

The newsletter of
The Acoustical Society of America

ECHOES

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Recollections of Acoustical Society founders

by Daniel W. Martin

Anyone who investigates the founding of the Acoustical Society of America will find four prominent names. Three of them are: Wallace Waterfall, then research director for the Celotex Corporation in Chicago, an early producer of acoustical materials; Floyd R. Watson, longtime physics professor at University of Illinois, a pioneer and consultant in architectural acoustics, and Waterfall's teacher; and Vern O. Knudsen, professor of physics at UCLA, who was also a prominent consultant in architectural acoustics.

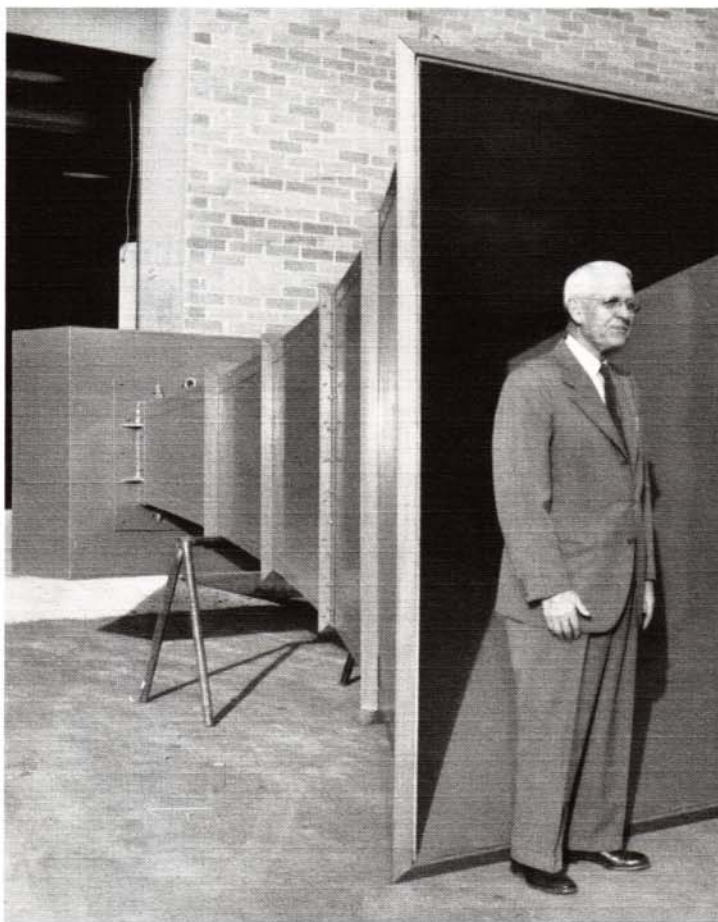
During a 1928 visit to California (by train, of course), Watson and Waterfall visited Knudsen and the three decided to enlist others in forming the Society. In an effort to include other branches of acoustics, they recruited Harvey Fletcher, an eminent researcher at Bell Telephone Laboratories in speech and hearing. Fletcher offered to host a discussion at Bell Labs, during a December meeting of the AAAS, to get things moving. Forty men came, elected temporary officers, and appointed a

constitution and bylaws committee. Harvey Fletcher became the Society's first President.

The following May 9-11, 1929, at Bell Telephone Laboratories, our Society was inaugurated in a joint session with the Society of Motion Picture Engineers (sound movies were a new development then).

There were 183 members in attendance, out of about 500 charter and regular members listed that year. The last name on the list, since his name starts with Y, was Robert W. Young, who is still active in the Society today.

At the early Society meetings we had only one technical session at a time, so you saw everyone and could hear all of the papers. The first meeting I attended was the tenth anniversary meeting in New York in 1939, when my professor, Watson, introduced me to Knudsen who had served as Society President from 1933 to 1935. Knudsen gave a speech on "An Ear to the Future," starting with the words, "The golden age of sound should be just around the corner." He predicted many advances



Dr. Harvey Fletcher, one of the founders of the Acoustical Society of America, with a stereophonic demonstration loudspeaker

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We hear that . . .

Three ASA awards will be presented at the Denver meeting this October. **Clarence S. Clay** will receive the Silver Medal in Acoustical Oceanography; **Homer P. Bucker** will receive the Pioneers of Underwater Acoustics Medal; and **Steven L. Garrett** will receive the Silver Medal jointly in Physical Acoustics and Engineering Acoustics.

1993 appears to be the year to recognize the outstanding achievements of Steven Garrett, as he has also been named Rolex Laureate and has earned the Rolex Award for Enterprise for his role in the development of the thermoacoustic refrigerator. The Rolex awards recognize individuals who have displayed a remarkable spirit of enterprise in the fields of applied sciences and invention, exploration and discovery, and the environment.

Peter M. Narins, Professor of Biology at UCLA and recently elected ASA Fellow, has received the Guggenheim Fellowship for his work in animal communication. He intends to use the award to investigate the use of self-generated seismic signals for communication by animals.

Two ASA Fellows were elected to the National Academy of Sciences this year: **Bishnu S. Atal**, Head of the Speech Research Department at AT&T Bell Laboratories, and **Stephen H. Crandall**, Ford Professor of Engineering at MIT. In addition two ASA members were elected to the National Academy of Engineering: **Earl H. Dowell**, Dean of Engineering at Duke University, and **Nicholas Rott**, Visiting Professor of Aeronautics and Astronautics at Stanford University.

The American Society of Naval Engineers (ASNE) has presented its highest award, the ASNE Saunders Award, to

Larry J. Argiro for his pioneering work in developing the acoustical measurement and analysis technology to characterize and classify ships and submarines, and for his work in machinery silencing.

Prizes for outstanding students and young presenters

Four technical committees presented prizes to students or other young presenters at the recent ASA meeting in Ottawa. The winners were:

NOISE. **Robert L. Clark, Jr.** of Duke University for the paper "Active structural acoustic control of cylinder radiation with piezoelectric actuators and PVDF sensors," and **Bart Lipkens** of the University of Texas at Austin for the paper "Further report on the propagation of spark-produced N waves through turbulence."

SPEECH COMMUNICATION. **Sharlene A. Liu** of MIT for the paper "Locating landmarks in utterances for speech recognition."

ENGINEERING ACOUSTICS. **Daniel M. Warren** of the National Center for Physical Acoustics for the paper "Deflections and vibrations of the unimorph flexural disk transducer."

STRUCTURAL ACOUSTICS AND VIBRATION. First Place: **Jerry Farstad** of Ohio State University for the paper "Analysis of vibration transmission through joints using component modes." Second Place: **Raymond Panneton** of the University of Sherbrooke for the paper "Vibrations and acoustic radiation of a simply supported cylindrical shell under circumferentially moving loads: Modeling and experiments."

Receptions for ASA Women

Approximately 150 people attended the reception for women at the Ottawa meeting, providing an opportunity for ASA women to get acquainted and network. (Men were welcome and several did attend.) A similar reception will be held at the Denver meeting from 5:00 to 6:00 p.m. on Thursday. The second half hour will be devoted to a panel discussion with audience participation on the subject of women in science and, in particular, women in acoustics.

Hunt Fellowship applications due by September 1

ASA members who have recently received their doctoral degrees or expect the degree in the Spring of 1994 are eligible to apply for the F.V. Hunt Postdoctoral Research Fellowship in Acoustics. The 12-month award is for \$28,000 and candidates must be able to use the facilities of their institutions for their research. Applications on the appropriate ASA forms must be postmarked no later than September 1, 1993. Information may be obtained from ASA's Woodbury office, (516) 576-2360.



ECHOES

Newsletter of the Acoustical Society of America

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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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ASA Founders

ASA FOUNDERS—from pg. 1

in acoustics concerning speech articulation testing, hearing aids and protective devices, binaural systems, noise control, musical timbre tone analysis and synthesis, electronic music, and the probable role of acousticians in the development of military acoustics. The 1939 meeting was when pioneer Watson became President. It was also when Floyd Firestone succeeded Watson as Journal Editor.

Professor Watson, whom I knew best and longest, was small in physical stature, but a giant in the eyes of his graduate students. The oldest of the founders, born in 1873, he was a true gentleman. Fortunately for his graduate students, he was patient and considerate. He enjoyed an excellent reputation as a teacher of general physics, and had a motto, "If you can't explain it simply, you don't understand it." He wrote the first textbook for architectural acoustics courses. Although he still had an operational Rayleigh disc for acoustical calibration, and an organ pipe and stopwatch for measuring reverberation time, he worked with his graduate students in the development of automatic electronic reverberation measurement systems.

Watson's big project just after academic retirement was as acoustical consultant for the Pentagon building then being constructed in Washington. He retired to California and sent a taped message to the Society when awarded the Sabine Medal in 1959. His last formal project at age 90 was an auditorium for California Institute of Technology. I visited him when he was 99. He was still very alert when I called to congratulate him on his hundredth birthday. He died in 1974, the same year as Knudsen and Waterfall.

Professor Knudsen was 20 years younger. He was tall, rather imposing in stature, spoke forcefully and convincingly, and was very highly respected. I was in awe of Knudsen. He had written an excellent text on architectural acoustics, later revised by Cyril Harris and now available from the Society. Knudsen's great interest in human welfare led him from physical acoustics into physiological and psychological acoustics, as well as architectural acoustics. He personified acoustics in the broadest sense and responded to



ASA founders Floyd Watson, Vern Knudsen, and Wallace Waterfall taken at the May 1964 dedication of Knudsen Hall at UCLA.

challenges with vigor.

A decade before his death, at the International Congress on Acoustics held at Copenhagen, I saw (and heard) Professor Knudsen respond to a challenge. The Congress planners had an ingenious system for keeping the simultaneous sessions on the same schedule. When the time was up, a recorded musical theme was reproduced in all meeting rooms, first very softly to allow speakers to make their conclusion, then with a gradual crescendo until most speakers would become inaudible

if they continued. Knudsen refused to be controlled by the sound system. When it was at full volume he could still be heard and finished his lecture on his own schedule.

Wallace Waterfall, still younger than Knudsen, was a soft spoken man, but his voice was carefully listened to when he spoke. At Executive Council meetings he sometimes said, "As long as I have the privilege of voice at these meetings, I don't miss having the vote." Anyone who served as Secretary for 40 years would eventually be accused of "running" the Society, but I clearly remember when I served on the Council that Wallace's advice was not always taken. When Council took a position adverse to Wallace's, he accepted it and did his best to comply with the decision.

Wallace Waterfall did enough research early in his career to have great appreciation for it, but his strength was as an organizer. He was very diplomatic and cheerful most of the time, and was intensely committed to the Acoustical Society. Although he seemed to work for the Society almost full time, he did so without salary or honorarium during most of his tenure. He organized the Acoustical Materials Association and gave advice to the founders of the National Council of Acoustical Consultants. During World War II he was a key figure in the administration of government acoustical research and development. Later his widespread contacts with universities, acoustical industries, and government laboratories were a tremendous asset to the Society and to the field of acoustics.

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Winners selected for 1992 science writing awards

The Committee on Public Relations received four entries for the 1992 Science Writing Award for Journalists and five for the Science Writing Award for Professionals in Acoustics. The Committee presented its recommendations to the Executive Council, which approved the winners.

Malcolm W. Browne of *The New York Times* won the journalist's award for a group of four articles on acoustics appearing during 1992. The titles were "Cooling with sound: An effort to save ozone shield," "Using natural sounds, system tries to 'see' objects deep in ocean," "Clues to quality heard in the sound of corn," and "Ear's own sounds may underlie its precision."

Winner of the award for acousticians was **T.M. Georges**, for his article "Taking the ocean's temperature with sound" appearing in the July 1982 issue of *The World and I*.

The prizes will be presented at the plenary session of the upcoming Denver meeting.

Not to be missed in Denver

During the Plenary Session, ASA Fellow Ingo Titze will give a lecture/demonstration/concert with the colleague of his creation, Pavaroboti. His presentation will feature the wonders of the human voice, including a video of a larynx in motion.

The highlight will be a duet sung by Ingo and the computer generated voice of his versatile robot, named after the great operatic tenor Luciano Pavarotti. Rumor has it that the two will sing *Nessun Dorma* from Puccini's *Turandot*.

On the practical side, those who do not already have airline reservations should check with Continental Airlines, which is offering a special meeting fare equivalent to the Super-Saver fare without the requirement to stay over a Saturday night. Also, child care will be available.

*Interested parties
should call Elaine Moran
at (516) 576-2360*

Results of the noise workshop in Ottawa

The Technical Committee on Noise hosted an all-day workshop at the meeting in Ottawa on "The Role of the Acoustical Society in Noise and its Control." The workshop was attended by about 40 members. In his opening address, ASA's president-elect Richard Lyon called on the Society's members to use their talent and credibility to assist both industry and government in coping with noise and its control, particularly in the area of product noise control.

The attendees then divided into six small groups focusing on ASA's role in the areas of environmental, industrial, and product noise control, hearing loss prevention, government, and education. The objective of each group was to define the issues, problems, and solutions in its area and to recommend actions for consideration by the Society.

During the general session that followed, some 50 recommendations for action were presented by the group leaders. Examples include:

- Encouraging articles by noise control professionals for the lay readership
- Developing public service announcements on noise
- Establishing an ASA clearing house for information on noise control
- Developing an effective audio demonstration on hearing loss
- Providing timely expertise to government officials and committees
- Coordinating efforts with other professional and consumer organizations

The workshop's organizing committee is currently preparing a report for the Noise Committee and will present a summary report in a special session at the Denver meeting. Contact Robert Hoover (713) 496-9876.



At the Ottawa meeting, Tom Rossing demonstrates the world's largest handbell, an aluminum bell tuned to G₁ (49 Hz).

ASA Founders

ASA FOUNDERS—from pg. 4

The fourth founder of the Society, Dr. Harvey Fletcher, was a brilliant researcher and research administrator. While a graduate student at University of Chicago, he participated in the famous Millikan oil drop experiments measuring the charge on the electron. Fletcher was a dominant figure in Bell Labs research on speech, hearing, and telephones. At the 1941 Rochester meeting he demonstrated three-channel, live, stereophonic orchestral sound to the Acoustical Society over telephone lines from Washington, D.C., using three loudspeaker systems of exceptional quality.

We think primarily of Fletcher's contributions to speech and hearing, but *my* greatest recollection of him was in 1947, when he proposed a National Institute of Musical Acoustics at a Society program session. I think he would have liked to head such a research institution. His dream was an inspiration to those of us who also gave papers on musical acoustics in that session. We hoped that Fletcher could somehow make it happen. He did, but in a different way, by retiring to Brigham Young University to continue his research career with a new emphasis on musical acoustics. Dr. Fletcher, first President, was present and spoke at the 50th anniversary program of the Society. He died at age 97.

Finally, I want to mention Floyd Firestone, a charter member and longtime editor, although not one of the four founders. Most ASA members knew and admired Bruce Lindsay, our Editor of longest service, but may not have heard much about Firestone. He was a jaunty, cheerful person, verging on a flamboyant style at times. For example, in his Foreword to the Journal's first Cumulative Index he said, "Through flattery and other seductive means of persuasion, Editor F. R. Watson induced the present Editor to undertake the preparation of the analytical subject index."

It was Firestone who started our system of associate editors. Firestone also started listing contemporary references in acoustics, initially in each issue, now over 500 pages annually. Firestone was a physics professor with a flair for invention that led him into engineering, especially mechanical engineering. He developed an acoustical analogy system for mechanical engineers that rivalled Harry Olson's dynamical analogies for electrical engineers. Floyd published his system in the Journal in 1956 under the title "Twixt earth

and sky with rod and tube: the mobility and classic impedance analogies."

Floyd Firestone was unconventional at times, but he certainly kept things interesting. When the Society had a New York meeting session at Radio City Music Hall, Floyd wrapped a picture of the dancing Rockettes around the printed program. When Homer Dudley demonstrated dramatically to the Society the first Vocoder system, for analyzing speech sound and transmitting it in coded form to an early speech resynthesizer, Firestone announced "On this same stage tomorrow night, I will speak and sing without using my larynx." He did so by piping carrier tones from his Hammond Novachord electronic organ into his mouth, while supplying consonant sounds normally.

So the Acoustical Society has a lighter side as well as its serious professional one. One time a group of us was having lunch in a Chicago hotel dining room. Several women came over from another table and said, "You're from the Acoustical Society!" We said, "How did you know?" One of the women said, "Our husbands belong to the Optical Society, but you people always seem to have so much more fun!" I agree.

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Daniel W. Martin in 1937

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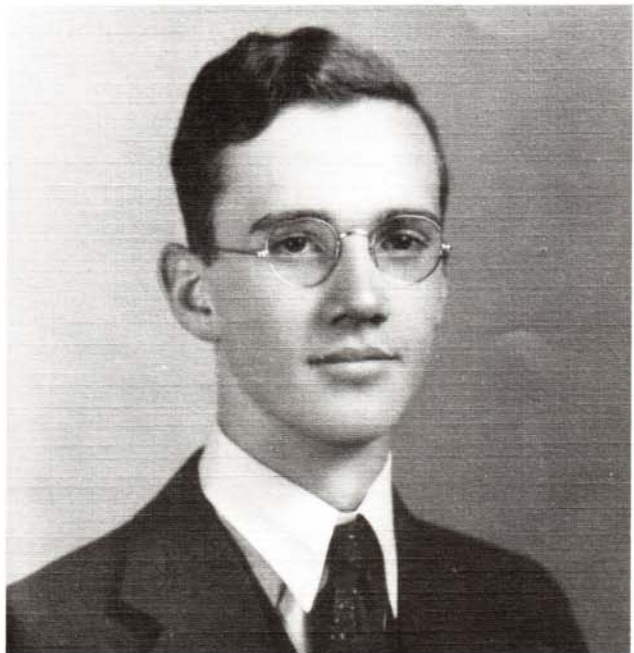
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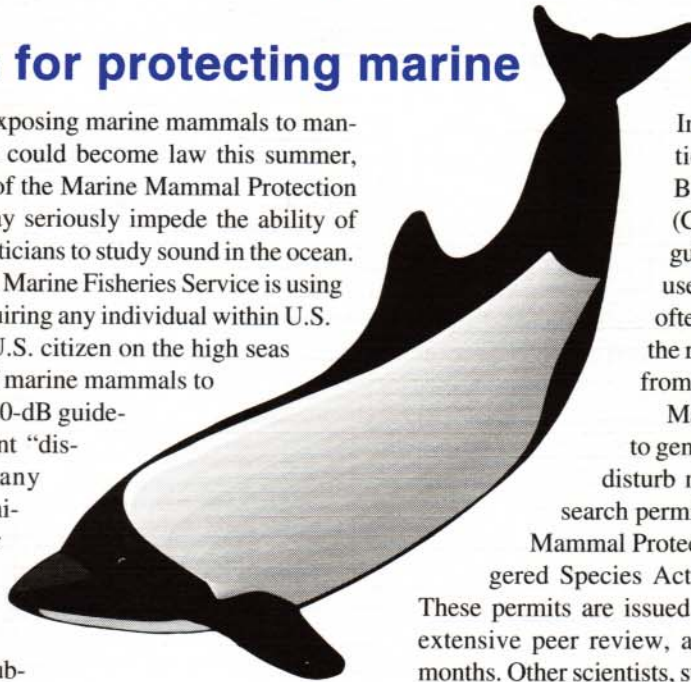
Miscellaneous Soundings

Noise rules for protecting marine mammals

Informal guidelines for exposing marine mammals to man-made noise in the ocean could become law this summer, with the reauthorization of the Marine Mammal Protection Act. These new rules may seriously impede the ability of acousticians and bioacousticians to study sound in the ocean.

Currently, the National Marine Fisheries Service is using an informal guideline requiring any individual within U.S. territorial waters or any U.S. citizen on the high seas to limit noise exposure of marine mammals to 120 dB (re 1 μ Pa). The 120-dB guideline is intended to prevent "disturbance," defined as any detectable change in an animal's behavior. Neither the bandwidth nor the method of measurement is specified. This guideline is unavailable to the public in written form.

Exposure of marine mammals to man-made noise sources in the sea is normally controlled by setting minimum approach distances for vessels and aircraft. Recently there has been an effort to develop acoustical guidelines, but the lack of information on animal effects has impeded these activities.



In the absence of better information, the Committee on Hearing, Bioacoustics, and Biomechanics (CHABA) has recommended using guidelines intended for humans. The use of A-weighting, however, will often be inappropriate for animals, as the range of animal audibility extends from 0.1 Hz to 200 kHz.

Marine mammal scientists who wish to generate noise that might "harass" or disturb marine mammals may obtain research permits under the terms of the Marine Mammal Protection Act of 1972 and the Endangered Species Act (if the species is endangered). These permits are issued only after public comment and extensive peer review, a process that usually takes 4-8 months. Other scientists, such as acoustic tomographers and seismologists are not entitled to permits, but must apply for an exemption to the Marine Mammal Protection Act, which can take over a year to obtain. This is the same exemption that is used by commercial fishermen and oil-industry sources, allowing them to "take" (harass, injure, or kill) a certain

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Acoustics in the News

Because the national media seems to be increasingly interested in acoustics, *Echoes* cannot report on all of the articles and news broadcasts that pertain to this topic. We will, however, mention some of the recent highlights that may be of interest to readers.

The May 3 issue of *Newsweek* carried an article about a low-frequency hum plaguing residents of northern New Mexico. Scientists believe the sound may be caused by "seismic slip" in the earth's tectonic plates.

Synthesized auditory signals representing physiological phenomena appear to be more readily perceived than visual displays by physicians, according to a research project reported in the May-June issue of *American Scientist* (p.229).

The subject of virtual acoustics continues to be popular in the U.S. media. The July issue of *Technology Review* contains an article (p. 17) that mentions the research of Elizabeth Wenzel of NASA, intending to bring spatially separate acoustical signals to air traffic controllers. Dr. Wenzel's work was also featured in May on ABC's *Nightline* with Ted Koppel.

CNN ran a special on virtual acoustics in May as well, describing the Air Force's "3-Dimensional Audio Cue Syn-

thesizer" and its demonstration in the Harrier aircraft at China Lake, California. ASA member Richard McKinley discussed the research behind the Cue Synthesizer's development at the Bioacoustics and Biocommunications Branch of the Armstrong Laboratory.

The March 5 issue of *Science* (p. 1405) mentions the funding of the second trial of the underwater sonic thermometer, led by Walter Munk of the Scripps Institution of Oceanography. This time the signals will be generated off Hawaii and the California coast and will be quite a bit lower in level than those sent from Heard Island (see feature article in *Echoes*, vol. 1, no. 4, 1991).

Hair cell regeneration in the inner ear is also a "hot topic" in today's media. While the regeneration of avian hair cells is not recent news, two articles in the March 12 issue of *Science* report on evidence of regenerating hair cells in mammals, even humans (pp. 1616 and 1619). This research, conducted by scientists at University College London and the University of Virginia School of Medicine, focussed on sensory epithelia in the vestibular system rather than in the cochlea. A summary of this topic also appears in the July issue of *Scientific American*.

MARINE MAMMALS—from pg. 7

number of marine mammals incidental to their activities.

Ironically, the intense broad-band noise levels of 170-220 dB (re 1 μ Pa) produced by the commercial shipping industry have never been subject to regulation. In fact, short-term noise signals from marine mammals themselves have been measured at 185-190 dB (re 1 μ Pa).

The 120-dB criterion happens to be only 10-30 dB above the ambient level in the ocean in the relevant one-third-octave bands. Many discrete natural noise sources can exceed 120 dB. The behaviors on which the criterion is based are often so subtle that they can only be detected statistically in studies with large samples. Moreover, the biological consequences of these changes in behavior have never been shown to be detrimental. For example, it is difficult to know whether the responses reflect annoyance or just the natural wariness of a naive animal, in which case the animal could habituate without any adverse effect. If a whale deviates by less than a kilometer on a 9000 km migration because he hears a strange noise, is this evidence that it has been harassed in an important way?

It is clear that marine mammals are very dependent on sound as a source of information about their environment and there is a need to limit their exposures to harmful levels of noise. Considerable research and debate will be needed, however, before the 120-dB guideline can be translated into a fair and meaningful standard. Technical input is badly needed from scientists, government scientific review committees, such as CHABA and the Ocean Studies Board, and ASA and ISO standards committees. ASA's Animal Bio-

acoustics Technical Specialty Group will convene an evening panel discussion on this problem at the Denver meeting, bringing together experts from the National Marine Fisheries Service and the ASA.

Anyone interested in the problem may contact William Cummings, who chairs ASA's Animal Bioacoustics group (619) 453-3257, or Ann Bowles (619) 226-3873 (e-mail bowles@munk.ucsd.edu).

*Ann Bowles
Hubbs-Seaworld Research Institute*

Report on the effects of low-frequency sound on marine mammals to be available

The National Research Council's Ocean Studies Board has convened a committee to study the effects of low-frequency sound on marine mammals. The committee, consisting of several ASA members, is chaired by David Green. Its charge is to review the current state of knowledge and ongoing research, advise the sponsors about the effects while considering the trade-offs between the benefits of underwater sound as a research tool and the possibility of harmful effects, and to recommend needed research. The report should be available from the NRC in late August or early September by calling Robin Rice (202) 334-2714.



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