High School Student Mrs. Paola Mora

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My experience regarding the NSF Research Project Internship

At the end of my junior year at Godinez Fundamental High School, I did not have a good idea of what I wanted my career to be. I have always thought it was between being a doctor or an engineer. Then one day in my physics class Professor Capolino, along with three of his students, gave a presentation about an internship opportunity they had available for high school students over the summer at UCI. I was interested right away. Professor Capolino gave us his email to contact him, and right away I made sure to contact him. During the first meeting, both Frank, the other intern, and I were introduced to the goal of Prof. Capolino's research, which was to look at the effect of charge carriers on the refractive index in a silicon perturbation in an optical leaky wave antenna. As interns, we were supposed to learn about silicon semiconductors and the effect of doping on internal current and carrier distribution. At first, I was a bit taken off guard. Never had I worked with undergraduate and graduate students, let alone talked so much about semiconductors. I went straight home and studied semiconductors to get a better understanding of what I would be researching and learning about. During the meetings we would review what I had studied at home, and if I had any questions the students were always willing to help us figure it out. I learned about Einstein's relationship, carrier action, currents in a semiconductor,

hole current : $\mathbf{J}_p = \mathbf{J}_{p|\text{drift}} + \mathbf{J}_{p|\text{diffusion}} = q\mu_p p\mathbf{E} - qD_p \nabla p$, electron current : $\mathbf{J}_n = \mathbf{J}_{n|\text{drift}} + \mathbf{J}_{n|\text{diffusion}} = q\mu_n n\mathbf{E} + qD_n \nabla n$.

Two of the hardest concepts to grasp were the current equations for diffusion and drift. The difficulty was due to the poor preparation that I had in high school. This difficulty came because I was taught with numbers rather than with variables.

These equations were the basis for the internship so we took a long time studying and interpreting the equations. I was able to learn how to graph the built-in voltage, the electric field, and the charge density between different layers of doping and how they can be used to find the other. I also learned P-N Junctions which allowed us to advance to PIN junctions using the continuity equations to find the current density. We then found the electric field and the width of the depletion region. When I first started, these things sounded like a different language to me, but once I started studying more and getting help from the other students I understood everything much better.

This experience helped me learn more about electrical engineering, as well as exposing me to what college will be like. It has also allowed me to see college in perspective and helped me keep an open mind about what career to choose. Although I had difficulties throughout the internship, I have learned that I am able to understand the new things that I will be exposed to in college as long as I work at it. All in all, this internship has provided me with new knowledge and a great learning experience.

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