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Mary Catherine Decker  
*College of Saint Benedict/Saint John's University*

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# DEVELOPMENT OF A SYSTEM FOR ANALYSIS OF MUSCLE CONTRACTION PATTERN DURING CRAWLING BEHAVIOR

MARY CATHERINE DECKER AND JENNIFER SCHAEFER

DEPARTMENT OF BIOLOGY

COLLEGE OF ST. BENEDICT | ST. JOHN'S UNIVERSITY

## 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.

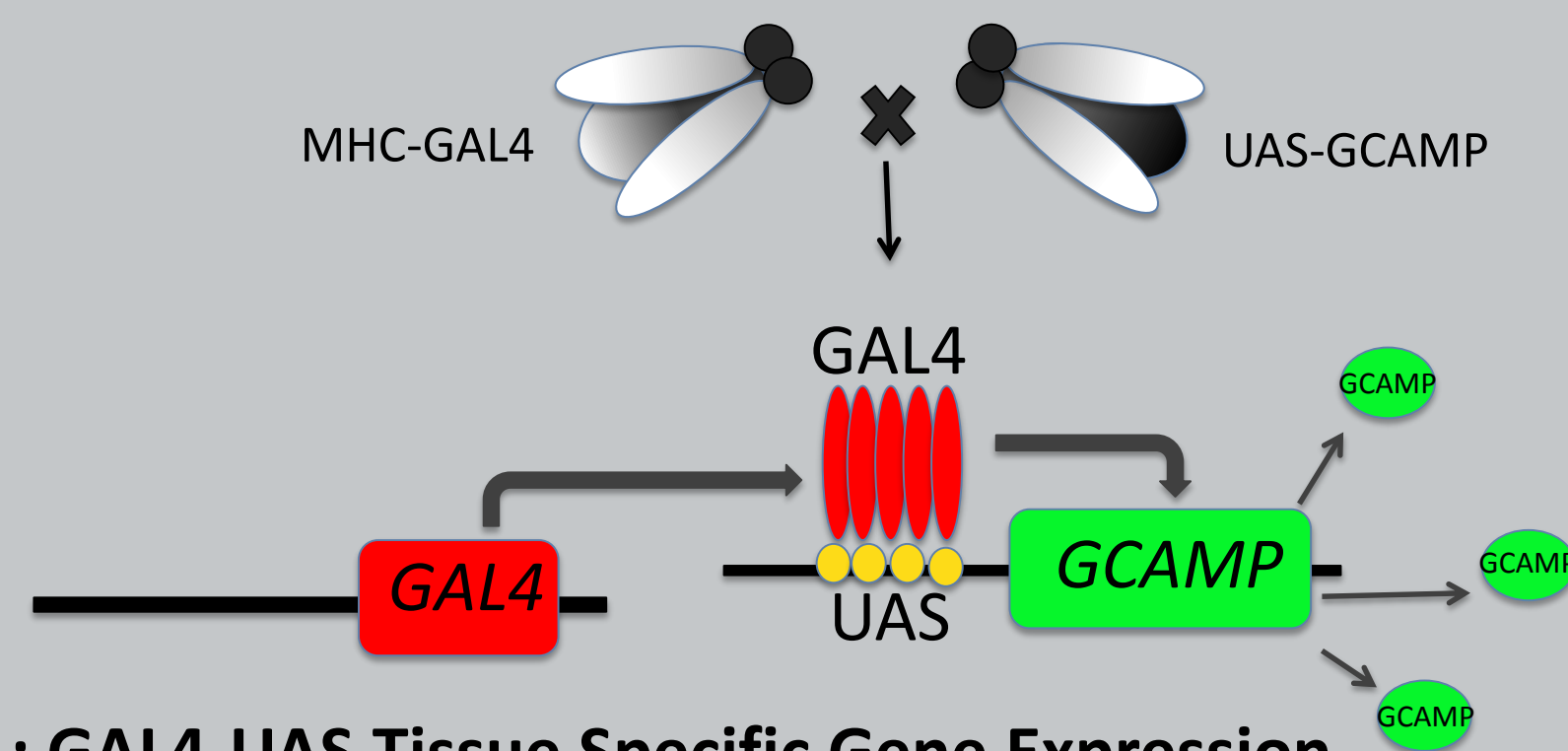


Figure 1: GAL4-UAS Tissue Specific Gene Expression

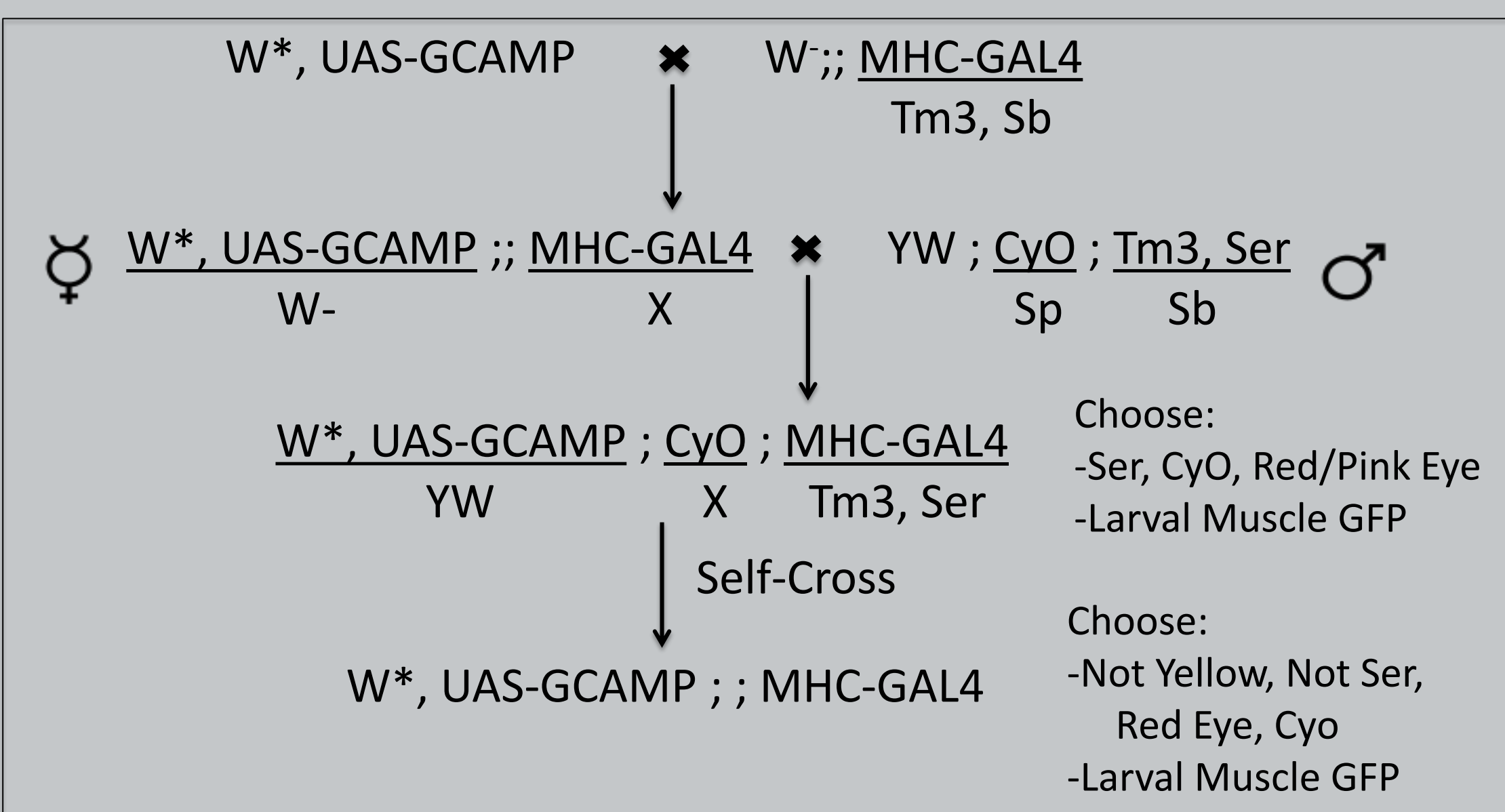


Figure 2: Homozygous MHC-GAMP | UAS-GAL4 Cross Plan

## THE MECHANICS:

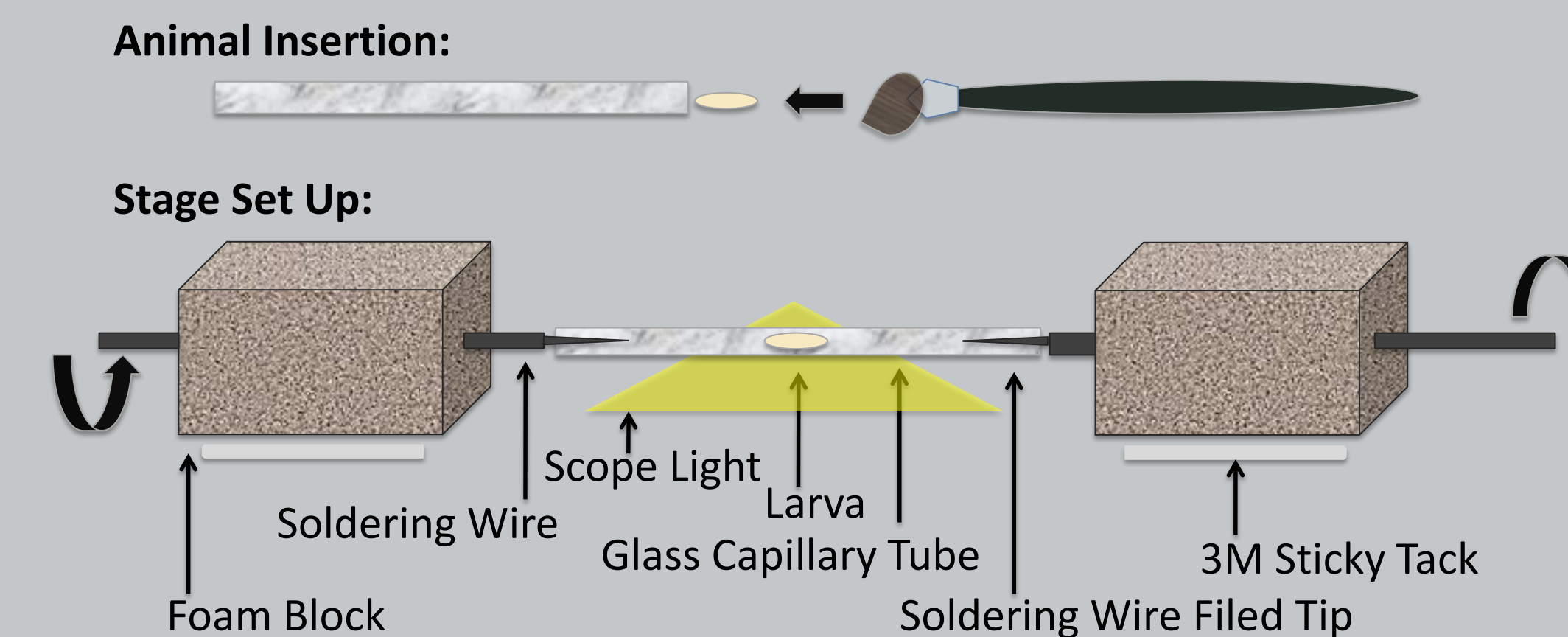


Figure 3: Florescent Microscope 360 Degree Footage System

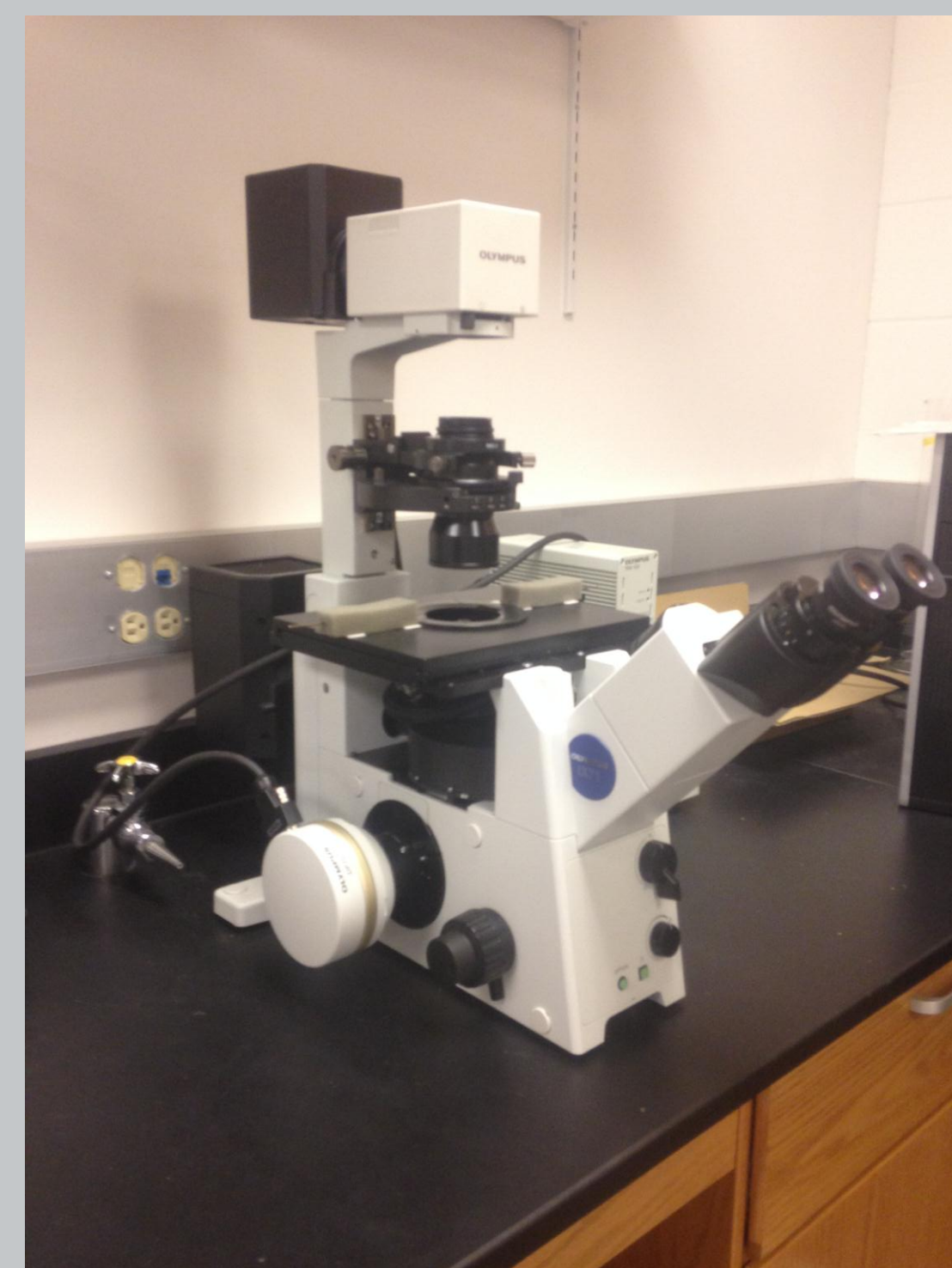


Figure 4: Florescent Microscope with 360 Degree System



Figure 5: Still Frames of GCAMP Expression in Various Muscles

## THE OUTCOME:

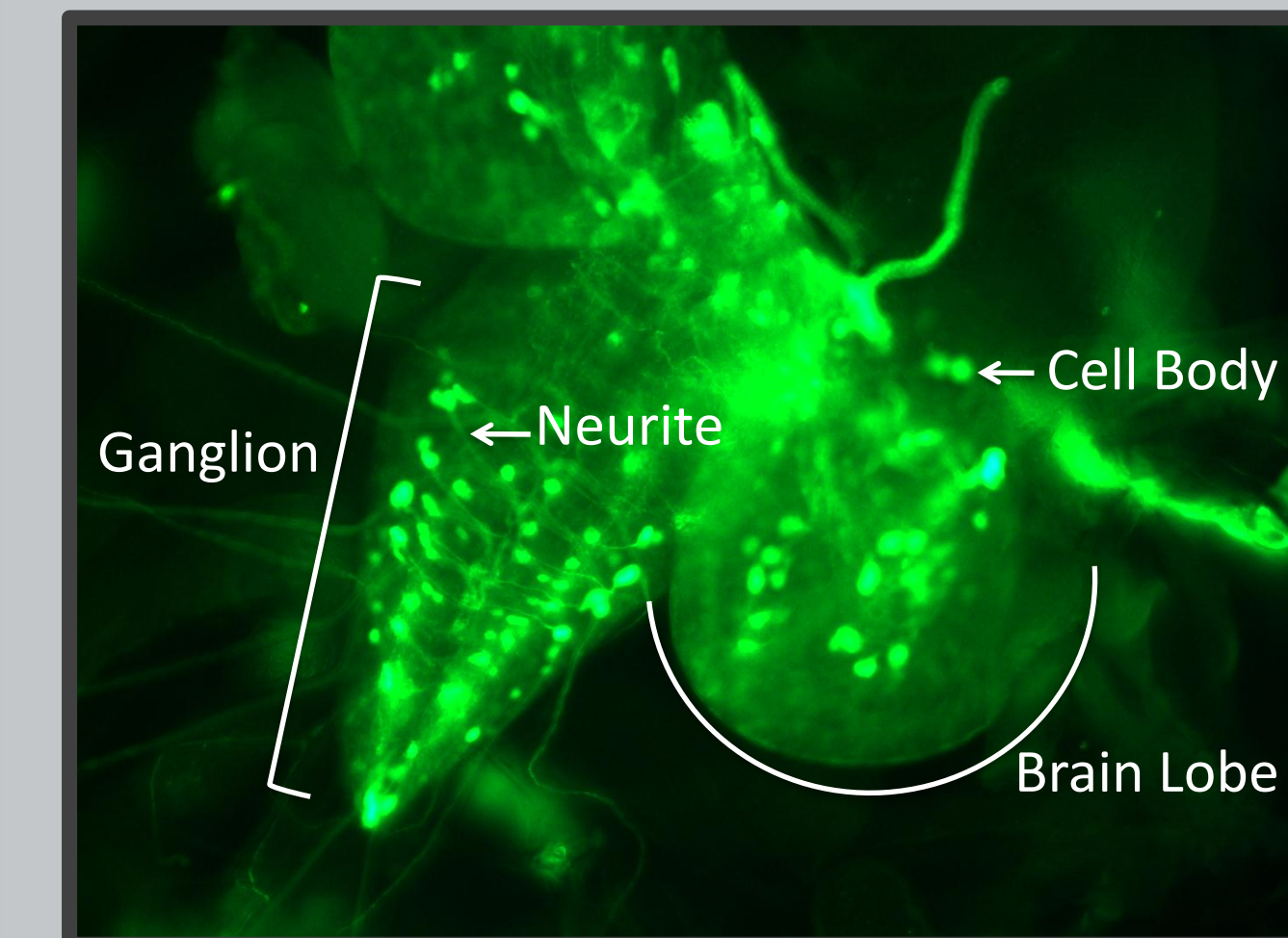


Figure 6: GFP Expression in dopaminergic and serotonergic neurons

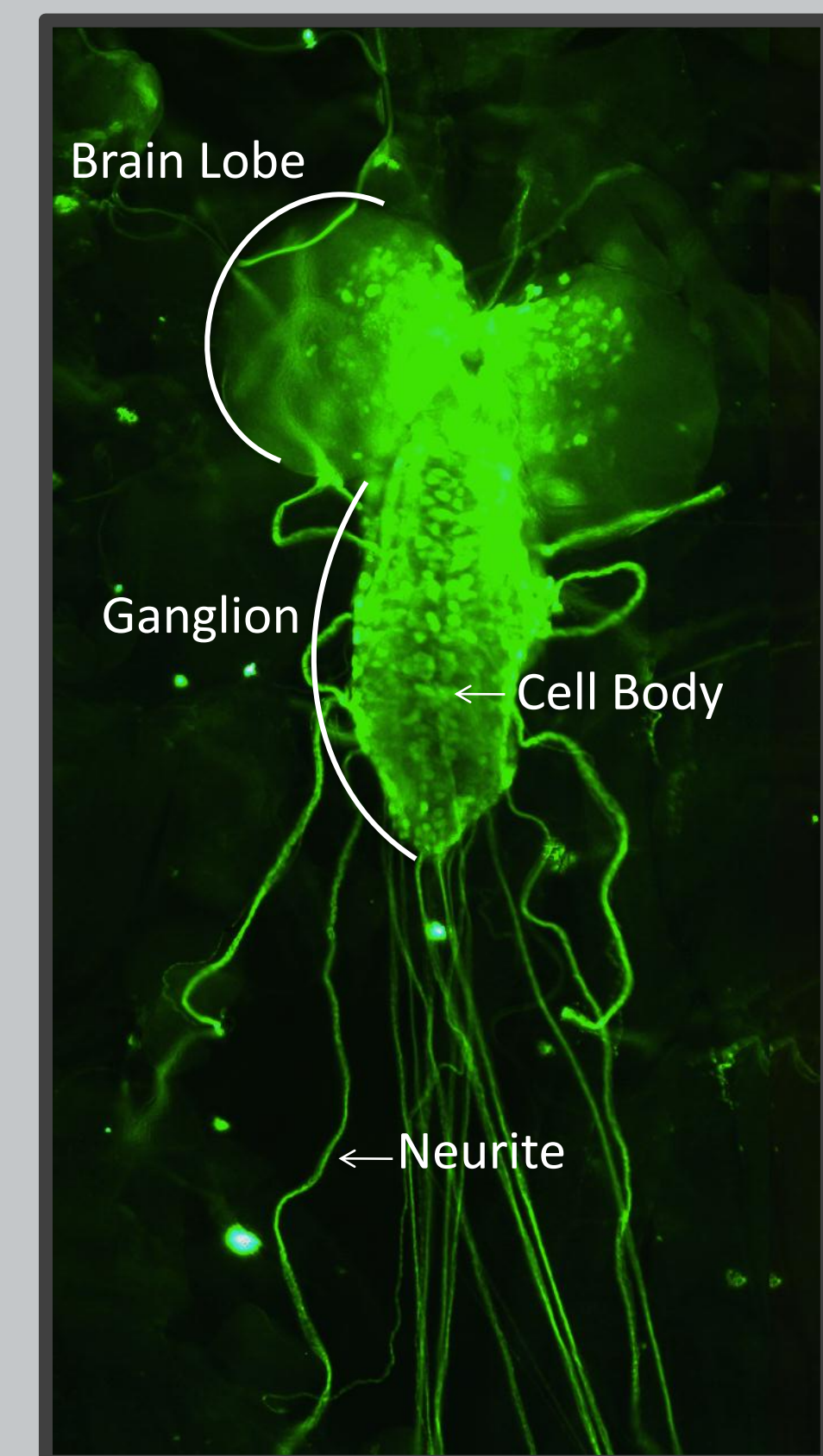


Figure 6: GFP Expression in glutamatergic neurons

### To Come:

EKO GAL4-UAS lines for cholinergic, dopaminergic, serotonergic, glutamatergic, and tyraminergetic 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.