

Zachary T. Pennington, PhD

Department of Neuroscience · Friedman Brain Institute
Icahn School of Medicine at Mount Sinai
One Gustave L. Levy Place, Box 1639, NY, NY 10029
Email: Zachary.Pennington@mssm.edu
Website: ZachPenn.github.io

Current Position

2023-present **Instructor, Icahn School of Medicine at Mount Sinai**
Laboratory of Dr. Denise Cai

Education & Training

2018-2022 **Icahn School of Medicine at Mount Sinai**
Postdoctoral Fellowship, Department of Neuroscience
Laboratory of Dr. Denise Cai

2018 **UCLA**
PhD, Behavioral Neuroscience and Quantitative Psychology
Advisor: Dr. Michael Fanselow

2010 **UCLA**
BA, Psychology
Advisor: Dr. J. David Jentsch

2008 **Pasadena City College**
AA, Psychology

Grants & Fellowships

Current Funding:

2023-2028 NIMH K99/R00 Pathway to Independence Award - \$999,000
“Disentangling the consequences of trauma”

2023-2025 Behavior & Brain Research Foundation, Young Investigator Award - \$70,000
“Contributions of the anterior hypothalamic nucleus to post-trauma stress sensitization”

2023-2025 NIMH R56 (Co-Investigator) – \$783,000
“Fear and anxiety circuit mechanisms in anterior hypothalamic nucleus”

Fellowships, Awards and Honors

2023-2028 NIMH K99/R00 Pathway to Independence Award
2023-2025 Behavior & Brain Research Foundation, Young Investigator Award

2022	McKnight Foundation Doupe Fellow
2022	Mount Sinai Neuroscience Outstanding Citizen Award
2018-2019	NIDA T32 Postdoc Fellowship: Sinai Interdisciplinary Training in Drug Abuse
2017-2018	UCLA Dissertation Year Fellowship
2017	UCLA Teaching Practicum Program Fellow
2016	UCLA Teaching Practicum Program Fellow
2015-2017	NIMH F31 Fellowship
2015	UCLA Brain Research Institute, Society for Neuroscience Travel Award
2012-2014	NIDA T32 Predoctoral Fellowship: UCLA Translational Neuroscience of Drug Abuse
2012	Travel Award to attend the BBC Translational Addiction conference
2012	UCLA Graduate Summer Research Mentorship Fellowship
2008	Opal Jones Trust Scholarship in Psychology. Pasadena City College
2008	Valedictorian of Pasadena City College

Diversity and Inclusion:

Being a high-school dropout and a community college graduate, I am where I am today because people saw my potential and mentored me. I am committed to extending the same caring hand to those from non-traditional and under-represented backgrounds. As a graduate student, I tutored homeless youth and served as a mentor for the UCLA Psychology Undergraduate Research Journal. As a postdoctoral fellow, I have helped acquire diversity supplements to support undergraduates from underrepresented backgrounds and have mentored these students in preparation for graduate school. As chair of the Neuroscience Postdoctoral Association, I co-led the development of a fellowship to help graduate students from underrepresented backgrounds secure postdoc positions, and am helping to develop youth outreach activities. Throughout my career, I hope to improve upward mobility at all stages of education and to promote an inclusive environment.

Publications:

Preprints:

Pennington ZT, LaBanca A, Sompolpong P, Christenson Wick Z, Feng Y, Dong Z, Francisco TR, Chen L, Fulton SL, Maze I, Shuman T, Cai DJ (2023). Dissociable contributions of the amygdala and ventral hippocampus to stress-induced changes in defensive behavior. *BioRxiv*, 2023.02.27.530077. <https://www.biorxiv.org/content/10.1101/2023.02.27.530077v2>

Zaki Y, **Pennington ZT**, Morales-Rodriguez D, Francisco TR, LaBanca AR, Dong Z, Carrillo Segura S, Silva AJ, Shuman T, Fenton A, Rajan K, Cai DJ (2023). Aversive experience drives offline ensemble reactivation to link memories across days. *BioRxiv*, 2023.03.13.532469. <https://www.biorxiv.org/content/10.1101/2023.03.13.532469v1>

Research Reports:

Dong Z, Mau W, Feng Y, **Pennington ZT**, Chen L, Zaki Y, Rajan K, Shuman T, Aharoni D, Cai DJ (2022). Minian, an open-source miniscope analysis pipeline. *eLife*: 11:e70661.

- Pennington ZT**, Diego KS, Francisco TR, LaBanca AR, Lamsifer SI, Liobimova O, Shuman T, Cai DJ (2021). ezTrack – A step by step by step guide to behavior tracking. *Current Protocols in Neuroscience*, 1(10): e255.
- Blaze J, Navickas A, Phillips HL, Heissel S, Plaza-Jennings A, Miglani A, Asgharian H, Foo M, Katanski CD, Watkins CP, **Pennington ZT**, Javidfar B, Espeso-Gil S, Rostandy B, Alwaseem H, Hahn CG, Molina H, Cai DJ, Pan T, Yao WD, Goodarzi H, Haghighi F, Akbarian S (2021). Neuronal Nsun2 deficiency produces tRNA epitranscriptomic alterations and proteomic shifts impacting synaptic signaling and behavior. *Nature Communications*, 12(1): 4913.
- Lichtenberg NT, Sepe-Forrest L, **Pennington ZT**, Lamparelli AC, Greenfield VY, Wassum KM (2021). The medial orbitofrontal cortex → basolateral amygdala circuit regulates the influence of reward cues on adaptive behavior and choice. *Journal of Neuroscience*, 41(34): 7267-7277.
- Rajbhandari AK, Oceau JC, Gonzalez S, **Pennington ZT**, Mohamed F, Trott J, Chavez J, Ngyuen E, Keces N, Hong WZ, Heve RL, Waschek J, Khakh BS, Fanselow MS (2021). A basomedial amygdala to intercalated cells microcircuit expressing PACAP and its receptor PAC1 regulates contextual fear. *Journal of Neuroscience*, 41(15): 3446-61.
- Shuman T, Aharoni D, Cai DJ, Lee CR, Chavlis S, Page-Harley L, Vetere LM, Feng Y, Yang CY, Mollinedo-Gajate I, Chen L, **Pennington ZT**, Taxidis J, Flores SE, Cheng K, Javaherian M, Kaba CC, Rao N, La-Vu M, Pandi I, Shtrahman M, Bakhurin KI, Masmanidis SC, Khakh BS, Poirazi P, Silva AJ, Golshani P (2020). Breakdown of spatial coding and neural synchronization in pilocarpine-treated epileptic mice. *Nature Neuroscience*, 23(2): 229-238.
- Pennington ZT**, Trott JM, Rajbhandari AK, Li K, Walwyn WM, Evans CJ, Fanselow MS (2020). Chronic opioid pretreatment potentiates the sensitization of fear learning by trauma. *Neuropsychopharmacology*, 45(3): 482-490.
- Pennington ZT**, Dong Z, Feng Y, Vetere LM, Page-Harley L, Shuman T, Cai DJ (2019). ezTrack: An open-source video analysis pipeline for the investigation of animal behavior. *Scientific Reports*, 9(1): 19979.
- Kosarussavadi S*, **Pennington ZT***, Covel C, Schlinger BA (2017). Across sex and age: Learning and memory and patterns of avian hippocampal gene expression. *Behavioral Neuroscience*, 131(6): 483-491.
- *Joint first authors
- Pennington ZT**, Anderson AS, Fanselow MS (2017). The ventromedial prefrontal cortex in a model of traumatic stress: Fear inhibition or contextual processing? *Learning & Memory*, 24(9): 400-406.
- Lichtenberg NT, **Pennington ZT**, Holley SM, Greenfield VY, Cepeda C, Levine MS, Wassum KM (2017). Basolateral amygdala to orbitofrontal cortex projections enable cue-triggered reward expectations. *Journal of Neuroscience*, 37(35): 8374-8384.
- James AS, **Pennington ZT**, Tran P, Jentsch JD (2015). Compromised NMDA/glutamate receptor expression in dopaminergic neurons impairs instrumental learning, but not Pavlovian goal-tracking or sign-tracking. *eNeuro*, 2(3): e0040-14.

Reviews and Commentaries:

- Pennington ZT**, Cai DJ (2021). Propranolol inhibits reactivation of fear memory. *Biological Psychiatry*, 89(12):1111-12.
- Fanselow MS, **Pennington ZT** (2018). A return to the dark ages of psychiatry with a two-system framework for the study of fear. *Behaviour Research and Therapy*, 100:24-29.

- Pennington ZT**, Fanselow MS (2018). Indirect targeting of sub-superficial brain structures with transcranial magnetic stimulation reveals a promising way forward in the treatment of fear. *Biological Psychiatry*, 84(2): 80-81.
- Fanselow MS, **Pennington ZT** (2017). The Danger of LeDoux & Pine's Two System Framework for Fear. *American Journal of Psychiatry*, 174(11): 1120-1121.
- Jentsch JD, Ashenurst JR, Cervantes MC, Groman SM, James AS, **Pennington ZT** (2014). Dissecting Impulsivity and its relationship to addictions. *Annals of the New York Academy of Sciences*, 1327(1): 1-26.
- Jentsch JD, **Pennington ZT** (2014). Reward, interrupted: inhibitory control and its relevance to addictions. *Neuropharmacology*, 76B: 479-486.

Professional Activities and Service

- 2023 Instructor, Cold Spring Harbor Laboratories, Imaging Structure and Function in the Nervous System
- 2021-present Founder/Organizer, Sinai Anxiety Fear and Trauma Journal Club
- Created multi-lab journal club to facilitate collaboration amongst labs and safe place for trainees to refine their science and presentation skills.
- 2021-2022 Chair, Mount Sinai Neuroscience Postdoctoral Association
- Co-developed Mount Sinai Emerging Scholars Program.
 - Helped orchestrate multiple career panels for postdocs.
 - Created grant-writing resources to help postdocs identify and secure funding.
 - Organized job-search support group for postdocs going on faculty search.
 - Hosted socials to facilitate sense of welcome amongst postdoc community.
- 2021 Instructor, Virtual Miniscope Workshop
- 2019 Instructor, CAJAL Advanced Neuroscience Training Programme
- 2019-present Committee Member, Mount Sinai Neuroscience Postdoctoral Association
- 2018-2021 Committee Member, Mount Sinai Neuroscience Seminars
- 2015-2017 Graduate Student Mentor, UCLA *Undergraduate Research Journal of Psychology*

Teaching

Uniquely positioned at the intersection of numerous disciplines, neuroscience requires the sharing of information amongst individuals with diverse perspectives. In order for these individuals to communicate effectively, complex ideas must be distilled so that they can be both appreciated and collaboratively worked on. The spirit of accessibility embedded in this has had a profound impact on me. Entering science relatively late in my education, I believe it is why I felt welcome despite my scientific naivety. As an educator, making information accessible is my central goal. Moreover, I hope to foster an environment where every student feels that they can contribute to the scientific discourse.

Academic Courses

- 2022-present Invited Lecturer at Icahn School of Medicine at Mount Sinai
Courses Taught:

- Neuro Core Unit 3, Behavioral and Cognitive Neuroscience
- Techniques and Approaches in Neuroscience

2016-2017 Instructor at UCLA
Average Overall Rating: 8.4/9 (N = 70)
Courses Taught:

- Psych 15, Introductory Psychobiology (2 school quarters)

2012-2018 Teaching Assistant at UCLA
Average Overall Rating: 8/9 (N = 291)
Courses Taught:

- Psychology 110, Fundamentals of Learning (1 school quarter)
- Psychology 115, Principles of Behavioral Neuroscience (3 school quarters)
- Psychology 116, Behavioral Neuroscience Laboratory (6 school quarters)
- Neuroscience M101L, Neuroscience Laboratory (1 school quarter)

Workshops

2023 Instructor at Cold Spring Harbor Laboratories – “Imaging Structure & Function in the Nervous System” (Cold Spring Harbor, NY)

2021 Instructor at UCLA Virtual Miniscope Workshop

2019 Instructor at Cajal Advanced Neuroscience Training Programme – “Miniscope Imaging” (Bordeaux, France)

Research Advising

Research Mentor at Icahn School of Medicine at Mount Sinai

2023-Present Shereen Abdel-Raheem, Undergraduate in Cai Lab

2022-Present Patlapa Sompolpong, Research Associate in Cai Lab

- Author on Pennington et al. BioRxiv, 2023
- First author poster presentation at SFN 2023
- Poster presenter at SFN 2022

2020-2022 Alexa LaBanca, Research Associate in Cai Lab

- Author on Pennington et al. BioRxiv, 2023
- Author on Pennington et al. Current Protocols in Neuroscience, 2021
- First author poster presentations at SFN 2021, SFN 2022, Mount Sinai Neuroscience Retreat 2021, Mount Sinai Neuroscience Retreat 2022

2019-2021 Taylor Francisco, Neuroscience and Behavior Student at Columbia

- Author on Pennington et al. Current Protocols in Neuroscience, 2021
- First author poster presentation at SACNAS 2021.
- NIMH Diversity Supplement Awardee

Senior Thesis Mentor at UCLA

2018-2018 Kevin Li, Psychobiology

- Author on Pennington et al. Neuropsychopharmacology, 2020

- First author poster presentation at UCLA Psychology Undergraduate Research Conference 2018
- 2017-2018 Dimyana Hana, Neuroscience
- First author poster presentation at UCLA Neuroscience Undergraduate Research Conference 2018
- 2015-2016 Austin Anderson, Psychobiology,
- Author on Pennington et al. *Learning & Memory*, 2017
 - First author poster presentation at UCLA Psychology Undergraduate Research Conference 2016
- 2013-2014 Patricia Stan, Neuroscience
- First author poster presentation at UCLA Psychology Undergraduate Research Conference 2014
- 2012-2013 Kyra Phillips, Psychology
- First author poster presentation at UCLA Psychology Undergraduate Research Conference 2013
- 2012-2013 Taylor Clark, Psychology
- First author poster presentation at UCLA Psychology Undergraduate Research Conference 2013

Press and Media

- 2021 *Neuropsychopharmacology* Press Release
- 2017 *Society for Neuroscience* Press Release

Invited Talks:

- 2023 Pavlovian Society Meeting, Austin, TX.
- 2022 UT Southwestern, El Paso. Learning Technology Seminar Series (Virtual)

Reviewer:

Journal Review:

- Neuropsychopharmacology*, Reviewer (since 2021)
- Journal of Neuroscience*, Reviewer (since 2023)

References:

Denise Cai, Ph.D.

Associate Professor
Department of Neuroscience
Icahn School of Medicine at Mount Sinai
Email: denisecai@gmail.com

Michael Fanselow, Ph.D.

Distinguished Professor

Departments of Psychology, and Psychiatry and Biobehavioral Sciences
University of California, Los Angeles
Email: mfanselow@gmail.com

Eric Nestler, MD, Ph.D.,
Dean, Academic and Scientific Affairs
Director, Friedman Brain Institute
Departments of Neuroscience, Psychiatry, and Pharmacological Sciences
Icahn School of Medicine at Mount Sinai
Email: eric.nestler@mssm.edu