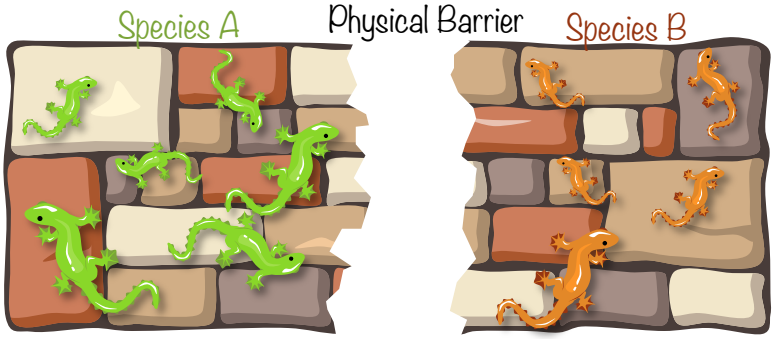
A4.1

Evolution & Speciation (HL)

SPECIATION – **Formation of new species (not gradual).** When a group of the same species is not able to reproduce together due to some form of "barrier". If they remain separated by this "barrier" for long enough it could lead to speciation.

Occurs by **REPRODUCTIVE ISOLATION**:
- Geographical barrier* → ALLOPATRIC SPECIATION
- Behavioral barrier → SYMPATRIC SPECIATION
- Temporal barrier → SYMPATRIC SPECIATION

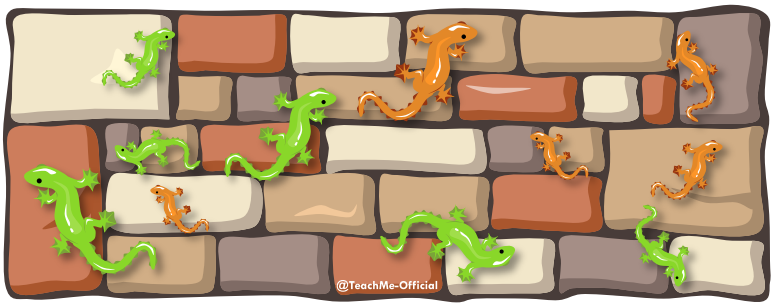
*covered in A4.1 SL/HL



A. ALLOPATRIC SPECIATION

When a new species forms because a population is separated by a physical boundary.

GEOGRAPHICAL ISOLATION leads to allopatric speciation.



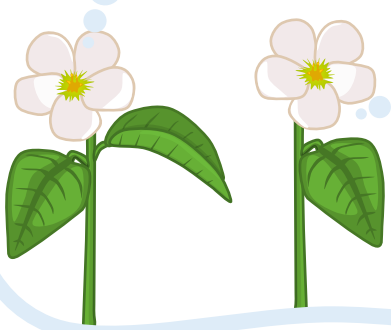
B. SYMPATRIC SPECIATION

When a new species forms from existing species living in the same geographical location.

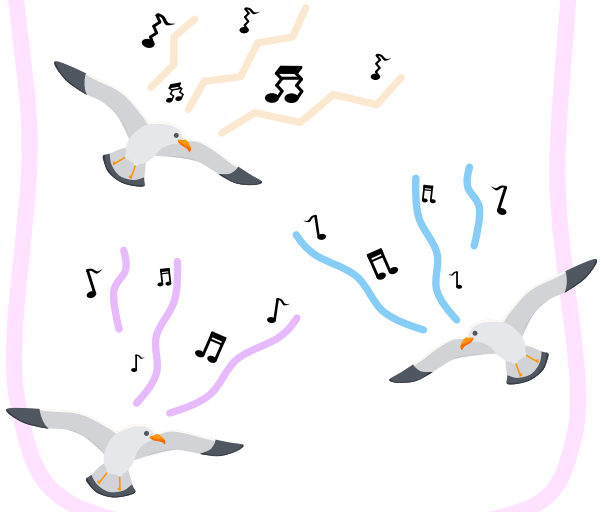
TEMPORAL or **BEHAVIORAL** reasons lead to sympatric speciation.

How does reproductive isolation occur?

1 **TEMPORAL ISOLATION** – Refers to incompatible time frames that prevent populations or their gametes from encountering each other. A timing issue.



2 **BEHAVIORAL ISOLATION** – When part of the population develops a different behavior that isolates it from the rest of the population.



Evolution & Speciation (HL)

What leads to Speciation?

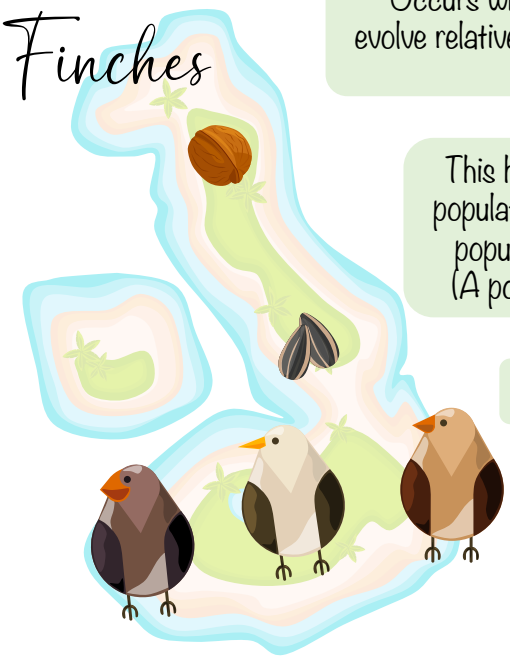
1 Adaptive Radiation

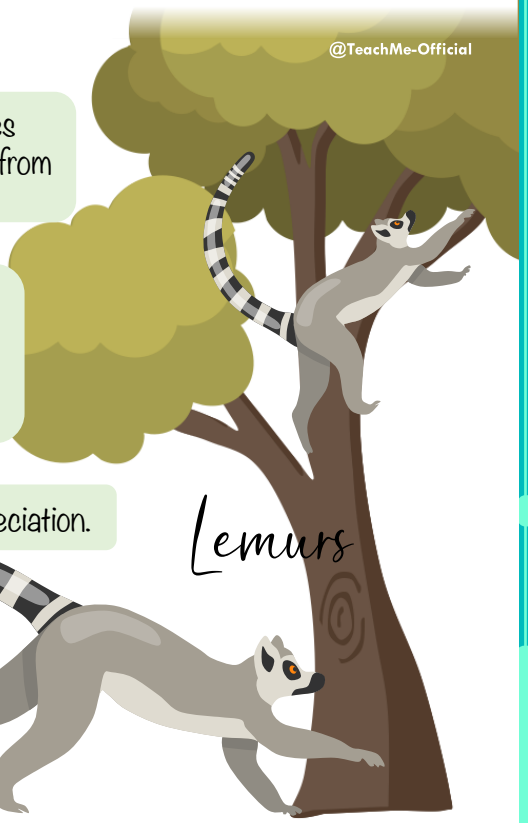
Occurs when many similar but distinct species evolve relatively rapidly from a single species or from a small number of species.

This happens because variation within a population allows certain members of that population to occupy different niches*. (A position or role within a community)

Reproductive isolation leads to speciation.

Finches





2 Hybridization

A hybrid organism is one that has been generated by fertilization between two *different* species.

Definition: To be classified as the same species, two organisms must be able to breed together and produce fertile offspring.

Since hybrids are formed by fertilization of two different species, they are infertile. ➡ WHY?

Rare in wild because of barriers:

- Temporal,
- Behavioral
- Geographical

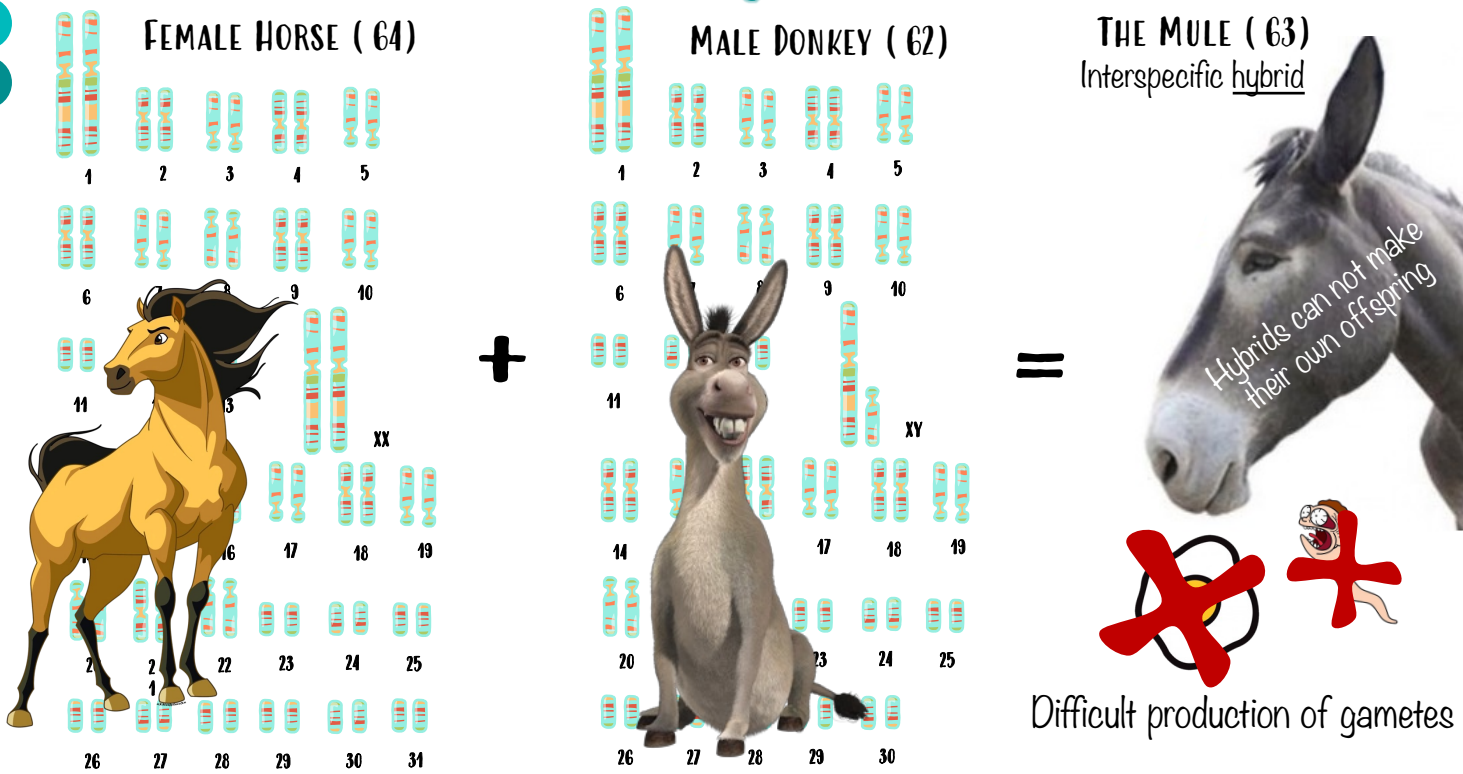
Seen in zoo (since confined together).

HYBRIDS

Theory

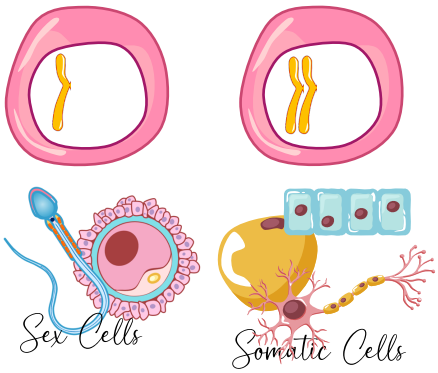
This mismatch of genes & chromosomes explains the infertility of interspecific hybrids. Mismatch makes the production of egg and sperm cells (gametes) difficult, if not impossible. Gene mismatch = sterile.

Evolution & Speciation (HL)



3 Abrupt Speciation (mostly in plants)

Refers to a situation when cell contain three or more sets of chromosomes.



How does it happen?

Can happen during **MEIOSIS** (incomplete separation).

When two plants **FUSE THEIR GENETICS.**

The change is significant enough that production of offspring with the original population becomes impossible, resulting in speciation.

More common in plants than animals.

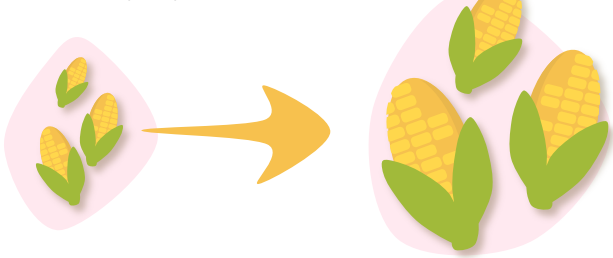
Examples

Knot Weed or Smart Weed

African Clawed Frogs

In animals, having an entire extra set of chromosomes is usually **FATAL**

In plants the extra sets of chromosomes can lead to more vigorous plants that produce **BIGGER FRUITS** or food storage organs and are more **RESISTANT TO DISEASE**. Can also be bad.



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