

Section 2 Sensory Communication

Chapter 1 Auditory Psychophysics and Aids for
the Deaf

Chapter 1. Auditory Psychophysics and Aids for the Deaf

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1.1 Introduction

Research is being conducted on a variety of topics concerned with the auditory and tactile senses, particularly with a view to the development of improved aids for the deaf. Supporting grants are listed below. Detailed progress reports are available from principal investigators listed and granting agencies. Publications and talks reporting this work follow the project listing.

1.2 Binaural Hearing

Sponsor

National Institutes of Health
Grant 2 R01 NS10916

Principal Investigator

Dr. H. Steven Colburn

1.3 Hearing Aid Research

Sponsor

National Institutes of Health
Grant 5 R01 NS12846

Principal Investigator

Professor Louis D. Braida

1.4 Tactile Communication of Speech

Sponsor

National Institutes of Health
Grant 5 R01 NS14092

Principal Investigator

Dr. Charlotte M. Reed

1.5 Multimicrophone Hearing Aids

Sponsor

National Institutes of Health
Grant 2 R01 NS21322

Principal Investigator

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1.6 Cochlear Prostheses

Sponsor

National Institutes of Health
Grant 1 P01 NS23734

Principal Investigator

Dr. William M. Rabinowitz

1.7 Hand Function

Sponsor

National Science Foundation
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Principal Investigator

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Publications

Clifton, R.K., P.M. Zurek, B.G. Shinn-Cunningham, and N.I. Durlach. "Cross-Frequency Interactions in the Precedence Effect." *J. Acoust. Soc. Am.* 85:S83 (1989).

Duchnowski, P., and P.M. Zurek. "Simulation of Sensorineural Hearing Loss." *J. Acoust. Soc. Am.* 85:S26 (1989).

Duchnowski, P. *Simulation of Sensorineural Hearing Impairment*. S.M. thesis. Dept. of Electr. Eng. and Comput. Sci., MIT, 1989.

Durlach, N.I., L.A. Delhorne, A. Wong, W.Y. Ko, W.M. Rabinowitz, and J. Hollerbach. "Manual Discrimination and Identification of Length by the Finger-Span Method." *Percept. Psychophys.* 46:29-38 (1989).

Durlach, N.I., C.E. Sherrick, and J.D. Miller. "Sensory Substitution: Visual and Tactual Methods." in *Speech Communication Aids for the Hearing Impaired: Current Status and Needed Research*. Report of CHABA Working Group 95. Eds. C.S. Watson, R.A. Dobie, N.I. Durlach, H. Levitt, J.D. Miller, C.E. Sherrick, F.B. Simmons, G.A. Studebaker, R.S. Tyler, and Widin, forthcoming.

Durlach, N.I., H.Z. Tan, N.A. Macmillan, W.M. Rabinowitz, and L.D. Braida. "Resolution in One Dimension with Random Variations in Background Dimensions." *Percept. Psychophys.* 46:293-296 (1989).

Eide, E.M. *Extracting Stimulus and Response Center Locations from Confusion Matrices*. S.M. thesis. Dept. of Electr. Eng. and Comput. Sci., MIT, 1989.

Greenberg, J.E. *A Real-Time Adaptive Beamforming Hearing Aid*. S.M. thesis. Dept. of Electr. Eng. and Comput. Sci., MIT, 1989.

Greenberg, J.E., and P.M. Zurek. "Evaluation of a Real-Time Adaptive Beamforming Hearing Aid." *J. Acoust. Soc. Am.* 86:S87 (1989).

Greenberg, J.E., P.M. Zurek, and P.M. Peterson. "Reducing the Effects of Target Misalignment in an Adaptive Beamformer for Hearing Aids." *J. Acoust. Soc. Am.* 85:S26 (1989).

Henderson, D.R. *Tactile Speech Reception: Development and Evaluation of an Improved Synthetic Tadoma System*. S.M. thesis. Dept. of Electr. Eng. and Comput. Sci., MIT, 1989.

Maney, J.W. *Token Variability of Intra-Speaker Speech*. S.B. thesis. Dept. of Electr. Eng. and Comput. Sci., MIT, 1989.

Payton, K., R. Uchanski, and L.D. Braida. "Speech Intelligibility as a Function of Environment and Speaking Style." *J. Acoust. Soc. Am.* 85:S55 (1989).

Picheny, M.A., N.I. Durlach, and L.D. Braida. "Speaking Clearly for the Hard of Hearing III: An Attempt to Determine the Contribution of Speaking Rate to Differences in Intelligibility between Clear and Conversational Speech." *J. Speech Hear. Res.* 32:600-603 (1989).

Reed, C.M., N.I. Durlach, and L.D. Braida. "Analytic Study of the Tadoma Method: Effects of Hand Position on Segmental

- Speech Perception." *J. Speech Hear. Res.* 32:921-929 (1989).
- Reed, C.M., N.I. Durlach, L.D. Delhorne, W.M. Rabinowitz, and K.W. Grant. "Research on Tactual Communication of Speech: Ideas, Issues, and Findings." *The Volta Rev.* 91:65-78 (1989). (Special Monograph on Sensory Aids for Hearing-Impaired People. Ed. N.S. McGarr.)
- Schneider, B.A., and P.M. Zurek. "Lateralization of Coherent and Incoherent Targets Added to a Diotic Background." *J. Acoust. Soc. Am.* 85:1756-1763 (1989).
- Shinn-Cunningham, B.G. *Understanding the Precedence Effect: An Examination of Parameters Affecting Its Strength*. S.M. thesis. Dept. of Electr. Eng. and Comput. Sci., MIT, 1989.
- Tamir, T.J. *Characterization of the Speech of Tadoma Users*. S.B. thesis. Dept. of Electr. Eng. and Comput. Sci., MIT, 1989.
- Tan, H.Z., W.M. Rabinowitz, and N.I. Durlach. "Analysis of a Synthetic Tadoma System as a Multidimensional Tactile Display." *J. Acoust. Soc. Am.* 86:981-988 (1989).
- Zissman, M.A. *Co-channel Talker Interference Suppression*. Ph.D. diss. Dept. of Electr. Eng. and Comput. Sci., MIT, 1989.
- Zissman, M.A., C.J. Weinstein, L.D. Braida, R.M. Uchanski, and W.M. Rabinowitz. "Speech State Adaptive Simulation of Co-channel Talker Interference Suppression." ICASSP '89, pp. 361-364.
- Zurek, P.M. "Binaural Advantages and Directional Effects in Speech Intelligibility," In *Acoustical Factors Affecting Hearing Aid Performance II*, eds. G.A. Studebaker and I. Hochberg. Boston: College-Hill Press, forthcoming.

