Population Genetics with Selection Worksheet

[please leave this comment intact. PGS designed and created by Stephen Gasior and Eva Comaroski. More info and sample worksheets can be found at: http://was.fm/secondlife:population_genetics_and_selection Feel free to modify this worksheet in whatever way suits your course design, but please leave this attribution and persistent link embedded in any wide copy redistribution. Fine to delete for assignment sheets]

WARNING: Imprudence Viewer will not work because it doesn't support dialog box text input

You should already have an avatar registered with Second Life and know the basics of the interacting and navigating controls
Open this SLURL to get to the activity

Look around until you see a large circle and follow any navigation signs. Click anywhere on the disk and a menu will appear in the top right corner of your screen. If there are already moths or bird flying around, click the "Stop" button to clear the PGS.

This menu with several options.

Robins – opens a box to input # of them
Bark – configures the environment type
in another menu between brown, black, and green
Moths – opens a box to input # of them
p – change the starting frequency of the dominant allele

Set the following practice parameters

robins 4, moths 20, p=0.5, land green
then click Run! (stopwatch instructions)

You will see robins and moths, both brown (about 5) and black (about 15), appear in front of the disk. The robins will start to fly around and occasionally eat a moth which will be accompanied by a noise that kind of sounds like a squeeze toy.

Pan your camera (click the "camera controls" button at the bottom of your screen to get the controls OR hold down the *Alt* key and left-click with your mouse to move your camera) to the yellow and brown ball and look at the floating text. It includes the total number of moths (always check you counts later with this total) as well as the elapsed time.

When the timer reaches 3 minutes, click on the machine again and this menu will pop up. click "Pause." Look at the disk
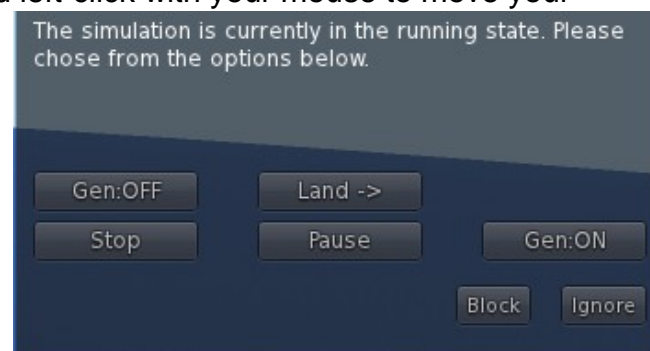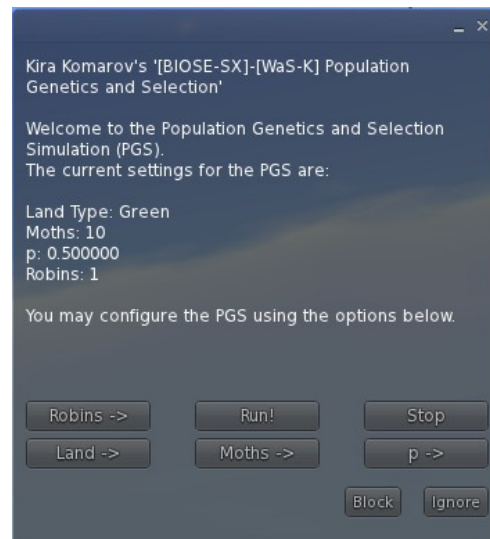
again, the coloration of the disk will change to white and the robins will stop flying and consuming moths. Now count the # of each type of moth and fill in the blanks below. You might need to use your camera controls again.

1) number of brown moths _____, number of black moths _____.

click the menu "Unpause" button to resume running the simulation but immediately press "Stop"

If you press "unpause" then the simulator will resume where it left off (look at timer, same elapsed time as when you stopped it). We wish to collect data several times in this exercise, so "Stop" will clear the moths and birds (give it time to do so, look at the text in the bottom left corner of your screen). To run it a second time with the SAME initial settings, just click "RUN!" and a fresh set of moths (20) and birds (4) will come up and *p* will be back to 0.5. If you look at the elapsed time text again, you'll see the timer has reset.

Your initial activity is to see the effect of environmental change from a common starting point. You have 3 sets of conditions but will run each experiment 3 times with each setting. Make sure you stop and clear the moths and birds in between runs.

Common settings:Sets 1-3:
robins 4, moths 20, p=0.5 (set this at the very beginning of the experiment)
elapsed time: 5 minutes (watch the timer or use your own stopwatch)

Set 1: bark to green
Set 2: bark to brown
Set 3: bark to black

Settings:	#black moths	#brown moths	q^2	Final p
Green bark				
Green bark				
Green bark				
Brown bark				
Brown bark				
Brown bark				
Black bark				
Black bark				
Black bark				

Go back and calculate q^2 p and final p frequencies and answer the following questions.
q^2 = # brown moths/total number of moths
p = 1- q

Questions:

What is your general impression of how the environment affects the population of the moths? Why do you think this is case?

Is there a difference in the <u>rate of change</u> for the recessive (*bb*, brown) phenotype versus the dominant (*BB* or *Bb*, Black) phenotypes when under positive selection in set 2 versus set 3 (brown and black environments)? How much change from $p = 0.5$ was there in each case?