

Sean R Mills

BA (Hons.) Experimental Psychology (University of Oxford) 1st Class
PhD in Tactile Psychophysics (University of Southampton)
Co-Founder and Co-Investigator, The Electro-Haptics Research Project

I am a trained experimental psychologist with extensive experience in tactile psychophysics and multi-sensory neuroscience. I have designed, programmed and conducted a broad range of experimental designs in and across human sensory systems, in order to build psychophysical models of how we perceive the world around us.

PhD in Tactile Psychophysics (January 2016 to January 2019)

Institute of Sound and Vibration Research, University of Southampton, UK.

“Feeling the Difference: Discrimination of Vibration Frequency and Magnitude in the Tactile Channels”. A psychophysical model for supra-threshold information processing in the tactile system. This model uses vibrotactile psychophysics to measure difference limens for vibration frequency and magnitude within and across the Pacinian and Meissner systems, in order to develop new methods for measuring the sensitivity of touch perception. This research gives insights into how health and environmental factors affect the sense of touch, especially in the case of hand-arm vibration syndrome (HAVS). The aim of the project is to build new methods for diagnosis of impaired touch perception. This project used a wide range of psychophysical methods and statistical analyses implemented in MATLAB and R.

- Secretary of Human Factors Research Unit.
- Awarded EPSRC grant-funded research scholarship (£47,190). Further funding awarded by University of Southampton Faculty of Engineering and Physical Sciences; and *HVLab*, a commercial vibration and touch perception diagnostic laboratory.

BA Experimental Psychology (October 2011 to July 2014)

Department of Experimental Psychology and Wadham College, University of Oxford, UK

First class honours degree that included modules on experimental design and statistics, behavioural and cognitive neuroscience, neurophysiology and neuroanatomy, psychophysical models of consciousness, developmental psychology, perceptual psychology, and psychology of language and cognition. Secretary of the University of Oxford Psychology Society.

- Attained 73% for library dissertation on “Neurocognitive Models of Synaesthesia”, a systematic review of the mechanisms behind synaesthesia.
- Attained 73% for research project on “Intrinsically Photosensitive Melanopsin-Expressing Retinal Ganglion Cells Mediate Perception of Brightness”, a visual psychophysics project that selectively activated specific ganglion cell populations.
- Awarded the 2013 Wadham College University of Oxford Prize in Sciences and Mathematics.

Fellowships

Member of the British Neuroscience Association (BNA).

Research and Employment

Co-Founder and Co-Investigator, The Electro-Haptics Research Project (2016 to Present)

Institute of Sound and Vibration Research, University of Southampton, UK.

Cochlear Implant (CI) users struggle to hear in noisy environments, such as a busy office or café, often leading to social isolation. I took the opportunity to create, develop and conduct a new research project aimed at augmenting the limited audio signal from a CI with additional speech information provided through vibrations on the skin. In close collaboration with my colleague Dr Mark Fletcher, I designed and processed a tactile signal to provide this missing audio information and delivered it to the finger of participants listening to sophisticated cochlear implant simulations. We measured their speech-in-noise performance and [published](#) our results in the leading audiology journal. We recently conducted a second major experiment in real CI users, in which I worked closely with this hard-to-study population (and occasionally their adorable hearing dogs). We recently submitted a paper to PNAS reporting our findings. We are collaborating closely with the Oticon Foundation, Oticon Medical (a cochlear implant manufacturer), the Technical University of Denmark, and the University of Iceland to develop equipment and design future work. This research was conducted in my spare time, independently of my PhD.

- Multi-sensory research to improve speech-in-noise performance in CI users using vibro-tactile stimulation.
- Designed, developed and conducted independently of my PhD.
- Articles published in the leading audiology journal and recently submitted to PNAS.
- Featured in [The Conversation](#).
- My work was shared by professional bodies, including: the [National Acoustic Laboratories \(NAL\)](#), [Acoustical Society of America \(ASA\)](#), [British Psychological Society \(BPS\)](#) and [British Society of Audiology \(BSA\)](#).

Secretary, Human Factors Research Unit (August 2016 to February 2018)

Institute of Sound and Vibration Research, University of Southampton, UK.

I was responsible for organising research group meetings, taking minutes, and managing the completion of action items by colleagues. I enjoyed the collegiate and collaborative nature of this organisational role.

Instructor, Presenting Your Research (October 2016 to January 2019)

Faculty of Engineering and Physical Sciences, University of Southampton, UK.

I delivered practical teaching sessions to first year PhD students, as part of the Graduate School Training Programme. These sessions provided training in communication skills including body language and verbal communication. I have received excellent feedback for this role.

Panel and Community Intern, ICM Research (August – November 2014)

In this post-graduate role, I worked in a range of consumer research, opinion polling, and community management capacities. I liaised with different teams to coordinate the bid, design, data extraction, maintenance and evaluation of community databases for large multi-national clients. I directed communications with more than 200,000 community members and was responsible for a recruitment drive to increase membership in under-represented demographics.

Research Assistant, Perceptual Decision Lab (June – July 2013)

Department of Experimental Psychology, University of Oxford, UK.

I programmed, developed and conducted a novel psychophysical paradigm, paired with eye-tracking technology, to measure information integration during noisy decision making. Coordinated the recruitment of participants and conducted data analysis.

Teacher and Course Co-ordinator (February 2010 – September 2014)

Across a wide range of teaching, tutoring and course coordinator roles in the UK, China, Hong Kong and Vietnam, I planned and taught lessons for students of varying abilities and backgrounds. I also wrote and delivered invited talks on international education pedagogies to students and faculty at Guangzhou University and to members of the Education Working Committee of Guangdong Provincial Party Committee. I achieved a 150hr Advanced Course TEFL Certification.

Publications

Journal papers

Fletcher, M. D., **Mills, S. R.**, & Goehring, T. (2018). [Vibro-Tactile Enhancement of Speech Intelligibility in Multi-talker Noise for Simulated Cochlear Implant Listening](#). *Trends in hearing*, 22. DOI: 10.1177/2331216518797838

Fletcher, M. D., & Goehring, T. & **Mills, S. R.** (2018). Electro-haptic hearing: Speech-in-noise performance in cochlear implant users is enhanced by tactile stimulation of the wrists. *Proceedings of the National Academy of Science*. (Submitted).

Mills, S. R., & Griffin, M. J. (2018). Discrimination of vibrotactile frequency and acceleration magnitude across the tactile channels. *Attention, Perception & Psychophysics*. (In preparation).

Selected Conference Papers and Invited Talks

Mills, S. R., & Griffin, M. J. (2018, September 13th) *Discrimination of the Frequency of Vibration Applied to the Finger at Two Acceleration Magnitudes*. Paper presented at the 53rd UK Conference on Human Responses to Vibration, Ascot, UK.

Mills, S. R., & Griffin, M. J. (2017, September 6th) *The Touch Perception Puzzle: A Basis for Choosing Stimulus Parameters in Vibrotactile Psychophysics*. Paper presented at 52nd UK Conference on Human Responses to Vibration, Cranfield Defence Academy, UK.

Mills, S. R. & Griffin, M. J. (2017, September 21st). *How are you feeling?*, 'Sensing our world' SoNG annual meeting, University of Southampton, UK.

Sean R Mills
Tactile Psychophysicist

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Mills, S. R., Morioka, M., & Griffin, M. J. (2016, September 15th). *Limitations of Vibrotactile Thresholds*. Paper presented at the 51st UK Conference on Human Responses to Vibration, Institute of Naval Medicine, Gosport, UK.

Mills, S. R. (2013, February 17th) *Brain-machine interfaces cross new boundaries*, The Oxford University Cross-College Symposium Oxford, UK.

Selected Conference Posters

Fletcher, M., Hadeedi, A., Goehring, T., & **Mills, S. R.** (2018). Using tactile stimulation to improve speech-in-noise performance in cochlear implant users. *British Society of Audiology Basic Auditory Science 2018, Newcastle University, UK*

Mills, S. R. & Griffin, M. J. (2017). Investigating Touch Perception with Vibrotactile Psychophysics, *SoNG Annual Meeting, University of Southampton, UK*

Media, Esteem and Science Communication

The Conversation

Mills, S. R. & Fletcher, M. D. (2018, September 16th), [Playing sound through the skin improves hearing in noisy places, The Conversation](#)

The Science Room

I am a frequent talker and facilitator at [The Science Room](#), a bi-monthly informal science community group in Southampton allowing everyone to participate in science through talks, questions, art, exploration and discussion. I enjoy sharing my expertise in this engaging environment.

Key Skills

Experimental design and implementation

I have programmed and conducted a huge range of experimental designs, including complex psychophysical experiments. I've worked in different domains, with different software, participants and apparatus.

Primary programming languages: MATLAB, R.

Advanced inferential statistics

I have a keen interest in advanced statistical methods, both as a research methodology and a framework for modelling perceptual decision making.

Psychophysical modelling

I have worked with and helped develop complex psychophysical models of vision, touch, and audition and how they interface with and influence one another. I am fascinated by the idea of how these models change and adapt to new psychophysical and neurophysiological evidence.