

The newsletter of  
The Acoustical Society of America

# ECHOES

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Fall 2009

## Historic San Antonio hosts ASA

For its 158th meeting, ASA will visit San Antonio for the first time ever. This historic city, the second largest in Texas, has flown six different flags throughout its history. Famous for Spanish missions, the Alamo, the River Walk, the Tower of the Americas, and host to SeaWorld and Six Flags Fiesta Texas theme parks, the city is visited by approximately 26 million tourists per year according to the San Antonio Convention and Visitors Bureau.

The Technical Program Committee, chaired by Nicholas Chotiros, has planned an outstanding program, including 660 papers and 49 special sessions. A “Hot Topics” session sponsored by the Tutorials Committee will cover the fields of Acoustical Oceanography, Biomedical Ultrasound/Bioresponse to Vibration and Noise. A tutorial presentation on “Podcasting Demystified: From concept to production for every budget” will be given by Kathleen P. King of Fordham University and The Teachers’ Podcast ([www.teacherspodcast.org](http://www.teacherspodcast.org)) on Monday, 26 October 2009 at 7:00 p.m.

The ASA provides the “Meeting Papers Online” website where authors of papers to be presented at meetings will be able to post their full papers or presentation materials for others who are interested in obtaining detailed information about meeting presentations. The proceedings of this meeting will be a separate volume of the online journal, “Proceedings of Meetings on Acoustics” (POMA). Publication is optional.

The speaker at the Fellows Luncheon on Thursday, 29 October is Todd Ditmire, physics professor at the University of Texas. The Women in Acoustics luncheon will be on Wednesday October 28. Buffet socials will be held on Tuesday



*Hyatt Regency and River Walk*

and Thursday evenings.

A short course on “Acoustic Imaging Applications: Seismic, underwater, biomedical and speech” will be taught by a team of instructors including Max Deffenbaugh, a geophysicist with Exxon Mobil Research; Jules Jaffe, research oceanographer at Scripps Institution of Oceanography; Christy Holland, Dept. of Biomedical Engineering, University of Cincinnati; and Maureen Stone, University of Maryland Dental School. The course meets Sunday 1:00 to 5:00 p.m. and Monday 8:30 am to 12:30 pm, and the registration fee of \$250 (\$50.00 discount for registration prior to 20 October) covers attendance, instructional materials and coffee breaks

With this lineup of events, there won’t be much time for sightseeing,

but attendees who arrive early or stay a few days after the meeting will enjoy visiting the historic Alamo and some of its many museums, including the Witte Museum, the Marion Koogler McNay Art Museum, the San Antonio Museum of Art, and the Institute of Texan Culture on the University of Texas San Antonio HemisFair Park Campus, a short walk from the Alamo and the River Walk. San Antonio Missions National Historical Park preserves four of the five Spanish frontier missions in San Antonio.

Dia de los muertos (day of the dead) is celebrated in Mexico and by Latinos and others in the United States. It is traditionally celebrated on the eve of All Saints Day (as is Halloween), but some communities celebrate it earlier or later. Traditions include building private altars honoring the deceased, using sugar skulls, marigolds, and the favorite foods and beverages of the departed, and visiting graves with these as

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• ASA members **David Preves, Sandra Gordon-Salant, David Fabry** and **Stig Arlinger** recently received awards from the American Academy of Audiology. Preves received the Samuel F. Lybarger Award for Achievements in Industry, while Gordon-Salant received the Jerger Career Award for Research in Audiology. Fabry received a Distinguished Achievement Award, and Arlinger received the International Award in Hearing.

• Funds contributed to ASA by the Institute for Acoustics for the Performing Arts to honor **Russell Johnson** will make it possible for students to attend Concert Hall group meetings. Previous summer meetings have been held in Tanglewood MA, Saratoga Springs NY and Aspen CO. The next one is scheduled for 2010 or 2011, and application information will be announced after a site and date are chosen.

• The **Walter Munk Award**, for distinguished research in oceanography related to sound and the sea, will be awarded at the plenary session at the ASA meeting in San Antonio, the first time it has been awarded at an ASA meeting. The award is granted jointly by the Oceanography Society, the Office of Naval Research and the Office of the Oceanographer of the Navy. The first recipient of the award in 1993 was Walter Munk.

• The merger of the **Acoustical Society Foundation** into ASA has been officially approved by New York State.

• As *ECHOES* was going to press, news reached us of the deaths of two ASA members who were enthusiastic supporters of acoustics and especially musical acoustics: Carleen Hutchins and Barry Larkin.

**Carleen Hutchins**, co-founder and long time leader of the Catgut Acoustical Society, died at age 98 (see Spring 1997 issue of *ECHOES*). She had been awarded four honorary doctorates as well as the ASA Silver Medal in Musical Acoustics and Honorary Fellowship in the Society. She is best known for her work in developing the New Violin Family.

**Barry Larkin**, associate professor of music at Iowa State University and principal percussionist with the Des Moines Symphony, died at age 54. In addition to his papers on musical acoustics, he contributed to acoustics education at ASA meetings (see Winter 2002 and Fall 2009 issues of *ECHOES*).

## From the Editor: A time of opportunity

We read a lot about how the economic downturn is a time of great challenge, but also a time of opportunity for savvy investors, our national leaders, and for all of us. In some ways acoustics may be experiencing some of the same challenges and opportunities.

The major concerns of our country seem to be national security, the environment, energy, healthcare, and the economy. I would argue that the science and technology of acoustics can—and will—contribute to all of these areas of concern. It would be a gross exaggeration to claim that acoustics can solve any or all of these problems, but I think we can contribute to all of them. It is important to make our government leaders, as well as the public, aware of the potential contributions that acoustics can make, and to interest young people in the study of acoustics. As a start I would like to see copies of *ECHOES* and *Acoustics Today* in every school library.

Acoustics has, and will continue to, make major contributions to our national security. The Navy depends upon sonar in many ways, and has been a major supporter of acoustical research to improve sonar and keep our naval technology at the forefront of the world. By means of underwater sound it is possible to communicate with ships half an ocean or more away. Buried land mines are a tragic heritage of past wars, and a great deal of time and effort are required to locate and remove them. Non-metallic mines are especially difficult to locate, and often acoustic detectors are the only way they can be dealt with.

One of our major environmental concerns is noise, which affects our quality of life as well as our public health. Most environmental noise is a product of our industrial world, and if left unchecked noise pollution will continue to increase as we manufacture more products and travel more miles. Factories, automobiles, and airplanes can be made quieter, and must be made quieter. A major concern has been noise in schools and hospitals, which tends to defeat the purpose for which they are intended.

The effect of noise on wild life, both on land and sea, is becoming a major concern. The effect of sonar on marine mammals is a subject of continuing study. Some states are raising concerns about the effect of anthropogenic noise on wild life close to urban areas.

For a number of years we have depended heavily upon acoustical methods to explore for petroleum, and acoustical research has led to major improvements in these methods. Alternative methods for generating power, such as wind turbines, often generate a substantial amount of noise, and their general acceptance may depend upon the extent to which the noise can be reduced. Thermoacoustic refrigeration may someday be a factor in energy conservation.

Shockwave lithotripsy, ultrasonic diagnostics, and bloodless ultrasonic surgery are just a few of the many ways that acoustics has contributed to healthcare. More often than not,

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**ECHOES**



**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.

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# San Antonio hosts ASA

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Technical Program Organizing meeting, San Antonio. (L to R) Nicholas Chotiros, Natalie Sidorovskia, Kai Ming Li, Augustine Agwuele, Dan Costley, James Stockton, Mark Wochner, Marcia Isakson, Doug Winker, Tim Hawkins, Pamela Harght, David Woolworth, Rajka Smiljanic, Preston Wilson, Juan Arvelo, Craig Champlin, James Cottingham, Judy Cottingham (not pictured Rama Ratnam) (Photo by C. Schmid)

gifts. Dia de los muertos events take place at various sites in San Antonio before, during and after the ASA meeting, and visitors may wish to take in some of them. Wurstfest, a 10-day

German salute to sausage, takes place October 30-November 1 on the Wurstfest Grounds in Landa Park as well as throughout New Braunfels and Comal County



Jim Stockton, Nick Chotiros (Technical Program Chair), Tim Hawkins (Photo by C. Schmid)



San Antonio River Walk (Photo by C. Schmid)

## From the Editor

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these sophisticated procedures reduce the cost of medical treatment as well as improving the quality of life for those who benefit from them. Research in physiological acoustics and psychoacoustics have contributed to breakthroughs in our ability to hear. Cochlear implants, once considered a “miracle” have advanced to the point where bilateral implants are now used for infants as young as three months.

I have not seen any accurate estimates of how much acoustics has contributed to our economic recovery, but I know

that as I drive up and down Silicon Valley I pass many startup companies that depend upon acoustical research and development. In spite of the general unemployment problems our graduates in acoustics seem to be very much in demand by high tech companies.

Acoustics alone will certainly not solve our national and world problems, but it will be a major contributor to the solutions, and we ought to be increasing our efforts to let people know about this!

# Echoes from Portland



*Mini-concert by members and friends of the Edinburgh Renaissance Band at session 2pMUb*



*Hands-on session for high school students*



*Barry Larkin demonstrates drum acoustics at hands-on session for students*



*After-hours jam session at the hotel*

## Best student and young investigator paper awards (Portland)

### *Animal Bioacoustics*

First: Mary Bates, Brown University  
Second: Asila Ghoul, University of California, Santa Cruz

### *Biomedical Ultrasound/Bioresponse to Vibration*

First: Kelley Garvin, University of Rochester

### *Engineering Acoustics*

First: Timothy Marston, Pennsylvania State University  
Second: Scott Porter, Pennsylvania State University

### *Musical Acoustics*

First: Nicholas Goodweiler, University of Iowa  
Second: David Krueger, Brigham Young University

### *Noise*

Norman Philipp, University of Nebraska-Lincoln  
*Signal Processing in Acoustics*

Hui Ou, University of Hawaii at Manoa  
*Speech Communication*

First: Matias Zanartu, Purdue University  
Second: Rachel Miller, University of California, Riverside  
*Structural Acoustics and Vibration*

First: Nicholas O'Donoghue, Carnegie Mellon University  
Second: Na Zhu, Wayne State University

### *Underwater Acoustics*

First: Aubrey Espana, Washington State University  
Second: Jorge Quijano, Portland State University

# Scanning the Journals

Thomas D. Rossing

- Tiger moths emit ultrasonic clicks that throw off **bats' sonarlike echolocation**, according to a story in the 17 July issue of *Science*. Lots of moths click by vibrating membranes on their abdomens, but this moth (*Bertholdia trigona*) is an order of magnitude louder. It is the first time this type of acoustic interference has been demonstrated in the natural world. It is thought that the clicks resemble echoes, creating multiple acoustic images in space, thus throwing off the ranging software in the brain of the bat.

- A **sound laser (saser)** that produces beams at terahertz frequencies is reported in the June issue of *Physical Review B*. Although it's not the first saser ever constructed, it is the first able to produce beams at terahertz frequencies, much higher than those used in medical ultrasound imaging. The saser depends upon a beam of phonons stimulated by a light beam, bouncing back and forth between layers in a lattice of gallium arsenide and aluminum arsenide, each layer a few atoms thick. In addition to potential applications in medical imaging, sasars have a number of promising applications to nanotechnology.

- An article about **Walter Munk** and his work studying how ocean waves form is included in the 28 June issue of *New Scientist*. During World War II he saved countless lives by helping the Allied military determine when troops could make amphibious landings without being swamped by big surf hundreds of meters from a hostile shore. After the war, Munk's methods helped surfers find the biggest waves.

His many honors include the Arthur L. Day Medal from the Geological Society of America, the Sverdrup Gold Medal from the American Meteorological Society, the Gold Medal of the Royal Astronomical Society, the Alexander Agassiz Medal from the National Academy of Sciences, the Captain Robert Dexter Conrad Award from the U.S. Navy, the National Medal of Science, the William Bowie Medal from the American Geophysical Union, and the Kyoto Prize. He was elected to the National Academy of Sciences in 1956, and he became an Honorary Fellow of the ASA in 2004.

- Young male zebra finches develop individually **distinct song** by imitating adult males. The adult wild-type (WT) song includes stereotyped syllables repeated in fixed order in both wild and domesticated zebra finch colonies. In the 28 May issue of *Nature* is a report on an experiment designed to determine whether wild-type song culture might emerge over multiple generations in an isolated colony. The results showed that songs evolved towards the wild-type in three to four generations.

- Intense cyclonic storm systems generate strong ocean-surface winds that transfer atmospheric energy into **ocean gravity waves**. According to a report in the 22 May issue of *Science*, some of the ocean wave energy couples to the solid earth, causing what seismologists have long considered as ambient noise because it interferes with the study of earth-

quake signals measured by seismometers. However, this seismic "noise" can be used to monitor climate change effects, locate storms, and elucidate the structure of Earth's crust.

- A discussion of **vibroacoustic harp therapy** appears in the Fall issue of the *Harp Therapy Journal*. Vibroacoustic Harp Therapy (VAHT) is a therapeutic approach in which an amplified acoustic harp is played into a chair or bed with built-in vibrational speakers, thus providing a "musical massage" for the client. VAHT is shown to reduce pain and lower heart rates in many subjects.

- **Phonon-enhanced Auger losses** may be one of the causes of "droop" that causes a severe drop in the efficiency of light-emitting diodes (LEDs) at high power, according to an article in the August issue of *IEEE Spectrum*. This droop is considered a very important problem to be solved in order to conserve energy by extensive use of LEDs in electric lighting. LEDs maintain their high efficiency at low power, but lose efficiency at high power due to a droop that has yet to be fully explained

- **Somatosensory signals** from the facial skin and muscles of the vocal tract provide a rich source of sensory input in speech production. According to a paper in the January 27 issue of *Proceedings of the National Academy of Sciences* (PNAS), there is also a somatosensory involvement in speech perception. Using a robotic device to create patterns of facial skin deformation that would normally accompany speech production, it is found to alter the sounds people hear. For example, when subjects listened to words that were taken from a computer-generated continuum between the words *head* and *had*, the perceptual boundary was altered in a predictable way by skin stretch perturbation. When the skin was stretched upward, the stimulus was more often judged as *head*, but when it was stretched downward the stimulus sounded more like *had*.

- The 25 June issue of *Nature* includes a series of **essays on Science Journalism**. The first one argues that the process of science needs to be opened up if journalists are to provide proper critique. Much contemporary science journalism can be seen as a second or even a third draft, but rather the journalist should be allowed access to the referees' comments as well as the final paper. The second essay tracks the progression of scientific correspondents from "cheerleaders" to "watchdogs." Science writers in the 1930s and 1940s believed that it was their job to persuade the public to accept science as the salvation of society. Now in the digital age, science journalism has moved from working for the glory of the scientific establishment to taking back its independence and exercising a "new responsibility to the public." The third essay addresses the "Arab boom" in science. Despite strong links between science and the media, Arab science institutions remain relatively closed to journalists.

- The left hemisphere of the human brain **controls language**

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# Scanning the Journals

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and also controls the dexterity of the right hand, while the right hemisphere is dominant in the control of how objects interrelate in space, among other things. In past decades studies of many other animals have shown that their two brain hemispheres also have distinctive roles. An article in the July issue of *Scientific American* argues that the specialization of each hemisphere in the human brain was already present in its basic form when vertebrates emerged about 500 million years ago.

- Mid-frequency sonar can induce **temporary hearing loss** in a bottlenose dolphin (*Tursiops truncatus*), according to a paper in the 23 August issue of *Biological Letters*. Mild-behavioral alterations were also associated with the exposures. The auditory effects were induced only by repeated exposures to intense sonar pings with total sound exposure levels of 214 dB re: 1  $\mu\text{Pa}^2 \text{ s}$ . Data support an increasing energy model to predict temporary noise-induced hearing loss and indicate that odontocete noise exposure effects bear trends similar to terrestrial mammals.

- Nobel prize winner George Smoot (see Spring 2007 issue of *ECHOES*) has an essay "Cosmology's golden age" in the June issue of *Cern Courier*. "There has never been a more exciting time for cosmologists than now," he informs us. He points out that we now have precise observations of a very early epoch through images made using CMB (cosmic



Hands-on session for high school students (Portland)

microwave background) data. We also have many impressive galaxy surveys that show the relics of the **acoustic oscillations** in the very, very early universe. (see Fall 2007 issue of *ECHOES*; also Winter 2004).

- Physicists in Israel have created a black-hole analogue that can **trap sound** in the same way an astrophysical black hole can trap light, according to an article in the June 16 issue of *Physics World News*. The system, which comprises a "density-inverted Bose-Einstein

condensate," may present one of the best chances yet to detect elusive Hawking radiation. For a long time, the notion that black holes are totally black led scientists to think objects could not be observed directly, but in the early 1970s Stephen Hawking showed that this need not be the case. Hawking's calculations indicated that if a particle-antiparticle pair came into existence straddling the event horizon, the one closest to the black hole would fall inwards while the other would escape. The sum of escaped particles would constitute Hawking radiation, and could reveal the black hole's presence. Though the Israeli group does not yet have evidence for Hawking radiation, which in a Bose-Einstein condensate would constitute packets of sound energy of phonons, they predict the Hawking temperature to be in the neighborhood of 0.3 nK. Just an order-of-magnitude increase in this temperature should be enough to make the Hawking radiation visible they say.

## Committee on Archives and History

by Jay Maynard and Charles Schmid

The Committee on Archives and History is engaged in establishing management procedures for the documentation, collection, storage, maintenance and use of archival and historical collections of the Society. The committee works with the History Center at the American Institute of Physics (<http://www.aip.org/history/>) which provides professional management for archiving and retrieval of documents provided by its member societies. Included in the Society's collection are photos of all of the

ASA presidents and over 25 oral history interviews of well-known members of the Society. If you are interested in arranging for an oral history of a colleague please contact Jay Maynard ([maynard@phys.psu.edu](mailto:maynard@phys.psu.edu)). Currently the Committee is working to produce a CD containing all of the publications of Isadore Rudnick who was well known for his "hands on" approach to acoustics. The Committee currently consists of 17 members and meets during spring and fall meetings of the Society.



(l to r) Anthony Atchley, Dick Stern, Logan Hargrove, Jont Allen, Steve Garrett, Jay Maynard (Chair), Carr Everbach, Vic Sparrow at Portland OR (Photo by C. Schmid)

# Acoustics in the News

- A computer chip modeled on the human ear could be used in universal receivers for radio-frequency signals, a technology note in the 13 June issue of *New Scientist* tells us. Devices such as cellphones or FM radios are generally tuned to only a narrow frequency band. The new devices, inspired by the network of hair cells in the ear, can pick up a wide range of frequencies. A network of transistors in the device act like hair cells in the ear. Frequencies ranging from 600 MHz to 8 GHz requires no more electrical power than single-frequency receivers.

- Ear identification scan could one day be a commonplace technique to identify a caller on the telephone, according to a technology note in the 11 April issue of *New Scientist*. The concept relies on the fact that the ear not only senses sound but also makes noises of its own, albeit at a level only detectable by sensitive microphones. Such otoacoustic emissions (OAEs) emanate from within the cochlea, and they are thought to be produced by the motion of the hair cells within the outer part of the cochlea. Sounds entering the ear cause these hair cells to vibrate, and these vibrations are converted to electrical signals. OAEs can be provoked when a series of clicks is played into the ear. The returning sound emissions comprise signals between 0 and 5 kHz. The clicks could be supplied by a telephone to identify the person at the other end.

- Mice carrying a humanized version of a gene considered key to the human capacity for speech show subtle changes in their brains when they vocalize, according to a story in the 4 June issue of *Nature*. Researchers substituted two amino acids in the mouse Foxp2 protein to generate the humanized version. The animals remained generally healthy, but calls made by isolated pups had a different structure from those of normal mouse pups. They also found structural, neurochemical, and neurophysiological changes to neurons in a brain circuit associated with speech in humans.

- Evidence suggests that musical training, especially from an early age, fine-tunes a person's hearing not just for music but also for emotional aspects of speech, according to a note in the 13 March issue of *Science*. The researchers hooked their subjects up to electrodes that recorded the response of the auditory brainstem to a quarter-second of an emotion-laden sound, an infant's wail. The subjects with the most musical experience responded the fastest to the sound. Those who had practiced since early childhood had the strongest response to the parts of the cry for which timing, pitch, and timbre were most complex.

- Mockingbird songs are more elaborate in species that live in more variable climates, according to a note in the 28 May issue of *Science*. Places where precipitation and temperature were more variable and less predictable had birds that sang more consistently, had a broader repertoire and were better at copying the calls of other species.

- Brain scans have been used to make music, according to a story in the 4 July issue of *New Scientist*. Each region of the brain is assigned a different pitch, and special software creates these pitches as the corresponding brain areas light up. Each note is played at a level that corresponds to the intensity of activity. The brains of people with schizophrenia switched

between low and high activity more erratically than healthy brains, allowing the two types of brain to be distinguished by sound alone.

- Light and ultrasound can be used to visualize the red fluorescent spinal column of a live fish, according to a story in the July issue of *Nature Photonics*. Light alone penetrates only to tissue depths of one millimeter or less. To achieve penetration depths of six millimeters, laser light is made "audible." Fluorescent pigments in the tissue absorb light, a process that causes slight local increases in temperature, which in turn result in tiny local volume expansions. This happens very quickly and creates small shock waves. In effect, the short laser pulse gives rise to an ultrasound wave that can be picked up with an ultrasound microphone.

- Bourret's horseshoe bat has an extremely large nose which may help the bat focus its sonar, according to a story in the July 14 issue of *US News and World Report*. Most bats emit sonar through their mouths, but this bat sends out the beam through its nose. Computer calculations showed that the perfect length for optimum focusing is the length of the nose of this bat.

- Daniel Kish, a 6-year old, is blind but he uses echolocation to navigate around his classroom. According to a story in the 11 April issue of *New Scientist* he clicks his tongue quickly and scans the reflected sound field with his head. When the reflection softens he senses a field of grass ahead. Moving along, he senses a solid object that is too thin to be a person; it is a pole. He doesn't remember exactly when he started using sonar to navigate, but he recalls climbing over a fence into a neighbor's yard when he was 2 ½ and clicking to find out what was around him.

- "U.S. science remains far from 'its rightful place'" according to a comment by U.S. Congressman and scientist Rush Holt in the March 14 issue of *Science News*. "Science, I think is not in a good situation now, in several senses. The funding, although not small, is proportionally less than in some other countries that we would compare ourselves with. But what troubles me more," he continues, "is the attitude towards science. I would say that most Americans would say yes, science is good. But they don't have a clue how it works, how you sustain it, and they refuse to think like scientists." Holt advocates restoration of the Office of Technology Assessment which used to advise the Congress but which was abolished 14 years ago. He also urges scientists to talk more about the practicality of science. "It is from science that we get the innovation that provides productivity and growth for the future economy."

- Light and ultrasound can be used to visualize the red fluorescent spinal column of a live fish, according to a story in the June 21 edition of *Nature Photonics*. Using a process that makes light audible, bioengineers in Germany have developed a technique that allows 3-D optical and fluorescence imaging of tissue to a depth of several centimeters, allowing whole-body visualization of adult zebra fish. The fluorescent pigments absorb the light, a process that causes slight local increases in temperature, which in turn result in tiny local vol-

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## Acoustics in the News

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ume expansions. This happens very quickly and creates small shock waves. In effect, the short laser pulse gives rise to a wave that can be picked up with an ultrasound microphone. The real power of the technique, however, lies in special mathematical formulas used to analyze the resulting acoustic patterns, which help to interpret distortions caused by scales, muscles, bones and internal organs. The result of this “multispectral optoacoustic tomograph” (MSOT) is a 3-D image with a spatial resolution better than 40  $\mu$ m (0.04 mm).

- Composer John Morton has recorded sounds in New York’s Central Park and its environs and plays them on loudspeakers in a pedestrian tunnel near the Zoo to create a “Tunnel of Sound,” according to a story in the July 6 issue of *The New York Times*. Sounds ranging from jackhammers to cracking winter

ice to chime music reverberate through the tunnel. A computer records the Delacorte clock chimes nearby each time they sound and immediately replays them in disjointed fragments

- The U.S. Department of Energy (DOE) has committed \$85 million next year for a new program to help 50 young scientists establish their research careers, according to a report in the 24 July issue of *Science*. The program is financed by the \$1.6 billion given to DOE’s Office of Science earlier this year in the government-wide stimulus package. As such, the money must be spent quickly, with the expectation that it will provide jobs and help pull the nation out of its economic doldrums. DOE officials say the program also responds to the recommendations of several expert panels, including the 2005 National Academies’ *Rising Above the Gathering Storm*.