

How to alter the alleles in a population

Gene Flow, Genetic Drift, Bottle Neck Effect and
Founder Effect

Natural Selection

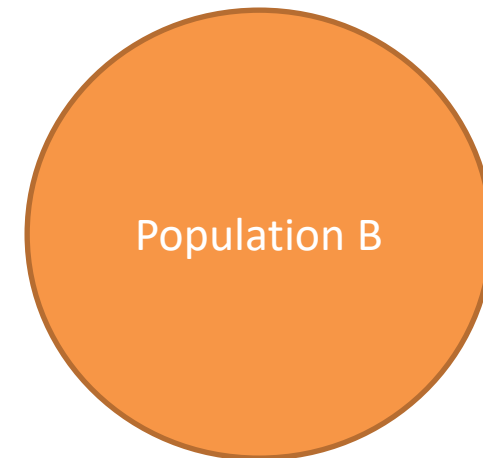
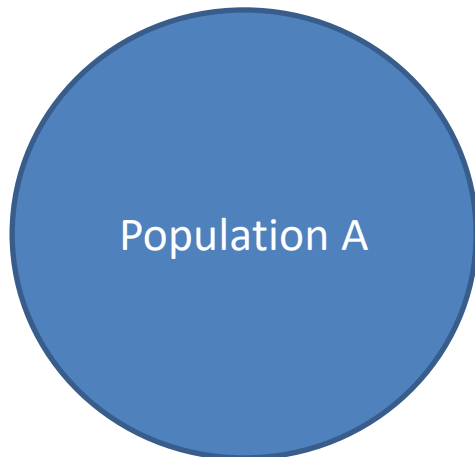
Definition: A process in which individuals that have certain inherited traits tend to survive and reproduce at higher rates than other individuals *because* of those traits

- Stresses from the environment creates situations where the organisms with a beneficial trait will survive and reproduce, those without will die off
- Surviving organisms reproduce and contribute alleles to the gene pool.

Gene Pool

Definition: The total of all copies of every types of allele at all loci (locations) in every individual in a population

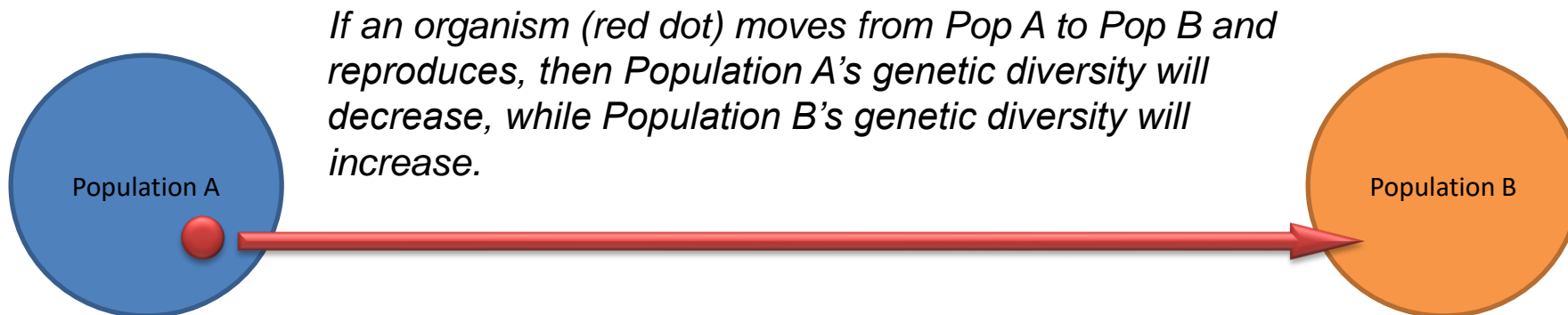
- There are genetic differences between Populations A & B due to random mutations.



Gene Flow

Definition: When genetic material is moved through Immigration (Entering) or Emigration (Leaving) of a population.

- If organisms enter or leave a population, they change the variability of the gene pool that can be genetically mixed through reproduction.



Genetic Drift

Definition: A process in which chance events cause unpredictable fluctuations in allele frequencies from one generation to the next.

- Has a more negative effect on smaller populations, because the gene pool is already limited

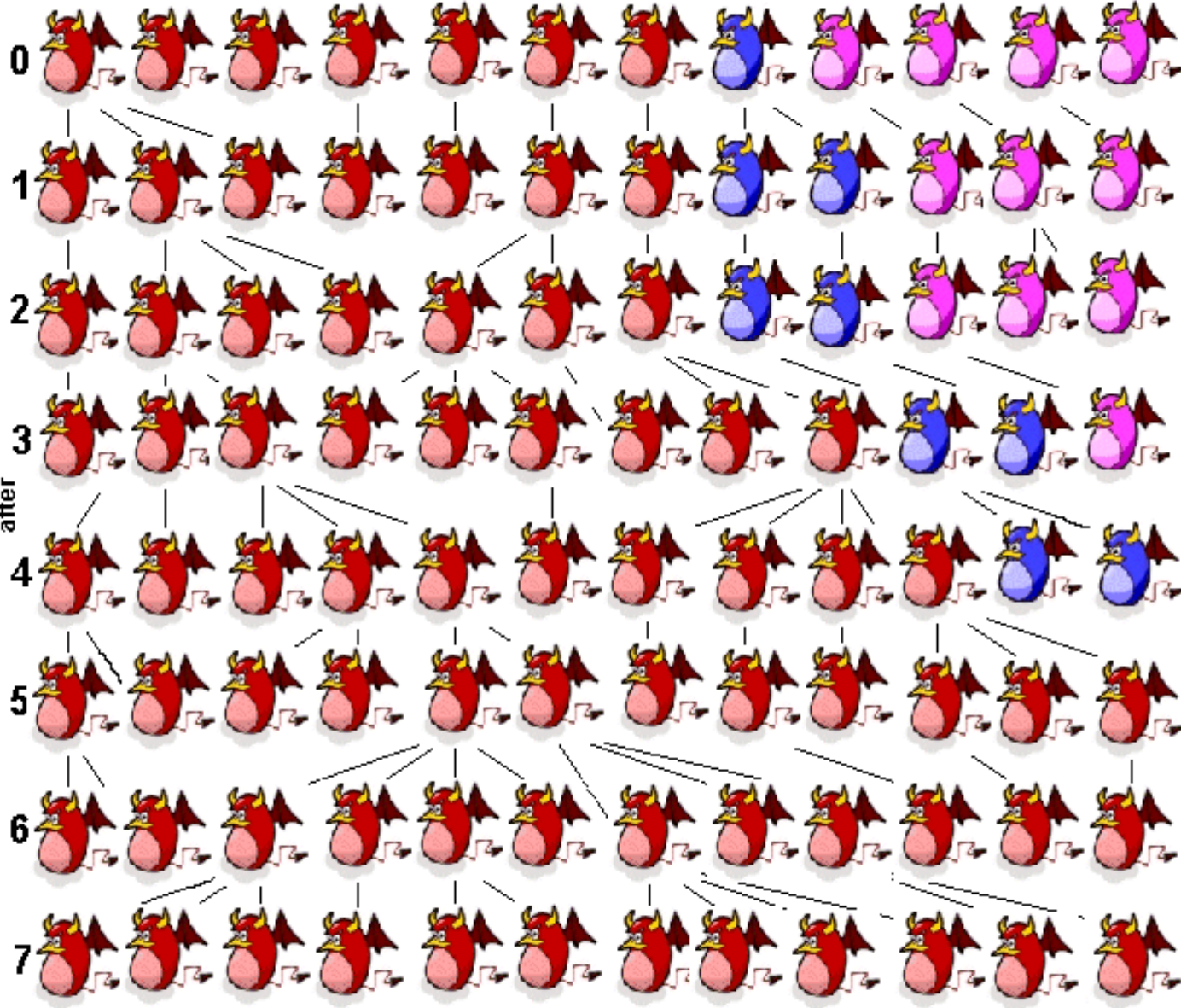
Genetic Drift

- Something in the environment randomly affects organisms (only a few organisms are allowed to breed) over many generations.
- This could limit the alleles that get passed on to the next generation, this limits the alleles in the gene pool.



Generations

www.ucl.ac.uk/~uchhdjm/courses/b242/InbrDrift/InbrDrift.html
after



Concept Question: Genetic Drift

A population of flowers in a field consists of red, purple, pink and white varieties. Insects randomly move between the flowers, but do not go to each.

If bees randomly picked only red flowers to visit, what would happen to the flower population next year when this year's seeds sprout?

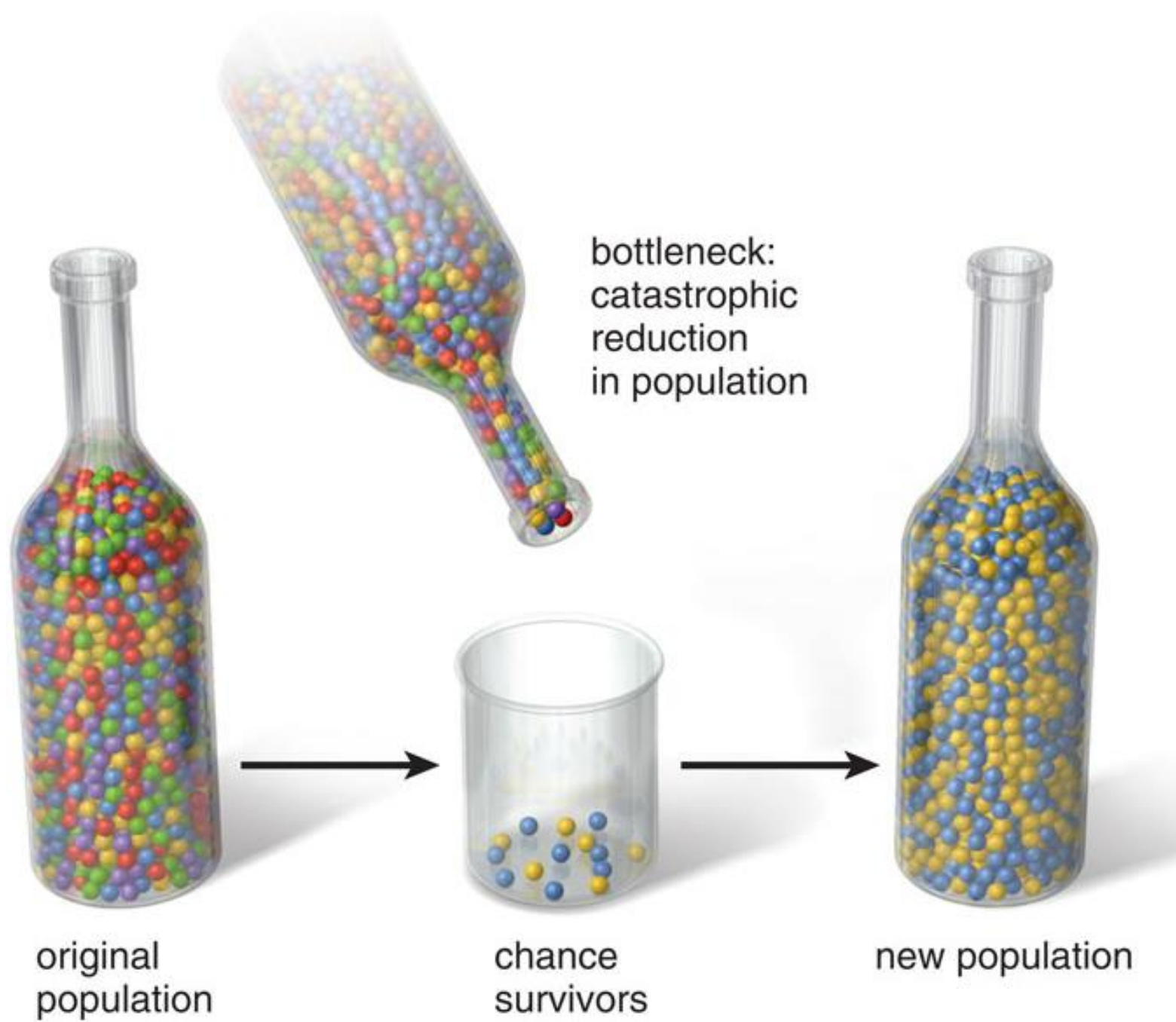
Concept Question Answer

- The alleles for the red color in flowers will become the prevalent (main) color for the population over time.
- The population's genotype has **DRIFTED** toward one phenotype. This reduces the genetic variability of the population.

Bottle Neck Affect

Definition: A kind of genetic drift that occurs when the size of a population is reduced, as by a natural disaster or human actions. Usually the surviving population is no longer genetically representative of the original population.

- Only a few organisms live/survive to reproduce, this limits the alleles that can be passes on.



bottleneck:
catastrophic
reduction
in population

original
population

chance
survivors

new population

Concept Question: Bottle Neck Effect

A population of flowers in a field consists of red, purple, pink and white varieties. A herd of cows moves through and tramples the field only leaving 3 white and 1 pink flower alive

What is next year's population in the field for these flowers going to look like phenotypically?

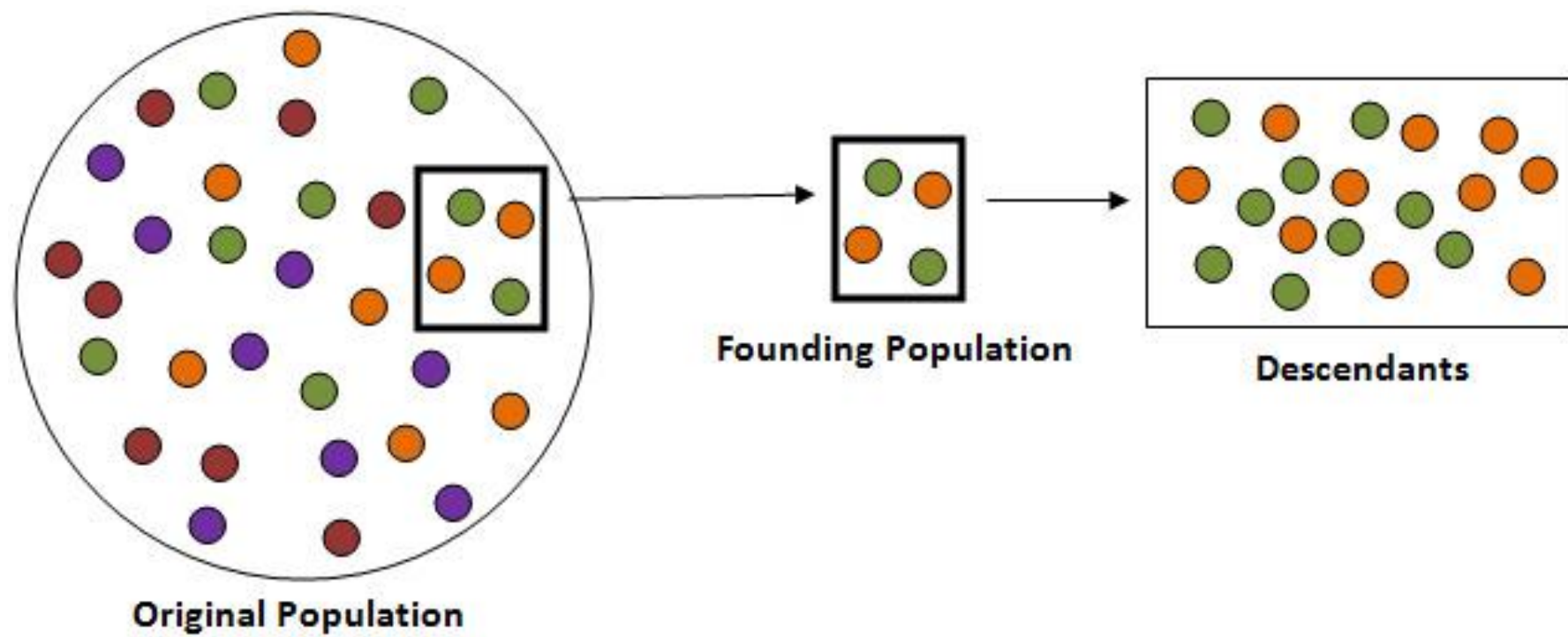
Concept Question Answer

- Because there are more white flowers left, they will eventually out-reproduce the pink flowers. The alleles for the white color in flowers will become the prevalent (main) color for the population over time.
- This reduces the genetic variability of the population.

Founder Effect

Definition: A kind of genetic drift that occurs when a few individuals become isolated from a larger population and form a new population whose gene pool composition is not reflective of the original population.

- Since the new population is a small group, this limits the number of alleles in the gene pool.



Concept Question: Founder Effect

A field biologist wants to repopulate an empty prairie dog nest with some prairie dogs from 10 miles away. The large nest 10 miles away has four phenotypic varieties: black, brown, white and tan. The biologist grabs 3 black and 3 tan prairie dogs to start the repopulation of the old site.

How would you describe the phenotypes of the new population at the old site in 5 years?

Concept Question Answer

- Because the new population is limited in the possible genotypes it can mix during reproduction, there will be no brown or white prairie dogs created. The **FOUNDERS** are the only ones that contribute genes to the population's gene pool.
- This reduces the genetic variability of the population.

Definition practice

- Without looking at your notes and in your own words, create definitions for:
 - Natural Selection
 - Genetic Drift
 - Bottle Neck Effect
 - Founder Effect