

*2011 Hawkins Memorial Lecture  
in Heat Transfer  
Thursday, October 13, 2011  
4:30pm, ME 1061*

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Princeton University**



**Challenges and Frontiers in Combustion**

**Abstract:** Combustion, the science of chemically reacting flows, lies at the heart of many natural phenomena and technological processes, from forest fires to the fires within rocket engines. In particular, being the source of over 80% of the world's energy needs and a major agent in environmental degradation, the need to understand and control combustion, in conjunction with the development of alternative fuels and new concepts of engine processes, are crucial to the solution of energy sustainability and climate change. The seminar consists of two parts. The first part overviews the coupled issues of energy and the environment, and discusses the role of combustion in moderating the escalating crisis. It then considers the options for next-generation fuels, particularly those for aero-propulsion. The second part overviews the frontiers of combustion: from combustion under extreme conditions and dimensions to its integration into the new sciences of bio, nano, info, and materials. The disciplinary expansion of combustion from chemically reacting flows to reacting flows in general is emphasized.

**Bio:** Chung K. Law received a B.S. in Physics from the University of Alberta in 1968, an M.A.Sc. in Aerospace Studies from the University of Toronto in 1970, and a Ph.D. in Engineering Physics from the University of California at San Diego in 1973. He holds the Robert H. Goddard Professorship of Mechanical and Aerospace Engineering at Princeton University. Law's research interests are in combustion, propulsion, heat and mass transfer, energy, alternative fuels, and the environment. He has published over 400 journal-class articles in these areas. For his research accomplishments he has received the Curtis W. McGraw Research Award of the American Society for Engineering Education (ASEE) in 1984, a Silver Medal and the Egerton Gold Medal of the Combustion Institute in 1990 and 2006 respectively, the Propellants and Combustion Award, the Energy Systems Award, and the Pendray Aerospace Literature Award of the American Institute of Aeronautics and Astronautics (AIAA) in 1994, 1999, and 2004 respectively, the Heat Transfer Memorial Award, in Science, of the American Society of Mechanical Engineers (ASME) in 1997, an Outstanding Alumnus Award from the University of California at San Diego in 2000 and from the Hong Kong Polytechnic University in 2007, and several best conference paper awards. He is a fellow of the AIAA, ASME, and the American Physical Society (APS), a member of the U.S. National Academy of Engineering (NAE) and a fellow of the American Academy of Arts and Sciences (AAAS), a past president (2000-2004) of the Combustion Institute, the current director of the Combustion Energy Frontier Research Center sponsored by the U.S. Department of Energy, and the founding and current director of the Center for Combustion Energy at Tsinghua University, China.

*Refreshments will be served at 4pm in  
common area outside ME 2137 – Gatewood Wing*