Personal, Background, and Future Goals Statement

Before I started my bachelor's degree, I was never really encouraged to study geoscience, and I ultimately arrived to this field was because I ventured to seek out my passion for paleontology. As I grew up, I was always attracted to evolution, ancient life and the fact that scientists were able to look back millions of years back to know how Earth was like. Unfortunately, I never had a personal frame of reference on how to form part of this paleontological community nor did I understand how I could work on it at Puerto Rico (P.R.). As a high school senior, I got involved in research through an outreach program from my future alma mater [University] (Uni), where I participated in a phytopathology study of the endangered cacti *Harrisia portoricensis* with Dr. F. This opportunity, which arose from an outreach initiative from [Uni], introduced me to research, helped my future academic prospects, and showed me the positive impact outreach could have on a student. Afterwards, I started my bachelor's at [Uni] in Industrial Biotechnology, having been encouraged towards this field because of its modern applicability and its relation to biology and chemistry, fields which I both generally liked. Nonetheless, paleontology stayed in the back of my mind, even when most of my peers did not know anything about it nor promoted it as a feasible field to make a career out of.

I started seeking out internships as soon as I started college, to have a hands-on experience with paleontology and see for myself if I was a fit for this field. In the meantime, I continued with my academic studies and kept working on phytopathology projects with Dr. F. With her I was learning laboratory techniques in biological culturing, gaining data analysis skills, familiarizing myself with research troubleshooting and protocols, and developing my love for research. At that point I was convinced that **the research career was for me**, because of how it allowed me to break up problems and find them solutions, and that after my bachelor's **I would pursue a PhD**. In my internship search I found Natural History Research Experiences (NHRE), a program that would allow me to go the Smithsonian's National Museum of Natural History to do research in paleontology, using one of the most renowned museum collections in the world, and join a community of leading scientists in geology. Without hesitation, I applied and got accepted. Once there, I studied the *Leptaena* brachiopod phylogeny alongside Drs. W and D and investigated the effects of mass extinction over the *Leptaena* lineage. With them I learned the basics of paleontology, fossil collections, gathering information from specimens, and was introduced to statistics and programming. Even though I was just there for a summer, this experience proved my paleontology calling. Topics of evolution and the relationship of organisms with their surroundings millions of years ago turned to be of great interest to me, and **pursuing paleontology changed from being just an idea to a real and compelling desire**.

When I returned to P.R., I promptly sought out the [Uni]'s Department of Geology. Within a short time, I changed majors from Industrial Biotechnology to Geology and started a statistics and probability minor since at NHRE I learned the usefulness this knowledge could have in future academic endeavors. After going to NHRE, I presented my *Leptaena* project at the Geological Society of America 2015 Meeting by giving an oral presentation in one if its topical sessions. In addition, I kept getting involved with research by joining the PR-LSAMP Undergraduate Research Program and the [Uni] Department of Agricultural Sciences Undergraduate Research Program. Within these programs I worked on projects studying the phylogenetics of *Colletotrichum* fungi and characterizing it in yam crops. Although it seems polarizing that I kept working on non-paleontological projects, my motivation stemmed from my desire to keep conducting research and enriching my knowledge, besides giving myself time to start learning more about the basics of geology to narrow down my research interests and explore what questions I could study in the

field. Moreover, my participation in these programs gave me the chance to go to multiple conferences, both local and at continental United States, advance my technical and scientific writing, learn how to scope the literature, and develop networking abilities.

I decided to further my research experience by participating in the Stanford University's Summer Undergraduate Research in Geoscience and Engineering (SURGE) Program in a project with Dr. S. There, I was able to delve in another aspect of the geosciences, geochemistry, and see how it could apply to paleontology. In this internship I researched the oxygenation conditions of Silurian oceans, through iron-redox geochemistry analyses of shale. With these analyses we were able to interpret local signals of oceans that pointed towards ferruginous, sulfidic, or oxygenated conditions. The data I gathered along that summer would later be added to the Sedimentary Geochemistry and Paleoenvironments Project database and it would be used to set up the oceanic environmental background that underlaid the evolutionary events and the organismal developments during the Paleozoic. Although this project was a bit further apart from paleontology, it opened my eyes towards many interdisciplinary possibilities between paleontology and geochemistry. Geochemistry added new tools with which you could complement paleontological research and push what traditional paleontology could learn from geological samples. Given this, I was determined to find future work that better bridged these two fields, to be able to provide more complete pictures of evolution and life in the past.

In such endeavor, I joined the University of Colorado Boulder (CU Boulder), as a part of the Summer Multicultural Access to Research Training (SMART) Program, in a project mixing both paleontology and geochemistry directly. There, I worked with Drs. W and C on on studying the stable oxygen and carbon isotopes of coprolite (fossilized feces) specimens from Campanian herbivore dinosaurs that were obtained from the Kaiparowits and Two Medicine Formations. What was unique about this project, besides its topic, was **the level of independence that I achieved through that summer**. I was involved with this research from start to finish. I helped develop the sampling scheme for the specimens, I interpreted the data, developed protocols to process the samples, wrote up a report for the results, and took control over the direction this research took over time. Besides, no one had ever analyzed these specimens for isotopes, so I was in uncharted territory. Our novel approach of investigating the $\delta^{13}C$ and $\delta^{18}O$ of the carbonates in the coprolite samples yielded interesting results, showing that the carbonate samples taken from unique components of single coprolite specimens had differing isotopic values. Currently, I am still working on this project, looking into whether microbial respiration could be a factor in the varying carbonate isotopic values of single coprolite specimens.

Ever since my internship at Boulder, I developed the ability to independently work on research and **the knowledge to start asking my own research questions.** Participating heavily in research consequently helped me obtain awards, like the AWG Undergraduate Excellence in Paleontology Award and the Paleontological Society Student Ambassador Program Award, which enabled me to continue researching and present my research results, respectively. My research experience, since high school up until this moment, helped me later develop my own stable isotope geochemistry project using rudists as seasonality indicators, and another project studying the carbonate microfacies of a core using statistical cluster analysis based on data I collected from numerous thin sections. Furthermore, the knowledge and experience I attained by the time I finished my bachelor's degree in geology (with a minor in statistics and probability) got me my current position as research assistant at CU Boulder. Here, I have continued working on personal research, I have delved more into mass spectrometry, and I have assisted projects in Drs. W's, S's, and C's laboratories.

Intellectual Merit: All my research up until this moment has been in a broad spectrum of subjects: phylogenetics, iron-redox analyses, stable isotope analyses, carbonate microfacies, and phytopathology. This breath of experiences has prepared me to tackle an array of scientific questions, through the integration of my diverse knowledge within geology and the use of all the analytical tools and skills I have gained so far. Moreover, my knowledge of both paleontology and geochemistry gives me a different perspective when approaching research, that is likely less secular than the one of people dedicated to either one of these fields. **All of this is key for my success in the pursuit of a PhD and will enable me to achieve concrete applications of geochemical tools to paleontological questions, advancing these fields' knowledge simultaneously.** Finally, as a Puerto Rican woman, I have a unique view regarding geology that I can bring to the table as I collaborate more in the scientific community.

Future Goals: In a PhD program, I will investigate paleontological questions focused on evolution and key moments in geological history (mass extinctions and drastic environmental change) using geochemical tools applied to either fossils or other geological specimens that are currently used as environmental proxies. My goal is to be able to master an array of geochemical techniques (like triple oxygen stable isotopes, other stable isotopes, clumped isotopes, etc.) that I can use towards any kind of paleontological research at the end of my doctoral degree. The maturity I develop through the journey of a PhD will continue to develop my capability to be an independent researcher and achieve professorship positions that will allow me to be an influential part of the scientific community. The NSF GRFP will allow me to have more focus on my research to achieve my full scientific potential. As well, this fellowship could allow me to have more time to dedicate to outreach efforts that resonate with me.

Broader Impacts: I established in the beginning of this statement that outreach had a huge impact in my professional success, propelling myself towards many opportunities that got me to where I am today. Additionally, I brushed upon how geology was a less encouraged STEM field amongst Puerto Ricans in comparison to other fields. As a result, I got involved in various outreach efforts. In my freshman year, I joined Science and Research Society, Inc., a non-profit organization. Within it, I successfully helped with an outreach program to connect high school students to [Uni] researchers and I collaborated in a laboratory development program in my previous high school. In addition, along my bachelor's degree I participated in various student organizations related to geology, where I gave talks to public school students and organized activities to expose current [Uni] students to opportunities in the geosciences. Through these, I was able to scope the lack in geoscience education amongst students of all academic levels. Nonetheless, the most rewarding experience I had was at Individualized Study Method (ISM), a corporation where I worked alongside students from various education levels to develop and conduct simple research projects (some related to geology) from start to finish, proposal to poster/scientific report. **This practical exposure to outreach, my acquaintance with the necessity of better geoscience education in P.R., and my scientific knowledge, aids me in my goal of impacting and consequentially diversifying the geosciences.** I plan to continue these efforts once in graduate school by joining the diversity and inclusion efforts of internship programs and organizations like the Geological Society of America and the Paleontological Society. Moreover, I would help Puerto Rican geoscientists get opportunities in STEM through my connection to [Uni], by reaching out to Puerto Rican students through seminars and one-on-one mentorship. Immersing myself in outreach during graduate school can later aid me, in a post-doc or professorship position, to develop my own outreach programs and projects, and get funding to make them more widespread and impactful at any institution I join.