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Development of a system for analysis of muscle contraction pattern during *Drosophila melanogaster* crawling behavior

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Development of a System for Analysis of Muscle Contraction Pattern During Crawling Behavior

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The Idea:

The aim of this study was to attain footage of the crawling Drosophila larva from 360° angles in order to visualize the pattern of individual muscle contractions. A GAL4-UAS system was used to drive homozygous GCAMP expression, causing the muscles of the Drosophila larva to fluoresce when contracting. A stand was designed in order to place a live, crawling larva in a glass capillary tube under a fluorescent microscope and then rotate the tube completely for 360° video footage. Through the combination of the GCAMP expression and the rotatable stand, video of the individual muscle contraction pattern of a crawling Drosophila larva can be successfully attained and analyzed from all angles. Future research will identify the roles of specific interneuron populations in crawling through visualization of changes in the pattern of muscle contractions during crawling following interneuron knockout.

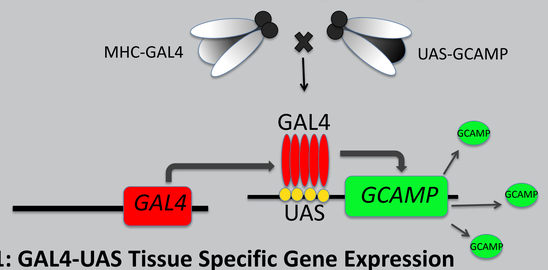

Figure 1: GAL4-UAS Tissue Specific Gene Expression

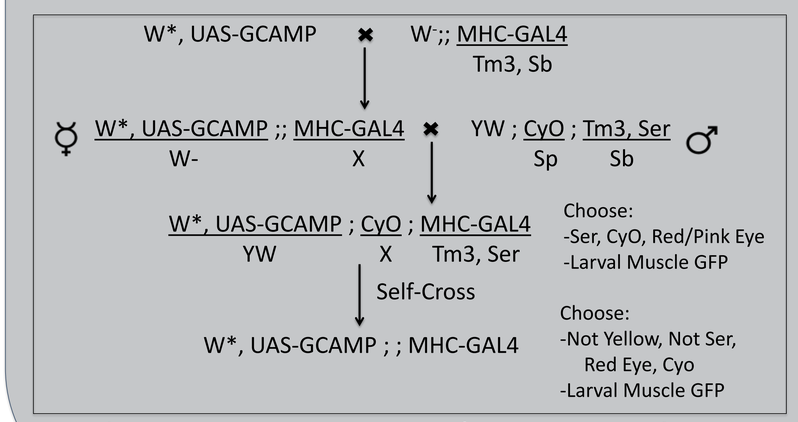

Figure 2: Homozygous MHC-GAMP | UAS-GAL4 Cross Plan

The Mechanics:

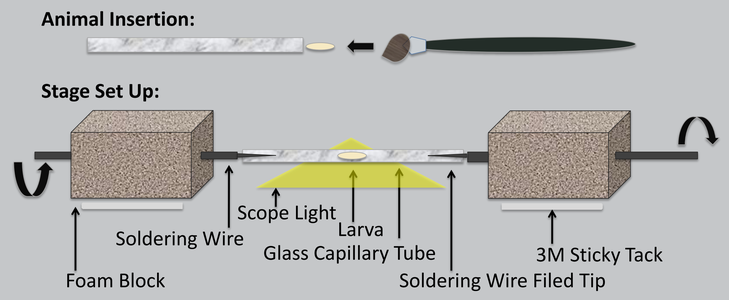

Figure 3: Florescent Microscope 360 Degree Footage System

Figure 4: Florescent Microscope with 360 Degree System

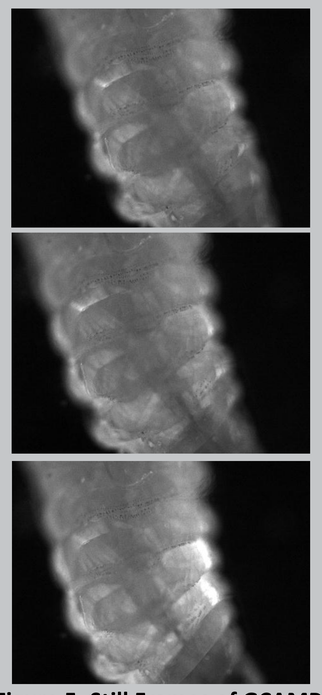

Figure 5: Still Frames of GCAMP Expression in Various Muscles

The Outcome:

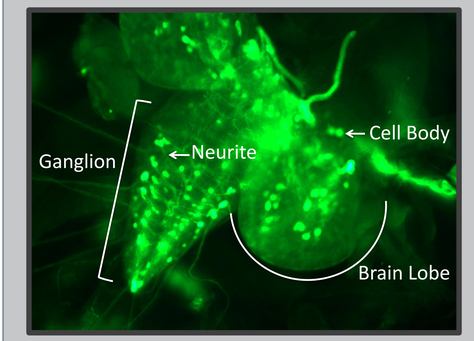

Figure 6: GFP Expression in dopaminergic and serotonergic neurons

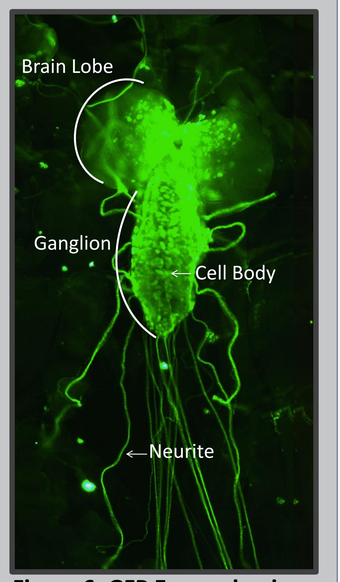

Figure 6: GFP Expression in glutamatergic neurons

To Come:

EKO GAL4-UAS lines for cholinergic, dopaminergic, serotonergic, glutamatergic, and tyraminergic interneuron populations will be crossed with the GCAMP line.

- Record larvae in 360 degree footage to analyze change in muscle contraction patterns
  - -Physical manifestation of interneuron populations specific behavioral role visualized
- Dissect larvae for brain/ganglia isolation and stain for GFP
  - -Location of knocked out interneuron populations visualized
- Honors thesis: *Effects of Specific Interneuron Populations on Muscle Contraction Patterns in Drosophila melanogaster during Crawling Behavior* on the role of interneuron populations in locomotor control as seen in the crawling behavior of Drosophila larvae.

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References:

Lee T, Luo L. 2001. Mosaic analysis with a repressible cell marker (MARCM) for *Drosophila* neural development. *Neurosci.* 24:251-254.