A quote from Dr. Eric Kandel reads, "If you want to understand the brain, you're going to have to take a reductionist approach, one cell at a time." I have come to realize that this idea best describes my research interests in neural development by studying small organisms at a cellular level. Reading how Dr. Marc Hammarlund is using *C. elegans* to study neuron regeneration and circuit maintenance, which can be useful to the understand susceptibility to neurodegenerative disease in humans; or Dr. Lin's study of self-renewing division of stem cells using *Drosophila*, convinces me that these models can be used in ingenious ways to understand basic mechanisms of the brain that can be applied to human health. Even after years of research experiences using these organisms, I can say that I am just as excited about my work as when I started, and just as eager to learn more.

During my three years in the Deitcher epilepsy lab at Cornell, I had the opportunity to study synaptic organization using *Drosophila Melanogaster*. In recent years, the lab had found a novel gene (CG14509) that, when mutated, causes seizure-like behavior in *Drosophila*. My honors thesis involved characterizing different neural properties of this mutant gene in the larval stage of development. More specifically, I studied the localization of synapses in the central nervous system (CNS) of mutant CG14509 positive neurons by driving the expression of different pre- and postsynaptic proteins tagged with GFP marker. I then conducted immunocytochemistry experiments to look at positioning and quantity of synapses at the CNS. Interestingly, I saw that presynaptic proteins have a different organization in the larval ventral ganglion in CG14509 mutants compared to wild type. This experience showed me that research is not straightforward, since it involved many trials-and-errors to find the right markers for my experiment as well as the right developmental stage for the model. It also required looking for outside resources on my own to be able to analyze the images of my project properly. Although it could be discouraging at times to have my project fail, I kept working on it because it was an opportunity to impact human health through basic research in neurobiology.

Last summer, I had a project that once again involved basic research and human health. My research in the Ashrafi Lab at UCSF focused on metabolism and the effect of neural signaling on mechanisms outside of the nervous system. The lab works to delineate the pathway through which serotonergic signaling causes inhibition of neuronal AMPK, a kinase involved in energy balance, and leads to enhanced fat oxidation in peripheral tissue. To do this, I conducted a screen of neuronal G-Protein Coupled Receptors using RNAi to uncover genes that would suppress fat reducing effects of AMPK inhibited animals. Besides this method, the lab is using other experiments to learn more about the pathway, such as CRISPR for specific gene knockdown and reverse genetics. Understanding how this neural pathway leads to fat metabolism can make a significant contribution in obesity and diabetes research. Moreover, working with *C. elegans* made me realize all of the creative ways they can be used for genetics and cellular approaches to research.

I am also using *C. elegans* as a model for axon guidance in the Colón-Ramos lab at Yale University, where I am currently a post-baccalaureate. My research focuses on understanding how neurons begin to organize themselves into circuits by examining the development of the *C. elegans* central nervous system, called the "nerve ring". To do this, I am characterizing the temporal and spatial requirements for SAX-3/Robo, an important guidance receptor in neurons that has previously been shown to cause abnormal nerve ring formation when mutated. I have generated mutant *sax-3* worm strains that contain membrane-bound GFP expressed under a

different neuronal promoter to visualize subsets of neurons during development. I am also learning how to use the CRISPR/Cas9 system to insert GFP just prior to *sax-3*'s stop codon, to then determine when SAX-3 is expressed during embryonic development. Through the characterization of SAX-3, I can begin to study different mechanisms, such as fasciculation and axonal guidance, which are involved in neuron organization in the nerve ring of *C. elegans*. My research experience so far, has exposed me to novel techniques of research within neurodevelopment, and has reaffirmed my interest in understanding neural networking using simple organisms.

These research experiences have helped me come to the decision of becoming a scientist in an academic setting for my future. Transitioning from a small school in Puerto Rico to a large university in the United States, and adjusting to the academic rigor at Cornell University was overwhelming. However, I was able to overcome these challenges because of my enthusiasm for biology and scientific investigation, as can be seen in my significant academic improvement and my dedication in my research experiences. Therefore, I look forward to the opportunity of teaching and mentoring students like myself to thrive in the STEM fields, especially science.

Yale University would be the ideal institution to receive the preparation I need to succeed in my goals. As a graduate student, I look forward to facing new challenges that will help me continue growing as a scientist through the opportunity of working with world-renowned scientists such as Dr. Hammarlund and Dr. Lin. I am confident that with guidance from the top researchers in neuroscience, I will hone my skills of understanding neural organization, one synapse at a time.