**Note: read through the shiny Instructions in the Introduction folder if you haven’t already, or have forgotten how to make shiny run.**

**Balancing selection, with or without genetic drift simulation.**

This simulator allows you to simulate over- and under-dominant selection. It can also combine selection and drift. Again, we follow evolution at a single locus with two alleles, ‘A’ and ‘a’in panmictic (random mating) populations of constant size. There is still no migration or mutation, so all of the allele frequency changes are due to either natural selection or random genetic drift.

**Input:**

*p,* the initial frequency of the A allele.

-The number of generations to allow the simulation to run

-Should the simulation include genetic drift? (deterministic = no genetic drift, stochastic = includes genetic drift)

If you select ‘stochastic’, two new options will appear, for the population size and for the number of replicates to simulate.

Should the simulation be at an overdominant or underdominant locus?

*wAA,* the fitness of the AA homozygote

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Here, *wAa*, the fitness of the Aa heterozygote, will be set to 1.

**Output:**

**Fitness of Genotypes**: The plot on the left shows the fitness scheme. Check that it fits the overdominant or underdominant scenario you are trying to simulate.

**Plots** There are two plots, each showing the results of the same simulation in different ways:

1-The top plot on the left shows the frequency of the A allele over generations since the start of the simulation. The dotted line shows the expected equilibrium allele frequency. Results from additional populations are shown as additional lines.

2-The bottom plot on the right shows the outcome of the simulations at the last generation simulated (which depends on what you set in the slider on the left). It shows a histogram of the final allele frequencies for different populations.

Answer the questions below to make sure you understand the simulation.

Press escape to end the simulation when you are done.

1. **Overdominance.** Set up a simulation with overdominant selection, an equilibrium allele frequency somewhere between 0 and 1 (check the dotted line in the top plot on the right) and enough generations to see the final outcome.
   1. Using a deterministic simulation, start with an allele frequency above/below/and exactly the equilibrium frequency. What happens to the allele frequency in each case? Explain how these results show how overdominance does or does not maintain genetic diversity.
   2. Repeat with a stochastic simulation. Does genetic drift change the overall picture?
2. **Underdominance.** Set up a simulation with underdominant selection, an equilibrium allele frequency somewhere between 0 and 1 (check the dotted line in the top plot on the right) and enough generations to see the final outcome.
   1. Using a deterministic simulation, start with an allele frequency above/below/and exactly the equilibrium frequency. What happens to the allele frequency in each case? Explain how these results show how underdominance does or does not maintain genetic diversity.
   2. Repeat with a stochastic simulation. Does genetic drift change the overall picture?