SURF 2016: Second Progress Report

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Project: *Quantitative measurements of olfactory perceptual thresholds in Drosophila*
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Progress

My project compromised of two major components: designing and manufacturing a purpose-built chamber to run odor-driven behavioral experiments in, and running such experiments to make quantitative measurements of performance limits of odor-driven behavior in *Drosophila.* Now, at the end of week 7, I have completed the first of these major components and the purpose-built chamber is set-up and ready to run experiments in. I had predicted the chamber to take me between 6-7 weeks to fully set-up, and to spend 3-4 weeks running experiments and collecting data, so I am on track for finishing all of the goals I set for myself at the start of the SURF.

Methods for Building Chamber

I fully constructed the behavioral chamber in which I will run my experiments over the next three weeks, and in which another student who may take over the project in the fall will be able to run experiments. The steps I have taken over the last seven weeks to build the chamber (in chronological order) are listed below:

- Acrylic sheets were cut out using a laser cutter to house the flies. This section forms the main part of the chamber. The chamber is built of five layers, a base layer, a ventilation layer, a PCB layer, a layer where the Drosophila will be housed, and a cover/loading layer.
- The PCB board to provide electric shocks to the flies was designed and ordered, and successfully provides a 60V electric shock to the flies in the chamber
- A framing for the chamber was constructed from railing to keep everything in places
- Infrared LED panels were constructed to illuminate the chamber
- A pointgrey CCD camera was installed to visualize the Drosophila in the chamber. Image acquisition software was installed on MATLAB and fly tracking software (Ctrax and JAABA) were installed and successfully tracked the flies movements in the chamber in test trials.
- Mass flow controllers were installed to control the flow of air into the system and MATLAB code was compiled to control these mass flow controllers remotely
- A circuit was assembled to control valves to switch between odors in the set-up and a DAQ board was installed and MATLAB code compiled to control these valves remotely

With all of these steps now complete the system is ready for flies to be loaded and

presented with odors for training (via electric shock) and testing (movements tracked via the camera and processed using tracking software).

Goals for end of projection

Over the next three weeks I hope to run experiments in the chamber. In these experiments I plan to train the flies at varying concentrations of odors and test them at varying concentration. This will allow me to see how far along the concentration curve in either direction and in both testing and training the flies maintain learned aversion.

I hope that this data will help me to quantify performance limits on odor-driven behaviors in *Drosophila* and to see how odor-driven behavior varies along the concentration curve.