Interrupted Speech Perception

Friday, January 29, 2010 4:00 p.m. in ETC 4.120

Professor Su-Hyun Jin
Department of Communication Sciences and Disorders
The University of Texas at Austin
http://csd.utexas.edu

In a previous study of hearing-impaired (HI) listeners' speech perception in noise (Jin and Nelson, 2004), two factors emerged as highly related to amplified sentence recognition in the presence of fluctuating noise: low frequency audibility and auditory filter bandwidths. Nine young adult listeners with sensorineural hearing loss and eight young adults with normal hearing (NH) sensitivity as controls participated in the series of experiments. Amplified speech recognition performance of the HI listeners was equal to that of the NH listeners in quiet and in steady noise, but was significantly poorer in fluctuating noise. Thus, even when amplification was adequate for full understanding of speech in quiet and in steady noise, HI listeners experienced significantly less masking release from the modulated maskers.

The results indicated that those listeners with greatest hearing losses in the low frequencies were poorest at understanding amplified sentences in modulated noise. In addition, those HI listeners with wider auditory filters (in the 2k – 4k Hz region) were poorer than HI listeners with near-normal auditory filter bandwidths. These two findings are consistent with the hypothesis that strong spectral representation of voice pitch is necessary for auditory segregation of speech from noise (e.g., Qin and Oxenham, 2003). Additional results from HI and NH listeners will be presented; first, spectral resolution of HI and NH listeners was measured using the notched-noise method. This approach attempts to relate performance of current participants on psychophysical measures of spectral resolution to speech recognition. Second, the audibility of different frequency regions of speech was systematically varied by filtering. Sentences were interrupted by either speech-shaped noise or silence gap while measuring the percent of sentence recognition. The purpose of the follow-up study was to examine the contribution of different spectral regions to the auditory segregation/integration of interrupted speech. Implications for noise-reduction signal processing algorithms will be discussed.

Toward Abatement of Underwater Drilling Ship Noise Using Air Bubbles

Friday, February 5, 2010 4:00 p.m. in ETC 4.120

Dr. Kevin M. Lee
Applied Research Laboratories
The University of Texas at Austin
http://www.arlut.utexas.edu

Drilling operations are currently prohibited in the Arctic Ocean due to a variety of environmental concerns, including the effect of underwater noise on marine mammals. It is well known that bubbles cause significant dispersion and attenuation, and that bubbly water possesses significantly different acoustic impedance than bubble-free water. Bubbles can therefore be used to abate underwater noise, but such

effects have not been experimentally verified in the drilling ship noise band (10 Hz to 200 Hz), in part due to the difficulty of creating stable bubbles of appropriate resonant size. A series of 1-D waveguide measurements were performed using tethered, encapsulated bubbles of various shapes (spheroids, toroids, and spherical caps) to investigate the effective acoustic properties in this frequency regime. Results will be presented and compared to model predictions. Generation of large, stable, freely-rising toroidal air bubbles, and their acoustic behavior will also be discussed. Finally, results of a large-scale tank experiment, in which a low frequency sound source was surrounded by a column of freely-rising sub-resonant bubbles, a matrix of tethered resonant air balloons, and a combination of the two will be presented and compared to model predictions.

Acoustical and Noise Control Criteria and Guidelines for Building Design and Operations

Friday, February 12, 2010 4:00 p.m. in ETC 4.120

Jack B. Evans, P.E. and Chad N. Himmel, P.E.
JE Acoustics
Austin, Texas
http://www.jeacoustics.com

Noise, vibration and acoustical design, construction, commissioning practices, and operation practices influence building cost, efficiency, performance, and effectiveness. Parameters for structural vibration, building systems noise, acoustics noise, and environmental noise that crosses property boundaries will be presented. Brief case studies illustrating noise and vibration problems with successful solutions will also be discussed. Mechanical, power, and plumbing systems within the building contribute to building operations noise and vibration, which affects occupants, sensitive installations, and functional uses. Various noise and vibration design criteria, field measurements, design concepts, and design specifications can be applied in facilities to achieve noise mitigation and vibration control to enhance building operations and reduce tenant or neighbor problems. Concepts for enhancement will be presented that achieve specific program criteria and improve the built environment for occupants and functional uses. Concepts relating to noise and vibration control can also reduce short and long-term operations costs and save energy. Acoustical designs can be implemented in new construction to achieve specific requirements for LEED certification in healthcare and educational facilities. Common problems, objective criteria, sensitive installations, and solutions will be presented to offer a basic understanding of effective noise and vibration control for central plant equipment, power systems, transformers, standby generators, and roof mounted HVAC equipment.

Internal Gravity Waves in the Ocean: Unexpected New Developments on Their Generation and Propagation

Friday, February 19, 2010 4:00 p.m. in ETC 4.120

Benjamin King
Center for Nonlinear Dynamics and Department of Physics
The University of Texas at Austin
http://chaos.utexas.edu

Internal gravity waves in the ocean transfer energy from large scale tidal motions to small scale turbulence and mixing. Understanding their generation and subsequent propagation is critical to improving current ocean circulation models. Results from laboratory experiments and numerical simulations will be presented that demonstrate how these waves are generated by oscillating tidal flow over bottom topography in the ocean. Unexpected second harmonic internal waves are generated by nonlinear effects near topography and account for much of the radiated energy. An ongoing ocean data analysis project which has uncovered regions in the deep ocean where these seemingly ubiquitous waves cannot propagate will also be discussed.

Sounds and the Sea: Ocean Acoustics in a Complex Environment

Friday, February 26, 2010 10:00 a.m. in RLM 11.204

Dr. Marcia J. Isakson
Applied Research Laboratories
The University of Texas at Austin
http://www.arlut.utexas.edu

Understanding acoustic propagation in littoral waters is critical to ocean mammal tracking, underwater communications, and bottom mapping. However, the coastal water environment is extremely complex. Variations in water temperature, pressure, and salinity can bend acoustic rays, while volume heterogeneities such as fish schools and wind-driven surface roughening can scatter them. The coastal ocean bottom is roughened by marine organisms and rippled by ocean currents, while its sediment ranges from soft muds with compressional sound speeds close to that of water to hard rocks that support shear modes. Packing and pressure create sound speed gradients in the sediment, while shells, worm holes, and geological structures (deposits, uplifts and layers) create volume and interface heterogeneities. The ubiquitous sand covering much of the coastal ocean bottom presents special difficulties, because sand is neither fluid nor elastic solid, but rather a poro-elastic material in which a coupled wave equation describes both particle and fluid motion. This leads to dispersion in sound speed, a key factor in modeling the ocean bottom. This lecture will present an overview of the challenges of shallow water acoustics, focusing on the particular difficulties of modeling reflection and scattering from, and propagation through, sandy sediment. The effects of scattering from and transmission into interfaces on propagation and reverberation in shallow water waveguides will be evaluated.

High Performance CMUTs with Monolithically Integrated Front-End Electronics for Medical Ultrasound Imaging

Friday, March 5, 2010 4:00 p.m. in ETC 2.136

Professor F. Levent Degertekin
George W. Woodruff Chair in Mechanical Systems
George W. Woodruff School of Mechanical Engineering
Georgia Institute of Technology
http://www.me.gatech.edu/faculty/degertekin.shtml

Capacitive micromachined ultrasonic transducers (CMUTs) have emerged as an enabling technology for ultrasound imaging, especially for applications requiring highly dense 2-D arrays and miniature arrays requiring a high level of integration. A key premise of CMUT technology is that it allows for the integration of front-end electronics while providing equal or better transduction performance as compared to piezoelectric transducers. In this talk, we describe our progress towards these goals. We have developed a low-temperature plasma enhanced chemical vapor decomposition based process to fabricate CMUTs on silicon wafers containing complementary metal–oxide–semiconductor (CMOS) electronics. We have designed, fabricated, and tested a variety of CMUT arrays for intracardiac and intravascular imaging which operate in the 4 MHz to 60 MHz range. In parallel with electronics integration efforts, we have developed CMUT structures with multiple electrodes and non-uniform membranes to improve transduction performance in transmit pressure level, receive sensitivity, and electromechanical coupling coefficient. As a result, we currently have CMUTs operating at an 8 MHz center frequency that can simultaneously achieve 3 MPa output pressure, 134% fractional bandwidth, and a coupling coefficient of 0.82 at a DC bias that is 90% of the collapse voltage. These measured performance metrics show that CMUTs can perform at the level of state-of-the-art single crystal piezoelectrics and provide tolerance for array non-uniformity while retaining the manufacturing and electronics integration advantages offered by microfabrication techniques.

HP-Adaptive Finite Elements Applied to Shallow-Water Acoustic Wave Propagation

Friday, March 12, 2010 4:00 p.m. in ETC 4.120

Jeffrey Zitelli
Institute for Computational Engineering and Sciences
The University of Texas at Austin
http://www.ices.utexas.edu

Finite element methods generally require more computational resources than other numerical schemes which are often employed to predict acoustic wave propagation in shallow-water waveguides. However, finite elements have an important role to play in addressing complicated waveguides for which other methods (e.g. normal modes or parabolic equations) cannot be expected to provide accurate results. In this talk, the mathematical theory of finite elements in the context of acoustic wave propagation is introduced. Motivation for the use of hp-adaptivity to make feasible the finite element solution of

long-range waveguides featuring many wavelengths is also provided. The hp-adaptive finite element code is described, and numerical results for a variety of waveguides are presented and compared with previous results. Finally, promising research concerning the Discontinuous Petrov-Galerkin formulation of the Helmholtz problem is discussed.

2D hp-Finite Element Simulation of Sonic Measurements in Boreholes

Friday, March 26, 2010 4:00 p.m. in ETC 4.120

Dr. Pawel J. Matuszyk
Center for Petroleum & Geophysical Systems Engineering
The University of Texas at Austin
http://www.cpge.utexas.edu

Sonic logging has been used extensively by oil companies to measure the porosity, permeability, and mechanical properties of formation rocks. The finite element method (FEM) can accurately model acoustic wave propagation in the borehole environment and can also be utilized to design logging tools. We have developed a fully automatic hp-adaptive multi-physics FEM code that optimally adapts the mesh for each frequency, both with respect to element size h and polynomial order of approximation p, delivering exponential convergence rates. The use of high-order methods drastically reduces the dispersion error, which enables one to obtain accurate simulation results. In addition, the hp-FEM is ideally suited to account for the boundary layers that necessarily arise from the use of perfectly matched layers, which we employ to truncate the computational FE domain. The code enables simulation of problems with axial-symmetry, with the formation consisting of an arbitrary number of horizontal layers (solid or fluid) and a casing. Despite the use of a two-dimensional FE code, we can solve problems with a monopole acoustic source, as well as with dipole and quadrupole sources. Simulations can be performed for an open borehole, or with wire-line and logging-while-drilling tools down hole.

Low-Frequency Acoustics of Methane Hydrates

Friday, April 2, 2010 4:00 p.m. in ETC 4.120

Chad A. Green
Mechanical Engineering Department
and
Applied Research Laboratories
The University of Texas at Austin
http://www.me.utexas.edu

Methane hydrates are ice-like substances found in ocean sediments. These naturally-occurring solids are of interest as a potential energy source and as a potential contributor to global climate change. Better knowledge of the low-frequency (10 Hz to 10 kHz) acoustic properties of methane hydrates and methane gas bubbles in the ocean-bottom environment will improve efforts to locate and quantify them using seismic and acoustic surveys. This presentation details the experimental designs and results of three laboratory investigations. As a step toward a better understanding of the three-phase case of gas-bearing

water-saturated sediments, the two-phase cases of air and sulfur hexafluoride bubbles in water were investigated. In these tests, the low-frequency sound speeds of the bubbly liquids were measured as a function of hydrostatic pressure and results are compared to Wood's model. Similar measurements were performed on natural methane hydrate samples in a temperature- and pressure-controlled chamber. Current work toward passive acoustic remote sensing of marine gas seeps will also be presented. A short travelogue from a recent methane expedition in the Beaufort Sea will conclude the presentation.

The Inverse Medium Problem in Semi-infinite PML-truncated Domains

Friday, April 9, 2010 4:00 p.m. in ETC 4.120

Professor Loukas F. Kallivokas
Department of Civil, Architectural and Environmental Engineering
The University of Texas at Austin
http://www.ce.utexas.edu

Recent progress in the full-waveform imaging of probed solids/soils is discussed, with geotechnical and geophysical applications in mind. Of particular interest are arbitrarily heterogeneous domains, whose semi-infinite extent has been limited by the introduction of perfectly-matched-layers (PMLs) at truncation interfaces. The goal is to image the probed domain's elastic properties using elastic waves.

New developments in the forward wave modeling of PML-truncated domains in the time-domain are presented. First, in the context of a mixed Galerkin method, I discuss a hybrid, non-convolutional, unsplit-field approach that leads to a new displacement-only formulation for the interior domain, while retaining a mixed form only for the PML buffer zones. Next, to drive the inverse medium problem, response misfits are being used, constrained by the forward wave modeling. In this context of PDE-constrained optimization, there arises a PML-endowed adjoint problem, and a time-independent control problem. All three problems are resolved following a reduced-space approach. Thirdly, to alleviate solution multiplicity, Tikhonov and Total Variation regularizations are used together with a source continuation scheme. To accelerate convergence I also discuss a simple regularization factor continuation scheme. I report numerical experiments with synthetic data in heterogeneous domains, and discuss our experience with the (acoustic) Marmousi benchmark problem.

Helicopter Rotor Noise Prediction: Background and State-of-the-Art

Thursday, April 15, 2010 3:30 p.m. in WRW 113

Professor Kenneth S. Brentner
Department of Aerospace Engineering
The Pennsylvania State University
http://www.aero.psu.edu

A great deal of progress has been made toward the prediction of rotor noise over the past three decades. Although the modeling effort has focused on helicopter main rotors, the theory is generally valid for a wide range of rotor configurations. The Ffowcs Williams-Hawkings (FW-H) equation has been the foundation for much of the development. The monopole and dipole source terms of the FW-H equation account for the thickness and loading noise, respectively. Blade-vortex-interaction noise and broadband noise are important types of loading noise; hence much research has been directed toward the accurate modeling of these noise mechanisms. High-speed impulsive noise prediction strategies, based on the FW-H quadrupole source term, have proven effective but require accurate computation of the unsteady, transonic flow field around the rotor blades. Recently, significant progress has been made coupling advanced computational fluid dynamics and computational structural dynamics tools for accurate rotor noise prediction in both steady and maneuvering flight. The development of acoustic scattering prediction tools for rotorcraft configurations is one of the latest advances. This talk will give a brief introduction to rotor noise prediction, including the history and basic theory, followed by a status report on the noise prediction capability.

Evaluation of Negative Stiffness Elements for Enhanced Material Damping Capacity

Friday, April 30, 2010 4:00 p.m. in ETC 4.120

Lia B. Kashdan
The Product, Process and Materials Design Lab
Department of Mechanical Engineering
and
Applied Research Laboratories
The University of Texas at Austin
http://www.me.utexas.edu

Constrained negative stiffness elements in small quantities (1% to 2% by volume) implemented within viscoelastic materials have been shown to provide greater energy absorbing behavior than conventional materials [Lakes et al., Nature (London) 410, 565-567 (2001)]. These combined materials, called meta-materials, could be utilized in a variety of applications including noise reduction, anechoic coatings, and transducer backings. The mechanism behind the meta-materials relies on the ability of the negative stiffness element to locally deform the viscoelastic material, dissipating energy in the process. The work presented here focuses specifically on the design of the negative stiffness elements, which take the form of buckled beams. By constraining the beam in an unstable, S-shaped configuration, the strain energy density of the beam will be at a maximum and the beam will accordingly display negative stiffness. To date, physical realization of these structures has been limited due to geometries that are difficult to construct and refine with conventional manufacturing materials and methods. By utilizing the geometric freedoms allowed by selective laser sintering machines, these structures can be built and tuned for specific dynamic properties. The objective of this research is to investigate the dynamic behavior of meso-scale negative stiffness elements with the future intention of miniaturizing the elements to create highly absorptive meta-materials.

Nonlinear Dynamics of Two Interacting Aspherical Bubbles in a Liquid

Friday, August 27, 2010 4:00 p.m. in ETC 4.120

Dr. Eru Kurihara
Division of Mechanical and Space Engineering
Hokkaido University
Sapporo, Japan
http://www.hokudai.ac.jp/en
and
Applied Research Laboratories
The University of Texas at Austin
http://www.arlut.utexas.edu

The interaction of bubbles in close proximity to one another can play an important role in applications of biomedical acoustics that include shock-wave lithotripsy (disintegration of kidney stones), sonoporation (delivery of large molecules through cell membranes), and histotripsy (ultrasonic removal of internal tissue). The nonlinear interaction of bubbles is known to cause shape deformation of their surfaces. Dynamical equations for two interacting aspherical bubbles in a viscous liquid are derived in the framework of Lagrangian mechanics using a multipole expansion of the velocity potential. Surface perturbations are considered through octupole mode so that the equations account for the onset of liquid jetting that can occur during bubble collapse. In order to obtain the dynamical equations, second-order terms for the surface modes are taken into account in both the expression for the velocity potential and the boundary condition. In this way additional interaction terms in the dynamical equations are obtained in comparison with previous models. The derived equations describe not only deformation of the bubbles but also translational motion. The behavior of the bubbles, which is calculated numerically from the resulting set of coupled ordinary differential equations, agrees qualitatively with observed phenomena that include translation, deformation, and the onset of jetting. Stability of the surface oscillations is also investigated.

An Investigation of the Combustive Sound Source

Friday, September 3, 2010 4:00 p.m. in ETC 4.120

Andrew McNeese
Applied Research Laboratories
The University of Texas at Austin
http://www.arlut.utexas.edu

This seminar describes the development and testing of the Combustive Sound Source (CSS), which is a broadband underwater sound source. The CSS is being developed as a clean, safe, and cost effective replacement to underwater explosive charges, which exhibit an inherent danger to marine life and researchers using the charges. The basic operation of the CSS is as follows. A combustible mixture of gas is held below the surface of the water in a combustion chamber and ignited with an electric spark. A combustion wave propagates through the mixture and converts the fuel and oxidizer into a bubble of combustion products, which expands due to an increase in temperature, and then ultimately collapses to a smaller volume than before ignition, producing a high intensity, low frequency acoustic signal. The seminar begins by discussing the background, history, and purpose of developing the CSS. It continues by describing the current apparatus and the essential components and convenient features added to the latest mechanical design. The general operation is discussed along with a description of an experiment conducted to determine the acoustic output and robustness of the current CSS. The results of this experiment are presented in terms of the effect of volume, ignition depth, oxidizing gas, combustion chamber size, and repeatability of acoustic signatures. Apparatus robustness is discussed to suggest improvements for future CSS designs.

Soil Vibration and Micro-Imaging: The Challenge of Designing Sensitive Imaging Facilities for Sites

Friday, September 10, 2010 4:00 p.m. in ETC 4.120

Chad N. Himmel, P.E.
JE Acoustics
Austin, Texas
http://www.jeacoustics.com

Sensitive imaging instruments for research and diagnosis, including magnetic resonance imaging units (MRI), computerized tomography (CT) scan systems, and scanning and transmission electron microscopes, analyze specimens at millimeter, micron, and sub-micron detail. Such instruments are often affected by environmental noise and vibration, which can disturb the stability and resolution of the specimen's image. Vibration received at instrument rooms can come from nearby indoor sources, such as elevators, human activity, and rotating building equipment, and can also come from distant external sources, such as ground borne vibration in soils from truck and bus traffic, passing trains, and large outdoor mechanical equipment. Significant floor vibration and noise disturbances must be identified and dealt with in building design in order for the imaging equipment to function properly. Examples of some challenging building sites will be presented, with results from on-site measurements, and illustrations and photos of design solutions that were explored and implemented. Examples include hospital diagnostics

affected by a nearby power plant, university biological research imaging centers affected by buses and train traffic, and microelectronics imaging affected by human foot traffic and various unidentified sources.

Light, Sound, nanoAction: Nanoparticle-mediated Ultrasound-guided Photoacoustics

Friday, September 24, 2010 4:00 p.m. in BME 3.204

Professor Stanislav Y. Emelianov
Ultrasound, Imaging, and Therapeutics Research Laboratory
Department of Biomedical Engineering
The University of Texas at Austin

Ultrasound-guided photoacoustics is a high-resolution and high-sensitivity imaging technique where ultrasound is used to visualize anatomical structures and photoacoustics is used to provide functional information about the tissue. Furthermore, augmented by targeted contrast agents such as bioconjugated plasmonic nanoparticles, cellular and molecular photoacoustic imaging is possible. Several representative examples of nanoparticle-mediated ultrasound-guided photoacoustic imaging will be presented. The ability of ultrasound and nanoparticle-mediated photoacoustic imaging to simultaneously obtain the anatomical and molecular map of tumor in vivo will be demonstrated using spherical gold nanoparticles functionalized to target cancer biomarkers such as the epidermal growth factor receptor. Once injected intravenously, the gold nanospheres undergo molecular specific aggregation at the site of active cancerous cells. This receptor mediated aggregation of nanoparticles, leading to an optical red-shift of the plasmon resonance frequency, was used to obtain three-dimensional ultrasound and molecular specific photoacoustic images of mouse tumor in vivo. The role of ultrasound and photoacoustic imaging in photothermal laser therapy of cancer will also be demonstrated. Through use of a combined ultrasound, photoacoustic and elasticity imaging system, the photothermal therapy can be planned (confirmation of the delivery and interaction of molecular specific photoabsorbers with cancerous tissue), guided (tracking the laser-induced temperature) and monitored (assessment of the short-term and the long-term treatment outcome). Finally, the development and future directions in ultrasound-guided photoacoustics and contrast agents will be discussed.

Non-destructive Testing of Concrete Structures Using Air-coupled Sensors

Friday, October 1, 2010 4:00 p.m. in ETC 4.120

Professor Jinying Zhu
Department of Civil, Architectural and Environmental Engineering
The University of Texas at Austin
http://www.ce.utexas.edu

Elastic wave-based non-destructive testing (NDT) methods are effective for flaw detection in concrete structures and pavements. With the recent developments in computing hardware and software, imaging techniques have become very popular in NDT applications, and are able to provide direct visual results for rehabilitation decision. However, the application of elastic wave-based imaging methods for concrete

structures is severely limited by the physical coupling between sensors and concrete surface, which significantly reduces testing efficiency. The air-coupled sensing method is proposed as a solution to develop rapid NDT techniques for concrete infrastructure.

This presentation reviews the development of the air-coupled sensing technique for concrete structures in civil engineering applications. It presents four stages of the research: 1) feasibility study through theoretical analysis; 2) air-coupled surface wave velocity measurement; 3) air-coupled surface wave transmission measurement to determine crack depth; 4) air-coupled impact-echo test to locate delaminations and voids in concrete.

Dynamics of Tandem Microbubble and Their Potential Biotechnological and Biomedical Applications

Friday, October 8, 2010 4:00 p.m. in ETC 4.150

Professor Pei Zhong
Department of Mechanical Engineering and Materials Science
Duke University
http://www.mems.duke.edu/fds/pratt/MEMS/faculty/pzhong

Acoustic cavitation is known to play a pivotal role in a diverse range of biomedical applications, including cancer therapy, drug/gene delivery, and shock wave lithotripsy. We have recently developed a new method based on laser-generated tandem microbubble to investigate bubble-cell interaction in unprecedented detail (PRL 105, 078101, 2010). Results from high-speed imaging and μPIV will be presented to demonstrate the asymmetric collapse of the bubble with directional formation of microjets (~ 10 m/s) and vortices (up to 350,000 1/s) that can cause a pinpoint opening (0.2 ~ 2 μm) on the membrane of an adherent cell placed nearby. The effects of the phase delay between the tandem microbubble on microjet formation and particle displacement in the surrounding fluid will be presented. Potential applications in localized and directional drug/gene delivery to individual cells and cavitation-based cell sorting will also be discussed.

There’s Music in the Air

Friday, October 15, 2010 4:00 p.m. in ETC 4.120

David A. Nelson, INCE Bd. Cert., P.E.
Principal Consultant, Nelson Acoustics
http://www.nelsonacoustical.com

There are few activities that define the “Austin experience” better than sitting under the stars with friends, sipping a cool beverage, and listening to live music. The same music travels out into surrounding areas where it may be perceived as annoying “noise” by residents. In comparison with other environmental sound sources, music presents special challenges because of its tonal, rhythmic, and lyric content. Outdoor music compounds the challenges by adding often unanticipated factors like weather, ambient noise, and topography. The complexity of the situation is at odds with the simplicity of many noise

ordinances and with the public's often naive understanding of what sound is "supposed" to do and what residents are "supposed" to find tolerable.

The presentation will cover examples of problematic outdoor sound propagation, methods by which potential use conflicts can be foreseen, and suggestions for improving noise ordinances.

Anatomy of the Audio Analyzer

Friday, October 22, 2010 4:00 p.m. in ETC 2.108

Dr. Thomas D. Kite
Audio Precision, Inc.
Beaverton, Oregon
http://ap.com

Audio analyzers are used by consumer and professional audio equipment manufacturers, broadcast studios, and recording studios to measure the quality and integrity of the audio signal chain. Modern audio analyzers are sophisticated computer-controlled machines that combine the most interesting aspects of analog and digital audio, low-noise design, and digital hardware. This seminar will discuss the architecture of audio analyzers, the specialized techniques used to achieve top performance, the latest measurement methods that combine speed and accuracy, and much more. There will also be demos using the latest Audio Precision instrument.

Dr. Kite is Vice President of Engineering at Audio Precision, Inc., the world's leading manufacturer of audio test equipment. He holds a B.A. in Physics from Oxford University, and MSEE and Ph.D. degrees from The University of Texas at Austin, where he specialized in acoustics and signal processing. He is a member of the Audio Engineering Society, and has published and presented works at the AES, the ASA, IEEE, and in trade journals.

Acoustic Particle Interaction and Aerosol Manipulation

Friday, October 29, 2010 4:00 p.m. in ETC 4.120

Paul A. Waters
Applied Physics and Acoustics Group
Applied Research Associates, Inc.
Denver, Colorado
http://www.ara.com

Acoustic manipulation of small particles is a well-documented phenomenon dating back to the 1860s, when Kundt first observed nodal patterns in glass tubes dusted with lycopodium powder and excited by an acoustic wave. Since these original experiments, researchers have applied acoustic aerosol manipulation techniques to reduce industrial aerosol pollutants through agglomeration processes, improved nano-scale manufacturing techniques through levitation and periodic placement, and now Applied Research Associates has developed an acoustic aerosol concentrator and filter. These

technologies use high-intensity standing wave fields to manipulate small (1-10 μm) particles into removable streams. This talk reviews the three main acoustic-particle forces used to manipulate particles in a high-intensity standing wave field: radiation force, asymmetric Stokes drag, and acoustic streaming. Hardware performance results are presented and discussed.

Paul Waters is a staff engineer at Applied Research Associates, Inc. He holds a B.S. in Mechanical Engineering and M.S. in Mechanical Engineering–Acoustics from The University of Texas at Austin.