

Laura K. Shanahan, Ph.D.

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EDUCATION

Ph.D., Neuroscience **January 2019**
Northwestern University, Chicago, Illinois

B.S., Neurobiology and Psychology **May 2011**
University of Wisconsin, Madison, Wisconsin

ACADEMIC APPOINTMENTS

Assistant Professor of Psychology **2022 – present**
Rhodes College, Memphis, Tennessee

Adjunct Professor of Neuroscience **2020 – 2021**
Loyola University, Chicago, Illinois

Adjunct Professor of Neuroscience **2020**
Lake Forest College, Lake Forest, Illinois

Visiting Teacher Scholar **2019**
Lake Forest College, Lake Forest, Illinois

RESEARCH EXPERIENCE

Postdoctoral Research Fellow **2019 – present**
Northwestern University, Chicago, Illinois
Principal Investigator: Thorsten Kahnt, Ph.D.
Topics: Olfactory perceptual decision-making, satiety state, sleep and sleep deprivation, olfactory development, physiological and neural mechanisms

Graduate Research Assistant **2012 – 2019**
Northwestern University, Chicago, Illinois
Principal Investigator: Jay Gottfried, M.D., Ph.D.
Topics: Olfactory targeted memory reactivation, declarative memory, sleep, neural mechanisms

Research Volunteer **2011 – 2012**
University of Colorado, Boulder, Colorado
Principal Investigator: Rui Yi, Ph.D.
Topic: Effects of microRNA expression on skin tissue in a mouse model

Undergraduate Researcher **2010 – 2011**
University of Wisconsin Psychiatric Institute and Clinics, Madison, Wisconsin
Principal Investigator: Giulio Tononi, M.D., Ph.D.
Topic: Effects of long-term meditation on human sleep architecture

Study Abroad Research Scholar **2010**
School for Field Studies, Atherton Tablelands, Queensland, Australia

Topic: Dietary habits of two Australian python species

TEACHING EXPERIENCE

INSTRUCTOR OF RECORD

PSYC 382: Behavioral and Cognitive Neuroscience (undergraduate level)

Fall 2020, Fall 2021

Loyola University, Chicago, Illinois

Behavioral and cognitive neuroscience is a required for the cognitive and behavioral neuroscience major at Loyola University, and the goal of the course is to familiarize mid- and upper-level undergraduate students with related neuroscience topics (i.e., object recognition, attention, language, learning and memory, cognitive control, and emotion) through lecture-based instruction, engagement with primary literature, and collaborative group work. I am solely responsible for course design and content, which involves crafting the syllabus, establishing learning objectives, developing and recording asynchronous lectures, and selecting and presenting primary research articles. I also design and evaluate exams, participation assignments, individual and collaborative writing assignments, and final projects. Course takes place online, initially due to COVID-19 pandemic, and now due to elevated demand for online courses. *Class size: 48 students.*

NEUR 365: Neuroscience of Sleep (undergraduate level)

Spring 2020

Lake Forest College, Lake Forest, Illinois

Designed and taught a seminar-style course to introduce mid- to upper-level undergraduate students to brain-based sleep research through the lens of primary literature. Topics included sleep across species, sleep and health, sleep and cognition, and dreams. I was solely responsible for course design and content, which involved crafting a syllabus, establishing learning objectives, developing and presenting lectures, selecting primary research articles, and designing and evaluating writing assignments and independent research projects. Adapted in-person course to online format mid-semester due to COVID-19 pandemic. *Class size: 18 students.*

GUEST LECTURER

BIOL 130: Biology Inquiry – Deadly Shapes, Hostage Brains (undergraduate level)

Fall 2019

Lake Forest College, Lake Forest, Illinois

Lectures on synaptic transmission and research methods

Neuroscience Seminar Series (high school level)

2015, 2016, 2018

Walter Payton High School, Chicago, Illinois

Lectures on introductory neuroscience and sleep-dependent memory consolidation

NUIN 401-3: Fundamentals of Cognitive Neuroscience (graduate level)

Spring 2017

Northwestern University, Chicago, Illinois

Lecture on neural mechanisms of memory consolidation (i.e., memory replay)

PSYCH 361: Brain Damage and the Mind (undergraduate level)

Winter 2017

Northwestern University, Evanston, Illinois

Lecture on frontal lobes and cognitive control

TEACHING ASSISTANT

Research Communication Training Program (graduate level)

Summer 2019

Northwestern University, Chicago, Illinois

NUIN 401-2: Fundamentals of Systems Neuroscience (graduate level)

Winter 2014

Northwestern University, Chicago, Illinois

NUIN 401-1: Fundamentals of Molecular Neuroscience (graduate level)

Fall 2013

Northwestern University, Chicago, Illinois

MENTOR

Research Mentor, Kahnt Lab 2020 – present

Northwestern University, Chicago, Illinois

Provide research support for rotation graduate student and undergraduate student

Tutor, Collaborative Learning & Integrated Mentoring in the Bioscience Program (CLIMB) 2016 – 2019

Northwestern University, Chicago, Illinois

Provided academic support for three graduate students (neuroscience coursework, Ph.D. candidacy qualifying exam)

Study Group Facilitator, CLIMB 2014, 2016

Northwestern University, Chicago, Illinois

Led study sessions for small groups of graduate students

Academic Mentor, Chicago Lights 2013 – 2014

Chicago, Illinois

Provided personal and academic support for high school student as part of tutoring program that serves underrepresented communities

WORKSHOP LEADER

Graduate Student Training 2019

Northwestern University, Chicago, Illinois

Workshop on how to deliver an effective research presentation

Searle Center Workshop Series [*co-presenter] 2018

Northwestern University, Evanston, Illinois

Workshops on engaged lecturing and incorporating primary literature into the STEM classroom

Chicago Public School Teacher Training Event [*co-presenter] 2013 – 2017

Northwestern University, Chicago, Illinois

Workshops on brain injury and safety, motor learning, learning and memory, and the chemical senses

ASSISTANT SCIENCE TEACHER

Sciensational Workshop for Kids (elementary & middle school level) Summer 2011

Lafayette, Colorado

RELEVANT GRADUATE COURSEWORK

Molecular & Cellular Biology for Neuroscience ♦ Molecular Neuroscience ♦ Systems Neuroscience ♦ Cognitive Neuroscience ♦ Neuroanatomy ♦ Great Experiments in Systems Neuroscience ♦ Cellular & Molecular Methods of Information Storage ♦ Quantitative Methods & Experimental Design ♦ Responsible Conduct of Research ♦ Training Course in MRI ♦ Research Communication Training Program ♦ Skills & Careers in Science Writing

PEDAGOGICAL TRAINING AND SERVICE

Founder and Co-Director, Neuroscience Teaching Fellowship Program 2018 – present

Northwestern University, Chicago, Illinois

Launched a new initiative to provide hands-on teaching experience for graduate students and postdoctoral fellows in Interdepartmental Neuroscience Program; currently lead and facilitate initiative

Searle Center Graduate Teaching Fellow 2017 – 2018

Northwestern University, Evanston, Illinois

Awarded year-long fellowship to improve teaching and learning within Interdepartmental Neuroscience Program

Searle Center Teaching Certificate Program

2016 – 2017

Northwestern University, Evanston, Illinois

Took part in year-long program to improve pedagogy through engagement with primary literature, group discussion and reflection, and practical experience

Searle Center Teaching Workshops

2016 – 2017

Northwestern University, Evanston, Illinois

Participated in pedagogical workshops on promoting active learning in STEM and engaging in difficult conversations around social identity

PEDAGOGICAL SERVICE PRESENTATIONS

Lin C*, **Shanahan L***, Pitman J, & Swanson G (2021). *New Fellowship Improves Teaching Skills for Neuroscience Graduate Students and Postdoctoral Fellows at Northwestern University*. Society for Neuroscience Annual Meeting, virtual format. [*co-first authors]

Shanahan L* & Lin C* (2019). *New Fellowship Provides Hands-On Teaching Experience for NUIN Graduate Students and Postdoctoral Fellows*. Northwestern University Interdepartmental Neuroscience Program Retreat, Chicago, IL. [*co-first authors]

PUBLICATIONS

PEER-REVIEWED PUBLICATIONS

Sagar V, **Shanahan L**, Zelano C, Gottfried J, & Kahnt T (under review). High-precision mapping reveals the structure of odor coding in the human brain.

Shanahan L & Kahnt T (accepted). On the state-dependent nature of odor perception. *Frontiers in Neuroscience*.

Shanahan L, Bhutani S, & Kahnt T (2021). Olfactory perceptual decision-making is biased by motivational state. *PLOS Biology*, 19, pg. 1-21.

Bao X, Gjorgieva E, **Shanahan L**, Howard J, Kahnt T, & Gottfried J (2019). Grid-like neural representations support olfactory navigation of a two-dimensional odor space, *Neuron*, 102, pg. 1-10.

Shanahan L, Gjorgieva E, Paller K, Kahnt T, & Gottfried J (2018). Odor-evoked category reactivation in human ventromedial prefrontal cortex during sleep promotes memory consolidation, *eLife*, 7, pg. 1-21.

Fill J, McBride P, **Shanahan L**, Stark J, Freeman A, & Curran T (2012). Diet of Amethystine (*Morelia kinghorni*) and Carpet Pythons (*Morelia spilota*) in North Queensland, Australia. *Herpetological Review*, 43, pg. 30-34.

BOOK CHAPTERS

Shanahan L & Gottfried J (2017). Scents & reminiscence: Olfactory influences on memory consolidation in the sleeping human brain. In N Axmacher & B Rasch (Eds.), *Cognitive Neuroscience of Memory Consolidation* (pg. 335-346), Springer.

Shanahan L & Gottfried J (2014). Olfactory insights into sleep-dependent learning and memory. In E Barkai & B Wilson (Eds.), *Odor Memory and Perception* (pg. 309-343), Elsevier.

FELLOWSHIPS AND GRANTS

Institutional Postdoctoral National Research Service Award – T32HL007909

2019 – 2021

Training Program in Sleep and Circadian Rhythms

Individual Predoctoral National Research Service Award – F31DC015374 (Score: 10) National Institute on Deafness and Other Communication Disorders	2016 – 2019
Institutional Predoctoral National Research Service Award – T32NS047987 Human Cognition Training Program	2014 – 2016
Institutional CORE Facilities Equipment Grant (significant contributor) Northwestern Office for Research	2015
Community Building Grant The Graduate School of Northwestern University	2014 – 2017

RESEARCH PRESENTATIONS

RESEARCH TALKS: EXTERNAL

Loyola University Neuroscience Seminar Series Virtual format <i>Title:</i> Olfactory flexibility: Exploring links between odor perception, brain activity, and behavior	2021
Association for Chemoreception Sciences Annual Meeting [*symposium chair] Virtual format <i>Title:</i> How satiety modulates perceptual decision-making in olfactory circuits	2021
International Symposium on Olfaction and Taste Annual Meeting Virtual format <i>Title:</i> Motivational state influences olfactory perceptual decision-making in humans	2020
Chicago Brain Bee Lake Forest, Illinois <i>Title:</i> How scents in sleep strengthen associated memories	2020
Lake Forest College Glassman Symposium Lake Forest, Illinois <i>Title:</i> How scents in sleep strengthen associated memories	2019
International Sleep Replay Workshop Evanston, Illinois <i>Title:</i> An fMRI signature of targeted memory reactivation	2019
Society for Neuroscience Annual Meeting Washington DC <i>Title:</i> Olfactory cues evoke stimulus-specific replay in the sleeping human brain to enhance memory recall	2017

RESEARCH TALKS: INTERNAL

Neurology Department Research in Progress Seminar Series Chicago, Illinois <i>Title:</i> Satiety alters sensitivity – Effects of food intake on olfactory processing in humans	2020
Public Thesis Defense Chicago, Illinois <i>Title:</i> Forgetting Stinks: How smells in sleep improve memory	2018
Research Communication Training Program Symposium Chicago, Illinois <i>Title:</i> Mind control: Using odors to improve memory [https://www.youtube.com/watch?v=mXxj4rq-Fh0]	2018

- Cognitive Brain Mapping Group Seminar Series** [*co-presenter] **2016**
Chicago, Illinois
Title: Enhancing appetite through food odors occurring during sleep
- Cognitive Brain Mapping Group Seminar Series** **2016**
Chicago, Illinois
Title: Elucidating mechanisms underlying odor-mediated memory consolidation in the sleeping human brain:
An EEG-fMRI study
- Data Blitz** **2016**
Chicago, Illinois
Title: Elucidating mechanisms underlying odor-mediated memory consolidation in the sleeping human brain:
An EEG-fMRI study
- Human Cognition T32 Training Day** **2015**
Chicago, Illinois
Title: Elucidating mechanisms underlying odor-mediated memory consolidation in the sleeping human brain:
An EEG-fMRI study
- Neurobiology Department Seminar Series** **2012**
Evanston, Illinois
Title: Effects of age and photoperiod on retinal morphology in *Drosophila* neurodegeneration models

RESEARCH POSTER PRESENTATIONS

- Shanahan L**, Mithal L, Otero S, Wakschlag L, Seed P, Parrish T, & Kahnt T (2021). *Investigating the physiological and neural correlates of olfaction in infants*. Society for Neuroscience Annual Meeting, virtual format.
- Shanahan L**, Bhutani S, & Kahnt T (2021). *Motivation biases olfactory decision-making through odor-specific and odor-general changes in neural signaling*. Cognitive Neuroscience Society Meeting, virtual format.
- Shanahan L** & Kahnt T (2019). *Satiety alters sensitivity: Effects of food intake on olfactory processing in humans*. Society for Neuroscience Annual Meeting, Chicago, Illinois.
- Shanahan L**, Gjorgieva E, Kahnt T, & Gottfried J (2017). *Investigating Neural Correlates of Olfactory Targeted Memory Reactivation in the Sleeping Human Brain*. Association for Chemoreception Sciences, Fort Myers, Florida.
- Shanahan L**, Gjorgieva E, Kahnt T, & Gottfried J (2017). *Elucidating Neural Correlates of Olfactory Targeted Memory Reactivation in the Sleeping Human Brain*. Brain Research Foundation 17th Annual Neuroscience Day, Chicago, Illinois.
- Shanahan L**, Gjorgieva E, Kahnt T, & Gottfried J (2017). *Elucidating Neural Correlates of Olfactory Targeted Memory Reactivation in the Sleeping Human Brain*. Society for Neuroscience Chicago Chapter Annual Meeting, Chicago, Illinois.
- Shanahan L**, Gjorgieva E, Kahnt T, & Gottfried J (2017). *Elucidating Neural Correlates of Olfactory Targeted Memory Reactivation in the Sleeping Human Brain*. Cognitive Neuroscience Society Meeting, San Francisco, California.
- Shanahan L**, Gjorgieva E, & Gottfried J (2016). *Investigating the Neural Correlates of Olfactory-Mediated Memory Consolidation in the Sleeping Human Brain*. Society for Neuroscience Annual Meeting, San Diego, California.

Shanahan L, Gjorgieva E, & Gottfried J (2016). *Elucidating Mechanisms Underlying Odor-Mediated Memory Consolidation in the Sleeping Human Brain*. Association for Chemoreception Sciences, Fort Myers, Florida.

Shanahan L & Allada R (2013). *Using Retinal Morphology to Assess Neurodegeneration: Can Alternating Photoperiod Have Neuroprotective Effects?* Brain Research Foundation 13th Annual Neuroscience Day, Chicago, Illinois.

Shanahan L (2010). *Dietary Composition of the Carpet Python and the Amethystine Python in North Queensland, Australia*. Atherton Tablelands Community Meeting, Queensland, Australia.

SCIENTIFIC SERVICE AND OUTREACH

- Counselor, Society for Neuroscience Chicago Chapter** 2020 – present
Chicago, Illinois
Elected to a team of neuroscientists to organize annual meeting; served as liaison between chapter and outreach group
- Symposium Co-Chair, Association for Chemoreception Sciences Annual Meeting** 2021
Virtual format
Organized and facilitated symposium entitled “Satiety-based modulation of chemosensory processing across organisms”
- Documentary Interview, NOVA PBS (Dream Hacking Episode)** 2021
Discussed and re-enacted sleep and memory experiment for lay audience
[\[https://www.youtube.com/watch?v=7M06fJxiayo\]](https://www.youtube.com/watch?v=7M06fJxiayo)
- Presenter & Volunteer, Chicago Brain Bee** 2020
Lake Forest College
Gave talk on olfaction and sleep-dependent memory; served as co-moderator for Brain Bee Competition
- Judge, Chicago Science Fairs** 2013, 2014, 2016 – 2019
Chicago Public Schools
Evaluated elementary, middle, and high school student science projects
- Podcast Interview, eLife Podcast (Scented Memories Episode)** 2019
Discussed sleep and memory publication for lay audience [<https://elifesciences.org/podcast/episode53>]
- Co-President, Northwestern University Brain Awareness Outreach** 2014 – 2017
Northwestern University
Led initiative to inform and inspire the Chicago community about the brain; initiated, organized, advertised, and executed several neuroscience outreach events (e.g., annual Brain Awareness Fair, annual Brain Awareness Teachers Workshop, Walter Payton High School Neuroscience Seminar Series); collaborated extensively with Chicago public schools and local science education programs; coordinated over 100 volunteers (undergraduate and graduate students, postdoctoral fellows, lab technicians)
- Organizer, March for Science STEM Expo** 2017
Chicago, Illinois
Presented neuroanatomy demonstration
- Presenter, Noble Network of Charter Schools STEM Expo** 2015, 2016
Rauner College Prep
Presented on neuroscience outreach and careers in neuroscience
- Contributing Author & Consultant, “Meet Your Brain” Issue of Cricket Magazine** 2016
Co-authored “Ask a Brain” article; provided consulting support for rest of issue
- Volunteer, YOUmedia Learning Space** 2015

Harold Washington Library

Presented sensorimotor nervous system demonstration

TV Interview, Charlie Bonds and Chicago Brain Awareness Week

2015

Service Employees International Union Local 73

Engaged in conversational interview about popular brain facts and myths

Volunteer, Brain Awareness Fair

2013, 2014

Nettlehorst Elementary School

Led motor learning demonstrations

SCIENCE OUTREACH PRESENTATIONS

Warren K, Stojkowska I, **Shanahan L**, Frederick N, & McIver S (2017). *Northwestern University Brain Awareness Outreach encourages neuroscience education in the Chicagoland area*. Society for Neuroscience Annual Meeting, Washington DC.

Shanahan L*, Frederick N*, Bush N, Ryan É, & McIver S (2016). *Northwestern University Brain Awareness Outreach promotes neuroscience education in the Chicago community*. Society for Neuroscience Annual Meeting, San Diego, CA. [*co-first authors]

Shanahan L*, Frederick N*, Bush N, Ryan É, & McIver S (2015). *Northwestern University Brain Awareness Outreach cultivates excitement for neuroscience within the Chicago community*. Society for Neuroscience Annual Meeting, Chicago, IL. [*co-first authors]

Frederick N*, **Shanahan L***, Hattori S, & McIver S (2014). *The Northwestern Brain Awareness Outreach organization shares excitement for neuroscience with the Chicago community*. Society for Neuroscience Annual Meeting, Washington DC. [*co-first authors]

AWARDS AND HONORS

Polak Young Investigator Award

2021

Association for Chemoreception Sciences

Award for scientific merit of research abstract

Leadership Award

2017

Interdepartmental Neuroscience Program, Northwestern University

Award for top leadership and service

1st Place in 17th Annual Neuroscience Day Poster Competition Award

2016

Brain Research Foundation

1st Place in Program Retreat Poster Competition Award

2016

Interdepartmental Neuroscience Program, Northwestern University

Wildcat Excellence Award

2014

Northwestern University

Award for outstanding graduate student organization (Northwestern University Brain Awareness Outreach)