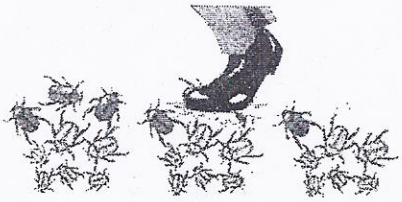
NAME _____ Class set

THE LIVING ENVIRONMENT

AVERILL PARK HS
Molecular Evolution

Driftworms: GENETIC DRIFT Simulation



INTRODUCTION

Evolution is the process by which modern organisms have **descended** from ancient **ancestors** over long periods of time. It is responsible for both the remarkable similarities we see across all life and the amazing diversity of that life. Evolution is often described as "descent with modification." But what exactly is being modified? Evolution only occurs when there is a change in **gene frequency** within a **population** over time. These resulting genetic differences can be passed on to the next generation over time (i.e., inherited), which is what really matters in evolution - long term change.

The major forces/mechanisms of change implicit in evolution are **mutations**, **recombination**, **migration** (gene flow in & out of a population), non-random mating, **natural selection** & **genetic drift**. These forces cause changes in **genotypes** & **phenotypes** over time and also determine the amount & kind of **variation** seen in a population. This simulation focuses solely on genetic drift.

Genetic drift is the **RANDOM** decrease in gene frequency within a population due to the role of "chance" and/or unpredictable "accidents." Small populations that are isolated from one another can differ greatly as a result of genetic drift. The cheetah is a great example.

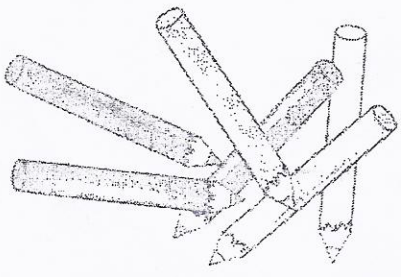
Let's examine a simple model of a population of fictional organisms called **driftworms**. Driftworms have only one gene that controls **skin color**. These worms reproduce **asexually** and are connected to their parents by lines. In any population of driftworms, each worm gives rise to exactly **one worm** in the next generation. There are five **alleles** (genes) that control skin color. In real life, some individuals have more offspring than others - purely by chance. The survival & reproduction of organisms is subject to unpredictable accidents. It doesn't matter how good your driftworm genes are if you get squished by a shoe before producing offspring!

- An ant may get stepped on
- A rabbit may get swept up by a tornado
- An elephant may drink a parasitic protozoan living in a puddle
- A plane may crash killing a Nobel Prize winner

None of the above events has anything to do with the dead organism's genotype and/or phenotype. These events occurred purely by chance.

MATERIALS

- Colored Pencils
- Driftworm Worksheet
- Single die



METHODS

1. On the **Driftworm Worksheet**, color each of the five worms in **Generation 0** (zero) a different color. You may choose the colors. Number the worms **1-5** (top to bottom).
2. Roll the die and put a dot (.) next to the corresponding worm. If you roll a 6, roll again.
3. Repeat Step 2 until you've chosen **N** numbers, where **N** is the number of worms in the population. In this case, **N = 5**.
4. Starting at the bottom, draw a line from each dot to the **bottom-most** worm in the next generation.
5. Color the worm(s) in the next generation the same color as its/their parent.
6. Repeat Steps 2-5 until **ALL** the worms in a generation are the **SAME** color. Please be patient since it may take a while. Group data will vary accordingly.

RESULTS

✓ Please staple your **Driftworm Worksheet** to the BACK of this handout

DISCUSSION

1. Why is there no point in adding more generations after an **allele** (gene) has become **fixed** (i.e., when all the worms are of the same color)?

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2. Using your group's data, what was the number of generations until an allele became fixed?

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3. Ask five other groups what their number was. Record below.

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4. Pretend we repeated this activity where **N = 10** (instead of 5). Would your answer to **Question #2** most likely increase **OR** decrease? Why? Please be specific.

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5. What is the **mathematical relationship** between population size **AND** the number of generations it takes for an allele to become fixed?

Name(s): _____

Generations of Driftworms