NATURAL SELECTION

What will we learn?

- natural selection and the implications of genetic drift including the Founder and Bottleneck Effects
- Effects of genetic drift
- Different modes of Selection

\# mutations → genetic variation → reproductive advantage → increases frequency of allele in population [adaptive evolution]

Genetic Drift : variation in the frequency of diff ent genotypes

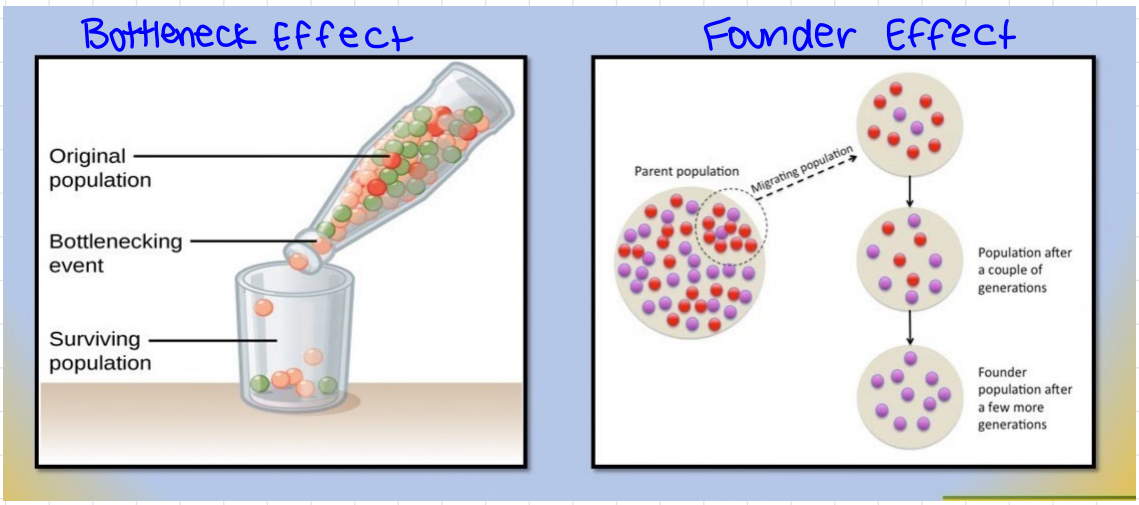
- significant impact on small populations has any change in the genome is magnified
- can cause allele frequencies to change at random
- can lead to loss of genetic variation
- can cause harmful alleles to become fixed

Founder Effect : individuals becomes isolated from original population and establish a new population with a different gene pool

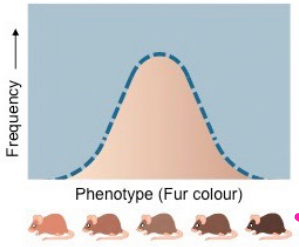
Bottleneck Effect : sudden environmental change –> drastic reduce in population

Gene flow : the transfer of alleles in and out of the population due to the movement of fertile individuals

Relative Fitness : the contribution an in individual makes to the gene pool of the next generation relative to the contributions of other individuals

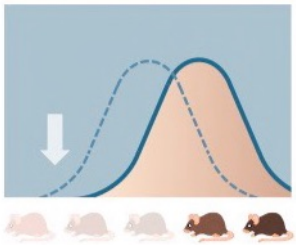


3 MODES OF SELECTION



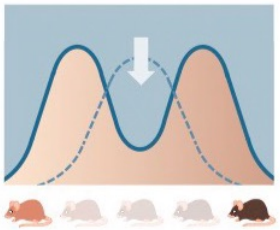
Normal Distribution
Gaussian (bell-shaped) trend

DIRECTIONAL



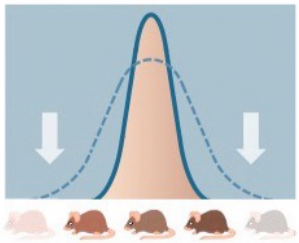
Directional Selection
Favours one extreme
Shifts distribution left / right

DISRUPTIVE



Disruptive Selection
Favours both extremes
Creates bimodal distribution

STABALIZING



Stabilising Selection
Culls extreme variations
Narrows width of distribution

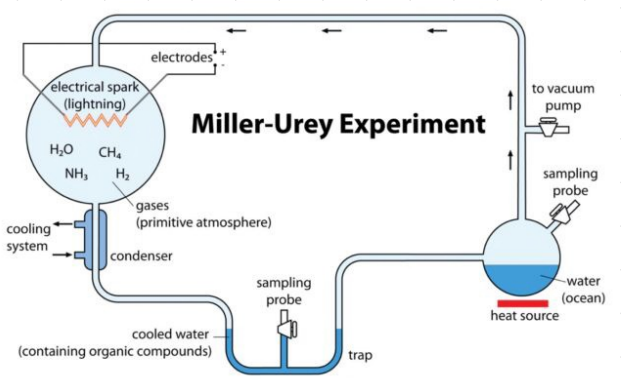
EARLY EARTH & ORGIN OF LIFE

Conditions on early Earth

- lightning, volcanic activity, UV radiation
- atmosphere = $H_2, N_2, CO, CO_2, H_2O, CH_4, NH_3$
- Vapor condensed into oceans

When did life begin?

- 3.5 billion years (fossil evidence)
-Simpler life before photosynthesis(3.9 bi years ago)



Miller UREY Experiment

Stimulated early earth
-H2O heated (sea)
- Gases)atmosphere)
-electrode discharging sparks (lightening)
- condenser with cold water –cooling gases (raining water + dissolved components)
-identified a variety of organic molecules

→ amino acids → abiotic synthesis was possible under these conditions

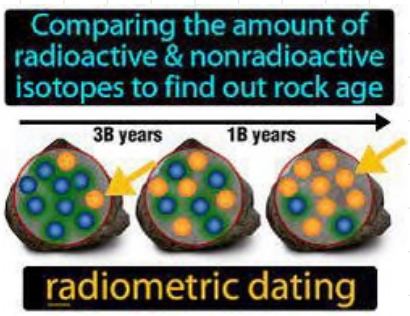
How Did Life Arise?

1. Abiotic synthesis of small organic molecules.
   - amino acids

2. Joining of these molecules into polymers
3. Packaging of polymers into protocells
   - membrane enclosed droplets
4. Origin of self -replicating molecules = inheritance
   -short strands of DNA

Radiometric dating

-based on the decay of radioactive isotopes
-fossils contain isotopes
-cardon -14
-helpful for young fossils (75 odd years)
-half-life = 5,730



Phylogeny

- evolutionary history of a species
  - inferred from fossils, morphological + molecular homologies among organisms

- Phylogenetic trees as hypotheses