

# Zachary T. Pennington, PhD

Department of Neuroscience

Icahn School of Medicine at Mount Sinai

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## Education

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- 2018 **PhD, Behavioral Neuroscience and Quantitative Psychology. UCLA** (GPA 3.97)  
*10 publications*
- 2010 **BA, Psychology. UCLA** (GPA 3.97)

## Positions

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- 2023-Present **Instructor, Icahn School of Medicine at Mount Sinai**
- 2018-2022 **Postdoctoral Fellow, Icahn School of Medicine at Mount Sinai**  
*10 publications*

## Experience

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- Systems Neuroscience**
- 13+ years of experience conducting systems neuroscience research uncovering biological basis for major mental health conditions
  - Rodent stereotaxic surgery, viral delivery, calcium imaging, optogenetics, neuroanatomy, tissue clearing, behavioral analysis, immunohistochemistry
- Management/Leadership**
- Designed and oversaw multi-year neurobehavioral research projects
  - Trained and managed multiple lab technicians, graduate students, and undergraduates, and guided them to their next career stage
  - Served as chair of postdoc association, spearheading multiple initiatives for trainee development. Developed and organized multi-lab journal club
- Communication**
- Instructed numerous courses for graduate/undergrad students
  - Taught several international technology workshops
  - Presented at professional conferences
  - Worked on collaborative multi-lab projects
- Science Writing**
- Have written/co-written multiple funded grants, several >\$1,000,000
  - Published >20 papers
- Programming/Data Analysis**
- Skilled at Python, R, git, Excel, SPSS
  - Analyzed data on numerous published manuscripts
  - Published multiple open-source software packages, most notably, the behavioral tracking software ezTrack, cited >100 times since 2019.
  - Shared numerous algorithms for cell counting, EMG/EEG analysis, behavior tracking, and more, on my github.
- Statistics**
- Multiple regression, hierarchical linear models, generalized linear models
- Microscopy**
- Confocal and epi-fluorescent microscopy, light-sheet microscopy, in vivo single photon calcium imaging
  - Skilled in 2D/3D image analysis

## Awards & Honors

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2023-2028	National Institutes of Mental Health Pathway to Independence Award (\$999,000)
2023-2025	Behavior & Brain Research Foundation, Young Investigator Award (\$70,000)
2022	Mount Sinai Neuroscience Outstanding Citizen Award (\$1,000)
2022	McKnight Foundation Doupe Fellow
2018-2019	National Institute on Drug Abuse T32 Postdoc Fellowship (\$60,000)
2017	UCLA Teaching Practicum Program Fellow (\$4,000)
2017-2018	UCLA Dissertation Year Fellowship (\$20,000)
2015-2017	National Institutes of Mental Health Predoctoral Fellowship (\$69,000)
2012-2014	National Institute on Drug Abuse T32 Predoctoral Fellowship (\$60,000)
2008	Valedictorian of Pasadena City College

## Professional Leadership & Service

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2021-present	Founder/Organizer, Sinai Anxiety Fear and Trauma Journal Club <i>Created multi-lab journal club to facilitate collaboration amongst labs and safe place for trainees to refine their science and presentation skills.</i>
2021-2022	Chair, Mount Sinai Neuroscience Postdoctoral Association <i>Co-developed scholarship opportunity for scientists from underrepresented backgrounds, organized multiple career panels, created grant-writing resources for trainees, created job-search support group for trainees, and organized socials.</i>
2019-present	Instructor, Miniscope Workshops <i>Co-instructed several international workshops on the use of miniature microscope assembly, use, and data analysis to a diverse group of scientists.</i>

## Grants & Fellowships

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### 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”

## Teaching

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2022-present	Invited Lecturer at Icahn School of Medicine at Mount Sinai
2016-2017	Instructor at UCLA (Average Overall Rating: 8.4/9, N = 70)
2012-2018	Teaching Assistant at UCLA (Average Overall Rating: 8/9, N = 291)

## Publications:

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### 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\***, Covell 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.