The moment I knew that I wanted to pursue a career in biomedicine occurred in my advanced placement biology course in high school when I learned about the mechanism behind HIV infection. The fact that we had the ability to study and characterize these complex cellular mechanisms amazed me and made me realize that I want to be involved with these discoveries and development of future therapeutics that rely on these scientific advancements. I followed this career aspiration by pursuing biomedical engineering for my undergraduate studies. I began this major with the intent of attending medical school and working to apply these discoveries as a physician, but as I moved forward, I realized that I wanted to be on the bench making the discoveries. With this realization, I decided to pursue a Ph.D. in biomedical engineering. This decision was fueled by the many positive experiences I had doing undergraduate research, STEM outreach, and teaching assistantships. These experiences are what shaped me into the scientist and mentor that I am today and my first year of graduate school has only further confirmed my love for mentoring and science discovery.

Outreach and Teaching Experiences

As a highly active member in the outreach community I developed a love for teaching and communicating science. I began doing outreach as an engineering ambassador for an outreach program sponsored by an NSF grant at the [redacted]. I was very excited to be involved with this program, as I was recruited to the field of biomedical engineering by engineering ambassadors. This opportunity gave me with the ability to return the favor that had been provided to me and demonstrate to myself how these programs reap long-term rewards. Through this position, I was involved in planning and running numerous outreach events held by the College of Engineering (COE) for high school students. My duties as an ambassador included designing bioengineering activity modules, along with running classroom visits, summer camps, and evening visits to the university. One of the most challenging and rewarding tasks I performed as an engineering ambassador was leading and planning the entire bioengineering portion of the annual summer engineering camp at the [redacted]. That summer we planned on performing a common biomaterials test with our campers, hemolysis. I personally had never performed a hemolysis test and I had to start from scratch, finding protocols in relevant journal articles, a supplier of blood samples, and calibrating lab equipment that hadn't been used in years. Fortunately everything came together, and with the help of my ambassador team I managed to lead the campers through the activity successfully. The campers demonstrated excitement and a growing interest in scientific endeavors. This was rewarding for me, as I saw how my actions caused high school students to gain interest in bioengineering. I participated in this program until the spring of 2014 and finished off my ambassadorship by coauthoring a paper covering the results of this NSF funded program in recruiting and retaining engineering students (see application).

Beyond my ambassadorship, I performed outreach through a number of student organizations. This began in my sophomore year when I became heavily involved with outreach with the Society of Women Engineers (SWE). The main activity I helped with was "Girl Scout Night", an annual event in which girl scouts of all ages come to the university for the evening to participate in science and engineering activities designed to help peak female interest in the STEM field at a young age. During my sophomore and junior year I was the main coordinator of the bioengineering session. This session showed girl scouts from ages 5-16 how to extract DNA from strawberries, which was a hit with girls of all ages. During my senior year I was an active member of the outreach committee of SWE and played a vital role in organizing all of the activities for Girl Scout Night. In addition to outreach with SWE, I performed outreach as a member of the engineering honor society Tau Beta Pi (TBP). As a public relations officer for TBP during my senior undergraduate year, I

recruited volunteers for a number of the COE outreach events, which included “Meet an Inventor Night” and “Elementary Engineering Week”.

In my first year of graduate school I have continued to be active in the outreach community by becoming the chair of the outreach committee for the bioengineering graduate student advisory committee (GSAC). In this role I am responsible for planning and managing outreach activities for GSAC. Last school year I invited and successfully recruited students to participate in COE sponsored activities alongside myself. This fall I began working on a community outreach project with the “[redacted]” ([redacted]), an organization that focuses on educating children in need within the community. They have recently added STEM activities to their afterschool program and need more volunteers for it thus I set myself up as a monthly volunteer and as a volunteer recruiter. I kicked off this outreach project by organizing a volunteer party of graduate students to participate in the “Day for Kids” event where we hosted a STEM activity table that involved making alginate gels and building penny boats with the kids, therefore giving them a feel for different types of science in a fun learning environment. Overall I have continued to develop my leadership skills and promote scientific outreach via leadership and direct hands on volunteering and will continue this throughout my career.

In addition to outreach, I have also been involved with teaching at a college level as a teaching assistant (TA). During both my senior year and final semester of my undergraduate career, I was a TA for a bioengineering fundamentals course taken by sophomore students. As a TA, I lead a lab section, in which I helped students with their homework and term projects. During my second year as a TA, I aided in developing ideas for labs to be used in following years. This experience taught me the patience it takes to teach engineering principles. It also taught me that I really enjoy teaching at a college level, thus reinforcing my decision to pursue graduate school.

Research Experiences

Performing undergraduate research shaped me as a scientist and innovator and was where my passion for science discovery grew. As a sophomore, I followed my interests in orthopaedic tissue engineering and pursued research under the direction of Dr. [redacted]. During this time, I was awarded an undergraduate research opportunities assistantship, which allowed me to participate in a research project focused on the regeneration of cartilage tissue to heal birth defects or traumatic injuries. I was the first person in the lab to work in the field of cartilage regeneration and my days included performing a generous amount of literature research and failed experiments, a frustrating yet exciting process as the results finally rolled in. I presented this project at numerous on-campus symposiums, an exhilarating experience sharing my personal strides in the lab. Additionally, I was first author on an abstract accepted for a poster presentation at the 2013 Annual Biomedical Engineering Society (BMES) meeting.

Towards the end of my undergraduate career I continued doing orthopaedic research under the direction of Dr. [redacted]. This project involved the investigation of 3D architecture of type I collagen gels using a focused ion beam scanning electron microscope (FIB/SEM). I worked with a post doc and a microscope technician to develop an imaging method and image analysis protocols that can analyze the 3D structure of these collagen gels at a nano-resolution that hadn’t previously been achieved. This project resulted in two poster presentations at the World Congress of Biomechanics, and the National Conference of Undergraduate Research, and an oral presentation at the 2014 Annual BMES Meeting**.** Additionally I am second author on a manuscript that has been submitted covering this work (see application), which has been a thrilling and awarding experience contributing to my scientific development.

Personal Statement [redacted]

With a desire to continue in orthopaedic research while expanding my skill set, I began research under the direction of a recent faculty hire at the [redacted], Dr. [redacted], during my first year of graduate school. Joining his lab has been a very unique and exciting opportunity, as I have been able to observe and help fulfill the daunting task of setting up a new lab. In his lab I study cell-engineering methods relevant to disc degeneration. My projects have involved working with recently developed CRISPR gene-engineering systems to understand and regulate the mechanisms involved with disc degeneration and back pain. My main project uses the CRISPRi system to down regulate the increased inflammatory signaling involved with disc degeneration in a novel and efficient way. For this project I had to learn a number of new skill sets, which included molecular cloning, DNA extraction, virus production, and quantitative PCR. Learning this while taking several courses during my first year of graduate school was quite challenging, but I was able to overcome this adversity and be productive by obtaining very promising data that resulted in three oral presentations at international (2015 Summer Bioengineering, Biotransport, Biomechanics Conference, and the 2015 BMES Annual Meeting) and local (2015 [redacted] Bioengineering Conference) conferences in my first year. Additionally this work is being prepared as a manuscript for submission. During this year I have also developed my mentorship skills by mentoring four undergraduate students in the lab. This has included training them and guiding them on their projects. This is a process I truly enjoy as I see them learn and understand highly technical concepts and skills all as a result of my guidance.

Intellectual Merit: My past and ongoing research, outreach and teaching experiences have made significant contributions to each lab, and have shaped me as a scientist and mentor. These experiences have resulted in publications and multiple presentations and demonstrate my ability to advance scientific knowledge through my own discoveries and my capability to mentor and shape future scientists. I graduated with honors and cum laude recognition and received an honorable mention for the 2015 NSF GRFP. While maintaining productivity in the laboratory and continuing to pursue scientific outreach activities, I have maintained a 3.96 GPA demonstrating my ability to excel in rigorous academic environments.

Broader Impacts: Since my freshman year of college I have been devoted to community outreach and spreading knowledge of the exciting opportunities that await in the STEM field especially to women. Through GSAC I will continue to promote the involvement of engineering students, such as myself in outreach. Student involvement is beneficial as it provides a unique perspective and demonstrates an example to aspiring scientists within the community, as students are capable of providing personally experienced scientific endeavors. The experiences I will communicate will specifically include discussion of cutting edge gene engineering tools and how they have the potential to have high impact on the way we study biology and therapeutics.

Future Goals: Through research, work, and extracurricular activities, I discovered that my passion lies with scientific advancement and discovery, both in its conduct and its communication. These passions are what caused me to pursue graduate studies in bioengineering so that I may follow my teaching and research aspirations. Being awarded an NSF fellowship would enable me to pursue this path with a higher community impact. With fewer funding restrictions, I could solely devote my time to my research projects in addition to better establishing and expanding the STEM program at the BGCGSL. Overall this fellowship would allow me to focus on what I feel is most important during my graduate career, being a science educator to my community, while developing the research skills and knowledge necessary to become a future scientific leader in bioengineering.