TOPIC 10.3: SPECIATION

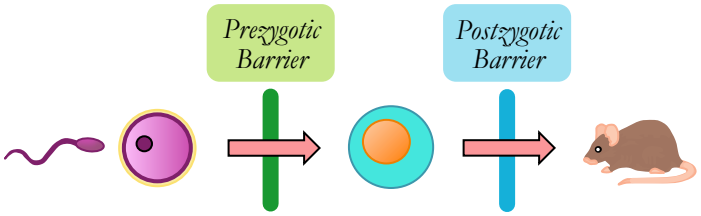
Reproductive Isolation

Reproductive isolation occurs when barriers prevent two populations from interbreeding (gene pools kept separate)

- Without gene flow, the gradual accumulation of genetic differences (mutations) will eventually lead to **speciation**

There are two categories of reproductive isolation barriers:

- Pre-zygotic barriers (no offspring are produced)
- Post-zygotic barriers (offspring are not viable or infertile)



Isolation Barriers

Examples of pre-zygotic isolation barriers include:

Temporal Isolation

- Populations have distinct / separate reproductive cycles
- **E.g.** Leopard and wood frogs mate at different times

Behavioural Isolation

- Populations exhibit or respond to specific courtships
- **E.g.** Different cricket species have distinct mating calls

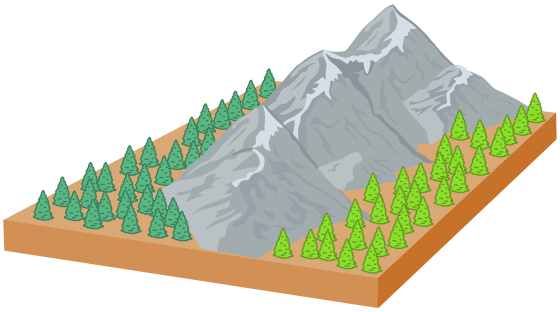
Geographic Isolation

- Populations occupy different habitats / niches in an area
- **E.g.** Lions and tigers don't often interact within a region

Types of Speciation

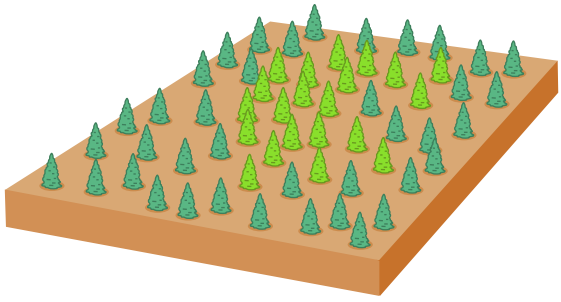
Allopatric Speciation

- Occurs when *geographic barriers* isolate populations
- The physically separated populations are exposed to different environmental conditions and begin to diverge



Sympatric Speciation

- Occurs when populations diverge *within a shared location* (i.e. the populations are **not** physically separated)
- Reproductive isolation leads to genetic divergence

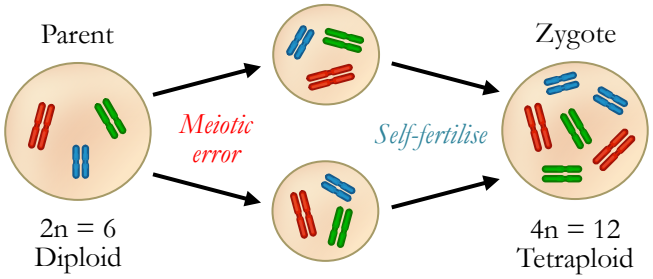


Polyploidy

Sympatric speciation may be caused by **polyploidy**

- A failure to undergo cytokinesis during meiosis results in gametes with additional sets of chromosomes *(not haploid)*

Polyploidy is more common in plant species (e.g. *Allium*) that can self-pollinate or reproduce asexually *(vegetative propagation)*



Pace of Speciation

Speciation may occur by one of two alternative models:

Phyletic Gradualism

- Speciation occurs at a *constant pace* over a period of time
- Involves a *continuous* / *gradual* accumulation of mutations
- Theory is supported by the presence of intermediate fossils (e.g. evolution of the modern horse hoof)

Punctuated Equilibrium

- Speciation occurs in *rapid bursts* with periods of stability
- If conditions are stable, characteristics are maintained
- Environmental change promotes rapid divergence
- Gaps in the fossil record provide support for this theory