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# BUILDING

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# ACOUSTICS

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# STAFF

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**U.S. DEPARTMENT OF COMMERCE / National Bureau of Standards**  
National Engineering Laboratory / Center for Building Technology





## Thomas W. Bartel

Physicist (Acoustics)  
Environmental Design Research Division  
Center for Building Technology  
National Bureau of Standards

B.S., Physics, Valparaiso University, 1966  
M.A., Physics, Washington University, 1969

Mr. Bartel joined the CBT staff in February 1979 to do research in building acoustics directed at improving the absorption of sound in buildings and the noise isolation between building elements. This program includes the development of methods to measure the amount of acoustic absorption existent in a semi-reverberant room and to characterize the transmission of sound from external sources into a room.

Arriving at NBS in 1973, Mr. Bartel has been involved with research on the behavior of sound in reverberant sound fields. In conjunction with this work, he has been responsible for the development of an automated data acquisition system for the NBS reverberation room. He has made use of this system in experiments to determine the precision of measurement of sound absorption of building materials in reverberation rooms and to characterize the qualification of reverberant materials for the measurement of sound power emissions.

Prior to coming to NBS, Mr. Bartel was assigned by the U.S. Army to the Goddard Space Flight Center in Greenbelt, Maryland, where he was responsible for developing tests to measure the field performance and frequency stability of several experimental hydrogen maser precision frequency standards used to fulfill the timing requirements for the tracking network during Apollo missions.

### Publications:

"Digital Processing of Decay Rates for Reverberant Sound Fields," in *Inter-Noise 74 Proceedings*, edited by J. C. Snowden, (Washington, D.C., October 1974), co-author.

"Recent Reverberation Room Qualification Studies at the National Bureau of Standards," *Noise Control Engineering* 7, 71-80 (1976) co-author.

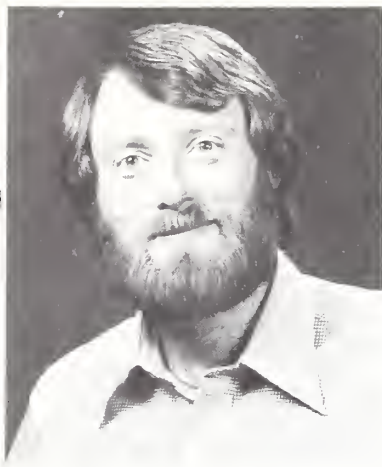
**Interactive Computer Program for the Determination of Reverberation Time**, National Bureau of Standards Internal Report 77-1383 (December 1977).

**Interactive Computer Program for the Determination of Sound Power**, National Bureau of Standards Internal Report 77-1384 (December 1977).

"Studies on the Spatial Variation of Decaying Sound Fields," *The Journal of the Acoustical Society of America* 63, 1841-1850 (1978) co-author.

"Studies on the Variation of Absorption Coefficient with Absorber Geometry," to be published.





Jay W. Bauer

Research Psychologist/Psychoacoustician  
Sensory Environment Program  
Center for Building Technology  
National Engineering Laboratory  
National Bureau of Standards

B.A., Psychology, University of California at  
Los Angeles, 1969.

Ph.D., Psychology, University of California at  
San Diego, 1974.

Dr. Bauer recently joined the CBT staff (7/78). For the year previous to that, he was on an IPA assignment to CBT from Northeastern University. Dr. Bauer has been involved in developing a psychoacoustic research program on the human response to highway traffic noise. He has also been responsible for developing CBT's psychoacoustic research facility, which will be used to conduct research directed towards developing building design criteria for noise.

Prior to Dr. Bauer's assignment to NBS, he was a consultant on an EPA contract at Northeastern University in Boston. While in that capacity, he was responsible for the analysis of various methods for predicting the loudness and acceptability of noise. Dr. Bauer was an NIH postdoctoral fellow in otolaryngology at the Massachusetts Eye and Ear Infirmary prior to his position at Northeastern University. While there, he conducted research on the sensory processes of the mammalian auditory system and did work on the basic theories of hearing.

Born in Columbus, Ohio, 1947, Dr. Bauer received his B.A. in Psychology from U.C.L.A. and Ph.D. in Psychology from U.C.S.D. where he obtained training in psychoacoustics, sensory neurophysiology and vision.

Principle Technical Interests:

Measurement of human response to noise and the effects of noise on people, and the basic mechanisms of hearing

Publications:

- "The Electrophysiological Correlates of Loudness Enhancement," Doctoral Thesis, University of California, San Diego, 1974.
- "Evoked potential correlates of auditory detection," (co-author), Science 172:1357-1360 (1971).
- "Computer signal detection by monitoring auditory evoked potentials," (co-author), Perception & Psychophysics 11:301-308 (1972).
- "Loudness enhancement following contralateral stimulation," (co-author), JASA 52:141 (abstract) and JASA 52:1127-1131 (1972).
- "Electrophysiological responses evoked during loudness enhancement in man," (co-author), JASA 44:426 (abstract) (1974).
- "Evoked potentials in cat auditory nerve: suppression by prior tonal stimulation," (co-author), Perception & Psychophysics 17:43-47 (1975).
- "Loudness enhancement in man. I. Brainstem evoked response correlates," (co-author), JASA 57:165-171 (1975).
- "Forward 'masking' of responses from single fibers of the cat auditory nerve," JASA 61:S28 (1977).
- "Comparison of various methods for predicting the loudness and acceptability of noise," (co-author), U.S. Environmental Protection Agency Report, EPA 550/9-77-101 (1977).
- "Effects of Time-Varying Noise on Human Response: What is known and what is not," (co-author), Proceedings of the Third International Congress on Noise as a Public Health Problem: Biological and Behavioral Effects," (in press).
- "Tuning curves and masking functions of auditory-nerve fibers in cat," Sensory Processes, in press.



William F. Danner

Research Psychologist-Psychoacoustics  
Sensory Environment Program  
Center for Building Technology  
National Bureau of Standards

M.A., Psychology, Washington University, 1975.  
B.S., Psychology, University of Wisconsin, 1970.

Mr. Danner is engaged in the development and implementation of the Sensory Environment Program's psychoacoustics laboratory, incorporating state-of-the-art technologies in acoustics, electroacoustics, and psychoacoustics to provide a facility capable of investigating auditory perception and the human response to acoustical environments.

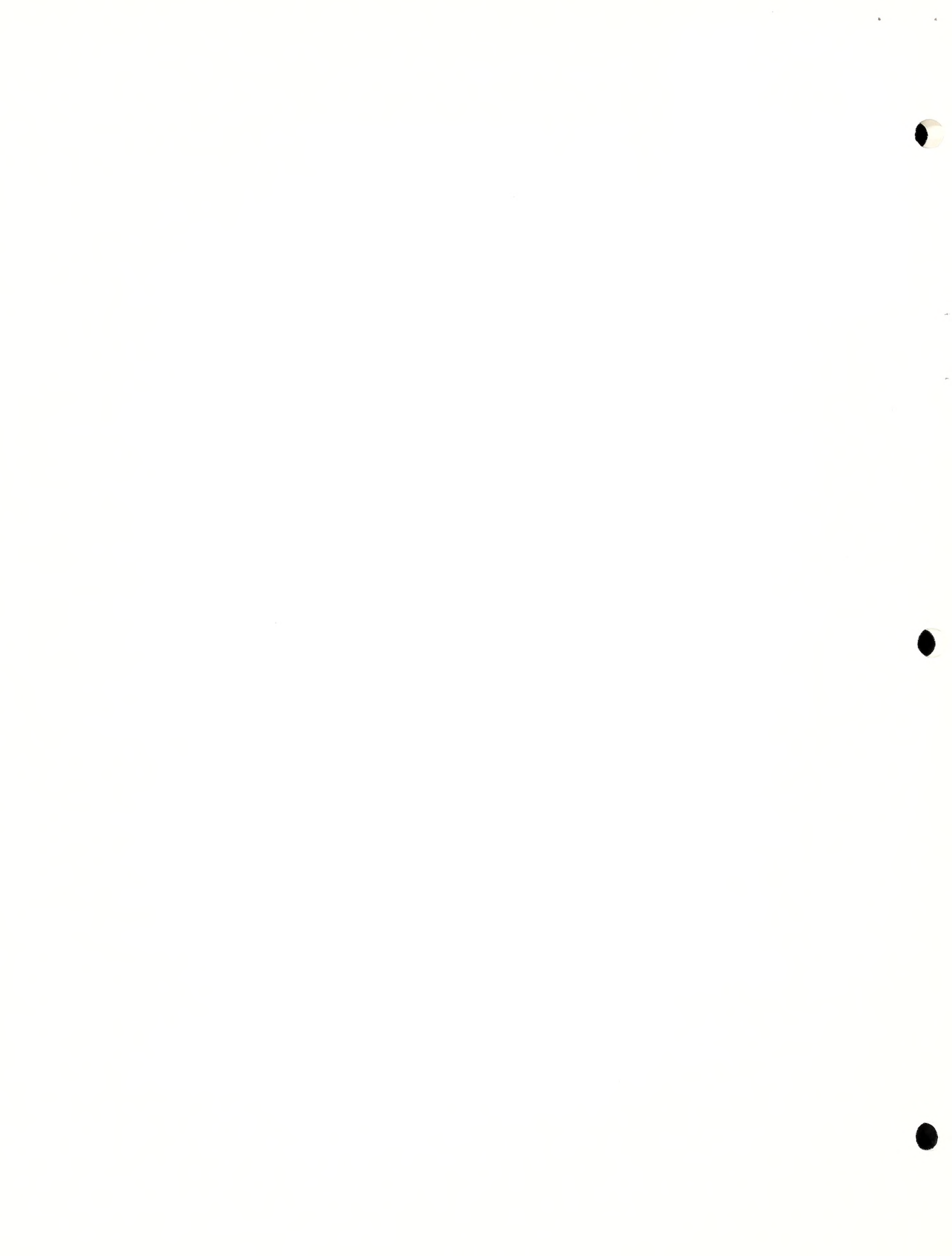
Mr. Danner has identified the needs concerning auditory localization and binaural perception in laboratory facilities as they relate to the acquisition of data on the human response to an acoustical environment; and alternatively the use of semirealistic (living room like) environments for psychoacoustic research.

Mr. Danner has served as a liaison between the programs of the Sensory Environment Program and the Sound, Applied Acoustics, and the Environmental Noise Programs of the National Engineering Laboratory.

Prior to coming to NBS Mr. Danner was a Research Assistant at the Central Institute for the Deaf in St. Louis, Missouri, where he was in charge of technical and theoretical aspects of ongoing research in the Psychoacoustics Laboratory. Mr. Danner's experience also includes work as a Research Assistant at the University of Wisconsin where he was responsible for laboratory operation in physiological psychology studying brain function and the behavioral correlates thereof.

#### Publications

"Discrimination of Time Intervals Marked by Brief Acoustic Pulses of Various Intensities and Spectra," Perception and Psychophysics, Vol. 21(2), 125-142, Feb., 1977.





PETER H. HUANG

Physicist  
Environmental Design Research Division  
Center for Building Technology  
National Bureau of Standards

B. S., Physics, National Taiwan University, Taipei,  
Taiwan (Republic of China)  
Ph.D., Physics, Georgetown University, Washington, D.C.

Dr. Huang received his doctorate from Georgetown University in 1977. While there he developed a mathematical theory for acoustic wave propagation in layered media which he verified experimentally.

From 1977 to 1979 Dr. Huang conducted research in the field of surface acoustic waves at the U. S. Naval Research Laboratory, Washington, D.C. as a Research Associate sponsored by the National Academy of Sciences. During this tenure he analyzed leaky mode wave propagation and developed a computer model for its multi-dimensional non-linear optimization. In addition he established the design, testing, and development of high dynamic range and large time-bandwidth surface acoustic wave convolvers/correlators for acoustical signal processing functions.

Dr. Huang joined the staff of the Center for Building Technology in 1979. Since then he has been involved in the investigation of impact sound generated in buildings by footsteps, furniture dragging, and falling objects. The results of this research activity will be used to improve standard methods for measuring and rating impact noise isolation of floor-ceiling assemblies.

Patents:

Dispersion Compensated v/v Acoustic Surface Waveguides Using Diffused Substrates, ONR/NRL No. 63914, 1979.

A Technique for Producing Defect-free Surfaces in Diffused Substrates, ONR/NRL No. 73946, 1979.

Publications:

"Ultrasonic Reflection from a Three-layered Medium",  
Ph.D. Thesis, Georgetown University, Washington, D. C.,  
1977.

"Sonic Phase and Group Velocity in Floating Sea  
Ice Plates," Journal of the Acoustical Society of  
America, Vol. 62, 635 (1977), coauthor.

"Plane Wave Reflection from a Plate Immersed in and  
Floating on a Liquid", Acustica, Vol. 40, 223 (1978).

"Changes in Effective Electromechanical Coupling  
Caused by Metallic Diffusion into YZ-LiN60<sub>3</sub>", IEEE  
Journal of Sonics and Ultrasonics, in press.

"Surface Acoustic Wave Attenuation in Metal Film-  
Coated Delay Lines", Journal of Applied Physics,  
in press, coauthor.

"Improved High Efficiency Surface Acoustic Wave  
Convolvers Using Diffused Waveguides", IEEE, Journal  
of Sonics and Ultrasonics, in press.



## John A. Molino

Research Psychologist  
Environmental Design Research Division  
Center for Building Technology  
National Bureau of Standards

Ph.D., Psychology, Columbia University, 1970  
M.A., Psychology, Columbia University, 1965  
B.A., Psychology and Russian, Columbia College, 1963

John Molino joined the staff of the National Bureau of Standards in 1969. He has worked as a research psychologist for the Sound Section, for the Environmental Noise Program Team, and for the Acoustical Engineering Division. This research focused on measurement scales for the loudness, annoyance and aversiveness of sounds for application in noise abatement and noise control.

Dr. Molino was a Eugene Higgins Fellow at Columbia University (1963-1964) and an exchange student in psychology at Moscow State University (1965-1966). He has taught at Columbia University, Montgomery College and the University of Maryland. While at the National Bureau of Standards, he has directed psychoacoustic research projects for various government agencies. These projects have investigated fog horn sounds for the Coast Guard, appliance noises for the Environmental Protection Agency, and corona noise from high voltage transmission lines for the Department of Energy. His present research concerns human response criteria for noise in and around buildings.

### Publications:

"Is There a New Soviet Psychology?" In A. Simirenko (Ed.) **Social Thought in the Soviet Union**. Chicago: Quadrangle, 1969.

"Auditory Space Perception," In B. Wolman (Ed.) **International Encyclopedia of Neurology, Psychiatry, Psychoanalysis and Psychology**. New York: Aesculapius Publishers, 1977.

"Annoyance and Noise," In C. M. Harris (Ed.) **Handbook of Noise Control**. 2nd Edition. New York: McGraw Hill, 1979.

"Perceiving the Range of Sound Source When the Direction is Known," **J. Acoustical Society of America**, Vol. 53, 1973.

"Pure-Tone Equal-Loudness Contours for Standard Tones of Different Frequencies," **Perception and Psychophysics**, Vol. 14, 1973.

"Equal Aversion Levels for Pure Tones and 1/3-Octave Bands of Noise," **J. Acoustical Society of America**, Vol. 55, 1974.

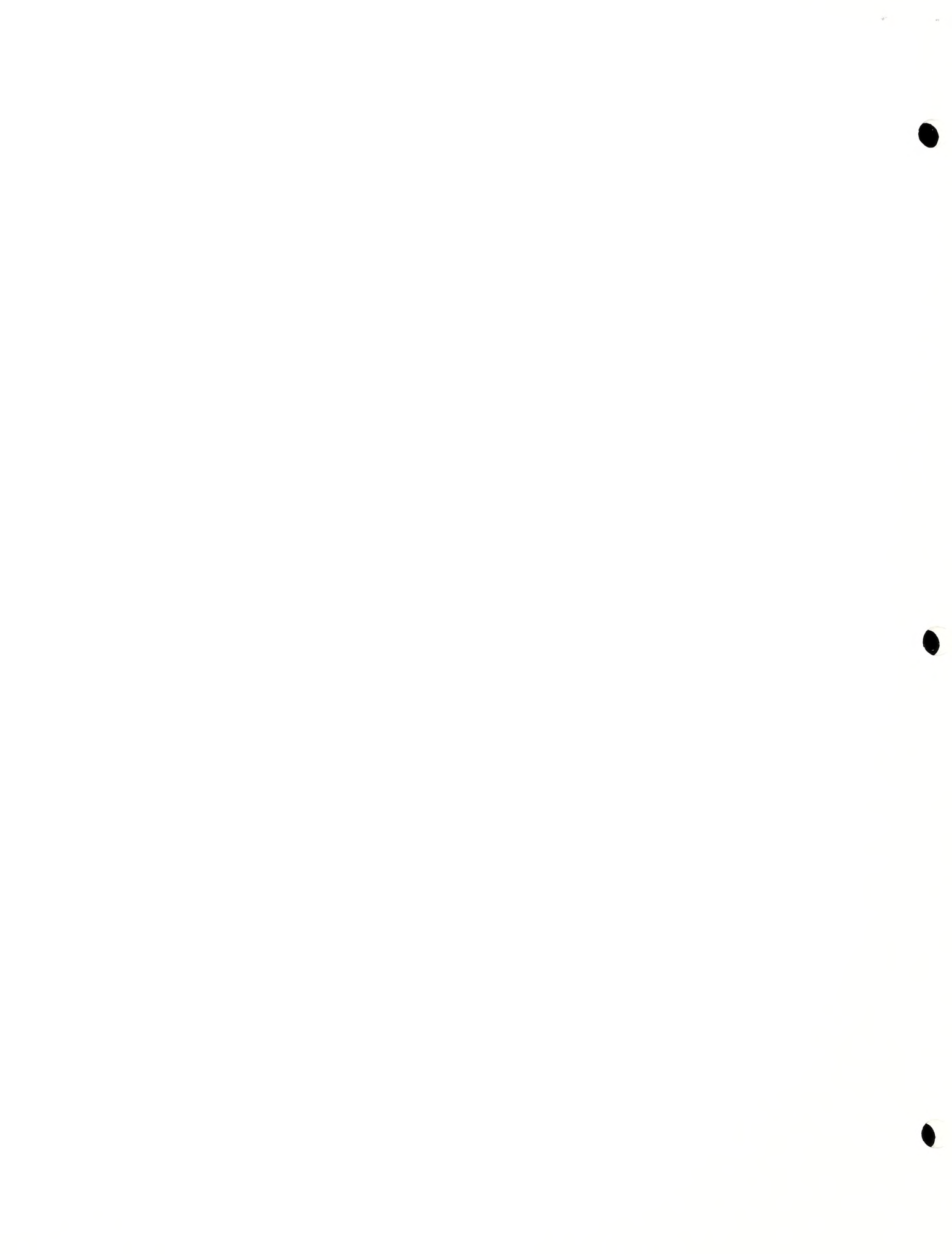
"Psychophysical Verification of Predicted Interaural Differences in Localizing Distant Sound Sources," **J. Acoustical Society of America**, Vol. 16, 1974.

"Toward a More Musical Foghorn," **Human Factors**, Vol. 16, 1974, co-author.

**Psychophysical Evaluation of Acoustic Navigation Aids: Preference and Aversiveness**. National Bureau of Standards, NBS Report 10 960, 1972, co-author.

**Noise and Speech Interference: Proceedings of a Minisymposium**, In W. T. Shepherd (Ed.), NASA Technical Memorandum, TM X-72696, 1975.

**Preliminary Tests of Psychoacoustic Facilities and Techniques for Studying the Human Response to Transmission Line Audible Noise**, Dept. of Energy Res. HCP/T-6010 EZ, 1977, co-author.



FRED F. RUDDER, JR.

Physical Scientist  
Environmental Design Research Division  
Center for Building Technology  
National Bureau of Standards

B.S., Aeronautical Engineering, Georgia Institute  
of Technology, 1963

M.S., Aeronautical Engineering, Georgia Institute  
of Technology, 1965

Graduate Studies, Georgia Institute of Technology,  
1965-67

Three months study at Institute for Sound and  
Vibration Research, University of Southampton,  
England, 1970

Mr. Rudder joined the CBT staff in August 1979 to  
conduct research in building acoustics and vibration  
directed at improving noise isolation design and  
field verification measurements of building elements.  
This program includes the development of standard  
field measurement methodologies and design guidelines  
to characterize building element noise isolation  
performance.

Prior to joining NBS, Mr. Rudder was a senior acoustical  
consultant for Science Applications Incorporated. He  
was responsible for directing projects in the areas of  
surface transportation noise, construction noise,  
environmental noise, structural dynamics and architectural  
acoustics.

Prior to joining SAI, Mr. Rudder was a principal member  
of a private acoustical consulting firm. His activities  
comprised community noise surveys, research in sonic  
fatigue, architectural acoustics, and noise control projects.  
Prior to forming the consulting firm, Mr. Rudder was  
employed by the Lockheed Aircraft Corporation. At  
Lockheed, Mr. Rudder engaged in research projects in  
structural dynamics and acoustic fatigue. Mr. Rudder was  
an alternate member (US) on the AGARD working group for  
sonic fatigue design methods.

During 1963-1964, Mr. Rudder was a Tau Beta Pi fellow  
at the Georgia Institute of Technology, Mr. Rudder is  
a registered professional mechanical engineer.

Publications:

"National Roadway Traffic Noise Exposure Model", U.S. Environmental Protection Agency, Report No. EPA 550/9-(to be assigned), 1979.

"User's Manual: FHWA Highway Traffic Noise Prediction Model, SNAP 1.0", U. S. Department of Transportation, Federal Highway Administration Report No. FHWA-RD-78-139, 1979, co-author.

"User's Manual: FHWA Level 2 Highway Traffic Noise Prediction Model, STAMINA 1.0", U. S. Department of Transportation, Federal Highway Administration, Report No. FHWA-RD-78-138, 1979, co-author.

"Impact from Traffic-Induced Vibrations, Executive Summary", U. S. Department of Transportation, Federal Highway Administration Report No. FHWA-RD-78-165, 1978.

"Engineering Guidelines for the Analysis of Traffic-induced Vibration", U. S. Department of Transportation, Federal Highway Administration, Report No. FHWA-RD-78-166, 1978.

"Determination of Impact from Vibrations Related to High Use", U. S. Department of Transportation, Federal Highway Administration, Report No. FHWA-RD-78-167, 1978, co-author.

"Statistical Analysis of FHWA Traffic Noise DATA", U. S. Department of Transportation, Federal Highway Administration, Report No. FHWA-RD-78-64, 1978.

"Update of TSC Highway Traffic Noise Prediction Code (1974)", U. S. Department of Transportation, Federal Highway Administration, Report No. FHWA-RD-77-19, 1977, co-author.

"Sonic Fatigue Design Guide for Military Aircraft," Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio, Report No. AFFDL-TR-74-112, 1975, co-author.

"Acoustic Fatigue Resistance of Aircraft Structures at Elevated Temperatures", in H. T. Nagamatsu (Ed.), Aeroacoustics Fan, STOL, and Boundary Layer Noise; Sonic Boom; Aeroacoustic Instrumentation, Progress in Astronautics and Aeronautics Series, Vol. 38, American Institute for Aeronautics and Astronautics, 1975, co-author.

"Analytical Study for Acoustic Fatigue Design Data", Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio, Report AFFDL-TR-73-155, 1974.

"Acoustic Fatigue Resistance of Internal Airframe Structure", Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio, Report AFFDL-TR-71-107, 1971.

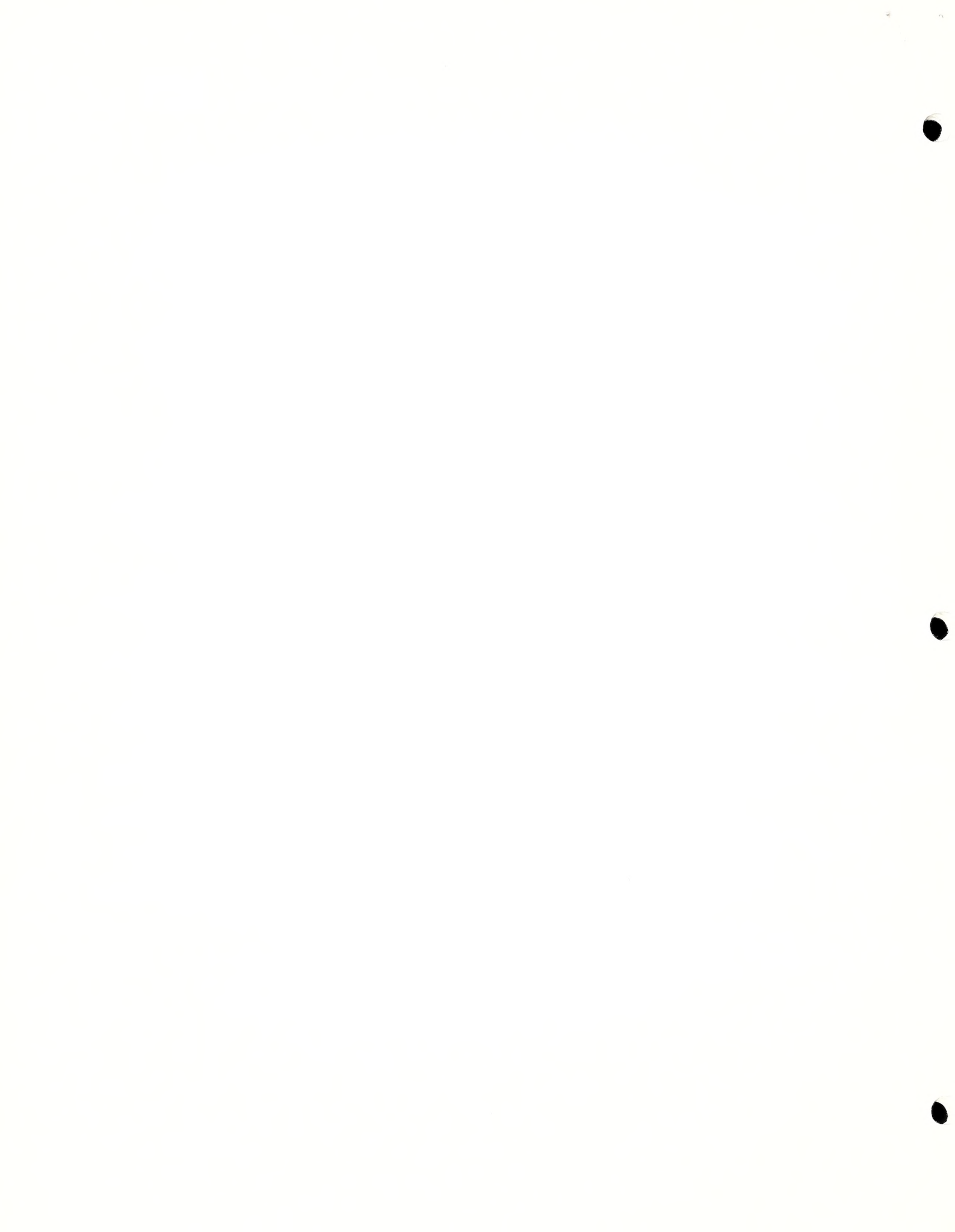
"Study of Effects of Design Detail on Structural Response to Acoustic Excitation", National Aeronautics and Space Administration, Report No. NASA-CR-1959, 1971.

"Normal Mode Displacement, Strain, and Damping Data for a Set of Stiffened Panels", National Aeronautics and Space Administration, Report No. NASA-CR-111988, 1971.

"Effect of Stringer Eccentricity on the Normal Mode Stress Response of Stiffened Flat Panel Arrays", in Conference on Current Developments in Sonic Fatigue, Institute for Sound and Vibration Research, the University, Southampton, England, 1970.

"Charts for Estimating the Effect of Shear Deformation and Rotary Inertia on the Natural Frequencies of Uniform Beams", Shock and Vibration Bulletin No. 39, Part 3, 1969.

"Refinement of Sonic Fatigue Structural Design Criteria", Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base. Report No. AFFDL-TR-67-156, 1967, co-author.







Simone L. Yaniv

Research Psychoacoustician  
Environmental Design Research Division  
National Engineering Laboratory  
National Bureau of Standards

B.S., Experimental Psychology, University of  
Pittsburgh, 1966.

M.S., Noise Control, Bioacoustics and Psychoacoustics,  
University of Pittsburgh, 1968.

Ph.D., Noise Control, Bioacoustics and Psychoacoustics,  
University of Pittsburgh, 1972.

Dr. Yaniv has been employed since August 2, 1974 as a research psychoacoustician at the National Engineering Laboratory at the National Bureau of Standards in Washington, DC. She has primary responsibility for the development of noise research activities, involving both laboratory and field studies, designed to improve noise criteria and test methods used to assess the auditory environment in and around buildings. Prior to her employment at NBS she held a position as a bioacoustical scientist at the Office of Noise Abatement and Control of the U.S. Environmental Protection Agency, where her primary responsibilities were the preparation of the Noise Criteria Document and the Levels Document published by EPA. In addition, she formulated research requirements and programs designed to insure a proper data base upon which noise criteria could evolve that were protective of the public health and welfare. Before coming to Washington, Dr. Yaniv held the position of noise pollution expert consultant to Allegheny County Health Department (Pittsburgh, Pennsylvania) in charge of developing a noise pollution abatement program for Allegheny County.

Publications:

"Building Noise Criteria: A Critical Evaluation,"  
(co-author), NBS Special Publication 499, 1978.

"Technical Manual on Architectural Acoustics,"  
TM 5-805-15, for Technical Manual of the  
U.S. Army, Corps of Engineers.

"Methode pour Quantifier les Effects d'un changement  
daus le niveau du bruit ambiant sur la Sante',"  
proceedings of Conference on Noise and Vibration  
Research held in 1975 in Bendor, France in  
print.

"Evaluation of the Effects of Motor Vehicles Noise  
Regulations on Population, Impact of Motor  
Vehicle Noise Control," Special Report 152,  
Transportation Research Board, National Research  
Council/National Academy of Sciences,  
Washington, D.C., 1975.

Summary/Abstract: "Noise Criteria for Building Codes,"  
Journal of the Acoustical Society of America,  
Vol. 59, Supplement No. 1, 1976.

"Method for the Identification of Environmental  
Noise Levels Requisite to Protect Public Health  
and Welfare," proceedings of the International  
Symposium on Recent Advances in the Assessment  
of Health Effects of Environmental Pollution  
World Health Organization, Geneva, Switzerland,  
June 1974.

"Criteria for Noise Regulation," Noise News, Vol. 3,  
No. 4, July/August 1974.

"Comprehensive Noise Abatement Program for Allegheny  
County," Technical Report published by the  
Allegheny County Health Department,  
Pittsburgh, Pennsylvania, 1973.

"Impedance Tube Measurement of Propagation Constant  
and Characteristic Impedance of Porous Acoustical  
Materials," Journal of the Acoustical Society of  
America, Vol. 54, No. 5, 1973.

"Evaluation of Impedance Tube Techniques for the  
Determination of Propagation Constant and  
Characteristic Impedance of Porous Acoustical  
Materials," University of Pittsburgh, 1972.

"Comparative Study of Pure Tone Hearing Sensitivity  
Measurements by Two Earphone Cushion Arrangements,  
University of Pittsburgh, 1968.

## Gerald A. Zerdy

Research Psychologist  
Environmental Design Research Division  
Center for Building Technology  
National Bureau of Standards

Ph.D., Industrial and Quantitative Psychology, University of Maryland  
M.S., Psychology, University of Maryland  
B.S., Psychology, Pennsylvania State University

Gerald A. Zerdy has been investigating human aversion to sound at NBS since 1971. He has been a coinvestigator on environmental noise research sponsored by the U.S. Coast Guard, the Consumer Product Safety Commission, the Department of Energy, the Environmental Protection Agency and the Federal Highway Administration. In addition, he has conducted basic research on the aversive properties of sound. Dr. Zerdy has also designed and implemented software for the control and analysis of experiments for the psychoacoustics laboratory in the Sound Building at NBS. Since being transferred to the Center for Building Technology (March 1979), Dr. Zerdy has been involved in research designed to improve noise criteria and test methods used to assess the acoustic environment in and around buildings.

Dr. Zerdy received his doctorate from the University of Maryland in 1971. While there he conducted research in the areas of human memory and information processing and computer-assisted instruction.

### Publications:

Incidental retention of recurring words presented during auditory monitoring tasks. Master's Thesis, University of Maryland, 1970.

The effects of information processing complexity on incidental retention of recurring words in auditory monitoring tasks. Doctoral Dissertation, University of Maryland, 1971.

"Incidental retention of recurring words presented during auditory monitoring tasks," *Journal of Experimental Psychology*, 1971, 88, 82-89.

**Psychophysical evaluation of acoustic navigation aids: preference and aversiveness**, National Bureau of Standards Final Report #10 960, 1972, co-author.

"Toward a more musical foghorn," *Human Factors*, 1974, 16, 567-575, co-author.

"Intense sounds as payoffs in a simulated signal detection task," *The Journal of the Acoustical Society of America*, 1974, 55, S19 (abstract), co-author.

"Choosing among intense acoustic background stimuli—an acoustic 'menu'," *The Journal of the Acoustical Society of America*, 1974, 56, S64 (abstract), co-author.

**Consumer product noise: a basis for regulation**, National Bureau of Standards Report NBSIR 74-606, 1974, co-author.

**Preliminary tests of psychoacoustic facilities and techniques for studying the human response to transmission line audible noise**, Dept. of Energy HCP/T-6010/EZ, 1977, 1-67, co-author.

"Psychoacoustic feasibility studies on transmission line audible noise," *IEEE Proceedings*, in press, co-author.

**Initial psychoacoustic experiments on the human response to transmission line audible noise**, U.S. Department of Energy Technical Report, 1979, in press, co-author.

"Audible noise from high-voltage transmission lines: psychoacoustic findings," to be published in *Proceedings of Department of Energy Environmental Control Symposium (Energy and Environmental Goals: Compatibility Through Environmental Controls)*, co-author.

"Psychoacoustic evaluation of the audible noise from extra-high voltage power lines," *IEEE Proceedings*, in press, co-author.



