**Max E. Horowitz**
Undergraduate
Tulane University, New Orleans, LA

Mentor: XiaoChing Li, Ph.D. Additional Affiliates: Hannah
Neuroscience Center of Excellence LSU Health Sciences Center

**"How Overexpression of miR-9 in Juvenile Songbirds Affects Neural Pathway Development Within Area X"**

The human basal ganglia are subcortical nuclei whose function, language development, is remarkably similar to Area X of the songbird brain. A molecular explanation of this similarity lies within FOXP2, a genetic sequence that facilitates the creation of neural pathways responsible for language development. Just prior to my arrival, my lab successfully identified specific microRNAs that directly affect the expression of the FOXP2 gene, and subsequently, language development within juvenile songbirds. Exposing juvenile Zebra Finches to overexpression of the specific microRNA, miR-9, my team discovered two findings: 1) downregulation of FOXP2 expression and 2) more variable (less effective) song production in adulthood. These findings go hand in hand as FOXP2 is responsible for the plasticity of language development that ultimately results in the quality of language understanding in adulthood. We are currently elaborating on these findings by studying the mechanism behind FOXP2's effect on the neural circuit development within Area X when overexpression of miR-9 is induced. Juvenile Zebra Finches were randomly split into two groups, experimental and control. In the experimental group, the miR-9 introduction took place via a viral injection, while the control group injections contained an empty virus. Injections occurred between the ages of 26-28 days. Half of the birds from the experimental group were sacrificed at 60 days of age while the other half at 100 days of age in order to compare results between juvenile and adult birds. The same was done within the control group. Images of medium spiny neurons (MSN), specific inhibitory cells that make up the majority of neural circuitry in Area X, were captured for dendrite and spine analysis postmortem. Specific data points such as branch point number and spine density, among others, are being collected as indicators of neural pathway development. Data analysis is still in progress, and conclusive results are currently unavailable as the blind nature of the analysis remains vital to the integrity of non-biased evaluation. The similarity between Area X and the human basal ganglia provides potential application of this study's eventual results. Understanding the structural effect that suppression of FOXP2 has on the neural pathway development could improve understanding in mild language defects, such as stuttering, and more notable language defects seen in autism spectrum disorders.