve instantaneous peak cooling efficiencies surpassing those other advanced cooling systems. The presentation will close with a discussion of opportunities to ‘practice our scales’ further to enable cost-effective, large-scale production of these technologies.

About the speaker:

Timothy S. Fisher (PhD in Mechanical Engineering, 1998, Cornell) was born in Aurora, IL USA. He joined UCLA's Department of Mechanical & Aerospace Engineering after spending 15 years in Purdue's School of Mechanical Engineering, and several previous years at Vanderbilt University. He is an Adjunct Professor in the International Centre for Materials Science at the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) and co-directs the JNCASR-Purdue Joint Networked Centre on Nanomaterials for Energy. From 2009 to 2012, he served as a Research Scientist at the Air Force Research Laboratory's newly formed Thermal Sciences and Materials Branch of the Materials and Manufacturing Directorate. He is active in service to the American Society of Mechanical Engineers through a variety of responsibilities and is a former Co-Editor of the journal Energy Conversion & Management and currently Specialty Chief Editor for Thermal and Mass Transport of the journal Frontiers in Mechanical Engineering.

Conference Information

Date: Friday, May 25th 2018
Location: Bourns Hall A265
Time: 8:30 am – 4:30 pm

Schedule

08:30 – 9:00 am	Registration & Breakfast
09:00 – 9:15 am	Welcome Address (Dean Walker)
09:15 – 10:00 am	**Prof. Dunn-Rankin**
10:00 – 10:10 am	Break
10:10 - 10:30 am	Ariana Sabzeghabae - *The Effect of Surface Tension on Cavitation Bubble Dynamics* (fluids)
10:30 - 10:50 am	Masoud Ghasemian - *Ice Floe Tracker (*fluids)
10:50 - 11:10 am	Coffee break
11:10 - 12:00 pm	**Prof. Fisher**
12:00 - 1:00 pm	Panel & Working Lunch
1:00 - 1:20 pm	Tommaso Menara - *Cluster Synchronization in Networks of Kuramoto Oscillators for the Analysis of Functional Connectivity in the Human Brain* (controls)
1:20 - 1:40 pm	Siddharth Agarwal - *Control systems and Synthetic biology* (controls)
1:40 - 2:30 pm	Posters
2:30 - 2:50 pm	Nicholas Derimow - *High-Entropy Alloys: Understanding Liquid Phase Separation and Dendritic Growth* (materials)
2:50 - 3:10 pm	Seyed Aria Hosseini - *Thermoelectric model of nanoengineered bulk Silicon for high temperature applications* (materials)
3:10 - 3:30 pm	Samantha Corber - *Isotropic Profile Control in Titanium Deep Reactive Ion Etching of Drug Delivery Systems* (materials)
3:30 – 3:50 pm	Paul Lou - *Spin Seebeck effect and thermal spin-orbit torque in Ni80Fe20/p-Si bilayers* (materials)
3:50 - 4:00 pm	Short break
4:00 - 4:30 pm	Awards ceremony

Event Description

The MEGSA Research Symposium has been a tradition since its inception in 2005. The symposium was established as a space for students to showcase their work in a supportive environment where attendees have an interest in their growth as future professionals. Additionally, it has been a space where academics from other institutions can present their work and provide insight on research efforts ongoing at their institutions. This year, the tradition continues as we host the 9th Annual MEGSA Research Symposium. The event will feature the Dean of Engineering as the introductory speaker, invited speakers from distinguished Southern California universities and an alumni panel talk on early career development. We are proud to provide an overview of Mechanical Engineering Department graduate student research through numerous talks and posters. We plan for a full day of idea interchange, scientific discussion, and career development.

Contact Information

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