

James Traer

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Born 28th April, 1983 in
Colorado Springs, USA

Research

- **Research Scientist, Massachusetts Institute of Technology (MIT)** Cambridge, MA
Department of Brain and Cognitive Sciences Jan. 2016 – present
 - Focus areas: Human auditory inference of physical properties from contact sounds, such as impacts and scrapes. Modelling human auditory inference with generative models.
 - Principal Investigator: Prof. Josh McDermott
- **Post-doctoral Fellow, MIT** Cambridge, MA
Department of Brain and Cognitive Sciences Jan. 2013 – 2016
 - Focus areas: Human perception of acoustic reverberation. Computational sound synthesis.
 - Awarded an NRSA funding grant (NIH).
 - Adviser: Prof. Josh McDermott
- **Postdoctoral Associate, University of California, San Diego (UCSD)** San Diego, CA
Applied Ocean Sciences, Scripps Institution of Oceanography Aug. 2011 – Jul. 2012
 - Focus areas: Remote sensing of ocean and earth properties from ambient seismic noise. Theoretical modelling of seismic noise generated by ocean waves.
 - Adviser: Dr. Peter Gerstoft

Education

- **UCSD** San Diego, CA
Phd. Oceanography Sep. 2006 – May. 2011
 - Focus areas: Geophysical inference of the ocean bottom with ambient oceanic noise (passive fathometer).
 - Adviser: Dr. Peter Gerstoft
- **Cambridge University** Cambridge, UK
MSc. Physics Oct. 2005 – Jun. 2006
 - Graduated with 1st-class honors.
 - Awarded the 2006 Neville-Mott prize for best student research project in the Cavendish laboratory.
 - Research Project: Effect of fluid motion in blood vessels on functional Magnetic Resonance Imaging (fMRI).
 - Adviser: Dr. Rhodri Cusack
- **Cambridge University** Cambridge, UK
BSc. Physics Oct. 2002 – Jun. 2005
 - Graduated with 1st-class honors.

Journal Publications

- J. Hu, J. Traer, M. Cusimano, and J.H. McDermott, “A model of human perception of object material and room size from impact sounds”, (in preparation).
- J. Traer, and J. H. McDermott, “Intuitive physics in auditory perception”, (in preparation).
- J. Traer, S. V. Norman-Haignere, and J. H. McDermott, “Causal inference in environmental sound recognition”, (in preparation).
- M.J. Bianco, P. Gerstoft, E. Ozanich, M. A. Roch, S. Gannot, C.-A. Deledalle, J. Traer and W. Li, “Machine learning in acoustics: a review”, *J. Acous. Soc. Am.*, (2019 – submitted).
- K. J. P. Woods, M. H. Siegel, J. Traer and J. H. McDermott, “Headphone screening to facilitate web-based auditory experiments”, *Atten., Percep., Psych.*, (2017).
- J. Traer, and J. H. McDermott, “Statistics of natural reverberation enable perceptual separation of sound and space”, *PNAS*, **113**(48), E7856–E7865, (2016).
- J. Q. Taylor, P. Kovacic, J. Traer, P. Zakahi, C. Osowski, A. S. Widge, and C. A. Glorioso, “Avoiding a lost generation of scientists”, *eLife*, **5**, e17393, (2016).
- J. Traer and P. Gerstoft, “A unified theory of microseisms and hum”, *Journal of Geophysical Research: Solid Earth*, **119**(4), 3317–3339, (2014).
- C. Yardim, P. Gerstoft, W.S. Hodgkiss and J. Traer, “Compressive geoacoustic inversion using ambient noise”, *J. Acoust. Soc. Am.*, (2014).
- J. Traer, P. Gerstoft, P. D. Bromirski and P. M. Shearer, “Microseisms and hum from ocean surface gravity waves”, *J. Geophys. Res.*, **117**, B11307, (2012).
- J. Traer and P. Gerstoft, “Coherent averaging of the passive fathometer response using short correlation time,” *J. Acoust. Soc. Am.*, **130**, 3633–3641, (2011).
- J. Traer, P. Gerstoft and W. S. Hodgkiss, “Ocean bottom profiling with ambient noise: A model for the passive fathometer,” *J. Acoust. Soc. Am.* **129**, 1825–1836, (2011).
- J. Traer, P. Gerstoft, H. C. Song and W. S. Hodgkiss, “On the sign of the adaptive passive fathometer impulse response,” *J. Acoust. Soc. Am.* **126**, 1657–1658, (2009).
- J. Traer, P. Gerstoft, P. D. Bromirski, W. S. Hodgkiss and L. A. Brooks, “Shallow-water seismoacoustic noise generated by tropical storms Ernesto and Florence,” *J. Acoust. Soc. Am.* **124**, EL170–EL176, (2008).

Conference Publications

- J. Traer, M. Cusimano, and J.H. McDermott, “A perceptually inspired generative model of rigid-body contact sounds”, *Digital Audio Effects (DAFx)*, (2019 – submitted).
- J. Traer, and J.H. McDermott, “Intuitive Physical Inference from Sound”, *Comp. Cog. Neuro.*, (2018).
- Z. Zhang, J. Wu, Q. Li, Z. Huang, J. Traer, J.H. McDermott, J.B. Tenenbaum, and W.T. Freeman, “Generative Modeling of Audible Shapes for Object Perception”, *ICCV*, (2017).

Teaching experience

- **Instructor, MIT** Cambridge, MA
Department of Brain and Cognitive Sciences Jan 2019
 - MIT Independent Activity Period course: “Generative Electronic Music Composition using Modular Synthesis Techniques”.
 - 4 2-hour lectures on digital sound synthesis.
 - 16 registered students.
 - Co-wrote original content and and co-presented with Jeremy Schwarz.
- **Mentor for graduate student projects, MIT** Cambridge, MA
Department of Brain and Cognitive Sciences Mar 2018–Dec 2018
 - Co-mentored 1st-year graduate students for one-semester rotation research projects with Prof. Josh McDermott.
 - Michael Happ: Mar–Jun 2018.
 - Jenn Hu: Oct–Dec 2018, resulting in a conference paper (CogSci 2019).
 - Adrian Cho: Oct–Dec 2017.
- **Guest lecturer, Berklee School of Music** Boston, MA
Liberal Arts Department Oct 2016/Feb 2017/Oct 2017
 - Prof. Marcela Castillo-Rama’s course: “Human anatomy and physiology” .
 - 2 1-hour lectures on human audition.
 - \approx 20 students.
 - Wrote original content.
- **Lecturer (informal), MIT** Cambridge, MA
Department of Brain and Cognitive Sciences June 2015
 - Informal lecture series: “Acoustical Physics for Auditory Researchers” .
 - 4 2-hour lectures covering the physics underlying the generation of everyday sounds.
 - Attended by \approx 15 members of the department.
 - Wrote original content.
- **Teaching Assistant, MIT** Cambridge, MA
Department of Brain and Cognitive Sciences Mar–Jun 2015
 - Prof. Josh McDermott’s undergraduate lecture course 9.35: “Sensation and Perception” .
 - One-semester undergraduate course on human perception.
 - Gave weekly tutorials and graded class assignments.
- **Mentor for undergraduate research assistants, MIT** Cambridge, MA
Undergraduate Research Opportunities program (UROP) Jun 2013–Dec 2018
 - Jeremy Ma: Jan 2019–Mar 2019
 - Andrew Rouditchenko: Sep 2018–Mar 2019
 - Jasmine Zou: Jan 2018–May 2018
 - Aaditya Singh: Jan 2018–Aug 2018
 - Sarah Royka (local high-school student working as a voluntary research assistant): Jun 2017–May 2018
 - Nahom Marie: Sep 2017–Mar 2018
 - Alexander Laiman: Jun 2017–Aug 2017
 - Nathan Munet: Jun 2016–Aug 2016
 - Adilene Esquinca: Sep 2015–Dec 2015
 - Erika Trent: Sep 2013–Mar 2014
 - Caitlin Cooper-Courville: Sep 2013–Dec 2013
 - Miranda Gavrin: Jun 2013–Aug 2013
 - Nicole Schmidt: Jun 2013–Aug 2013

Funding

- Current research project partially funded by IBM-MIT cognitive computing initiative.
- Awarded an NIH NRSA postdoctoral fellowship 2014.
- Awarded a postdoctoral fellowship at Woods Hole Oceanographic Institute in 2012 (declined).
- Awarded a student research award from the Office of Naval Research (ONR), 2007.
- Awarded a Doherty fellowship at Scripps Institute of Oceanography. Sep 2006–Sep 2007.

Honors

- Awarded MIT spot award May 2016.
- Awarded best student paper award at the 161st and 162nd meetings of the ASA, (Cancun, November, 2011 and Seattle, May 2011).
- Awarded the 2006 Neville-Mott prize for best student research project in the Cavendish Laboratories, Cambridge University.
- Awarded first prize in 2001 Oxford University science writing competition in 17–18 year old age group.

Work Experience

- **Acoustical Society of America (ASA)**
Student council member *May 2009 – May 2011*
 - Acted as liaison between student body and Acoustical Oceanography technical council.
 - Served on the ASA diversity committee to promote outreach towards historically under-represented groups.
 - Website administrator for the ASA student council page.
- **NATO Undersea Research Centre (NURC)** La Spezia, Italy
Research internship *July 2008 – September 2008*
 - Remote sensing research with ambient oceanic noise under the supervision of C. H. Harrison.
- **Independent Producer** Cambridge, UK and San Diego, CA
Managed musical and theater productions *2005 – 2009*
 - San Diego, 2007–2009: Co-manager of Guava Belly limited liability company (LLC).
 - Cambridge, 2005–2008: Studio recording for Hamfatter (Pink Hedgehog records), including the single ‘sziget’ (No. 54 in the 2007 UK pop charts).
 - Cambridge, 2004–2005: Co-manager, investor and producer of a theater production at the 2005 Edinburgh fringe festival.
- **Pembroke College International Programs** Cambridge, UK
Teaching assistant *Mar 2006 – Apr. 2006*
 - Teaching assistant for English language classes for Japanese university students.
- **Student Action for Bosnia** Tuzla, Bosnia
Teacher *Jul 2005 – Aug. 2005.*
 - English teacher for Bosnian university students.
- **Korea Oxford-Cambridge Summer English Camp** Gyeonggi-do, S. Korea
Teacher *Jul. 2003 – Aug. 2003*
 - English teacher for 8–16 year old students.
- **Frontier Conservation Program** Madagascar (2001), Tanzania (2002)
Voluntary Research Assistant *Oct. 2001 – Mar. 2002*
 - Gathered data on coral reef and mangrove forest ecosystems.

Presentations

- Australian Hearing Hub, hosted by Prof. David McAlpine. Sydney, Australia, Mar 2019.
- Johns Hopkins University, hosted by Prof. Jason Fischer. Baltimore, MD, Feb 2019.
- Boston ASA Chapter Meeting. Boston, MA, Sep 2018.
- MIT Brain and Cognitive Sciences Department, Cog Lunch Seminar Series. Cambridge, MA, Dec 2018.
- J. Traer and J. H. McDermott, “A library of real-world reverberation and a toolbox for its analysis and measurement,” Acoustical Society of America (ASA), Boston, MA, Jun 2017.
- MIT Brain and Cognitive Sciences Departmental Retreat. Providence, RI, July 2016. “The Perception of Reverberation is Constrained by Environmental Statistics,” Acoustical Society of America (ASA), Salt Lake City, UT, May 2016.
- J. Traer and J. H. McDermott, MIT Brain and Cognitive Sciences Department, Cog Lunch Seminar Series. Boston, MA, Oct 2014.
- J. Traer and P. Gerstoft, “Coherent averaging of the passive fathometer response using short correlation time,” 162nd meeting of the Acoustical Society of America (ASA), San Diego, CA, Nov 2011.
- J. Traer and P. Gerstoft, “Estimation of geophysical parameters from ambient noise correlation,” (Awarded best student presentation) 161st meeting of the Acoustical Society of America (ASA), Seattle, WA, May 2011.
- J. Traer, P. Gerstoft, M. Siderius and W. S. Hodgkiss “Ocean bottom profiling with ambient noise: a model for the passive fathometer,” *Invited paper* (Awarded best student presentation) 160th meeting of the Acoustical Society of America (ASA), Cancun, Mexico, Nov 2010.
- J. Traer, P. Gerstoft, and W. S. Hodgkiss, “Ocean bottom mapping with ambient noise: a model for the passive fathometer,” European Conference on Underwater Acoustics (ECUA), Istanbul, Turkey, Jul 2010.
- J. Traer, “Ocean Acoustic Measurement,” International Meeting of Students in Physical Oceanography (IMSPO), Ensenada, Mexico, September 2009.
- C. H. Harrison, J. Traer, and P. Gerstoft, “Synthesis of adaptive processing of a passive fathometer,” 157th meeting of the Acoustical Society of America (ASA), Portland, OR, May 2009.

Conference Posters

- J. Traer and J. H. McDermott, “Intuitive Physics in Auditory Scene Analysis,” Association for Research in Otolaryngology (ARO), Baltimore, MD, Feb 2019.
- J. Traer and J. H. McDermott, “Environmental Sound Recognition in Reverberation as Causal Inference,” Association for Research in Otolaryngology (ARO), Baltimore, MD, Feb 2019.
- J. Traer and J. H. McDermott, “Human inference of force from impact sounds: perceptual evidence for inverse physics,” Acoustical Society of America (ASA), Minneapolis, MN, May 2018.
- J. Traer and J. H. McDermott, “Human recognition of environmental sounds is not always robust to reverberation,” Acoustical Society of America (ASA), Minneapolis, MN, May 2018.

- J. Traer and J. H. McDermott, “Statistics of Resonant Modes Allow Auditory Inference of Material from Impact Sounds,” Association for Research in Otolaryngology (ARO), San Diego, CA, Feb 2018.
- J. Traer and J. H. McDermott, “Investigating audition with a generative model of impact sounds,” Acoustical Society of America (ASA), Boston, MA, Jun 2017.
- M. Cusimano, J. Traer and J. H. McDermott, “Auditory perception of object properties as inverse acoustics,” Acoustical Society of America (ASA), Boston, MA, Jun 2017.
- J. Traer and J. H. McDermott, “Ecological Acoustics and the Effect of Material and Force on Impact Sounds,” Association for Research in Otolaryngology (ARO), Baltimore, MD, Feb 2017.
- J. Traer and J. H. McDermott, “Statistics of natural reverberation enable perceptual separation of sound and space,” Speech and Audio in the North-East (SANE), Cambridge, MA, Oct, 2016.
- J. Traer and J. H. McDermott, “Human Perception of Reverberation Incorporates Natural Statistics,” Association for Research in Otolaryngology (ARO), Baltimore, MD, Feb 2015.
- J. Traer and J. H. McDermott, “The Perception of Reverberation is Constrained by Environmental Statistics,” Association for Research in Otolaryngology (ARO), San Diego, CA, 2014.
- J. Traer, P. Gerstoft, P. D. Bromirski and P. M. Shearer, “Shallow water microseism generation,” American Geophysical Union (AGU), San Francisco, CA, Dec 2011.
- J. Traer, P. Gerstoft, and W. S. Hodgkiss, “Ocean bottom mapping with ambient noise and adaptive array processing ,” American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, Dec 2009.
- J. Traer, P. Gerstoft, L. A. Brooks, P. D. Bromirski, W. S. Hodgkiss, and D. P. Knobles “Low-frequency acoustic signature of tropical storms Ernesto and Florence,” 155th meeting of the Acoustical Society of America (ASA), Paris, France, Jun 2008.