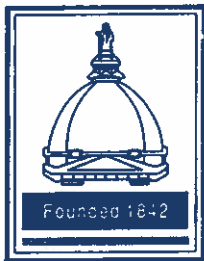


# AEROSPACE & MECHANICAL ENGINEERING



## 2011 COLLOQUIUM 2012 SEMINARS ARE OPEN TO THE PUBLIC

INFORMAL COFFEE PERIOD BEFORE THE SEMINAR IN ROOM 365 FITZPATRICK HALL  
UNIVERSITY OF NOTRE DAME, NOTRE DAME, INDIANA 46556

- SPEAKER:** Professor Nick Glumac  
Mechanical Science and Engineering Department  
University of Illinois at Urbana-Champaign  
Urbana, Illinois
- TOPIC:** SPECTROSCOPIC DIAGNOSTICS  
OF ADVANCED ENERGETIC MATERIALS
- DATE:** Tuesday, October 4, 2011
- TIME:** 3:30 p.m.
- PLACE:** 138 DeBartolo Hall

### ABSTRACT

A recent surge in research in metal-based energetic materials has been fueled by the potential of new opportunities in explosives and propellants for exploiting the chemical storage potential of metals mixed with oxidizers at the nanoscale using modern synthesis approaches. These new energetic systems exploit elements that span the periodic table, expanding greatly upon the classical H-N-C-O combinations of the past. Along with these new materials have emerged challenges in making measurements of the kinetics and reaction paths of these systems. Such systems react on very short timescales, involve very high temperatures and pressures, are often obscured by optically thick clouds, and involve species that are not well known or commonly observed. At UIUC, we have developed a series of approaches to dealing with the needs of simultaneous temporal, spatial, and spectral resolution in transient events. We have applied ultrafast spectrometers and high speed framing cameras to capture energetic events such as detonation breakout with sub-microsecond, sub-millimeter, and sub-nanometer temporal, spatial, and spectral resolution. Using fiber-probe arrays, we have been able to capture events within optically thick fireballs, and we have applied modeless dye laser pulses to probe absorption in dense media as well. These diagnostics have uncovered a host of unusual phenomena including extremely high temperatures at detonation breakout that may have important implications for modeling energetics. In this talk, I will discuss these spectroscopic approaches, and some of the novel metal/oxidizer systems to which these diagnostics are being applied.

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**NOTE:** *If you are interested in meeting individually with  
Prof. Glumac, please contact Evelyn at 631-5431*