

Narayan Sankaran

Kavli Center for Ethics, Science, and the Public

University of California, Berkeley

narayan@berkeley.edu

(510) 684 1734

Education

- 2012–2018 **Ph.D.**, Neuroscience, *University of Sydney*, Sydney, Australia
Supervisors: Simon Carlile & William Forde Thompson
Dissertation: The structure of cortical representations of music and speech
- 2006–2010 **B.A.**, Physics (Music minor), *University of California, Berkeley*, Berkeley, CA.

Research Experience

- 2023– **Postdoctoral Fellow**, *University of California, Berkeley*
- Evaluating ethical implications of neuroscience research.
- 2018–2022 **Postdoctoral Scholar**, *University of California*, San Francisco (PI: Edward F. Chang)
- Developed computational approaches for studying neural encoding of music in ECoG recorded from human temporal lobe.
 - Discovered spatial code in auditory cortex for representing distinct properties of music.
 - Identified neural specialization in humans for encoding statistics of natural music.
- 2013–2018 **Graduate Student**, *University of Sydney* (PI: Simon Carlile)
- Developed computational techniques for quantifying neuronal population codes for basic elements of music and speech.
 - Probed transformations in auditory pathway using simulations and auditory peripheral modelling.
- 2016 **Research Intern**, *Starkey Hearing Technologies*, Berkeley, CA.
- 2016 **Research Intern**, *Oculus VR*, Redmond, WA.
- 2012–2013 **Software Developer**, *Creativity & Cognition Studios*, University of Technology, Sydney, Aus.
- 2010–2011 **Research Assistant**, *Berkeley Center for Cosmological Physics*, Lawrence Berkeley National Labs, Berkeley CA.

Publications

Preprints

- [1] **Narayan Sankaran**, Matthew Leonard, Frederic Theunissen, & Edward Chang (2023). Encoding of melody in human auditory cortex. *bioRxiv*. DOI: <https://doi.org/10.1101/2023.10.17.562771>
- [2] **Narayan Sankaran** & Winston Chiong. Decoding language from the brain: the tension between speech-restoration and mental surveillance. (Manuscript in preparation)
- [3] **Narayan Sankaran** & Simon Carlile. Perceptual grouping of melodic contour patterns. (Manuscript in preparation).

Peer reviewed articles

- [4] **Narayan Sankaran**, David Moses, Winston Chiong, and Edward Chang (2023). Recommendations for promoting user agency in the design of speech neuroprostheses. *Frontiers in Human Neuroscience* 17: 1298129. DOI: <https://doi.org/10.3389/fnhum.2023.1298129>
- [5] Perry, Gemma, Vince Polito, **Narayan Sankaran**, & William Forde Thompson (2022). How Chanting Relates to Cognitive Function, Altered States and Quality of Life. *Brain Sciences* 12, no. 11: 1456.
- [6] Ashlyn Schmitgen, Jeremy Saal, **Narayan Sankaran**, Maansi Desai, et al. (2021). Musical Hallucinations in Chronic pain: the anterior cingulate cortex regulates internally generated percepts. *Frontiers in Neurology*. DOI: [10.3389/fneur.2021.669172](https://doi.org/10.3389/fneur.2021.669172)
- [7] **Narayan Sankaran**, Thomas Carlson, & William Forde Thompson (2020). The rapid emergence of musical pitch structure in human cortex. *Journal of Neuroscience*. DOI: [10.1523/JNEUROSCI.1399-19.2020](https://doi.org/10.1523/JNEUROSCI.1399-19.2020)
- [8] **Narayan Sankaran**, William Forde Thompson, Simon Carlile, & Thomas Carlson (2018). Decoding the dynamic representation of musical pitch from human brain activity. *Nature Scientific reports*. DOI: [10.1038/s41598-018-19222-3](https://doi.org/10.1038/s41598-018-19222-3)
- [9] **Narayan Sankaran**, Jayaganesh Swaminathan, Christophe Micheyl, Sridhar Kalluri, & Simon Carlile (2018). Tracking the dynamic representation of consonants from auditory periphery to cortex. *The Journal of the Acoustical Society of America*. DOI: [10.1121/1.5065492](https://doi.org/10.1121/1.5065492)
- [10] Heather Kelly, Gaven Lin, **Narayan Sankaran**, Jing Xia, Sridhar Kalluri, & Simon Carlile (2017). Development and evaluation of a mixed gender, multi-talker matrix sentence test in Australian English. *International journal of audiology*. DOI: [10.1080/14992027.2016.1236415](https://doi.org/10.1080/14992027.2016.1236415)

- [11] **Narayan Sankaran**, Johahn Leung, & Simon Carlile (2014). Effects of virtual speaker density and room reverberation on spatiotemporal thresholds of audio-visual motion coherence. *PloS one*. DOI: [10.1371/journal.pone.0108437](https://doi.org/10.1371/journal.pone.0108437)

Published Conference Abstracts

- [12] **Narayan Sankaran**, Thomas Carlson, & William Forde Thompson (2019). Decoding MEG responses to musical pitch reveals the dynamic emergence of tonal structure in human cortex. *The Journal of the Acoustical Society of America*.
- [13] Yaqing Su, **Narayan Sankaran**, & Jayaganesh Swaminathan (2018). Perceptual and neural representation of consonants in hearing impaired listeners. *The Journal of the Acoustical Society of America*.
- [14] **Narayan Sankaran**, James Hillis, Marina Zannoli, & Ravish Mehra (2016). Perceptual thresholds of spatial audio update latency in virtual auditory and audiovisual environments. *The Journal of the Acoustical Society of America*.
- [15] **Narayan Sankaran**, Francesca Meliton, & Simon Carlile (2015). Bottom-up predictive processing of melodic stimuli. *XII International Conference on Cognitive Neuroscience*.
- [16] **Narayan Sankaran**, Johahn Leung, & Simon Carlile (2013). Effects of reverberation on the spatiotemporal synchrony of moving audio-visual stimuli. *Multisensory Research*.

Selected Presentations

- 2023 *World Congress of Science and Factual Producers*, “Designing Neurotechnologies for the future.” Seattle, WA (Forthcoming)
- 2023 *UCSF Clinical Ethics Seminar*. “Designing neurotechnology to promote user agency”. San Francisco, CA.
- 2023 *Dana Center Neuroscience & Society Panning Meeting*. “Decoding language from the brain: the tension between speech-restoration and mental surveillance.” Virtual Meeting.
- 2022 *Young Investigator Keynote. Cognition and Sensory Processing Workshop (CNSP)*. “Encoding and decoding approaches for investigating the neural processing of music.” Virtual meeting.
- 2022 *Research Club Seminar. Inserm Institut de Neurosciences des Systèmes, Aix-Marseille*. “The encoding of music in intracranial recordings from human superior temporal gyrus”. Virtual meeting.
- 2022 *Electronic Auditory Research Seminar Series (EARS)*. “A spatial code for music in the human superior temporal gyrus”. Virtual meeting.

- 2021 *Early Career Spotlight Presentation. Advances and Perspectives in Auditory Neuroscience.* "Neural specialization for processing melody in the human superior temporal gyrus". Virtual meeting.
- 2019 *Symposium Presentation. The Acoustical Society of America.* "Decoding MEG responses to musical pitch reveals the dynamic emergence of tonal structure in human cortex." Louisville, KY.
- 2019 *CCRMA Hearing Seminar Series.* Decoding music and speech from M/EEG activity. Stanford University, CA.
- 2017 *Research Seminar. Columbia University.* "The structure of cortical representations of Music and Speech." New York, NY.
- 2016 *International Conference on Music Perception & Cognition.* "Decoding the dynamic representation of musical pitch from MEG activity." San Francisco, CA.

Teaching

- 2023 **Lecturer**, Department of Molecular & Cell Biology, *University of California, Berkeley.* MCB290: Neuroscience, ethics, and society.
- 2020–2022 **Volunteer Instructor**, *Oasis for Girls.*
- 2019–2020 **Volunteer Instructor.** *Prison University Project* at San Quentin State Prison.
- 2016 **Instructor**, School of medical sciences, *University of Sydney.* NEUROSC3904: Music perception and cognition.
- 2015–2016 **Graduate Teaching Assistant**, School of medical sciences, *University of Sydney.* NEUROSC3004: Functional Neuroanatomy
- 2014–2016 **Graduate Teaching Assistant**, School of medical sciences, *University of Sydney.* BIOS1165: Hearing Science and Audiology

Grants and Awards

- Pending **Professional Development Award (\$5,500)**
The Dana Foundation
- Pending **Civic Science Fellowship (role: key-personnel)**
The Dana Foundation
- Pending **R21 Neural encoding of music in coma recovery (role: key-personnel*)**
National Institute of Health

** Postdoctoral scholars are unable to serve as PI on NIH grants. However this grant submission is intellectually spearheaded by myself.*

- 2021 **Early Career Researcher Travel Award (\$500)**
Advances and Perspectives in Auditory Neuroscience (APAN).
- 2021 **Selected Early Career Researcher Panelist**
Symposium for Cognitive Auditory Neuroscience (SCAN).
- 2020 **Berkelhammer Postdoctoral Pathway to Independence Award (\$2,000)**
University of California, San Francisco.
- 2014 **Postgraduate Research Award in Auditory Neuroscience (\$25,000)**
University of Sydney.

Professional Service

Ad-hoc Peer Reviewing

Proceedings of the National Academy of Sciences, PLOS Computational Biology, Journal of Cognitive Neuroscience, Frontiers in Neural Systems, PLOS One, Frontiers in Neuroscience, Music Perception, Neuroscience

Memberships

Science Policy Group (UCSF), Society for Neuroscience, Society for Music Perception and Cognition, International Neuroethics Society

Mentoring

Juliana Chase, Graduate Student, University of California Berkeley (2022 – 2023)
Steven Losorelli, Medical Student, Stanford University (2018)
Jennifer Lee, Honors Undergraduate, University of Sydney (2014 – 2015)
Francesca Meliton, Masters Student, University of Sydney (2013 – 2014)

References

Edward F. Chang, edward.chang@ucsf.edu
Professor, University of California San Francisco

Frederic Theunissen, theunissen@berkeley.edu
Professor, University of California Berkeley

Jayaganesh Swaminathan, *jayaganesh.swaminathan@eargo.com*
Director, Acoustics Engineering and Clinical Research & Development, Eargo

Simon Carlile, *carlile.simon@gmail.com*
Associate Professor, University of Sydney

Winston Chiong, *winston.chiong@ucsf.edu*
Associate Professor, University of California San Francisco

Jodi Halpern, *jhalpern@berkeley.edu*
Professor, University of California Berkeley