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# Sedona N. Ewbank

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## Summary

Curious, intrinsically motivated, and collaborative scientist with 10 years of experience in neuroscience and fluency in artificial intelligence. Keen interest in leveraging computational tools to address impactful research questions.

## Education

**Stanford University** *Sept. 2019 – March 2026*
PhD in Neurosciences

**University of Washington** *Sept. 2015 – Aug. 2018*
BS in Neurobiology and Biochemistry
Departmental distinction; magna cum laude

## Experience

**Research Fellow** *March 2026 – July 2026*
BluelightAI *Palo Alto, CA*

- Investigating instruction-following and jailbreak mechanisms in requests in large language models using difference-in-means vector steering, geometric analysis, cross-layer transcoders

**Graduate Research Assistant** *Sept. 2020 – March 2026*
Stanford University *Stanford, CA*
Advised by Raag D. Airan, MD, PhD

- Used computer vision and statistical inference to characterize ketamine-evoked naturalistic behaviors in rats and their relationship to neurophysiology and pharmacokinetics
- Implemented diffusion MRI biophysical models, image analysis, and Monte Carlo simulations to assess brain microstructure in disease and therapeutic interventions in mice, rats, and humans
- Developed pipelines for EEG signal processing and pharmacokinetic modeling for ultrasonic brain drug delivery platform

**Research Technician** *Aug. 2017 – Aug. 2019*
Howard Hughes Medical Institute / University of Washington *Seattle, WA*
Advised by Richard D. Palmiter, PhD

- Performed behavioral experiments, pharmacological manipulations, intracranial viral injection surgeries, chemogenetics, patch clamp electrophysiology, and 16S rRNA sequencing of cecal microbiota in mice to study energy metabolism
- Used R and bash tools to perform bioinformatic and statistical analyses

**Summer Research Fellow** *July 2017 – Aug. 2017*
École Polytechnique Fédérale de Lausanne *Lausanne, VD, CH*
Advised by Brian D. McCabe, PhD

- Performed *D. melanogaster* brain tissue extraction, immunostaining, and histology to characterize promoter expression patterns for use in a neurodegeneration model

**Undergraduate Research Fellow** *April 2016 – June 2017*
University of Washington *Seattle, WA*
Advised by Leo J. Pallanck, PhD

- Performed locomotor behavioral experiments, pharmacological manipulations, and PCR and western blotting of tissue extracts in a *D. melanogaster* model of Parkinson's disease due to GBA deficiency

**Research and Development Intern** *July 2015 – Sept. 2015*
Aervoe Industries, Inc. *Gardnerville, NV*

- Updated Safety Data Sheets of raw materials for compliance with OSHA regulations
- Conducted bench chemistry lab work related to paint production and quality control testing

## Skills

**Computational**

- Languages: Python, Shell, Matlab, R
- Tools: TensorFlow, PyTorch, Pandas, Numpy, Statsmodels, Scikit-learn, Scipy, MNE, FSL, Nibabel, DiPy, Nilearn, DeepLabCut, Matplotlib, NetworkX, Git, Singularity, SLURM
- Systems: high-performance computing, containerized software
- Methods: signal processing (fUS, ECoG, audio/video), software development and documentation, large dataset curation, machine learning, neural network hyperparameter tuning and model training, statistics, biomedical image analysis, pharmacokinetic modeling, simulation

**Experimental**

- Rat cranial window implantation and functional ultrasound imaging
- Mouse and rat handling, husbandry, stereotactic surgery, behavior, and tissue collection
- *D. melanogaster* husbandry, genetics, behavior, and tissue collection
- Immunohistochemistry

## Code Repositories

**InstructBreak**
Code repository for mechanistic study of why irrelevant instructions alter large language models' refusal behavior in response to harmful information requests.

**MARIPoSA**
Platform for analyzing, visualizing, and simulating pose estimation and segmentation data designed to integrate with a variety popular open source pose analysis research tools.

**Open Diffusion Toolbox**
Toolbox for implementing dMRI model fitting (DTI, NODDI), registration, and ROI- and voxel-based analysis in mice, rats, or humans using an HPC.

## Research Support

**Ongoing**

- National Science Foundation Graduate Research Fellowship — $138,000 *2021-2026*
  *"Focal Neuromodulation by Ultrasound-Gated Nanoparticle Release of a $GABA_A$ Receptor Antagonist"*

**Past**

- Neuroscience Preclinical Imaging Lab Neuroimaging Pilot Grant — $5,000 *2023-2024*
  *"Developing a translational diffusion MRI-based biomarker for the therapeutic action of psychedelics"*
- Washington Research Foundation Fellowship — $7,500 *2017-2018*
  *"Investigating whether AgRP neuronal maintenance of energy homeostasis involves regulation of the gut microbiota in mice"*
- University of Washington Mary Gates Research Scholarship — $5,000 *2017*
  *"Genetic screen for modifiers of GBA1 pathogenicity in D. melanogaster model of GBA1 deficiency"*

## Awards & Honors

- International Society for Magnetic Resonance in Medicine Magna Cum Laude Merit Award *2025*
- International Society for Magnetic Resonance in Medicine Trainee Educational Stipend *2025*
- Stanford University Mind, Brain, Computation, & Technology Program *2022*

- Stanford University School of Medicine Bertarelli Fellowship *2021*
- Society for Neuroscience Trainee Professional Development Award *2018*
- University of Washington Undergraduate Research Conference Travel Award *2018*
- University of Washington Husky 100 Award *2018*
- University of Washington Rex J. and Ruth C. Robinson Scholarship Fund in Chemistry *2017*
- ThinkSwiss Summer School Scholarship *2017*
- University of Washington Purple and Gold Scholarship *2015*
- National AP Scholar and AP Scholar with Distinction *2015*
- Nevada Prize Exam in Mathematics Certificate of Merit and Best Paper awards *2014*

## Publications

**Ewbank SN**, Sinha Roy K, Gopal DN, Beladi A, Muwanga GPB, Tawfik VL, Airan RD. "Ketamine-evoked naturalistic behaviors predict brain chemistry and neurophysiology." In preparation.

**Ewbank SN**, Hart AR, Gopal DN, Azadian MM, St. Laurent RM, Rodriguez CI, McNab JA, Airan RD. "Multishell diffusion MRI models have limited sensitivity to ketamine-induced microstructural changes in the mouse brain." In revision.

Muwanga GPB, Tena AC, Pang A, **Ewbank SN**, Siliezar-Doyle J, Nippert AR, Airan RD, Tawfik VL. Ethological profiling defines pain behaviors and parses analgesia from drug side effects in a mouse model of complex regional pain syndrome. PAIN 167(6):p 1453-1469, June 2026. doi:10.1097/j.pain.0000000000003976

Yu BJ, Purohit M, Sinha Roy K, Xiang Y, **Ewbank SN**, ... Airan RD. "Acoustically activatable liposomes as a translational nanotechnology for site-targeted drug delivery and noninvasive neuromodulation." Nat Nanotechnol. 2025 Aug 18;ePub. doi:10.1038/s41565-025-01990-5

Di Ianni T, **Ewbank SN**, Levinstein MR, Azadian MM, Budinich RC, Michaelides M, Airan RD. "Sex dependence of opioid-mediated responses to subanesthetic ketamine in rats." Nat Commun. 2024 Jan 30;15,893. doi:10.1038/s41467-024-45157-7

**Ewbank SN**, Campos CA, ... Palmiter RD. "Chronic Gq signaling in AgRP neurons does not cause obesity." Proc Natl Acad Sci USA. 2020 Aug 25;117(34):20874-20880. doi:10.1073/pnas.2004941117

## Presentations

### Oral

**Ewbank SN**, Hart AR, Dai E, Gopal DN, St. Laurent RM, Vo I, Magana O, Mukunda P, McNab JA, Rodriguez CI, Airan RD. "Cross-species quantification of the effect of ketamine on gray matter microstructure in obsessive-compulsive disorder." Oral presentation. International Society for Magnetic Resonance in Medicine (ISMRM) Annual Meeting & Exhibition. Honolulu, HI. *2025*

**Ewbank SN**, Muwanga GPB, Gopal DN, Yu BJ, Tawfik VL, Airan RD. "Quantitative ethological profiling of the psychopharmacology and pain-alleviating effects of subanesthetic ketamine." Oral presentation. Society for Neuroscience. Chicago, IL. *2024*

**Ewbank SN**. "Noninvasive quantification of ketamine-induced structural plasticity in mice using multishell diffusion weighted imaging." Oral presentation. Wu Tsai Neuroscience Preclinical Imaging Lab Symposium. Stanford, CA. *2024*

### Poster

**Ewbank SN**, Hansen J. "Why do Irrelevant Instructions Inhibit Refusal?" Poster. International Conference on Machine Learning (ICML) Mechanistic Interpretability Workshop. Seoul, Korea. *2026*

**Ewbank SN**, Habib P, Liang X, Noristani R, Kim J, Bliss TM, Airan RD, Steinberg G. "Leveraging a reproducible diffusion MRI analysis pipeline to characterize stem cell-driven structural recovery in stroke-injured rat brains." Poster. Knight Initiative for Brain Resilience Symposium. Stanford, CA. *2025*

**Ewbank S**, Hart A, Muwanga G, Gopal D, Sinha Roy K, Yu B, St. Laurent R, Tawfik V, Rodriguez C, McNab J, Airan R. "Quantitative Profiling of the Effects of Subanesthetic Ketamine on Naturalistic Behavior and Brain Microstructure." Poster. American College of Neuropsychopharmacology Annual Meeting. Phoenix, AZ. *2024*

**Ewbank S**, Hart A, Muwanga G, Gopal D, Sinha Roy K, Yu B, St. Laurent R, Tawfik V, Rodriguez C, McNab J, Airan R. "Quantitative profiling of the effects of subanesthetic ketamine on naturalistic behavior and brain microstructure." Poster. Wu Tsai Neurosciences Institute Symposium: Brains & Machines: The Co-Evolution of Neuroscience and AI. Stanford, CA. *2024*

**Ewbank SN**, Hart AR, Casey AB, McNab JA, Heifets BD, and Airan RD. "Noninvasive quantification of ketamine-induced structural plasticity in mice using multishell diffusion weighted imaging." Poster. International Society for Magnetic Resonance in Medicine (ISMRM) Annual Meeting & Exhibition. Singapore. *2024*

**Ewbank SN**, Gopal DN, Airan RD. "Quantitative ethological profiling of the effects of subanesthetic ketamine in health, chronic pain, and substance withdrawal in rats." Poster. NIH HEAL Initiative Scientific Meeting. Rockville, MD. *2024*

**Ewbank SN**, Di Ianni T, Bishop JH, Airan RD. "Computational analysis of ketamine's effects on naturalistic behaviors and pain in rats." Poster. Wu Tsai Neurosciences Institute Retreat Symposium. Santa Cruz, CA. *2022*

**Ewbank SN**, Campos CA, Padilla SL, Bowen AJ, Palmiter RD. "The role of AgRP neurons in shaping the composition and energy harvest capacity of the gut microbiota." Poster. Society for Neuroscience. San Diego, CA. *2018*

**Ewbank SN**, Campos CA, Padilla SL, Bowen AJ, Palmiter RD. "Energy Homeostasis Neural Circuitry In the Brain Regulates the Composition of the Gut Microbiota." Poster. University of Washington Undergraduate Research Symposium. Seattle, WA. *2018*

**Ewbank SN**, Asadzadeh J, McCabe BD. "Establishing a Drosophila Model System to Study Tau Imbalance and Spreading in Neural Circuits." Poster. École Polytechnique Fédérale de Lausanne Summer Research Program Poster Symposium. Lausanne, VD, CH. *2018*

**Ewbank SN**, Germanos AA, Pallanck LJ, Davis MY. "Using a Drosophila melanogaster Model to Understand the Role of Mutations in the Glucosidase, Beta Acid 1 Gene in Parkinson's Disease." Poster. UW Department of Neurology Trainee Research Symposium. Seattle, WA. *2017*

**Ewbank SN**, Germanos AA, Pallanck LJ, Davis MY. "Using a Drosophila melanogaster Model to Understand the Role of Mutations in the Glucosidase, Beta Acid 1 Gene in Parkinson's Disease." Poster. University of Washington Undergraduate Research Symposium. Seattle, WA. *2017*

## Teaching & Service

### Teaching

- Celsius and Beyond Neuroscience Summer Camp, Teacher *2026*
- Stanford Neurosciences Preclinical Imaging Laboratory Data Processing Workshop, Instructor *2024*
- Stanford Neuroscience Undergraduate Research Opportunity Fellowship, Teaching Assistant *2022*
- Stanford Intensive Neurosciences Boot Camp (NEPR 299), Teaching Assistant *2020*

### Service

- Stanford Future Advancers of Science and Technology (FAST), Mentor *2020-2022*
- Stanford Neurosciences Application Assistance Program (SNAAP), Mentor *2020-2022*
- Stanford Biosciences Student Association, NSF GRFP Application Mentor *2021*
- University of Washington Undergraduate Research Program, Leader *2017-2018*

### Peer Reviewing

- Biological Psychiatry, *ad hoc* reviewer *2025*
- Neuropsychopharmacology, *ad hoc* reviewer *2025*
- Neuropharmacology, *ad hoc* reviewer *2022*