Project 2 - Genetic Drift in Populations of *Drosophila melanogaster*

Purpose: We will test the hypothesis that genetic drift is greater in small populations than in large populations.

Genetic drift is an important issue in population genetics. Genetic drift occurs when allele frequency in a population changes from one generation to the next because of random differences among individuals in reproductive success. For example, in Dall sheep in Denali National Park, less than half of newborn lambs survive to reproduce. Which lamb lives and which dies depends largely on predators who take the first lamb they find. Hence, it is pretty much chance who survives to reproduce and who dies; it has nothing to due with having good genes or bad genes; it's just a matter of who gets spotted first. As a result, the survivors represent only a *random* sample of the original newborns. In a large population, this sample of survivors is large enough that it will generally be representative of the entire cohort at birth. But, in a small population, the few survivors might, by chance, deviate significantly from the original cohort. When these survivors go on to reproduce, the cohort of offspring they produce may be significantly different from the cohort they were born into. Because sampling error is greater in a small population than a large, genetic drift should be greater in small populations than in large populations.

Some population geneticists argue that for many genetic loci and for many genetically determined traits, genetic drift may be as important or more important in determining evolutionary patterns than natural selection. This approach has been called the Neutral Theory of Evolution. Contrast this with the Theory of Evolution by Natural Selection originally developed by you know who.

Although we will not be studying population genetics until the end of the semester, we will be collecting data from this experiment throughout the semester. At the end of the semester we will use these genetic data in combination with lecture material to discuss natural selection and genetic drift.

During the semester, we will be raising large and small populations of the fly *Drosophila melanogaster* for three generations. Each generation will take about three weeks, so we will have plenty time to examine the data. In each generation, we will control the number of adults that contribute to the next generation.

Today we will set up populations of flies. Each lab will be divided into four teams. Two teams will examine allele frequencies in a large population ($N = 25$); two teams will examine allele frequencies in a small population ($N = 4$). The large population isn't very large but who wants to count 200 flies, and theory says the difference in population size should still great enough that we will get an interesting result. But, who knows - we're dealing with real organisms here!

We will randomly select flies that survive to reproduce in our populations; the others we will release out the window. We are essentially acting out the role of predators in the population of Dall sheep described above. The predators leave a random sample of survivors among the newborns each year; we select a random sample of flies in each generation to survive and reproduce. Just like nature! Right!

We don't need to worry about selecting flies for our next generation until the first generation emerge. This will be in three weeks. Today we just need to start our populations with a controlled, starting allele frequency. Your TA will show you how we will accomplish this.