



THE UNIVERSITY OF TEXAS
AT AUSTIN

Department of Mechanical Engineering

ACOUSTICS SEMINAR

Jointly Sponsored by
Mechanical Engineering, Electrical and Computer Engineering,
Engineering Mechanics, and Applied Research Laboratories

Friday, January 31, 1997

4:00 p.m. ETC 7.146
(Note change in room.)

by

Karl Martin

Department of Mechanical Engineering

Review of Recent and Ongoing Developments in the Acoustic Treatment of Aerosols

Acoustic agglomeration is the use of high intensity sound to cause aerosol particles to stick together. It is a process with applications in pollution control and bulk materials handling. The acoustic agglomeration effect has been known for some time, but is only recently beginning to be explained. Several theories have been proposed, the most prominent being orthokinetic effects, mutual scattering and radiation pressure interactions, and acoustic wake effects. These theories will be reviewed and discussed in light of recent results in the literature. Recent work in acoustic agglomeration at the University of Texas has focused on a novel process known as acoustic filtration. This process uses a standing wave to force aerosol particles to migrate to certain, fixed points in a closed chamber. These particles form disks which levitate and act as filters by capturing more particles. Measurements will be presented which quantify the effectiveness of acoustic filtration versus previous implementations of acoustic agglomeration, and which characterize the development of the disks in detail.



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Friday, February 21, 1997

4:00 p.m. ETC 4.120

by

Tracianne Neilsen

Department of Physics

Mode Extraction from a VLA Using Singular Value Decomposition

A method is developed for extracting the depth-dependent mode functions from single-frequency measurements on a vertical line array as a source moves out in range. A matrix of the complex pressure field versus receiver depth and source range is formed, and the cross-spectral density matrix (CSDM) is computed. A singular value decomposition (SVD) is performed on the CSDM to obtain the orthonormal eigenvectors and the eigenvalues. Rearrangement of the normal mode equations reveals that under ideal conditions, the eigenvectors correspond to the mode functions and the eigenvalues are proportional to the modal source excitation and wavenumber. When two or more eigenvalues are nearly equal, the eigenvectors are not unique, and the correct mode functions are linear combinations of the eigenvectors. Other complications arise when the pressure field is not sampled adequately in depth or range. The procedure is applied to simulated data for a Pekeris waveguide and a realistic geoacoustic profile. Extracted mode functions from sources of opportunity are intended to be used for geoacoustic inversion of the sound speed profile and bottom properties.



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Monday, March 3, 1997

4:00 p.m. ETC 4.120
(Note change in day.)

by

Dr. Milton Lumpkin
Manager, Noise Engineering, 737/757 Programs
Boeing Aircraft Company

Noise Control and Engineering Acoustics at Boeing

At Boeing, the Noise Engineering and Noise Laboratory organizations employ approximately 160 people to insure that Boeing aircraft set world class standards for low noise emissions. Our scientists, engineers, and technicians work to reduce the noise radiated by the airplane both in flight and on the ground; we also minimize (subject to cost and weight constraints) the noise inside the airplane, both inside the passenger areas and also on the flight deck. An overview of our programs, staff, noise control technology, prediction and analysis techniques, and laboratory facilities will be presented.



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Friday, March 28, 1997

4:00 p.m. ETC 4.120

by

Dr. Wayne M. Wright

Department of Physics, Kalamazoo College

Experimental Studies with N Waves from Sparks

Weak sparks in air can be used to generate intense, short-duration acoustic transients that resemble N waves. Measurements made with wide-band capacitor microphones have confirmed theoretical predictions of amplitude decay and waveform elongation with propagation distance. These waves have made possible a number of studies of reflection and diffraction of transient signals, as well as modeling of the propagation of sonic booms through the atmosphere. Emphasis of the talk will be on practical considerations that affect this experimental work.



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Wednesday, April 2, 1997

3:00 p.m. ETC 4.120
(Note change in day and time.)

by

Brian J. Landsberger

Department of Mechanical Engineering

Second Harmonic Generation in Sound Beams Reflected from and Transmitted through Immersed Elastic Solids*

This seminar reports a theoretical and experimental investigation of finite amplitude sound beams reflected from, and transmitted through, isotropic elastic solids immersed in liquids. Attention is focused on the fundamental and nonlinearly generated second harmonic components in the beam as functions of incidence angle. The theoretical model is based on angular spectrum theory, and it describes second harmonic generation in sound beams radiated by arbitrary sources and incident on the solid at arbitrary angles, including mode conversion at the fluid-solid interfaces. Experiments were performed in water with an ultrasonic sound beam incident on either an aluminum or acrylic block. Extensive measurements of the reflected and transmitted fields were made at angles of incidence for which strong nonspecular phenomena are observed. These angles are associated with generation of interface or evanescent waves and are characterized by rapid variations in the phases of the reflection and transmission coefficients. Theory and experiment are in close quantitative agreement in all cases, especially comparisons of side lobe structures in the diffraction patterns. These appear to be the first such comparisons for second harmonic generation in solids. The close agreement indicates that similar comparisons of theory and experiment can be used to determine the nonlinearity coefficients for the solid.

*Final oral defense of Ph.D. dissertation.



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Friday, April 4, 1997

4:00 p.m. ETC 4.120

by

Robert D. Bruce

Collaboration in Science and Technology, Inc.
Houston, TX

Forensics and the Acoustical Engineer

Acoustics and acoustical engineers have been at the center of attention in addressing some of our nation's important legal problems. For example:

- Was the 18 minute gap in President Nixon's dictaphone recording created deliberately or accidentally?
- How many shots were fired in Dealey Plaza on 23 November 1963?
- What did acoustics have to do with the two different judgments in the Rodney King cases?
- What do recorded sounds reveal about plane crashes such as TWA Flight 800 or the ValuJet crash?

Other examples of forensic acoustics will be discussed, including the following:

- Can a purchaser collect damages if a vendor's equipment violates noise specification?
- Can residential complaints about noise from nightclubs, racetracks, industrial facilities, and schools shut down the operation?
- Did the doctor hear an alarm and fail to respond to the emergency, or was the alarm turned down to a lower setting?
- Did the construction worker hear the back-up alarm before he was crushed by the truck, or did the alarm fail to operate properly?
- Did the driver of the automobile fail to yield the right of way to the locomotive because he did not hear the horn, or did the engineer of the train fail to sound the horn?



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Friday, April 11, 1997

4:00 p.m. ETC 4.120

by

Jack Evans

Jack Evans & Associates, Inc.
Austin, TX

Community Noise Issues in and around Austin

Commercial and industrial properties are often adjacent to residential properties. Land use compatibilities are poorly regulated in many communities, with neither rational noise zoning nor permissible continuous noise criteria in ordinances. Recent community noise issues in and around Austin will be discussed with regard to ambient vs. disturbed sound levels, time of day for disturbance, and resolution or proposed solutions. Cases discussed will include:

- (Former) Pulpo Loco in the Park, Austin: amplified music after 10:00 p.m.
- HEB #8 Supermarket, Austin: truck dock noise between 8:00 p.m. and 8:00 a.m.
- Southwestern Bell, Pflugerville: engine-generator noise after 10:00 p.m.

In one case, a business was closed. In another, significant physical changes mitigated by noise are planned. In the third, zoning and permitting for a building expansion were affected by neighborhood noise considerations.