

All organisms, from plants to animals to humans, begin as a single cell that divides, grows and differentiates into diverse cell types that make up a whole organism. A complex timing of signals must take place at precise moments for the development of the organism to occur. Likewise, my development into a scientific researcher has required several significant advancements throughout my academic and professional life. Beginning with my undergraduate studies where I **graduated summa cum laude with Bachelor of Science in Biology**, a strong foundation for becoming a proficient researcher was built from multiple research experiences from which I gained necessary management and technical skills to be successful in a laboratory setting. Furthermore, the didactic and research training of graduate school are aiding my future career goals of becoming an academic research professor.

Undergraduate education and past research

My undergraduate career at [REDACTED] began as a Marine Science major. I had aspirations of becoming a marine mammal specialist at top research facilities learning about both animal welfare and rehabilitation of rescued animals. I was on the President's List throughout my undergraduate career and was awarded the **President's Award** at graduation for attaining the highest cumulative GPA in the class of 2013. However, after a year of classes, I realized my interest in science existed at a more basic cellular biology level, and I entered into the next phase of my research development.

After changing my major to Biology and adding a **minor in Psychology**, I decided to explore biological science research as a future career field based on my enjoyment working and learning in laboratory based courses. In Summer 2012, I was awarded a **summer research fellowship from the American Society for Pharmacology and Experimental Technologies** and worked with [REDACTED] at the [REDACTED]. During this independent summer research fellowship, I evaluated the role of dopamine receptor subtypes in reinforcement behavior of drug-seeking rats. Our results suggested the D₁ dopamine receptor subtype is involved in drug reinforcement and could be a possible target for drug abuse therapies. This fellowship gave me a glimpse into the effort it takes to be successful in a research laboratory and solidified my decision to **focus on biological research** for my future career.

Encouraged by my fellowship at [REDACTED], I pursued additional research experience back at my undergraduate institution by **initiating an independent research study** under the mentorship of [REDACTED] during my senior year. The goal of my study was to gain insight into genes impacted in a Parkinson's disease-like model. I induced Parkinson-like symptoms in *Drosophila melanogaster* by using a compound to damage DNA through the production of reactive oxygen species and found that increasing concentrations decreased climbing behavior, used to assess Parkinson-like phenotypes in flies. My results indicated that oxidative stress may play a role in Parkinson's disease and future work on this particular study would involve identification of genes most affected by oxidative stress. I developed communication skills by presenting my research as a **poster at the annual meeting for the Association of Southeastern Biologists** in the spring of 2013. Between this research project and valuable mentoring from [REDACTED] conducting research and designing experiments to test my own hypotheses became important to me and I knew I was on the right path to becoming the researcher I desire to be.

Following my graduation, I sought to further strengthen my technical research experience and gain management skills important to have as a researcher. I worked as a **Research Specialist** in [REDACTED]'s lab at the [REDACTED]). Under the guidance of [REDACTED] associate professor, I managed several behavioral

studies investigating neuropharmacological effects of addiction in a mouse model of dependence. In one study, I evaluated glutamate levels in animals following acute versus repeated alcohol exposure utilizing High-Performance Liquid Chromatography. Additionally, I **developed a protocol** for infusion of adeno-associated viral vectors into the brain reward circuitry to distinguish how specific branches of the reward pathway contribute to addictive behaviors. I also **published studies** on methylphenidate, a commonly abused prescription drug used for ADHD therapy, and how a sensitization exposure paradigm affects discrimination of the drug versus saline vehicle in mice (██████████) [1]. During this invaluable experience, my development into a scientist accelerated as I learned how to manage multiple research projects, develop new experimental protocols, write scientific manuscripts, and developed a work ethic that would contribute to success in graduate school.

Graduate Education and Current Research

I chose the (██████████) at ██████████ where a focus on creating strong collaborative environments is ideal for my graduate training. As a scientist, I have learned that research is not one-dimensional and conducting research in a collaborative setting across multiple science disciplines is necessary to address questions remaining in biological science. As an IGP student, I had the opportunity to work with multiple distinguished principle investigators while exploring different themes of science. I joined the laboratory of ██████████ and the ██████████, at the conclusion of my IGP year. ██████████ research closely aligns with my interests in developmental biology, and the ██████████ provides a rigorous training environment to continue my career development.

During my rotation in the ██████████ laboratory, I **developed a model** of Anderson's disease by **using a CRISPR/Cas9 approach** to insert the corresponding human mutation into the zebrafish genome. Working on this project, I mastered the CRISPR/Cas9 molecular technique and am excited to use the genome editing system in the aims of my research proposal. My rotation also offered an opportunity to learn a completely new model organism, the zebrafish. Zebrafish offer several benefits as a model organism including externally developing embryos that allow observation of developmental processes as they occur. While many rodent models of development are embryonic lethal, the identification of mutant zebrafish lines has greatly contributed to understanding fundamentals of development. Since joining the ██████████ laboratory in Spring 2016, I have **co-first authored a book chapter** (to be published in ██████████ ██████████ in 2017) on how the field of developmental biology has benefited from using zebrafish as a model organism. My thesis work will include work examining developmental defects resulting from disruption of cellular mechanisms such as glycosylation. Additionally, I was awarded a **T32 training grant position in the ██████████ ██████████**, which provides one year of funding. Given my past research experience in neuroscience and current research interests in developmental biology, both my graduate education and training program can be merged into a comprehensive study on how basic cellular mechanisms contribute to neurodevelopment.

Broader Impacts

One of my biggest passions is education of others. As a sophomore at ██████████ ██████████ I was hired as a **tutor in the Mathematics Learning Center (MLC)**, which I continued until my graduation. The MLC provides tutoring services to students in classes ranging from college algebra to calculus and strived to promote a relaxed learning environment

for students to come to their peers for assistance. During my time with the MLC, I **organized and led multiple seminars and exam reviews** to provide students with additional details and help not covered during normal class hours. The most rewarding aspect of tutoring was witnessing dramatic improvement students had in math and analytic skills after working with me over an extended period of time. In continuation of my interest in education, I worked as a **tutor and teaching assistant for the Biology Department** in my junior and senior years, respectively. As a teaching assistant for the Cell Biology laboratory class, I learned how to **effectively communicate protocols and teach hands-on procedures**. My extensive experience tutoring and as a teaching assistant strengthened my leadership and teaching skills, which I utilized while **mentoring undergraduates** in [REDACTED] at [REDACTED] and **mentoring high school students** in [REDACTED]. Currently, I participate in [REDACTED], where I travel to an area middle school to teach and perform science experiments with students in order to promote excitement about STEM fields.

Additionally, during my time at [REDACTED], I helped establish a local chapter of **Phi Sigma Pi National Honors Fraternity**, which was founded on the pillars of scholarship, leadership, and fellowship. While serving as **Vice President from 2012-2013**, I was responsible for coordinating all subcommittees within the fraternity, organizing events around campus for both fraternity members and other students, and organizing fundraising events. Our chapter raised funds and collected school items for Teach for America, Phi Sigma Pi's national philanthropy while I was a brother. To this day, I continue my support of the fraternity as a member of the National Alumni Association. My other contributions to the [REDACTED] community were recognized through the **Women in Philanthropy and Leadership Scholarship**, the **Dean's Excellence Scholarship**, and the **Outstanding Student in Biology award for the class of 2013**.

Future Goals/Directions

While all of my past academic awards and research experiences have contributed to my development as a successful research scientist, I am excited about the opportunities [REDACTED] offers to expand on my interests in education and community impacts. I plan to continue my volunteer work with [REDACTED] because I understand the importance of exposing young students to STEM education in a fun and interesting way. Additionally, [REDACTED] offers other opportunities to contribute to the education of the public including a [REDACTED] program put on by the [REDACTED] during [REDACTED] where I can teach area school children [REDACTED].

Based on my past leadership and passions for educating others, my **future career goal is to become a principal investigator** at a teaching/research institution. My educational and research training is preparing me to teach at a higher education level while maintaining a research lab of my own. Receiving the NSF Graduate Research Fellowship would not only support my graduate education and research, but also foster my potential to develop into a successful scientist who has an impact on society.

Reference: [1] [REDACTED]
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