

Dana Boebinger

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RESEARCH SUMMARY

My research investigates how the human auditory system builds representations of complex sounds, with a focus on speech and music perception. Trained across auditory neuroscience, cognitive neuroscience, and speech and hearing sciences, I use multiple experimental modalities including intracranial EEG, scalp EEG, fMRI, and behavioral testing alongside computational modeling approaches such as encoding and decoding models and statistical component analyses. My work addresses questions including how speech- and music-selective neural populations achieve robustness to acoustic variability, how auditory cortex integrates information over time, and how these neural computations bear on communication disorders and hearing loss.

EDUCATION

Ph.D. in Speech and Hearing Bioscience & Technology, Harvard University, 2021

Supervisors: Josh McDermott & Nancy Kanwisher

Thesis: *The Nature and Origins of Selectivity for Music in the Human Brain*

M.Sc. in Cognitive Neuroscience, University College London, 2013

Supervisor: Sophie K. Scott

Thesis: *Perception of Speech in Noise and Other Maskers by Musicians and Non-Musicians*

B.A. in Psychology & B.A. in Music, Florida State University, 2012

Supervisor: Michael Kaschak

Thesis: *Are Implicit Learning Abilities in Language and Music Related?*

ACADEMIC POSITIONS

Postdoctoral Fellow, University of Rochester, 2024 - present

Supervisor: Sam Norman-Haignere

Postdoctoral Associate, University of Rochester, 2022 - 2024

Supervisor: Sam Norman-Haignere

Postdoctoral Associate, Massachusetts Institute of Technology, 2021

Supervisor: Nancy Kanwisher

Graduate Research Assistant, University College London, 2013 - 2014

Supervisor: Sophie K. Scott

RESEARCH FUNDING

NIH/NIDCD NRSA Individual Postdoctoral Fellowship (F32), 1F32DC022145-01 (PI: Boebinger). *"The impact of noise on temporal integration of speech in the human brain."* 2024-2027.

NIH/NIDCD Institutional National Research Service Award (T32), 5T32DC000038, Predoctoral Training Grant, Harvard University. 2014-2017.

US-UK Fulbright Postgraduate Award, University College London. 2012-2013.

PUBLICATIONS

- Boebinger, D.**, Skrill, D., Liao, G., Nourski, K.V., Howard, M.A., Garcia, C.M., Wychowski, T., Pilcher, W., Norman-Haignere, S.V. Speech-selective neural populations exhibit strong and rapid invariance to extrinsic acoustic variation. (*under review*).
- Hicks, J.M., **Boebinger, D.**, Nourski, K.V., Howard, M.A., Garcia, C.M., Wychowski, T., Pilcher, W., Norman-Haignere, S.V. Invariant correlation: A general and straightforward method to quantify invariance in time-varying neural signals. (*accepted at CCN-P*).
- Boebinger, D.**, Norman-Haignere, S.V., McDermott, J.H., Kanwisher, N. (2026). Music-selective cortex is sensitive to structure in both pitch and time. *Cerebral Cortex*, 36(6), bhag072.
- Regev, T.I., Lipkin, B., **Boebinger, D.**, Paunov, A.M., Kean, H., Norman-Haignere, S.V., Fedorenko, E. (2024). Preserved functional organization of human auditory cortex in individuals missing one temporal lobe from infancy. *iScience*, 27(9), 110548.
- Tuckute, G., Feather, J., **Boebinger, D.**, McDermott, J.H. (2023). Many but not all deep neural network audio models capture brain responses and exhibit correspondence between model stages and brain regions. *PLoS Biology*, 21(12), e3002366.
- Norman-Haignere, S.V., Feather, J., **Boebinger, D.**, Brunner, P., Ritaccio, A., McDermott, J.H., Schalk, G., Kanwisher, N.G. (2022). Intracranial recordings from human auditory cortex reveal a neural population selective for musical song. *Current Biology*, 32(7), 1470-1484.
- Boebinger, D.**, Norman-Haignere, S.V., McDermott, J.H., Kanwisher, N. (2021). Music-selective neural populations arise without musical training. *Journal of Neurophysiology*, 125, 2237-2263.
- Popham, S., **Boebinger, D.**, McDermott, J.H. (2018). The Role of Harmonicity in the Cocktail Party Problem: Insights from Inharmonic Speech. *Nature Communications*, 9(2122), 1-13.
- Meekings, S., Evans, S., Lavan, N., **Boebinger, D.**, Krieger-Redwood, K., Cooke, M., & Scott, S.K. (2016). Distinct neural systems recruited when speech production is modulated by different masking sounds. *The Journal of the Acoustical Society of America*, 140(8), 8-19.
- Lima, C.F., Lavan, N., Evans, S., Agnew, Z., Halpern, A.R., Shanmugalingam, P., Meekings, S., **Boebinger, D.**, Ostarek, M., McGettigan, C., Warren, J.E., Scott, S.K. (2015). Feel the Noise: Relating individual differences in auditory imagery to the structure and function of sensorimotor systems. *Cerebral Cortex*, 25(11), 4638-4650.
- Meekings, S., **Boebinger, D.**, Evans, S., Lima, C.F., Chen, S., Ostarek, M., Scott, S.K. (2015). Do we know what we're saying? The roles of attention and sensory information during speech production. *Psychological Science*, 26(12), 1975-1977.
- Boebinger, D.**, Evans, S., Rosen, S., Lima, C.F., Manly, T., Scott, S.K. (2015). Musicians and non-musicians are equally adept at perceiving masked speech. *The Journal of the Acoustical Society of America*, 137(1), 378-387.
- Evans, S., Meekings, S., Nuttall, H.E., Jasmin, K., **Boebinger, D.**, Adank, P., Scott, S.K. (2014). Does musical enrichment enhance the neural coding of syllables? Neuroscientific interventions and the importance of behavior data. *Frontiers in Human Neuroscience*, 8(964).

SELECTED CONFERENCE PRESENTATIONS

- Boebinger, D.**, Skrill, D., Liao, G., Nourski, K., Howard, M., Garcia, C., Wychowski, T., Pilcher, W., Norman-Haignere, S. *Invariance to Extrinsic Acoustic Variation is Accomplished by Hierarchical Anatomical and Temporal Computations Selective for Speech-Specific Structure*. Podium talk, Association for Research in Otolaryngology (ARO), San Juan, Puerto Rico (Feb 2026).
- Boebinger, D.**, Skrill, D., Liao, G., Nourski, K., Howard, M., Garcia, C., Wychowski, T., Pilcher, W., Norman-Haignere, S. *Rapid and dynamic construction of acoustically invariant speech representations in the human auditory cortex*. Talk and poster presentations at International Conference on Auditory Cortex (ICAC, Maastricht), Advances and Perspectives in Auditory Neuroscience (APAN, San Diego), and Society for Neuroscience (SfN, San Diego) (Sept-Nov 2025).

Bandreddi, A. & **Boebinger, D.** (co-first authors), Skrill, D., Nourski, K., Howard, M., Garcia, C., Wychowski, T., Pilcher, W., Norman-Haignere, S. *Disentangling of Spoken Words and Talker Identity in Human Auditory Cortex*. Poster presentations at Cognitive Computational Neuroscience (CCN, Amsterdam) and ICAC (Maastricht) (Aug-Sept 2025).

Liao, G., Norman-Haignere, S., **Boebinger, D.**, Garcia, C., Nourski, K., Howard, M., Wychowski, T., Pilcher, W. *Envelope representations substantially enhance the predictive power of spectrotemporal receptive field models in the human auditory cortex*. Poster presentations at Cosyne (Montreal), SfN (Chicago), and APAN (Chicago) (Nov 2024 - Mar 2025).

Skrill, D., **Boebinger, D.**, Garcia, C., Nourski, K., Howard, M., Wychowski, T., Pilcher, W., Norman-Haignere, S. *Component encoding: Low-dimensional, interpretable, and predictive models of neural computation*. Poster presentations at SfN and APAN, Chicago, IL (Nov 2024).

Boebinger, D., Liao, G., Garcia, C., Nourski, K., Howard, M., Wychowski, T., Pilcher, W., Norman-Haignere, S. *Acoustically invariant speech representations are rapidly constructed in speech-selective neural populations of human non-primary auditory cortex*. Poster presentation at APAN, Chicago, IL (Nov 2024).

Boebinger, D., Liao, G., Nourski, K., Howard, M., Garcia, C., Wychowski, T., Pilcher, W., Norman-Haignere, S. *Invariant representations of words are rapidly constructed across the auditory cortical hierarchy*. Poster presentation at CCN, Boston, MA (Aug 2024).

McPherson, M., **Boebinger, D.**, Kanwisher, N., McDermott, J. *Selective Cortical Responses to Harmonic Sounds*. Poster presentation at APAN, San Diego, CA (Nov 2022).

Tuckute, G., Feather, J., **Boebinger, D.**, McDermott, J. *Many but not all Deep Neural Network Audio Models Predict Auditory Cortex Responses and Exhibit Hierarchical Layer-Region Correspondence*. Poster presentations at APAN (San Diego), CCN (San Francisco), and Cosyne (virtual) (Mar-Nov 2022).

Boebinger, D., Norman-Haignere, S., McDermott, J.H., Kanwisher, N. *Music-selective cortex is sensitive to structure in both pitch and time*. Poster presentations at APAN (2020), ARO (2021, 2022), and ICAC, Magdeburg, Germany (2022).

Boebinger, D., Norman-Haignere, S., McDermott, J.H., Kanwisher, N. *Comparing the timescale of analysis for speech- and music-selective cortex*. Poster presentation at ARO (Feb 2022).

Boebinger, D., McDermott, J.H., Kanwisher, N. *Music-selective neural populations arise without musical training / Cortical music selectivity is independent of extensive musical training*. Poster presentations at ICAC, Banff, Canada; APAN, Washington D.C.; and CCN, Philadelphia, PA (2017-2018).

Norman-Haignere, S., **Boebinger, D.**, McDermott, J. *Comparing the timescale of cortical speech and music analysis with sound quilts*. Poster presentations at Neuromusic, Boston, MA and ARO, Baltimore, MD (Feb-June 2017).

Boebinger, D., Lima, C., Evans, S., Rosen, S., Scott, S.K. *Perception of speech in noise and other maskers by musicians and non-musicians*. Poster presentations at Neuromusic V (Dijon, France), SNL and SfN (San Diego, CA), and the International Max Planck Research School Summer School (Leipzig, Germany) (2013-2014).

Co-author on 10 additional poster presentations (2013-2016) on speech perception, auditory imagery, and vocal emotion with the Scott Lab (UCL), presented at SfN, ASA, SNL, and CNS.

AWARDS, FELLOWSHIPS & HONORS

Postdoctoral & Graduate

- 2024 - NIH/NIDCD NRSA Individual Postdoctoral Fellowship (F32)
- 2022 - Travel Award, International Conference on Auditory Cortex (ICAC)
- 2021 - Best Poster Award, Advances and Perspectives in Auditory Neuroscience (APAN)
- 2021 - Symposium for Cognitive Auditory Neuroscience (SCAN) Early Career Awardee
- 2020 - Harvard Division of Medical Sciences PATHS Certification in “Science Communication”

- 2019 - Graduate Student Award, Harvard Mind, Brain, & Behavior Initiative
- 2019 - Conference Grant, Harvard Graduate Student Council
- 2018 - Computational Cognitive Neuroscience Conference Student Travel Award
- 2017 - Lake Como School of Advanced Studies Summer School: Music, Language & Cognition (Italy)
- 2013 - UCL Shallice Prize (top performing MSc Cognitive Neuroscience student each year)

Predoctoral (2011-2013)

- US-UK Fulbright Scholar, University College London; UCL Global Excellence Graduate Scholarship; International Max Planck Research School, Neuroscience of Communication Summer School (2012-2013)
- Phi Beta Kappa (Florida State University); Marion Jewell Hay Undergraduate Research Award; Outstanding Senior Scholar, FSU Honors Program (2012)
- Bess H. Ward Honors Thesis Award; Presser Foundation Undergraduate Scholar Award; FSU College of Arts and Sciences Enrichment Scholar; NSERC-Create Summer Undergraduate Research Grant (2010-2011)

INVITED TALKS

- 2025 - Electronic Auditory Research Seminars (E.A.R.S) Early Career talk (*virtual*)
- 2025 - Cognition and Natural Sensory Processing (CNSP) Workshop (*virtual*)
- 2025 - Postdoctoral speaker, University of Rochester Neuroscience departmental retreat
- 2022 - Women in Neuroscience internship program (*University of Texas at Austin*)
- 2021 - Panelist, "Women and Gender Minorities in Auditory Neuroscience," APAN (*virtual*)
- 2020 - "Music on the Brain," ARO Midwinter Meeting (San Jose, CA)
- 2019 - "The neuroscience of music perception," Harvard *Science in the News*
- 2019 - "Creating Perception: How the Brain Constructs the World," *Science in the News* (Harvard)

TEACHING EXPERIENCE & GUEST LECTURES

- Derek Bok Center Teaching Certificate, Harvard University (2021)
- Teaching Assistant, *9.13 The Human Brain*, MIT Brain and Cognitive Sciences (2018)
- Teaching Fellow, *H126 Typical & Atypical Neurodevelopment*, Harvard Graduate School of Education (2016)

Guest Lectures

- "The neuroscience of music & language," *SAR SH 501 Neurobiology of Language* (Boston University, 2022)
- "Cortical music selectivity," *HST S78 Music Psychology Seminar* (MIT, 2019)
- "The relationship between music and language development," *SH524 Language Acquisition and Development* (Boston University, 2019)
- "The Visual Brain" & "Neuroscience of language," *Psych 2209 Physiological Basis of Behavior* (Emmanuel College, Boston, 2019)
- "Music and the brain," *Music 410 Your Musical Brain* (Phillips Academy Andover, 2019)

TECHNICAL SKILLS

- **Experimental:** intracranial EEG, scalp EEG, fMRI (including surface-based fROI analysis)
- **Computational/Analytical:** encoding & decoding models (TRF, ridge regression), statistical component modeling, temporal context invariance (TCI) analysis; evaluation of deep neural network model predictions against neural data
- **Programming:** MATLAB; basic Python

- **Tools:** FreeSurfer, GLMdenoise, Overleaf/LaTeX, Adobe Illustrator

MENTORING EXPERIENCE

- James Pichardo: High school; Summer 2025; UR Neuro-RocHS program
- Yahia Abdalla: Undergraduate, City College of New York; Summer 2025; UR NeuroCity program
- Ouriya Boshi Levine: Undergraduate, University of Rochester; 2024 - present
- Edwin Gao: Undergraduate, University of Rochester; 2024
- Krish Patel: Undergraduate, University of Rochester; 2023 - present; awarded UR Schwartz Discover Grant
- Vishnu Pendri: Undergraduate, University of Rochester; 2022 - 2023; awarded UR Schwartz Discover Grant

SCIENCE COMMUNICATION & OUTREACH

Leadership and Organization

- Co-Organizer, UR Neuro2All outreach program (2025 - present)
- Co-Director, UR Thinkers (2022 - 2024)
- Co-Organizer, UR Center for Hearing & Balance auditory neuroscience journal club (2022 - present)
- Organizer and Chair, ComSciCon National Science Communication Workshop (2017 - 2022)
- Co-Director, Science in the News (2017 - 2019) and Co-Organizer, Science by the Pint (2014 - 2017), Harvard University

Training and Mentorship

- PATHS Certification in Science Communication, Harvard DMS (2020); Alan Alda Center Science Communication Workshop (2018)
- Harvard Scientific Citizenship Initiative “Intro to Science Policy” and MIT edX “Tools for Academic Engagement in Public Policy” courses; Harvard Science Policy Group Washington D.C. trip (2018, 2021)
- Mentor, Simply Neuroscience, “Letters to a Pre-Scientist,” and “Skype-A-Scientist” programs (2018 - 2023)
- Lecturer, “How to Create and Present a Scientific Poster,” UR Laboratory for Laser Energetics and Schwartz Discover Grant programs (2023, 2025, 2026)
- Designed and taught a short course on auditory neuroscience, MIT SPLASH (2015); consulted on educational materials for the Boston Museum of Science and Harvard GSE (2015 - 2021)

Outreach, Public Lectures, and Media

- Organized and participated in school outreach programs, including UR Brain Awareness Week, MIT Museum “Girls’ Day,” and Harvard’s “Model Organism Zoo” (2017 - 2025)
- Gave public lectures on auditory perception and the brain at venues including the Tallahassee Senior Center, MIT Museum, Pint of Science Boston, and Harvard’s *Science in the News* (2017 - 2021)
- Interviewed for *Quanta Magazine*, the *Twenty Thousand Hertz* podcast, *Story Collider*, and the Boston Museum of Science; wrote for *The Conversation* and Harvard’s *Science in the News* blog (2017 - 2021)

AD-HOC JOURNAL REVIEWING

Acta Psychologica, Cell, Cell Reports, Developmental Science, Frontiers in Human Neuroscience, Hearing Research, Journal of Neuroscience, Journal of the Acoustical Society of America, Language and Speech, Oxford Research Encyclopedia, Nature Communications, Neurology, Proceedings of the National Academy of Sciences, Psychonomic Bulletin & Review, Science Advances, Scientific Reports, Trends in Hearing