Since I was young my family and I have had held a deep respect for the contribution of science to medicine. In elementary school my mother was diagnosed with breast cancer. Initially, ultrasound was unable pass through the dense tissue and find the tumor. Instead, an early version of magnetic resonance imaging (MRI) provided enough evidence for an early diagnosis. It wasn't until I was older that I realized how serious her condition was and how critical an early diagnosis was for her survival.

As I entered high school, MRI impacted my family once more. My father had dealt with severe depression since I can remember. He had participated in numerous therapy programs and tried, what seemed like, every drug on the market with little success. Eventually it reached the point where he was unable to work or live his life anymore. His doctor proposed an experimental MRI treatment in which his brain would be stimulated by the magnetic field. Since the treatment my Father's quality of life has drastically improved and he is living a normal life.

As I began to decide upon a career path I took inspiration from how science and medicine had influenced my own life and decided to pursue a degree in a STEM field. I began attending Bridgewater State University (BSU) as a biochemistry major. At BSU I quickly became interested in undergraduate research and started on my first project the fall of my sophomore year working in the lab of Dr. xxxx xxxxx. The xxxxx lab is primarily interested in understanding how the structure and functions of protein influences behavior and interactions. I began building up a repertoire of biochemical and synthetic techniques with a fine-tuned focus on bioconjugation. My objective involved synthesizing a protein based photocatalytic hydrogen production system. I directly apply theory from my early undergraduate classes and using site directed mutagenesis and multiple purification techniques successfully expressed and purified several protein variants designed for bioconjugation and electron transfer. At the same time, I adapted several from several literature procedures and synthesized a ruthenium based photosensitizer for use in light driven hydrogen production. As part of this work I received the Adrian Tinsely Scholorship for undergraduate research along with the xxxxxx Research Award Fund. I have also had the opportunity to share my work at several national and regional ACS conferences as well as a global conference in China. To date, my work in the xxxxx group has evolved into an honors thesis and will be a significant portion of a future publication.

As I moved into my junior year at BSU I received another biochemical research opportunity with Dr. xxx xxxxx. With Dr. xxxx I worked to understand the effect mutations have on the protein polymerase Kappa. Kappa is a member of the Y class of DNA repair polymerases and is responsible for bypassing DNA lesions caused by mutations. Ultimately polymerase kappa has evolved to become a form of DNA damage tolerance in biological systems and its malfunction is directly linked to the onset of cancer. Using crystal structural data along with a genetic database, I identified several key residues near the active site of polymerase kappa that were likely locations for malignant mutation. I then altered these residues and investigated the fidelity and thermal stability of the mutated protein My hypothesis proved correct as it was determined that the residues of interest were indeed critical for efficient and effective protein function.

While I was thoroughly inspired by the work I had accomplished with Dr. xxxx and Dr. xxx, my ultimate goal was to apply my knowledge to medicine. I became interested in Dr. xxxx xxxxx's group at xxxxx University. The xxxxx group had successfully synthesized a novel DOTA based

ligand capable of binding to transition metal complexes. The result was a compound that showed promise as a potential MRI contrast agent drug. After speaking with Dr. xxxxx, I successfully applied for and received a scholarship enabling me to work in his group for a summer. In the xxxxxx group, I first focused on improving upon the synthesis of the DO3A based ligand significantly altering synthetic efficiency. I then took to synthesizing a variety of first row transition metals complexed by the DO3A based ligand, crystalizing and characterizing these compounds using X-Ray crystallography, UV-Vis spectroscopy, NMR spectroscopy, IR spectroscopy and cyclic voltammetry. I then began to investigate how I could conjugate these newly synthesized compounds into biological systems. Using density functional theory along with gaussian 09 I computationally determined possible bioconjugate routes with these complexes, specifically the feasibility of a Diels alder reaction. From my work I discovered that these compounds are extremely dynamic and fluxional, existing in multiple conformations. This result had led me to perform a computational investigation of the energetic barrier behind the internal movement of these molecules. I will be focusing on this area during the fall and spring of 2018.

My success as an undergraduate researcher has solidified my desire to enter a Ph.D program focused on inorganic chemistry with applications to medicine. xxxxxx University hosts several research groups specifically studying inorganic chemistry with biological applications including the xxxxx group as well as the xxxxxx group. Furthermore, the xxxxx group's focus on theoretical chemistry peaks my interests developing mechanistic models through application of theory. As such, acceptance into xxxxx University would open up a myriad of opportunities for me to explore.