The newsletter of
The Acoustical Society of America

ECHOES

Volume 21, Number 2
Spring 2011

ASA returns to Seattle

ASA returns to one of our favorite cities, Seattle, for its 161st meeting, May 23-27. With over 1400 papers, this will be a large meeting, although not as large as the joint ASA/ICA meeting in Seattle in 1998. The general chair for the meeting is Thomas Matula, and the technical program chair is Eric Thorsos. Sessions will be held at the Sheraton Seattle Hotel.

Eric Thorsos (technical program chair) and Tom Matula (general chair) with scheduling board for Seattle meeting (Photo by Charles Schmid)

A tutorial lecture on "Shedding Light on Medical Ultrasound: The Combined Use of Light and Sound for Imaging and Therapy" will be given by Ronald Roy of Boston University on Monday, 23 May at 7:00 p.m. Advance registration of $15 ($7 for students) includes a set of notes. A short course on Active Noise Control will be taught by a team of experts including Scott Sommerfeldt and Kent Gee of Brigham Young University. Registration fee is $300 ($125 for students) with a discount for early registration.

The Society Lecture and Luncheon will take place on Thursday, 26 May ($30), and the Women in Acoustics Luncheon will be on Wednesday, 25 May ($20, students $10). Buffet socials with cash bar will be held on Tuesday and Thursday, and the Plenary Session will be on Wednesday. Open meetings of the technical committees are scheduled for Tuesday, Wednesday, and Thursday evenings. A Gallery of Acoustics, consisting of a multimedia collection of images, videos, audio clips, and narrations will be open for viewing during the meeting, as will entries in the Student Design Competition.

A workshop on Acoustic Challenges in Aquatic Ecosystem Assessment, jointly sponsored by ASA and the American Fisheries Society, will take place 25-27 May. Advance registration is $150 for ASA members ($95 for student members).

A technical tour of the Boeing plant is scheduled for Wednesday morning, and a tour of Dusty Strings is scheduled for Thursday evening.

Presenters may post their papers or presentation materials on the "Meeting Papers Online" website for others to download for six months. A more permanent respository is the "Meeting Papers Online" (POMA) website, where papers will remain indefinitely.

With a full program of interesting papers and events, there won't be much time for sightseeing, but visitors who come early or remain a few days after the meeting will find many attractions in Seattle. Just a short walk from the Sheraton is the Pike Place market, the oldest continually operating market in

continued on page 3

Space Needle and Mt Rainier

Technical tour of the Boeing plant on Wednesday morning

Technical tour of Dusty Strings on Thursday evening

We hear that . . .

• **ASA has a new website.** For the next 6 months links or bookmarks to the old url (asa.aip.org) will be redirected automatically to AcousticalSociety.org. However, access to subdirectories, (e.g., http://asa.aip.org/meetings.html) will be redirected to a page containing a message explaining that users should use the new navigation tools to find the page they want.

• **Shig Yoshikawa** writes that many Japanese acousticians were returning from a meeting of the Acoustical Society of Japan, held at Waseda University in Tokyo March 9-11 when the earthquake occurred. So far as he knows, our Japanese colleagues are safe. Tohuku University was severely damaged and is closed at least until late April.

• ***Acoustical Science and Technology***, the English-language journal published by the Acoustical Society of Japan, is available online at http://www.jstage.jst.go.jp/browse/ast/_vols. Articles can now be downloaded in PDF format without charge.

• **William M. Hartmann, Robert L. Clark** and **Dan H. Sanes** have been elected Fellows of AAAS (the American Association for the Advancement of Science) and were honored at the annual meeting in Washington, February 19.

• **Joe Wolfe** and his colleagues at the University of New South Wales are creating Physclips, a multi-media physics resource that includes learning and reference tools for students and resources for teachers. Units will deal with mechanics, sound, electricity and magnetism, and thermal physics. The unit on Waves and Sound, now nearing completion, can be previewed at www.animations.physics.unsw.edu.au/waves-sound/. Joe is a fellow of ASA and winner of several awards including ASA's Science Writing Award in 2002, The Scientific American Website Award in 2005, the Pirelli Prize for Science Communication in 2007, and the Australian College of Educators Award for University Teaching in 2006.

• **Brigitte Schulte-Fortkamp** was given an award by the Hear the World Foundation for an outstanding contribution to the fields of hearing and hearing loss. Professor Schulte-Fortkamp, a professor at the Institute of Fluid Mechanics and Engineering Acoustics, Technische Universität Berlin, is an ASA Fellow and has chaired the Technical Committee on Noise. She is currently vice-president elect.

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
Advisors . . . . . .Elaine Moran, Charles Schmid

Phone inquiries: 516-576-2360. Contributions, including Letters to the Editor, should be sent to Thomas Rossing, Stanford University, CCRMA Department of Music, Stanford, CA 94305 <rossing@ccrma.stanford.edu>

• The US team in the 2010 **International Physics Olympiad** won five medals (one gold two silver, and two bronze) to tie with South Korea for 11th place overall. The competition, held in Zagreb, Croatia July 17-25, featured over 400 students representing more than 80 nations. China, Taiwan, and Thailand tied for first with five gold medals each.

A Letter from the Editor

Some thoughts about ASA meetings

I'm sure that a lot of us are saving our pennies to attend the joint meeting of ASA, the Chinese Acoustical Society, the Hong Kong Institute of Acoustics, and the Western Pacific Acoustical Conference (Wespac) in Hong Kong May 13-18, 2012. The joint organizing committee, including ASA's Whitlow Au, is hard at work organizing this gala meeting which once again will bring together East and West.

International meetings are exciting, but as air travel becomes more expensive and visas become more difficult for some of our international students, it might be well to consider more interaction with acousticians in other societies in the United States. We have had several successful meetings with organizations such as the Institute of Noise Control Engineering and the National Council of Acoustical Consultants. I would like to see ASA hold joint meetings with the Audio Engineering Society, and with other societies whose interests overlap ours such as the Optical Society of America, American Association of Physicists in Medicine, American Speech and Hearing Association, American Association of Physics Teachers, etc.

Another possibility that might be explored is regional acoustical meetings. Regional meetings, which would be especially attractive for students and for acousticians with limited travel money, could alternate with national meetings.

Thomas Rossing
Stanford University

MESSAGE FROM THE PRESIDENT

George V. Frisk

In recent years, the Acoustical Society of America has increased its involvement in international activities in a variety of ways. These initiatives are the result of a conscious effort on the part of the Society to maintain and strengthen its global presence in an ever shrinking world. The Society already has a well established track record as the premier organization in the world for the pursuit of all aspects of acoustics, and its membership continues to strongly endorse and support these global activities.

International meetings play a key role in the Society's overall strategy to increase its international involvement. An important recent example was the 2nd Pan-American/Iberian Meeting on Acoustics that was held 15-19 November in Cancun, Mexico. The meeting was jointly organized by the Acoustical Society of

continued on page 3

Message from the President

Message from the President, *continued from page 2*

America, the Iberoamerican Federation of Acoustics, and the Mexican Institute of Acoustics and comprised the 160th Meeting of the Acoustical Society of America, the 7th Iberoamerican Congress on Acoustics, and the 17th Mexican Congress on Acoustics. The meeting drew a total of 895 registrants from 33 countries including 223 students. A total of 886 papers, organized into 94 sessions, covered the areas of interest of the three cosponsoring organizations. In addition to these technical sessions, there were numerous social activities and entertainment, including a Mexican dance troupe that performed at the opening ceremony and a concert by classical guitar virtuoso Juan Carlos Laguna during a special session in musical acoustics. This international meeting model is being pursued further as the Society prepares for another joint meeting to be held in Hong Kong 14-18 May 2012, this time with the Hong Kong Institute of Acoustics, the Chinese Acoustical Society, and the Western Pacific Acoustics Conference.

International initiatives sometimes develop in circuitous and mysterious ways, one example being the concept of an International Year of Acoustics (IYA). The seeds of this idea were first planted in October 2010 at an international workshop at the University of Rhode Island that included members of the ASA animal bioacoustics and ocean acoustic communities. The goals of the workshop included examining the feasibility of an International Quiet Ocean Experiment (IQOE) in which all sources of manmade sound in the sea would be shut down for some period of time so that the effects of the reduced anthropogenic sound levels on marine organisms could be evaluated. The discussions surrounding this proposal questioned its practicality, but also generated several interesting ideas that should be attractive to the entire acoustics community, one of them being the IYA. During that year, which has yet to be selected (perhaps 2014, the 85th anniversary of the ASA), attention would be focused in many different ways on all of the sub-disciplines embraced by the field of acoustics. Numerous observational periods spotlighting various types of acoustic activity (or lack thereof) would be embedded within this year, thereby enabling the implementation at some level of the original IQOE concept. Further discussion of the IQOE and the IYA will take place at an international meeting in Paris on 30 August – 1 September 2011. Stay tuned, as these exciting ideas continue to develop!

The illustrations described above are just two examples of the many ways in which the ASA and its membership engage in international activities. This involvement will continue to grow and evolve as the Society strives to maintain its preeminent position on the global stage of acoustics.

ASA Returns to Seattle, *continued from page 1*

the country, where you can buy fresh fish, fruits and vegetables, arts and crafts. Only a little further away is Pioneer Square, Seattle's oldest neighborhood. At the waterfront are many seafood restaurants and the Seattle Aquarium.

The Seattle Art Museum (locally known as "SAM") maintains three facilities: the main museum downtown, the Seattle Asian Art Museum on Capitol Hill and the Olympic Sculpture Park on the waterfront. Besides being home to the Seattle Symphony, Benaroya Hall features acoustical design by Cyril Harris, a chandelier by Dale Chihuly, and a large (4490-pipe) pipe organ.

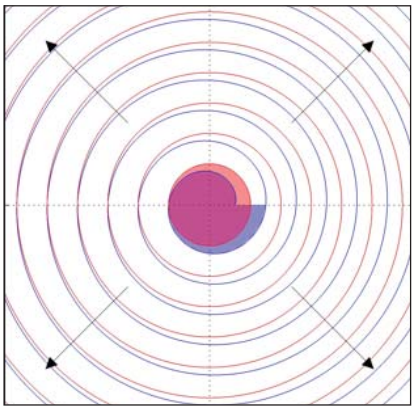
The monorail will take you to the Seattle Center with its Space Needle which still remains from the World's Fair in 1962. The United States Science Pavilion is now the Pacific Science Center. Adjacent to the Seattle Center buildings, the Experience Music Project was designed 40 years later by Frank Gehry to fit in with the fairground atmosphere, and still later a Science Fiction Museum. On a clear day, Mt. Rainier is visible from many places downtown, but a drive to see it closer is well worthwhile.

Members of the Technical Program Organizing Committee. Back Row: Richard Daniel Costley, Jr., Steven Kargl, Todd Hefner, Andrew Piacsek, Tom Matula (Meeting Chair), Michael Yantis, James Phillips, Brian Dushaw; Middle Row: Francesco Curra, Stuart Mitchell, Eric Thorsos (Technical Program Chair), Richard Wright, Dajun Tang; Front Row: Lynne Werner, Jason Summers, Benjamin Shafer, Ron Sauro, Kathleen Stafford, Molly Babel, Kimberly Matsune, Jerry Lilly (photo by Charles Schmid)

Navigating Underwater Using Spiral Sound

Benjamin R. Dzikowicz and Brian T. Hefner

With the increased use of underwater robotics in both Navy and commercial applications, underwater navigation becomes more and more important. As these vehicles become smaller and less expensive, simple systems for the navigation of multiple vehicles become important. We've developed and tested an underwater navigation system that uses a spiral shaped acoustic wave to determine aspect. Our single stationary beacon can provide a navigation signal for any number of underwater vehicles.



A spiral wave front source, in blue, collocated with a circular one, in red.

Navigating with spirals

Navigation by the satellite Global Positioning System (GPS) has become ubiquitous in modern life. Receivers are available for cars, boats and even cell phones. These systems can be accurate to within a few meters. Differential GPS (DGPS), which uses a fixed antenna as a reference, can be accurate to within a centimeter. Unfortunately, GPS signals cannot penetrate the water's surface. Thus, various acoustic and inertial techniques have been developed for underwater navigation. Inertial techniques include accelerometers, like those popular in gaming consoles and gyroscopic compasses that can determine position by judging how the vehicle is moving relative to the earth. One acoustic technique available is known as "long-baseline", which uses the distances to fixed sound sources, determined from the time it takes the sound to reach the receiver, to triangulate to the receiver's position. Another popular acoustic technique called "ultra-short baseline" navigation measures the arrival of a single incoming signal using several hydrophones (underwater microphones) positioned on the same vehicle.

Our navigation technique differs from the baseline techniques because the signal coming out of the beacon itself varies with aspect, thus only a single hydrophone is required. Consider the pattern of concentric circles made on the surface of a pond after a pebble is tossed in. These ripples are known as wave fronts and they travel out from a central source at a fixed speed. Under the water's surface, sound waves can easily be made to form (in two dimensions) circular wave fronts, analogous to the pebble in the pond. We've developed another type of wave front, a spiral wave front, where, instead of concentric circles, there is one continuous spiral shaped front emanating from the source. The figure shows a spiral wave front and its source collocated with a circular wave front. Notice, in this figure, the phase difference between the circular and spiral wave fronts does not change along a particular direction. Thus, if a hydrophone is placed at some position around the beacon, the aspect angle to the beacon could be determined by comparing the arrival of the different wave fronts. This navigation technique is also used by aircraft navigation and is called VOR (VHF Omnidirectional Range). However, VOR uses radio signals rather than sound waves.

Testing on a radio-controlled boat

Based on this concept, we had a beacon built for us by the Naval Undersea Warfare Center in Newport, RI. To test the accuracy of the beacon we attached it to a dock on a pond about 3 meters below the water's surface at the Naval Surface Warfare Center in Panama City, Florida. A remote controlled (RC) pontoon boat was equipped with a hydrophone below the water's surface to determine aspect from the spiral wave front beacon and a GPS antenna above the surface to determine aspect using DGPS. We then drove the RC boat around a pond and compared the aspect determination from the spiral wave front beacon to the DGPS result. Using the DGPS data we were able to put the results into a movie showing the position of the RC boat and using arrows to depict the aspect to the beacon using both the spiral wave front beacon results and the GPS results. For ranges up to 60 m, the results were quite accurate giving an error between 5 and 15 degrees across all of the data. The highest errors occurred in areas of high reverberation such as in very shallow water. We also tested several different signal processing schemes, some of which worked better in different conditions than others.

The biggest advantage of our system over more traditional baseline techniques is simplicity. A single stationary beacon can be used to navigate any number of remote underwater vehicles. The remote vehicles need only have a single hydrophone available, and can even repurpose one from its sonar or acoustic communications system. With future visions of swarms of underwater vehicles, this can be a huge advantage.

Ben Dzikowicz

Brian T. Hefner

Ben Dzikowicz is a physicist at the Naval Research Laboratory in Washington, D.C. Brian T. Hefner is a scientist at the Applied Research Laboratory in Seattle WA. *This article is based on paper 2aUWb2 presented at the 160th ASA meeting in Cancun.*

Scanning the journals

Thomas D. Rossing

• By passing a **focused beam of 1-MHz ultrasound through water**, the speed of sound and the density were measured simultaneously in a region of negative pressure, according to a paper in *Journal of Chemical Physics* **133**, 174507 (published online 2 November 2010). Time-resolved Brillouin scattering was used to measure the speed of sound, while a fiber optic probe hydrophone allowed the determination of the density. Together, these optical methods gave an ambient temperature equation of state of metastable liquid water down to the acoustic cavitation threshold, which is a measure of the tensile strength of the liquid. Knowledge about the cavitation threshold in water is indicative of the *spinodal*, the limit of stability, and the equation of state.

• American adults **hear better than they did 40 years ago** according to studies published in the December issue of *Ear and Hearing*. Although testing equipment and methods have changed, the hearing thresholds for subjects between 25 and 64 revealed that men and women today have better hearing than 40 years ago, primarily in the upper frequencies (2, 3, 4, and 6 kHz), while being roughly the same for 1 kHz. Although the cause of the improvement is not clear, researchers suggest a variety of health factors, including a drop in smoking, better care for diabetics and people with cardiovascular disease, and better care for childhood ear infections, may have played a role. Additional factors may be the reduction manufacturing jobs and the increase in hearing conservation legislation.

• Some **deaf people have extraordinarily keen vision** and a study of cats in the October 10 issue of *Nature Neuroscience* may explain why. In deaf cats, brain regions typically used for hearing get co-opted to enhance vision. With the help of a 3-mm-wide cooling coil, the researchers inactivated particular regions of the cats' auditory cortices and found that cats with chilled hearing-related brain regions lost their visual edge in very specific ways. These functions were not distributed randomly over the auditory cortex but were specifically localized in particular places

• The rising tide of **man-made** ocean noise, which disrupts the lives of marine animals, is highlighted in an article in the February issue of *National Geographic*. Whales and other marine mammals, fish, and even some invertebrates depend on sound, which travels farther in water than does light. Naval vessels testing submarine-hunting sonar and oil company ships firing air guns to explore for oil under the seafloor are major problems, but the main increase in ocean noise is due to the dramatic growth in shipping traffic. The habitat of endangered northern right whales includes busy shipping lanes for the port of Boston, and whale calls are all but obliterated when ships pass. Unable to communicate, the whales have trouble finding each other and spend more time on their own. A small note of hope is provided by listening buoys which transmit real-time data on whale locations to tanker captains, who can then slow down their ships or alter their course to avoid the whales.

• Abnormalities in the brain's limbic regions, which determine which conditions are important, may play a key role in **tinnitus**, according to a paper in the 13 January issue of *Neuron*. Functional magnetic resonance imaging was used to scan the brains of volunteers, half of whom had tinnitus, while they listened to various sounds. Patients with tinnitus showed heightened activity in the nucleus accumbens, a limbic region, when presented with sounds that matched the frequency of the ringing in their ears. Complementary structural differences were identified in ventromedial prefrontal cortex, another limbic structure heavily connected to the nucleus accumbens. Tinnitus-related anomalies were intercorrelated in the two limbic regions and between limbic and primary auditory areas, indicating the importance of auditory-limbic interactions in tinnitus.

• A review of **trailing edge noise generated by airfoils** at low to moderate Reynolds number appears in the December issue of *Acoustics Australia*. Various explanations for the trailing edge noise mechanism have been proposed. Quadrupole noise sources in the boundary layer are made more efficient through a diffraction process at the sharp trailing edge, forming a cardioid directivity pattern. At low Reynolds number the flow about airfoils has different characteristics from that found at high Reynolds number. Airfoil profoil has a significant effect on the flow in the wake.

• A laboratory experiment in which students in a physics of

continued on page 6

Mt. Ranier

Sheraton Seattle Hotel

Scanning the journals

continued from page 5

music class create **Chladni patterns on drumheads** of different diameters is described in the January issue of *The Physics Teacher*. Patterns are observed on single-headed tunable drum frames which are excited by a small loudspeaker. After studying symmetrical patterns, the students are asked to modify one of them by tightening or loosening one lug to create non-uniform tension and compare the asymmetric pattern to the symmetric pattern previously obtained. Students develop an understanding of the relationship between applied tension and the tuning of a drum, and they discover how different the Chladni patterns on a real drum can be from those on an ideal membrane.

- Astronomers have examined acoustical fluctuations in a distant star, **a technique they call "stellar seismology,"** according to a paper in the August 27 issue of *Science*. The oscillation modes are sensitive to variations in magnetic field, and their characteristics change throughout the activity cycle. In the Sun, for example, the oscillation frequencies are shifted higher during solar mascium while the amplitudes decrease, showing anticorrelated temporal variations. The 11-year activity cycle of the Sun is a consequence of a dynamo process occurring beneath its surface. In the CoRoT space mission, solar-like oscillations were observed in the star HD49933 which gave evidence for stellar dynamo models under conditions different from those of the Sun.
- Repetition alone may be a **cue for sound segregation in a cocktail party environment**, according to a paper in the January 3 issue of *Proceedings of the National Academy of Sciences*. Hearing two sounds played together once didn't help the subjects improve their identification over chance, but when a sequence in which the target sound was mixed repeatedly with different distractor sounds, the subjects became much better at picking out the target sound. The work could help to explain why birds and monkeys often repeat calls in rapid succession.
- A paper in *Archives of Acoustics* **3**, 331 (2010) reports that the percentage or correct chroma recognitions in **music students with absolute pitch** decreases as the lowest harmonic in the spectrum is moved higher. Identification of musical intervals remains stable, however.
- Two books that chart the laboratory origins of **avant-garde electronic music** are reviewed in the 20 January issue of *Nature*. Louis Niebur's Special Sound: *The Creation and Legacy of the BBC Radiophonic Workshop* chronicles the 40-year history of a workshop that pioneered the development of high-tech sounds and produced electronic sounds for science-fiction series such as *Quatermass, The Hitchhiker's Guide to the Galaxy* and *Doctor Who*, until it closed down in 1998. *Begin Again: A Biography of John Cage by Kenneth Silverman, focuses on composer John Cage*, who passed away four weeks shy of his 80th birthday. He championed percussion instruments, developed the "prepared piano," and the "silent piece'" which contains no notes for much of its 5-minute duration.
- Exposure to **noise from road traffic can increase the risk of stroke**, particularly in those aged 65 and over, according to a paper in the January issue of *European Heart Journal*. The study by investigators at the Danish Institute of Cancer Epidemiology was based on more than 50,000 participants in the Copenhagen and Aarhus areas. The study, which allowed for other factors, such as air pollution, smoking, diet, alcohol and caffeine consumption concluded that the risk increased 27% for every 10 dB of higher road traffic noise in those aged 65 and over in these urban areas.
- The 3 February issue of *Nature* has an interesting comment by a psychologist on the film "The King's Speech" and the **treatment of stuttering**. Controversy exists about whether the benefits linger when treatment ends. If the film is a fair reflection of George VI's speech as a child, he would have had relatively little chance of recovery as an adult.
- A **simulated wave machine** of the type produced by John Shive is described in the February issue of *The Physics Teacher*. The simulation allows users to change the lengths of 64 horizontal bars attached to a torsion rod and also allows various pulse shapes to be sent down the machine by selecting a function for the twist of the first rod or by dragging the first rod. A second window shows the steady-state mechanical energy as a function of frequency.
- **Sound absorption in the ocean**—in the range between ~100 Hz and ~10 kHz—could fall by up to 70% in the high latitudes and in areas of deep-water formation due to increasing quantities of absorbed CO_2, according to a paper in the January 2010 issue of *Nature Geoscience*. This will make the ocean more transparent to sound and create "hot spots" of noise. (published early 2010)
- Clinicians have referred to **ultrasound technology** as the "stethoscope of the future," predicting that as the equipment shrinks in size, it will one day be as common as the stethoscope, according to an article published February 24 in the *New England Journal of Medicine* **364** (8), 749. From anesthesia to vascular surgery, the use of ultrasonography has increased across the board, with the biggest growth seen among non-radiologists. Some medical schools are training students to use ultrasound before they choose a specialty.
- A letter in the January issue of *Acoustical Science and Technology* discusses ways to express **loudness level in temporally varying sounds**, such as in music Although A-weighting is generally a good starting point for sounds with wide frequency components, it does not always work so well for sounds with prominent frequency components. The results suggest that LL_z (proposed by Zwicker, 1960) and LL_m (proposed by Glasberg and Moore, 2002) show good agreement and correlate well with loudness judgments.
- An editorial in the 27 January issue of *Nature* takes issue with the widely-held view that **scientists are not good communicators**. The author, a former science editor for The Guardian commissioned working scientists to write on a variety of subjects and found that "almost all of them delivered high-standard well-focused newspaper prose." The author has found that those who can think clearly can usually write clearly. The problem is that language, form and conventions of the published scientific paper tend to conceal information. But alas, people listen selectively even to the best communicators, which might be why so many Americans think Darwin's theory of evolution is "only a theory."

Scanning the journals

continued from page 6

• A paper that reports "Simultaneous **infrasonic, seismic, magnetic, and ionospheric observations in an earthquake epicentre"** appears in the *Journal of Atmospheric and Solar- Terrestrial Physics* **72**, 1231-1240 (2010). Infrasonic oscillations (1-12 Hz) in the epicentric region appear to be excited essentially by the vertical seismic oscillations. No infrasonic effects of the earthquake were observed in the ionosphere due to the low earthquake magnitude and too short periods of excited infrasound to be capable to excite ionospheric effects and to be identified by the Doppler measuring system.

• The guesswork whether a **submarine earthquake is going to produce a tsunami** can be changed by monitoring infrasound, according to a bulletin posted online March 11 by *New Scientist*. The Comprehensive Nuclear Test-Ban Treaty Organization monitoring center in Vienna warned of the tsunami that resulted from the Japanese earthquake on March 11. Since infrasound may travel faster than the tsunami, it may provide an advance warning. For futher discussion, see the Fall 2005 issue of *ECHOES*.

• A **sonic cyrstal** composed of a periodic array of steel rods, is described in *Physical Review Letters* **106**, 84301 (2011). The geometry was selected to give rise to a band gap, whereby the transmission of sound waves in a specific frequency range is prohibited in one direction but allowed in the opposite direction. By mechanically rotating the square steel rods, the diode-like behavior can be switched on and off. Possible applications include acoustic isolation and filtering to ultrasound imaging.

• Although they don't deal directly with acoustics, two items in the 17 March issue of *Nature* may be of interest to *ECHOES* readers. First, is a "**Seismic puzzle,**" a sidebar to an article about the earthquake off the coast of Japan. Few experts had thought that the seismic zone near Sendai was capable of producing earthquakes anywhere near as powerful as the magnitude 9.0 shock on March 11. The quake occurred along a seam where the Pacific Ocean floor is diving beneath the tectonic plate carrying northern Japan. Geophysicists thought that great subduction-zone earthquakes happened only where younger oceanic crust scrapes its way into the mantle. Older crust, which is cooler and denser, was thought to slide much more readily, and the oean crust off the northeast part of Japan is about 140 million years old. The last great tsunami recorded in Sendai struck in 869. However, an Earth scientist wrote in 2001 that giant waves visit the region about every 800-1000 years, so that "the possibility of a large one striking the Sendai plain is high."

Another article of interest in the 17 March issue is "To invisibility and beyond," an article about **optical metamaterials**, which are analagous to acoustic metamaterials (see the Winter 2011 issue of **ECHOES**).

Acoustics in the News

• While 756 people heard a concert inside the New World Center in Miami, many more watched it telecast on a 7000-square foot wall next to the center and listened to it on 167 loudspeakers according to a story in the January 31 issue of *The New York Times*. The area adjacent to the center, designed by Frank Gehry, is called Miami Beach Soundscape. The speakers are tucked into an array of horizontal and vertical tubes.

• The Commercial Advertisement Loudness Mitigation Act (the CALM act), passed by Congress on Dec. 2, will force broadcasters and cable operators to keep the level of commercials on a par with the average noise level of the shows they punctuate, according to a story in the December 20-27 issue of *The New Yorker*. Previously ads were allowed to be as loud as the loudest noise in the show (including a round of gunfire or an explosion). The act gives the Federal Communications Commission up to one year to mandate adoption of an advertisement volume standard.

• Repeatedly pairing tones with a brief stimulation of the vagus nerve sharpens auditory neuron tuning and eliminates the physiological signs of tinnitus, according to a note in the13 January issue of *Nature*. This suggests that restoring normal neural activity to circuits that have been pathologically modified can provide a benefit in conditions involving aberrant neural plasticity.

• Two large studies, one examining voice stress analyzers in a lab and the other in a jailhouse setting, found that the analyzers do pinpoint some lies, according to a story in *Science* News online, but they also peg true statements as lies at similar rates. These false positives, which are often left out of studies and company descriptions of the technologies, are key for evaluating merit

• Using sonification to create sounds from physical data may help particle physicists sort through scads of data generated at the Large Hadron Collider (LHC) for exotic particles, such as the Higgs particle, according to a story on "All Things Considered" on National Public Radio (NPR). Three columns of data representing physical parameters of sub-atomic particles, for example, could be mapped to pitch, loudness, and duration, and observers could learn to recognize the audible signature of the particle for which they are searching. While they could hardly be considered music, the resulting clangs, beeps, and whistles may appeal to casual listeners as well as scientists.

• A scientist at the MIT Media Center has fabricated a working flute using a 3D printer, according to a story in the 20 January issue of *New Scientist*. The flute was constructed in

continued on page 8

ACOUSTICAL•SOCIETY•OF•AMERICA
Suite 1NO1
2 Huntington Quadrangle
Melville, New York 11747-4502

Non-Profit Org.
U.S. Postage
PAID
Hicksville, NY
Permit No. 289

Acoustics in the News

continued from page 7

four parts over a period of 15 hours. A video clip of the flute being printed and played appears at http://thetechjournal.com/off-topic/3d-printed-flute.xhtml.

• Whispering puts more of a strain on the larynx than normal speech, according to a story in the February 8 issue of *The New York Times*. For people concerned about their voices, a prominent otolaryngologist recommends speaking softly rather than whispering.

• Replacing the air-supported roof of the Metrodome in Minneapolis, which collapsed under a heavy load of snow, may be an opportunity to improve the acoustics of the structure, which is used for rock concerts as well as for football, according to a story in the February 14 issue of *The Journal*, a local Minneapolis newspaper. One proposal involves doing away with the Dome's current acoustic controls: inner liners that hang down from the roof's central, diamond-shaped panels. Instead, "vertical batting" would be installed, which could help lessen the Dome's notoriously jarring reverberation.

• Nearly two thirds of Americans 70 and over suffer from hearing loss according to a story in the March 8 issue of *The New York Times*. Hearing loss is more common in men than in women, and it is significantly less common in black adults. Only a minority of older people with hearing impairments use hearing aids, however.

• Sound interacts with light in an optical clock, according to a story in the September issue of *Photonics Spectra*. To counter attenuation in optical fibers, pump light is injected at the far end so that it travels in the opposite direction and generates acoustic phonons. The sound waves then scatter the pump light, enabling the existing signal photons to stimlate the emission of many more photons.