My curiosity and passion for science bloomed in fourth grade when I decided to conduct an independent project for the school science fair. For the first time, I wanted to answer my own scientific questions and not the ones suggested by my parents. I decided to embark on discovering how plants responded to different musical stimuli. My findings suggested that indeed, *Phaseolus vulgaris* had increased leaf and root development when exposed to Mozart, Beethoven, and Strauss as compared to Metallica, Iron Maiden, and ACDC. These findings led me to share my independent research work for the first time and, needless to say, motivated me to pursue a degree in biology. Through the experience of learning the fundamental processes that enable life, an eagerness to understand such immense beauty emerged in me.

Research Experience

My first research experience was in 2013 in Dr. Kalpna Gupta's laboratory at the University of Minnesota. Dr. Gupta conducts research on vascular biology and molecular mechanisms of angiogenesis. Although I had few laboratory skills and was relatively ignorant about the day-to-day practice of research, I worked on examining the impact of morphine on the activation and abundance of tumor-associated mast cells within mouse models of breast cancer. Over the course of my research term I learned several techniques and by its conclusion I was adept at independently extracting murine mammary tumors, immunostaining tissue samples, imaging sections with a microscope, and analyzing and quantifying data. Furthermore, the results of my work revealed that mice treated with morphine had higher levels of mast cells within their mammary tumors than controls, suggesting that administration of this pain medication might promote cancer-associated inflammation and angiogenesis. These important contributions earned me co-authorship on a manuscript that was published, my first peer-reviewed research article.

That same year, I joined a plant molecular biology and biotechnology lab at the University of Puerto Rico in Mayagüez. Dr. Dimuth Siritunga leads a research program to identify DNA barcodes within plant species. These uniquely patterned DNA sequences are characteristic to each living organism and can be used to identify species and determine phylogenetic relationships. I worked on characterizing Bamboo DNA barcodes, specifically determining barcodes that are still unavailable in databases, in an effort to collaborate with scientists throughout the world that perform research with this economically important plant. This research experience provided me the opportunity to work on a long-term project as an essentially independent undergraduate researcher, while at the same time working closely with peers who were identifying DNA barcodes in other plant species. My responsibilities included designing experiments, analyzing data, troubleshooting protocols, and communicating my findings with regards to my independent research. In addition, I also had the opportunity to teach fellow researchers techniques, protocols, and software usage essential for their independent projects. These experiences have greatly contributed to my training, mostly by developing my identity as an independent scientist and exposing me to being a mentor and leader to others. As a result of my work, a paper is expected to be published with the novel DNA barcodes found in Bamboo as elucidated by my research.

In 2014, I worked in the lab of Dr. Jayanta Debnath at the University of California in San Francisco. Dr. Debnath's focuses on understanding the role of autophagy in epithelial homeostasis and cancer. My project involved testing the requirement for a Golgi structural protein, GRASP55, in matrix detachment-induced apoptosis. Previous studies suggest that Golgi fragmentation is necessary for apoptosis, but the molecular mechanisms underlying this process remain poorly understood. To dissect the role of GRASP55 in apoptosis, I learned tissue culture, short-hairpin

RNA knockdown using lentiviral vectors, immunoblotting, and immunofluorescence microscopy. The most challenging assay I performed involved testing the ability of human mammary epithelial cells to form colonies in soft agar, a measure of anchorage-independent growth and transformed phenotypes. Remarkably, depletion of GRASP55 in non-tumorigenic cells promotes resistance to matrix detachment-induced apoptosis and the formation of small colonies in soft agar assays. These intriguing data identify GRASP55 as an effector of detachment-induced apoptosis and suggest that loss or inhibition of GRASP55 may contribute to cellular transformation and pro-tumorigenic phenotypes. This experience taught me many things, including the dedication and creativity required to carry out leading-edge research.

In September 2015, I started my graduate studies at Yale University. I recently joined Dr. Rodeheffer's Lab which investigates the cellular and molecular mechanisms that control adipose tissue mass under normal and disease states. When I started in the Rodeheffer lab, I was quickly involved in an on-going research program studying how the adipose tissue microenvironment contributes to adipogenesis, the process of cell differentiation that gives rise to adipocytes, in specific fat depots and how this process is affected by sex hormones. I was very intrigued by this question and contributed to the data analysis and quantification of confocal microscopy images which earned me co-authorship in my second peer-reviewed research article. I will continue studying this phenomenon as part of my thesis project, specifically how estrogen receptor-α (ERα) signaling controls the sex-specific pattern of adipocyte hyperplasia.

Future Plans and Broader Impact

My decision to pursue a Ph.D. in the field of molecular biology was driven by a desire to understand the basic biology of life. However, there were other factors that motivated me to pursue this journey. During my time at UPRM and other US universities, I witnessed that very few women occupy faculty positions in STEM, a fact that concerned me deeply. Statistics show that even though women obtain almost half of Ph.D. degrees in STEM, they are twice as likely to leave the science field compared to men. As a young Hispanic female, I am aware of the obstacles and social pressures women and minorities are constantly exposed to in this field. I have seen and experienced how women need to work harder than fellow male peers to gain the same respect from the scientific community. Furthermore, I have felt underestimated in numerous occasions during interviews, poster, and oral presentations because of my Hispanic background. As an undergrad, I felt the need to prove that any Hispanic woman with the desire to pursue a career in STEM can be successful; I strived for academic excellence. As a result of my hard work, I finished my biology degree with a perfect academic record and was awarded the prestigious Luis Stefani Raffuci award for academic excellence.

However, pursuing academic excellence was not my only goal as an undergrad. I was also very invested in developing leadership skills and participating in activities that promoted science education and impacted the broader community of Puerto Rico. As a leader of the National Biological Honor Society BBB, I helped organize numerous scientific symposiums, workshops, and seminars to educate undergraduates about research opportunities in and out of UPRM, how to prepare good application materials for summer programs and graduate school, and how to communicate scientific research clearly via poster or oral presentations. The broader Mayagüez community was also impacted by BBB efforts, such as organizing activities to expose high school students to research labs in UPRM, recruiting volunteers to judge elementary school science fairs, and organizing a biotechnology summer camp for middle school and high school students.

Once at Yale, I decided to continue my efforts as an advocate to broaden the representation of underrepresented groups in science. By joining the Yale Minority Scientist Research Network (YMSRN), I have gained perspective on the implications of being a minority in STEM, especially at the higher professoriate level I one day aspire to reach. As part of the YMSRN I plan to travel to minority conferences to increase the recruitment of minority students and diversify the scientific community specifically of Yale University. In addition to joining YMSRN, I have been mentoring an undergraduate female student in science as part of the Women in Science at Yale (WISAY) mentoring program. The goal of WISAY mentoring is to help increase the success of young women entering scientific fields by building and fostering valuable mentoring relationships between women in science at all career levels. I have hopes that this experience will not only shape me into becoming a great leader and mentor, but that throughout my mentorship I can inspire young females into pursuing careers in STEM. I am also part of other organizations that represent the interests of Hispanics and minority students, like the Latinx Graduate Network, in which the diverse communities across graduate and professional schools at Yale come together every month to build a sense of community, social and intellectual relationships, and mutual support. I am also a member of CienciaPR, a nonprofit organization composed of scientists, professionals, students and citizens committed to the advancement of science in Puerto Rico and with promoting science communication, science education, and scientific careers. Through this program I have participated in skype sessions with young students from PR to talk about pursuing science careers and my transition towards graduate school in the US while having studied all my life in PR.

I am applying to NSF Graduate Research Fellowship Program because winning this fellowship will allow me to continue my graduate studies at a leading cutting-edge research institution and thus set a stronger foundation for a career in academia. I have hopes of running a successful lab and collaborate with universities in Puerto Rico and other Latin-American countries. I plan to ease the accessibility of Hispanic students with limited resources into research programs at major US institutions. One of my greater goals is establishing a second research laboratory in Puerto Rico to target in a more efficient matter the needs of Puerto Rican students interested in STEM and help advance science knowledge at both the university level and at the middle school/high school level where there is minimal education about careers in science right now. These efforts will also contribute to the diversification of the scientific community by preparing these students to be strong candidates for PhD programs at global science leading institutions and hopefully follow careers in academia.. I believe the qualities I have demonstrated in my experiences as a student of excellence, independent researcher, community leader, and advocate for women and minorities in science set a precedent for the greater things I will accomplish as a science educator and global leader in STEM.

Publications: