STEPHEN L. COWEN, PH.D.

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RESEARCH OVERVIEW

My laboratory seeks to understand how the organized activities of neurons and the release of dopamine support navigation, movement, and the formation of lasting memories. We also explore how communication between neurons is disrupted in aging, Parkinson's disease, Alzheimer's disease, and chronic pain. My colleagues and I also develop novel instrumentation for visualizing and modulating brain activity, measuring dopamine release, and quantifying behavior and physiological stages of sleep.

CHRONOLOGY OF EDUCATION

2007-2008 *The Neurosciences Institute* *San Diego, CA*
Postdoctoral Fellow Advisor: Dr. Douglas A. Nitz
I investigated how the activities of ensembles of neurons in the hippocampus and prefrontal cortex contribute to cost-benefit decision making and spatial navigation.

2007 *University of Arizona* *Tucson, AZ*
Ph.D. Psychology, minor Neuroscience Advisor: Dr. Bruce McNaughton
I investigated the neural mechanisms underlying working memory, navigation, and memory consolidation using *in vivo* single-unit recordings.
Dissertation: "Selective Delay Activity in the Medial Prefrontal Cortex: The Contribution of Sensory-Motor Information and Expectation"

1992 *University of Wisconsin* *Madison, WI*
B.A., Business Administration, Dean's List.

CHRONOLOGY OF EMPLOYMENT

2019-present *The University of Arizona* *Tucson, AZ*
Associate Professor, Psychology Department
Member of the following UA Graduate Interdisciplinary Programs (GIDP): Neuroscience, Cognitive Science, Physiological Sciences, Applied Biosciences, and Biomedical Engineering.

2012-2019 *The University of Arizona* *Tucson, AZ*
Assistant Professor, Psychology Department
Member of the following UA Graduate Interdisciplinary Programs (GIDP): Neuroscience, Cognitive Science, Physiological Sciences, and Biomedical Engineering.

2010-2012 *The Neurosciences Institute* *San Diego, CA*
Associate Fellow, Neuroscience

2008-2010 *The Neurosciences Institute* *San Diego, CA*
Research Fellow, Neuroscience

1996-1997 *The Lytton Neuroscience Laboratory* *Madison, WI*
Computer System Administrator and Programmer

1992-1994 *The United States Peace Corps* *Roatán, Honduras*
Microbusiness volunteer

SERVICE

Committees:

2022-2024 **Host, organizer, and emcee:** the Neuroscience Data Blitz. 4 events/year at the Museum of Contemporary Art, Tucson, AZ.

2022-2024 **Member:** Neuroscience Graduate Interdisciplinary Program (GIDP) Executive Committee**,** University of Arizona.

2020-2024 **Member:** Graduate Training in Applied Statistics (GTAS) committee

2022-2024 **Director:** NIH/NIDA sponsored U. Arizona Center for Excellence in Addiction Studies (CEAS) Pilot grant project. Lead of the proposal review committee. **Awarded >$100,000 internal UA grants since 2022**.

2023-2024 **Member:** Psychology Faculty Awards Committee.

2020-2021 **Sabbatical**

2021 **Member of the University of Arizona Healthy Aging Seed Grant review panel ($75,000 distributed to 3 awardees),** University of Arizona.

2021 **External Member and Examiner:** Graduate Committee for Ali Mashhoori, U Alberta, Lethbridge Canada.

2020 **Chair:** Undergraduate Curriculum Committee, Psychology Department

2019 **Chair:** Undergraduate Curriculum Committee, Psychology Department

2019 **Member:** Neuroscience Graduate Curriculum Committee

2019 **External Member and Examiner:** Graduate Committee for Saeedeh Hashemniayetorshizi, U Alberta, Lethbridge Canada.

2018 **Chair/Organizer:** Parkinson's Disease Data Blitz: M. of Contemporary Art

2018 **Chair:** Undergraduate Curriculum Committee, Psychology Department

2018 **Chair:** Nugent Award Selection Committee, Psychology Department

2018 **Chair:** Michelle Villegas Award Committee, Psychology Department

2018 **Chair:** Galileo Award Committee, Psychology Department

2018 **Member:** Graduate Training in Applied Statistics (GTAS) committee

2018	**Member:** Teaching Faculty Search Committee, Psychology Department
2012-present	**Mentor:** for more than 50 undergraduate and 5 high school students
2013-present	**Member:** masters, prelim, or doctoral committees for 19 graduate students
2013-present	**Member:** Undergraduate Curriculum Committee, Psychology Department
2017	**Member:** McKnight Brain Institute Scientific Advisory Board
2017	**Member:** Graduate Training in Applied Statistics (GTAS) committee
2017	**Chair:** Faculty Search Committee, Psychology Department
2016	**Chair:** Faculty Search Committee, Psychology Department
2016	**Member:** Graduate Student Admission Committee, Neuroscience GIDP
2015	**Chair:** *Ad hoc* Grade Appeal Committee, University
2015	**Chair:** Outstanding Senior Selection Committee, Psychology Department
2015	**Member:** Faculty Search Committee, Psychology Department
2015	**Member:** Faculty Search Committee, Neuroscience Department
2015	**Member:** Graduate student admission committee, Neuroscience GIDP
2014	**Member:** Outstanding Senior Selection Committee, Psychology Department
2014	**Member:** Faculty Search Committee, Neuroscience Department

Peer-Review:

2012-present	**Invited referee for peer-reviewed journals:** Neuron, The Journal of Neuroscience, Neuroscience Letters, Frontiers in Neuroscience, Journal of Neuropharmacology, Cerebral Cortex, Future Medicine: Nanotechnology, Current Opinion in Behavioral Sciences, Journal of Neural Engineering, ACS Chemical Neuroscience, PLOS Biology, Neurobiology of Aging, Behavioral Brain Research, PNAS.

Other:

2024	**Faculty Host:** For visiting computational neuroscientist Tim Lewis (UC Davis) for his visit March 21.
2022-2024	**Host, organizer, and emcee:** the Neuroscience Data Blitz (4 events/year at the Museum of Contemporary Art), Tucson, AZ
2023	**Panelist:** Work-life Balance. A discussion for graduate students, faculty, and staff in the University of Arizona Psychology Department (organized by Dr. Jamie Edgin). (2/17/2023)
2021	**Ad-hoc NIH grant reviewer.**
2019	**Host and emcee:** the Neuroscience Data Blitz, Tucson, AZ
2018:	**Panelist:** Careers panel discussion for the Undergraduate Research Opportunities Consortium (UROC) given at the Integrated Learning Center.

I regularly accept UROC and Summer Institute for Medical Ignorance (SIMI) students in the laboratory and support the diversity efforts of these programs.

2016 **Panelist:** Career advisory panel for undergraduate students in the Neuroscience and Cognitive Sciences program with Anita Koshi and Lynne Oland

2016 **Grant Reviewer:** Michael J Fox Foundation

2015 **Host and emcee:** the Neuroscience Data Blitz, Tucson, AZ

2015 **Host:** Laboratory promotion event for District 2 Representative Rossana Gabaldón, Tucson, AZ

2015 **Faculty host:** For **Ralph Greenspan,** Ph.D. (UCSD), At University of Arizona, Neuroscience Seminar Series Talk: "The Fruit Fly and the B.R.A.I.N. Initiative."

2014 **Grant Reviewer:** Arizona Alzheimer's Disease Core Center

2014 **Host and emcee:** the Neuroscience Data Blitz, Tucson, AZ

2014 **Faculty host:** For **Doug Nitz, Ph.D**. (UCSD), University of Arizona CNS Seminar Series Talk: "Cell Assemblies of the Basal Forebrain"

2013 **Panelist:** Career advisory panel for undergraduate students in the Mind, Brain, and Behavior program.

OUTREACH

Woods Hole Neural Systems & Behavior summer course instructor (2023, 2024). Invited instructor for the 2-week intensive course in neurobiology hosted at the Massachusetts Marine Biological Laboratories at Woods Hole, MA.

Tucson Festival of Books Presenter (2014-2024, March). Each year, my students and I volunteer at the Festival of Books to teach children about neuroscience and the scientific process. We use our in-house Jell-O Brain neurophysiology demonstration kit to demonstrate how scientists measure electrical brain activity.

Sabino Canyon "Stars at Sabino" Science Outreach (May 2022, Tucson). My students and I (students did most of the work) used our in-house Jell-O B the Brain neurophysiology demonstration kit to demonstrate neuroscience to visitors at Sabino Canyon.

Invited Speaker for the Alzheimer's Foundation (March 31, 2021).

Science and Entertainment Exchange (National Academy of Sciences). *Ad hoc* scientific consultant (unpaid). Worked with Lisa Gold on television-series script involving out of body experiences. Feb 2020.

Organizer and creator of the B-the-Brain program for teaching K-12 students about neuroscience. Local schools and The Tucson Festival of Books**.** Jan**-**March 2020. Tucson, AZ.

Invited Speaker: UA Retired Faculty Dinner. "The Aging Mind and Brain", July 2019. Tucson, AZ.

Invited Speaker: Sun City Oro Valley (SCOV) Active Health Committee. "How our brains learn and remember and the impact of age", Feb 15, 2019. Oro Valley, AZ.

Invited Speaker: Tucson Science Fiction Writers Association. "Dopamine, Neuroscience, and Science Fiction", Feb 2, 2019. Tucson, AZ.

Speaker: Tucson Community Science Café. "Your Brain on Dopamine.", Jan 15, 2019. Tucson, AZ.

B the BRAIN: B the BRAIN was developed by Dr. Cowen and graduate student Matthew Schmit as an interactive computer and gelatin-based brain demonstration kit. This kit and curriculum allow K-12 students to "poke" electrodes into an electronic responsive brain, allowing the students to explore hypotheses about what the artificial brain is sensing. B the Brain is a recurring interactive exhibit at the Flandrau Science Center (Tucson) and the Tucson Festival of Books. It has also been presented at local high schools, the Tucson Library (S.Y.STEM program), St. Cyril's K-8 school, and three middle schools. The design of B the Brain and the curriculum that we developed was presented at the Society for Neuroscience meeting (Nov. 2016).

Blast Off Summer Camp Brain Demonstration. Summer 2017. Students presented a 60-minute active electrophysiology demonstration at a Tucson science summer camp.

Science and Entertainment Exchange (National Academy of Sciences). *Ad hoc* scientific consultant (unpaid). Worked with Sid Mohanty Fall 2016 and Spring 2018 on Hollywood script development about parietal hemineglect (~20 hours of research, conference calls, and emails).

Speaker/Organizer: Flandrau Science Center "Drugs and the Brain" Science Café Series (5 talks by 5 neuroscientists). Title: "Brain waves, drugs, and the chemical basis for hallucinations.", Tucson, AZ, Spring 2016.

Arizona Public Media NPR broadcast interview with Dr. Leslie Tolbert. I described my research in memory and decision-making. Tucson, AZ, Spring 2015.

Speaker: Arizona Integrated Wellness Cooperative (AIWC). Title: "Memories are made of this: How our brains create the past." Tucson, AZ, September 22, 2015.

Speaker: NAWBO Women's Business Wellness Workshop, "Move it or lose it: How our bodies empower our brains", Tucson, AZ January 12, 2015.

Podcast presentations: As a part of my graduate class (Neural Mechanisms of Decision Making), we collaborated with a 6th grade class in Port Washington, Wisconsin. In this collaboration, my students produced 10 brief podcasts and videos describing neuroscience research. We also received great feedback from the 6th graders. Tucson, AZ, Spring 2015.

Presenter: Tucson Festival of Books. Assisted with the cockroach neuroscience hands-one demonstration that teaches K-12 children about nerve conduction. Tucson, AZ, Spring 2014.

Presenter: Science in the City. "Effort, Risk, and Parkinson's Disease", Tucson Electric Power Building, Tucson, AZ, Spring 2013.

PUBLICATIONS/CREATIVE ACTIVITY

Peer-reviewed Journals:

Current and former trainees are underlined, * Work done as a graduate student, [c] A collaborator
https://www.ncbi.nlm.nih.gov/myncbi/stephen.cowen.1/bibliography/public/

Hamilton A.R., Vishwanath A., Weintraub N.C., **Cowen S.L.**, Heien M.L[c]. (2024) Dopamine release dynamics in the nucleus accumbens are modulated by the timing of electrical stimulation pulses when applied to the medial forebrain bundle and medial prefrontal cortex. ACS Chemical Neuroscience (accepted, in press)

Jordan, G.A., Vishwanath, A., Holguin, G., Bartlett, M.J., Tapia, A.K., Winter, G.M., Sexauer, M.R., Stopera, C.J., Falk[c], T., **Cowen, S.L.**, (2024). Automated system for training and assessing reaching and grasping behaviors in rodents. Journal of Neuroscience Methods 401, 109990. PubMed PMID: 37866457 https://doi.org/10.1016/j.jneumeth.2023.109990

Liu Y, Lim K, Sundman M, Ugonna C, Ton That V, **Cowen S**, Chou YH (2022) Association between responsiveness to transcranial magnetic stimulation and interhemispheric functional connectivity of sensorimotor cortex in older adults. Brain Connect. 2022 May 27;. doi: 10.1089/brain.2021.0180. PubMed PMID: 35620910.

Crown L.M., Gray DT, Schimanski LA, Barnes CA[c], **Cowen S.L.** (2022) Aged rats exhibit altered behavior-induced oscillatory activity, place cell firing rates, and spatial information content in the CA1 region of the hippocampus. J Neurosci. Apr 27;. doi: 10.1523/JNEUROSCI.1855-21.2022. PubMed PMID: 35477900.

Liu, Y., Lim, K., Sundman, M., Ugonna, C., That, V. T., **Cowen, S**., & Chou, Y. (2021). Interhemispheric functional connectivity of sensorimotor cortex predicts responsiveness of transcranial magnetic stimulation in older adults. Brain Stimulation, 14(6), 1683. https://doi.org/10.1016/j.brs.2021.10.303

Izadi, A., Schedlbauer, A., Ondek, K., Disse, G., Ekstrom, A. D., **Cowen, S.L.**, Shahlaie, K., & Gurkoff, G.G. (2021). Early Intervention via Stimulation of the Medial Septal Nucleus Improves Cognition and Alters Markers of Epileptogenesis in Pilocarpine-Induced Epilepsy. Frontiers in Neurology, 12. https://doi.org/10.3389/fneur.2021.708957

Ye, T., Bartlett, M. J., Sherman, S. J., Falk, T[c]., & **Cowen, S. L**. (2021). Spectral signatures of L-DOPA-induced dyskinesia depend on L-DOPA dose and are suppressed by ketamine. Experimental Neurology, 340, 113670. https://doi.org/10.1016/j.expneurol.2021.113670

Ondek K, Pevzner A, Tercovich K, Schedlbauer AM, Izadi A, Ekstrom AD, **Cowen SL**, Shahlaie K, Gurkoff GG [C]. (2020). Recovery of Theta Frequency Oscillations in Rats

Following Lateral Fluid Percussion Corresponds With a Mild Cognitive Phenotype. Front Neurol [Internet] 11:600171. Available from: http://www.ncbi.nlm.nih.gov/pubmed/33343499

Seaton BT, Hill DF, **Cowen SL**, Heien ML[C] (2020) Mitigating the Effects of Electrode Biofouling-Induced Impedance for Improved Long-Term Electrochemical Measurements In Vivo. Anal Chem 92:6334–6340. Available from: http://www.ncbi.nlm.nih.gov/pubmed/32298105

Siegenthaler JR, Gushiken BC, Hill DF, **Cowen SL**, Heien ML[C] (2020) Moving Fast-Scan Cyclic Voltammetry toward FDA Compliance with Capacitive Decoupling Patient Protection. ACS sensors 5:1890–1899.

Cowen SL, Gray DT, Wiegand JL, Schimanski LA, Barnes CA[C] (2020) Age-associated changes in waking hippocampal sharp-wave ripples. Hippocampus. 2020 Jan;30(1):28-38. doi: 10.1002/hipo.23005. Epub 2018 Nov 11. PubMed PMID: 29981255; PubMed Central PMCID: PMC6322975.

Bartlett MJ, Flores AJ, Ye T, Smidt SI, Dollish HK, Stancati JA, Farrell DC, Parent KL, Doyle KP, Besselsen DG, Heien ML [C], **Cowen SL**, Steece-Collier K, Sherman SJ [C], Falk T [C] (2020) Preclinical evidence in support of repurposing sub-anesthetic ketamine as a treatment for L-DOPA-induced dyskinesia. Exp Neurol 333.

Crown LM, Bartlett MJ, Wiegand J-PL, Eby AJ, Monroe EJ, Gies K, Wohlford L, Fell MJ, Falk T[C], **Cowen SL** (2020) Sleep Spindles and Fragmented Sleep as Prodromal Markers in a Preclinical Model of LRRK2-G2019S Parkinson's Disease. Front Neurol [Internet] 11. Available from: https://www.frontiersin.org/article/10.3389/fneur.2020.00324/full

Spanó G, Gómez RL, B. Demara M, **Cowen SL**, Edgin JE [C] (2018) REM sleep in naps differentially relates to memory consolidation in typical preschoolers and children with Down syndrome. *Proc Natl Acad Sci U S A,* Nov., 115:11844–11849.

Ye T, Bartlett MJ, Schmit MB, Sherman SJ [C], Falk T [C], **Cowen SL** (2018) Ten-Hour Exposure to Low-Dose Ketamine Enhances Corticostriatal Cross-Frequency Coupling and Hippocampal Broad-Band Gamma Oscillations. *Front. Neural Circuits* 12, 61. doi: 10.3389/fncir.2018.00061

Cowen SL, Phelps, CE, Navratilova E [C], McKinzie DL, Okun A, Husain, BS, Gleason SD, Witkin JM, Porreca F [C] (2018) Chronic pain impairs cognitive flexibility and engages novel learning strategies in rats. Pain doi:10.1097/j.pain.0000000000001226 (Editor's Choice article)

Hill DF, Parent KL, Atcherley CW, **Cowen SL** and Heien ML [C] (2017) Differential release of dopamine in the nucleus accumbens evoked by low-versus high-frequency medial prefrontal cortex stimulation. Brain Stimul doi:10.1016/j.brs.2017.11.010.

Note: Cowen is corresponding author. Cowen and Heien contributed equally.

Lewis SA, Negelspach DC, Kaladchibachi S, **Cowen SL**, Fernandez F [C] (2017) Spontaneous alternation: A potential gateway to spatial working memory in Drosophila Neurobiol Learn Mem 142:230–235. doi:10.1016/j.nlm.2017.05.013.

Parent KL, Hill DF, Crown LM, Wiegand J-P, Gies KF, Miller MA, Atcherley CW, Heien ML [C], **Cowen SL** (2017) Platform to Enable Combined Measurement of Dopamine and Neural Activity. Anal Chem 89:2790–2799.

Okun A, McKinzie DL, Witkin JM, Remeniuk B, Husein O, Gleason SD, Oyarzo J, Navratilova E, McElroy B, **Cowen SL**, Kennedy JD, Porreca F [C] (2016) Hedonic and motivational responses to food reward are unchanged in rats with neuropathic pain. Pain 157:2731–2738.

Wiegand J-PL, Gray DT, Schimanski LA, Lipa P, Barnes CA [C], **Cowen SL** (2016) Age Is Associated with Reduced Sharp-Wave Ripple Frequency and Altered Patterns of Neuronal Variability. J Neurosci 36:5650–5660.

Cowen SL, Nitz DA [C] (2014) Repeating Firing Fields of CA1 Neurons Shift Forward in Response to Increasing Angular Velocity, J Neurosci, 34(1):232-41.

Miller MA, Thomé A, **Cowen SL** (2013) Intersection of Effort and Risk: Ethological and Neurobiological Perspectives, Frontiers in Neuroscience, 7:208.

Cowen SL, Davis GA, Nitz DA [C] (2012) Anterior cingulate neurons in the rat map anticipated effort and reward to their associated action sequences. Journal of Neurophysiology 107(9):2393–2407.

*__Cowen, SL__ and McNaughton, BL (2007) Selective delay activity in the medial prefrontal cortex of the rat: The contribution of sensory-motor information and contingency. Journal of Neurophysiology, 98(1):303-16.

*Maurer, AP, **Cowen, SL**, Burke, SN, Barnes, CA and McNaughton, BL (2006) Phase precession in hippocampal interneurons showing strong functional coupling to individual pyramidal cells. The Journal of Neuroscience, 26:13485-13492.

*Maurer, AP, **Cowen, SL**, Burke, SN, Barnes, CA and McNaughton, BL (2006) Organization of hippocampal cell assemblies based on theta phase precession. Hippocampus, 16:785-794.

*Battaglia, FP, Sutherland, GR, **Cowen, SL**, McNaughton, BL and Harris, KD (2005). Firing rate modulation: A simple statistical view of memory trace reactivation. Neural Networks, 18:1280-1291.

*McNaughton, BL, Barnes, CA, Battaglia, FP, Bower, MR, **Cowen, SL**, Ekstrom, AD, Gerrard, JL, Hoffman, KL, Houston, PF, Karten, Y., Lipa, P, Pennartz, CMA. and Sutherland, GR (2003) Off-line reprocessing of recent memory and its role in memory consolidation: A progress report. In: P. Maguet, C. Smith and B. Stickgold (Eds.) Sleep and Brain Plasticity. Oxford University Press: United Kingdom, pp. 225-246.

Invited Review:

Nitz D, **Cowen S**. Crossing borders: sleep reactivation as a window on cell assembly formation. Nature Neuroscience. 2008;11(2):126–8.

Intellectual Property:

Cowen S.L., Heien M.H. [C], U.S Patent Application (Ser. No., PCT/US16/46396) entitled "Methods and Systems for Near Simultaneous Measurement of Neuron Activity and Neurotransmitter Concentration" filed on 8/10/2016.

Cowen S.L., Heien M.H. [C], U.S Provisional Patent Application (Ser. No., 62/218, 994) entitled "Methods and Systems for Near Simultaneous Measurement of Neuron Activity and Neurotransmitter Concentration" filed on 9/15/2015.

Ph.D. Dissertation:

Cowen S.L., Selective Delay Activity in the Medial Prefrontal Cortex: The Contribution of Sensory-Motor Information and Expectation (2007). The University of Arizona.

WORKS IN PROGRESS

Wilhite CA, Oliva A, Berenyi, A, Bartlett, M, Falk, T, Witte RS [C], **Cowen SL**. Activation of the hippocampal CA2 region precedes CA3 following perforant-path stimulation and internally generated dentate spikes. *Under review, Hippocampus (2022).*

Clark NM, Hill DF, Sullivan AW, Wolhford LA, Karibo C, **Cowen SL** (2023), Fast, accurate, and low-cost sensing of reward consumption and lick responses in rodents. *In Preparation, J Neuro Methods.*

Hill DF, Olson Z, Bartlett MJ, Falk T, Heien ML [C], **Cowen SL,** Simultaneous measurement of ventral tegmental area activity and nucleus accumbens dopamine release reveals patterns of neuron firing associated with dopamine release. *In Preparation, Neuron.*

MEDIA

Software:

Reaching and Grasping Analysis and Automation Toolbox. Companion code for Jordan, G.A., Vishwanath, A., Holguin, G., Bartlett, M.J., Tapia, A.K., Winter, G.M., Sexauer, M.R., Stopera, C.J., Falk[c], T., **Cowen, S.L.**, (2024). Automated system for training and assessing reaching and grasping behaviors in rodents. Journal of Neuroscience Methods 401, 109990. https://doi.org/10.1016/j.jneumeth.2023.109990

https://github.com/CowenLab/String_Pulling_System

Lickometer: An open-source package of Matlab and Arduino (C) software and 3D printer files for building a system for detecting the timing and force of licking for the analysis of reward consumption. (https://github.com/CowenLab/LickSensor)

WaveformCutter: An open-source software tool for real-time and off-line identification of single-neuron spiking activity from physiological recordings. WaveformCutter is integrated into the popular spike-sorting program MClust 3.5. I am also a contributing author to the MClust source code (http://redishlab.neuroscience.umn.edu/MClust/MClust.html)

In the media and videos:

Allison Eby (Student research assistant in my lab) spoke about our research on KXCI, a Tucson radio Station on "Thesis Thursday" (June. 2019): https://ubrp.arizona.edu/allison-eby-on-kxcis-thesis-thursday-5-30-19/

Erin Mamaril (Student research assistant in my lab) spoke about our research on KXCI, a Tucson radio Station on "Thesis Thursday" (Aug. 2018): https://ubrp.arizona.edu/erin-mamaril-on-kxcis-thesis-thursday-8-30-18/

Cowen, SL "Four Questions: Chronic Pain and How It Affects the Brain" University of Arizona interview. University Communications (May 2018): https://uanews.arizona.edu/story/four-questions-chronic-pain-and-how-it-affects-brain?utm_source=uanow&utm_medium=email&utm_campaign=
Also released in the UA Alumni magazine: http://arizonaalumni.com/article/four-questions-chronic-pain-and-how-it-affects-brain

Wiegand J-PL, **Cowen, SL,** "Memory-related brainwaves occur less often in old age" Arizona Daily Star Science Supplement, p. 18, 1/29/2017. http://arizonadailystar.az.newsmemory.com/?special=College+of+Science

UA Researchers Develop Brain-Mapping Technology. UA Now article describing an NIH R24 grant in which I am a co-investigator with Dr. Russel Witte. https://uanews.arizona.edu/story/ua-researchers-develop-brain-mapping-technology
Also covered in Cronkite news. http://cronkitenews.azpbs.org/2016/09/16/ua-researchers-aim-to-look-deep-inside-the-brain/
And the Arizona Sentinel: http://www.tucsonsentinel.com/local/report/091916_abi_brain/ua-researchers-developing-new-way-look-deep-inside-brain/

Cowen, S.L., Heien, M.A. 2015 Video report and interview for NSF Brain Initiative grant awardees: http://www.nsf.gov/discoveries/disc_videos.jsp?cntn_id=135837&media_id=79376&org=NSF

Cowen, S.L., Heien, M.A. 2015 Video interview for UA Now regarding collaborative research and technology development: http://uanews.org/videos/lab-two-heads-are-better-one

Cowen, S.L. KUAZ Arizona Public Media NPR Science interview with Dr. Leslie Tolbert entitled "How the brain makes up its mind" December 2015.

Cowen, S.L. "Is memory in your brain, body or both?" Arizona Daily Star, Sunday Dec. 1, 2013.

CONFERENCES/SCHOLARLY PRESENTATIONS

Invited talks and consultation:

Winter Conference on Neural Plasticity (WCNP). Title: "Motion, age, and hippocampal rhythms", Puerto Vallarta, Mexico, Feb 21, 2024. https://www.wcnpmeet.org/

Invited speaker: McKnight Brain Institute Meeting. Title: "The influence of aging on the capacity of the hippocampus to respond to sensory and spatial input", Atlanta GA, May 1, 2023.

Invited Speaker: University of Arizona Center for Excellence in Addiction Research (CEAS). "Chronic pain, kappa opioid receptors, and sleep.", Feb 15, 2023. Tucson, AZ. In-person.

Invited Speaker: University of Arizona Neuroscience Data Blitz. "Age-associated changes in hippocampal gamma oscillations, place-cell firing rates, and spatial information content", Dec 2, 2021. Tucson, AZ. In-person.

Invited Speaker: Alzheimer's Association Public Forum. "Age, sleep, and memory", March 31, 2021. Virtual: Tucson and Hawaii.

Invited Speaker: Biomedical Engineering Seminar. "Neural synchrony in health and disease", Feb 15, 2021. Tucson, AZ.

Invited Speaker: Neuroscience Data Blitz. "Neural Synchrony, Memory, and Parkinson's Disease", Oct 13, 2020. Tucson, AZ.

Invited Speaker: U Nevada, Las Vegas. "The Plastic Hippocampus: Shifting Place Fields, Memory Consolidation, and Aging", Sept. 2020. Las Vegas, NV. (This became a Zoom talk due to COVID-19 precautions)

Invited Speaker: "Regulation of Dopamine Release, Oscillations and Memory Consolidation" Univ. Alberta, Lethbridge Canada, Aug 16, 2019.

Panel Speaker: Undergraduate Research Opportunities Consortium (UROC) for underrepresented students. Panel on preparation for graduate admission, June 2019. Tucson, AZ.

Invited Speaker: UA Retired Faculty Dinner. "The Aging Mind and Brain", May 2019. Tucson, AZ.

Invited Speaker: Sun City Oro Valley (SCOV) Active Health Committee. "How our brains learn and remember and the impact of age", Feb 15, 2019. Oro Valley, AZ.

Invited Speaker: Tucson Science Fiction Writers Association. "Dopamine, Neuroscience, and Science Fiction", Feb 2, 2019. Tucson, AZ.

Speaker and Organizer: Parkinson's Disease Data Blitz. "Neural Synchrony and Parkinson's Disease", Nov 20, 2018. Tucson, AZ.

Invited Speaker: Georgetown University. "Neural Synchrony, Memory, Aging, and Parkinson's Disease", Oct 23 2018. Washington, DC.

Invited Speaker: New Mexico EEG, Translation, and Behavior Meeting. "Neural Synchrony, Memory, Aging, and Parkinson's Disease", Aug 2 2018. Albuquerque, NM.

Invited Speaker: The UA Cognitive Science Colloquium. "Ketamine and Neural Synchrony", Sep 14 2018. Tucson, AZ.

Invited Speaker: The UA Psychology Colloquium. "Aging, Oscillations, and Memory Formation", Oct 31 2018. Tucson, AZ.

Invited Speaker: Learning and Memory Conference. "Aging-related changes in neuronal oscillations", Apr 2018. Huntington Beach, CA.

Invited Speaker: Arizona Psychology Undergraduate Research Conference "Brain Oscillations, Drugs, and Pain", Mar 17, 2018. Phoenix, AZ.

Video Presentation: "Tools for Measuring Neural Activity", Presented within Arunava Majumdar's (IBM Center for Advanced Studies) talk entitled "Neuro-Electro-Chemical Transmitter Analytics Research", IBM Cloud University Conference. Berlin, Germany, Oct 10, 2017.

Invited speaker: Mayo Clinic Brain Initiative Symposium, "Integrated Measurement of Dopamine Release and Large-Scale Ensemble Activity in Behaving Animals", Rochester, MN, Apr 1, 2017.

Invited speaker: U of Arizona Neuroscience DataBlitz "Brains, oscillations, aging, and memory", Tucson AZ, Jan 23, 2017.

Invited poster presenter: NSF/NIH Brain Initiative Investigators Meeting. "A system for the combined measurement of dopamine and neural activity (DANA)", Bethesda, MD, Dec 13, 2016.

Invited speaker: U of Arizona Brain Initiative Collaboration DataBlitz "Synchronous neuronal activity, Parkinson's disease, and ketamine", Tucson AZ, Dec 7, 2016.

Invited speaker: U of Arizona Neural Systems and Cognitive Sciences Seminar "Brains, oscillations, aging, and Parkinson's disease", Tucson AZ, Dec 6, 2016.

Invited speaker: Michael J Fox Foundation Consortium Progress Update "Identification of network and oscillatory signatures of the LRRK2 mutation", Oct 23, 2017, Video presentation.

Grant Proposal Presentation: To **Northrop Grumman** (with Dr. Bob Wilson) "Biologically-inspired algorithms for solving the explore-exploit dilemma", Tucson, AZ, Nov 1, 2016, Video presentation.

Invited speaker: Taormina Pain Mechanisms and Therapeutics Conference, "Ketamine and its impact on corticostriatal-limbic interactions", June 10, 2016, Taormina, Italy.

Invited speaker: U. of Arizona, Title: "Brains, oscillations, aging, and Parkinson's disease", Undergraduate Program in Biology. Tucson, AZ, May 25, 2016.

Invited speaker: Emory University. "Effort-reward decision making: Neural systems and neuromodulation", Atlanta, GA. March 8, 2016

Invited speaker: Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy national convention. "Simultaneous Detection of Dopamine Release and Multiple Single-Unit Activity in Awake and Behaving Rats", Atlanta, GA. March 7, 2016

Invited speaker: Arizona Integrated Wellness Cooperative (AIWC). "Memories are made of this: How our brains create the past." Tucson, AZ, September 22, 2015.

Faculty host: For **Ralph Greenspan,** Ph.D. (UCSD), At University of Arizona, Neuroscience Seminar Series Talk: "The Fruit Fly and the B.R.A.I.N. Initiative.", Tucson, AZ, September 2015.

Invited speaker: U of A Psychology Dept. Undergraduate Honors Seminar. Title: "Research and Research Opportunities in the Cowen Laboratory." Tucson, AZ, September 15, 2015.

Invited speaker: U of A Medical School: Medical School Residents Journal Club. Title: "Ketamine and neural oscillations." Tucson AZ, September 7, 2015.

Invited consultant: Science and Entertainment Exchange (National Academy of Sciences). Consultation on hemineglect for a writer/producer developing a film script. Oct. 2015.

Invited speaker: UC Davis. Title: "The Influence of Aging on the Variability of Neuronal Activity", Davis CA, May 8, 2015.

Invited speaker: McKnight Brain Institute Meeting. Title: "The Influence of Aging on the Variability of Neuronal Activity", Miami FL, May 1, 2015.

Invited speaker: Undergraduate Neuroscience Association, Title: "The Circuitry of Choice: Roles of neural activity and neuromodulation in decision making", Tucson AZ, March 23, 2015.

Invited speaker: Quantitative Biology Colloquium, University of Arizona, Title: "Ripples, Neurons, and Aging", Tucson, AZ, February 3, 2015.

Invited speaker: Graduate Interdisciplinary DataBlitz, University of Arizona, Title: "Effort, Reward, and Dopamine", Tucson, AZ, January 26, 2015.

Invited speaker: NAWBO Women's Business Wellness Workshop, "Move it or lose it: How our bodies empower our brains", Tucson, AZ January 12, 2014.

Invited speaker: Workshop on the Computational Properties of the Prefrontal Cortex "Effort and the Anterior Cingulate", Whistler, BC (Canada), Sept 2014.

Invited speaker: Rising Stars in Neuroscience lecture,
Evelyn F. McKnight Brain Institute, "Neural System, Networks, and the Impact of Aging", Gainesville, Florida, April. 24, 2014.

Faculty host: For **Doug Nitz, Ph.D**., University of Arizona, CNS Seminar Series Talk: "Cell Assemblies of the Basal Forebrain", Tucson, AZ, February 2014.

Invited speaker: University of Arizona Evelyn F. McKnight Brain Institute Scientific Program, Title: "The Impact of Aging on Physiology and Function of the Prefrontal Cortex", Tucson, AZ, Oct. 23, 2013.

Invited speaker for the Neural Circuits of Adaptive Control workshop, Title: "The Measurement and Meaning of Effort Guided Behavior", Paris, France, Sept. 28 2013.

Invited speaker at the COSYNE computational neuroscience conference. "Beyond the cost of work: Relationships between physical effort, risk, and reward." Salt Lake City, UT, March 1, 2013.

Invited speaker: University of Arizona Neuroscience DataBlitz "Action and Effort in the Anterior Cingulate Cortex", Tucson AZ, Aug 28 2012.

Invited speaker: **Decision Making in Rodents and Primates Conference,** "Actions first, outcomes second: Sensorimotor and outcome processing in the dmPFC", Heidelberg, Germany, Sept. 28, 2012.

Invited speaker: Inter-departmental University of Arizona seminars including the Cognitive Science Brown Bag, Neuroscience Seminar Series, and Neurology Journal Club, Biochemistry Journal Club, Tucson, AZ, 2012.

Invited speaker: "What is computational neuroscience", Frances Parker High School, San Diego, CA, May 2011.

Invited speaker: Title: "Embodied Cognition" for the Casa de Mañana retirement community, the Minding the Brain Symposium, May 2010, San Diego, CA.

Consultant for the Science and Entertainment Exchange (National Academy of Sciences) 2010, Los Angeles, CA.

Talks by others on collaborative work performed:

Phelps, C. Learning and Memory Conference. "Chronic pain impairs cognitive flexibility and engages novel learning strategies in rats" (UC Irvine) Huntington Beach, CA April 2018.

Spanò, G., Gomez, R., Demara, B., **Cowen, S.L.,** and Edgin J.O. To Nap or Not to Nap?: Sleep-dependent Memory Consolidation in Typically and Atypically Developing Preschoolers. World Sleep, Prague, October 2017.

Spanò, G., Gomez, R., Demara, B., **Cowen, S.L.,** and Edgin J.O. To Nap or Not to Nap?: Sleep-dependent Memory Consolidation in Typically and Atypically Developing

Preschoolers. Sleep: A joint meeting of the American academy of sleep medicine and the sleep research society, Boston, MA. 2017.

Spanò, G., Gomez, R., Demara, B., **Cowen, S.L.**, and Edgin J.O. Memory Consolidation across Naps in Typical Development and in Preschoolers with Down Syndrome. The 2017 SRCD Biennial Meeting in Austin, TXs, April 2017.

Spanò, G., Gomez, R., Demara, B., **Cowen, S.L.**, and Edgin J.O. Memory Consolidation across Polysomnography-assessed Naps in Preschoolers with Down Syndrome. The 50th Annual Gatlinburg Conference, in San Antonio, TX, March 2017.

Juried conference abstracts, student talks, and poster presentations:

Vishwanath A, Hamilton AR, Weintraub NC, Stopera CJ, Winter GM, Serna MF, Heien ML, **Cowen SL** (2023) Differential effects of medial forebrain bundle stimulation on distinct neural subpopulations and dopamine release in the nucleus accumbens. Society for Neuroscience Abstracts, Washington DC. November 10-15.

Vishwanath A, Bartlett MJ, Keener A, Falk T, **Cowen SL** (2023) In a hemi-lesioned model of L-DOPA-induced dyskinesia neuronal firing was reduced in the un-lesioned striatum and ketamine reduced burst-like firing in striatal neurons bilaterally. Society for Neuroscience Abstracts. Washington DC. November 10-15.

Holguin G, Tapia AK, Jorgensen K, Jordan G, Vishwanath A, Miron SA, Vigil EC, Webster AL, **Cowen SL** (2023) Modulation of hippocampal theta power and phase during a bimanual string-pulling behavior. Society for Neuroscience Abstracts. Washington DC. November 10-15.

Weintraub NC, Hamilton A, Vishwanath A, Holguin G, **Cowen SL**, Heien, ML. (2023) The effects of variability in the timing of electrical brain stimulation pulse sequences on the dynamics of dopamine. Society for Neuroscience. Washington DC. November 10-15.

Dominguez BR, Holguin G, Bjork R, **Cowen SL,** Miller JE. (2023) Alpha-synuclein overexpression in the basal ganglia vocal nucleus, Area X, alters waveform patterns in a zebra finch model of Parkinsonian vocal deficits. Society for Neuroscience. Washington DC. November 10-15.

Stopera CJ, Bartlett MJ, **Cowen SL**, Sherman SJ, Falk T (2023); Pravastatin sensitizes parkinsonian rats to L-DOPA and blocks the long-term anti-dyskinetic activity of subanesthetic ketamine. Society for Neuroscience Abstracts. Washington DC. November 10-15.

Srivathsa S, Vishwanath A, Church ER, **Cowen SL**, Barnes CA (2023) Investigating age-related changes of mPFC neural responses to ventral hippocampus stimulation. Society for Neuroscience Abstracts. Washington DC, November 10-15.

Hamilton AR, Vishwanath A, Weintraub NC, Winter GM, Lin KK, Lewis TJ, **Cowen SL**, Heien ML (2023) The effects of variability in the timing of electric brain stimulation pulse

sequences on dopamine release and single-unit activity in the nucleus accumbens. BRAIN Initiative Conference: Bethesda MD. June 11., 2023

A Vishwanath, MJ Bartlett, JL Kwidzinski, M Kaminski, T Falk, **SL Cowen**. Phase-locking of motor cortex neurons to ketamine-generated slow gamma oscillations and 80-Hz gamma oscillations in parkinsonian rats with L-DOPA-induced dyskinesias: Society for Neuroscience Meeting, San Diego, CA, November 2022.

Falk T, Bartlett MJ, Richards SS, Lind A, Stopera C, Liu C, **Cowen SL**, Steece-Collier K, Heien ML, Hsu CP, Sherman SJ; Repurposing of sub-anesthetic ketamine to treat LDOPA-induced dyskinesia – Results from preclinical models and an open-label Phase I/II clinical trial. Society for Neuroscience Abstracts, 2022.

S Srivathsa, A Vishwanath, **SL Cowen**, CA Barnes. Investigating age-related changes of mPFC neural responses to ventral hippocampus stimulation: Society for Neuroscience Meeting, San Diego, CA, November 2022.

Falk T, Bartlett MJ, Stopera C, Vishwanath A, Liu C, Heien ML, **Cowen SL**, Sherman SJ. Update on preclinical and clinical evidence in support of repurposing sub-anesthetic ketamine as a treatment for L-DOPA-induced dyskinesia. 7th Annual ABRC-Flinn Research Conference, Phoenix, AZ, 2022.

NC Weintraub, AR Hamilton, A Vishwanath, G Holguin, **SL Cowen,** M Heien. The effect of inter-pulse variability in electrical deep-brain stimulation on the time course of evoked dopamine release, San Diego, CA, November 2022.

Vishwanath A, Bartlett MJ, Falk T, **Cowen SL**; Ketamine disrupts 80-Hz gamma oscillations and reduces burst firing in naïve and parkinsonian rats with levodopa-induced dyskinesia. 16th International Conference on Alzheimer's and Parkinson's Diseases and related neurological disorders, AD/PD™ Abstracts, 2022.

AR Hamilton, A Vishwanath, NC Weintraub, GR Holguin, **SL Cowen**, ML Heien. The effects of variability in the timing of electrical brain stimulation pulse sequences on the dynamics of dopamine, BRAIN Initiative Presentation May 20, 2022 (virtual).

Falk T, Bartlett MJ, Ye T, Stopera C, Liu C, Heien ML, **Cowen SL**, Sherman SJ. Update on preclinical and clinical evidence in support of repurposing sub-anesthetic ketamine as a treatment for L-DOPA-induced dyskinesia. 6th Annual ABRC-Flinn Research Conference, Phoenix, AZ, 2021.

Bartlett MJ, Stopera C, Sexauer MR, Vishwanath A, Jordan G, **Cowen SL**, Falk T The string-pulling task as a novel and simple behavior to test for parkinsonian deficits in unilaterally 6-OHDA-lesioned rodents. Society for Neuroscience Meeting: Global Connectome, Jan. 11-13 2021.

Vishwanath A, Bartlett MJ, Jordan G, Boudreau V, Sherman SJ, Falk T, **Cowen SL** Ketamine disrupts 80-Hz gamma oscillations in parkinsonian rats with L-DOPA-induced dyskinesia. Society for Neuroscience Meeting: Global Connectome, Jan. 11-13 2021.

Crown L, Gray DT, Schimanski LA, Barnes CA, **Cowen SL** Decreased dynamic range of hippocampal CA1 gamma in aged rats. Society for Neuroscience Meeting: Global Connectome, Jan. 11-13 2021.

Falk T, Bartlett MJ, Ye T, Farrell DC, Heien ML, Steece-Collier K, **Cowen SL**, Sherman SJ. Preclinical evidence in support of repurposing sub-anesthetic ketamine as a treatment for L-DOPA-induced dyskinesia. European Neuroscience Virtual Forum Abstracts, 2020.

Falk T, Bartlett MJ, Ye T, Farrell DC, Heien ML, **Cowen SL**, Sherman SJ. Preclinical and clinical evidence in support of repurposing sub-anesthetic ketamine as a treatment for L-DOPA-induced dyskinesia. 5th Annual ABRC-Flinn Research Conference, Phoenix, AZ, 2020.

Seaton BT, Hill DF, **Cowen SL**. Heien ML, Mitigating the effects of electrode biofouling for improved long-term measurement of dopaminergic signaling. Chicago, IL: Society for Neuroscience Meeting, November 2019.

Martin AB, Andersen KR, Morrow JK, Hillier EA, Cardenas S, Lee S, **Cowen SL**. Gothard KM, From discriminative to affective touch: A mesoscale perspective of the somatosensory pathway to the primate amygdala. Chicago, IL: Society for Neuroscience Meeting, November 2019.

Hill DF, Olson Z, Bartlett MJ, Falk T, Heien ML, **Cowen SL.** Simultaneous measurement of ventral tegmental area activity and nucleus accumbens dopamine release reveals patterns of neuron firing associated with dopamine release. Chicago, IL: Society for Neuroscience Meeting, November 2019.

Crown L, Gray DT, Schimanski LA, Barnes CA, **Cowen SL.** Spatial eye-blink learning but not age predicts theta-gamma coupling in the CA1 region of the hippocampus. Chicago, IL: Society for Neuroscience Meeting, November 2019.

Monroe EJ, Crown LM, Bartlett MJ, Wiegand J-P, Eby AJ, Falk T, **Cowen SL.** Increased sleep spindle density in LRRK2 G2019S mice. Chicago, IL: Society for Neuroscience Meeting, November 2019.

Wilhite C, Alvarez A, Burton A, Preston C, Mustacich D, Fuglevand A, Gothard K, **Cowen SL**, Witte RS**.** *In vivo* swine model for developing and validating acoustoelectric brain imaging: Towards noninvasive, real-time 4D electrical brain mapping. Chicago, IL: Society for Neuroscience Meeting, November 2019.

Ye T, Bartlett MJ, Sexauer M, Sherman SJ, Falk T, **Cowen SL.** Oscillatory signatures of L-DOPA-induced dyskinesia are dependent on the LID induction protocol and L-DOPA dose. Chicago, IL: Society for Neuroscience Meeting, November 2019.

Wilhite CA, Witte RS, **Cowen SL.** Activation of hippocampal CA2 region precedes CA3 following perforant-path stimulation and spontaneously occurring dentate spikes. Chicago, IL: Society for Neuroscience Meeting, November 2019.

Falk T, Ye T, Bartlett MJ, Sherman SJ, **Cowen SL.** Region-dependent cross-frequency interactions in a preclinical model of L-DOPA-induced dyskinesia after low-dose ketamine. Chicago, IL: Society for Neuroscience Meeting, November 2019.

Falk T, Bartlett MJ, Heien ML, Ye T, **Cowen SL**, Steece-Collier K, Sherman SJ; Mechanisms underlying the anti-dyskinetic effect of sub-anesthetic ketamine. 39th Blankenese Conference: Signaling in Health and Disease, Hamburg, Germany, 2019.

Hill DF, Olson Z. **Cowen SL**. Pharmacologically induced transient dopamine release is not correlated with increased VTA dopamine cell activity, ARCS Foundation Scholar Conference Phoenix, AZ April, 2018. (Dan was awarded the prestigious ARCS scholarship).

Hill DF, Olsen Z, Heien ML, **Cowen SL**. Encoding of phasic nucleus accumbens dopamine release by ventral tegmental area neurons revealed through simultaneous single-unit recording and fast-scan cyclic voltammetry. Washington, DC: Society for Neuroscience Meeting, November 2018.

Crown L, Wohlford L, Bartlett MJ, Wiegand JP, Eby AJ, Monroe E, Gies K, Falk T, **Cowen SL**. Six-month-old LRRK2 G2019S knock-in mice do not express motor learning deficits on the rotarod task. Washington, DC: Society for Neuroscience Meeting, November 2018.

Wilhite CA, Witte RS, **Cowen SL**. Peak activation of the CA2 subregion of the hippocampus precedes peak activation of CA3 following perforant-path stimulation. Washington, DC: Society for Neuroscience Meeting, November 2018.

Ye T, Bartlett MJ, Falk T, **Cowen SL**. L-DOPA-induced striatal gamma oscillations split into low- and high-frequency components following ketamine exposure in an animal model of L-DOPA-induced dyskinesia. Washington, DC: Society for Neuroscience Meeting, November 2018.

Cowen SL, *Hill DF, Heien M. Integrated measurement of dopamine release and neural ensemble activity, Brain Initiative Conference, Bethesda, MD, April, 2018. (Dan Hill presented the poster.)

Wilhite C, Burton A., Hill DF, Bera T, Ingram P, **Cowen SL**., Witte RS. Acoustoelectric brain imaging in anesthetized rats: towards noninvasive, real-time 4D electrical brain. Brain Initiative Conference, Bethesda, MD, April, 2018.

Wilhite C, Burton A., Hill DF, Bera T, Ingram P, **Cowen SL**., Witte RS. Acoustoelectric brain imaging: preliminary results in anesthetized rats. UA COM Founder's Day Junior Investigator Poster Forum, Tucson AZ, November 2017.

Wiegand, J, Gies, K, Bartlett, M, Falk, T, **Cowen, SL** Altered sleep physiology in a LRRK2 mouse model in Parkinson's Disease. Program No. P299.07. Washington, DC: Society for Neuroscience, November 2017.

Crown, L, Nitz, D, **Cowen, SL** Local-field potential activity in the medial prefrontal cortex does not respond to anticipation of effort or reward. Society for Neuroscience Annual Meeting 2017, Washington, DC, November 2017

Ye T, Bartlett MJ, Falk T, **Cowen, SL**. Oscillatory Signatures of L-DOPA-induced Dyskinesia Are Not Reduced by Ketamine. Society for Neuroscience Annual Meeting, Washington DC, November 2017.

Richard C, Crown L, Wiegand J-PL, Bartlett M, Falk, T, Heien M, **Cowen SL**. Altered Sleep Spindles in a LRRK2 Mouse Model of Parkinson's Disease. UROC Minority Health Disparities Summer Research Program Poster Session, Tucson AZ, August 2017

Parent, KL; Bartlett, MJ; Crown, LM; Gies, KF; Miller, MA; Falk, T; **Cowen, SL;** Heien, ML "Longitudinal studies of tonic dopamine for investigation of neural disorders" Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy March 8, 2017, Chicago, IL

Schmit M, Ye T, Bartlett M, Falk T, **Cowen SL**. Directional propagation of ketamine-induced high-frequency oscillations between the striatum, hippocampus, and motor cortex. Program No. 302.25. Society for Neuroscience, 2016.

Wiegand, J-PL, Gies, K, Bartlett, M, Falk, T, **Cowen, SL** Increased power of sleep spindle oscillations in the LRRK2 mouse model of Parkinson's disease. Program No. P06.22. Portland, OR: World Parkinson Congress 2016.

Ye T, Bartlett MJ, Schmit M, Sherman SJ, Falk T, **Cowen SL** (2016). Gamma-band oscillatory activity in the motor cortex is progressively enhanced following repeated ketamine administration in 6-OHDA-lesioned rats. Portland, OR: World Parkinson Congress 2016.

Parent, K.L.; Bartlett, M.J.; Crown, L.M.; Gies, K.F.; Miller, M.A.; Falk, T.; **Cowen, S.L.;** Heien, M.L. "Real-time measurement of ketamine-induced tonic dopamine fluctuations in freely- moving rats" Monitoring Molecules in Neuroscience June 1, 2016, Gothenburg, SWE

Parent, K.L.; Hill, D.F.; Wiegand, J.P.; Miller, M.A.; Atcherley, C.W.; **Cowen, S.L.**; Heien, M.L. "Simultaneous detection of dopamine release and neural activity" Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy March 7, 2016, Atlanta, GA

Gray, D., Wiegand, J., Schimanksi, L., **Cowen, S**., Barnes, C. Age-related reduction in signal-to-noise ratio of sharp-wave ripple oscillations following behavior in aged rats. San Diego, CA: The Evelyn F. McKnight Brain Institute 2016.

Gray, D., Wiegand, J., Schimanksi, L., **Cowen**, **S.L.**, Barnes, C. Age-related reduction in signal-to-noise ratio of sharp-wave ripple oscillations following behavior in aged rats. Program No. 182.11. Society for Neuroscience, 2016.

Wiegand, J., Gray, D., Schimanski, L., Lipa P., Barnes, C., **Cowen S.L**. Age-Related Changes in Theta-Delta Ratio Measures of Slow-Wave Sleep. Tucson, AZ: The Science of Consciousness, 2016.

Falk T, Bartlett MJ, Ye T, Lazarus LB, Heien ML, **Cowen SL**, Sherman SJ. Preclinical evaluation of sub-anesthetic ketamine infusion to reduce L-DOPA-induced dyskinesias: is it a 'chemical' DBS? Movement Disorders Society Abstracts, 2016.

Gray, D., Wiegand, J., Schimanksi, L., **Cowen, S.L**., Barnes, C. Age-related reduction in signal-to-noise ratio of sharp-wave ripple oscillations following behavior in aged rats. San Diego, CA: The Evelyn F. McKnight Brain Institute 2016.

Wiegand, J., Gies, K., Bartlett, M., Falk, T. , **Cowen, S.L.** Stronger cortical spindles and less power variability in hippocampal ripples in a LRRK2 mouse model of Parkinson's disease. Program No. 699.07. Society for Neuroscience, 2016.

Wiegand, J., Gray, D., Schimanksi, L., Lipa, P., Barnes, C., **Cowen, S.L**. Time-dependent decrease in the peak frequency and power of hippocampal sharp-wave ripples and high-gamma events during post-behavior sleep in aged and young rats. Program No. 179.06. Chicago, IL: Society for Neuroscience, 2015.

Heien, M., Parent K., Hill D., Wiegand, J., Miller M., Atcherley C., **Cowen S.L.** Simultaneous detection of dopamine release and neural activity. Program No. 266.08. Chicago, IL: Society for Neuroscience, 2015.

Ye, T., Bartlett, M., Wiegand, J., Schmit M., Sherman S., Falk, T., **Cowen S.L.** Modulation of high-frequency oscillations and beta coherence in striato-cortico-limbic circuits following repeated sub-anesthetic ketamine exposure. Program No. 479.09. Chicago, IL: Society for Neuroscience, 2015.

Wiegand, J., Gray, D., Schimanksi, L., Lipa P., Barnes C., **Cowen S.L**. Age-related changes in high-frequency local field activity in the rodent hippocampus during ripple and inter-ripple periods. Phoenix, AZ: Arizona Alzheimer's Consortium 2015.

Hill, D., Heien, M., Parent K., **Cowen S.L** Simultaneous detection of dopamine release and neural activity. Mayo Clinic BRAIN Initiative conference, Rochester MN. 2015

Heien, M., Parent K., Hill D., Wiegand, J., Miller M., Atcherley C., **Cowen S.L**. Simultaneous detection of dopamine release and neural activity. New Orleans, LA: PITTCON 2015.

Parent, K.L.; Hill, D.F.; Wiegand, J.P.; Miller, M.A.; Atcherley, C.W.; **Cowen, S.L.**; Heien, M.L. "Simultaneous detection of dopamine release and neural activity" Society for Neuroscience October 18, 2015, Chicago, IL

Miller, M.**, Cowen, S.L.:** "Non-linear optical imaging". Arizona Alzheimer's Research Consortium, Phoenix, AZ. 2015.

Miller, M., Mehravar, S., Gray, D., Koshy, A., Cabral, C., Chawla, M., Kieu, K., Barnes, C., **Cowen, S**., Peyghambarian, N. Non-linear optical imaging: A powerful new technique for acquiring high-resolution brain images and possible application for identifying cell types and neuronal activity. Program No. 560.05. Washington, DC: Society for Neuroscience, 2014.

Hill, D., Miller M., Atcherley, C., Heien, M., Parent, K., Rauscher, M., Ye, T., **Cowen, S.** Prefrontal regulation of phasic dopamine release in the nucleus accumbens.Program No. 362.16. Washington, DC: Society for Neuroscience, 2014.

Wiegand, J., Gray, D., Schimanksi, L., Lipa P., Barnes C., **Cowen** S.L. Age-related changes in high-frequency local field activity in the rodent hippocampus during ripple and inter-ripple periods. Program No. 560.03. Washington, DC: Society for Neuroscience, 2014.

Cowen S.L., Wiegand, J., Gray, D., Schimanski, L., Lipa P., Barnes, C. Age-associated changes in spike-timing of hippocampal principal cells and interneurons during ripple oscillations. Program No. 560.04. Washington, DC: Society for Neuroscience, 2014.

Parent, K.L.; Hill, D.F.; Miller, M.A.; Atcherley, C.W.; Rauscher, M.; Ye, T; **Cowen, S.L.**; Heien, M.L. "Changes in phasic dopamine signaling in the nucleus accumbens and dorsomedial striatum through electrical stimulation of the medial prefrontal cortex" Monitoring Molecules in Neuroscience August 3-7, 2014, Los Angeles, CA.

Invited Oral Presentation by Mentored Graduate Students:

July 16, 2019: Lindsey Crown: Speaker at the University of California, San Diego "Sleep, Parkinson's disease and the G2019S LRRK2 mutation. ", San Diego, CA.

January 23, 2018: Lindsey Crown: Speaker at the University of Arizona Neuroscience Recruitment Data Blitz Title: "Local Field Potential Oscillations in the Anterior Cingulate Cortex and their Relationship to Effort-based Decision-Making", Tucson AZ.

October 31, 2017: Jean-Paul Wiegand: Speaker at the Neurocolloquium: "Altered sleep physiology in a LRRK2 mouse model in Parkinson's Disease", Tucson AZ.

October 30, 2017: Tony Ye: Speaker at the Cognition & Neural Systems (CNS) Seminar. Title: "Oscillatory Signatures of L-DOPA-induced Dyskinesia Are Not Reduced by Ketamine", Tucson AZ.

August 2017: Daniel Hill: Dissecting ventral tegmental area control of dopamine release. UA Physiological Science Departmental Forum Presentation, Tucson, AZ.

October 2017: Cameron Wilhite: Speaker at UA Physiology Student Forum. Title: "Electrophysiological mapping of the perforant path input to the hippocampus; Towards validation of acoustoelectric brain imaging," Tucson, AZ.

September 15th, 2017: Zach Olson: Speaker at forum presentation to the Department of Physiology University of Arizona. Title: "Simultaneous recording of ventral tegmental area single-unit activity and nucleus accumbens dopamine release" Tucson, AZ.

December 4, 2017: Lindsey Crown: Psychology Department CNS Seminar Presentation Title: "Investigating local field potential activity in the rat anterior cingulate cortex during effort- and reward-based decision-making", Tucson AZ.

November 22, 2016: Jean-Paul Wiegand: Speaker at the Neurocolloquium: "Altered sleep physiology in a LRRK2 mouse model in Parkinson's Disease", Tucson AZ.

April 29, 2016: Jean Paul Wiegand: Speaker at the Science of Consciousness Conference "Age-Related Changes in Theta-Delta Ratio Measures of Slow-Wave Sleep", Tucson AZ.

April 29, 2016: Lindsey Crown: Speaker at the Science of Consciousness Conference "Ketamine Injection Acutely and Rapidly Decreases Tonic Dopamine Levels in the Rat Dorsal Striatum", Tucson, AZ.

Spring 2015: Jean Paul Wiegand: Formal Presentation to the Arizona Alzheimer's Research Consortium, Phoenix, AZ.

January 27 2015: Jean-Paul Wiegand: Speaker at the Neuroscience Data Blitz: "Age-related changes in hippocampal ripple dynamics", Tucson AZ.

Poster Presentations and Abstracts Presented at the University of Arizona

Summers, AJ, White, T, Hill, D, Siegenthaler, J, Heien,M., **Cowen, SL.** A Comparison of Conductive Adhesives for Chronically Implantable Carbon-Fiber Microelectrodes. UA Undergraduate Biology Research Program Poster Session January 2018.

Wohlford, L, Crown, L, Parent, K., Bartlett, M., Falk,T, Heien,M., **Cowen, SL.** Fast-Scan Controlled Adsorption Voltammetry as a Method to Measure Absolute Levels of Dopamine In Vivo. UA Undergraduate Biology Research Program Poster Session January 2017.

Seghezzo G, Ye T, Hill DF, Bartlett MJ, Sherman SJ, Falk T, **Cowen SL**. Effects of ketamine on single-unit activity in the dorsolateral striatum and hippocampus. 27th Annual Undergraduate Biology Research Program Conference. 2016

Davis BC, Ye T, **Cowen, SL**. Investigating the relationship between high-frequency oscillations and neuronal spiking due to sub-anesthetic ketamine in a rodent model for dyskinesia. Neuroscience and Cognitive Science Undergraduate Summer Poster Session 2016.

Parent, K.L.; Hill, D.F.; Wiegand, J.P.; Miller, M.A.; Atcherley, C.W.; **Cowen, S.L.**; Heien, M.L. "Multimodal measurements of neural networks and chemical communication" Chemistry and Biochemistry Research Symposium, August 10, 2016, Tucson, AZ.

Parent, K.L.; Hill, D.F.; Crown, L.M.; Gies, K.F.; Wiegand, J.P.; Miller, M.A.; Atcherley, C.W.; **Cowen, S.L.;** Heien, M.L. "Developing instrumentation to expand neuroscience" Biological Chemistry Program-Drug Discovery and Delivery Retreat November 13, 2015, Tucson, AZ

Parent, K.L.; Hill, D.F.; Crown, L.M.; Gies, K.F.; Wiegand, J.P.; Miller, M.A.; Atcherley, C.W.; **Cowen, S.L.**; Heien, M.L. "Developing instrumentation to expand neuroscience" Chemistry and Biochemistry Research Symposium, August 13, 2015, Tucson, AZ

Petersen L, **Cowen S.L** Three neural pathways to encode two types of decision cost. Honors poster session. 2014.

Lazar, M, Miller M., **Cowen S.L**., How ACC neurons behave during delay tasks and affect motor movement. Freshman honors poster session. 2013

Miller M., **Cowen S.L**., Neural mechanisms of cost-benefit decision making. Science in the City and Tech Launch Arizona technology showcase. 2013

AWARDED GRANTS AND CONTRACTS

Note: I am on 9-month salary. Consequently, the percent effort indicates percent of a year in addition to the 9-month salary period.

Arizona Alzheimer's Consortium Match Projects: Coordination between dopamine release, sharp-wave ripple oscillations, and neural ensemble activity during sleep in a transgenic rodent model of Alzheimer's disease. (Role: Co-PI, PI: Lee Ryan) ***7/1/24 - 6/30/25***

Objective: 1) Determine if the timing of dopamine release in the nucleus accumbens and neural activity during hippocampal sharp-wave ripple oscillations is disrupted in the TgF344-AD model of Alzheimer's disease. 2) Establish a TgF344-AD colony at UA ($33,000).

Arizona Alzheimer's Consortium Match Projects: Assessing hippocampal-prefrontal communication during memory guided and sensorimotor behaviors using a transgenic rodent model of Alzheimer's disease. (Role: Co-PI, PI: Lee Ryan) ***8/1/23 - 8/31/24***

Objective: Determine if neural communication between the hippocampus and prefrontal cortex is disrupted in a novel rat model of Alzheimer's disease using high-density neural recording methodologies. ($30,990).

R43 OD034043-01A1 SBIR An automated system for post-surgical health and environmental monitoring with real-time alerts for laboratory rodents using scalable hardware and deep learning (Role: Co-I, PI: Paul Gibson, Applied Universal Dynamics) ***6/1/23 - 5/31/24***

Objective: Develop a within-cage monitoring system to track the health of laboratory animals following surgical procedures. (Total cost: $256,488).

(internal) Center for Excellence in Addiction and Pain Research Pilot grant (Role: PI): The effects of opioid use and chronic pain on the physiology of sleep and neural circuits involved in pain and addiction. ***8/15/22 - 8/14/23***

Objective: Determine if sleep-associated oscillatory activity is impacted by chronic pain and opioid receptor agonism and antagonism. ($30,000, equipment and student support).

R01 RF1AG081767 Frontal and Temporal Lobe Interactions in Rat Models of Normative Aging and Alzheimer's Disease (Role: Co-I, PI: Carol Barnes)

5/15/23 - 4/30/28

Objective: Determine if neural interactions between the frontal cortex and hippocampus are impaired in a transgenic rat model of Alzheimer's disease ($3,266,421).

Arizona Alzheimer's Consortium Match Projects (Proposal No: TBD): Investigation of age-associated changes in neural coordination in behaving animals (Role: Co-I, PI: Lee Ryan)

8/1/22 - 7/31/23

Objective: Test and advance Neuropixels technology for 1000+ site recording in awake and behaving rats to study age-associated cognitive changes. ($31,000, equipment and student support).

P30 NIH-NIDA (3042524) Core Center of Excellence in Addiction Studies (Role: Co-PI and Pilot Core Lead) **07/01/21 - 06/31/26**

Objective: Develop core facilities at the UA to support research at the intersection of addiction and pain management. My role is to develop a Pilot Core that encourages de-novo research and ultimately leads to NIDA R01 applications. (est. Total Costs $6,422,364, my budget: total: $614,274).

U. of Arizona Psychology Faculty Pilot Grant Award: Wireless transcranial optogenetic stimulation for the interrogation of neural circuits involved in memory formation (Role: PI) ***6/1/21 - 5/31/22***

Objective: Develop technologies for transcranial stimulation of neurons in rodents through skull-mounted LED and optogenetics. ($10,000, equipment and student support only).

Arizona Alzheimer's Consortium Match Projects (Proposal No: 45978): Investigation of age-associated changes in neural coordination and plasticity using advanced high-density neural-ensemble recording technologies (Role: Co-I, PI: Lee Ryan) ***8/1/21 - 7/31/22***

Objective: Advance large-scale neural recording for the study of cognitive decline in aging through application of 1000-site neural recording technologies. ($29,000, equipment and student support).

R01 NIH NINDS BRAIN (NS123424-01): Control of the time course of dopamine release through optimized electrical brain stimulation (Role: PI) ***8/1/21 - 7/31/26***

Objective: Develop new ways to use electrical deep brain stimulation for the precise control of tonic (slow) and phasic (fast) dopamine release in the brain. Disrupted tonic and phasic dopamine release underlies addiction, depression, Parkinson's disease. (0.45 academic and 2 summer months), $ 1,833,908 total).

R21 NIH (NS123512-01): Alpha-synuclein driven cellular changes and vocal dysfunction in Parkinson's Disease (Role: Co-investigator, PI: Julie E. Miller) ***7/01/21 - 6/30/23***

Objective: Characterize the genetic and electrical brain activity driving the early parkinsonian vocal deficits in an animal model. (1 summer mo, Yr 1 & 0.50 summer mo, Yr 2, Direct: $275,000).

R01 NIH NINDS (NS122805-03): Mechanisms of low-dose ketamine treatment for Parkinson's disease (Role: Co-investigator, PI: Torsten Falk) ***7/01/21 - 6/30/25***

Objective: Identify the circuit and single-neuron properties that drive Parkinson's disease associated oscillations and determine how ketamine works to reduce pathology associated oscillatory activity. (0.27 academic and 2 summer months), $1,861,435 total).

U01 NIH (EB029834-01): 4D Transcranial Acoustoelectric Imaging for High Resolution Functional Mapping of Neuronal Currents (Role: Co-investigator, PI: Russ Witte) ***09/30/20 - 06/30/25***

Objective: Develop methodologies for non-invasive imaging of electrical activity in the brain using ultrasound and the acoustoelectric effect. (Total: $688,097)

PENDING:

R01 NIH NINDS: Uncovering Early Parkinson's Mechanisms Via A-Synuclein Driven Vocal Dysfunction (Co-I, PI: Julie Miller)

Objective: Identify circuit-level dysfunction in a zebra finch animal model of Parkinson's disease.

PAST:

U01 NIH (1U01EB028662-01): 4D Transcranial Acoustoelectric Imaging for High Resolution Functional Mapping of Neuronal Currents (Role: Co-investigator, PI: Russ Witte) ***09/30/19 - 06/30/20***

Objective: Develop methodologies for non-invasive imaging of electrical activity in the brain using ultrasound and the acoustoelectric effect. ($428,307)

R44 NIH (1R44MH114776-01, 4029010): High density, miniaturized, zero switching, stimulation and recording headstage for small animals (Role: Co-investigator, PI: Daniel S Hedin) (Phase 2 awarded from previously funded proposal) ***8/01/19 - 2/28/21***

Objective: Develop new technologies for simultaneously stimulating and recording brain activity. (5% effort (0.52 SM), $224,957 total.).

R56 NIH (NS109608): Mechanisms of low-dose ketamine treatment for Parkinson's disease (Role: Co-investigator, PI: Torsten Falk) ***8/01/19 - 8/1/20***

Objective: Identify the circuit and single-neuron properties that drive Parkinson's disease associated oscillations and determine how ketamine works to reduce pathology associated oscillatory activity. (0.27 academic and 2 summer months), $ 372,287).

R44 NIMH (R44MH114776): High density, miniaturized, zero switching, stimulation and recording headstage for small animals (Role: Co-investigator, PI: Daniel S Hedin) ***8/01/17 - 1/31/18***

Objective: Develop new technologies for simultaneously stimulating and recording brain activity. (5% effort (0.52 SM), $224,957 total.). Phase 2 support is pending.

R24 NIMH (MH106108-01): High-resolution electrical brain mapping by real-time and portable 4D acoustoelectric imaging (Role: Co-investigator, PI: Russel Witte) ***10/01/15 - 9/31/18***

Objective: Develop new technologies for acoustoelectric imaging of brain activity. (7% effort, $900,000 total.)

NSF BRAIN-EAGER (DBI-1450767): Integrated measurement of dopamine release and large-scale ensemble activity in behaving animals (Role: PI) ***09/01/14 - 08/31/17***

Objective: Develop novel technology for the simultaneous recording of the activities of individual neurons and dopamine release in freely behaving animals. (8.33% effort, $300,000 total, 1 summer mo.)

NIH R01 (NS084026-01A1): Restoring functional connectivity following TBI (Co-investigator, PI: Gene Gurkoff) ***06/01/14 - 09/01/18***

Objective: Assist investigation of functional connectivity changes associative traumatic brain injury and following deep-brain stimulation therapy. Support for travel to assist with inter-region LFP surgical procedures and recording. (8.3% effort $121,039, 1 summer mo.)

Intra-institutional Grants:

U. Arizona Accelerate for Success Grant: From Pathophysiology to Therapeutics in Childhood Epilepsy: A translational approach using an SCN8A mouse model and human induced pluripotent stem cells
(Co-investigator, PI: Michael Hammer) ***07/01/17 - 07/31/18***

Objective: Identify mechanisms underlying SCN8A epilepsy. My role: collect and analyze video and EEG data in mutant mice expressing the mutant SCN8A gene. (Total Grant: $99,164)

U. Arizona Improving Health TRIF Grant: Building capacity for inferring facial communication from video data
(Co-investigator, PI: Jacobus Bernard) ***07/01/17 - 07/31/18***

Objective: Develop algorithms to infer emotion and neuromodulator levels from video and eyeblink tracking data in humans, non-human primates, and rodents. My role: assess eye blink rates associated with emotional state in rodents. (Total Grant: $88,677)

Foundation Grants and Fellowships:

***Japan Society for the Promotion of Science (JSPS) Invitational Fellowship. (Role: Funded Researcher) 07/1/2021- 11/1/2021. (Had to cancel due to COVID travel restrictions)**

Objective: Sabbatical research in Japan (Okinawa Institute for Science and Technology) to determine how sequences of neural activity in the hippocampus underlies the formation of memories. (¥2,475,600 = ~$23,000)

Michael J Fox Foundation (11014.01): Identification of network, oscillatory and behavioral signatures of the LRRK2 expression (Role: PI) ***05/01/17 - 04/31/19***

Objective: Identify neural biomarkers that distinguish the LRRK2 genetic form of Parkinson's disease from healthy controls and idiopathic Parkinson's disease. (8% effort $200,000)

LuMind Foundation: Brain development, sleep and learning in Down syndrome
(Role: Co-Investigator, PI: Jaime Edgin) ***1/01/17-8/31/18***

Objective: Identify neural signatures of sleep dysfunction in Down-syndrome subjects (EEG). (Total $250,000, 6.2% effort)

Michael J Fox Foundation (11014): Identification of network and oscillatory signatures of the LRRK2 mutation (Role: PI) ***08/01/15 - 07/31/16***

Objective: Identify neural biomarkers that distinguish the LRRK2 genetic form of Parkinson's disease from healthy controls and idiopathic Parkinson's disease. (11% effort, $124,929)

Evelyn F. McKnight Brain Research Foundation (Role: PI) ***08/01/12- 08/01/20***

Objective: To investigate how high-order integration centers such as the frontal cortex and hippocampus change as a function of normal aging. One effect of age may be in the strength and fidelity interactions between neurons and brain regions. Large-scale ensemble recording allows the direct investigation of this issue in behaving animals. ($125,000 to startup)

G Harold and Leila Y. Mathers Charitable Foundation (Co-PI) **12/01/08 - 12/01/11**

My Role: As a co-investigator, I performed ensemble-recording experiments that investigated how associations between reward, effort, and actions are stored in the frontal cortex and how these associations change when contingencies reverse. My work also informed the work of other investigators on this grant who study the rules of associative learning in cortical slices and in anesthetized animals. ($300,000)

The San Diego Foundation: Blasker-Rose-Miah Award (PI) **07/01/10 - 06/30/11**

My Role: I was the principal investigator on this grant and performed multi-unit recordings in the anterior cingulate and orbitofrontal cortex of rats as they completed decision-making behaviors. ($50,000)

SUBMITTED GRANTS (LAST 3 YEARS):

NIH R25 (R25AG092294) Teacher Teams Enhancing AD/ADRD Diverse Mentorship/Research Education in Arizona (TEAMAz) (Role: MPI, PI: Marlys Witte) 04/01/2025 - 03/31/2030

NIH R01 (1R01NS136226) Uncovering Early Parkinson's Mechanisms Via A-Synuclein Driven Vocal Dysfunction. (Role: Co-Investigator, PI: Julie Miller) 12/01/2024 - 11/30/2029

2021: 2 SBIR grants for new neurotechnology. 1 ERC Neural Engineering grant for pain and addiction. NIH R21 for Transcranial Optogenetics.

LIST OF COLLABORATORS AND THEIR ORGANIZATIONAL AFFILIATIONS (5 YR)

** indicates currently active collaborations.*

Christopher Atcherley, the Mayo Clinic, Phoenix AZ
*Carol A. Barnes, the University of Arizona, Tucson AZ
Jacobus Barnard, the University of Arizona, Tucson AZ
Sara Burke, the University of Florida, Gainesville FL
*Lindsey Crown, USC, Los Angeles CA
Glen Davis, San Diego CA
*Torsten Falk, the University of Arizona, Tucson AZ
Jamie Edgin, the University of Arizona, Tucson AZ
Olivier George, the Scripps Research Institute, San Diego, CA
*Philipp Gutruf, University of Arizona, Tucson AZ
Fabian Fernandez, the University of Arizona, Tucson AZ
*Gene Gurkoff, the University of California, Davis, Davis CA
Michael Hammer, the University of Arizona, Tucson AZ

Kevin Harris, HTech Inc., Kentucky
Reid Harrison, Intan Technologies, Los Angeles, CA
*Michael L. Heien, the University of Arizona, Tucson AZ
Charles Higgins, the University of Arizona, Tucson AZ
*Dan Hill, Cambridge, England
Khanh Q. Kieu, the University of Arizona, Tucson AZ
Anita A. Koshy, the University of Arizona, Tucson AZ
Andrew Maurer, the University of Florida, Gainesville FL
*Lalitha Madhavan, the University of Arizona, Tucson AZ
Nirav Merchant, the University of Arizona, Tucson AZ
Mike Miller, the University of Arizona, Tucson AZ
*Julie Miller, the University of Arizona, Tucson AZ
Doug Nitz, the University of California, San Diego CA
Kate L. Parent, the University of Arizona, Tucson AZ
Nasser Peyghambarian, the University of Arizona, Tucson AZ
Bill Plant, the University of Arizona, Tucson AZ
*Frank Porreca, the University of Arizona, Tucson AZ
Shipherd Reid, the University of Arizona, Tucson AZ
*Scott J. Sherman, the University of Arizona, Tucson AZ
Jennifer Teske, the University of Arizona, Tucson AZ
Alex Thomé, the University of Arizona, Tucson AZ
Robert Wilson, the University of Arizona, Tucson AZ
*Russell Witte, the University of Arizona, Tucson AZ
*Tony Ye, UCLA

GRADUATE, POSTDOCTORAL, THESIS ADVISORS, OR SPONSORS

Bruce McNaughton, the University of California, Irvine (Graduate)
Doug Nitz, the University of California, San Diego (Postdoctoral)

TEACHING

Summer 2024: Invited instructor for the 2-week intensive course in neurobiology hosted at the Massachusetts Marine Biological Laboratories at Woods Hole.

Spring 2024: Advanced Drugs, Cognition, and the Brain (PSY 413, >150 students)

Spring 2024: Brain Waves – neural oscillations course (PSY 310)

Spring 2024: Co-Lecturer (2.5 weeks) Systems Neuroscience (Grad level NRSC 560)

Fall 2023: I designed a new course: Brain Waves – neural oscillations course (PSY 310)

Summer 2023: Invited instructor for the 2-week intensive course in neurobiology hosted at the Massachusetts Marine Biological Laboratories at Woods Hole.

Spring 2023: Drugs, Cognition, and the Brain (PSY 313, >200 students)

Spring 2023: Co-Lecturer (2.5 weeks) Systems Neuroscience (NRSC 560)

Spring 2022: Co-Lecturer (2.5 weeks) Systems Neuroscience (Grad level NRSC 560)

Spring 2022: Advanced Drugs, Cognition, and the Brain (PSY 413, >150 students)

Fall 2022: Neural Coding and Memory (PSY 506) (co-teach)

Fall 2022: Graduate Statistics Fundamentals using R (PSY 510)

Fall 2021: Advanced Drugs, Cognition, and the Brain (PSY 413)

Fall 2021: Graduate Statistics Fundamentals using R (PSY 510)

Fall 2020 - Spring 2021: Sabbatical

Spring 2020: Drugs, Cognition, and the Brain (PSY 313, 213 students)

Spring 2020: Co-Lecturer (2.5 weeks) Systems Neuroscience (NRSC 560)

Fall 2019: Graduate Statistics Fundamentals using R (PSY 510)

Fall 2019: Graduate-level Drugs and the Brain (PSY 513)

Spring 2019: Neural Coding and Memory (PSY 506)

Spring 2019: Co-Lecturer (2.5 weeks) Systems Neuroscience (NRSC 560)

Spring 2019: Drugs, Cognition, and the Brain (PSY 313)

Fall 2018: Graduate Statistics using R (PSY 510)

Spring 2018: Guest lecture Neuroanatomy: Limbic system (PSY 502)

Spring 2018: Co-Lecturer (2.5 weeks) Systems Neuroscience (NRSC 560)

Spring 2018: Drugs, Cognition, and the Brain (PSY 313)

Spring 2018: Statistics (PSY 230)

Fall 2017: Graduate Statistics Using R (PSY 510) University of Arizona

Spring 2017: Guest lecture (4 lectures on learning and memory systems) Systems Neuroscience (NRSC 560a)

Spring 2017: Neural Coding and Memory (PSY 506a)

Fall 2016: Graduate Statistics using R (PSY 510)

Spring 2016: Guest lecture/speaker for the Neuroscience and Cognitive Science (NSCS) club.

Spring 2016: Guest lecture (3 lectures on learning and memory systems) Systems Neuroscience (NRSC 560a)

Spring 2016: Drugs, Cognition, and the Brain (PSY 313)

Fall 2015: Statistics (PSY 230)

Fall 2015: Honors research class presentation (PSY 396H)

Fall 2015: Brain and Cognition (PSY 402)

Spring 2015: Guest lecture "The anatomy of the basal ganglia. (PSY 502: Principles of Neuroanatomy)

Spring 2015: Guest lecture (3 lectures on learning and memory systems) Systems Neuroscience (NRSC 560a)

Spring 2015: Neural Mechanisms of Decision Making (PSY/NRSC 596)

Fall 2014: Statistics (PSY 230)

Fall 2014: Brain and Cognition (PSY 402)

Fall 2014: Honors research class presentation (PSY 396H)

Spring 2014: Neural Coding and Memory (PSY 506a)

Spring 2014: Guest lecture (3 lectures on learning and memory systems) Systems Neuroscience (NRSC 560a)

Spring 2014: Guest lecture (Hippocampus and space) Systems Neuroscience (NSCS 315)

Fall 2013: Statistics (PSY 230)

Fall 2013: Brain and Cognition (PSY 402)

Fall 2014: Honors research class presentation (PSY 396H)

Spring 2013: Neural Mechanisms of Decision Making (PSY/NRSC 596e)

ADVISING AND MENTORING

Member: masters, prelim, or doctoral committee for 26 graduate students since 2013. As of 2022, I have graduated 4 Master's students and 4 PhD students.

Current Dissertation, Prelim, and Master's committees (2022): Abhilasha Vishwanath (Psychology), Wesley Schnapp (Neuroscience), Kelsey McDermott (Neuroscience), Marc Zempare (Neuroscience), Yilin Liu (Psychology), David Negelspach (Psychology), Sarah Seger (Neuroscience), **Rajashree Ramamoorthy (BME), Gabe Holguin (Psychology)**.

External Member (2021): Dissertation committee (U Alberta, Lethbridge)

External Member (2020): Dissertation committee (U Alberta, Lethbridge)

External Member (2018): Dissertation committee for Katelynn Ondek (UC Davis)

Dissertation and Master's committee (2018): 9 graduate students, chair of committee for 2 students.

Dissertation and Master's committee (2017): 8 graduate students, chair of committee for 2 students.

Dissertation committee (2016): 7 graduate students, chair of committee for 1 student.

Honors Thesis adviser (2016-present): 3 students.

Dissertation committee (2015): 2 graduate students.

Dissertation committee (2014): 2 graduate students.

Graduate adviser (2014 - present): 4 students.

Graduate adviser (2013): 3 students.

Honors Thesis adviser (2013-present): Undergraduate thesis.

Demonstrator and Instructor (2013): Tucson Book Festival neuroscience booth. Spikerbox electrophysiology demonstration.

Thesis adviser (2012-2017): Master's thesis advisor for 4 students (Physiological Sciences and Neuroscience Departments).

Mentor: (2012-present): >50 Undergraduate and 5 High School student research assistants.

Thesis adviser (2010): Undergraduate thesis advisor for student at Whitman College.