

*The AAE Fall 2009 Colloquium Series*

**Tunable Diode Laser Sensing in Harsh Environments:  
Applications to Propulsion and Combustion**

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**Thursday, November 12, 2009**

**3:00 P.M.**

**ARMS 1109**

**Abstract**

Wavelength-tunable diode lasers (TDLs), derived from the telecommunications industry, are convenient visible and near-infrared light sources for line-of-sight absorption spectroscopy. This presentation will provide an overview of work at Stanford University to develop and apply TDL sensors for non-intrusive monitoring of combustion and propulsion flows. Quantities of interest include temperature, species concentrations and mass flux. Examples will be drawn from successful applications in diverse facilities, including arcjets, aeroengine inlets, scramjets, piston engines, pulse detonation engines and shock tubes. Extensions of TDL sensing into the mid-infrared will be presented, including use of new tunable laser sources at 2.5-2.7 microns for improved detection of CO<sub>2</sub> and H<sub>2</sub>O, and use of multiple-wavelength difference-frequency-generation laser sources for simultaneous measurements of fuel concentration and temperature in reactive gas flows and in multi-phase flows.

**Biography:**

Professor Hanson earned engineering degrees from Oregon State University, Arizona State University and Stanford University. He has been affiliated with Stanford University since 1972, and presently is the Woodard Professor of Mechanical Engineering. He served as the ME Department chair at Stanford from 1993-2003, and has been the principal advisor of more than 75 Ph.D. graduates. His research has been in the fields of laser diagnostics and sensors, shock wave physics, advanced propulsion and combustion chemistry, and he is the author or co-author of over 400 archival publications in these areas. Dr. Hanson is a Fellow of the American Institute of Aeronautics and Astronautics (AIAA), the American Society of Mechanical Engineers (ASME) and the Optical Society of America (OSA), and is a member of the National Academy of Engineering (NAE). He is a recipient of the Silver Medal and the Alfred Egerton Gold Medal of the Combustion Institute and of the AIAA Awards for Propellants and Combustion and Advanced Measurement Technology.

*An informal coffee & cookie reception will be held prior to the lecture at 2:30 p.m. in the AAE/ARMS undergraduate lounge (directly in front of ARMS 3<sup>rd</sup> floor elevators)*

COLLOQUIUM