Date: **October 13th 2006**

Time: **11:00 AM**

Location: **Maryland Hall 110**

Speaker: **Dr. Robert Barlow Sandia National Laboratories**

Title: **“Scalar Structure of Turbulent Jet Flames in the Dissipation Range”**

Abstract

Scalar dissipation is a central concept in the theory and modeling of nonpremixed flames, and significant effort has been invested toward the measurement of mixture fraction dissipation in turbulent flames over the past 15+ years, using a variety of laser-based diagnostic techniques. The accuracy of such dissipation measurements can be determined with confidence only if the effects of spatial averaging and experimental noise can be quantified, and this is possible only if the local dissipation cutoff scale is known. This seminar will outline recent progress in measuring the scalar structure of jet flames in the dissipation range of turbulence. This progress is based on Rayleigh scattering experiments on jet flames of $CH_4/H_2/N_2$ in air, conducted at UT Austin (time series) and in two laboratories at Sandia (highly-resolved 1D and 2D imaging). One-dimensional dissipation spectra of measured temperature fluctuations are compared to the 1D form of the model spectrum of Pope [*Turbulent Flows*]. This model spectrum, which was developed for velocity fluctuations in isotropic turbulence, is shown to be remarkably robust in representing scalar fluctuations in jet flames. By fitting the model spectrum to the data, the local dissipation cutoff scale and Batchelor scale can be determined, even in cases were these scales in the spectra are influenced by noise or are not resolved by the experiment. Similarities and differences among dissipation spectra for temperature, mixture fraction, and select reactive species (measured using line-imaged Raman scattering) will be described.