Biophysics Statement of Purpose

Hydrogen bonds are stable, Central America, not so much. I am glad I have access to information to know good chemistry here in the US as opposed to Belize, where my family used to live. With the privilege of attending college, I knew I wanted to get involved in research. I finally decided I needed to start getting serious about my future. My goal is to obtain a Ph.D. in Biophysics and pursue research with an emphasis on medicinal study. Research has always been a clear goal for me and I continue to be very serious about it. As an undergraduate, I pursued the opportunity to participate in undergraduate research and gain valuable knowledge and experience. I feel that with what I have learned from my undergraduate classes and the research done in different lab settings, I am sufficiently prepared for a future as a Ph.D. candidate. After completing the Biophysics Ph.D. program, I plan to enter industry as a medicinal chemist and expand on modern techniques that will contribute to the design and synthesis of novel drugs that can better treat serious diseases that affect millions of people.

I started doing undergraduate research in January 2016. During my junior year, I was given the opportunity to observe and work in Dr. Holder's research lab while simultaneously taking what I learned and applying it to my own independent study. I worked under the guidance of a mentor, who assisted me with building a proposed mechanism, operation of lab instruments, and keeping updated observations in a lab notebook. I observed the current project to propose a possible mechanism involving an inorganic cobalt complex that, when put into action, will eventually evolve into a system that produces hydrogen as a renewable energy source. I also participated in a second study that uses d-block transition metal complexes to find an anti-cancer agent. After careful observation and proper training, I conducted my own study titled *"Mechanism of the Oxidation of a Cobaloxime by Sodium Bromate in Aqueous Solution."* From there, I performed stopped-flow experiments using a cobalt(II) complex and gathered kinetic data; which I then used to design a mechanism. After observing this mechanism, conclusions were made on rate of reaction, effect of sodium bromate variation, and type of mechanism it was based on its reactions. Afterwards, I presented my research at the 252nd ACS National conference in Philadelphia, PA. Working with this research team greatly impacted my growth as a researcher. I learned how to use lab instruments plus read, fit, and interpret data gathered by them. The major lesson that I took away from the experience was how slight alterations to the reaction environment could alter the reaction rates of the complex.

The second research project I undertook was in Dr. Czajkowski's lab as part of UW-Madison's SROP program. It involved looking at differing effects of positive and negative benzodiazepines (BZD) allosteric drug modulation on the β_4-β_5 linker in $GABA_A$ receptors. We tested the linker in these receptors to observe the BZD modulation of GABA by monitoring the current response using a two- electrode voltage clamp. The resulting current response data found that mutating the linker had no significant effect on negative BZD modulation of GABA current response. By exploring different mechanisms and overall function of the $GABA_A$ receptor, I understood how it works and saw the potential for designing better drugs to enhance modulation of this receptor. Furthermore, I learned how to independently conduct and modify the experiment as needed when one method does not work. I then presented this research at

ABRCMS 2017 in Phoenix, AZ. Participating in this study has greatly impacted my management skills and was a major deciding factor in my decision to pursue a Ph.D. in the Biophysics program at UW-Madison.

The latest research project was a unique experience that exposed me to research abroad in Florianopolis, Brazil. Over the summer, I had the opportunity to conduct biochemistry research at Universidade Federal de Santa Catarina in their aquaculture laboratory under Dr. Risoleta Marques. The study involved testing Catalase as a biomarker in *Crassostrea brasiliana,* a local species of oyster, after being exposed to two xenobiotics; Fluorene and Pyrene. The study investigated if these compounds have a significant effect on Catalase gene transcript levels and enzyme activity by using RT-PCR and UV visible spectroscopy. the results concluded that Pyrene had a significant effect on biomarker response associated to Catalase and could potentially lead to various consequences. This investigation taught me the importance of time management, collaborating between institutions, and overcoming challenges like language barriers or cultural differences.

My research interests vary in subject and I am open to many varieties of subjects. I found several trainers in the Biophysics program whose projects peaked my interests: Prof. Meyer Jackson (neuronal signaling); Prof. Samuel Gellman (bioorganic chemistry); Prof. Matthew Merrins (Metabolic changes in diabetes). Reading over their research interests and papers have reinforced my belief that UW-Madison's Ph.D. program is a great fit for my interests.

Along with research and classes, I became very involved with extracurricular activities. I was demonstrations officer for ACS and a lab assistant for the organic chemistry 2. I also volunteer in community events, such as the STEM career fair at University of District of Columbia, which help to teach young minority kids about potential career paths in STEM. With my increased work in outreach, I failed to manage my time wisely; which resulted in the low grades in my last year of undergraduate classes. However, I feel proud and fulfilled with the work I've done because I was using what I loved and knew about chemistry to encourage other minority members that a career in the STEM field is possible. I am passionate about science and I'll use my enthusiasm to drive my Ph.D. research study. I want to expand my knowledge while sharing information with others. I know this exchange of ideas will lead me to contribute to new and exciting discoveries in medicine.