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On one Friday night, I received a call from Laura Weinberg about a new research opportunity at Multi-Functional Nano & Supra Molecular Biosystems Laboratory at Stony Brook University. Excited from just imagining how much research I could conduct for two whole summers, I gladly accepted the opportunity and promised myself that I would give my all to get the most out of this experience rarely available for high school students. Since it was the coalition's first year sending students to this lab, the absence of essays from past students' experiences left me labyrinthine about what to expect from this lab. Without any knowledge on the focus of the lab, but with an effort to be in the fittest, most efficient, and most capable position before working, I presumptuously jumped to the papers published by the lab. Three lines. It took me three lines of the abstract to perplex me- I was completely lost. "Nanoparticles…single-walled carbon nanotubes…multi-walled carbon nanotubes…The Raman…UV Vis Spectrophotometer…Atomic Force Microscope…Theranostic agents?" Overwhelmed by numerous jargons, I took a step back and read the basic papers found on the lab's website. Searching any foreign terms, little by little I began to understand the goal of the Sitharaman Lab.

On July 5th, the day of the orientation, I was as ebullient as a young child in a candy store. But, I was also timorous, not knowing both what to expect from them and what they would expect of me. I sat in the conference room with about ten to fifteen incoming high school researchers, graduate students, and post docs. After realizing they were also new to the lab and knowing I was not the only intimidated one, I was comforted. During the tour of relatively small, but new, organized, and advanced bioengineering building, each lab introduced their current research topics. Having read the publications and studied the fundamentals of bioengineering beforehand, I was able to comprehend general purposes of each research. At the end of the tour, I fathomed that each lab was interconnected with each other through their studies. For example, one lab focused specifically on bones, while other lab focused on mesenchymal stem cell, cells which are multipotent and pluripotent to become bone or muscle cells, growth and manipulation.

After the orientation, I moved into Irving College dorm. It was a high school dorm, so all of the students there were high school researchers working in other departments. After a few days, I got to know everyone, and even found out some students were from my school. Every day after lab work, usually around 5:30 or 6:00 PM, students would gather in the lounge, where it is cooler than their rooms because using air conditioner is prohibited. Although the curfew was set at eleven o'clock, the amiable resident assistants found ways for students to have fun and feel connected. With ten to fifteen students, we would eat dinner together at the Student Activities

Center or at the Stony Brook Medical Center and talk about what each and every one is doing in their labs. These bright students were from all around the world: some students were from California, Washington, and even Romania. During the discussions, we gave each other advices about writing research papers and even the research itself. Bringing their studies together, students inspired and refined themselves as researchers. Having been in that environment with future innovators of this world, I was galvanized and learned to think, rather than parochially of my own research, broadly- how each research can be viewed from different perspectives, and how each can be interconnected and ultimately improve people's lives.

For first few days in the Sitharaman Lab, I was introduced to our cordial lab manager Juee, who was the "go to" person for literally anything. I also met my excellent mentor, Sayan, a graduate student who, personally, was the most dedicated to his duties. Always accessible, either via text message or Facebook, Sayan never seemed to be bothered to help me, whether it would be repeating the protocols for assays or simply explaining how each machine works. He was also the pure epitome of other lab members, not hesitating to stop what they were doing to assist me. On Friday lab meetings, even Dr. Sitharaman comforted us, "No question is a stupid question. Feel free to ask anything." However, it would be an absolute misconception to claim that I was treated as a child. Every question I asked was answered with attention. Every opinion I shared was treated with the same manner as the professor's. In addition, nothing was spoon-fed to me. I was responsible for everything. It was my responsibility to approach the professor to evaluate my progress and to gain assistance to how I should approach the data. It was my responsibility to ask Sayan which assays we are planning to conduct over the course of few weeks. It was my responsibility to research the purposes of each assay and explanations on why each reaction occurs. And it was my responsibility to look up journal articles relevant to the research. I am not complaining how it was difficult even with the help from the members, but I am actually thankful for this independent environment. Again, it was environment of this lab that has shaped me to become adept to real-life situations. I realized, the more I contribute to this research, the more *I* will gain. It was then I started reading more journal articles (thankfully the students were given unlimited printing privilege), spending more time in the lab (several times I came to the lab as early as seven in the morning, and left as late as 10:30 in the evening), and look for other types of experiments that can be done along with the major ones we have planned. The plasticity and freedom that the lab environment provided allowed me to bring in *my* elements and individual contributions to what was already set and to justify that I was conducting *my* research.

The main focus of the lab was studying carbon based nanoparticles, which have unique chemical, mechanical, and electrical properties superb for applications as contrast agents for medical imaging, scaffolds for tissue regeneration, drug delivery, and such. With emerging field of nanotechnology and incredible potential applications for the nanoparticles, more nanoparticles are being released in our environment, for example through cosmetic products and sun screens, thus, more people are exposed to them. Because nanotechnology is relatively new and is at its burgeoning stage, not a lot of risk assessments of the nanoparticles are done. Therefore, before

more nanoparticles, both manmade and natural, come into contact with humans and are used as their potential applications, toxicological studies must be done. I got to test the cytotoxicity of graphene oxide nanoribbon, which its molecular structure and highly magnetic properties allow it to be used as contrast agents for magnetic resonance imaging (MRI). In other words, my aim was to find at which dose or concentration of graphene oxide nanoribbons will be harmful to our bodies. In order to determine the concentration, I conducted two types of assays that will determine how many cells are dead or alive due to interaction with the graphene oxide nanoribbons: colorimetric and non-colorimetric. Colorimetric assays such as Lactate Dehydrogenase Assay, Neutral Red Assay, WST-1 Assay, and AlamarBlue Assay depend on measuring the fluorescence of each sample using the UV Vis spectrophotometer and Cytofluor plate reader and deriving the number of cells alive from the fluorescence value. However, since the nanoparticles can interfere with the values, I've conducted non-colorimetric assay such as Cell Counting Assay to compare the trend and neutralize any possible errors. Before I was able to start anything, I had to culture my cells. I was given SkBr breast cancer cell line and grew them in the lab's culture facility. With the incubator, kindly shared by Dr. Hadjiargyrou from adjacent lab, and culture fume hood in an isolated room, the facility successfully minimized contamination and provided perfect system for cells to thrive. After conducting various assays, I noticed the relationship between cell viability and the concentration of nanoparticles: as the concentration of nanoparticles increased, the cytotoxicity increased. After series of calculations and analysis, we concluded that at 100 μg/ml of graphene oxide nanoribbon, it would be incompatible with human body. Although we have arrived at the conclusion, there are still more grounds to be covered before justifying the future use of these nanoparticles: synthesizing and characterizing these nanoparticles using State-of-the-art electron microscopes and atomic force microscopes. Although summer is almost over, my research will continue as I commute back to the lab throughout the school year until I attend college. Until then and in the future, my research will not cease to increase societal awareness and bring prevention in Great Neck, Nassau County, Long Island, New York, the U.S., and the world.