I wasn't always sure if I was going to make it through college. Coming from a single-parent household with a surplus of socioeconomic hardships, there were plenty of times that paying that tuition bill didn't even seem worth it. Even so, I knew that **the fact I was able to attend college was a great privilege and as the first in my family to pursue a higher education, I certainly wasn't going to let that opportunity go to waste.** As such, every decision I have made—what to major in, what opportunities to pursue, what to do after graduation—were all ultimately based on the desire to take advantage of this privilege and work towards a career that I would love. And though I had received little guidance in making these important decisions, I felt an overwhelming sense of joy and pride as I looked out into a sea of green. I was in the middle of a northern Michigan forest standing atop a 30-meter tower with the instrument I had helped create standing before me. And in that moment, I realized this was exactly the direction I wanted my career to go.

Research Experience & Intellectual Merit

I was first introduced to the field of environmental and earth science when I decided to take an introductory course in the summer following my freshman year of college. Though I had a completely different career plan in mind at that time, I quickly found this new field to be filled with opportunities where **I could apply my background in chemistry in interesting and engaging ways**. As I excelled in my summer class, fueled by my quickly growing interest, my professor, James Sickman, took notice and offered me an opportunity to work in his biogeochemistry research lab, an offer I eagerly accepted.

While working in this group, I contributed to two separate projects. Beginning in my sophomore year, I worked with a postdoctoral researcher on furthering existing methods for quantifying nitrite in soil. This nitrogen compound is a precursor for the formation of HONO, an atmospheric compound that contributes to smog formation. However, nitrite is seldom measured in soils because, until recently, it was thought to rarely accumulate. In this project we showed that when using traditional soil extraction methods, nitrite pools are often underestimated and accumulation does in fact occur. I was able to assist in experimental design, literature searches and ultimately the development of methodology for a new extraction method more amenable to accurate nitrite measurements in soils. **This new technique was described in our manuscript published in the *Soil Science Society of America Journal*.** (doi:10.2136/sssaj2015.02.0061n).

As my sophomore year progressed, **I also took the lead on a project** investigating whether isotopic variations recorded in paleoarchives of the Sierra Nevada Mountains served as reliable records to identify sources of atmospheric moisture. This impactful research could aid in the reconstruction of past snowfall variability and improve future predictions of California's diminishing freshwater resources. We obtained promising results during winter 2012-13 as the isotopic composition of the snowfall collected at our field site (Lodgepole, CA) showed significant statistical correlation with the storm track trajectories. This indicated a climatic significance in the isotopic analysis of proxies of the area. However, findings also showed that archived samples, particularly those collected by the National Atmospheric Deposition Program, would not be reliable in showing this correlation, most likely due to a method collection that incorporated several storm events into a single sample. As this project progressed, **I presented these findings at several locations**: twice at UC-Riverside's undergraduate symposium, and twice at the American Geophysical Union (AGU) Fall Meeting. In addition, **this project was also submitted as my honors undergraduate thesis prior to graduation**.

Although I enjoyed all the progress and success I achieved in my three years in Professor Sickman's group, I found myself wanting to explore other fields related to the chemistry of environmental systems. Fortunately, there was a commonality between my two research projects that had always fascinated me: their relation to the atmosphere. Whether it was through gaseous soil emissions or the influence of meteorological factors on the isotopologues of precipitation, both projects captivated me by their connection to atmospheric science. As my junior year ended, I continued my passion for research by applying for several internships, this time focusing on the atmosphere.

To my excitement, I was accepted into NASA's Student Airborne Research Program the summer following my junior year. This research opportunity not only allowed me to get a feel for the discipline of atmospheric science, but **it also provided the opportunity to get hands-on experience with collaborative scientific campaigns and field work**. Under the guidance of Dr. Donald Blake, this eight-week internship allowed me to collect *in situ* whole air samples aboard the NASA DC-8 airplane as it maneuvered over the LA Basin, the Inland Empire and the San Joaquin Valley. In particular, I focused on depicting trends of long-lived halocarbons over the Los Angeles Basin, which can contribute to the global warming potential of Earth. I showed through comparison with global background measured through the AGAGE network that the LA Basin still contributes to the global load of HCFCs with foreseeable increasing trends. In addition to formulating a final oral presentation that I presented to my colleagues, I also now uncovered the path I wanted to take with my career. Soon after ending this internship, I made the decision to apply to the top graduate schools for atmospheric chemistry and ultimately **accepted admission to the Chemistry PhD program at the California Institute of Technology.**

Current Graduate Study

I have recently begun my second year of my graduate studies working in the research group of Dr. Paul Wennberg. **My research focuses on studying gas-phase oxidative reactions that occur in the atmosphere**, particularly in or near forested areas. During my first year, I became involved in a project that focused on the design of a high resolution gas chromatograph coupled with a time-of-flight chemical ionization mass spectrometer (GC-HR-ToF). Alongside a postdoctoral researcher, **I was in charge of the design, construction and integration of a novel gas chromatograph into an improved field-hardened CIMS design**. Though CIMS has proven itself as an invaluable technique in the understanding of the oxidation of VOCs in the atmosphere, its inability to individually identify compounds of the same mass has left ambiguity in the data sets it has provided. With the addition of the GC, the combination of these two systems provides an analytical advantage, particularly during field campaigns, allowing for the detection of isomer-specific distributions of important atmospheric species in the ambient air.

Our first test of this instrument took place this past summer during the PROPHET 2016 campaign at the University of Michigan Biological Station. This campaign aimed to bring together scientific collaborators with a range of instruments to better understand the sources, sinks and cycling of important radicals (e.g. HO_x) and isoprene oxidation products. Sitting at approximately 30 meters atop the PROPHET tower, **our instrument obtained data that allowed the observation of fluxes of important oxygenated volatile compounds between the atmosphere and forest canopy**. Additionally, due to the GC component that I had integrated into this system, ***in situ* isomer distributions of isoprene oxidation products were observed for the first time in the field**. As I continue with this project, I plan to further develop the GC-HR-ToF and participate in future field campaigns. Combined with chamber studies, this will allow for an extensive data set that will ultimately test our current understanding of isoprene oxidation and provide new insight into the fate and importance these particular biogenic compounds play in the global system.

Broader Impacts

Overall, my academic career was established because I chose to take advantage of my opportunity to receive education; a chance no one else in my family was granted. Though I have succeeded thus far, a lot of the choices I made felt less informed than my peers due to the fact that I was a first generation student and my family couldn't provide the necessary guidance. For instance, I wasn't aware of the importance of acquiring internships or participating in undergraduate research until later in my academic career. The fact that I had participated in the opportunities above was through a lucky coincidence. However, because I know the disadvantages first-generation minorities face while navigating the academic realm, **I have made it my mission to advise students through my blogging platform**, caffeinatedconfidence.com. Here, I provide advice on the best ways to triumph as a STEM major in college, writing posts that discuss topics such as how to find STEM internships and how to obtain undergraduate research. I also discuss advice on how to apply to, and ultimately, succeed in grad school, being sure to emphasize what makes a successful grad school applicant and how one could start preparing early.

Additionally, **I am also passionate about the advancement of women & minorities in the sciences and the discussion of mental health issues in academia**; both topics are frequently discussed on my website. On these topics, some of my more popular pieces provides advice on how to cope with anxiety in grad school as well as talks about my experiences with navigating academia as a first generation minority student. Lastly, as my blog has become a regular resource for 16,000+ unique visitors, **I am planning to dedicate a subsection of this platform to write short science communication pieces** about topics related to my research. Though I already have two posts that talk about the atmospheric importance of forests and the capabilities of remote sensing methods, I hope to extend my reach beyond the scientific community, using social media as a tool to talk about the field of atmospheric chemistry to those who may otherwise never be introduced to this important discipline.

Future Goals

During my tenure at Caltech, I plan to continue my research in isoprene oxidation and aid in the understanding of its role in the production of organic aerosols, its modulation of tropospheric ozone and, ultimately, its influence on our future climate. I plan to do this by further improving our GC-HR-ToF and utilizing its capabilities to interpret field data and provide more insight into the full mechanistic scheme of isoprene. After, **I plan to bring my knowledge and expertise to government laboratories that focus on atmospheric chemistry** in hopes to expand our current analytical abilities through instrument development and continue pursuing the research that so greatly affects the world.

Furthermore, I have plans to expand my blog and deeply involve myself in opportunities that broaden my influence to not just science, but society as well. This will include advising incoming science graduate students both through my blog and on campus through the various mentorship programs available. Additionally, I hope to strengthen my science communication skills and introduce the world of atmospheric chemistry and by doing so, bring awareness to the importance of this research in combatting current environmental issues. The NSF Graduate Research Fellowship will grant me the opportunity to take part in all these activities. With this fellowship, I will not only be able to continue my budding research career, but I will also be given the flexibility to pursue the additional opportunities and become an influential voice that can create a positive change in my community.