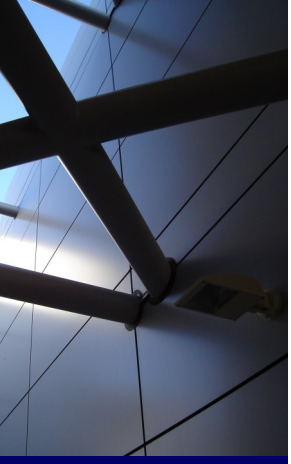

COLLOQUIUM
MECHANICAL ENGINEERING

The Department of Mechanical Engineering presents:

Dr. Renkun Chen

Department of Mechanical & Aerospace Engineering
University of California at San Diego

Friday, October 29
11:10AM-12:00PM
Bourns Hall A265

Nanoscale Heat Transfer and Its Applications for Thermal Energy Conversion and Management

Abstract: Thermal transport plays a very significant role in both energy production and consumption: More than 80% of the world's total power is generated by heat engines and more than 60% of the U.S. primary energy is used in the form of heat. The fundamental length scales associated with the transport of basic heat carriers, such as phonons, electrons and photons, generally fall in the range of 1-1000 nm. Therefore, exploring and exploiting basic heat transfer physics at micro and nanoscale hold the key for developing materials and devices for thermal energy conversion, storage and management. Despite its important applications, understanding of heat conduction at nanoscale is still in its infancy. For example, the range of thermal conductivities of natural materials only spans five orders of magnitude at room temperature, with air and diamond as the lower and upper bounds, respectively, and the theory for explaining the phonon transport in solids is still essentially the Drude model. In contrast, the range of electrical conductivities spans more than eighteen orders of magnitude at room temperature and our understanding on electron transport has been advanced significantly over the last century. In this seminar, I will discuss our prior and current work on using nanostructures for studying nanoscale heat transfer and developing thermoelectric materials and thermal management devices. Examples include probing phonon transport in nanowires by using nanofabrication technique, 50-fold enhancement in thermoelectric efficiency of Si nanowires over bulk Si, and more than three-fold enhancement of critical heat flux of boiling heat transfer on micro- and nano-structured surfaces.

Bio: Renkun Chen received a B.S. in Thermo-physics from Tsinghua University in 2004, and a Ph.D. in Mechanical Engineering from the University of California, Berkeley in 2008, for research conducted in the laboratory of Professor Arun Majumdar. Following a one year postdoctoral fellowship at Lawrence Berkeley National Laboratory, he began his faculty appointment as an assistant professor in the department of Mechanical and Aerospace Engineering at UC San Diego in November 2009.