

# CEAT Research Seminar Series

Friday, April 17, 2014 1:30-2:30

170 Architecture Hall

Jack and Carol Corgan Auditorium

## **Advanced Sensing Techniques for Improved Tornado Warning**

**Brian R. Elbing, Ph.D. Assistant Professor  
School of Mechanical & Aerospace  
Engineering**

Without improved warning systems, deadly tornadoes, like the one that hit Moore, Oklahoma in May of 2013 killing 24, are likely to become more common due to population growth in tornado prone areas. Since 1978, warning lead times have increased from 3 to ~13 minutes, and false alarms have decreased from 90% to 75%. This progress has been due to a combination of advancements in observation technologies (e.g. Next-Generation Doppler radar) as well as an improved understanding of tornado formation processes. However, over the past decade warning lead times have reached a plateau and a new approach is needed to produce further advancement. Remote sensing via atmospheric infrasound (i.e. noise at frequencies below human hearing) is a technology that has the potential to break through this plateau. Dozens of tornado producing severe storms have been shown to emit infrasound hours before the formation of a tornado. This presentation will focus on current work to utilize these infrasonic measurements to improve tornado warnings as well as their integration with unmanned aerial vehicles (UAV) and data-driven modeling.

## **The Microbiology of Detoxification**

**Mark Krzmarzick, Ph.D. Assistant Professor  
School of Civil and Environmental  
Engineering**

Microbes don't collect a paycheck yet can do a host of beneficial jobs turning toxic compounds to innocuous end-products. Three thrusts of research on 'useful' microbial processes will be presented. First, chlorinated compounds are some of the most toxic and widespread contaminants in the environment, yet the field is still struggling to fully understand and exploit the microbial processes, call organohalide respiration, that removes these contaminants. In my lab, new studies looking at purely naturally occurring organohalide respiration has raised new insights, and new questions, regarding how these bacteria grow and thrive in the environment. Secondly, nitro-organics, like TNT and other explosives, are another class of toxic and difficult to degrade compounds. Currently, the first ever development of DNA-based tools to study nitroreduction processes, key to remediation, is underway so that these microbial processes can finally be studied and understood in the real world environment and not just on a proverbial petri dish. Finally, new work will be presented that evaluates what happens to surface soil microbial communities when impacted by representative fracking fluid mixtures in surface soils.