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The Acoustical Society of America

ECHOES

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# Green Buildings: Implications for Acousticians

*Michael R. Noble*

The current trend towards energy efficiency and green buildings is codified in the LEED (Leadership in Energy and Environmental Design) Green Building Rating System of the US Green Building Council. The essence of the LEED movement is that a building should minimize its environmental footprint from both energy consumption and material consumption viewpoints. The rating system does not explicitly provide credits for acoustics, and acousticians (who are charged with providing an interior acoustical character which addresses the users' needs) find themselves faced with an acoustically hostile environment, as the building designers cope with novel energy efficient design strategies including daylighting, passive cooling and natural ventilation. These aspects of the building are usually built into the project brief, and are addressed as integral issues as the design is developed. In contrast, many owners, architects and engineers perceive acoustics as a sometimes optional add-on to enhance the finished product if the budget permits, rather than an integral part of the design. Thus, it is easy for project designers to discount acoustics where it conflicts with the energy efficiency parameters. Our experience over the last 10 years with a number of LEED certified buildings in western Canada provides some insights into the design process from the acoustician's perspective

A 1996 university teaching building was designed to use natural ventilation, implying the introduction of outdoor air into the classrooms by natural convection (stack effect). This initiative required large open windows on the building exterior to admit outdoor air, and correspondingly large openings in the interior walls to exhaust stale air to a multi-story atrium and ventilation shaft, without the need for energy-consuming fans. The ventilation concept was competent, and would have provided effective ventilation and cooling for much of the year in our temperate coastal climate. However, the acoustical ramifications were substantial: the exterior openings would have let in inordinate amounts of traffic and pedestrian noise from nearby roads and walkways, and the interior openings would limit noise isolation between classrooms and let in occupant noise from the atrium gathering spaces. The addition of baffles or other noise isolating restrictions in the openings was unacceptable if the natural airflow was to be achieved. These acoustical issues forced a redesign to provide individual ducted ventilation fans for each room and smaller, sound trapped openings. However, the space requirements for the fans and ducts could not be accommodated in the design, and the building was eventually constructed with a normal HVAC system and mechanical cooling. It did not achieve the desired energy savings, but was successful acoustically.

Several more recent projects have used radiant cooling as an energy-saving approach. The passive form uses the building mass as a heat sink to absorb occupant heat during the day, and release it at night to be flushed out of the building by the mechanical ventilation system. The active version uses cooling coils embedded in the concrete slabs overhead to carry away the heat. Both of these strategies require that the structural concrete ceilings are exposed to the occupied space and not covered with any insulating material, denying the acoustician any opportunity to provide a sound absorbing ceiling.

A 1999 office building for a utility company employed the passive approach in numerous large floor plates for open-plan cubicle offices, without the benefit of any acoustical consultant input. The sound absorption in the space was limited to a low pile carpet and some acoustically "hard" (sound reflective) workstation screens. After receiving many complaints from occupants regarding privacy, disturbance and inability to concentrate, we were engaged to assess the situation. Measurements in the open offices showed, to no one's surprise, that speech privacy was not achieved under any conditions. Indeed, sentence intelligibility was 95% or greater for all conditions of screen heights and workstation separations. The background noise in the rooms was fairly low (around NC 35) and there was no sound masking system.

Mitigation options explored were the addition of a ceiling (ruled out because of HVAC considerations), addition of vertical hanging baffles (eliminated by the owner for aesthetics and interference with the energy-efficient indirect lighting), addition of wall panels (ineffective because there were few available walls), and replacement of screens with sound absorbing units (too expensive). As far as we know, the poor acoustical

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# We hear that...


• **James Flanagan**, ASA Fellow and Gold Medalist, received the 2005 IEEE Medal of Honor for "sustained leadership and outstanding contributions in speech technology." The medal was presented June 18 at the annual IEEE Honors Ceremony in Chantilly, Virginia. The award comprises a gold medal, bronze replica, certificate and cash honorarium.

• The National Hearing Conservation Association has presented **Les Blomberg**, Executive Director of the Noise Pollution Clearinghouse, with its 2005 Media Award.

• **Eric Ungar**, ASA Fellow, received the INCE Distinguished Noise Control Engineer Award from the Institute of Noise Control Engineering at its July 2004 NOISECON Conference. Eric served as INCE President in 1985.

• **Suk Wang Yoon**, ASA Fellow, is general chairman of WESPAC9, which will be held in Seoul, Korea June 26-28, 2006. The website is www.wespac9.org

## Acoustics Today

As you may have heard, ASA is launching a new popular acoustics magazine which will be called *Acoustics Today*. According to present plans, *ECHOES* will be incorporated into the magazine (we will be the "centerfold"). ASA members will receive *Acoustics Today* quarterly, just as they now receive *ECHOES*.

Although the format may change a little, we don't anticipate any major editorial change in *ECHOES*. We still intend to feature news about acoustics and ASA members, an article or two about "hot" topics in acoustics, and letters to the editor from readers. As always, we welcome contributions from readers; keep them short, keep them readable. Photos are always welcome.

ECHOES

Newsletter of the Acoustical Society of America

*Provided as a benefit of membership to ASA members*

The Acoustical Society of America was organized in 1929 to increase and diffuse the knowledge of acoustics and to promote its practical applications.

Echoes Editor . . . . . .Thomas Rossing
ASA Editor-in-Chief . . . . . .Allan Pierce
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## From the Student Council

*Andrew Morrison*

The Spring meeting in Vancouver was a busy week for the Student Council and all students in attendance. It was a great opportunity to interact and meet fellow students, especially students from the Canadian Acoustical Association.

One of the highlights of the week was a "Hot Topics" talk given by David Bradley, Chair of the Student Council. David highlighted all of the recent accomplishments and current initiatives that the Council has undertaken. Some of the topics covered included the fellowships and grants workshop organized by the Council, the new website and the Mentoring Award which was established by the Council. David's main message was that the Student Council has been extremely successful in communicating information to students. David ended his term as chair of the Council at the end of the Vancouver meeting. The new chair is Brian Monson.

On Wednesday, the Council hosted a student reception. Turnout for the reception was over 100 people including many undergraduate students as well as professionals in acoustics. The reception is always a great place for students to socialize with each other and to network with people in acoustics. Following the reception, approximately 30 students went on the student outing to a nearby pool hall.

The next deadline for the Student Council Mentoring Award is September 5, 2005. This deadline occurs before the Minneapolis meeting and the award will be presented at the Fall 2006 meeting. Application information can be found on the Council's website: www.acosoc.org/student.

### Best student paper awards (Vancouver)

*Animal Bioacoustics*
Randy J. Hill, University of South Florida

*Acoustical Oceanography*
First: Srinivasan Jagannathan, MIT
Second: Ben Biffard, University of Victoria

*Biomedical/Bioresponse*
First: Adam Maxwell, University of Washington
Second: Parag Chitnis, Boston University

*Engineering Acoustics*
Andrew P. Medley, University of Warwick

*Musical Acoustics*
First: Patricio de la Cuadra, Stanford University
Second: Niels W. Larsen, Oersted DTU

*Noise*
Connor Duke, Brigham Young University

*Structural Acoustics and Vibration*
First: Jerome Pinsonnault, Université de Sherbrooke
Second: Dany Francoeur, Université de Sherbrooke

*Underwater Acoustics*
First: Alexander MacGillivray, University of Victoria
Second: Jie Yang, Georgia Institute of Technology

# Discoveries and Breakthroughs: Acoustics on TV

Martha Heil, Science writer for the American Institue of Physics (AIP), shared some information about acoustics clips that have been distributed recently to TV stations by the AIP Discoveries and Breakthrough Inside Science (DBIS) program (see *ECHOES*, Summer 2004 issue).

"When I Say Charge It!" (released June 04)– **Electrical engineers develop a secure voice-activated credit card**. A new smart credit card contains a tiny microphone, a loudspeaker and a built-in voice recognition chip. A user records a voice and password which are converted to a fax-like sound.

"Sonar Net" (released June 04)– **Acoustical engineers develop new layer for pool safety**. Based on underwater technology from the US Navy, a new system, called SonarGuard, can detect a child accidentally falling into a pool. Sensors in the pool send out sound waves which are broken if a child falls into the pool, which then triggers an alarm.

"FM Hearing Aids" (released May 05)– **Audiologists adding dimension to the flat sound quality in cochlear implants**. Current cochlear implants don't separate one instrument or voice from another, and music that should sound normal sounds muffled. So researchers added the FM signal you use to tune in your favorite radio station. FM, or frequency modulation, enhances voice and music recognition.

## Green Buildings *continued from page 1*

condition has not yet been corrected, perpetuating a less-than-satisfactory acoustical environment for many workers. This building has won design awards and is considered to be a LEED success story, even though the users have significant and justified complaints regarding the interior environment.

A 2003 university research/teaching building employed active cooling, and again required bare, exposed concrete slabs overhead. While some reverberation control was achieved by means of acoustical wall panels, the area of treatment was severely reduced by budget considerations, with the result that the large occupied office and research lab spaces were too reverberant for occupant comfort, and elicited many complaints. It should be noted that the reduction of acoustical panel area was a budget driven decision at a late stage of construction, which did not involve the acoustician. To avoid these potential problems in future projects, it is imperative that the acoustician be regarded as a full member of the design team, with involvement in all decisions affecting the interior environment. We need to be more forceful in presenting our ideas.

A more acoustically positive initiative is the trend to green roofs, where planting is used on the roof to control solar gain and storm water run-off, recycle grey water, and regenerate oxygen. The acoustical benefits result from the provision of a heavier roof structure to support the soil, which in turn improves the noise isolation of the roof system. This is particularly beneficial for buildings adjacent to airports and other elevated noise sources, where the cost of improving the noise isolation would be unattractive to a building owner.

In conclusion, the current implementation of LEED guidelines for green buildings has provided significant challenges for acousticians which have not always been addressed in an effective manner where acoustical needs are at odds with the LEED commitment. As acousticians, we must be more pro-active in promoting interior acoustics, and must also lobby for the establishment of acoustics credits in the LEED rating system.

*Michael R. Noble is an acoustical consultant with BKL Consultants Ltd. in North Vancouver, BC <www.bkla.com>.*
*This article is based on paper 1pAA4 at the ASA meeting in Vancouver.*

## Editor, Acoustics Today

The Acoustical Society of America (ASA) is launching a popular acoustics magazine, "Acoustics Today," and seeks applications for the position of Editor. *Acoustics Today* is a full-color, quarterly print publication that provides technical and Society information to ASA members and includes tutorials, technical articles, position and commercial advertisements, and highlights of activities of members, of Technical Committees, and of Standards.

The Editor of *Acoustics Today* is responsible for planning the content of the magazine, soliciting and receiving articles and other materials from authors, and coordinating with the American Institute of Physics (AIP) Special Publications and Advertising Departments. The Editor attends the twice-annual meetings of the Society and chairs meetings of the magazine's Editorial Board. Periodic visits to the ASA Office in New York will be required to interact with ASA and AIP staff. Duties associated with this position are expected to require an average time commitment of two days per week. A broad knowledge of acoustics is required and experience with publication production processes is desirable. The honorarium is negotiable. Refer to http://asa.aip.org/ateditor.html for additional information.

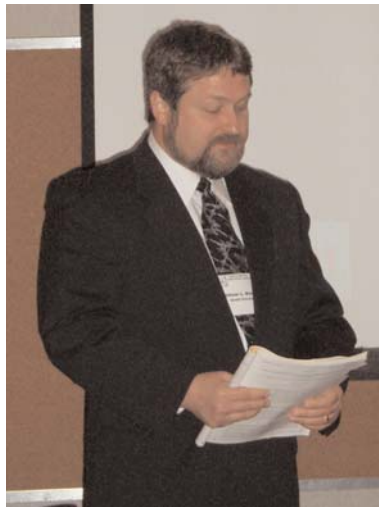
Candidates should submit a cover letter describing their interest in and qualifications for the position, curriculum vitae/resume, and the names and contact information of at least three references. Nominations of qualified individuals are also welcome. Applications and nominations should be sent by e-mail or postal mail to: Judy R. Dubno, Ph.D., Chair, Search Committee for the Editor of *Acoustics Today*, Acoustical Society of America, Suite 1NO1, 2 Huntington Quadrangle, Melville, NY 11747-4502, Email: dubnojr@musc.edu

Review of applications will begin in September, 2005 and continue until the position is filled.

## Low-frequency content in music reproduction: Is one sub-woofer enough?

*Jonas Braasch and William L. Martens*

The reproduction of low-frequency content in music has become an important issue in the development of a cost-effective solution for multichannel stereophonic sound systems. In particular, the International Telecommunication Union (e.g., in ITU/R BS 775-1) has recommended the use of a single loudspeaker for musical content below 120 Hz. The acceptance of this standard has had a substantial impact upon what the audio industry has offered consumers for their 5.1 channel home theater systems, and it has become hard to find such systems that feature 5 loudspeakers covering the full range of audio signals historically covered by high-fidelity stereo systems (i.e., extending down to 20 Hz). Both researchers and practitioners have begun asking whether something of importance to human perception is being lost when all the low-frequency content in multichannel music is mixed together for reproduction via a single low-frequency driver. To discuss this and related issues, it was decided to hold a special session on the topic of "Low-frequency content in music" at the 2005 Vancouver meeting.



*Bill Martens (paper 1pMU1)*

To begin with, auditory localization cues are often considered to be negligible in loudspeaker reproduction at low frequencies. On the one hand, interaural phase differences remain very small at the low end. On the other hand, interaural level differences, the other strong binaural localization cue, disappear when the signal wavelength exceeds the dimensions of the head (and the sound signal reaches the contralateral ear without significant loss). The acoustical response of the reproduction environment makes it even more difficult to localize low-frequency sound sources, primarily due to room modes and reflections of the loudspeaker signals. Based upon such reasoning, and also due to the legacy of film sound reproduction in the cinema, the ITU standard became accepted, and it became common to send all low-frequency content below 80 to 120 Hz to a single subwoofer. In the special session on "Low-frequency content in music," however, most speakers questioned the validity of this reasoning, and presented new findings to indicate that the importance of spatial information in the low-frequency range generally has been underestimated.

The main focus of the session turned out to be a review of the spatial auditory imagery associated with more adequate reproduction of low-frequency sound. Among the most convincing evidence in support of the use of multiple low-frequency drivers were two acoustical demonstrations that David Griesinger and Robin Miller presented to the audience in the session via two laterally-positioned subwoofers. In his talk, Griesinger pointed out that the spatial content at low-frequency is very important for the perception of listener envelopment for reproduced music in general, and not just a difference that is heard when narrow bands of uncorrelated noise are presented. His acoustic demonstrations revealed how "world class" listener envelopment requires at least two low-frequency drivers to reproduce musical content adequately, and requires at least four low-frequency drivers if listeners are allowed to turn their heads by 90 degrees.

Interestingly, despite the predominance of single-subwoofer reproduction systems in consumer home theater systems, the coding of spatial attributes in low-frequency sound has remained a common practice in the music and film industry. This was Robin Miller's conclusion after analyzing the content of numerous recent productions, including, for example, substantial signal incoherence at frequencies as low as 7 Hz in some film sound effects. During the session he shared several audio examples with the audience that systematically explored these low-frequency effects.

More evidence in support of the importance of low-frequency spatial cues was provided by several papers on psychoacoustic experiments. In these presentations it was generally agreed upon that spatial cues are detectable in rooms for low frequencies. In terms of sound localization, Jonas Braasch, et al., reported on a source identification experiment in which listeners were able to identify whether an octave-wide noise burst with a center frequency as low as 31.5 Hz, was presented from left, front or right. William Martens explained that differences in interaural coherence in narrow bands of noise were both discriminable and identifiable in terms of well-defined perceptual attributes, such as auditory source width and distance. Sungyoung Kim reported on similar discrimination of stimulus interaural incoherence in the reproduction of the sound of individual musical instruments, while Gilbert A. Soulodre's results supported the conclusion that the laterality of low-frequency energy is important in predicting listener envelopment ratings made for classical music sources.

After so much support in favor of low-frequency spatiality, one might wonder how the International Telecommunication Union came to make its contrasting recommendation. Significant variations in the acoustics between rooms is one likely reason why the ITU suggested the use of a single low-frequency driver. First of all, reverberation time typically increases with decreasing frequency, and often rooms that have been acoustically treated are still "boomy" at the low end. To

treat a room at low frequencies is simply more difficult and costly compared to treatment at higher frequencies. Even so-called anechoic chambers are still reverberant in the low end, with typical critical frequencies between fifty and several hundred hertz. Often the residual reverberation at low frequencies remains unnoticed, perhaps because the fundamental frequency of our natural sound source, the voice, is not low enough to excite the room response in this range. Background noise is also typically so low that its reverberation is not noticed, especially since the threshold of hearing increases at low frequencies.

Room modes play an important role in the acoustics of listening rooms, and at low frequencies the wavelength of sound is on the order of the room dimensions, so we observe distinct sound pressure nodes and maxima. When setting up a sound reproduction system, it is important to place the low-frequency driver in a pressure maximum for at least one frequency. Otherwise the loudspeaker cannot radiate sound effectively. If the listener intends to pick up the sound at this particular frequency he or she should not be positioned at a pressure node. Otherwise, the ear-drums, which are sensitive to pressure, will not be excited and nothing will be heard. The matter becomes more complicated when the goal is spatial reproduction at low frequencies. In this case, the position of velocity nodes and maxima have to be considered as well. To be able to detect phase differences between the ears at low frequencies, the listener must be placed outside the velocity node(s) for this frequency. David Griesinger pointed out in a series of diagrams that, for the best result, two room modes at overlapping frequencies have to be utilized for both pressure and velocity.

It is very likely that the ITU/R BS 775-1 recommendation was derived from psychoacoustic experiments that were conducted in spaces with non-optimal spatial characteristics. Even though these types of rooms represent the typical home entertainment scenario, the acoustics of high-profile spaces such as sound recording studios and concert spaces are often more well tuned. In his study using more typical listening room acoustics, Todd Welti reported experimental results in which the listeners faced difficulties in discriminating between different subwoofer set-ups involving two or more subwoofers in various configurations. During the discussions it was agreed upon that the acoustical character of the room is a crucial determinant of a listener's ability to perform binaural tasks in the low-frequency range. While it is well understood how performance of listeners on binaural tasks at higher frequencies varies with the type of room (e.g., anechoic chamber, small seminar room, cathedral), the determining factors for similar tasks at low frequencies are visually less apparent. These concerns raise the question of how to best treat a room acoustically at low frequencies. Two talks were dedicated to this topic during the special session. Timothy Ryan, et al., reported on how the treatment of a space with classic methods of employing bass traps and Helmholtz resonators could improve the low-frequency acoustics for better source localization. Niels Werner Larsen, et al., contributed a unique solution to low-frequency treatment employing an inflatable bass trap that behaves just like an air mattress.

In conclusion, it is worth questioning what good is the ".1" in "5.1" channel music content. In film sound, this low-frequency effect (LFE) channel has been well used to allow higher-intensity reproduction of low-frequency sound effects, such as that expected for explosions and powerful impact sounds. But if full-range multichannel signals are used in music reproduction, then for what might this additional channel be well used? Kent Walker suggested that structural vibration is another important low-frequency phenomenon that should be reproduced, due to its importance in creating a sense of presence for a music listener. To answer a practical question for multimodal music transmission, he investigated an observer's tolerance for asynchrony in the arrival of airborne and structure-borne signal reproduction. Judgments regarding the temporal order of these two components revealed different points of subjective simultaneity for different musical sound sources, with human subjects making more acute discriminations for percussive tones (such as the kick drum) and less acute discriminations for more sustained tones (such as the bowed bass violin). So it might be suggested that the ".1" in "5.1" channel music reproduction might well be used to transmit the low-frequency structural vibrations that are missing in most music reproduction.

*Jonas Braasch and William L. Martens are in the Faculty of Music at McGill University. This article is based on session 1pMU at the ASA meeting in Vancouver.*

*Participants in a special session honoring Wesley Nyborg. Dr. Nyborg is third from left in first row.*

*Ilene Busch-Vishniac (l) and Bill Kuperman (r) congratulate Gold Medalist Allan Pierce (c).*

# Scanning the Journals

*Thomas D. Rossing*

• "Sultan of Sound" is the title of a biographical article about **James Flanagan** in the May issue of *IEEE Spectrum*. It points out how voice mail, speech recognition, the artificial larynx, and packet-switched voice, are all built on his pioneering research. His early experiments to determine how accurately the ear detects speech coding errors were reported in a letter to the editor in the May 1955 issue of JASA, his most frequently requested publication. Flanagan's work with speech coding heralded a series of advances, including the widely used *linear predictive coding*. For "his sustained leadership and outstanding contributions in speech technology" he was awarded the 2005 IEEE Medal of Honor (see "We hear that…" in this issue).

• Elephants are capable of **vocal learning**, according to an article in the 24 March issue of *Nature*. A ten-year old adolescent African elephant living in a group of orphaned elephants in Kenya, 3 km from the Nairobi-Mombasa highway, learned to emit truck-like sounds for several hours after sunset, the optimal time for the transmission of low-frequency sound in African savannahs. Acoustical studies showed that the truck-like calls differ from the normal calls of African elephants and are similar to the recorded truck sounds. Vocal learning enables a flexible and open communication system in which animals may learn to imitate signals that are not typical of the species.

• Seismometers capable of measuring ground vibrations with periods of several seconds have recorded a continuous seismic hum called "**ocean microseisms**," according to a note in the 4 February issue of *Science*. The hum is not the result of tectonic forces, but rather the response of the solid Earth to ocean wave-wave interactions, which have seismic energy comparable to that of earthquakes. Early studies showed that ocean microseism signals are linked to ocean swell conditions such as wave direction, amplitude, and period. The conditions for generating these wave-wave interactions probably occur at cyclonic depressions and along steep coastlines.

• A **mechanical oscillator** that responds up to 1.5 GHz is reported in *Physical Review Letters* **94**, 030402, 2005. The device consists of 500-nm silicon paddles sprouting from a 10.7-micrometer spine of silicon. It was driven electromagnetically at temperatures of 1 K and below. It is believed to be the fastest mechanical oscillator to date.

• The March/April issue of *Acta Acustica/Acustica* includes a special collection of 12 papers on **String Instruments** edited by Antoine Chaigne. Authors include Gabriel Weinreich, Eric Jansson, Colin Gough, Matti Karjalainen, Julius Smith, and others.

• The May/June issue of *Acta Acustica/Acustica* has a special collection of 15 papers on **Advances in Research on Spatial and Binaural Hearing** edited by Adelbert Bronkhorst and Douglas Brungart. These papers were presented at a conference on spatial and binaural hearing held in Utrecht in June 2003. The papers address two main research areas: Sound localization, and sound segregation. The editors' preface to the issue includes 71 references to the recent literature on the subject.

• Seismological results indicate that the devastating **26 December earthquake** was 2.5 times larger than initial reports suggested, and is second only to the 1960 Chilean earthquake in recorded magnitude, according to a communication in the 31 March issue of *Nature*. These results come from analyzing the Earth's normal modes of vibration that have distinct periods due to the planet's rotation and ellipticity. The decay of energy with time owing to inelastic processes in the Earth depends on the mode's attenuation of quality factor Q. There was a systematic increase in seismic moment with period, which explains why the earthquake size was underestimated. The larger moment reflects slow slip that was not detectable from surface waves. The slow slip helped to excite the tsunami.

• To explore the enticing possibility of **sonofusion** (or acoustic inertial confinement fusion), four universities and a development company have created the Acoustic Fusion Technology Energy Consortium (AFTEC), according to an article in the May issue of *IEEE Spectrum*. The five founders are Boston University, Impulse Devices Inc., Purdue University, the University of Mississippi, and the University of Washington. Its goal is to promote the development of sonofusion and its related science and technology. Current sonofusion experiments use deuterated acetone which is subjected to sound waves of about 20 kHz. Intense standing waves produce sound pressures up to 1500 kPa. The apparatus developed for sonofusion experiments may also have application as a low-cost pulsed neutron generator, the article points out.

• "Homeward Sound" is the catchy title of a brief note in the 8 April issue of *Science* that describes experiments showing how **reef fish use sounds** to orientate toward and guide themselves around select reefs. Recordings of reef noise played through submersible speakers showed that greater populations settled on noisy patch reefs than on silent reefs.

• High-resolution **Ultrasonic Transmission Tomography** (HUTT) uses ultrasound to create three-dimensional images of soft tissue, according to a story in the 16 April issue of *New Scientist*. Unlike most ultrasonic scanners, which detect the echoes of sound waves, HUTT uses the sound that passes through the tissue to create an image. HUTT gives a higher resolution than any other medical scanning technology, including MRI and X-rays, the article claims. HUTT, which uses ultrasonic pulses at a frequency of 4 to 12 MHz, has a resolution of 0.4 mm. Clinical trials of HUTT will be performed later this year, and it will likely be 3 years before it is commercially available. A HUTT scanner will probably be considerably cheaper than an MRI scanner.

• Hair cell synaptic ribbons are essential for synchronous **auditory signaling**, according to a letter in the 14 April issue of *Nature*. Although the function of presynaptic ribbons is still largely unknown, the lack of properly anchored synaptic ribbons reduced synchronous auditory signaling in mouse mutants. A defect of synchronous inner hair cell synaptic transmission could explain some cases of poor speech discrimination in humans.

• Studies of a particular family with **developmental speech difficulties** have implicated a mutation in a gene known as FOXP2, according to a paper in *Am. J. Human Genetics* **76**, 1074 (2005).

# Scanning the Journals

The entire FOXP2 gene was examined in 49 volunteers with verbal dyspraxia. In one four-year old boy, a "nonsense" mutation that caused the protein product to be truncated was found. Moreover, his mother and sister carried the same mutation and also reported language problems where his father had a normal gene and normal speech.

• **"Using Guitars to Teach Vibrations and Acoustics"** is the title of a series of articles in *Experimental Techniques*. Article 4: Psychoacoustics and Sound Quality appears in the March/April issue. Previous articles in the series focused on string vibrations, the mechanics of the guitar body, and data acquisition using an electric guitar. *Experimental Techniques* is a publication of the Society for Experimental Mechanics (SEM).

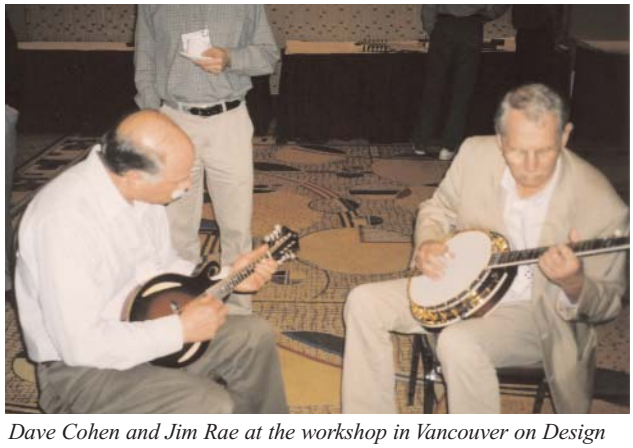
• Sox2 is required for sensory organ development in the **mammalian inner ear**, according to a letter in the 21 April issue of *Nature*. Two allelic mouse mutants, light coat and circling (Lcc) and yellow submarine (Ysb), were identified in mice that show hearing and balance impairment. Lcc mice are completely deaf, whereas Ysb mice are severely hearing impaired. These phenotypes are due to the absence (in Lcc mutants) or reduced expression (inYsb mutants) of the transcription factor SOX2, specifically within the developing inner ear.

• A paper entitled "Visualization/Auralization of **Sound Fields for Room Acoustics**," originally appearing in the Proceedings of WESPAC8, has been reprinted in the December issue of *Acoustics Australia.* Differences of sound wave propagation and sound diffusivity in rooms with different shapes and diffusion treatments are visualized by computer animation and the room impulse responses are compared by auralization technique. An idea for simulating a sound field by combining finite difference time domain calculations with a 4-channel reproduction system is also presented.

• An "acoustic TV" is part of a fuel-cell powered unmanned **underwater survey vehicle** described in the May issue of *Acoustical Science and Technology*. The TV has an acoustic lens and a 2D hydrophone array of 128x128 elements, and three projectors that transmit at 400, 500, and 600 kHz.

• **Singing sand dunes**, which emit a loud sound as they avalanche, exhibit wave-particle mode locking, according to a paper in the 3 December issue of *Physical Review Letters*. Avalanches excite elastic waves at the surface of the dune, whose vibration produces the coherent acoustic emission in the air. The amplitude of the sound (≈105 dB) saturates exactly when the vibration makes the grains take off the flowing layer. The sound frequency (≈100 Hz) is controlled by the shear rate inside the sand avalanche, which for granular matter is equivalent to the mean rate at which grains make collisions. This proves the existence of a feedback of elastic waves on particle motion, leading to a partial synchronization of the avalanching sand grains.

*Chocolate fountain was a big hit at the buffet social.*



*Dave Cohen and Jim Rae at the workshop in Vancouver on Design and Constructin of String Instruments.*

*Four bald eagles (aigles) seen in Vancouver.*

*Larry Crum (l) and Pat Kuhl (r) present the Telly award, which the Society won for its 75th Anniversary Film, to ASA president Bill Kuperman (c).*

# Acoustics in the News

• At a dinner discussion which included Intel CEO Craig Barrett and the presidents of eight major research universities, there was general agreement that science in the United States is losing ground to foreign competitors, according to a story in the April 6 issue of *Newsday*. Many at the Science Coalition's yearly media roundtable, held at the Penn Club in Manhattan, cited China and India as important new players, and bemoaned a lack of funding for basic research at home. Several attendees criticized the nation's K-12 science education as being woefully inadequate.

• A study of finless porpoises in China has shed some light on how these marine mammals make use of their sonar-like ability to navigate and hunt prey, according to a story in the 3 May issue of *The New York Times*. The researchers developed a sonar-monitoring device, with two small hydrophones, that they attached to eight porpoises. When the porpoise makes its echolocating clicks, any return echoes off objects are received by the hydrophones at slightly different times. The researchers found that the porpoises would use their sonar at relatively long range (up to 250 feet) before turning it off and swimming into the area. The researchers also observed what happens when a porpoise encounters a school of fish or other prey. In that case, it keeps the sonar trained on the target until it can see the prey visually or a capture is made.

• People who are exposed to consistently high levels of noise and carbon monoxide could suffer levels of hearing loss up to 50% worse than if they were exposed to just the noise alone, according to a story in the May 18 issue of *National Post* (Vancouver), based on paper 3aNS8 at the 149th ASA meeting. This should be of real concern to garage mechanics, welders, construction workers, and even servers in noisy, smoky bars.

• The so-called blood-brain barrier stops lots of bad stuff from reaching our brains, but it can also keep out potentially life-saving medicines, according to a story on *WTOP radio*, the news service of the National Academy of Engineering, dated April 25. The story is based on paper 2aBB1 at the Vancouver ASA meeting. Animal studies suggest it could be possible to temporarily pop those threads with ultrasound, so doctors might surgically remove a brain tumor, apply ultrasound at the site, and then kill any leftover cancer with traditional chemotherapy during the two to three days it takes your body to do the "resewing."

• Gently bouncing a baby while you sing can help to wire the baby's brain to hear rhythm, according to an *Associated Press* story dated June 2. Babies catch on quickly—they are able to perceive aspects of melody and recognize different beats at just a few months of age. They prefer to listen to a pattern matching the way they've been bounced.

• Children need more time to learn to read and remember less if their schools are near noisy airports, according to a story in the June 14 issue of *The New York Times*. The story is based on data from 89 primary schools close to airports near Amsterdam, Madrid, and London. After correcting for socioeconomic differences between schools, the investigators found that aircraft noise had a significant negative effect on reading comprehension. They suggested that in learning to ignore the irrelevant noise of the airplanes, students may simultaneously have learned to tune out relevant speech.

• The Israeli army has used bursts of loud sound to quell disturbances in a West Bank village, according to a story in the June 5 issue of *The Seattle Times*. The bursts of sound, at an undisclosed frequency, were about one minute in duration.

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