The newsletter of
The Acoustical Society of America

ECHOES

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Winter 1992-93

Ultrasound in diagnostic medicine

Wesley L. Nyborg and Marvin C. Ziskin

During World War II, ultrasound proved to be very effective in detecting submarines and other objects in the sea. After the war, imaginative physicians, engineers, and physicists began exploring the possibility that ultrasound might similarly be useful in medicine. While some became discouraged, others persisted, so that now diagnostic ultrasound has reached success in medicine that far surpasses the initial expectations. One measure of its acceptance is that in worldwide sales of medical diagnostic equipment, sales for ultrasound now exceed those for X-ray equipment (with the exception of CT scanners), and are in the range of 1.8 to 1.9 billion dollars annually.

Pulse-echo ultrasound

One of the earliest applications to become important was midline echoencephalography, a procedure for detecting space-taking lesions, such as tumors or hematomas, which cause parts of the brain to be displaced. In this application, a special form of pulse-echo ultrasound, a piezoelectric source transducer is placed in acoustic contact with one side of the head, above the ear, and a pulse of ultrasound is transmitted through the skull into the brain.

The traveling pulse reaches the midline structures, including the pineal gland and the fluid-filled third ventricle. The pulse is partially reflected from these structures because of the relatively large difference between their acoustic

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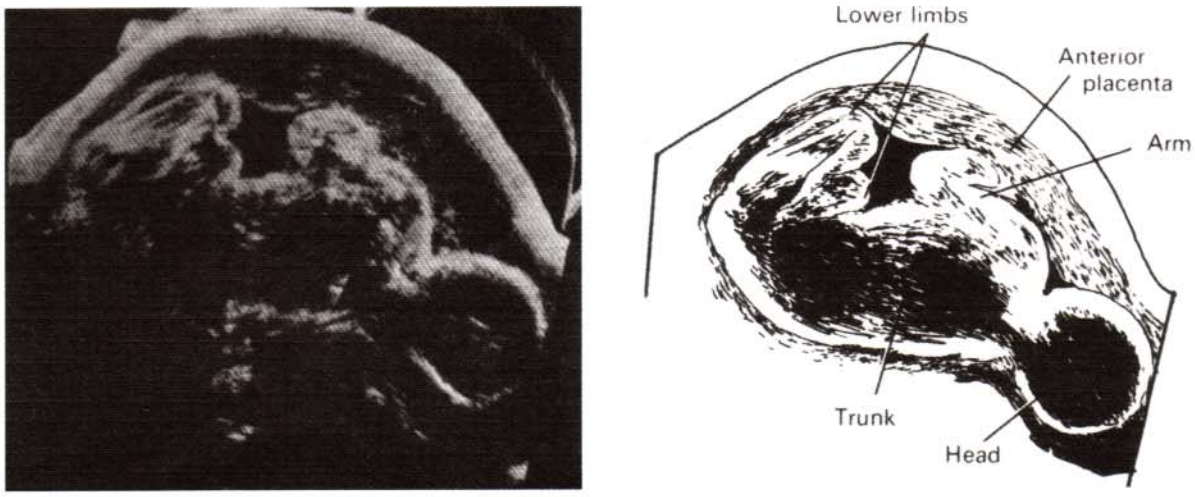

LEFT: Ultrasound scan of a normal fetus at 34 weeks of gestation. RIGHT: Anatomical drawing. From K.J.W. Taylor, *Atlas of Gray Scale Ultrasonography.* Churchill Livingstone: NY, 1978. (Reprinted with permission)

We hear that . . .

Carr Everbach of Swarthmore College became one of 30 Presidential Faculty Fellows, 15 scientists and 15 engineers, selected by the National Science Foundation to be awarded research funds at the White House. With his award he is setting up a laboratory for nonlinear dynamics, which will be integrated into the engineering curriculum. In June the awardees will have a reunion in Washington, at which time they will present recommendations for the NSF to President Clinton and Vice President Gore.

Czechoslovakia's Palacky University, one of the oldest in Central Europe, has honored **Malvin Teich** by presenting him with its Memorial Gold Medal for contributions to the understanding of the fundamental nature of light. Professor Teich is a faculty member in the Departments of Electrical Engineering and Applied Physics at Columbia University.

Ching-Sang Chiu, Associate Professor of Oceanography at the Naval Postgraduate School in Monterey received the institution's Carl Menneken Outstanding Research Award in December 1992.

Patricia Kuhl of the University of Washington's Department of Speech and Hearing Sciences has been selected the first Virginia Merrill Bloedel Scholar in Behavioral Science. The main focus of Dr. Kuhl's research is the processing of spoken language. This award will lighten her teaching load and enable her to devote extended time to her research interests.

Carnegie Mellon University has announced the appointment of **Adnan Akay** as head of its Mechanical Engineering Department. Dr. Akay was formerly DeVlieg Professor of Mechanical Engineering at Wayne State University.

Joseph Dickey recently received the George W. Melville award for his contributions in acoustics and shipboard sensing systems. The award is the highest technical honor bestowed on scientists and engineers at the Naval Surface Warfare Center in Annapolis, Maryland.

The Technology and Environment Program of the National Academy of Engineering recently hosted a workshop to encourage the advancement of industrial ecology and design for environment. The workshop was chaired by **Robert A. Frosch,** Vice President of General Motors Corporation, and held at the J. Erik Jonsson Woods Hole Center.

In October of 1992, **James Flanagan,** Board of Governors Professor in Electrical and Computer Engineering at Rutgers University, received the degree Doctor Honoris Causa from the Polytechnic University of Madrid.

Northwestern University has presented the first Hugh Knowles Prize to **Joseph Zwislocki,** Distinguished Research Professor at Syracuse University's Institute for Sensory Research. The prize is given to individuals who have contributed most significantly to the study of hearing and its disorders.

We welcome news items about ASA members for "We hear that." Please send them to: Echoes Editor, Acoustical Society of America, 500 Sunnyside Blvd., Woodbury, NY 11797.

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

ASA abstracts available electronically

Everyone enrolled in PINET has easy access to the ASA meeting abstracts, which are available within about four weeks of the program organizing meeting and remain until they are replaced by the next batch. Now the abstracts are also available to anyone with access to INTERNET by following these instructions:

Use your own access to INTERNET

What you enter	What monitor shows
ftp	ftp>
open pinet.aip.org	name?
anonymous	password?
e-mail address or "guest"	ftp>
cd ASAPAPERS	ftp>
binary	ftp>
get fullmeeting.txt	Transfer complete, ftp>
bye	

You can now download meeting abstracts from your local directory to your own PC.

News from the Executive Council

The Journal

Starting with the January issue, the *Journal* will be printed on a better grade of paper that will decrease the thickness of each issue. Also in January, there will be a mandatory excess page charge for new submissions exceeding 12 published pages (see editorial in the October issue). This is a one-year experiment approved by the Executive Council.

The Council passed a motion authorizing the paper selection committee to shorten meeting abstracts as necessary to meet the long-standing 200-word limit. This fact has been printed in the Call for Papers for the Ottawa meeting.

Recycling JASAs

ASA members who are moving or retiring: Would you like to donate back copies of *JASA* to a deserving newer member?

ASA newer members: Would you like to receive back copies of *JASA*? Interested donors or recipients should notify ASA's office in Woodbury, 516-576-2360.

Technical Council to receive more funds

Because some of its initiatives are becoming institutionalized, the Executive Council decided to refer to these as "discretionary funds" and increase the amount from $24,000 to $30,000 per year. These funds should cover ongoing projects within the Technical Committees as well as new initiatives.

ASA seeking to expand membership

ASA's Membership Committee has, in the past, concentrated its efforts on reviewing dossiers of prospective ASA Fellows and making recommendations to the Executive Council. Recently, however, the Executive Council determined that this Committee should now assume responsibility for increasing the Society's individual membership in the U.S., Canada, and overseas.

New science writing awards in acoustics

ASA's Executive Council has approved the funding of two newly established awards of $1000 each to be given for science writing in acoustics published or aired during 1992 and intended for the general public. One award will be presented to a journalist (print, photo, video, or audio) and the other to a professional in acoustics who has published an outstanding article, book, film, or audio or video tape about acoustics for the non-technical public. The awards will be presented no more frequently than once a year. The Public Relations Committee will present its recommendations to the Executive Council for approval. The first award (or awards) are expected to be presented at the ASA meeting in Denver, November 1993.

Entries should be postmarked no later than April 10, 1993 and sent to:

Elaine Moran
Acoustical Society of America
500 Sunnyside Blvd.
Woodbury, NY, 11797

For further information call 516-576-2360.

Acoustics in the News

The New York Times

Two recent articles in the *New York Times* have featured acoustics and the ASA. On November 10, 1992, the *Times* ran a piece by Tim Hilchey entitled "Skull and air sacs fine-tune dolphin sonar" based on the study by Aroyan, Cranford, Kent, and Norris reported in the November issue of *JASA*. The December 9 issue carried an article by Glenn Rifkin called "A high-tech baton for living-room maestros." The article described the "radio baton" created by Max Mathews. The ingenious device consists of radiotransmitters enclosed in mallets, which control a personal computer and synthesizer. The system allows the "conductor" to control the volume, timbre, and tone of preprogrammed music.

Newsday

The December 1, 1992 issue of New York's *Newsday* carried a story about the Heard Island experiment on its cover. (See also the Winter 1991 issue of *Echoes* and the September 1992 issue of *Physics Today*.) "Sounding out the ocean—to a degree" by Robert Cooke presented a lengthy discussion of the efforts of scientists to assess global warming by measuring the speed of sound in the ocean. Mr. Cooke interviewed several ASA members, including Arthur Baggeroer, Robert Spindel, Walter Munk, Ann Bowles, and John Spiesberger.

Science magazine

Science magazine included in its November 27 issue (Vol. 258, pp. 1436-1437) an article "In search of the human touch" by Ivan Amato. It appears to have been stimulated by one of the special sessions at the ASA meeting in New Orleans: Virtual Environments V—The Haptic Channel. The article discusses the research of engineers and neuroscientists to simulate a multitude of textures for the hand.

Science News

The November 7 issue of *Science News* (Vol. 142, p. 308) contained an article entitled "Sounding out a sharper ultrasound echo" by Ivars Peterson. The article discusses the research of Mack Breazeale and Dehua Huang, presented at the ASA meeting in New Orleans, on the development of improved transducers capable of emitting single beams at frequencies of either 375 or 332 kHz.

PBS

A video program called "Math, who needs it?" was presented nationally in September 1992 by PBS. It featured ASA member Elizabeth Cohen taking sound level measurements at the Hollywood Bowl, as well as other notables, such as Jaime Escalante. The program is based on the *Futures* series developed by FASE Productions, which also includes a 15-minute video called "Sound Engineering." These programs may also be aired periodically by local public broadcasting stations.

New standards available

Five new American National Standards are now available from ASA's Standards Secretariat, 335 E. 45th St., New York, NY 10017-3483:

ANSI S1.22-1992 (ASA 100) Scales and Sizes for Frequency Characteristics and Polar Diagrams in Acoustics

ANSI S3.42-1992 (ASA 103) Testing Hearing Aids with a Broad-Band Noise Signal

ANSI S3.43-1992 (ASA 102) Standard Reference Zero for the Calibration of Pure-Tone Bone-Conduction Audiometers

ANSI S12.12-1992 (ASA 104) Engineering Method for Determination of Sound Power Level of Noise Sources Using Sound Intensity

ANSI S12.14-1992 (ASA 101) Methods for the Field Measurement of the Sound Output of Audible Public Warning Devices Installed at Fixed Locations Outdoors

This year the ASA plans to move its Standards Office from the present site in the AIP-owned building in New York City to an office on the 32nd floor at 120 Wall Street, because the AIP is selling its building. The space will be shared with the American Vacuum Society. Future issues of *Echoes* will alert readers to the exact date of the move and new address.

AIP to publish new series in acoustics

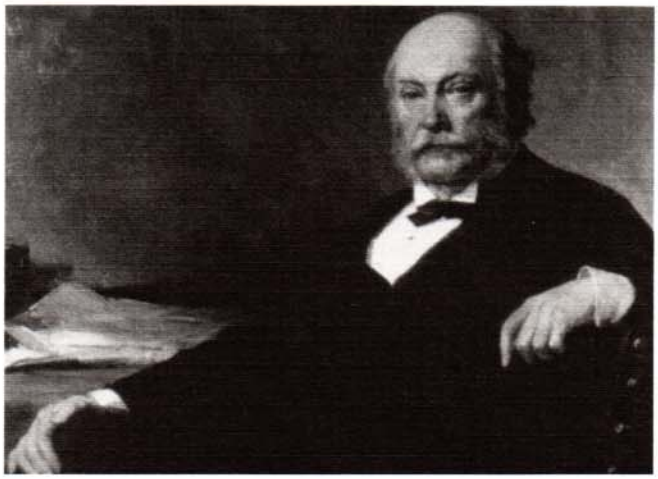
Modern Acoustics & Signal Processing is the name of a new series of monographs, graduate level textbooks, and reference materials in acoustics that will be published by the American Institute of Physics. The series' Editor-in-Chief is Robert Beyer of Brown University, ASA's current Treasurer. Its editorial board includes:

Acoustical Oceanography	Herman Medwin
Physiological and Psychological Acoustics	Ira Hirsh
Underwater Sound	Arthur Baggeroer
Architectural Acoustics	Yoichi Ando
Bioacoustics	Floyd Dunn
Noise	John Erdreich
Structural Acoustics	Chris Fuller
Musical and Physical Acoustics	William Hartmann
Speech Communications	Joanne Miller
Acoustical Signal Processing	W.A. von Winkle

The editors are currently seeking manuscripts for new books in the above fields.

Lord Rayleigh, 1842-1919 — A glimpse into our illustrious past

1992 marked the 150th anniversary of the birth of John William Strutt, Lord Rayleigh. One of the greatest physicists of all time, Lord Rayleigh's major contributions were in acoustics and optics. His broad legacy includes studies of acoustic resonances, absolute intensity of sound (Rayleigh disc), surface waves (Rayleigh waves), telephone theory, and the human perception of a sound's direction of propagation.



His book, *Theory of Sound*, clearly one of the masterworks of science, was begun on a trip up the Nile in 1872 when Rayleigh had little, if any, reference material with him. It was published in two volumes in 1877 and 1878, and since that time it has never been out of print.

Rayleigh had an enduring relationship with Cambridge University. As an undergraduate he earned two prizes in mathematics, and in 1880, after the death of James Clerk Maxwell, he became Professor of the famed Cavendish Laboratory. Later he served as Chancellor of the University from 1908 to 1919.

Rayleigh's scientific interests were by no means restricted to acoustics and optics. Many people are unaware that Rayleigh was awarded the Nobel Prize for the discovery of argon in 1904. He later became President of the Royal Society and for many years served as the unofficial "chief scientist" for the British Government. Many of his nearly 450 published scientific papers are considered classics and are still consulted today.

In 1885 Rayleigh established a scientific laboratory at his country estate at Terling, 25 miles east of London, which is still in existence today. It was here that he discovered argon and that he conducted much of his other scientific work.

A special session honoring Lord Rayleigh was held at the Acoustical Society's 1988 meeting in Seattle. During this session the Honorable Guy Strutt lectured on his grandfather's life and work. Six articles from the special session are due to be published in *JASA* this spring.

Malcolm Crocker, Auburn University

Technical committees honor outstanding students at New Orleans meeting

At the recent meeting in New Orleans, the Technical Committee on Noise selected two winners for the "Outstanding Paper by a Young Presenter" award. **Ralph T. Muehleisen** of Pennsylvania State University received a $200 prize for his paper, "An impedance model for actively controlled finite waveguides," and **Wayne Bradley** of the University of Illinois was awarded the same amount for the paper, "Noise reduction using coffered ceiling models." To receive the Noise Committee awards, presenters need not be students or members of ASA, but they must be under 30 years of age.

Brenda Henderson of the University of Houston's Mechanical Engineering Department was awarded a $250 prize by the Technical Committee on Engineering Acoustics for her paper, "Impingement tones of axisymmetric choked jets on small plates."

The Technical Committee on Speech Communication gave a $250 award to **Philip Hodgson** of Northeastern University for his paper, "Internal phonetic category structure depends on multiple acoustics properties: Evidence for within-category trading relations." A total of 14 students participated, and James Flege, who chaired the awards committee, reported that their papers were exceptionally fine.

The Technical Committee on Structural Acoustics and Vibration gave its first prize of $300 to **J. Gregory McDaniel** of Georgia Institute of Technology for his paper, "Scattering from infinite coated cylindrical shells by a new shell theory," and the second prize of $200 to **Gregory Kaduchak** of Washington State University for the paper, "Backscattering of chirped bursts by a thin spherical shell near the coincidence frequency."

Noise-93 St. Petersburg

There is still time to register for the international conference on noise and vibration control taking place in St. Petersburg, Russia, May 31 – June 3, 1993. ASA is one of 16 professional societies cosponsoring this conference, which, to date has attracted 180 Russian participants and 220 from 35 other nations. Contact Dr. Malcolm Crocker, Auburn University, (205) 844-3310.

Noise in the Nation's Capital

Fate of EPA's Noise Office

At the June 19, 1992 Plenary Session of the Administrative Conference of the U.S., the Conference approved a series of recommendations concerning the activities of the Environmental Protection Agency in noise abatement and control. Recognizing that the defunding of EPA's Office of Noise Abatement and Control posed certain administrative problems, the Conference recommended that EPA should analyze the implications of this funding cessation. In making its determinations the EPA should take into account such factors as: (1) the scientific and technological developments that have occurred since 1981; (2) whether there is a need to update EPA's methodology for measuring and assessing the effects of noise; (3) whether there is a need for additional federal coordination of noise activities; (4) the adequacy of current coordination between the U.S. and foreign governments with respect to standards and regulations impacting international trade; and (5) the relative use of public education, market incentives, emission standards, or other approaches to noise abatement. Finally, the Conference stated that Congress should either repeal the Noise Control Act or fund EPA's responsibilities under the Act.

This action by the Administrative Conference was only one of a series of events concerning EPA's defunct noise office. Earlier in the year Congressman Richard Durbin of Illinois had introduced H.R. 3710 to reinstitute an Office of Noise Abatement in EPA. The bill has been supported by a "Noise Action Network" coordinated by the American Speech-Language-Hearing Association (ASHA), consisting of about 100 professionals. As of last fall, Congressman Durbin had nine co-sponsors for the bill. Of course, bills that do not come up for a vote expire at the end of the session and must be reintroduced in the next session.

The outlook for Congressman Durbin's bill in 1993 is questionable. First, much of Mr. Durbin's interest will be devoted to an appropriations subcommittee of which he has recently become the chair, the Subcommittee on Agriculture and Rural Development. Also, such a bill would need extensive support, considering that there are some 5000 bills entertained by Congress every year and the sponsor of each one is looking for support.

But there are other groups besides the ASHA Noise Action Network that have rallied for this issue. The Board of Directors of the Institute of Noise Control Engineering (INCE) voted unanimously to support H.R. 3710 and has urged Representative John Dingell, Chairman of the House Committee on Energy and Commerce, to support it. Many INCE members have written to their legislators asking for their support. In addition, there are a number of citizens groups and at least one environmental group (the National Resources Defense Council) that favor the reinstitution of a noise office within EPA.

There are also a number of individuals who do not favor the recreation of EPA's noise office, for various reasons. Both the pros and cons, as well as several other noise-related issues, will be the subject of an all-day workshop at the upcoming ASA meeting in Ottawa.

Resources

Airport Noise Report, a biweekly update on litigation, regulations, and technological developments. 43978 Urbancrest Court, Ashburn, VA 22011. (703) 729-4867.

ASHA's Noise Action Network. Contact Evelyn Cherow, 10801 Rockville Pike, Rockville, MD 20852. (301) 897-5700.

The NOISE Newsletter, published monthly by the National Organization to Insure a Sound-Controlled Environment. 1225 Eye Street NW, Suite 300, Washington, DC 20005. (202) 682-9386.

National Airport Watch Group, 207 Humboldt Avenue North, Minneapolis, MN 55405. (612) 374-2604.

New developments in aircraft noise

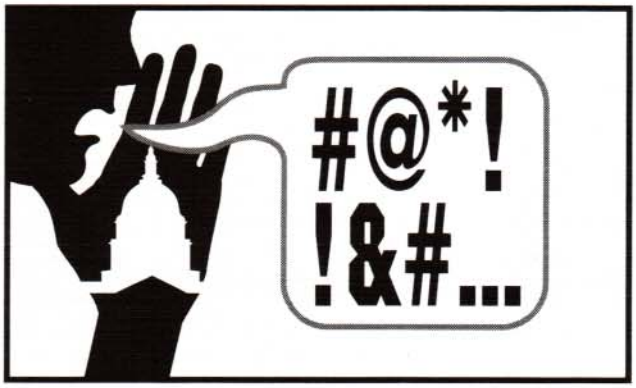
Toward the end of the last session Congress passed and the President signed legislation reauthorizing FAA's programs, which included some noise provisions. Among them was a requirement for the FAA and NASA to conduct a joint R&D program in noise reduction for commercial aircraft. The program would receive $25 million per year for three years.

The bill also required FAA to conduct an analysis of the social, economic, and health effects of airport noise on populations within the 65, 60, and 55 DNL contours to determine the "actual level" where noise causes an adverse impact on populations. The results of the analysis must be reported to Congress within the year.

Another FAA requirement was the establishment of a "blue-ribbon" commission to consider airline competition and noise that must include a citizen noise activist.

The results of the recent election are gratifying to citizens groups favoring noise abatement. Evidently, quite a few members of these groups have contacts with the staffs of President Clinton, Vice President Gore, and members of the transition team. 1993 may be an eventful year for noise abatement.

Congressional Fellow



OR, ACCORDING TO POGO, "We have met the enemy and he is us." We can't blame the Members of Congress for the ills of Congress—we put them there. The question is how we can help them do their job better.

The problem: The federal discretionary budget for next year will be some $220 billion and about 76 percent of this deals with R&D (a LOT of money). This money and the need to understand the technologies is in practically every piece of legislation on the Hill. For example, the $5 billion for environmental R&D is spread over 20 agencies and 100 subcommittees! There are no Senators and only about a half-dozen House members who have any formal training in technical matters. (In October we lost our only Ph.D engineer, Ritter, from Pennsylvania.) They mean well; they just don't know what to do.

So what's an ASA member to do? Either (1) get elected to public office, (2) write your Member of Congress (your letters do get read), or (3), best yet, apply for the Acoustical Society's Congressional Science Fellowship. This means there would be one more scientist/engineer/rational mind helping sort out the technology and R&D challenges in this country.

I look at this as an obligation on the part of the science community to make itself available to Congress. It certainly is not a case where the professional societies are promoting their own special interests—it is just the opposite.

Virtually every person in the Capitol Hill community (Member or committee staff) who has any training in science or technology has come through the Congressional Fellows Program. This program, coordinated by the American Association for the Advancement of Science (AAAS), provides the administration and guidance for Congressional Fellows in science and engineering who have been selected and supported by societies such as ours. Each year the AAAS coordinates a first-class, three-week indoctrination to the workings of Congress and the Administration for a group of 30 to 40 new Congressional Fellows.

The Fellows then spend a year on the staff of a Member or a committee doing whatever needs to be done. There is no agenda on the part of the ASA; Fellows are free to focus on whatever issues they choose. Typically, the Fellows are outgoing, highly motivated and energetic, and they span the age range from post-docs to retirees. About a third of them are women, most of them have Ph.Ds, and they may come from academia or industry, but there are no rules as to their backgrounds. What is interesting is that more than half of the Fellows stay in Washington and something like half of these stay on Capitol Hill. This is not a loss to science—this is a gain.

Their activities run the spectrum from stuffing envelopes to attending some pretty high-level functions when their Member is double-booked. Typically, the Fellows in the House offices do everything with some emphasis on digesting current science-related issues for action by their Member. These jobs may include participating and reporting back on caucus and committee meetings and hearings, analyzing and editing legislation, and writing position papers, speeches, and letters to constituents. House office staffs are limited to about ten people, so everybody does everything. The Senate offices are about three times this size and people tend to specialize a little more. Committee staff members tend to be highly specialized.

For myself, I was on a House office staff and spent a lot of energy working on pre-college math and science education. I analyzed and edited some legislation, wrote some speeches and a legislative agenda, organized hearings, and generally had a good time. It was one of the toughest years of my career, but I look back on it as the best. Also, I don't complain about the #%!! Congress anymore. . . .

Joe Dickey, ASA Congressional Science Fellow 1983-84

ASA's 1993-1994 Congressional Science and Engineering Fellowship

ASA members with a Ph.D. or Sc.D. degree are invited to apply. The stipend will be $40,000 plus relocation and travel expenses up to a maximum of $2500, and up to $500 for travel expenses to two ASA meetings. The period of the Fellowship is one year, beginning September 1, 1993.

See p. 3038 of the Nov. 1992 JASA for more details; call ASA's Woodbury NY office at 516-576-2360 for application instructions. Interested candidates may also call former ASA Congressional Fellows Joe Dickey 410-267-2759 and Charles Schmid 206-842-6001 for further information.

Applications must be postmarked no later than March 1, 1993

Spring Meeting Preview

ASA meets in Ottawa, May 17-21

For the spring meeting, ASA goes north of the border to the Chateau Laurier Hotel in Ottawa, Ontario. Being the capital city of Canada, Ottawa boasts many fine museums and other public buildings, and ASA members may wish to combine the meeting with some sightseeing.

Several interesting sessions will precede, accompany, and follow the regular program. Information on most of these may be found in variously colored inserts in the Call for Papers, which went out in November. In cases involving tuition, discounts are offered to early registrants, so interested parties would be wise to sign up right away. The same holds true for hotel reservations, where discounted rooms will be available until April 15, but members are urged to reserve their rooms immediately to avoid disappointment.

Short courses, tutorials, and workshops

A Short Course on Nonlinear Acoustics, taught by David Blackstock and Mark Hamilton of the University of Texas at Austin, will take place on Sunday and Monday, May 16-17. The course is intended for engineers and scientists who wish to learn about nonlinear effects in propagation, reflection and refraction, diffraction, dispersion, and absorption of intense sound waves *(gold brochure)*.

Tony F.W. Embleton will give the Tutorial Lecture at this meeting on Noise Outdoors, with the object of imparting a good understanding of all the sound propagation phenomena *(pink flyer)*.

On Wednesday, May 19, there will be an all-day special workshop on the ASA's Role in Noise and its Control sponsored by the Technical Committee on Noise *(green half-page flyer)*. The workshop is an outgrowth of the special session on this topic held at the New Orleans meeting, and the participants will attempt to develop an action plan. Participants must sign up in advance and they must be meeting registrants, but there is no additional cost.

Technical program

The technical program will include some 26 special sessions. A few of the more eye-catching ones are:

- Ocean acoustics in shallow water
- Effects of noise on animals
- Effects of aging on hearing and touch
- Noise and vibration of high-speed trains
- Acoustics in space
- Novel applications of ultrasound in medicine
- Intelligent machine acoustics
- Three-dimensional seismo-acoustics
- "Hot topics" in acoustics

This list is far from complete . . .

The Plenary Session has been scheduled for the new Canadian Museum of Civilization, and will provide the opportunity to see the film *Momentum,* showing spectacular views of Canadian scenery using the IMAX HD technique.

Technical Tours will feature the carillon in the Peace Tower, as well as the acoustics of halls in the National Arts Centre and facilities in the Canadian Museum of Civilization.

Reception for women members

The recently formed ASA Committee on the Status of Women has planned a number of initiatives aimed at increasing the participation of women in Society activities. These plans focus on recruiting and retaining women members, increasing the attendance of women at Society meetings, and providing a network of contacts for women members that can encourage more active involvement by women at all levels of the ASA. Toward these goals, the Committee will host a reception for women members and other interested persons on Thursday, May 20, at 5:00 p.m.

Student incentives

Awards are given to students and young professionals by four different technical committees. Details on the awards and methods for applying are spelled out in the blue flyer. Students may also apply for transportation subsidies to ASA meetings. Preference will be given to students presenting papers who propose to travel in groups using economical ground transportation *(see gray half-page flyer)*.

Sightseeing

Art galleries, shopping areas, and many of Ottawa's museums are located within easy access of the Chateau Laurier Hotel. In addition, tours have been planned for the city and to the Upper Canada Village. (Details will be available in the preliminary meeting program, to be mailed in February.) In the "not to be missed" category is the Canadian Tulip Festival featuring several million spring bulbs, which takes place May 20-24 in Major's Hill Park.

Violin meeting May 14-16

The Violin Society of America and the Catgut Acoustical Society will hold a joint meeting devoted to the "Many Facets of the Violin World" on May 14-16, just before the ASA spring meeting. The exact location is yet to be announced, but it is expected to take place in the New York City area. Interested persons should notify the Violin Society of America at 614 Lerew Road, Boiling Springs, PA 17007-9500.

President's Message

The state of the Society

The fall 1992 issue of *Echoes* contained Executive Director Charles Schmid's synopsis of an external survey conducted by Market Probe Inc. for the Council of Engineering and Scientific Society Executives. The survey showed that the ASA is one of the country's top professional scientific societies in the categories of "publications," "standards," and "overall satisfaction with the Society's activities." These results are pleasing and I don't think we need an additional poll to find out why we did so well. As our Executive Director's Opinion Column in the last issue explained, the answer is simple if one acknowledges the extensive participation of volunteer members, which also helps keep our costs low.

Our membership fees have been relatively low and our Society has prospered primarily because we have maintained a minimum of administrative overhead. Our highly efficient staff in Woodbury consists of Office Manager Elaine Moran and co-workers Ellen LaPerna and Jolene Johanson. Their support has supplemented the massive contributions in time and ideas coming from our volunteer members. Many new ideas have come spontaneously from the 14 members of the Executive Council, the 303 members of our 11 Technical Committees and Specialty Groups, as well as the 131 members of our 15 standing Administrative Committees. This year we also have 59 members of 11 Ad-Hoc Committees, which are set up to take advantage of new opportunities or solve what we hope are only temporary problems.

In the past six years, our "no-cost" internal surveys conducted by the Long-Range Planning Committee and the Technical Council have guided us to several innovations. Responding to these surveys we have initiated Tutorial Lectures to broaden our capabilities as acousticians, Distinguished Lectures to bring prestigious speakers to our meetings, and Technical Specialty Groups to provide grass-roots forums for new areas of acoustics. In the past two years, this popular quarterly newsletter, *Echoes,* and short courses have been started, and satellite conferences have been proposed.

This past year we held the first Physical Acoustics Summer School supported by the Office of Naval Research, and we became the first society of the American Institute of Physics to provide our members with electronic advance meeting abstracts, accessible (free) from anywhere in the world. All of these changes were born from the ideas of volunteers, were developed by the contributions of time and energies of volunteers, and were supported by our superb small staff.

One other factor that has led to member satisfaction has been the bargain registration fee for attendance at our semi-annual meetings. These fees are low because the meetings are proudly and unselfishly put together by dedicated ASA volunteers in various cities of the U.S. and Canada. By contrast, other societies hire an expensive profit-making corporation to take care of meetings, and the cost of meeting registration soars when this is done.

Our publication, *JASA,* is clearly the pre-eminent journal of acoustics in the world and, additionally, ranks an amazing 14th out of 1041 professional journals of all types which are requested on inter-library loan in the U.S., U.K., and France. We have maintained this position by selecting (in 1985) as Editor-in-Chief Daniel Martin, a distinguished Fellow and former President of the Society. He followed another distinguished Fellow and former President R. Bruce Lindsay, who held the job from 1957 to 1985. The Editor-in-Chief is assisted by 28 *JASA* Associate Editors who, in turn, are aided by hundreds of volunteer reviewers of the technical papers, in addition to capable and dedicated AIP copy editors.

The standards support operation has a staff of three, ably headed by Standards Manager Avril Bring. But their work all depends on the volunteer contributions of approximately 700 scientists and engineers who serve on the four independent Standards Committees and nine liaison writing groups. The operation is approaching 70 percent self-sufficiency through contributions and sales of the standards publications.

Finally, the entire financial operation of this 7000 member organization has been kept afloat by the frugal and wise financial management of another Fellow and Past President of our Society, ASA gold medalist Robert Beyer, our Treasurer since 1974.

The future is bringing problems and opportunities. Our prominent position in inter-library loans is evidence that *JASA* is not always available where people are doing research in acoustics. This goes hand-in-hand with a gradual decline in our non-member (e.g. library) subscriptions to our journal (and to other technical journals), which is putting a significant squeeze on our budget.

Perhaps the best way to describe where we are going is to say something about some of our new Ad-Hoc Committees which were appointed this past summer:

The Committee on a Popular Acoustics Journal seeks to define the characteristics of a journal that would be useful to ASA members and attractive to the thousands of non-member acousticians (Chair, Richard Stern). The Committee on Cooperation between American and Eastern-European Acousticians is considering ways in which the ASA can coordinate efforts to provide technical and economic aid to Eastern-European acousticians (Chair, Ira Dyer). The Committee on the Status of Women is working to improve the status and participation of women in the ASA and to attract women to the science of acoustics (Chair, Alexandra Tolstoy).

Our success as a Society depends on our volunteer members. We all profit from your generosity.

Herman Medwin, President

Ultrasound techniques have also proved valuable in the care of patients with prostate cancer, the second leading cause of male deaths from malignant disease. Real-time sonography is used to detect the cancer and to monitor the progress of any therapy. In addition, a pulse-echo technique is used very effectively in guiding the needle during biopsy.

For most diagnostic-ultrasound equipment the available frequency range is 2-10 MHz. Lower frequencies are seldom used, as the spatial resolution would be inadequate, and higher frequencies are not practical in most applications because the attenuation would be too great to allow adequate penetration.

In special situations, however, where the region to be examined is close to the surface or where short acoustic pathlengths are involved, higher frequencies can be used to improve resolution. Frequencies up to 45 MHz have been used to scan within blood vessels, and frequencies of 50-100 MHz have been used to examine the frontal region of the eye. The upper section of the figure on page 10 shows an ultrasound image of an artery obtained with a transducer (2.1 mm diameter) that has been incorporated into a catheter and inserted into the artery's lumen. In contrast to the stained histological section shown in the lower portion, the elastic laminae are particularly prominent. This technique is a promising one for the study of plaque formation.

Doppler ultrasound

Another form of diagnostic ultrasound uses the Doppler effect to study motions and flows, particularly in the circulatory system. After determining a shift in the frequency of ultrasound reflected or scattered from an object, Doppler theory is used to obtain information about the object's velocity. In examining blood flow, frequency-shift information is contained in waves scattered from the red blood cells. While the energy scattered by a single cell is very small, the total energy from all of the cells in a specific region is large enough to be measured.

A common medical use of Doppler ultrasound is to test the viability of a fetus by listening for sounds of the beating heart, made audible by electronic means. Continuous-wave unfocused ultrasound is often used for this purpose, and the equipment is relatively inexpensive.

In other applications, where the aim is to obtain detailed information on the blood flow in a specific region, the ultrasound is focused and delivered in pulses. The pulse duration is a few ultrasound periods, somewhat longer than the very short pulses required for pulse-echo sonography. In duplex Doppler ultrasound, Doppler methods are combined with real-time imaging. One of the most important applications of duplex Doppler is the examination of flow in the carotid arteries. These are the principal arteries of the neck, governing the flow of blood to the brain, and are often involved in the occurrence of strokes.

In Doppler color imaging, color-coded flow information is superposed on the image. The technique is capable of displaying colors in a continuous range of hue, saturation, and luminance to represent different characteristics of the blood flow. Color-Doppler imaging is regarded as the primary noninvasive method for diagnosis of deep venous thrombosis, a problem believed responsible for most of the 600,000 cases of pulmonary embolism occurring annually in the U.S.

Role of the acoustician

Ultrasonic techniques are now among the methods most commonly employed in diagnostic medicine. Many members of the Acoustical Society of America have made important contributions in bringing this about, and their research findings have been reported at ASA meetings and in

Continued on pg. 12

"I love hearing that lonesome wail of the train whistle as the magnitude of the frequency of the wave changes due to the Doppler effect."

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ULTRASOUND—from pg. 11

the *Journal*. The basic studies of transducers, linear and nonlinear aspects of sound fields, propagation through various media, and interaction between ultrasound and biological systems have been of special importance.

In the future, higher frequencies will probably be used wherever possible, to obtain scans with ever-finer detail. Doing this will require further research along the lines described above, extended to higher frequencies. There is also likely to be increasing use of contrast agents, consisting of specially prepared small particles, usually containing undissolved gas, which are injected into the blood stream. These particles are highly effective in scattering or reflecting ultrasound and, therefore, appear prominently in the images of sites where they are located. Contrast agents can be used to obtain good images of parts of the body where this would not otherwise be possible.

Ultrasound can alter biological structures and physiological processes through a variety of thermal and nonthermal mechanisms. With the expanding use of ultrasound, research will be required on the interactions of ultrasound with living systems under new conditions. As the understanding of these mechanisms increases, so will the range of conditions under which ultrasound can be safely applied.

In the future, as in the past, acousticians will continue to play important roles in advancing the medical applications of ultrasound.

Wesley Nyborg, Ph.D, is Professor Emeritus of Physics at the University of Vermont. He chairs a scientific committee dealing with medical ultrasound for the National Council for Radiation Protection and Measurements. He is a Fellow of the Acoustical Society of America.

Marvin Ziskin, M.D., is Director of the Center for Biomedical Ultrasound at Temple University's School of Medicine. He is a former President of the American Institute of Ultrasound in Medicine, and also is an ASA Fellow.

CHABA sponsors symposium on speech communication

Speech Communication Metrics and Human Performance is the title of the annual spring symposium sponsored by the National Academy of Science's Committee on Hearing, Bioacoustics, and Biomechanics (CHABA). The meeting will take place on June 3-4, 1993 in Washington, DC. CHABA recognizes that good speech communication is important for performing daily activities in society and may be crucial for accomplishing a military mission. The intent, therefore, is to review the state of knowledge in evaluating speech performance and its relationship to comprehension, problem solving, and task performance. The symposium will be open to the public.

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