## BIOGRAPHICAL SKETCH

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NAME: Anderson, Katherine L.

eRA COMMONS USER NAME (credential, e.g., agency login): KATHANDERSON

POSITION TITLE: Graduate Student

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

| INSTITUTION AND LOCATION | DEGREE *(if applicable)* | Start Date MM/YYYY | Completion Date MM/YYYY | FIELD OF STUDY |
|---|---|---|---|---|
| Quincy University, Quincy, IL | N/A | 08/2015 | 05/2016 | Biological Sciences |
| University of Illinois at Urbana-Champaign, Urbana, IL | BS | 08/2016 | 05/2019 | Molecular and Cellular Biology |
| The Graduate Center at The City University of New York, New York, NY | PhD | 08/2019 | 05/2025 (Expected) | Molecular, Cellular, and Developmental Biology |

**A. Personal Statement**

I am pursuing a career as a tenure-track independent researcher at an R1 public university. Here, I will have access to competitive research facilities and will teach and mentor the next generation of scientists in the classroom and my laboratory. At a public university, I wish to make an effort to retain first-generation underrepresented minorities in the biological sciences, like myself. I plan to begin a postdoctoral fellowship in molecular and behavioral neuroscience immediately after defending my doctoral thesis in 2025. In addition to my graduate research, I actively work to improve science literacy and science accessibility in higher education by building improved communication methods in myself and my peers. I have completed an interactive technology and pedagogy certificate program during my graduate studies and have drafted an argumentative review manuscript; this serves as a critical analysis of current methods of early undergraduate STEM pedagogy, as well as provides a compiled overview of newer active-learning-based techniques. This manuscript will be submitted for review in the *Journal of Interactive Technology and Pedagogy* in the summer of 2023 (1. Anderson, *in preparation*). Additionally, I co-founded CUNYSciCom, a student-led organization which aims to build communication skills in STEM graduate students and to promote the importance of public-facing communications (2. Fresard, Anderson, et al., 2022). So far, I have organized two science-communication-focused symposiums and garnered institutional, external, and donor financial support. In addition to this, I am a student representative on multiple committees, and I serve as an excellent resource for my peers.

My research in Dr. Osceola Whitney's molecular neuroscience laboratory uses an avian model of vocal learning and production that demonstrates parallels to proposed neural mechanisms of social-context-appropriate human behavioral plasticity. I investigate the neural mechanisms of social-context-appropriate song production in the zebra finch songbird. My PhD thesis aims to connect two well-defined neural networks in the songbird brain - a network for social behaviors and a network for vocal control. By quantifying expression of an immediate early gene through *in situ* hybridization, I assess the functional relevance of the social behavior network in context-appropriate behavior as well as the consequences of pharmacological manipulations on context-dependent activation of the vocal control network.

This project is centered in basic neuroscience, aiming to increase understanding of the neural mechanisms underlying context-appropriate production of learned behaviors. Due to the extensive literature defining the neural mechanisms of song learning and production in zebra finches, my doctoral research interests are best

explored in an avian songbird model. In the postdoctoral phase of this proposed work, I aim to continue investigating the molecular mechanisms underlying context-appropriate animal behaviors. I will differentiate this work from my doctoral project by switching from general molecular biology-based characterizations of the vertebrate social behavior network to physiology-based characterizations (i.e. real-time recordings of cellular activation and delivery of molecules of intertest in the social behavior network in awake-behaving animals), further defining the complexities of social behavior. I plan to continue investigating the neural and molecular mechanisms underlying context-dependent animal behavior throughout my career. **I believe my completed and proposed work align well with the interests of the National Institute of Mental Health (NIMH) Division of Neuroscience and Basic Behavioral Science (DNBBS) area of high priority to "elucidate fundamental mechanisms of complex social behavior."**

In July 2020 I began research in the Whitney Laboratory. I have not yet published any of my doctoral findings, though I have a manuscript covering the first experiment in Aim 1 of my doctoral thesis currently in review at *Brain Structure and Function* (3. Anderson et al. *In Review*). I attribute this slow journey to publish to the nature of behavioral neuroscience and to joining a young laboratory as the first (and only) PhD student. In the Whitney Laboratory, I have facilitated nearly every laboratory project and optimized all new laboratory protocols, which has slowed down my own research productivity. But these setbacks on publishing have given me a unique advantage over my peers – I work very closely with Osceola and have a strong understanding of what running a new laboratory requires. Additionally, I have prepared six first-author posters for public presentation at institutional and international conferences and have aided in the preparation of four undergraduate posters, two undergraduate theses, one undergraduate oral presentation, and in securing summer fellowships for three undergraduates. In 2022, one undergraduate (L. Colón) I directly mentored successfully transitioned to a PhD program at Albert Einstein College of Medicine.

I have faced many hurdles in my academic training. I spent the first year of my undergraduate career at a very small, predominantly white university. Interactions I had with my peers at this institution took a major toll, not only on my academic productivity, but on my mental and physical health. Transferring to a different university was the only way for me to continue my degree, but the effects of this new environment were not immediate. After losing a year's worth of non-transferrable credits, drastic familial situations, and financial insecurity – I was constantly left with too much on my plate. Additionally, as a first-generation college student who is a woman of color and uninterested in pursuing medical school, I struggled to find undergraduate advisement that aligned with my wants and needs. Nonetheless, I truly enjoy the academic environment and am eager to prime myself to be a great resource for all whom I encounter. I intend to ensure those around me have access to the resources that are best suited to their individual needs. I am actively pursuing a tenure-track faculty position in molecular neuroscience at an R1 public university, where I will have the platform to positively impact those around me, while also performing independent research. At every point in my career, I plan to hone my experimental, pedagogical, and communication skills to help enforce the importance of well-rounded academic training for myself and my colleagues.

1. **Anderson, KL.** Weeding out weed-outs: a call for more-inclusive pedagogical practices in early undergraduate STEM education. (In Preparation).
2. Fresard, S, **Anderson, KL**, Avnon-Klein, D, Pangburn, S, Cranford, S. Should we sound smarter than eighth graders?. Matter. 2022 October; 5(10):3079-3082. DOI: 10.1016/j.matt.2022.09.010
3. **Anderson, KL**, Colón, L, Doolittle, V, Rosario Martinez, R, Uraga, J, Whitney, O. Context-dependent activation of a social behavior brain network associates with learned vocal production. (In Review). *Brain Structure and Function*. DOI: 10.21203/rs.3.rs-2587773/v1

**B. Positions, Scientific Appointments and Honors**

**Positions and Scientific Appointments**

| | |
|---|---|
| 2022 – 2022 | Undergraduate Biology Laboratory Revisor, The City College of New York, New York, NY |
| 2022 – 2023 | STEM Pedagogy Fellow, The Graduate Center, New York, NY |
| 2021 – 2022 | Science Communication Fellow, The Graduate Center, New York, NY |
| 2021 – 2023 | NSP Associate, Society for Neuroscience, Washington, DC |
| 2021 – Present | Student Member, Society for Neuroscience, Washington, DC |
| 2020 – 2023 | Trainee, NIH Graduate Research Training Initiative for Student Enhancement (G-RISE) |
| 2020 – Present | Adjunct Lecturer, Biology Department, The City College of New York, New York, NY |
| 2019 – Present | Member, The New York Academy of Sciences, New York, NY |

2018 – 2019 Learning Assistant, Physics Department, University of Illinois, Urbana, IL

**Honors**

2023 – 2023 Doctoral Student Research Grant, The Graduate Center, New York, NY
2021 – 2021 Provost's Pre-Dissertation Award, The Graduate Center, New York, NY
2019 – 2024 J. Bruce Llewellyn Fellowship for African-American Doctoral Students

**C. Contributions to Science**

1. **Characterizing the role of chromatin modifiers in temporal patterning of medulla neuroblasts:** My first formal research experience spanned the last full calendar year of my undergraduate career. I worked directly under Dr. Xin Li in her developmental neuroscience laboratory at the University of Illinois at Urbana-Champaign which investigates the regulation of neural progenitor temporal patterning and the subsequent generation of neural diversity in drosophila. In my project, I analyzed 18 transcription factor-GFP reporter lines that had previously been identified by a bioinformatics screen performed by a graduate student in the laboratory to be potential regulators of neuroblast development. From this screen, I highlighted five genes that may regulate the drosophila medulla neuroblast development stage defined by Eyeless expression. Additionally, I utilized RNAi to examine the regulatory properties of transcription factors, Lola and Dref, on medulla neuroblast development. I found that RNAi suppression of Lola repressed expected expression of known temporal marker Sloppy paired and that RNAi suppression of Dref allowed for release from expected repression of Sloppy paired. This novel finding increased our understanding of the molecular mechanisms underlying the tightly controlled temporal patterning of the drosophila medulla neuroblasts and was further explored by a graduate student in the laboratory after my graduation. Finally, I utilized MARCAM (mosaic analysis with a repressible cell marker) to identify Trithorax as both a suppressor of Sloppy paired and an activator of Tailless, two temporal patterning genes of medulla neuroblasts. My role in characterizing the underlying mechanisms of neural development may go on to support the development of personalized treatment of neurological disorders involving non-expected developmental patterning.
    1. **Anderson, KL**, Li, X. Characterizing the role of chromatin modifiers in temporal patterning of drosophila medulla neuroblasts. Undergraduate Research Symposium; 2019 May; Urbana, IL.

2. **Optimizing a protocol for decellularizing neural tissue in mice and humans:** I spent ten weeks as a PhD rotation student in Dr. Carmen Melendez-Vasquez's neuroscience laboratory at CUNY Hunter College during my first year of graduate school. The Melendez-Vasquez laboratory is interested in the chemical and physical components of the neural environment that prevent axon remyelination in neurodegenerative diseases, such as muscular sclerosis. Here, I optimized a protocol for mouse and human neural tissue decellularization. The protocol for creating decellularized tissue matrices has provided an opportunity for the laboratory to study the molecular steps of human oligodendrocyte differentiation on a controlled, but natural, substrate. In the Melendez-Vasquez laboratory I strengthened my ability to independently initiate and optimize new protocols for technical skills. Additionally, I received foundational training on mouse perfusions, handling, and care.

3. **Investigating a molecular mechanism for disruption of the blood brain barrier in advanced malaria:** During the onset of the COVID-19 lockdown, I was a doctoral rotation student in Dr. Julio Gallego-Delgado's laboratory at CUNY Lehman College. As in-person access to the laboratory was limited by CUNY and the COVID-19 pandemic – I performed this rotation online. In lieu of learning the technical skills required for the examination of the molecular mechanisms underlying severe malaria pathologies, I participated in a one-on-one weekly journal club to discuss key papers with Dr. Gallego-Delgado. From this I improved my ability to read scientific journal articles effectively and critically. Based on these discussions I designed an experiment to test the hypothesis that the mechanism for blood brain barrier disruption, as experienced in cerebral malaria, is a form of endothelial-to-mesenchymal transition. If I pursued thesis research in this laboratory, I would have initiated this project. The working relationship I established with Dr. Gallego-Delgado led me to invite him to serve on my thesis advisory committee.

4. **Characterizing the molecular and neural systems underlying context-appropriate behavior:** As part of my PhD thesis work in Dr. Osceola Whitney's laboratory at CUNY City College of New York, I am preparing a manuscript for submission that outlines the functional relevance of the social behavior network during female-directed production of a learned vocal-motor behavior in adult male zebra finches.

I found that all regions of the social behavior network, except the medial preoptic area of the hypothalamus, show higher levels of singing-normalized expression of activity marker *EGR1* mRNA transcripts when male zebra finches are singing social female-directed song, when compared to non-social undirected song. In social singing contexts, I found statistically higher levels of cellular activation in PVN and BSTl, a major production site of oxytocin and a brain region known for intercepting external stimuli, respectively. This work may indicate that external social cues, taken in from BSTl, are delivered to the social behavior network which, in turn, may influence the release of oxytocin to facilitate males to switch from more-variable undirected song to less-variable female-directed song production. This manuscript will serve as a presentation of the first step of my doctoral thesis work to investigate functional, anatomical, and effective connections between the social behavior network and the well-defined network for vocal control in adult male zebra finches (Anderson et al. *In Review*). More broadly, this work will help increase what is known about the neural mechanisms underlying social-context-appropriate behavioral output. I was the primary researcher for this work and wrote the first draft of the manuscript. I have presented preliminary data from this project at both local and international conferences.

1. **Anderson, KL**, Colón, L, Uraga, J, Whitney, O. Social-context-dependent activation of the social behavior network in zebra finch songbirds. Society for Neuroscience: Neuroscience 2021; 2021 November; Virtual.
2. **Anderson, KL**, Colón, L, Uraga, J, Whitney, O. Social-context-dependent activation of the social behavior network in singing and silent male zebra finch songbirds. NINDS OPEN Connections Poster Symposium: Advancing Scientific Excellence Through Diversity; 2022 March; Virtual.
3. in zebra finch songbirds. MCD-CNC Biology Subprogram Retreat; 2022 June; New York, NY.
4. **Anderson, KL**, Colón, L, Rosario Martinez, R, Doolittle, V, Whitney, O. Activation of the social behavior network in social and non-social singing zebra finches. Gordon Research Conference: Neural Mechanisms of Acoustic Communication; 2022 August South Hadley, MA.
5. **Anderson, KL**, Doolittle, V, Colón, L, Whitney, O. Singing context-dependent activation of oxytocin receptor neurons in the avian basal ganglia. Society for Neuroscience: Neuroscience 2022; 2022 November; San Diego, CA.

**D. Scholastic Performance**

| YEAR | COURSE TITLE | GRADE |
|---|---|---|
| | QUINCY UNIVERSITY | |
| 2015 | Principles of Biology I & Lab | |
| 2015 | General Chemistry I & Lab | |
| 2015 | Trumpet | |
| 2015 | Marching/Concert Band | |
| 2015 | Quincy University Connect | |
| 2015 | Western Religious Traditions | |
| 2016 | Principles of Biology II & Lab | |
| 2016 | General Chemistry II & Lab | |
| 2016 | Composition & Texts | |
| 2016 | Trumpet | |
| 2016 | Symphonic Band | |
| 2016 | Jazz Ensemble | |
| 2016 | Introduction to Psychology | |
| | UNIVERSITY OF ILLINIOS AT URBANA-CHAMPAIGN | |
| 2016 | Introduction to Medical Ethics | |
| 2016 | Preparation for Calculus | |
| 2016 | Undergraduate Open Seminar (Calculus Study Session) | |
| 2016 | Molecular & Cellular Basis of Life | |
| 2016 | Intro to Social Psychology | |
| 2016 | Biostatistics | |
| 2017 | Undergraduate Open Seminar (Organic Chemistry I Study Session) | |
| 2017 | Elementary Organic Chemistry I | |
| 2017 | Molecular Genetics | |
| 2017 | Experimental Techniques in Molecular Biology | |
| 2017 | MCB Merit Program Discussion (Molecular Biology Study Session) | |

| YEAR | COURSE TITLE | GRADE |
|---|---|---|
| 2017 | Advances Rhetoric and Composition | |
| 2017 | Broadway Musicals | |
| 2017 | Elementary Organic Chemistry Lab I | |
| 2017 | Cells, Tissues, & Development | |
| 2017 | Experimental Techniques in Cellular Biology | |
| 2017 | Genetics and Disease | |
| 2017 | College Physics: Mechanics and Heat | |
| 2018 | Ballet I | |
| 2018 | Biochemical & Physical Basis of Life | |
| 2018 | Developmental Biology, Stem Cells, & Regenerative Medicine | |
| 2018 | College Physics: Electricity & Magnetism & Modern | |
| 2018 | Chado (The Way of Tea) | |
| 2018 | Undergraduate Research | |
| 2018 | Elementary Organic Chemistry II | |
| 2018 | The Sustainable Home Garden | |
| 2018 | Calculus | |
| 2018 | Undergraduate Research | |
| 2018 | Cell Structure and Dynamics | |
| 2019 | Drug Discovery & Development | |
| 2019 | Eukaryotic Cell Biology Lab | |
| 2019 | Eukaryotic Cell Signaling | |
| 2019 | Senior Thesis | |
| 2019 | Archaeal Cell Biology | |
| 2019 | Freshman/Sophomore Special Topics Physics (Pedagogy Training) | |
| | THE GRADUATE CENTER | |
| 2019 | Genetics | B+ |
| 2019 | Molecular Biology | B |
| 2019 | Laboratory Rotation – Osceola Whitney | A |
| 2019 | Molecular/Cellular/Developmental Biology First Year Seminar | A+ |
| 2020 | Laboratory Rotation – Carmen Melendez-Vasquez | A |
| 2020 | Laboratory Rotation – Julio Gallego-Delgado | A+ |
| 2020 | Cell Biology | A- |
| 2020 | Developmental Biology | B |
| 2020 | Molecular/Cellular/Developmental Biology First Year Seminar | A+ |
| 2020 | Neurosciences I (Development, Physiology, Cell and Molecular) | B- |
| 2020 | Colloquium | A- |
| 2020 | Advanced Study – Thesis Research | P |
| 2020 | Interactive Technology and Pedagogy I: History & Theory | A |
| 2021 | Neurosciences II (Systems, Behavioral, Cognitive) | B+ |
| 2021 | Seminar in Special Topics: Brain Circuits Regulating Learning and Memory | B+ |
| 2021 | Advanced Study – Thesis Research | P |
| 2021 | Interactive Technology and Pedagogy II: Methods & Practice | A |
| 2021 | Advanced Study – Thesis Research | P |
| 2021 | Interactive Technology and Pedagogy III: Independent Study | A |
| 2022 | Dissertation Supervision | P |
| 2022 | Dissertation Supervision | P |
| 2023 | Dissertation Supervision | In Progress |
| 2023 | [AUDIT] Birds and Babies: The Acquisition of Communication | In Progress |

At The Graduate Center dissertation research is graded as Pass (P)/Fail (F) once a dissertation lab is chosen. I completed the four core courses for my subprogram (Genetics, Molecular Biology, Cell Biology, & Developmental Biology) in FA19/SP20. I took several courses intended for students in the neuroscience subprogram (Neurosciences I, Neurosciences II, & Brain Circuits Regulating Learning and Memory) in FA20/SP21 as electives to gain a historical overview of core neuroscience topics relevant to my doctoral research.