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GNBCC Summer Internship June-August 2014

I always wondered what people meant when they said that I will "have the experience of a lifetime." Maybe it is an opportunity that I will remember forever, a moment that I will look back on fondly, or an experience to be built upon for the future. The summer that I spent researching at Rensselaer Polytechnic Institute fills all those categories. I still recount my adventures in the lab, and I now teach visitors to the science museum where I work about surfactants. My experience at RPI was definitely a crucial building block in my future—I learned that, through hard work, I was able to accomplish many things that would set a precedent for the labs I would work in and the classes I would attend in the future.

On the first day at the lab, Sunny, Michael, and I sat down in “the fish bowl,” conference room in the Center for Biotechnology and Interdisciplinary Studies laboratory building—one of the newest buildings on campus at the Rensselaer Polytechnic Institute in Troy, New York. Here I was, four hours away from home, two minutes away from my dormitory, facing five scientists across a long conference table, finally meeting Dr. Gross’ green chemistry research team. The whole experience was intimidating, but it turned out that I had nothing to fear—everyone was very welcoming and enthusiastic about telling me about their research. Later that day, my intimidation had dissipated, quickly replaced by curiosity and fascination as I shadowed each scientist.

To learn more about their specific areas of research in order to choose who to work with, I observed three different labs, listening to the scientists speak about their research. This was the first time I ever set foot in a live laboratory, I was surrounded by industrial work tables, chemical fume hoods, equipment engulfing various glass vials (one was a rotavapor, the other, a lyophilizer, I later learned) and the constant bustle of undergraduates, graduate students and PhD candidates, all diligently working on projects I had yet to understand.

After I shadowed all five scientists, I decided to pursue a chemical engineering-based project for the summer with Amanda, who would be my mentor. She worked with non-toxic surfactants, called sophorolipids. In general, surfactants are used to combine immiscible substances into one phase. They can emulsify oil in water and are found in various items such as

lotion, soda, or salad dressing. However, many surfactants that major companies use are toxic, such as nonylphenol and octylphenol—estrogen mimickers shown to cause mammary tumors in laboratory animals— and 1,4 Dioxane, a likely carcinogen. However, since Dr. Gross' lab focused on green chemistry, they produced a new, nontoxic surfactant: the cellulose nanocrystal (CNC), which is derived from grass. Since the CNCs are composed of cellulose, they are nontoxic and biodegradable.

For my research project, I examined the interaction of the CNCs with almond oil and water at the oil/water interface. I chose to work with almond oil because it is commonly used in cosmetic products, and I have seen it listed as an ingredient on the moisturizers I use. My research could potentially be applied to cosmetics— if a lotion were to be made using CNCs and almond oil, it could potentially decrease the exposure to harmful chemicals since many people today inadvertently use lotions that contain toxic substances.

First, my mentor explained how to make and analyze one-gram emulsion samples, and I thus became well-acquainted with the laboratory shear homogenizer, incubator, dynamic light scattering machine, and microscope camera. I used the homogenizer to mix almond oil, water, and CNC in a glass tube one centimeter wide and then incubate it for a day, after which an emulsion layer would form. A quality emulsion consisted of a solution with the smallest possible oil droplets surrounded by microscopic CNCs, suspended in water. As I further developed my research project, I decided to learn more about the nature of the interaction between the CNCs, almond oil, and water. To do that, I would change the pH and ionic strength of the solution to test how the emulsion would hold up under different conditions. Over the course of the following six weeks, I tested different variations of these conditions.

By the end of my six weeks at RPI, I had learned so much, met so many great people, and had the opportunity to do research in a lab that I never would have imagined. I learned to enjoy my time making emulsions in the lab, reading papers at “home” in my dormitory, and organizing my data in the office. This past summer truly was the experience of a lifetime, and I am so grateful to the GNBCC for giving me this opportunity .