Katrina Deane

Postdoctoral Researcher

Razak Lab & Saltzman Lab
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Keywords

auditory neurophysiology
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Pallid bat
Fragile X Syndrome
biparental California Mice
population activity and microcircuitry
Current source density analysis

References

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Prof. Frank Ohl
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Education

Leibniz Institute for Neurobiology, Magdeburg
Doctorate in Neuroscience, 2018-2023

Otto von Guericke University, Magdeburg
Masters of Science in Integrative Neuroscience, 2016-2018

Michigan Technological University, Houghton MI
Bachelors of Science in Psychology, 2010-2014

Professional Summary

5 years of experience in auditory physiology, recording and analyzing mesoscopic population activity with laminar probes in anesthetized and awake Mongolian gerbils, C57BL/6J mice, and Seba's short-tailed bats. Currently adding California mice, Fragile X Syndrome Fmr1 KO mice, and Pallid bats. Expertise in current source density analysis of cortical column and layer activity, a suite of spectral analysis tools, NeuroNexus technology, and comparative auditory neurophysiology. Skilled in research development, experimentation, data analysis, collaboration, and scientific writing.

Postgraduate Work Experience

Postdoctoral Scholar
Dr. Khaleel Razak & Wendy Saltzman, University California Riverside,
Feb 2023-present

- Establishing laminar depth probe recording and data analysis in the primary auditory cortex.
- Investigating cortical layer-specific microcircuitry in auditory hypersensitivity of Fmr1 KO mice, as a Fragile X Syndrome model, compared to controls.
- Exploring potentially differential cortical population dynamics in auditory response profiles to pup calls in virgin males and females, fathers, and mothers in the biparental mammal: California deer mice.

Grant Funding

Research fellowship for doctoral students, 2022/23; DAAD
Host: Prof. Paul Faure, McMaster Bat Lab
Hamilton, Canada, Sep - Oct 2022
Awarded travel and material funding for a 6 week training in the McMaster Bat Lab to learn bat handling, single cell inferior colliculus recording and data analysis, and bat auditory physiology in the context of neuroethology and evolutionary biology .

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Publications

- **Deane, K. E.**, García-Rosales, F., Klymentiev, R., Hechavarria, J.C.*, Happel M.F.K.* (2022). *The auditory cortex of bats has a better signal to noise ratio and lower inter-trial variability in response to stimuli trains than mice.* bioRxiv, **preprint.** doi.org/10.1101/2022.10.28.514155
- **Deane, K. E.**, Klymentiev, R., Heck, J., Mark, M. D., Ohl, F.W., Heine, M., Happel, M. F. K. (2022). *Inhibiting presynaptic calcium channel mobility in the auditory cortex suppresses synchronized input processing.* bioRxiv, **preprint.** doi.org/10.1101/2022.03.30.486338
- Zempeltzi, M. M., Kisse, M., Brunk, M. G. K., Glemser, C., Aksit, S., **Deane, K. E.**, Maurya, S., Schneider, L., Ohl, F. W., Deliano, M., & Happel, M. F. K. (2020). *Task rule and choice are reflected by layer-specific processing in rodent auditory cortical microcircuits.* Communications Biology, 3(1), 345. doi.org/10.1038/s42003-020-1073-3
- **Deane, K. E.**, Brunk, M. G. K., Curran, A. W., Zempeltzi, M. M., Ma, J., Lin, X., Abela, F., Aksit, S., Deliano, M., Ohl, F. W., & Happel, M. F. K. (2020). *Ketamine anaesthesia induces gain enhancement via recurrent excitation in granular input layers of the auditory cortex.* The Journal of Physiology, 598(13), 2741–2755. doi.org/10.1113/JP279705
- Brunk, M. G. K., **Deane, K. E.**, Kisse, M., Deliano, M., Vieweg, S., Ohl, F. W., Lippert, M. T., & Happel, M. F. K. (2019). *Optogenetic stimulation of the VTA modulates a frequency-specific gain of thalamocortical inputs in infragranular layers of the auditory cortex.* Scientific Reports, 9(1), 1–15. doi.org/10.1038/s41598-019-56926-6

Conference Talk

14th annual meeting of the German Neuroscience Society (NWG), Mar 22-30, 2021, **Breaking News Symposium**, 3rd place winner: *Optogenetically aggregated calcium channels in the Auditory Cortex*. Katrina E. Deane, Jennifer Heck, Martin Heine, Stephan Herlitze, Melanie Mark, Max F.K. Happel; the recording is available here: https://www.youtube.com/watch?v=9oJuw9CAAVw

Poster Presentations

- **FENS Forum, International Neuroscience Conference,** Jul 9-13 2022, *Clustering voltage-gated calcium channels in the auditory cortex with optogenetics.* Katrina E. Deane, Ruslan Klymentiev, Jennifer Heck, Martin Heine, Melanie Mark, Max F.K. Happel
- **14th annual meeting of the German Neuroscience Society (NWG)**, Mar 22-30, 2021, *Clustering voltage-gated calcium channels in the auditory cortex with optogenetics.* Katrina E. Deane, Jennifer Heck, Martin Heine, Stephan Herlitze, Melanie Mark, Max F.K. Happel
- **FENS Virtual Forum, International Neuroscience Conference** Jul 11-15 2020, *Ketamine anesthesia induces gain enhancement via recurrent excitation in granular input layers of the auditory cortex.* Katrina E. Deane, Michael G.K. Brunk, Andrew W. Curran, Marina M. Zempeltzi, Jing Ma, Xiao Lin, Francesca Abela, Sümeyra Aksit, Mattias Deliano, Frank W. Ohl, Max F.K. Happel
- **13th annual meeting of the German Neuroscience Society (NWG),** Mar 20-23, 2019, *Tone-evoked current source density patterns between the awake and anesthetized auditory cortex of Mongolian gerbils indicates differential recruitment of inhibitory microcircuitry.* Katrina E. Deane, Michael G.K. Brunk, Marina M. Zempeltzi, Frank W. Ohl, Max F.K. Happel

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Qualifications & Development

Modern Programming Languages for Science and Statistics

Dr. Joerg Polzehl, PD. DR. Alexander Linke, Dr. Chris Rackauckas,
MMS Summer School, Oct-Nov 2019

In a 1-week course, we worked in teams to gain experience with the new Julia language and learn implementation and practical use for our own projects.

Analyzing Neural Time Series Data

Dr. Mike X Cohen, Radboud Summer School, Nijmegen NE, Jul 2019

In a 1-week course, I learned time-frequency and synchronization analysis techniques in Matlab to apply to local field potential or electro-/magneto-encephalogram data.

Julia Scientific Programming, with Honors

Dr. Juan H. Klopper, Dr. Henri Laurie, University of Cape Town, Coursera, May 2020

COMETiN - Coaching, Mentoring, Mentoring and Training in a Network

Organized by Dr. Anna Güthler, series of workshops for women in science by OVGU,
Jun 2019 - Oct 2020

- **Kick-Off Mentoring**, *Deborah Ruggieri, Jun 8-9 2019*
- **DIVA Training: Enjoying Power & Leadershing**, *Deborah Ruggieri, Aug 22-23 2019*
- **Time and Project Management for Researchers**, *Dr. Natasha Fletcher, Oct 24-25 2019*
- **Career Development through Research Funding**, *Dr. Beate Scholz, Apr 21-21, 2020*
- **Successful Networking and Self-Presentation**, *Dr. Silke Oehrlein-Karpi, May 6&25, 2020*
- **Scientist wanted! How to apply for positions in academia**, *Dr. Dieta Kuchenbrandt, Jul 3 2020*
- **A Healthy Work-Life Balance**, *Dr. Jan Stamm, Sep 4, 2020*

Good Scientific Practice Workshop

Dr. Michael Gommel, LIN, Magdeburg, Feb 21-22 2019

Grant Proposal Workshop

Dr. Sabine Preusse, LIN, Magdeburg, Jan 17-18 2019

FELASA EU directive 2010/63 Function A, D (FELASA B)

Humboldt University, Berlin / Berlin Mouse Clinic for Neurology and Psychiatry, Sep 2020

In a 40-hours course on Laboratory Animal Science—rat and mice, I learned European law regarding protection and safety of laboratory animals, proper housing and care, and protocols for drug administration surrounding surgical intervention. We had a 3 day, in person course to learn and practice numerous surgical interventions and anatomy of mice and rats.

Teaching and Supervision

Electrophysiology Lab Practical

In 2018, 19, and 20 I assisted in running the Lab Practical Course taught in the Master's of Integrative Neuroscience at Otto von Guericke University. I assisted in updating the reference material, running the experiments, teaching the student's to run the experiments, and discussing with them what we were doing and why. In 2021, I took over our lab's teaching spot in the course and earned a teaching credit from the University for organizing and running it.

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Supervision of Lab Rotations and Research Assistants

I have been responsible for the lab rotation of several students from the local Master's program and High School. I taught immunohistochemical staining, microscopy, and electrophysiological recordings to these students over several weeks and encouraged them to write a report based on their interest in the project. I managed one research assistant who helped with our data analysis and earned co-authorship on our publication for his contributions.

Long Night of Science Community Outreach

Doors open to the public, we provided a human version of a shuttle-box go/no-go experiment while explaining our research in Jun 2018 and Jun 2019. During the pandemic in Jun 2020, we instead made a video (youtube.com/watch?v=fcj45PGddEA) to explain our current project to the public. I directed and produced the video.

Pre-Graduate Work and Lab Experience

AG CortXplorer with Prof. Max F.K. Happel, LIN, Magdeburg

- **PhD Dissertation; "The adaptive primary auditory cortex microcircuitry across brain states, scales, and species"** *Dec 2018-Jan 2023*

States: In comparing primary auditory cortex (A1) response profiles of Mongolian gerbils while awake and ketamine anesthetized, I uncovered a non-linear process by which granular layer recurrent excitation was artificially amplified under ketamine. This was likely due to biased ketamine inhibition on parvalbumin releasing interneurons that would normally moderate this.
Scales: To illuminate how microscopic channel dynamics affect neuronal populations in C57BL/6-based transgenic mice, we optogenetically clustered the normally very mobile voltage gated calcium channels (VGCCs) in their pre-synaptic active zones. In single neurons, this reduces variability and increases neurotransmitter output. I established VGCC clustering across the entire A1 and found subsequent systemic suppression of neuronal activity in this area. This demonstrates the necessity of the variability introduced by VGCC mobility in neuronal populations, despite higher single neuron output.
Species: I compared A1 laminar activity from seba's short-tailed bats and mice. The data revealed that bats had a better signal to noise ratio in response to repetitive stimuli, a fundamentally different phase amplitude coupling profile, and less inter-trial phase variability than mice. This study indicates a divergent evolution via differing recruitment of shared mammalian laminar cortical architecture.

- **Master's Thesis; "Comparison of tone-evoked current source density distributions in the auditory cortex of anesthetized and awake Mongolian Gerbils"** *Apr-Oct 2018*

Research on cortical microcircuitry underlying sensory encoding has built its foundation experimenting with animals under anesthesia. To compare these classic anesthetized preperations with more recently possible awake recordings, I used local field potentials and current source density (CSD) analysis to provide a mesoscopic, spatial-temporal analysis. In this study, CSD profiles of anesthetized Mongolian gerbils (Meriones unguiculatus) were compared before and after cortical silencing with muscimol and CSD profiles of anesthetized and awake gerbils were compared. It was found that the strongest frequency response and the early granular population activity produced the greatest discrepancies between the groups. The features analyzed suggest a differential recruitment of microcircuitry with a possibly faster and more robust activation of inhibition in awake animals.

- **Lab Rotation: Sink Detection** *Jan-Mar 2018*

Optimized a Matlab script designed to detect areas of negative ion flow (sinks) in current source density (CSD) analyses. Revamped stable determination of threshold over which to detect a sink into a dynamic threshold based on the relevant baseline activity. Introduced a new method of detecting under-threshold but temporally relevant 'pre-sinks' while ignoring erroneous noise.

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Stork Lab with Prof. Oliver Stork, OVGU, Magdeburg

- **Lab Rotation: Behavioral Phenotyping** *Nov 2017-Jan 2018*

Implemented a battery of basic behavioral tests on a group of transgenic mice heterozygous for KRAS-V14I and homozygous for Emx1-cre. This was the first round of experimentation needed to validate the new mouse line, dubbed "KRE", as a valid genotypic model for the developmental deficits of Noonan Syndrome. Testing included measuring day/night cycle activity, anxiety, novelty learning, fear learning, and stress induced despair.

- **Research Assistant; Behavioral Neurobiology** *Jun 2017-Jan 2018*

Investigated behavioral differences in several lines of mice including NDR2 knock-outs, Fragile X Syndrome, and Rett Syndrome lines.

Lab Rotation: Attentional Templates

Dr. Reshanne Reeder, OVGU, Magdeburg, Feb-Mar 2017

Coded a localizer in Python for a visual fMRI experiment to analyze a baseline BOLD signal for the stimuli being presented. Administered pilot testing of an experiment to gauge clarity of instruction and identify any confounding factors that would undermine the results.

Research Assistant; Neuroanatomy

Prof. Dr. rer. nat. habil. Anna Katherina Braun, OVGU, Magdeburg, Dec 2016-Feb 2017

Assisted on study of early life stress in mice. Performed cell counting in amygdala slices to identify differences in cell growth during fear learning.

Judgement and Decision Making Lab Practical

Dr. Eward Cokely, MTU, Houghton MI, Spring 2012

Foraged for specific examples of poorly designed decision making environments or questions in past research for use in present research. Facilitated a study in a lab setting which included coordination of documentation and scheduling of study administers and participants.

Freelance English Teacher

Berlitz Language School, Hamburg, Mar 2015-Oct 2016

Tailored language learning to custom goals and abilities of each group or individual. Encouraged a professional, comfortable, and lively atmosphere for students to maximize their in-class participation and retention of language skills.

Tour Guide

Adventure Mining Company, Greenland MI, May 2014-Aug 2014

Led tourists through above and underground historical mining sites, demonstrating mining techniques and presenting information about the copper boom and the Adventure Mine. Performed general maintenance, cleaning of facilities and trails, and costumer service.

Coach and Reviewer at Student and Professional Development Center

Multiliteracies Center, MTU Houghton MI, Fall 2012-Summer 2014

Peer reviewed Master's and PhD research, proposals , theses, etc. for all non-content related elements. Facilitated team meetings, directing conversation to strengthen the students' understanding of the course material. Practiced English fluency and comprehension with international students.