



Science of Signatures Advanced Studies Scholars Program 2014



Speaker: James Ten Cate, EES-17 Geophysics, Wave Physics team

Title: Listening to things....

Abstract: Simply "listening" to things can be an extremely valuable diagnostic. A skilled car mechanic can identify a water pump going bad because it doesn't sound right, an experienced machinist can not only tell you what kind of metal you're cutting on your lathe but whether you're cutting it at a proper speed, an audiophile can hear nonlinear distortion (harmonics and intermodulation distortion) in a speaker or amplifier, and lots more examples could be cited. All these are examples of how acoustics can be used as a diagnostic for nondestructive testing, structural health monitoring or even something as simple as detecting whether an inaccessible power supply is on and working! The examples above are all human-audible examples. It's easy to imagine that having techniques and sensors to passively listen at very low frequencies (seismic or infrasound) or ultrasonic (above 20 kHz) or higher (MHz) could make acoustic---and nonlinear---acoustic nondestructive evaluation techniques extremely useful. Indeed, both linear and nonlinear Resonant Inspection techniques have been shown to be extremely valuable, limited only by the sensors needed to listen at the frequencies of interest. In this talk, we'll share an overview of some of the projects here at Los Alamos where acoustics and nonlinear acoustics played a prominent role in solving interesting problems.