The newsletter of
The Acoustical Society of America

ECHOES

Volume 7, Number 1
Winter 1997

Frog Vibrational Communication

Lessons From the Rain Forest

by Peter M. Narins

Standing alone at an altitude of one thousand meters in the Caribbean National Forest in Northeastern Puerto Rico at midnight, I heard a strange, chicken-like clucking noise that appeared to be coming from the ground all around me. It was a sound I had not noticed before since, until then, I had been concentrating on recording the calls of treefrogs perched on the leaves of the ginger plants and on the fronds of the ubiquitous Sierra Palms. The clucking continued and I decided to investigate. Stepping lightly toward the place where I thought the sound was originating, the call abruptly stopped. Only after several moments of silence on my part did it resume. And each time I tried approaching the calling animal, even at a distance of several meters, it became silent.

I was experiencing first hand the curious phenomenon known as the "zone of silence that surrounds herpetologists." After several abortive attempts at locating this elusive animal, I finally succeeded in capturing several calling male white-lipped frogs and subsequently entered into a collaboration with Dr. E. R. (Ted) Lewis at the University of California at Berkeley to study the vibration sensitivity of this remarkable animal.

We have now succeeded in documenting a particularly acute vibrational sensitivity both behaviorally and neurophysiologically in the white-lipped frog, *Leptodactylus albilabris*. This is a ground-dwelling, nocturnally-active amphibian found in the marshes, ditches, and along mountain streams throughout much of Puerto Rico. Males prefer vocalizing from within clumps of dense grass, often covered by fallen vegetation, or from shallow depressions or burrows in the muddy substrate. Relatively isolated individuals separated by several meters are common, although males are also frequently found calling in high densities around water-filled ditches. Females of this species are cryptically-colored and silent; they are thought to move great distances during their nocturnal foraging, perhaps so they can acoustically "sample" males in the area.

In subsequent field tests with white-lipped frogs, we found that even on a moonless night the lightest footfall or finger tapping at distances of up to five meters from a single calling male will often cause him to become silent for five or ten minutes. This remarkable behavior suggests that these animals might be detecting the presence of intruders by sensing vibrations transmitted in the substrate.

What is the neural basis for this extraordinary vibration sensitivity? In the absence of any known cutaneous mechanoreceptors specialized for vibration detection, our

thoughts turned toward the ear. It has long been known that the frog's inner ear contains eight separate sensory organs: three semicircular canals specialized for sensing angular acceleration in orthogonal planes, three otolithic organs (utriculus, lagena, and sacculus) that respond to combinations of gravity, linear acceleration and vibration, and the amphibian and basilar papillae, specialized for the reception of airborne sounds. Each of these organs con-

(Continued on page 4)

We hear that...

The American Institute of Architects in Illinois (AIA Illinois) presented its 1996 President's Award to **R. Lawrence Kirkegaard**, principal of Kirkegaard and Associates of Downers Grove. The award was based on the Kirkegaard firm's commitment to excellence in creating facilities where music and the spoken word can be enhanced.

William W. Lang, Treasurer of the ASA and also President of the International Institute of Noise Control Engineering, has been elected an honorary fellow of the Institute of Acoustics of the United Kingdom. He was cited for his "distinguished international contribution to noise control engineering."

John E. Ffowcs Williams, professor of engineering at the University of Cambridge in the United Kingdom, has been elected the next Master of Emmanuel College in Cambridge.

Twenty-nine members of the ASA were elected to fellowship at the Spring meeting in Indianapolis and were announced at the recent Fall meeting in Hawaii.

Sid P. Bacon
Avril Brenig
Catherine P. Browman
Antoine Chaigne
Ching-Sang Chiu
Raymond H. Dye
Earleen F. Elkins
Robert Allen Fox
Sadaoki Furui
D. Felipe Gaitan
D. Wesley Grantham
Roger J. Hanson
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Sonoko Kuwano
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Elaine Moran
Seiichiro Namba
Victor Nedzelnitsky
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David A. Nelson
Robert V. Shannon
Timothy K. Stanton
Hideki Tachibana
Richard L. Weaver

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.

Echoes Editor..... Alice Suter
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Phone inquiries: 516-576-2360. Article submissions and correspondence should be directed to Echoes Editor, Acoustical Society of America, 500 Sunnyside Blvd., Woodbury, NY 11797.

Editorial

Dear Readers,

This will probably be my next to last issue as Editor of *Echoes*. Having been at the helm for nearly seven years, it seems like the right time for ASA to seek out new blood. I must confess, also, that I'm in the process of retiring from a long career of consulting and government work, which includes professional activities as well.

Three years ago my husband and I moved to Ashland, Oregon, a little town just north of the California state line. In spite of what you've seen and heard recently in the news about our disastrous floods (all true), Ashland is a marvelous place to live, with much greater offerings of music, art, and theater than almost any other town its size. Ashland's call is too much to resist, so I have begun the process of retirement.

Echoes hasn't changed much since the first few issues, but its newsy style and feature articles with broad appeal have been quite popular. My colleagues and I on ASA's Public Relations Committee have maintained from the beginning that the Society, with such diversity among its members, needs a unifying publication. *Echoes* seems to have fulfilled that function quite well. In addition, *Echoes* has extended information on acoustics to non-ASA chapter members and science writers. But there is always room for growth and change, and a new editor may have some refreshing new ideas.

I couldn't have published *Echoes* alone and would like to recognize the many ASA members who contributed feature articles, shorter pieces, and news items. Unfortunately the list of names is too long to enumerate. Special thanks go to Dan Martin, Charles Schmid, and Elaine Moran for contributing materials and for reviewing the draft, always on a short turn-around. Thanks also go to AIP's Public Information Division, especially to Ben Stein, for keeping me well supplied with examples of acoustics in the news.

The response from the Executive Council as well as the membership leads me to believe that *Echoes* will continue indefinitely in one form or another. So long live *Echoes*, echoes, echoes....

Alice Suter,
Editor, *Echoes*

Wanted: Applications for the position of *Echoes* Editor.

Applicants should have a general knowledge of acoustics, possess editing skills, and be able to write in a journalistic style. Position includes an honorarium.

Anyone interested should send a letter of application, resume, and a sample of journalistic writing to the search committee chair:

Dr. Daniel Martin
Editor in Chief
Acoustical Society of America
7349 Clough Pike
Cincinnati, OH 45244

Deadline for applications: April 30, 1997

ASA and NOISE-CON meet in June

The Spring meeting of the Acoustical Society of America is being held jointly with the Institute of Noise Control Engineering's annual "NOISE-CON," the 1997 National Conference on Noise Control Engineering. The meetings will be held at the Penn State Conference Center Hotel in State College, Pennsylvania. The ASA meeting will take place June 16-20, NOISE-CON '97 sessions will take place June 15-17, and there will be some joint sessions on June 16 and 17.

The theme of NOISE-CON '97 is "Frontiers of Noise Control." Three topics will be emphasized: active control, vibration analysis of machinery health monitoring, and numerical methods for noise control. Information about NOISE-CON '97 may be found at: http://users.aol.com/noisecon97/nc97_cfp.html. On Sunday June 15, the NOISE-CON technical sessions and reception will be held at the Nittany Lion Inn on the Penn State campus. All other sessions will be held at the Penn State Conference Center.

Individuals may register for either meeting alone or may pay a joint registration fee to attend both meetings. ASA attendees who wish to attend both meetings may register for a modified registration fee. NOISE-CON and joint registrants will receive a copy of the NOISE-CON conference proceedings.

Information about the ASA meeting is available on ASA's home page at http://asa.aip.org. Information about accommodations, facilities, and activities may be found on the conference home page at http://www.acs.psu.edu.asa97.html.

Attractions of the State College area

State College is a lovely town in the midst of beautiful natural surroundings. Numerous scenic attractions are located within a short driving distance of the town. The surrounding limestone valley has many open natural caves to explore and nearby is the famous horseshoe curve of the old Pennsylvania Railroad, winding along a mountainside far above the Susquehanna River. Within an hour's drive are railroad and mining museums, providing descriptions of the area's history. There are several state parks and scenic areas, complete with hiking trails. The area is nationally known for its fly fishing rivers sporting native brown trout. Anyone interested may also visit the University's environmental center, which includes a program for raptors, such as hawks and owls, that have been injured and healed but are no longer able to survive in the wild. The college campus is also an attraction, with lovely landscaping and walks, a good place to relax for a few days before or after the meetings.

Meeting highlights

There will be the usual complement of interesting special sessions, just a few of which are these:

Bioacoustics communications
Human vibration exposure
Take fives: sharing ideas for teaching acoustics
Loudspeakers: past, present, and future
Acoustics of bells
Combined exposure to noise and other hazards
Product noise labeling issues
Time-reversed acoustic propagation

The following are joint special sessions with NOISE-CON '97:

Consumer product sound quality
Engineering controls for mining noise
Design for low noise and quality control
Noise in school classrooms
Power plant noise
Reaction to low-level environmental noise
Room noise criteria
Speech intelligibility in rooms

Further information about the meeting, including the tutorial lecture, distinguished lectures, short courses, and social programs may be obtained through the websites mentioned above or by contacting the ASA Woodbury office at (516)576-2360.

Workshop on Classroom Acoustics

A workshop that was not mentioned in the Call for Papers will consist of an open discussion on establishing guidelines for classroom acoustics. Sigfrid Soli will open the session with a discussion of speech communication in classrooms. The session is being organized by the Technical Committee on Architectural Acoustics, special subcommittee on Classroom Acoustics. For additional information contact Dana Hougland (303) 293-8883, e-mail dshougland@aol.com.

Special session in memory of W. Dixon Ward

The Society lost a long-time faithful member in the passing of Dix Ward this past December. There will be a memorial session in his honor at the Penn State meeting, jointly sponsored by the technical committees on Psychological and Physiological Acoustics, Noise, and Musical Acoustics. Ward was an ASA Fellow and held the positions of Vice President in 1986-1987 and President in 1988-1989. He was renowned for his expertise in psychoacoustics, having received his Ph.D. in that field from Harvard, and he also had abiding interests in noise and music. During his long career he worked at the Baldwin Piano and Organ Company, the Central Institute for the Deaf, and for many years at the University of Minnesota. An obituary will be published in an upcoming issue of the *Journal*.

Student design competition

The Technical Committee on Architectural Acoustics and the National Council of Acoustical Consultants are sponsoring a student design competition to be judged at the Penn State meeting. The purpose of the competition is to encourage students to express their knowledge of

(Continued on page 7)

(Frog..., continued from page 1)

tains its own complement of sensory hair cells that transduce mechanical vibrations into electrochemical events known as receptor potentials. These lead to the generation of action potentials, which propagate at high velocities to the brain along nerve fibers contained in the acoustico-vestibular (eighth) nerve.

At first in Ted's laboratory and later in my own, we were able to record from individual eighth nerve fibers in the white-lipped frog while applying whole-body sinusoidal vibrations of known frequency and amplitude. A response to these vibrations was indicated by the precise timing of the action potentials generated in a single fiber. In other words, the degree to which evoked action potentials were correlated (phase-locked) with the stimulus waveform provided a quantitative response measure. This protocol, we reasoned, would simulate the surface wave generated by an approaching predator and its neural response. We found many fibers that responded vigorously to whole body accelerations of 0.02 cm/s^2 and some fibers that responded reliably to accelerations as low as 0.002 cm/s^2. Succeeding experiments in which vibrationally-responsive fibers were filled with an opaque dye revealed that the peripheral origin of these fibers was the sacculus in the inner ear. Thus, the saccular hair cells in the Puerto Rican white-lipped frog exhibit the most acute seismic sensitivity yet observed in any terrestrial vertebrate.

Figure 1. An adult white-lipped frog, Leptodactylus albilabris, from the rain forest of Puerto Rico.

The predators of this cryptic frog are unknown. Although there are over thirteen species of bats found in Puerto Rico, none is known to be a frog-eater. Moreover, there are six types of snake on the island, but only two occur commonly in the rain forest and snake predation on *Leptodactylus* is evidently rare. The Puerto Rican Screech Owl is another potential predator, but again, hard evidence for owl predation on these animals is lacking. The selection pressures favoring the evolution of the white-lipped frog's remarkable sensitivity to substrate-borne vibrations remained elusive.

Some light was shed on this problem when Ted and I made a simple recording of the animal's call in two ways. We used a directional microphone located a meter from a calling male to register the call's airborne component, and simultaneously, we used three orthogonally-oriented geophones also located at a distance of one meter, to record any surface wave components of the call. To our surprise, the vertically-polarized geophone registered a clear "thump" associated with every call note of the white-lipped frog, but neither of the two horizontally-polarized geophones did.

This pattern of geophone response to the seismic thump associated with the frog's call, as well as the surface wave propagation velocity (measured at about 100 m/s) are consistent with the characteristics of Rayleigh waves, known to subserve prey detection in desert scorpions and various other invertebrates.

Careful observations of a male *Leptodactylus* revealed that during calling he often buries his rear end in the muddy substrate leaving only his head and forelegs exposed. During call emission, the vocal sac inflates rapidly, striking the substrate and generating a thump, milliseconds after the airborne sound is produced. By using a vertically-polarized geophone, a portable amplifier and a pair of earphones, we were able to explore seismically the habitat of the white-lipped frog.

We found that the background ground noise in the Puerto Rican rainforest is extremely low. (Typical background levels of microseismic noise at the earth's surface in the absence of machinery, traffic, and high winds, are on the order of 0.0005 cm/s^2 per Hz$^{1/2}$). By contrast, the peak acceleration of a typical thump is 2 cm/s^2 at one meter, and the thumps are easily detectable at distances of several meters. Moreover, not all frogs were "thumpers." We noticed that the prevalence of thumpers increased after a rain, presumably since rain facilitated burrowing in the otherwise difficult-to-penetrate substrate. We also observed that raindrops striking the ground and vegetation produce substrate vibrations that render individual frog thumps difficult to extract from the increased background noise; white-lipped frogs do not call during strong rains.

Many puzzles still remain. For example, the incessant chorusing by groups of males producing repetitive thumps at close proximity to neighboring frogs seems to be inconsistent with the distant predator detection role of the sacculus. It is as if these frogs are able to "turn down" the gain of their seismic amplifier when they are in a chorus of nearby thumping males, but can turn it up again when they are physically isolated from other males.

In a series of playback experiments currently being carried out in Puerto Rico with Ted Lewis and Kathy Cortopassi from UC Berkeley, it has been demonstrated that males of this species may be able to distinguish

(Continued on next page)

Frog Communication

(Frog..., continued from previous page)

another male's airborne and substrate call components since they appear to perceive the differences in the timing pattern of these two components. This remarkable behavior suggests a role for the seismic signals in the communication system of the white-lipped frog: they could serve as triggers for synchronizing the calls of neighboring males in a chorus. The resulting synchrony would make their signal more distinctive, rendering the chorus more effective in attracting females at a distance.

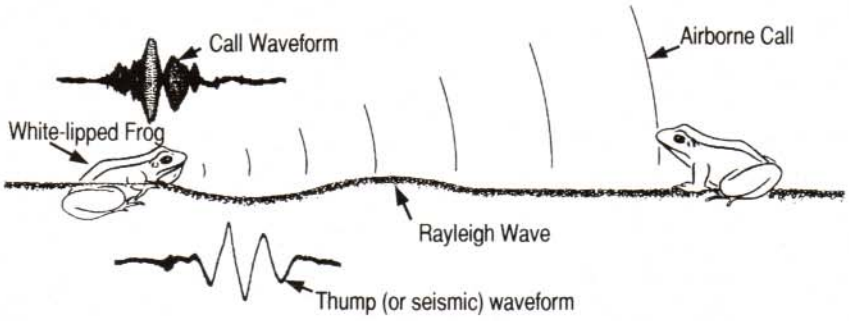

Figure 2. A male white-lipped frog produces an airborne call followed after a delay of 20 milliseconds by a "thump," audible in the substrate. The thump is generated by the vocal pouch, which expands explosively during call production, striking the substrate as it inflates. The resulting thump generates a vertically-polarized surface (Rayleigh) wave, which propagates in the muddy soil, outward in all directions at a velocity of about 100 m/s. Nearby males, who may or may not be "thumpers," can entrain their calls to the surface waves, presumably to maintain synchrony during chorusing in the face of the high ambient sound levels.

Seismic communication, or the exchange of information using self-generated vibrational signals transmitted via a substrate such as the soil, a plant stem, or even a blade of grass, affords many advantages for terrestrial animals. It can take place without light, during day or night. Vibrational signals are most effective over a short range and show short persistence. Thus they are well-suited for information exchange between nearby conspecifics, with little danger of detection by distant predators. Moreover, due to their comparatively long wavelengths, seismic signals are affected relatively little by obstacles in the soil. This latter feature of vibrational signals also accounts for one of their potential drawbacks; namely that the emitter may be difficult to localize since phase differences would be minimal between points on the body surface of a small receiver such as a frog.

Furthermore, there are clear mechanical limits on the upper frequency of seismic signal production, with the result that vibratory signals are restricted to frequencies below several hundred Hz, the upper frequency for synchronous muscle contraction. Despite these constraints, the list of animals known to exploit this relatively low-noise channel for communication now includes a variety of insect and frog species, kangaroo rats, mole-rats, and chameleons, with new examples appearing yearly. These intriguing communication systems offer a rich field for the student of animal bioacoustics.

Peter M. Narins, Ph.D., has been studying animal communication on all seven continents for more than twenty years. He is currently a professor in the Department of Physiological Science and a member of the Brain Research Institute at UCLA. He holds Fellowship in the ASA and received the 1995 ASA Science Writing Award for Professionals in Acoustics for his work on communication in tropical amphibians.

Soundings

Noise Awareness Day

Wednesday, April 30, 1997 marks the Second International Noise Awareness Day. The campaign for quiet is sponsored by the League for the Hard of Hearing in New York, along with numerous other organizations, including the ASA. The goal is to educate the public about the adverse effects of noise on hearing and health. A variety of events and programs will be implemented by participating groups around the world, including free hearing tests, dissemination of hearing protection devices, marking of safe settings on personal stereo systems, and town meetings to "sound off about noise." Participants will be asked to observe 60 seconds of quiet from 2:15 to 2:16 p.m., wherever they are. For further information: Nancy Nadler, Director, Noise Center, League for the Hard of Hearing, 71 West 23rd St., New York, NY 10010; http://www.lhh.org.noise.htm. Note that ASA's home page will have a link to the League's website.

New ANSI/IEEE standard available

The new ANSI/IEEE standard 260.4-1966, American National Standard Letter Symbols and Abbreviations for Quantities Used in Acoustics has been published by the Institute of Electrical and Electronics Engineers. ASA President Stan Ehrlich is Chair of the Writing Group, most of whom are ASA members. The Standard is a revision and redesignation of ANSI/ASME standard Y10.11-1984, and is now available from the ASA Standards Secretariat, (212)248-0373, at a cost of $100 plus shipping and handling.

Meetings and Conferences

In a Dec. 31st memo to members on the ASA listserver, ASA President Stan Ehrlich described several national and international meetings that have been endorsed or co-sponsored by the ASA. Those who missed seeing the list or who do not have e-mail may obtain a copy of the memo by contacting ASA's Woodbury office at (516) 576-2360.

International Symposium on Simulation, Visualization, and Auralization for Acoustic Research and Education (ASVA97) will take place in Tokyo, April 1-4 1997. Contact: ASVA97 Secretariat; fax +81-78-881-2508; e-mail asva97@icluna.kobe-u.ac.jp.

23rd International Symposium on Acoustical Imaging will be held April 13-16 in Boston, MA. Contact: Sidney Lees; fax (617) 262-4021, e-mail slees@forsyth.org; http://www.forsyth.org/23aocima.

First European Conference on Signal Analysis and Prediction will be held in Prague, June 24-27, 1997. Contact: ECSAP Secretariat; fax +42-2-2431-1082; e-mail ecsap@vscht.cz; http://www.vscht.cz/ecsap97/.

NATO Advanced Study Institute on Sonochemistry and Sonoluminescence will be held in Leavenworth, Washington at the Sleeping Lady Conference Center, Aug. 18-29. (See description in the Fall 1996 issue of *Echoes*, p.2.) Application deadline has been extended to Feb. 28, 1997. Contact: Nancy Penrose; tel (206) 543-1275; fax (206)543-6785; e-mail SONO-ASI@apl.washington.edu; http://www.apl.washington.edu/sonoasi.

The XVI Symposium of the International BioAcoustics Council will be held at Texas A&M University on Oct. 14-18, 1997. The symposium will focus on recent advances in animal bioacoustics, instrumentation, software, and other technologies used in bioacoustics. Contact: The Center for Bioacoustics; tel (409)862-4254; fax (409)847-9396; http://entcweb.tamu.edu/cfbahome.htm

The following four conferences are jointly organized and sponsored by the ASA:

The Acoustical Society of America and the Institute of Noise Control Engineering, will sponsor the conference organized by RH Lyon Corp, **Product Sound Quality '97** (PSQ'97), on Cape Cod in Massachusetts, Sept 21-23, 1997. Four main issues in product sound quality will be discussed: (1) Setting goals and criteria for product sound quality, (2) Achieving the right sound by design, (3) Manufacturing quality assurance for sound, and (4) Economics of sound quality. Contact: Richard H. Lyon; tel (617) 864-7260; fax (617) 864-0779; e-mail rhlyon@mit.edu

The workshop **Defining and Measuring the Benefit of Hearing Aids** will take place at the American Institute of Physics headquarters in suburban Maryland, Sept. 25-27, 1997. A preliminary list of participants in the planning and conduct of the workshop includes representatives from three government agencies: the Food and Drug Administration, the Department of Veterans Affairs, and the National Institute on Deafness and Other Communication Disorders, in addition to the ASA and several other professional societies. Contact: Sigfrid Soli; tel (213)353-7085; fax (213)413-0950; e-mail soli@hei.org.

June 20-26, 1998, the ASA will host the **16th International Congress on Acoustics** in conjunction with its Spring meeting in Seattle. The theme of the meeting is "The Sound of the Future: A Global View of Acoustics in the 21st Century." Details of the meeting are being planned well in advance -- for example, the deadline for receipt of abstracts is Oct. 20, 1997. Proceedings will be available at the meeting. Contact: ICA/ASA Conference Secretariat; tel (206) 543-1275; fax (206) 543-6785; e-mail ICA-ASA98@apl.washington.edu; http://www.apl.washington.edu/asa/.

Also of interest:

The **Second European Conference on Protection Against Noise** will be held in London at the Barbican Centre on April 16-19, 1997. The conference is sponsored by the European Commission, Fourth Framework, Biomedical and Health Research - Biomed 2. Contact: Dr. Deepak Prasher, Institute of Laryngology and Otology, University College London, 330 Grays Inn Rd., London WC1X 8EE. Fax: 44-171-278-8041.

Graduate Fellowship for Minorities

The Acoustical Society of America announces the availability of a fellowship for graduate study in scientific areas related to the field of acoustics. To be eligible for the fellowship, the applicant must have a permanent residence or citizenship in the U.S. at the time of application and must be a member of an ethnic minority group, such as Hispanic, African-American, or Native American. Evidence of acceptance into or good academic standing in a graduate degree program is also required.

The award consists of a $13,500 stipend for one academic year, to be dispensed over a 12 month period through the host institution. The award may be renewed for a second year.

To apply, a completed application form, official transcripts of all college and university study, Graduate Record Exam scores, a personal statement, and three letters of recommendation should be sent to the address below, **postmarked no later than April 15, 1997**. The successful applicant will be notified by July 1, 1997.

For application information: Elaine Moran, ASA Office Manager, 500 Sunnyside Blvd., Woodbury, NY 11797. Tel (516)576-2360, fax (516)576-2377, e-mail asa@aip.org.

Society Pages

Call for entries - ASA's Science Writing Awards

The Acoustical Society of America is requesting entries for its annual science writing awards for items published or aired during 1996. One award will be presented to a journalist (print, photo, video, or audio) and the other to a professional in acoustics. The awards will be presented during the plenary session at ASA's Fall meeting in San Diego and will be accompanied by a check for $1000.

The purpose of the awards is to recognize and stimulate distinguished writing (or producing) that improves the general public's understanding and appreciation of acoustics. Criteria on which the entries will be judged includes: relevance to acoustics, accuracy, understandability to lay persons, interest, newsworthiness, size of audience or readership, clarity of communication, and originality.

The winner of the 1995 journalist's award was science writer Richard Immel for his article in *Smithsonian*, "Shh - those peculiar people are listening," and the award for professionals in acoustics was presented to Peter Narins for his article, "Frog Communication" published in *Scientific American*.

Entries for the 1996 awards should be postmarked no later than April 15, 1997 and sent to:
Elaine Moran, Acoustical Society of America,
500 Sunnyside Blvd.,
Woodbury, NY 11797.
For further information call (516) 576-2360.

(Penn State Meeting...continued from page 3)
architectural acoustics and building noise control in the schematic design of a modest performing arts center for a small college. The center should include a performance hall, a rehearsal room, several practice rooms, and other facilities. Entries may be by individual students or teams with a maximum of three members. Designs are to be presented on no more than two poster boards with maximum dimensions of 24x36 inches. There will be a $1000 "first honors" award and four "commendation" awards of $500 each. Contact: Robert Coffeen; tel (913)864-3434; fax (913)864-5099; e-mail rcoffeen@falcon.cc.ukans.edu.

Job openings on the ASA Home Page

A new section on Job Openings has been added to the ASA Home Page. This service is provided free to any organization that wishes to post open positions, using the following guidelines:

- Limit the position description to 150 words.
- Include institution, position title and description, required qualifications, and complete contact information.
- Include statement that the institution is an Equal Opportunity Employer.
- Send information by e-mail to Elaine Moran at asa@aip.org.

Openings will be posted for two months or may be removed upon request from the offering institution.

Acoustics in the News

Newspapers

Over recent months there has been a series of articles about acoustics in *The Dallas Morning News* written by Alexandra Witze. In the Sept. 30 issue, the article "Sound Design" gives a cogent explanation of concert hall acoustics with special attention to the Eugene McDermott Hall in the Meyerson Center in Dallas. The Dec. 9 issue carried the article "Voice of technology" in which Witze describes research on the effects on speech recognition of conditions like intoxication and the common cold. In that same issue's "Discover" section, Witze reports on the work of Richard Campbell (in a paper at the recent ASA meeting in Honolulu) to record the buzz of mosquito wings, in hopes of controlling mosquito-spread diseases such as encephalitis.

The "Washington Business" section of *The Washington Post* (10-14-96) carried the article "From Colonels to Kernels" by Peter Behr, in which the author describes attempts by acoustician Ted Drzewiecki to transfer the military technology he had developed for advanced listening devices into a method for detecting the larvae of the maize weevil as they munch away inside kernels of grain. According to Drzewiecki, fumigants can kill adult bugs, but it's more efficient to go after the larvae, "the lesser of the two weevils." Another non-military development from Drzewiecki's firm is described by science reporter Stephen Strauss of the *Toronto Globe and Mail* in the article "'Kosher sound system' patented for rabbis" (9-14-96). The author describes Drzewiecki's sound system as relying on compressed air rather than electricity to amplify and project the human voice. The system enables rabbis and cantors to reach large audiences while complying with biblical strictures. A condensed version of the story was printed in the Oct. 28 issue of *Business Week* and NPR broadcast a segment for the Nov. 16 edition of "All Things Considered."

(Continued on page 8)

Acoustics in the News

(Continued from page 7)

The controversy over ATOC and the whales continues, but researchers from Cornell studying humpback whales found no response to the kind of low-frequency sounds emitted by the ATOC experiment. This finding was reported by Robert Lee Hots in "Just Another Noisy Day in the Ocean?" in the Sept. 23 *Los Angeles Times*.

The "Real Estate" section of the *Chicago Tribune* (11-17-96) featured the article, "Oh, a little bit softer now" by T.J.Becker, in which the author describes the effects and control of community noise. Several acousticians are interviewed and give tips on reducing noise in the home and office. Another article on noise appearing in the *Pacific Sun* (Sept. 25-Oct. 1), "Deafening noise," addresses the problem of loud music and the resulting hearing losses. Author Jill Kramer also discusses the increasingly high levels of sound effects in "blockbuster" action movies such as *Chain Reaction, Jurassic Park, and Backdraft.*

The *Salt Lake Tribune* ran the article "Voicing Emotions" by Lee Siegel on Dec. 3, in which he describes studies of people's ability to identify emotions carried by the voice, even though these identifications cannot be made by acoustical measurements.

Sonoluminescence continues to hold a fascination for scientists and the public alike, as in the headline of a recent article in *Science* by James Glanz, "The Spell of Sonoluminescence" (11-1-96). The author discusses several of the theories explaining researchers' findings in this controversial area, which were to be aired in a special session on sonoluminescence planned by Robert Apfel for the December ASA meeting in Honolulu. The topic was summarized after the ASA meeting by Phillip Schewe and Ben Stein in AIP's electronic service "Physics News Update" (12-13-96), and later was described in some detail by Malcolm W. Browne in *The New York Times* article "Mysterious Light From Tiny Bubbles Finds Practical Uses" (12-31-96).

Magazines

An October 1996 article in *Technology Review* by Stephen Strauss entitled, "Trends: Designer Sounds," addresses sound quality in the automobile. The author states that auto manufacturers are devoting entire laboratories to what is termed NVH (noise, vibration, and harshness), informally called BSR (bumps, squeaks, and rattles).

Science News carried two articles on acoustics in recent issues. In "Language mastery goes native in the brain," (11-23-96) Bruce Bower cites research findings via magnetic resonance imaging. While both spoken and signed English utilize a network of structures in the left hemisphere, the right hemisphere also appears to be involved in the processing of sign language. In "Sounds of the Seasons: Learning to pay attention to the sounds around us" (Dec. 21 & 28), science writer Ivars Peterson presents an intriguing discussion of the acoustical ecology movement, which emphasizes sensitizing people to the sounds they want rather than simply abating noise, with the goal of designing healthy and attractive sound environments. He mentions the recent formation of the "World Forum for Acoustic Ecology," which has an active website.

A short article by Michael Day in *New Scientist*, "Keeping perfect pitch in the family" (11-23-96), describes research presented at the recent meeting of the American Society of Human Genetics. Investigators have found evidence that what they term "perfect pitch" is not only learned but may also have a genetic component, and they are collecting DNA from subjects with this ability.

An article on sound quality by Richard Wolkomir originally appearing in the Feb. 1996 issue of *Smithsonian* (see also Spring 1996 issue of *Echoes*), has been condensed and reprinted in the Jan. 1997 issue of *Readers Digest* under the title "Listen to This."

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