My research is motivated by a desire to understand evolutionary processes at a fundamental level, and to use this knowledge to extract information from population genetic and genomic data. As the amount of genomic data is rapidly increasing in many different systems, the development of appropriate statistical tools for analysis is even more relevant in expanding our understanding of evolutionary biology and population genetics. I am currently in my first year as a graduate student at the University of California-Davis in their Population Biology Program. Here, I am working with Dr. Graham Coop who integrates deep thinking about evolution with the development of statistical approaches to gain insights from population genomic data. My motivations are reflected in his work, and this is an ideal place for me to learn and develop the necessary skills to continue as a scientist. In addition to having my own work impact the understanding of evolutionary processes at a population genetic level, I want to engage and motivate the next generation of scientists by involving undergraduate students in my research. Outside of academia, I believe it is important for the public to have an appreciation for biology and an understanding of evolution, so as a graduate student I will continue my involvement in outreach programs.

Being exposed to diverse experiences as an undergraduate at the University of Wisconsin-Madison allowed me to focus my interests. I was first introduced to evolutionary biology in high school and was immediately fascinated with the topic. Understanding life in the context of evolution impacted my thoughts about the world around me. I knew I wanted to focus on evolutionary biology as an undergraduate student, and in my first year, started working in the laboratory of Dr. Carol Lee in the Department of Zoology. Her work broadly focuses on the evolution of invasive species, particularly of the copepod *Eurytemora affinis* that has undergone multiple independent invasions from its native saltwater habitat into fresh water over the past 70 years. I continued to work in this lab for four and a half years. In addition to this experience in a wet lab, I studied abroad in Ecuador, where I was able to do fieldwork in tropical ecosystems. As a student, I majored in both biology and mathematics. I started in math because I liked the method of thinking and approaching problems in my classes, not because I thought it was relevant to biology. It was not until my fourth year, when I took courses in evolutionary genetics and stochastic processes in the same semester, that I fully realized how I could synthesize my love of math and evolutionary biology. The exposure to these diverse fields and experiences allowed me to realize my interests in the more computational and theoretical areas of evolutionary biology and guided my path to graduate school. At UC-Davis, I hope to continue to focus my interests and develop skills to build a foundation for my own research career.

I started my time in the Lee lab by helping graduate student Marijan Posavi with testing the marginal overdominance hypothesis for salinity tolerance in *E. affinis*. Marginal overdominance is observed when the mean fitness of heterozygotes across environments is higher than that of both homozygotes. This gives a heterozygote an advantage in fluctuating environments, protecting polymorphism and allowing rapid adaptation to a new environment. To test this hypothesis, we isolated juveniles from two freshwater and two saltwater inbred lines and mated them to produce sixteen reciprocal crosses. We then reared the offspring from these crosses in freshwater, saltwater, and an intermediate salinity and recorded survival data for these animals to measure fitness. I assisted with every aspect of this experiment. We determined that the mean fitness of the freshwater-saltwater hybrids across all salinities was higher than the mean fitness of both the freshwater-freshwater and saltwater-saltwater hybrids, supporting the marginal overdominance hypothesis. I was supported by an undergraduate research grant from the UW Department of Zoology. Being a part of this project gave me an understanding of how an entire

experiment is conducted, which helped me develop the tools necessary to work on my own independent experiment and complete an honors research thesis.

For my thesis, I studied the evolutionary response of *E. affinis* to crude oil toxicity in the context of the BP oil spill in 2010, since the copepod naturally occurs in the Gulf of Mexico. In addition to their ecological importance, as they constitute the main grazers of algae and major food source for larger carnivores, copepods are ideal organisms for studying rapid evolutionary responses due to their large effective population sizes and short generation times. I was awarded a Hilldale Undergraduate Research Fellowship to complete this project, which is a highly competitive campus-wide grant awarded based on written proposals. I aimed to address two questions: (1) can the copepod *E. affinis* evolve in response to crude oil toxicity? and (2) did wild populations of *E. affinis* evolve as a result of the 2010 Deepwater Horizon Oil Spill? To address the second question, I compared the fitness of populations of *E. affinis* collected from the same location in the Gulf of Mexico from before and after the oil spill, in experimental treatments with and without crude oil. If the post-spill population shows higher fitness in the oil treatment compared to the pre-spill population, an evolutionary response to crude oil may have occurred. I had access to a Gulf population in the lab collected from before the spill (2006) and I collected animals from the same location (which was within the area impacted by the 2010 spill) in March 2013. I requested crude oil directly from BP, who, after a lengthy review process of my experiment donated fifty liters of oil to my project. I am still in the process of statistically analyzing the data I collected, but the animals collected from after the spill were able to survive at greater frequencies in the crude oil treatment than those collected before the spill.

To help me with this large project, I recruited, trained, and worked with two undergraduates. I involved my research assistants in every step of the process including experimental design and problem solving, instead of just having them help with tedious tasks. Since I was working on this project in my last year in the lab and preparing to go on to graduate school, I was especially intent on passing on the opportunities I was given to the next generation of undergraduates. My oil toxicity experiment is still being carried out by two current undergraduates in the Lee lab who are addressing the first question by creating lines selected for crude oil toxicity, using animals from the pre-spill population. I am still involved in the project by answering questions and providing ideas. I also helped them to successfully apply for undergraduate research grants within the department. Once the final portion of the experiment is complete, I plan to assist in the data analysis so the students can have experience with this end of research as well. Finally, I hope to publish this study and for all of us to be involved in this process. As a graduate student, I will continue to involve undergraduate students in my research, as I want to help motivate the next generation of scientists and provide others with the same opportunities I encountered and which helped me to realize my interests and gain necessary skills. My work as a graduate student will have a more computational focus and I will be able to share these skills with current undergraduates, which is increasingly important in this data-rich era of biology.

I also sought out opportunities to work with even younger potential scientists in my time in Madison and plan to do the same in Davis. I really enjoy working with children and I think an impression made at a young age can last a lifetime. For example, I volunteered for three years with Expanding Your Horizons, a program aimed at inspiring middle school aged girls to become interested in STEM fields. We organized games to make math and science fun and accessible and assisted in different “career workshops” where the girls were able to talk to women who work in various STEM fields to see what a day on the job is like. As a woman in a

computational field, I am thankful I never felt limited in academia by my gender and hope to make this true for many other young girls. There are chapters of this organization in California that I plan to become involved with during my time in Davis.

I strongly believe biology and an appreciation for life should be shared with others outside of science and academia. In my third year as an undergraduate, I studied abroad for a semester in Ecuador. The program was created and led by two biologists who started a non-profit organization for tropical conservation. This was my first time outside of North America and I was able to see some of the extreme diversity of life on Earth. In the program, we conducted two independent, small-group experiments. In both cases, we developed our own questions, designed an experiment, analyzed our results, and shared them in both a written report and a presentation to our peers. The two projects I worked on were (1) studying the response of *Pseudomyrmex* ants to threats posed to themselves and their host *Triplaris* tree at Tiputini Biodiversity Station in the Amazon rainforest and (2) observing the behaviors of gaping and foot-watching seen in Swallow-tailed gulls (*Creagrus furcatus*) in the Galápagos Islands. While living in Ecuador, I also volunteered for a month at Maquipucuna Cloud Forest Reserve. In addition to conducting surveys of birds in the reserve's shade-grown coffee plantation and creating a reforestation plot to attract Spectacled Bear, I worked in a very small school located an hours walk away from the reserve. Being able to speak Spanish allowed me to connect with and learn from the people I met throughout Ecuador. It also allowed me to facilitate a pen pal correspondence program between the kids at the school and children in Hull, England. The students in England were very interested in the tropical cloud forest and would ask questions like "Have you seen any ocelots before?" By translating their letters, I was able to connect very different parts of the world. I hope these interactions will become a life-long memory for the students but more importantly promote a life-long interest in biodiversity and its conservation, as the school in England was working to raise money to protect a portion of land near the reserve. This experience was extraordinarily significant in my development as a person and I believe it is critical to continue outreach activities to promote an interest in biology and biodiversity throughout my life.

I was able to share my love for biology with others at my time in Madison. I volunteered at UW-Madison's Darwin Day, an event to get the public informed and interested in evolution. Specifically, I was involved in organizing interactive demonstrations and games for kids. I also have assisted in Explorando las Ciencas, which is aimed at engaging Spanish-speaking children and their parents in science. I plan to find similar opportunities for public outreach in Davis so I can continue to work towards this goal of engaging non-scientists in biology as a graduate student. I also want to continue to use my knowledge of the Spanish language to connect and share with others and will seek out opportunities to do so in California where there is a large Spanish-speaking population. I believe encouraging public outreach and accessibility is a vital aspect to the wide acceptance of scientific research and discovery, which benefits not only scientists but also people worldwide.

After my time at UC-Davis, I hope to stay in academia and work as a research professor. I think that this is not only the appropriate fit for me intellectually and scientifically, but it will help me achieve my goals of impacting general scientific knowledge while encouraging students to develop the same desire for investigation and discovery, through both teaching classes and being a mentor in research. I also want to continue to share an appreciation for biology with the non-scientific public throughout my life. Receiving support from the National Science Foundation would allow me to achieve these goals as a graduate student so that I can build upon them further in my own research career.