# Study Guide for Exam 3

Tuesday, April 16, 2019

This study guide will grow with a new section added after each lecture, so please revisit it often! Pace your studying so that you master each set of concepts before the next lecture.

## Tuesday, March 12: Introduction to natural selection

- What are the three ingredients required for natural selection?
- What is the result of natural selection?
- When does natural selection not lead to evolution?
- What is the difference between viability and fecundity?
- Define fitness (Darwinian fitness, not physical fitness)
- Does “survival of the fittest” accurately describe natural selection? Why or why not?
- What tends to happen to populations of daisies that become established on small islands?
- Why did soapberry bugs in Florida evolve smaller beaks whereas those in south-central US evolved larger beaks?

## Thursday, March 14: Natural selection at a single locus

- What gene controls bony armor in threespine sticklebacks? Is it dominant? If so, which allele is dominant?
- Threespine stickleback populations evolve when they become permanently trapped in inland freshwater lakes. Describe the typical evolutionary change that happens in these freshwater stickleback populations.
- What is a selective sweep? What is meant when the term “hitchhiking” is used in the context of a selective sweep?
- How does the G allele from the PtFT2 locus benefit European aspen living in the northern half of Sweden?
- Is it possible for a trait to become fixed in a population when it is not the underlying cause of fitness differences? (Hint: consider Fig. 3.14 in the textbook.)

## Tuesday, March 26: Modeling natural selection

- Be sure you can obtain allele frequencies if you are given genotype frequencies.
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- Be sure you understand how to calculate the mean fitness.

- Be sure you can compute genotype frequencies after selection given the fitness of each genotype and genotype frequencies before selection.
- What's the difference between the phrases "selected for" and "selected against"?
- Why did the dark melanic allele evolve to near fixation in British peppered moths? Why did the light colored allele evolve to near fixation in recent decades?
- Can a simulation of natural selection be used to solve engineering problems?