During my visit to the lab of Dr. Antonia Mónteiro at Yale University, I had the opportunity to study pattern development. This study involved solving the mechanisms behind the development of eyespots in butterflies. Elucidating these mechanisms will help us understand how the tree of life has acquired so much diversity over time. The small white cabbage butterfly *Pieris rapae,* proved to be an excellent candidate for this study because they are Pierids found in a relatively unexplored basal lineage. Previous work from Dr. Andrew Stoehr, a former Post-Doc in the Mónteiro lab, indicated that the mechanism in *Pieris rapae* might be similar to that of a nymphalid butterfly.

In the study, we tested whether the eyespots have a similar developmental basis as nymphalid eyespots and have a morphogen source at their center. In addition, because the anterior spot has a slight dumbbell shape, we also hypothesized that perhaps this spot originates from two slightly separated morphogen sources, each positioned anteriorly and posteriorly about the midline of the respective wing compartment. We succeeded in using ablation experiments that aim to destroy cell populations that are putative morphogen, and pierced the spot location at various positions and periods during pupal development to determine putative morphogen source(s), morphogen signaling periods, and the effects of the perturbations on spot size and shape. We predicted that if a morphogen source is present at the center of the spots, then piercing these central cells will result in an overall decrease in spot size.

Pictures of the spots were taken once the butterfly had emerged and the data was binned into three separate categories. The first category was for piercings done less than 13 hours after pupation, the second category was for piercings done 13-25 hours after pupation, and the final category was for piercings done more than 25 hours after pupation. By using image analysis software, we were able to make heatmaps of all the different spots and found that the amount of radial spot size reduction was the greatest when it was pierced 13-25 hours after pupation. Since the spot was reduced in size radially, these results indicated that there was one central source of morphogen and it was most active 13-25 hours after pupation.

Overall, there is very little I would change about the experience. The project resulted in a fairly definitive answer to the question posed. However, I wish I had read more literature prior to starting the project, that way I could make sure that I was immediately ready to start the experiment when I arrived, because I was barely able to finish. This exchange ended up being a great experience because not only was I able to finish a project, but I had the opportunity to work in a different lab environment separate from the lab I work in at Purdue. Through the EDEN program I broadened my knowledge base and skills and will hopefully allow me to use some of the techniques I learned back in my home lab.