

The AAE Spring 2009 Colloquium Series

Dynamics and Morphology of Expanding Spherical Flames

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3:00 P.M.

ARMS 1109

Abstract:

The dynamics of expanding spherical flames is of interest to a variety of practical and natural phenomena, such as the intentional and accidental spark ignition of a combustible mixture, and the explosion of the supernovae through the deflagration to detonation transition of the nuclear flame. Fundamentally, these processes are characterized by strong stretch effects during the early stage of flame propagation, and flamefront cellular instability during the later stage. The seminar will cover topics on the minimum critical radius for successful ignition, the nonlinear variation of the flame propagation speed with the stretch rate, transition to cellularity induced by hydrodynamic and diffusional-thermal instabilities, self-acceleration and the self-similar nature of the propagation, transition to detonation, and the formation of spiral waves and target patterns over the expanding flame surface as manifestations of diffusional-thermal pulsating instability. Theoretical and experimental results will be presented in a synergistic manner to demonstrate the rigor and beauty of combustion science.

Biography:

Chung K. Law is the Robert H. Goddard Professor of Mechanical and Aerospace Engineering at Princeton University. His research interests cover various physical and chemical aspects of fundamental combustion phenomena, with applications to propulsion, energy, fuels, and the environment. He is a fellow of the AIAA, ASME and APS, a member of the US National Academy of Engineering, a past president of the Combustion Institute, and a recipient of a number of professional and best paper awards for technical contributions.

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 3rd floor elevators)

COLLOQUIUM