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Virtual Lab: Population Biology

How to get there: ( [biol.co/paramec1](https://biol.co/paramec1) ) or <http://glencoe.mheducation.com/sites/dl/free/0078757134/383928/BL_04.html>

Alternately: type virtual lab population biology into google to find the page.

**Read the following information on Paramecium:** The genus *Paramecium* consists of unicellular species of protists that live in freshwater environments. Under ideal conditions-sufficient food, water, and space-populations of these species grow rapidly and follow a pattern known as exponential growth. **Exponential growth** is explosive population growth in which the total number of potentially reproducing organisms increases with each generation. However, populations of organisms will not increase in size forever. Eventually, limitations on food, water, and other resources will cause the population to stop increasing. When a population arrives at the point where its size remains stable, it has reached the carrying capacity of the environment. The **carrying capacity** is the greatest number of individuals a given environment can sustain. Competition for resources among members of a population **(intraspecific competition)** places limits on population size. Competition for resources among members of two or more different species **(interspecific competition)** also affects population size. In a classic series of experiments in the 1930s, a Russian ecologist, G.F. Gause, formulated his principal of competitive exclusion. This principle states that if two species are competing for the same resource, the species with a more rapid growth rate will outcompete the other. In other words, no two species can occupy the same niche. In competing populations of organisms, genetic variations that reduce competition are favored through natural selection. Suppose two species (A and B) compete for the same food source. Individuals of species A can also use another food source, which reduces the competition over the food source needed by species B. The individuals of species A that can use another food source survive because they do not have to compete with individuals of species B for that food. In nature, organisms frequently invade unoccupied habitats simply to avoid intense competition. Once the organism is in a new habitat, any variations that allow it to use the available resources will tend to be perpetuated through the population. In this way, the genetic makeup of the population may slowly change, and the species will become adapted to a new niche.

**Instructions:**

Go to: ( [biol.co/paramec1](https://biol.co/paramec1) ) or <http://glencoe.mheducation.com/sites/dl/free/0078757134/383928/BL_04.html>

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* Begin by filling the test tubes with samples from the stock culture in the flasks.
* Click the bulb at the top of the pipette to fill the pipette with culture.
* Click and drag the pipette to a test tube.
* Fill the three test tubes with *P. aurelia*, *P. caudatum* and or a combination of both. (Note: There is rice in the test tubes. The rice is food for bacteria, which in turn will be food for the Paramecium. The two species of Paramecium do not prey upon each other.)
* Click the Journal button to open and complete the FIRST question so you can move on with the lab.
* Make sure you are inputting the data on the answer sheet provided which will be submitted back to your teacher by email or in Schoology.
* Click the microscope on the back shelf to go to the lab bench. Then you will make wet mounts of the samples.
* Click the clean microscope slides box to set up a slide.
* Click the test tube to prepare wet mounts of the sample.
* Click and drag the three wet mounts to the stage of the microscope for viewing for 0 days. Count/Estimate the number of cells of each paramecium.
* If needed: Click the grid ON button for help with counting.
* Record your answer on your separate answer sheet.
* Click the clear slide button.
* Click the calendar to advance it by two days. Then get a new set of clean slides, place samples on them and count the number of Paramecium you see.
* Continue the steps above until the Table is complete on your answer sheet and you have recorded all three test tubes data for the 16 days.
* Click the table button to record your data (NOTE: The well in the microscope slide holds 0.5 mL.) You NEED to **multiply by 2 the number of cells** you counted or estimated in order to obtain the concentration per mL.
* Click the graph button and analyze the graph.
* Answer all questions on answer sheet based on your results.

**Analysis Questions:** Answer on the separate answer sheet provided

1. What are the objectives for this experiment? (you can summarize)

2. Make a hypothesis about how you think the two species of Paramecium will grow alone and how they will grow when they are grown together.

3. Explain how you tested your hypothesis.

4. On what day did the *Paramecium caudatum* population reach the carrying capacity of the environment when it was grown alone? How do you know?

5. On what day did the *Paramecium aurelia* population reach the carrying capacity of the environment? How do you know?

6. Explain the differences in the population growth patterns of the two Paramecium species. What does this tell you about how *Paramecium aurelia* uses available resources?

7. Describe what happened when the Paramecium populations were mixed in the same test tube. Do the results support the principle of competitive exclusion? (You may need to briefly explain competitive exclusion.)

8. Explain how this experiment demonstrates that no two species can occupy the same niche.