Siraat Zafar

One Monday morning, I received an email from Lisa Kratter about a new research opportunity at The Multi-Functional Nano & Supra Molecular Biosystems Laboratory at Stony Brook University conducted by principle investigator, Dr. Balu Sitharaman. I am extremely thankful towards HBCAC for honoring me to research in a state of the art laboratory for two summers. Although I was intimidated by the high expectations at first, I believed it would pave the way for a bright and successful future. Thankfully there have been several students who have researched at Stony Brook University before me. It perplexed me how great the task at hand was when I began to read the articles published by the Sitharaman Lab. More types of spectroscopy then I could count! Microscopes that had no optical lenses, chemicals that burn through clothes and culture hoods! Although daunted, I was not disheartened in the slightest. I knew I would be diving head first in to the real world and it was up to me to land on my feet. Slowly, but surely, I began to understand the goal of the Sitharaman Lab.

I remember the training session like it was yesterday, it was that memorable. Victor, my newfound friend, and I got dropped off at the Wang center for our first unofficial day. The training session was full of eager high school students, mostly from Siemens. We learned about Chemical hygiene and general lab safety from instructor Kim Auletta. The next instructor was the hazardous waste manager of Stony Brook, Jeffrey Carter, who was also very helpful. He told us how pouring certain chemicals down the drain as a method of disposal can result in a $33,000 fine! The final instructor was a jolly man, Bob Holthausen, who is a biosafety officer. He explained the real danger of the organic and inorganic material we would be working with and how to keep you protected. After the safety training we walked to the Sitharaman Lab. While Victor and I waited for Dr. Sitharaman's availability we were given a quick tour by graduate student Sunny Patel, who was helped us fathom a few of the various machines and instruments in the lab. The meeting with the professor was great, his wisdom and experience is apparent.

The first official day, July 2nd, Victor and I took the train for the first time, which was a great experience. The first few days we became familiar with all the scientific jargon and methods of spectroscopy, microscopy, and lab etiquette. Thankfully we had a full week to digest all the material before actually implementing the newfound knowledge. We soon received Sayan as our mentor and supervisor. Sayan is currently in pursuit of his PhD and will be giving his dissertation within the next two years. He is from India, and his dedication to his research is interminable. The goal of the lab is to understand carbon-based nanoparticles. These nanoparticles have novel mechanical, chemical, and electrical assets that are perfect for functioning as a contrast agent for medical imaging, scaffolds, and improving drug delivery. These nanoparticles are being studied at the Sitharaman Lab to unlock all the potential uses of these carbon-based nanoparticles. Due to the inevitable human contact with these nanoparticles, cytotoxicity tests must be conducted for public safety. With the acquirement of all this background knowledge we armed and ready to tackle our experiments.

We began our research with the oxidation of Graphene Oxide Nanoplatelets, this rigorous and time-consuming procedure was necessary. It essentially turned the graphite, which is a multi-

layered carbon-based particle, and turned it into graphene with a series of potent chemical reactions. We used extremely corrosive acids such as formic acid, and sulfuric acid. After a series of reactions we have our oxidized graphene ready for plating and eventually cytotoxicity readings. Our goal is to deduce the cytotoxicity of these particles in an effort to decide whether they are safe to be used in vivo studies and eventually in clinical studies to deliver cancer fighting drugs. This extensive procedure took almost three weeks. We then began to culture cells, although this should take only 2 to 3 days it required a week for the first time. We received our cell lines and specified medias for our first ever cell culturing. I got the breast cancer line of MCF7 with RPM-I as its media. Victor received MRC5 with the media DMEM. Although we both had a turbulent start with contamination, we plated the cells into the wells successfully. We performed three assays. All of which tested cell viability to see how many cells were dead compared to how many were present when we counted our cells under an optical microscope. Our research shows that our carbon Nanoplatelets are, indeed toxic, to a certain extent. nanoribbons are only harmful after 100µ. We still have to compute the data to determine which concentration is most potent. Next year I will further the knowledge of the cytotoxicity of graphene Nanoplatelets.

Although we have come to the conclusion, there is no end to the amount of time that will be consumed studying these nanoparticles. Although summer is almost over, my research will continue as I travel back to the lab throughout the school year to further study how to improve the accuracy of the cytotoxicity and finding the ‘perfect’ concentration of nanoplatelets. Until then, my research will not stop to increase societal consciousness and convey prevention all over Long Island and eventually publish my findings.