Personal, Relevant Background, Future Goals

"Give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime." (Maimonides) Throughout my two years as a Peace Corps Volunteer in Micronesia, this principle was at the forefront of my work with local counterparts at the Yap State Environmental Protection Agency. The people and beautifully diverse natural environments in Micronesia taught me that our global economy is deeply reliant upon our marine resources. My primary outreach activities were writing newsletters, giving presentations to community groups, elementary, high school and community college classes about the destructive impacts of dredging activities on coral reefs. In addition, we developed a long-term technical assistance relationship between the Yap State government and the U.S. Fish and Wildlife Service to monitor coral dredging activities around the Pacific island. When I left, this relationship and the important environmental work continued and was presented as a case study at the International Coral Reef Symposium in 2008. Upon returning to the US, I started teaching environmental science classes and continued presenting on local environmental resource issues and scientific research to school and local community groups. I coordinated a network of >100 volunteers of all ages and backgrounds for my job as the Shoreline Restoration Project Coordinator for the Florida Department of Environmental Protection, managing >150 miles of shoreline along the east coast of Florida. I learned that environmental resources are also a large part of the U.S. economy, which motivated my work in preserving and restoring mangrove habitat in Florida and will motivate my PhD research in California. In my professional experiences and in my future career in academia, my core philosophy is to train future generations of biologists and environmental scientists to be stewards of our environments.

I have stuttered since I first began to speak, eliciting in me a fear of public speaking. The recent genome assembly and annotation of zebra finch songbird[1] and genome-wide association studies in humans have provided neurophysiological, genetic and epigenetic evidence as causes for stuttering.[2,3] Learning about this really opened my understanding that I can't be "cured" of the tendency and to accept my challenge. With practice, I have had dozens of positive experiences delivering public presentations on scientific research and environmental issues. This perseverance will apply towards my future goal of being a faculty member. I have an empathetic understanding of students from a diversity of backgrounds and learning styles and I plan to help others learn more about themselves and diverse environments through comparative research.

Graduate Research Assistant, University of North Carolina at Wilmington

My interest in comparative biomolecular processes motivated me to pursue a Master's degree with Dr. Stephen Kinsey. I designed and carried out experiments, finding that aerobic metabolic processes become increasingly limited by surface area to volume and intracellular diffusion constraints in large >500 µm diameter white muscle fibers in blue crabs. The experience of presenting our research and winning a best student poster award at the Society for Integrative and Comparative Biology, then publishing my Master's thesis in the *Journal of Experimental Biology,* built my confidence that I could turn my passion into results and make a contribution to the field. During this time, I especially enjoyed training undergraduate students in our lab. One student went on to graduate school and is now a high school science teacher.

After returning from the Peace Corps in Micronesia, I continued pursuing my research interests in molecular responses to environmental stresses working as a lab manager at Harbor Branch Oceanographic Institute at Florida Atlantic University. I trained and mentored 13 staff, graduate and undergraduate students. All of the undergraduate students continued on to pursue research in graduate schools, and one graduate student continued on to do PhD research. During

that time, I was tasked with custom-designing a cDNA Agilent microarray for hard corals to monitor transcriptional-level responses to controlled environmental exposure experiments. I led the effort to mine publicly available nucleic acid sequencing records for corals and noticed peculiar annotations for genes typically associated with human diseases, such as BCAR3 and PKD113. This began my interest and excitement about the exploding field of comparative genomics and bioinformatics to provide evidence for conserved functional relationships in animals. This work resulted in five presentations at international conferences and three manuscripts in prep.

Bioinformatics Programmer at New York University Medical Center's Genome Technology Center

Wanting to further develop my bioinformatics skills, I took a job with the responsibility of providing bioinformatics services to the Medical Center research community and collaborating with the High Performance Computing facility. Over a period of one year, I was responsible for working on computationally intensive analyses for 17 different PIs, each with unique research designs, which required creative problem-solving and troubleshooting skills. I co-authored two publications and planned an independent side project that resulted in a literature review that was published as a book chapter. Additionally, I gave oral presentations at group meetings on project updates and trained those who were interested in bioinformatics computing skills. All of these experiences were an opportunity to broaden my skills as a working member of a bioinformatics team, serving in a leadership capacity helping less-experienced PIs develop sequence data analysis skills. While I loved the work I was doing, it helped me realize the importance of returning to graduate school to continue my own research training so that I can be better equipped to teach advanced computing skills to the biological and environmental science communities in the future. Some researchers did not understand the complexity and sources of error in the bioinformatics tools we were using, just as I did not always understand the complexity and sources of error in the experiments they had designed and conducted prior to my handling the data. I feel that interpretations of results from data analyses are the most accurate when conducted by the researchers themselves rather than a service core. By studying physiology and bioinformatics, I will understand both types of errors and be able to interpret results as accurately as possible.

Reasons for Interruption in Graduate Study

It has been more than two years since my past graduate MS degree, and I have now started as a PhD student for the fall quarter in September 2015 at UC Davis. Grades in several courses for my undergraduate were lower than I would like because I was an unfocused student. Then, I continued on to be a successful Master's student. I had difficulty in my first semester at the Florida Institute of Technology, partly because I was culture-shocked from returning to the US and fast-paced academia from Micronesia, but also because it was difficult as a young student to explain to faculty that the diversity of my interests span multiple biological scales. I am now returning to graduate school as a more focused student because I feel that we are moving into a really exciting time in biology, with advancing biotechnology and Next Generation Sequencing (NGS) platforms allowing us to answer questions spanning molecular to environmental scales. I want to drive future research initiatives in this field and teach others so that large-scale environmental resources can be managed effectively in the future. Along the way, I realized that advanced computing skills and programming are required to automate high-throughput bioinformatics analyses to document and answer questions in a reproducible way. I began teaching computer programming skills to myself and others around me, as I have always

loved using computers and playing around with programming webpages. It never occurred to me as a biologist that these skills would ever be useful. I want to make sure future STEM students know this. It is now my goal to personally bring advanced computing skills to undergraduate classrooms so that future biologists will be equipped with these skills, making important discoveries and advancements possible without herculean efforts at a computational level.

Teaching Assistant, Next-Generation Sequencing Analysis Workshop 2015, Michigan State University

During the summer before starting graduate school as a PhD student at UC Davis, I had the opportunity to be a teaching assistant at an annual international bioinformatics training workshop coordinated by Dr. C. Titus Brown from UC Davis, who is a Moore Data Driven Discovery investigator and a leader in the biotechnology field. This mentored teaching experience was pivotal for me, as all the instructors at this workshop are not only active, contributing members at the cutting edge of this new discipline but also experienced teachers who specialize in creating a safe, non-judgmental atmosphere conducive to learning. This is why I chose UC Davis for graduate studies because of its broad-minded, supportive, productive, and collaborative academic environment. UC Davis has a community of faculty and students who are actively seeking computational training for analyzing large data sets.

Dr. C. Titus Brown's lab for Data Intensive Biology (DIB) at UC Davis has an established history of widely collaborative research in environmental metagenomics, genome and transcriptome assemblies and annotation in marine eukaryotes, algorithm development, and software management. Working with Dr. Brown's lab group is enabling me to develop algorithms and software programming skills while as part of an interdisciplinary team. In addition to Dr Brown's lab, there is a group of faculty at UC Davis with wide interests in environmental genomics who I would like to work with, such as Dr. Jonathan Eisen, Dr. Andrew Whitehead, Dr. Ian Korf, Dr. Dietmar Kültz, and Dr. Anita Oberbauer.

Broader Impacts

When I first started to develop my own bioinformatics skills, I was isolated with no one else using bioinformatics tools where I worked. I attended two excellent workshops and learned to reach out to online genomics and bioinformatics resources and communities such as Biostars, Stackoverflow, twitter, and active bloggers. This inspired me to start my own blog to share and connect with others during my learning process, which had >4,000 unique visitors in 2014 and already >6,000 unique visitors from over 100 countries in 2015. I post version-controlled scripts and collaborate on software projects through the github open repository.

Training materials developed by Dr. Brown's lab are all publicly available and free for use and reuse, modeled after Software and Data Carpentry. During my time as a graduate student at UC Davis, I plan to become a certified instructor for Software Carpentry, which focuses on teaching small, focused workshops on advanced computing skills in Python programming, Linux/UNIX, and git version control to groups of scientific researchers. I will be a volunteer for Girls Who Code, specifically at Martin Luther King Jr. K-8 in Sacramento, CA who has identified a need for instructors.

I believe in open science, distributing materials, data, and results so that researchers from multiple fields across the globe can benefit. As a woman who loves to code, I aim to help others to learn these types of skills during my PhD research and my future research and teaching career.

References [1]Warren et al. 2010. *Nature.* doi:10.1038/nature08819; [2] Kang and Drayna. 2011. doi:10.1146/annurev-genom-090810-183119 [3]Rice 2012. doi:10.1186/1866-1955-4-27