Pennington CV

## Zachary T. Pennington, PhD

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## **Positions**

Starting 2026	Assistant Professor, University of British Columbia Department of Psychology & Centre for Brain Health
2023 – 2025	Instructor, Icahn School of Medicine at Mount Sinai Advisor: Dr. Denise Cai

# **Education & Training**

2018 – 2022	Icahn School of Medicine at Mount Sinai Postdoctoral Fellowship, Department of Neuroscience Advisor: Dr. Denise Cai
2018	University of California, Los Angeles (UCLA) PhD, Behavioral Neuroscience and Quantitative Psychology Advisor: Dr. Michael Fanselow
2010	University of California, Los Angeles (UCLA) BA, Psychology Advisor: Dr. J. David Jentsch
2008	Pasadena City College AA, Psychology

# **Grants & Fellowships**

## **Current Funding:**

2023 – 2028	Pathway to Independence Award, National Institute of Mental Health, K99MH131792 (\$999,000)  "Disentangling the consequences of trauma"
2023 – 2025	Young Investigator Award, Behavior Brain Research Foundation (\$70,000)  "Contributions of the anterior hypothalamic nucleus to post-trauma stress sensitization"

2024 – 2025	Postdoc Innovator Award, Friedman Brain Institute, Icahn School of Medicine at Mount Sinai (\$25,000)  "Contributions of GABAergic neurons in the anterior hypothalamic nucleus to defensive behavior"
2023 – 2025	National Institute of Mental Health, R56MH132959 (Co-Investigator, \$783,000)
	"Fear and anxiety circuit mechanisms in anterior hypothalamic nucleus"

# Fellowships, Awards and Honors

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2023 – 2028	K99/R00, Pathway to Independence Award, National Institute of Mental Health
2024 – 2025	Postdoc Innovator Award, Friedman Brain Institute, Icahn School of Medicine at Mount Sinai
2023 – 2025	Young Investigator Award, Behavior Brain Research Foundation
2025	Behavior Brain Research Foundation Freedman Prize Honorable Mention
2025	Best Postdoc Talk, Mount Sinai Neuroscience Retreat
2024	Travel Award, American College of Neuropsychopharmacology
2024	Travel Award, Stress Neurobiology Meeting
2022	McKnight Foundation Doupe Fellow
2022	Outstanding Citizen Award, Nash Family Department of Neuroscience, Icahn School of Medicine at Mount Sinai
2018 – 2019	Postdoctoral Fellow, Ruth L. Kirschstein NRSA Institutional Research Training Grant (Icahn School of Medicine at Mount Sinai), National Institute of Drug Abuse
2017 – 2018	Dissertation Year Fellowship, University of California, Los Angeles
2017	Teaching Practicum Program Fellow, University of California, Los Angeles
2016	Teaching Practicum Program Fellow, University of California, Los Angeles
2015 – 2017	Ruth L. Kirschstein Predoctoral Individual National Research Service Award, National Institute of Mental Health (F31)
2015	Society for Neuroscience Travel Award, UCLA Brain Research Institute
2012 – 2014	Predoctoral Fellow, Ruth L Kirschstein NRSA Institutional Research Training Grant (University of California, Los Angeles), National Institute of Drug Abuse
2012	Travel Award, Behavior, Biology and Chemistry: Translational Research in Substance Use Disorders
2012	Graduate Summer Research Mentorship Fellowship, University of California, Los Angeles
2008	Opal Jones Trust Scholarship in Psychology, Pasadena City College
2008	Valedictorian, Pasadena City College

## **Diversity, Equity, and Inclusion:**

At each step in the academic ladder, individuals from underrepresented groups face substantial hurdles that impede their ability to thrive. These hurdles produce great harm, both for the individual and society at large. We must make sweeping changes to improve upon the situation. As a person that struggled with mental illness, 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 AR, Abdel-Raheim SD, Bacon ME, Mahmoud AN, Sompolpong P, Baggetta AM, Zaki Y, Ko B, Dong Z, Smith ACW, Kenny PJ, Cai DJ (2024). An anterior hypothalamic circuit gates stress vulnerability. <u>bioRxiv</u>, 2024.10.28.620614v1. doi: 10.1101/2024.07.03.601770. [link]

## Research Reports:

- 2. Dong Z, Feng Y, Diego K, Baggetta AM, Sweis BM, Pennington ZT, Lamsifer SI, Zaki Y, Sangiuliano F, Philipsberg PA, Morales-Rodriguez D, Kircher D, Slesinger P, Shuman T, Aharoni D, Cai DJ (In Press). Simultaneous dual-color calcium imaging in freely-behaving mice. <u>Science Advances</u>. doi: 10.1101/2024.07.03.601770. PMID: 39005306. [link]
- 3. Sun WW, Gldflam K, Pennington ZT, Derks L, Coates WC, Nashu MA, Hossin T, Clark A, Tsyrulnik A, Linden JA. Quick to connect: a comparison of virtual and in-person speed mentoring for emergency medicine medical students, residents by faculty at a national conference. <a href="International Journal of Emergency Medicine">International Journal of Emergency Medicine</a>, 18(1): 42. doi: 10.1186/s12245-025-00860-0. PMID: 40033204. <a href="Ilink">Ilink</a>]
- 4. Feng Y, Diego KS, Dong Z, Christenson Wick Z, Page-Harley L, Page-Harley, V, Schnipper J, Lamsifer SI, Pennington ZT, Vetere LM, Philipsberg PA, Soler I, Jurkowski A, Rosado CJ, Khan NN, Cai DJ, Shuman T (2025). Distinct changes to hippocampal and medial entorhinal circuits emerge across the progression of cognitive deficits in epilepsy. <u>Cell Reports</u>, 44(2) 115131. doi: 10.1016/j.celrep.2024.115131. PMID: 39847482 [link]
- **5. Pennington ZT**, LaBanca AR, Sompolpong P, Abdel-Raheim SD, Ko B, Christenson Wick Z, Feng Y, Dong Z, Francisco TR, Bacon ME, Chen L, Fulton SL, Maze I, Shuman T, Cai DJ (2024). Dissociable contributions of the amygdala and ventral hippocampus to stress-induced

- changes in defensive behavior. *Cell Reports*, 43(11):114871. doi: 10.1016/j.celrep.2024.114871. PMID: 39427320. [link]
- 6. Zaki Y, Pennington ZT, Morales-Rodriguez D, Bacon ME, Ko B, Francisco TR, LaBanca AR, Sompolpong P, Dong Z, Lamsifer S, Chen HT, Carrillo Segura S, Christenson Wick Z, Silva AJ, Rajan K, van der Meer M, Fenton A, Shuman T, Cai DJ (2024). Offline ensemble coreactivation links memories across days. <u>Nature</u>. doi: 10.1038/s41586-024-08168-4. PMID: 39506117. [link]
- 7. Blaze J, Evans VD, Pliego JA, Unichenko P, Javidfar B, Heissel S, Alwaseem H, Pennington Z, Cai D, Molina H, Henneberger C, Akbarian S (2024). Neuron-specifc glycine metabolism links transfer RNA epitranscriptomic regulation to complex behaviors. <u>Biological Psychiatry Global Open Science</u>, 5(2): 100432. doi: 10.1016/j.bpsgos.2024.100432. PMID: 39911537 [link]
- 8. 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. <u>eLife</u>, 11:e70661. doi: 10.7554/eLife.70661. PMID: 35642786 [link]
- **9. Pennington ZT**, Diego KS, Francisco TR, LaBanca AR, Lamsifer SI, Liobimova O, Shuman T, Cai DJ (2021). ezTrack-A Step-by-Step Guide to Behavior Tracking. *Current Protocols*, 1(10):e255. doi: 10.1002/cpz1.255. PMID: 34610215. [link]
- 10. Blaze J, Navickas A, Phillips HL, Heissel S, Plaza-Jennings A, Miglani S, 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. Neuronal Nsun2 deficiency produces tRNA epitranscriptomic alterations and proteomic shifts impacting synaptic signaling and behavior. <u>Nature Communications</u>. 2021 Aug 13;12(1):4913. doi: 10.1038/s41467-021-24969-x. PMID: 34389722; PMCID: PMC8363735. [link]
- **11.** 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. PMID: 34272313. doi: 10.1523/JNEUROSCI.0901-21.2021. [link]
- **12.** Rajbhandari AK, Octeau CJ, Gonzalez S, **Pennington ZT**, Mohamed F, Trott J, Chavez J, Ngyuen E, Keces N, Hong WZ, Neve 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):3446-3461. doi:10.1523/JNEUROSCI.2564-20.2021 [link]
- 13. 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 interneuron synchronization in epileptic mice. <u>Nature Neuroscience</u>, 23(2): 229-238. doi: 10.1038/s41593-019-0559-0. PMID: 31907437. [link]
- **14. 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.

- <u>Neuropsychopharmacology</u>, 45(3): 482-490. doi: 10.1038/s41386-019-0559-5. PMID: 31787748; PMCID: PMC6968993. [link]
- **15. 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. <u>Scientific Reports</u>, 9(1): 19979. doi: 10.1038/s41598-019-56408-9. PMID: 31882950; PMCID: PMC6934800. [link]
- 16. Kosarussavadi S\*, Pennington ZT\*, Covell C, Blaisdell AP, Schlinger BA (2017). Across sex and age: Learning and memory and patterns of avian hippocampal gene expression. <u>Behavioral Neuroscience</u>, 131(6): 483-491. doi: 10.1037/bne0000222. PMID: 29189019. [link]
  - \*Joint first authors
- **17. 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. doi: 10.1101/lm.046110.117. PMID: 28814465; PMCID: PMC5580532. [link]
- **18.** 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. doi: 10.1523/JNEUROSCI.0486-17.2017. PMID: 28743727; PMCID: PMC5577854. [link]
- 19. 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. <u>eNeuro</u>, 2(3): e0040-14. doi: 10.1523/ENEURO.0040-14.2015. PMID: 26464985; PMCID: PMC4586930. [link]

#### Reviews:

- 20. Fanselow MS, Pennington ZT (2018). A return to the psychiatric dark ages with a two-system framework for fear. <u>Behaviour Research and Therapy</u>, 100:24-29. doi: 10.1016/j.brat.2017.10.012. PMID: 29128585; PMCID: PMC5794606. [link]
- 21. Jentsch JD, Ashenhurst JR, Cervantes MC, Groman SM, James AS, Pennington ZT (2014). Dissecting Impulsivity and its relationship to addictions. <u>Annals of the New York Academy of Sciences</u>, 1327: 1-26. doi: 10.1111/nyas.12388. PMID: 24654857; PMCID: PMC4360991. [link]
- **22.** Jentsch JD, **Pennington ZT** (2014). Reward, interrupted: Inhibitory control and its relevance to addictions. *Neuropharmacology*, 76B: 479-486. doi: 10.1016/j.neuropharm.2013.05.022. PMID: 23748054; PMCID: PMC4023480. [link]

#### Commentaries:

- **23.** Pennington ZT, Cai DJ (2021). Propranolol inhibits reactivation of fear memory. <u>Biological Psychiatry</u>, 89(12):1111-12. doi: 10.1016/j.biopsych.2021.04.007. PMID: 34082886. [link]
- **24. Pennington ZT**, Fanselow MS (2018). Indirect targeting of subsuperficial brain structures with transcranial magnetic stimulation reveals a promising way forward in the treatment of

fear. <u>Biological Psychiatry</u>, 84(2): 80-81. doi: 10.1016/j.biopsych.2018.05.003. PMID: 31178062. [link]

**25.** Fanselow MS, **Pennington ZT** (2017). The Danger of LeDoux and Pine's Two-System Framework for Fear. *American Journal of Psychiatry*, 174(11): 1120-1121. doi: 10.1176/appi.ajp.2017.17070818. PMID: 29088929. [link]

## **Invited Talks:**

2025	University of Alabama, Birmingham (Birmingham, AL)
2025	Temple University (Philadelphia, PA)
2025	Mount Sinai Neuroscience Retreat (New York, NY)
2025	Grady Trauma Project Colloquium at Emory University (Virtual)
2024	Hypothalamus Gordon Research Conference (Lewiston, ME)
2024	Neurobiology of Stress Conference (Boston, MA)
2024	University of California, Los Angeles, Behavioral Neuroscience Seminar (Los Angeles, CA)
2024	University of Colorado, Boulder, Behavioral Neuroscience Seminar (Boulder, CO)
2024	Yale Division of Molecular Psychiatry Seminar Series (New Haven, CT)
2023	American College of Neuropsychopharmacology (Tampa, FL)
2023	Pavlovian Society (Austin, TX)
2022	University of Texas, Southwestern, El Paso. Learning Technology Seminar Series (Virtual)

## **Professional Activities and Service**

2022 – 2024	Co-Director, Emerging Scholars Program, Icahn School of Medicine at Mount Sinai
2022 – 2025	Founder/Organizer, Faculty Search Support Group, Icahn School of Medicine at Mount Sinai
	<ul> <li>Organized mock chalk-talk session with faculty and trainees.</li> </ul>
	<ul> <li>Organized application review session with faculty input.</li> </ul>
	<ul> <li>Coordinated postdocs being able to attend departmental chalk-talks.</li> </ul>
2024	Organizer, Symposium on Diversity, Inclusion and Training at the Icahn School of Medicine at Mount Sinai
2023	Instructor, Cold Spring Harbor Laboratory Imaging Structure and Function in the Nervous System

2021 – 2024	Founder/Organizer, Sinai Anxiety Fear and Trauma Journal Club, Icahn School of Medicine at Mount Sinai
2021 – 2022	Chair, Neuroscience Postdoctoral Association, Icahn School of Medicine at Mount Sinai  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, 2021 Virtual Miniscope Workshop Organized by Drs. Daniel Aharoni, Denise Cai and Tristan Shuman
2019	Instructor, CAJAL Advanced Neuroscience Training Programme, Université de Bordeaux:  Principles and implementation of Miniscope imaging and analysis
2019 – present	Committee Member, Neuroscience Postdoctoral Association, Icahn School of Medicine at Mount Sinai
2018 – 2021	Committee Member, Mount Sinai Neuroscience Seminars, Icahn School of Medicine at Mount Sinai
2015 – 2017	Graduate Student Mentor, UCLA <i>Undergraduate Research Journal of</i> Psychology

# Teaching

## Academic Courses

2022 – present	Invited Lecturer, Icahn School of Medicine at Mount Sinai Courses:
	<ul> <li>Neuro Core Unit 3, Behavioral and Cognitive Neuroscience</li> <li>Techniques and Approaches in Neuroscience</li> </ul>
2016 – 2017	Instructor, University of California, Los Angeles (UCLA)  Average Overall Rating: 8.4/9 (N = 70)  Courses:
	<ul> <li>Psych 15, Introductory Psychobiology (2 school quarters)</li> </ul>
2012 – 2018	Teaching Assistant, University of California, Los Angeles (UCLA)  Average Overall Rating: 8/9 (N = 291)  Courses:

- Psychology 110, Fundamentals of Learning (1 school quarter)
- Psychology 115, Principles of Behavioral Neuroscience (3 school quarters) 0
- Psychology 116, Behavioral Neuroscience Laboratory (6 school quarters)
- Neuroscience M101L, Neuroscience Laboratory (1 school quarter)

## Workshops

2023	Instructor, Cold Spring Harbor Laboratory Imaging Structure and Function in the Nervous System
2021	Instructor, 2021 Virtual Miniscope Workshop Organized by Drs. Daniel Aharoni, Denise Cai and Tristan Shuman
2019	Instructor, CAJAL Advanced Neuroscience Training Programme, Université de Bordeaux
	Principles and implementation of Miniscope imaging and analysis

Research Advising	
Research Men	tor at Icahn School of Medicine at Mount Sinai
2024 – Present	<ul> <li>Afra Mahmud, Undergraduate Researcher in Cai Lab</li> <li>Author on Pennington et al. BioRxiv, 2024</li> <li>Invited talk at Hunter College Undergraduate Research Conference 2025</li> <li>First author poster presentation at Brown University Undergraduate Research Conference 2025</li> <li>First author poster presentation at Mount Sinai Neuroscience Retreat 2025</li> </ul>
2024 - 2025	Madeline Bacon, Research Associate in Cai Lab
2023 - 2024	<ul> <li>Shereen Abdel-Raheim, Undergraduate in Cai Lab</li> <li>Author on Pennington et al. Cell Reports, 2024</li> <li>Author on Pennington et al. BioRxiv, 2024</li> <li>First author poster presentation at Mount Sinai Neuroscience Retreat 2024</li> <li>Poster presenter at SFN 2023</li> </ul>

#### 2022 - 2024 Patlapa Sompolpong, Research Associate in Cai Lab

Author on Pennington et al. Cell Reports, 2024

Current position: Counseling Psychology MA student, Hunter College

Author on Pennington et al. BioRxiv, 2024

- First author poster presentation at SFN 2023
- Poster presenter at SFN 2022
- Current position: Neuroscience PhD student, Emory University

#### 2020-2022

#### Alexa LaBanca, Research Associate in Cai Lab

- Author on Pennington et al. Cell Reports, 2024
- Author on Pennington et al. BioRxiv, 2024
- 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
- Current position: Neuroscience PhD student, Icahn School of Medicine at Mount Sinai

#### 2019-2021

#### Taylor Francisco, Neuroscience and Behavior Student at Columbia

- Author on Pennington et al. Cell Reports, 2024
- Author on Pennington et al. Current Protocols in Neuroscience, 2021
- First author poster presentation at SACNAS 2021.
- NIMH Diversity Supplement Awardee
- Subsequent position: Data Science MA student, Columbia University

#### 2021

#### Keziah Diego, Research Associate in Shuman Lab

- Author on Pennington et al. Current Protocols in Neuroscience, 2021
- Current position: Medical student, U Chicago

#### 2021

### Sophia Lamsifer, Research Associate in Shuman Lab

- Author on Pennington et al. Current Protocols in Neuroscience, 2021
- Current position: Medical student, Yale School of Medicine

#### 2021

#### Olga Liobimova, Undergraduate Researcher in Shuman Lab

Author on Pennington et al. Current Protocols in Neuroscience, 2021

## 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
- Subsequent position: Medical student, UCSF Medical School

#### 2017-2018

## Dimyana Hana, Neuroscience

- First author poster presentation at UCLA Neuroscience Undergraduate Research Conference 2018
- Subsequent position: Brand strategist & content creator

#### 2015-2016

#### Austin Anderson, Psychobiology

- Author on Pennington et al. Learning & Memory, 2017
- First author poster presentation at UCLA Psychology Undergraduate Research Conference 2016
- Subsequent position: Medical student, Arizona College of Osteopathic Medicine

#### 2013-2014 Patricia Stan. Neuroscience

- First author poster presentation at UCLA Psychology Undergraduate Research Conference 2014
- Subsequent position: Neuroscience PhD student, University of Pittsburgh

#### 2012-2013 Kyra Phillips, Psychology

- First author poster presentation at UCLA Psychology Undergraduate Research Conference 2013
- Subsequent position: Psychobiology PhD student, University of Michigan Ann Arbor

#### 2012-2013 Taylor Clark, Psychology

- First author poster presentation at UCLA Psychology Undergraduate Research Conference 2013
- Subsequent position: Neuroscience PhD student, UT Austin

## **Press and Media**

2021 Neuropsychopharmacology Press Release 2017 Society for Neuroscience Press Release

## Reviewer:

#### Journal Review:

Neuropsychopharmacology, Reviewer (since 2021)

Biological Psychiatry, Reviewer (since 2023)

Journal of Neuroscience, Reviewer (since 2023)

Science Advances, Reviewer (since 2024)

Nature Communications, Reviewer (Since 2025)

Molecular Psychiatry, Reviewer (since 2024)