

Virtual Genetics Lab (VGL) I

Objective

- To use your knowledge of genetics to design and interpret crosses to figure out which allele of a gene has a dominant phenotype and which has a recessive phenotype. This simulates a real lab in that there is no way to see if you've got the answer right. You will have to convince yourselves when you've done enough experiments to be sure.
- You will also develop a procedure for solving problems and save it to your section's Discussion Board for use when you solve more complex problems with this simulation.

Description

VGLII is a computer simulation of the genetics of an imaginary insect. The computer randomly picks a character with two traits. It then randomly chooses which form of the character will be dominant and which will be recessive. That way, each time you start the program, you get a different problem (also, every group will get a different problem). Finally, it creates a population of insects with random genotypes called the Field Population.

As in a real genetics lab, the insects are kept in cages; Cage 1 contains the Field Population. You can select any two insects (one must be male and the other female) and cross them; the computer automatically puts their offspring in a new cage.

The task:

To solve a problem generated by VGLII and develop a strategy for solving problems with this simulation. A solution is a genetic model that accounts for all your data.

Starting up VGLII:

1) You will work in groups of three people per computer. You may want to take turns using the computer. It is easy to fill the screen with cages of creatures and get totally confused so you should work slowly and deliberately and keep careful notes about the experiments you do and the contents of each cage. If you get very confused, you can quit the program and start fresh with a new problem.

2) The program runs all of the computers in the lab.

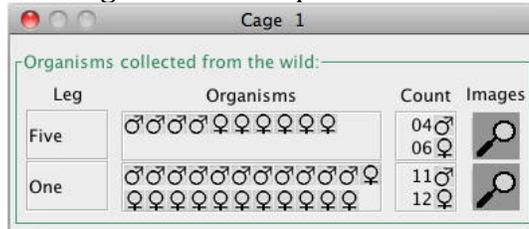
3) To run the VGLII program: double-click the VGLII icon in the dock at the bottom of the screen. The icon looks like a little fly.

4) If you want to read the manual, click on the VGLII Help bookmark at the top of the Welcome page. Note that the manual describes some features present in the version of VGL that you will not be using until later on in Bio 111.

5) Click on the **File** menu and choose **New Problem** to begin. Each time you start a new problem, the computer will choose a new set of traits and characters as well as the underlying genetic model. Note that a character with the same name may have different properties in a different problem.

Once you click "New Problem", a window will appear for you to select the problem you will work on. Double-click on the "VGL" folder and select "Level02.pr2".

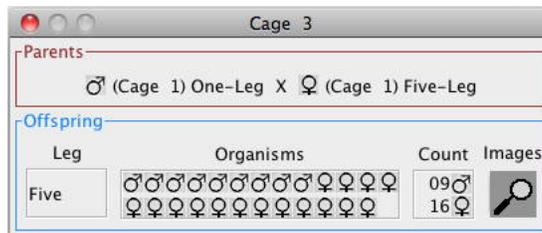
6) A cage will appear holding the "Field Population". It will look something like this:



In your case, the phenotypes involved will likely be different. Your task is to figure out which is dominant and which is recessive. You will determine this by designing crosses and analyzing the resulting offspring.

7) Begin your experiments. Select a male and a female fly to be the parents: click on one parent then click on the other parent. One parent must be male and the other female but they may come from different cages. Note that you can cross a given fly more than once.

To cross (also known as "mate") the selected flies, click the "Cross" button at the top of the VGLII window. A cage will appear with the resulting offspring. A typical result is shown below:



The information in this vial could also be presented in words:

"A male with one leg from Cage 1 (this is a translation of: "♂ (Cage 1) One-Leg")
was crossed with

a female with five legs from Cage 1 (this is a translation of: "♀ (Cage 1) Five-Leg")

This cross resulted in 25 (= 9 + 16) offspring:

9 males with Five Legs

16 females with Five Legs

8) Continue crossing as needed; the objective is to make a genetic model to explain the inheritance of the traits you are studying. You decide whether you're convinced or not; if not, keep crossing until you are. A complete model would look like:

"The number of legs is controlled by one gene with two alleles:

allele contribution to phenotype

F five legs (dominant)

f one leg (recessive)

9) When you are done with this problem, click the "Close Work" button at the top of the VGLII window. When it asks if you want to save your work, click "Don't save".



10) Finish by cleaning up the computer screen. Quit VGLII by clicking the box in the upper right corner of the window; you do not need to save your work.

11) As a class, discuss a general strategy for solving VGL problems. Your TA will record this on the board; some volunteers can then post it to your section's blog. You can then refer to it when solving VGLII problems in the future.

One possible strategy is as follows; you should elaborate it in your section:

1. Find 'conspicuous crosses' – crosses with 'surprising' or 'interesting' results. *What are these?* These will give you hints as to likely models.
2. Conduct some test crosses to see which if the likely models are correct.
3. Conduct some confirmatory crosses to be sure you're correct. *"If this were true, then if I crossed X and Y, I should get..."*

How to post to the class Blog

1. Log into **Blackboard** using your account.
2. Select **Bio 111**.
3. Find the blog for your lab section.
4. Follow the directions there for making a post.

If you have time, you should try as many problems as you can – they will help you with the exams. Here is a guide to the possible models you can find in the problems in the VGL folder:

- **Level01.pr2** 2-alleles only; autosomal inheritance only; simple dominance only; *practice mode*.
- **Level02.pr2** 2-alleles only; autosomal inheritance only; simple dominance only.
- **Level03.pr2** 2-alleles only; XX/XY sex-linked inheritance; simple dominance only; *practice mode*.
- **Level04.pr2** 2-alleles only; XX/XY sex-linked inheritance; simple dominance only.
- **Level05.pr2** 2-alleles only; autosomal, XX/XY or ZZ/ZW sex-linked inheritance; simple- or incomplete- dominance; *practice mode*.
- **Level06.pr2** 2-alleles only; autosomal, XX/XY or ZZ/ZW sex-linked inheritance; simple- or incomplete- dominance.
- **Level07.pr2** 2- or 3- alleles; autosomal inheritance only; simple-, incomplete-, circular-, or hierarchical- dominance; *practice mode*.
- **Level08.pr2** 2- or 3- alleles; autosomal inheritance only; simple-, incomplete-, circular-, or hierarchical- dominance.
- **Level09.pr2** 2- or 3- alleles; autosomal, XX/XY or ZZ/ZW sex-linked inheritance; simple-, incomplete-, circular-, or hierarchical- dominance; *practice mode*.
- **Level10.pr2** 2- or 3- alleles; autosomal, XX/XY or ZZ/ZW sex-linked inheritance; simple-, incomplete-, circular-, or hierarchical- dominance.

Lab report:

- There is no lab report for this lab.