

KATE GIFFIN

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EDUCATION

Doctor of Philosophy, Neuroscience University of Michigan, GPA 4.0	8/21 – 5/26 (expected)
Master of Science, Neuroscience University of Michigan, GPA 4.0	8/21 – 5/24
Bachelor of Arts, Biology with Distinction, Minor in Neuroscience - University of North Carolina at Chapel Hill, GPA 3.6 - Honors Thesis: “As Far as the Frog Can See: Visual Acuity in Two Tropical Frogs.”	8/18 – 5/20
Associate of Science, <i>Summa Cum Laude</i> Beaufort County Community College, GPA 4.0	8/17 – 5/18

RESEARCH EXPERIENCE

PhD Candidate Advisor: Ben Singer, MD, PhD <i>Neuroscience Graduate Program, University of Michigan</i> Early amyloid pathology worsens effects of sepsis on behavior, neuroinflammation, and microglial synaptic phagocytosis - Completed a project examining the intersection of sepsis and early amyloid pathology, modeled with 4-6 month old 5xFAD mice, started by a former post-doc. - Analyzed bulk RNAseq data with a two-factor design using DESeq2 to determine main and interaction effects, WGCNA for multigroup analysis. Found that 5xFAD sepsis mice had significantly upregulated brain immune, complement, and phagocytosis pathways. - Improved a flow-cytometry based assay for microglial synaptic phagocytosis, increasing yield from ~200k to ~2 million cells. Expanded panel allowed for separation of microglia from border-associated macrophages and measure C3aR. Found that microglial synaptic phagocytosis increased after sepsis in 5xFAD mice and in C3aR^{low} microglia. Single nucleus RNA-sequencing reveals cell-type specific neuroimmune changes during sepsis - Motivated to understand cell-type specific changes in non-neuronal cells during sepsis, I developed a protocol to isolate, fix, and label brain nuclei for flow-assisted nuclear sorting. Increased yield of nuclei from ~400k to ~1 million, eliminated debris, and flexible protocol allows for multiple stop points where fixed nuclei can be stored for months before sorting. Ultimately retrieved 50% more non-neuronal nuclei sequencing the NeuN- population compared to unsorted population. - Wrote transcriptomic analysis scripts. Trained multiple lab members on transcriptomic analysis using these scripts, leading to advances and publication of other lab projects. - Determined that sepsis causes upregulation of microglial phagocytic and inflammatory genes and downregulation of homeostatic genes in human parietal cortex. Analysis and comparison of mouse data is ongoing. - Mentored 7 undergraduate researchers, created lab best practice and training materials, and actively contributed to a collegial and collaborative lab environment.	5/22 – 5/26 (expected)
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PREP Post-Baccalaureate Scholar Advisor: Joyce Besheer, PhD <i>Bowles Center for Alcohol Studies, University of North Carolina at Chapel Hill</i>	7/20 – 5/21
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- **Rat strains are an effective model to explore how individual differences in immune functioning affect response to inflammation**
 - Compared a rat strain with dysregulated HPA axis (Lewis) with their outbred parent strain (Wistar) to test how individual immune differences affect inflammation-induced changes in behavior and neuroinflammation. Found that the strains had different baseline anxiety and arousal responses. Inflammatory challenge resulted in dysregulated behavioral response in female Lewis rats.
 - Extended these findings by designing a study investigating how an ethologically relevant stressor (predator odor) changes behavior and alcohol consumption in the rat strains.
- Contributed to toll-like receptor signaling projects, leading to coauthorship on a second paper.

Honors Thesis Student

8/19 – 5/20

Advisor: Sabrina Burmeister, PhD

Department of Biology, University of North Carolina at Chapel Hill

- **As far as the frog can see: Visual acuity in two tropical frog species** (Honors Thesis)
 - Designed a study to determine the visual acuity of two frog species. Developed an optomotor response behavioral apparatus for frogs and designed a protocol to histologically quantifying retinal ganglion cell density with Nissl stains (tissue phase cut short due to COVID-19 restrictions).
- Advanced other research projects in the lab by running Morris Water Maze and other behavioral trials, analyzing data collected through EthoVision, and collecting and processing brain tissue.

SMART Intern and Research Assistant

5/19 – 5/20

Advisor: Keely Muscatell, PhD, Social Neuroscience and Health Lab

Department of Psychology and Neuroscience, University of North Carolina at Chapel Hill

- **Effectiveness of antismoking ads across the socioeconomic spectrum**
 - Designed and implemented an online survey study examining the cultural aspects of antismoking advertisements. Contributed to additional lab projects on improving health messaging to reduce socioeconomic disparities in chronic disease.
- **Food insecurity is associated with worse cognitive functioning in older adults but is not mediated by peripheral inflammation**
 - Analyzed and cleaned data from the National Health and Nutrition Survey to investigate the relationship between socioeconomic stress, inflammation, and cognition.
- Collaborated on fMRI analyses, assisting with quality assurance, preprocessing, and data management. Scheduled research participants and administered the Trier Social Stress Task.

Research Assistant

8/18 – 5/19

Advisor: Haiyan Jia, PhD, Alan M. Jones Lab

Department of Biology, University of North Carolina at Chapel Hill

- Assisted in detailed lab maintenance tasks to advance G protein cell signaling research in plants.

TECHNICAL SKILLS

Skilled in flow cytometry, bulk and single-nucleus RNAseq tissue prep and analysis, behavior, PCR, histology, and rodent care and injections. Data analysis, statistics, and visualization with R, FlowJo, EthoVision, and GraphPad Prism. Data, protocol, and literature management with Excel, LabArchives, Turbo, Dropbox, and Zotero. Presentation and design with Powerpoint, Adobe Illustrator, and Canva.

PUBLICATIONS

- **Giffin, K.A.**, Puranik, N, Bustamante, A.C., Padilla, M, Zeng, Z, Randolph, G, Wheaton, L, Moore, S., Newstead, M, Denstaedt, SJ, Spencer-Segal, J & Singer, BH. Early amyloid pathology in mice synergistically worsens post-sepsis behavioral impairment and microglial synaptic phagocytosis. *Under revision at Brain, Behavior & Immunity – Health*.
- **Giffin K.A.***, Furman K.L.P*, Sulaman B.A., Hughes A, Lehman G, & Duncan R.K. Applied improvisation training for diverse undergraduate researchers develops their science communication skills, supports well-being, and fosters community. *Under review at Science Communication*. Preprint at: osf.io/preprints/edrxiv/t6xdk_v1 * = authors contributed equally.
- **Giffin, K.A.**, & Singer, B. H. (2026). Neuroimmune Mechanisms Transforming Acute Injury to Long-Term Brain Dysfunction After Sepsis. *Clinics in Chest Medicine*, 47(1), 129–141. <https://doi.org/10.1016/j.ccm.2025.11.002>
- **Giffin, K.A.***, Lovelock, D.*, & Besheer, J. (2023). Toll-like receptor 3 neuroimmune signaling and behavior change: A strain comparison between Lewis and Wistar rats. *Behavioural brain research*, 438, 114200. <https://doi.org/10.1016/j.bbr.2022.114200> * = authors contributed equally.
- Lovelock, D. F., Liu, W., Langston, S. E., Liu, J., Van Voorhies, K., **Giffin, K. A.**, Vetreno, R. P., Crews, F. T., & Besheer, J. (2022). The Toll-like receptor 7 agonist imiquimod increases ethanol self-administration and induces expression of Toll-like receptor related genes. *Addiction biology*, 27(3), e13176. <https://doi.org/10.1111/adb.13176>

HONORS AND AWARDS

- Rackham Conference Travel Grant, University of Michigan 7/23, 5/25
- Neuroscience Graduate Program R25 Travel Award, University of Michigan 4/23, 4/24, 4/25
- Rackham Candidate Graduate Student Research Grant, University of Michigan 9/24
- Honorable Mention, Graduate Research Fellowship Program, NSF 3/23
- Rackham Precandidate Graduate Student Research Grant, University of Michigan 9/22
- Rackham Merit Fellowship, University of Michigan 8/21
- Mid-Atlantic PREP/IMSD Research Symposium (MAPRS) 5/21
- 2nd Place Winner, Post-baccalaureate/Undergraduate Poster Presentation
- Annual Biomedical Research Conference for Minority Students (ABRMCS) Outstanding Poster Presentation Award 11/20
- Post-baccalaureate Research Education Program (UNC PREP) 6/20 – 5/21
- Office of Undergraduate Research Travel Award, UNC-CH 3/20
- Science and Math Achievement and Resourcefulness Track Research Internship 5/19 – 7/19

RESEARCH TALKS

- Brain dysfunction after sepsis** 10/25
 - Data blitz talk on thesis research. UM Neuroscience Graduate Program Retreat.
- Sequencing the needles in the haystack: Findings in the mouse and human brain** 6/25
 - Seminar presentation of the FANS technique to prep nuclei for snRNA SPLiT-Seq I developed, Lunch & Learn seminar sponsored by the UM Advanced Genomics Core and Scale Biosciences.
- Microglial synaptic pruning as a mechanism of brain dysfunction after sepsis** 4/25
 - Seminar on thesis research. UM Neuroscience Graduate Program Seminar.
- Applied Improvisation to Build Communication Skills in a Summer Undergraduate Research Program**
 - Joint oral presentation of science communication education project with Keith Duncan, Alika Sulaman, & Katie Furman. ConnectUR Annual Conference from the Council on Undergraduate Research. 6/24

- Sepsis, complement, and microglial synaptic pruning: findings in the mouse and human brain** 8/23
- Selected oral presentation. International Society of Neuroimmunology 16th International Congress of Neuroimmunology.
- Neuroimmune Activation and Mental Health: The Role of Individual Differences** 5/21
- Oral presentation of post-baccalaureate research. UNC PREP Research Symposium.
- As far as the frog can see: Visual acuity in two tropical frog species** 4/20
- Oral presentation of thesis. UNC John K. Koeppe Biology Undergraduate Honors Symposium.

TEACHING EXPERIENCE

Graduate Student Instructor, University of Michigan Department of Psychology 8/22–12/22
Course: Introduction to Behavioral Neuroscience (PSYCH 230)

- Led three weekly discussion sections to reinforce, supplement, and apply introductory behavioral neuroscience topics. Guided 75 students through sheep brain dissections, historical debates, research paper essays and presentations, and classroom discussions. Designed review materials and lectures, incorporating current research to engage students with the material.
- Earned exceptional teaching evaluations, with above-median instructor scores. Free response answers highlighted my passion for neuroscience, encouraging and accommodating classroom atmosphere, effective and engaging review/study techniques, and excellent help with questions.
 - Select free responses: “Kate was probably the best GSI I’ve had at Michigan so far.”
 “Kate is one of the main reasons this was my absolute favorite class at UofM.”
- Promoted undergraduate research and coached interested students, with four students securing lab positions.

Teaching Assistant, Duke Talent Identification Program Summer Studies, Davidson College 6/18–7/18
Course: Biological & Chemical Sciences

- Assisted in classroom management and facilitated labs, field trips, and activities such as student presentations. Responsible for 28 gifted middle school students.
- Led daily evening sessions and created materials for these sessions, including review games, science-based activities, and science lectures on engaging new research.
- Coordinated interdisciplinary collaborations with other Duke TIP classes, such as a neurobiology session about Sensation and Perception with the Psychology course.

Math Peer Tutor, Beaufort County Community College Trio Student Support Services 1/18–6/18

- Coached diverse students through math anxiety and helped them improve their math study skills, academic confidence, and understanding of course content.
- Created a math resources guide with notes and worksheets for future students and tutors.

TRAINING PROGRAMS & CERTIFICATES

Science Communication Through Poetry, Edinburgh Napier University 10/25 – 11/25

- Continuous professional development course on “the power of poetry to engage and inspire diverse audiences with science.” Learning outcomes included reflecting on poetry as a tool for science communication, create poetry to communicate scientific research, and analyzing poetry as a research method.

Biotech Career Development Program, UM Office of Graduate & Postdoctoral Studies 5/25 – 7/25

- Cohort-based program of workshops, networking, and experiential learning to explore careers outside of academic tenure-track faculty positions. Skills built include self-reflection, project management, goal setting, professional communication, branding, and networking.

Diversity, Equity, & Inclusion Certificate Program, UM Rackham Graduate School 8/24 – 4/25

- Program of workshops, trainings, career development, and coaching to prepare participants to work in a diverse environment, promote equity, and foster a climate of inclusivity. Skills built include intercultural competence, demonstrating commitment to diversity, connecting across difference, bystander intervention, anti-racism, and mitigating unconscious bias.

Collaboration Kit Workshop, Michigan Institute for Clinical & Health Research 1/6–7/25

- Two-day interactive workshop to build capacity to work in a high-performing cross-disciplinary team. Skills built include teamwork and interdisciplinary collaboration, project management, conflict resolution, and professional communication.

Emerging Creatives Student Summit, Alliance for the Arts in Research Universities (a2ru) 10/24

- Three-day program to explore the theme of migration and create an interdisciplinary project.
 - Final project: Welcome to the Fox Den, a pop-up third space that addresses the social aspect of home through an educational and interactive exhibit for participants to share the settings and memories they associate with home in a new community space.
- Skill acquired include interdisciplinary collaboration, project management, creative problem-solving, and critique and feedback.

Science Communication Fellows Program, UM Natural History Museum 1/24 – 4/24

- Science communication training program supported by the NSF-funded Portal to the Public framework. Included professional development workshops hosted by museum staff and education experts to build the skills of effectively engaging public audiences.
- Developed a meaningful, inquiry-based interactive activity (**Mighty, Mighty Microglia!**) to share research and communicate neuroimmunology findings with K-12 students and other members of the public at community outreach events.

GUEST LECTURES & WORKSHOPS

How poetry can enhance your science communication 2/25, 2/26

- Science communication workshop. Michigan Science Writers.

Yes, And! Engaging the Public in Neuroscience Through Improv Theater 11/23, 11/25

- Sponsored Social (2023) and Networking Event (2025) about science communication using improv exercises. Society for Neuroscience conference.

Neuroimmunology: Research and career 3/25

- Invited lecture for a career series. Guilford Technical Community College Biology Club.

Mighty, Mighty, Microglia! 3/24, 4/24

- Inquiry-based interactive activity about microglia and neuroimmunology research developed through the Science Communication Fellows Program. Presented at UM Natural History Museum Scientist Spotlight events.

Poetry & Scientific Communication 3/23, 3/24

- Invited guest lecture for the class PSYCH 402, Hormonal Contraceptives and the Brain.

Neutrophils contribute to Alzheimer's disease memory loss by reducing cerebral blood flow 1/23

- Journal club presentation. UM Neuroscience Graduate Program Seminar Series.

Science and Poetry: The Power of Interdisciplinary Thinking." 1/19

- Selected talk for the TEDxUNC Student Speaker Salon.

SCIENCE COMMUNICATION

Your Neighborhood Scientist, Senior Editor

2/25 – Present

- Provide structural and content edits, coaching contributors through writing for a general audience for the YNS newsletter, a nonprofit organization focused on publishing accessible scientific stories that highlight the importance of science in society and build trust in scientists.

Consilience Journal, Editor

9/23 – Present

- Editor for the science and poetry journal *Consilience*, providing authors with feedback to ensure their poems and scientific statements are both well-written and scientifically accurate.

NoBrainers Organizing Committee

9/22 – Present

- Organize and plan workshops on improvisational theatre to promote science communication.
- Share improv for science communication findings and curricula with others through presentations at conferences (Society for Neuroscience, Council for Undergraduate Research) and publications (*under review*).

EquilibriUM Editor in Chief, Senior Editor & Author

10/22 – 10/25

- Co-editor-in-Chief for *EquilibriUM* editions 3 and 4, a science and art print magazine from Michigan Science Writers. Managed the editorial team, organized and led meetings, fundraised funds for printing, coordinated pitch submissions and acceptances, and edited pieces.
- Senior editor and author for *EquilibriUM* edition 2, contributing the poem “Sight Beyond Light” exploring visual perception and visual neuroprotheses.

Michigan Science Writers

8/22 – Present

- Wrote the article “Can plants learn? A surprising academic debate” for the Michigan Science Writers science blog.
- Peer editor for other writers submitting blog posts.
- Co-editor-in-Chief for *EquilibriUM*, the print magazine associated with Michigan Science Writers that focuses on science, technology, engineering, art, math, and medicine (STEAMM).

UNC Science Communication Organizations

8/19 – 6/21

- **The Pipettepen:** Wrote the articles “Gastrophysics: How to hack your taste buds” and “What octopuses on ecstasy tell us about brain evolution” for the science blog The Pipettepen, run by the UNC Science Writing and Communication Club.
- **Carolina Scientific:** Interviewed UNC marine microbiologist Dr. Alecia Septer and wrote an article titled “Bacteria Battle it Out,” for the fall 2019 issue of the student undergraduate student-led research magazine, Carolina Scientific.

Splash/Rainstorm UNC

1/19 – 6/20

- Designed and taught a two short classes for visiting high school students on food psychology and animal behavior.

Freelance Science Writer, Giffink.com & Textbroker.com

12/16 – 6/18

- Maintained relationships with clients to consistently deliver high quality scientific content.
- Ghost-wrote a series of articles on the applications of stem cell research for the general public.

MENTORSHIP & ADVOCACY

NGP Peer-to-Peer Workshops Leadership Committee

8/23 – Present

- Organize and plan workshops to facilitate sharing of knowledge between students with the goal of exposing the hidden curriculum around grad school topics such as mentoring, fellowships, goal setting, and work-life balance.
 - Developed workshop curriculum.
- Contributor and editor for the peer-to-peer NGP Survival Guide and official NGP program guidelines and yearly goals.

PIBS Peer Mentor

8/23 – 5/25

- Peer mentor for a group of first-year graduate students in the Program in Biomedical Sciences. Organize bimonthly meetups to guide the students through their first year of graduate school, offering advice and support.

NGP Graduate Mentor Fellows Program

9/22 – 5/25

- Selected to be paired with a prospective graduate student to mentor them through the process of applying to graduate school and building a career in neuroscience.
- Complete mentoring trainings including the Mentoring Lenses workshops and mentoring session curricula.

NGP Cohort Representative, 2021 Cohort

12/22 – 12/24

- Liaison between NGP administration and the students. Provide updates to each party about news, feedback etc. from the other. Advocate for positive changes to NGP such as increased resource accessibility/clarity and the hiring of an academic coordinator.

Project Short

1/22 – 8/24

- Mentor with the national pre-graduate schooling mentoring organization Project Short with the goal of reducing socioeconomic barriers to postgraduate education. Paired with two prospective graduate students to mentor them through the process of applying to graduate school.
- Conducted mock interviews with other students to prepare them for graduate school interviews.

NGP Retreat Planning Committee

9/22 – 10/22

- Assisted in planning the 2022 Fall Retreat for the Neuroscience Graduate Program, particularly professional development and community-building activities.

NGP Outreach and Activism Taskforce

4/22 – 8/22

- Organized events to foster community engagement in the graduate program. Spearheaded projects such as updating the NGP Student Survival Guide and promoting voter engagement through public awareness projects such as a voter guide.

UNC Initiative on Poverty and Inequality, Food Security Committee Member

1/19 – 6/21

- Designed and organized events and resources to combat and raise awareness about food insecurity in UNC and Chapel Hill. For example, the student guide “Being Not Rich at UNC.”

RESEARCH POSTERS

- Giffin, K., Bustamante, A., Newstead, M., & Singer, B. (Nov 2025). “**Sequencing non-neuronal cells: Transcriptomic profiling reveals the combination of sepsis and amyloid increases**

endothelial cell, microglial inflammation and astrocyte reactivity.” Society for Neuroscience Conference.

- Giffin, K., Bustamante, A., Newstead, M., & Singer, B. (Oct 2025). **“Sepsis and amyloid pathology synergistically heighten negative outcomes in survivors.”** Neuroscience Graduate Program Retreat and Program in Biomedical Sciences Symposium.
- Giffin, K., Bustamante, A., Newstead, M., & Singer, B. (June 2025). **“Early amyloid pathology synergistically worsens cognitive impairment, neuroinflammation, & microglial synaptic phagocytosis in sepsis survivor mice.”** Keystone Neural-Immune Interactions Symposium.
- Giffin, K., Bustamante, A., Crane, P., & Singer, B. (May 2025). **“Sequencing the needles in the haystack: Flow-assisted nuclear sorting to enrich for non-neuronal brain cell types.”** University of Michigan Neuroscience Conference.
- Giffin, K., & Singer, B. (April 2025). **“Transcriptomic profile of glia during sepsis using flow-assisted nuclear sorting to enrich for non-neuronal cell types.”** University of Michigan Department of Internal Medicine Research Symposium.
- Giffin, K., Bustamante, A., Crane, P., & Singer, B. (June 2024). **“Transcriptomic profile of human microglia during sepsis.”** EMBO Microglia in Health & Disease workshop.
- Giffin, K., Bustamante, A., Crane, P., & Singer, B. (Nov 2023). **“Sepsis increases complement pathway expression in the mouse and human brain and is associated with increased microglial synaptic pruning in amyloid-burdened mouse brains.”** Society for Neuroscience conference.
- Giffin, K., Bustamante, A., Crane, P., & Singer, B. (June 2023). **“Sepsis on the brain: Interactions of complement, synaptic pruning, and amyloid.”** University of Michigan Neuroscience Conference.
- Giffin, K., Bustamante, A., Crane, P., & Singer, B. (June 2023). **“Single nucleus RNA-sequencing reveals cell-type specific changes to the human brain during sepsis.”** American Delirium Society meeting.
- Giffin, K., Lovelock, D., & Besheer, J. (May 2021). **“Inflammation and Mental Health: The Role of Individual Differences.”** Mid-Atlantic PREP/IMSD Research Symposium.
 - 2nd Place Winner, Post-baccalaureate/Undergraduate Poster Presentation Category
- Giffin, K., Lovelock, D., & Besheer, J. (Nov 2020). **“Inflammation and Mental Health: The Role of Individual Differences.”** Annual Biomedical Research Conference for Minority Students.
 - Outstanding Poster Presentation Award
- Giffin, K., Alvarez, G., & Muscatell, K. (April 2020). **“Effectiveness of Antismoking Ads Across the Socioeconomic Spectrum.”** *Poster archived* at the 2020 University of North Carolina at Chapel Hill Virtual Celebration of Undergraduate Research.
- Giffin, K., Sorrell, C., & Burmeister, S. (March 2020). **“As Far as the Frog Can See: Visual Acuity in Two Tropical Frogs.”** *Poster accepted for presentation* at the Virginia Tech Mid-Atlantic Undergraduate Research Conference (conference cancelled due to COVID-19).
- Giffin, K., Alvarez, G., & Muscatell, K. (July 2019). **“No Food for Thought: Food insecurity, Inflammation, and Cognitive Functioning.”** University of North Carolina at Chapel Hill Summer Undergraduate Pipeline Research Symposium.
- Giffin, K., & Carlisle, A. (April 2018). **“The Effect of Music on Taste Perception of Chocolate.”** Beaufort County Community College Science Fair, sponsored by North Carolina Science Festival.
 - First Place, Chemistry Poster
 - First Place, Overall Poster

REFERENCES

Ben Singer, MD, PhD (PhD Research Advisor)

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