**BGY 440: Population Genetics and Evolution**

**Fall 2016**

**Bi-directional Selection in *Drosophila***

The goal of this experiment is for you to manipulate the phenotype of subpopulations of *Drosophila melanogaster*. By choosing a phenotypic characteristic and then only allowing the extreme phenotypes to breed, you will be able to: 1) measure the selective pressure that you apply on the population, 2) measure the selective response of the population, and 3) calculate heritability scores (which measure the response relative to the selective pressure). All of these calculations are important in both artificial selection (it is important for a breeder to know whether a trait will respond to selection) and natural selection (populations that cannot respond go extinct; populations that can respond can persist).

**Protocol:**

You and your group members need to decide what aspect of the phenotype you will manipulate. Here are some possibilities:

**Physiological:**

These would be neat to try, but you’ll have to be creative with respect to scoring the phenotypes - you have to be able to collect the flies as they respond. So, you expose a population of flies to an environmental variable (heat, cold, chemical, anaesthetic) and you selectively breed for sensitivity and resistance.

Sambucetti, P., F. Scannapieco, & M. Norry. 2010. Direct and correlated responses to artificial selection for high and low knockdown resistance to high temperature in *Drosophila buzzatii*. J. Thermal Biology 35:232-238.

**Morphological:**

This might be labor intensive, but you examine/measure individual flies and select for some morphological trait. This has been done for bristle number, eye size, body size, and pigmentation.

Ramniwas, S., Kajla, B., Dev, K., & Parkash, R. (2013). Direct and correlated responses to laboratory selection for body melanisation in *Drosophila melanogaster*: Support for the melanisation-desiccation resistance hypothesis. *Journal of Experimental Biology, 216*(7), 1244-1254. doi:http://dx.doi.org/10.1242/jeb.076166

**Developmental:**

Developmental rate and larval behaviors can be selected for, too. You could select for slow and fast developmental speed, or pupation height in the vial.

Ruiz-Dubreuil, G., Burnet, B., Connolly, K., & Furness, P. (1996). Larval foraging behaviour and competition in *Drosophila melanogaster*. *Heredity, 76 ( Pt 1)*, 55-64. Retrieved from http://search.proquest.com/docview/77969619?accountid=11012

**Behavioral:**

These may be easy to screen (because it is done at the population level), but response to selection may be slow because so many factors influence behavior. You could screen for disturbance response, running direction (geotaxy in a maze), aversion/attraction to a chemical or environmental variable (light, gravity), clinging ability, etc.

Hoffman, AA. 1983. Bidirectional selection for olfactory response to acetaldehyde and ethanol in Drosophila melanogaster. Genetics Selection Evolution 1983, **15**:501-518 DOI: [10.1186/1297-9686-15-4-501](http://dx.doi.org/10.1186/1297-9686-15-4-501)



