PRINCETON
Mechanical & Aerospace Engineering

Friday, October 14, 2016
Bowen Hall Rm 222
3:30 PM

Fundamental and Applied Combustion Dynamics

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The interaction of turbulent fluid motion with combustion chemistry has many interesting effects across a wide range of scales. In this talk, we will explore how laser-based measurement techniques can help explain such interactions using two very different examples. Particular emphasis will be placed on 'high-speed' laser diagnostics that acquire data with sufficient temporal resolution to capture causality of the targeted phenomena. After a brief introduction to the physics, capabilities, and limitations of the diagnostics, we will attempt to reconcile discrepancies observed between experimental reactant consumptions rate and classical flame sheet theories at high turbulence intensities. This will be done by explicitly tracking fluid elements through 4D experimental data sets. Switching from micro- to macro-scales, we then will explain the physical mechanisms triggering, sustaining, and attenuating thermoacoustic oscillations in an aeronautical gas turbine combustor at flight-relevant conditions. Understanding these mechanisms can lead to improved design and operation of aeronautical engines for reduced environmental impact.

Adam Steinberg is an Associate Professor at the University of Toronto Institute for Aerospace Studies. His research develops and applies laser measurement techniques to unravel turbulent reacting flows, with particular emphasis on aerospace and energy applications. Professor Steinberg obtained his PhD from the University of Michigan in 2009, and then spent three years at the German Aerospace Center before joining the University of Toronto. He is the recipient of the Hiroshi Tsuji Early Career Research Award, the McCharles Prize or Early Career Research Distinction, an Ontario Early Research Award, two Best Paper awards from the AIAA, a Distinguished Paper Award from the Combustion Institute, and several other distinctions. He is a member of the AIAA Propellants and Combustion Technical Committee and the Editorial Board of Combustion and Flame.

Social Period outside of Bowen Rm 222, following the seminar

ALL VISITORS ARE WELCOME