

The newsletter of
The Acoustical Society of America

ECHOES

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Art, architecture and acoustics

An exclusive interview with Leo Beranek

Echoes is fortunate to have this glimpse of Leo Beranek's life and career through an interview conducted by another grey eminence in acoustics, Bill Cavanaugh. Bill, also an ASA Fellow and active contributor, is a long-time member of the Architectural Acoustics Technical Committee and active in the administrative Committee on Archives and History, having recently retired as its chairman. Bill worked with Leo at Bolt Beranek and Newman from 1954 through 1970, where he served as Divisional Vice President and Director of the Architectural Technologies Division.



Leo Beranek conducts the Boston Symphony Orchestra

Leo, what drew you to the field of architectural acoustics? Did you become interested before or during your college years?

Cav, it all began with a one-tube radio that my father bought in 1924, just as I turned ten. I was fascinated with

the set and within a year I said that I wanted to go to college and become a radio engineer. My father helped further. In my high school sophomore year in Mt. Vernon, Iowa, he bought me an International Correspondence Schools course on radio. Dad was co-owner of a store in Mt. Vernon that sold radios, hardware and farm machinery.

They hired a Cornell College student (in Mt. Vernon) to install and service the radios. When I finished the ICS course, Dad asked the Cornell student if he would take me on as an apprentice. He did, and I worked with him until he graduated two years later.

At the beginning of my freshman year in College in 1931, I became the "radio repair man" of Mt. Vernon. I was very successful and radio servicing was one of my sources of income throughout my college years. In my junior year, the head of the speech department at Cornell

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"We hear that . . ."

Alan Powell, recently retired President of the Acoustical Society of America, will receive the American Society of Mechanical Engineers' Gold Medal in December.



The recently issued 1991 directory of **National Council of Acoustical Consultants** contains a handy matrix of member specialties and advice on the selection of acoustical consultants.



Penn State's Telecommunications Program in Acoustics was selected the outstanding new degree program by the National University Continuing Education Association (NUCEA). The program was developed by Penn State's Graduate Program in Acoustics (headed by ASA's Vice President Elect, **Jiri Tichy**) in cooperation with the Applied Research Lab, ARL (directed by ASA member **Ray Hettche**). Program directors are **Alan Stuart** and **Richard Stern**.



This is the time of year libraries start pruning magazines and journals from their subscription lists. Stop by to chat

with your local university or company librarian to make sure JASA remains available for other researchers to read.

Some concern has been expressed about page charges, but it should be noted that a charge for JASA at \$60 per page doesn't match actual costs of \$200 per page.



The first recipient of the **Dennis Klatt Award**, jointly sponsored by the ASA and ASHA Foundation, will be announced at the Houston Meeting. Evaluation of candidates is currently underway by a joint ASA/ASHA committee consisting of **Ken Stevens**, **Ralph Ohde**, **Diane Kewley-Port**, **Ingo Titze** and **Theodore Glattke**.



A number of ASA members have been invited to an upcoming meeting with Soviet colleagues at Woods Hole on U.S. Strategies for Cooperation with the Soviets on Ocean Sciences.



Joanne Miller is the editor-in-chief of an impressive three-volume set of reprints in speech communication soon to be published by the ASA.



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Newsletter of the
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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. This newsletter is provided as a free benefit of membership to all Acoustical Society members.

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New standards would curb federal employee participation in professional societies

The Office of Government Ethics has proposed new standards that, if adopted, would curb the participation of federal employees in certain professional society activities. The proposal was published in the July 23 *Federal Register* on p. 33778. Of particular concern to some scientific societies is Section 2635.806(b) on p. 33811, which restricts federal employees from holding office in professional societies unless they perform their duties entirely on their own time. The proposed regs also tighten the rules on attending meetings and programs, and may extend to the editorship of scientific journals. According to Fred Spilhaus, Executive Director of the American Geophysical Union, "If these new rules go into effect, scientific societies will lose the talent and energies of a substantial number of their members."

To obtain further information or a copy of the proposal, call the Office of Government Ethics at (202)523-5757.

Society sponsors physics students

This year the Acoustical Society again supported the International Physics Olympiad. The ASA donated \$3,000 to sponsor high school students so they could compete in this summer's events which took place in Havana, Cuba.

The Acoustical Society . . . “of America”

Charles Schmid, Executive Director

Perhaps some issues are best left unexamined by technical organizations, especially those that only evoke emotional discussion and haven't much hope of resolution. The “of America” at the end of our Society's name may fall into this category. Nevertheless, a few observations from the Baltimore meeting and our recent questionnaire for the Directory are worthy of notice.

First, it is interesting to note that 17% percent of our Society's membership are from overseas: 9.3% from Europe, 5.5% from Asia, 1.3% from Australia and New Zealand, 0.5% from Central and South America, and 0.2% from Africa. (This does not include the 3.8% from Canada and Mexico; my Canadian friends have long since informed me that they too are in North America.)

It is also interesting that at Baltimore our editor-in-chief reported that almost 40% of the authors in JASA are from overseas, more than twice the percentage of the overseas membership.

In addition, although they reside in North America, all five primary speakers at the Baltimore plenary were born in Europe. Retiring President Alan Powell (Great Britain) received the tuning fork from President Eric Ungar (Vienna). The R. Bruce Lindsay Award was awarded to Yves Berthelot (Paris) and Joseph Cuschieri (Malta). Four of the five obtained most of their formal education in Europe; and, interestingly enough, three got degrees from the University of Southampton (Powell, Berthelot and Cuschieri). The Gold Medal was awarded to Manfred Schroeder (Germany), who received his degrees from the University of Gottingen where he is now Director of the Drittes Physikalisches

Institute. He maintains homes both in Gottingen and Berkley Heights, New Jersey.

How did we arrive at the name the “Acoustical Society of America”? It was on December 27th, 1928 at a meeting at Bell Telephone Labs, called to order by Dayton Miller and presided over by Harvey Fletcher. The minutes indicate that the initial name proposal was for the “American Acoustical Society,” which was quickly replaced by a motion for the “Acoustical Society of America.” The motion passed with only one dissenting voter, obviously not concerned with adjectives, who held out for the “Acoustic Society of America.”

Sixty years ago, in 1931, less than 7% of the membership was from overseas. Thirty years ago, in 1961, Robert Beyer, a member of the ASA Committee on International Relations and past president of the ASA, reported that 7.6% of the membership was from overseas, and 9% of JASA was being written by foreign authors. According to the minutes, another member of the committee,

F.V. (Ted) Hunt, “pointed out that the ‘of America’ in the name of the society may operate as an inhibiting factor in the promotion of the Society in the international field.”

Their group dissolved in November of that year, exactly 30 years ago, without resolving this issue. Nor are we going to resolve it here today.

Today, with an overseas membership of 17%, maybe we need only state that the Acoustical Society “of America” is an organization for acousticians around the world which has its offices and its meetings in America. But we must never forget that we rely on our overseas members—either by birth or residence—for important contributions to society leadership, to the ASA journal, and to the development of standards.

Perhaps this topic will not be brought up for another thirty years, but it needs to be revisited now and then.

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Foiled by noise

Two men were arrested in Miami in April as police caught them red-handed attempting to break into the Cash Mar Pawnshop. The police were summoned by a wailing burglar alarm, which the burglars failed to hear over the noise from the portable generator and power saw they were using to cut through the pawn shop's steel door. (Reported in the *East Side Weekend*, Cincinnati Ohio, August 22-28, 1991.)

“Whoever, in the pursuit of science, seeks after immediate practical utility, may generally rest assured that he will seek in vain.”

Hermann von Helmholtz
Academic Discourse, 1862

Interview with Leo Beranek

ABOUT LEO BERANEK

Leo L. Beranek is a past president and Fellow of the Acoustical Society of America, and a recipient of the Society's Gold Medal, Wallace Clement Sabine Award in architectural acoustics, and the Biennial Award (now the R. Bruce Lindsay Award). He is also co-founder of the well known acoustical consulting firm Bolt Beranek and Newman and is re-

nowned for his work in noise control and concert hall acoustics. He is justifiably considered a grey eminence in acoustics, both in the U.S. and throughout the world.

Leo's long list of contributions to the field include such classics as *Noise and Vibration Control*, recently revised and published by the Institute of

Noise Control Engineering, and *Music, Acoustics, and Architecture*, which will soon be re-issued by ASA. He is admired and appreciated not only for his technical work, but also as a patron of the arts. Not long ago, WCBR-FM radio in Boston declared him Person of the Year and named a music fellowship in his honor.

INTERVIEW—from page 1

came to me saying that the college had bought a small recording machine and wondered if they could hire me to operate it.

He wanted to record his students' voices at the beginning and end of his speech course. First, however, a studio was needed and that started my interest in acoustics. With the aid of publications in the college library, I designed a small studio, which the college built.

What did you do after graduating from Cornell?

I did my graduate work in the Applied Physics Department at Harvard University beginning in 1936. At the end of my first year, Professor Frederick Hunt asked me to become his half-time assistant. His field of research was acoustics. I learned much of what was known about the field of acoustics from his lectures and in helping with his research. I decided to do my doctoral thesis in the field.

I received my doctorate in June 1940 and joined the faculty at Harvard. World War II was already under way

in Europe. That fall, under funds supplied by the U.S. National Defense Research Committee, I was appointed Director of Harvard's newly formed Electro-Acoustic Laboratory, where I became acquainted with the latest sound measuring equipment.

When did you become involved in concert hall acoustics?

Well, in 1948, Richard Bolt and I formed a partnership, which soon included Robert Newman and became Bolt Beranek and Newman. Our first "official" job was a

major consulting contract with the architects for the United Nations Headquarters in New York City. We had to design four large auditoriums, many conference rooms and broadcast/translation studios, as well as to quiet all rooms and the air conditioning equipment. We also had to worry about eliminating the street noise from outside.

In the next few years, we designed many school auditoriums and consulted on the acoustics of churches, motion picture theaters, and a wide variety of listening spaces. Our first major concert hall projects came in the early 1950s. We consulted for architects on halls in Cambridge, Chicago, Detroit, New York, Vancouver, Berlin, Israel, and Venezuela. A most significant engagement began in about 1956 when we were retained by the Boston Symphony Orchestra to improve the acoustics of the Tanglewood Music Shed at their summer home in Lenox, Massachusetts.

The Tanglewood Music Shed was a large "no-frills" structure built at minimum cost in 1939 and had neither a suitable performance stage environment nor other interior features that we take for granted today in concert halls. Dick Bolt, Bob Newman, Russell Johnson, and I worked with the BSO management for nearly two years to understand adequately the acoustical design for this very large fan-shaped listening space. Only then was the renowned architect, Eero Saarinen, engaged to convert

"It all began with a one-tube radio that my father bought in 1924, just as I turned ten. I was fascinated with the set and within a year I said that I wanted to go to college and become a radio engineer."

Results of 1990 member salary survey now available from AIP

The latest salary report, "1990 Salaries: Society Membership Survey," is available from: Education and Employment Statistics Division, AIP, 335 East 45th Street, NY, NY 10017-3483. According to the report, the median salary for AIP society members overall reached \$54,000 in 1990. The median salary reported by Ph.D.'s rose from \$55,000 in 1989 to \$58,000 in 1990. This represents a 5.5% annual increase, matching the 5.3% inflation rate as measured by the Consumer Price Index. Ph.D.'s working in industry reported the highest salaries. Ph.D.'s in Pacific states report the highest overall median salary of \$61,300.

Interview with Leo Beranek

our acoustical design into "architecture." Reopened in 1959, the Tanglewood Shed is now recognized as one of the world's great halls for symphonic music.

And when did you begin your studies for your epic 1962 work, *Music, Acoustics, and Architecture*? This book contained previously unavailable technical as well as objective and subjective acoustical data on some 55 concert halls in 16 nations.

Cav, the true beginning of my research was listening to concerts by the Boston Symphony Orchestra during my years in graduate school at Harvard. Even before then I attended concerts in Orchestra Hall in Chicago, because there was no professional orchestra in Iowa. In 1948 I taught for one year in the University of Buenos Aires and had the opportunity to hear concerts in their acoustically famous Teatro Colon. During the next decade, I attended national and international acoustical meetings, where I took every opportunity to hear concerts in cities of North America and Old World cities, including, London, Munich, Stuttgart, Copenhagen, Gothenburg, Helsinki, and Zurich. During these times I became acquainted with many acoustical consultants who would later supply objective data and helpful criticism for the book.

In 1956, the New York architectural firm of Harrison and Abramovitz retained BBN as their acoustical consultant on the design of Philharmonic Hall in New York, which eventually opened in 1962. Immediately, I accelerated my studies on concert hall acoustics and on halls throughout the world. The decision to put all this in a book came later. Whenever possible, I made special trips to hear concerts in well known halls in England, the U.S., and continental Europe. I collected all available photographs and architectural drawings on the halls. I also arranged interviews with important orchestra and opera conductors of that day and with music critics in many cities. My colleagues at Bolt Beranek and Newman made acoustical measurements in the American halls and in halls in other countries for which we were consultants. Russell Johnson assisted with a number of the interviews. It was relatively easy to obtain interviews and objective data because of BBN's prestigious association with the Philharmonic Hall project.

Now Leo, which concert halls do you think have the best acoustics?

Cav, that's a difficult question because each hall's acoustics is unique. Further, the best orchestras adjust

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Interview with Leo Beranek

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their playing to suit the halls in which they play often. Also, as anyone involved in musical acoustics knows, other non-acoustical factors can have a profound influence on one's judgment, such as the general architectural ambience, the comfort of the seats, and the kind of lighting.

Generally speaking, today, there are four basic architectural motifs within which one can design successful acoustics. The oldest is the rectangular hall, commonly called the "shoebox" type. Second, the large fan-shaped Tanglewood Shed demonstrated the feasibility of using overhead hanging panels to achieve good acoustics. Then, Berlin's Philharmonie Hall introduced the segmented, nonsymmetrical audience arrangement we call the "vineyard" type. Finally, Christchurch Town Hall in New Zealand was the first extensive use of multiple upper-sidewall reflectors in an oval-shaped hall, which I call the "directed lateral-reflection type."

Any one of these four can be combined with coupled large "reverberant chambers" to produce a long reverberation time while preserving clarity of the sound. The acoustical design of the Meyerson Symphony Center in Dallas is a recent example.

The best example of the "shoebox" type is the 1680-seat Grosser Musikvereinssaal in Vienna. The best of the large shoebox halls is the 2600-seat Boston Symphony Hall. Tanglewood is the best of the "large-seating-capacity, overhead-hanging-panel" halls. The Orange County Performing Arts Center in Southern California is probably the best of the "vineyard" halls. And the Christchurch Town Hall is, in my opinion, the best of the "directed sidewall reflector" type.

Leo, which hall is your personal favorite?

Cav, I enjoy music in all of the four hall types just mentioned. In many ways, I like the front half of the Tanglewood Music Shed best, though for "comfortable old-shoe" reasons I prefer Boston Symphony Hall. Visually, the most beautiful hall in the world with good acoustics is, in my judgment, the renovated Schauspielhaus in Berlin.

You speak of listening to music in halls as one of your bases for judging the quality of the acoustics. What does an experienced listener listen for?

I have a check list of six or so items. First, I listen to whether the orchestra is intimately connected to me acoustically, as opposed to sounding as though it were remote or in a separate room.

Second, I listen for the reverberation. If the early reverberation is right, the music takes on a "singing" sound and the orchestra seems to expand laterally. Longer-time

reverberation gives body, loudness, and tonal quality to the music and makes it appear to surround you. It's like being immersed in the music.

Third, I listen for orchestral balance. The low-register strings, the string basses and cellos, must be in proper balance with the violins, violas, and woodwinds. Also, the brass and percussion must not dominate.

Fourth, there can be no "distortion," that is to say, the music must sound true and have a pleasant acoustical patina. This is accomplished in most halls by fine-scale surface irregularities on the wall and ceiling reflecting surfaces.

Fifth, the sound must be sufficiently loud, which is not possible if the room is too large or the "late" reverberation time is too short.

Finally, there must be no noise, echoes or other undesirable acoustical phenomena.

In addition to these measurable acoustical factors, I listen for the blend of the instrumental sounds on the stage and try to judge whether the orchestral ensemble is achieved easily or with difficulty by the players. When the musicians hear themselves and the other players well,

they produce better sound as a group in just about any hall.

I understand that the Acoustical Society plans to reissue your book, *Music, Acoustics, and Architecture*. Do you intend to make any changes?

Yes, Cav, I plan rather significant changes. I will delete the information on about a dozen of the halls, either because they no longer exist or they are not used principally for orchestral or operatic music. And I intend to add about 24 important halls that have opened since the

AIP offers "Communicating with Congress" kit to member societies

In response to requests from several member societies, AIP's Washington office has developed a kit called "Communicating with Congress." The introductory materials point out that scientists, as a group, take very little interest in public policy concerns, to the dismay of many elected officials. The kit consists of viewgraphs, talking points, and handouts on such topics as how the legislative process works, how Congress authorizes funds, and how to communicate with members of Congress.

The kit could be helpful to ASA members who wish to draw congressional attention to science issues on behalf of their universities, institutions, or citizens groups. The kit is available free of charge from AIP staff members Richard Jones or Audrey Leath at (202)234-7058.

Calendar

Upcoming meetings

ASA & CO-SPONSORED MEETINGS

November 4-8—Acoustical Society of America at Houston.

See back pages of the September *JASA* for list of sessions. The program will be sent to you in mid-October.

November 8-9—Workshop in Musical Acoustics at Houston.

January 27-31—American Geophysical Union, Ocean Sciences Meeting, New Orleans.

March 4-6—Second International Congress on Recent Developments in Air- & Structure-Borne Sound and Vibration, Auburn University, International Calendar. For more detail see *JASA*.

INTERNATIONAL MEETINGS

(check September *JASA* for details)

November 26-29—Western Pacific Regional Acoustics Conference IV, Brisbane.

December 2-4—INTER-NOISE 91, Sydney. See June 1991 issue of *Noise News*.

December 4-5—Auditory Processing of Complex Sounds, International Discussion Meeting, London.

March 23-26—International Conference on Acoustics, Speech and Signal Processing, IEEE, San Francisco.

April 5-8—International Symposium on Doppler Effect in Diagnostic Ultrasound, Brighton, England.

April 14-17—Second French Conference on Acoustics, Arcachon, France.

May 26-29—International Symposium on Acoustic Remote Sensing and Associated Techniques of the Atmosphere and Oceans, Athens. Write P.O. Box 200048, GR 1118 10 Athens, Greece.

June 23-25—AICB Congress "Aims for Noise Abatement in Future Europe," Prague.

July 29-31—6th Federation of Acoustical Societies of Europe (FASE) Congress, Zürich.

September 3-10—14th International Congress on Acoustics (ICA), Beijing. Pick up a flyer at ASA's registration desk in Houston or call the ASA at (516) 349-7800 to request one.

EPA noise program report available

The Spring 1991 issue of *Echoes* carried an article about the possible revival of EPA's Office of Noise Abatement and Control. An examination of the policy, administrative, and technical questions relating to a renewed federal noise program is currently being conducted by the Administrative Conference of the U.S. A report entitled "The Dormant Noise Control Act and Options to Abate Noise Pollution," and its technical appendix "Noise and its Effects," are now available from the Administrative Conference at 2120 L St., NW, Suite 500, Washington, D.C. 20037, or by calling David Pritzker at (202) 254-7065.

Establishing ties with Soviets

The Scientific and Technical Center "MODUL" would like to be contacted by any firms or universities in the U.S.A. that are interested in studying sources and propagation of acoustical energy, especially to decrease levels of noise and vibration in industry, construction, and transportation.

The Center's director in Leningrad (now St. Petersburg), Alexey Usov, conveyed his request to Red Wetherill in California in May of this year. The Soviet government has undergone tremendous changes since the letter was written, but the center is probably even more interested than ever in establishing technical ties with U.S. organizations. For more information contact Red at (415) 391-7610.

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