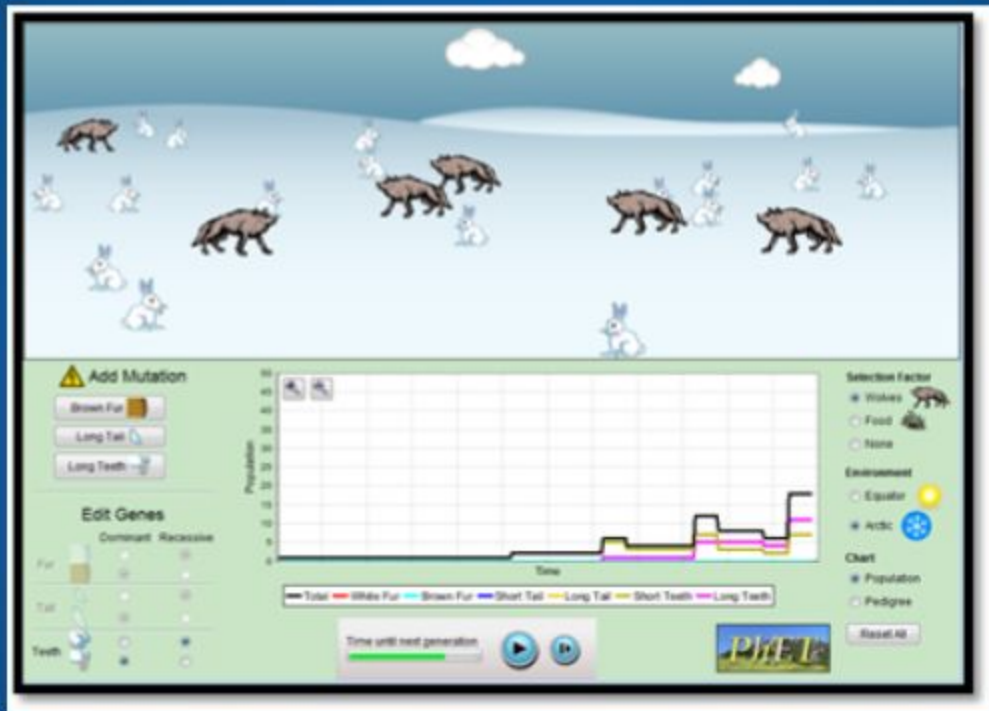


NATURAL SELECTION COMPUTER SIMULATION



READ THE PASSAGES:

NATURAL SELECTION

All species of animals look different and even the different individuals within a species look different. Think about how different people look and we are the same species! The reason species look different is because they all play a role in the environment and have adapted over time to survive where they live. These different looks are called **traits** and these traits can play an important role in whether individuals and/or populations survive. The process by which organisms that are better adapted to their environment tend to survive and produce more **offspring** is called **Natural**

Selection. The **genes** that all organisms have in their **DNA** are the instructions for making these traits as they grow from babies into adults. For example, a bunny that lives in the snow and has genes for white fur is more likely to survive and produce more offspring. Sometimes these genes randomly mutate/change and a mutation can have either a neutral effect (not bad or good), a negative effect, or a positive effect on the individual.



Variations of traits in animals or plants arise from mutations, but they cannot be controlled by that organism. Random mutations are spontaneous changes within an organism's DNA. The environment determines if certain traits will help an organism **adapt**. For example, if the bunny in the picture gave birth to a brown bunny, the chances of that brown baby bunny surviving long enough to produce offspring are very low. This would be an example of a **negative mutation**. However, what if the bunny pictured gave birth to a bunny even closer to the color of snow? You guessed it! A longer life and more offspring are more likely for the white-as-snow bunny. Adaptations that help an organism to better survive and reproduce are called **positive mutations**.



Instead of genes mutating or changing, sometimes the habitat or environment that a species lives in changes and makes a population decline in numbers. Quite often humans have changed habitats by building homes and destroying habitat. This can cause **limiting factors** that prevent a population from growing any larger. There are different limiting factors that exist in habitats and they work together with each other in various ways. These different factors consist of **biotic factors**, living things like the bunny, and **abiotic factors**, nonliving things like the snow it tries to blend in with to avoid **predators**.

WATCH THE VIDEO:



STUDENT DIRECTIONS

- Students SHOULD NOT run file in Presentation mode, or they will not be able to manipulate the answer choices. If time permits, they MAY use presentation mode to present their findings.
- Click in the colorful spaces to fill in the blanks.



A screenshot of the Java website. The top navigation bar is red with the Java logo, a search bar, and links for 'Download' and 'Help'. Below the navigation bar, there's a 'Help Resources' section with links like 'What is Java?', 'Browsers Other Versions', 'Create Java', 'Error Messages', 'Troubleshoot Java', and 'Other Help'. The main content area is titled 'Download Java for Windows' and shows the 'Recommended Version 8 Update 341 (Filesize: 1.97 MB)' with a release date of January 14, 2020. A yellow callout box highlights an 'Important Oracle Java License Update' dated April 16, 2019, explaining that the new license is different from previous ones and that commercial license and support are available for a fee. A black arrow points from the 'Important Oracle Java License Update' section to the yellow callout box on the right.



Some computers require Java to run this simulation. It's an easy download and it's free. Just Google "Java Free Download"



CLICK [HERE](#) AND FOLLOW THE DIRECTIONS BELOW

Click on simulations, then Biology, then Natural Selection, then Download, then Open and lastly click on Accept and Continue.

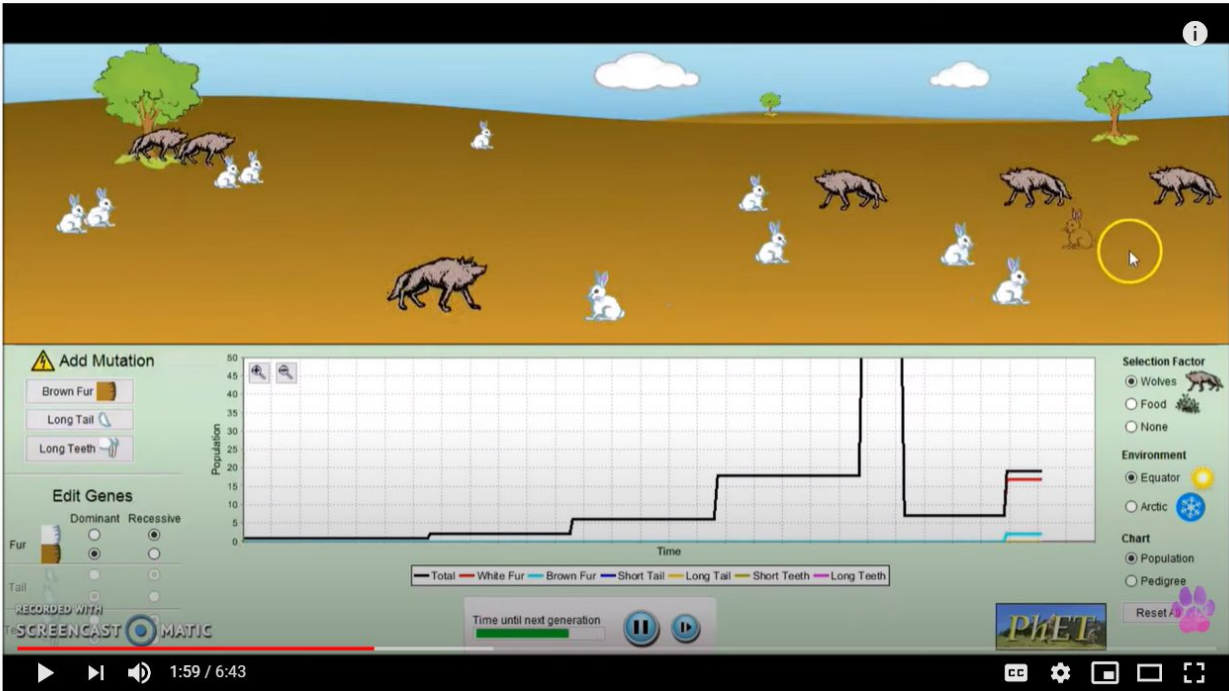
Take a look at the following options, to become familiar with the simulation:

1. Add a friend function
2. Add Mutation (must be selected AFTER “Add a friend” for the mutation to happen)
3. Selection Factors
4. What do the “X” and “Y” axis represent?
5. Environment
6. Time for next generation
7. The “fast forward” control

NOW FILL IN THE TABLES ON THE NEXT SLIDES AND FOLLOW THE DIRECTIONS IN THE LEFT HAND COLUMN.

CLICK [HERE](#) FOR THE VIDEO IF THE SIMULATION DOESN'T WORK

YouTube Search



The simulation interface is divided into several sections. At the top is a landscape with brown hills, green trees, and a blue sky with white clouds. Various animals are scattered across the landscape: grey wolves and white rabbits. A yellow circle highlights a small brown rabbit on the right side of the landscape. Below the landscape is a control panel. On the left, there is an 'Add Mutation' section with buttons for 'Brown Fur', 'Long Tail', and 'Long Teeth'. Below that is an 'Edit Genes' section with 'Dominant' and 'Recessive' radio buttons for 'Fur' and 'Tail'. In the center is a large graph with 'Population' on the y-axis (0 to 50) and 'Time' on the x-axis. The graph shows a black line representing the total population, which has several steps up and down. Below the graph is a legend with colored lines corresponding to different traits: Total (black), White Fur (red), Brown Fur (blue), Short Tail (yellow), Long Tail (orange), Short Teeth (green), and Long Teeth (purple). On the right side of the control panel, there is a 'Selection Factor' section with radio buttons for 'Wolves', 'Food', and 'None'. Below that is an 'Environment' section with radio buttons for 'Equator', 'Arctic', and 'Tropical'. At the bottom right, there is a 'Chart' section with radio buttons for 'Population' and 'Pedigree', and a 'Reset All' button. At the bottom of the interface, there is a 'RECORDED WITH SCREENCAST MATIC' watermark, a 'Time until next generation' progress bar, and a 'PHET' logo.

1:59 / 6:43

Natural selection. PhET Simulation

28,692 views • Nov 16, 2016

121 40 SHARE SAVE ...

EXPLORE

<i>DIRECTIONS</i>	<i>ABIOTIC FACTOR CHANGED</i>	<i>BIOTIC FACTOR CHANGED</i>	<i>MUTATION ADDED TO REACH 70</i>
<ol style="list-style-type: none">1. Make the White Rabbit population reach at least 70 individuals by "Adding a friend"2. Identify what biotic factor you changed,3. Identify what abiotic factor you changed and the mutation you added to reach 70 in the columns to the right.	Short teeth white fur	Made it to the arctic	Long tail

EXPLAIN

Explain why the white rabbit population was able to reach 70 individuals. Use the terms biotic, abiotic, limiting factor, predator, offspring and positive mutation in your explanation:

Because the biotic change was the arctic, this means that they can hide more from predators. They produced more offspring when all of this happened.

EXPLORE

<i>DIRECTIONS</i>	<i>ABIOTIC FACTOR CHANGED</i>	<i>BIOTIC FACTOR CHANGED</i>	<i>MUTATION ADDED</i>
<p>1. Now reduce the White Rabbit population by changing biotic factors, abiotic factors and adding a mutation.</p> <p>2. Indicate what you changed in the columns on the right.</p>	Long teeth	arctic	Brown fur

EXPLAIN

Explain why the white rabbit population declined. Use the terms biotic, abiotic, limiting factor, predator, offspring and negative mutation in your explanation

The biotic change was that they were in the arctic and they had an abiotic change of long teeth. The mutation was that they had brown fur. They couldn't produce offspring if they were dead.

EXPLORE

<i>DIRECTIONS</i>	<i>ABIOTIC FACTOR CHANGED</i>	<i>BIOTIC FACTOR CHANGED</i>	<i>MUTATION ADDED</i>
<p>1. Now make the brown rabbit population take over the White Rabbit population by changing biotic factors, abiotic factors and adding a mutation.</p> <p>2. Indicate what you changed in the columns on the right.</p>	Brown fur	Equator biome	Brown fur

EXPLAIN

Explain why the white rabbit population was taken over by the brown rabbits. Use the terms biotic, abiotic, limiting factor, predator, offspring, positive and negative mutation in your explanation:

Because with the biotic change of the equator biome and the abiotic change of the brown fur they were able to produce offspring without being killed by predators.

EVALUATE

1. How did the simulation simulate Natural Selection?

By killing off the wrong color rabbit of the biome

2. What were the main differences between the environments?

One was white the other was brown

3. How do certain factors influence an organism's ability to survive in its habitat?

They can give away positions like a long tail

EVALUATE

4. Why do you think the wolves eat the white bunnies in the equator environment?

Because they can see them very easily

5. How do mutations change a species?

They can make physical changes to their bodies and get them killed off

6. How do mutations affect an organism?

They can make physical changes to their bodies and get them killed

EVALUATE

7. How do animals adapt in different seasons?

They can change color

8. What happens when you add the mutation for longer teeth?

They can get spotted more by the wolves

9. What parts of the simulation are biotic?

The climate

10. What parts of the simulation are abiotic?

Brown or white fur