

Evolution & Speciation

PART 1

EVOLUTION – The cumulative change in HERITABLE characteristics of a population over **GENERATIONS**, passes on genetically

DOESN'T HAPPEN OVERNIGHT!

DARWINISM

Species have their own set of heritable differences (genetic) which have accumulated gradually over time.



Among ancestral giraffes, some has longer necks than others.

Those with longer necks left more offsprings; also, with longer necks.

This happened repeatedly over generations, forming long-necked giraffes.

LAMARKISM

Organism's aquired characteristics through their lifetime and passed them on to their offsprings.



The ancestral giraffes stretched their necks to reach leaves.

The offsprings inherited the aquired stretched necks.

This happened repeatedly over generations, forming long-necked giraffes

EVIDENCE FOR EVOLUTION

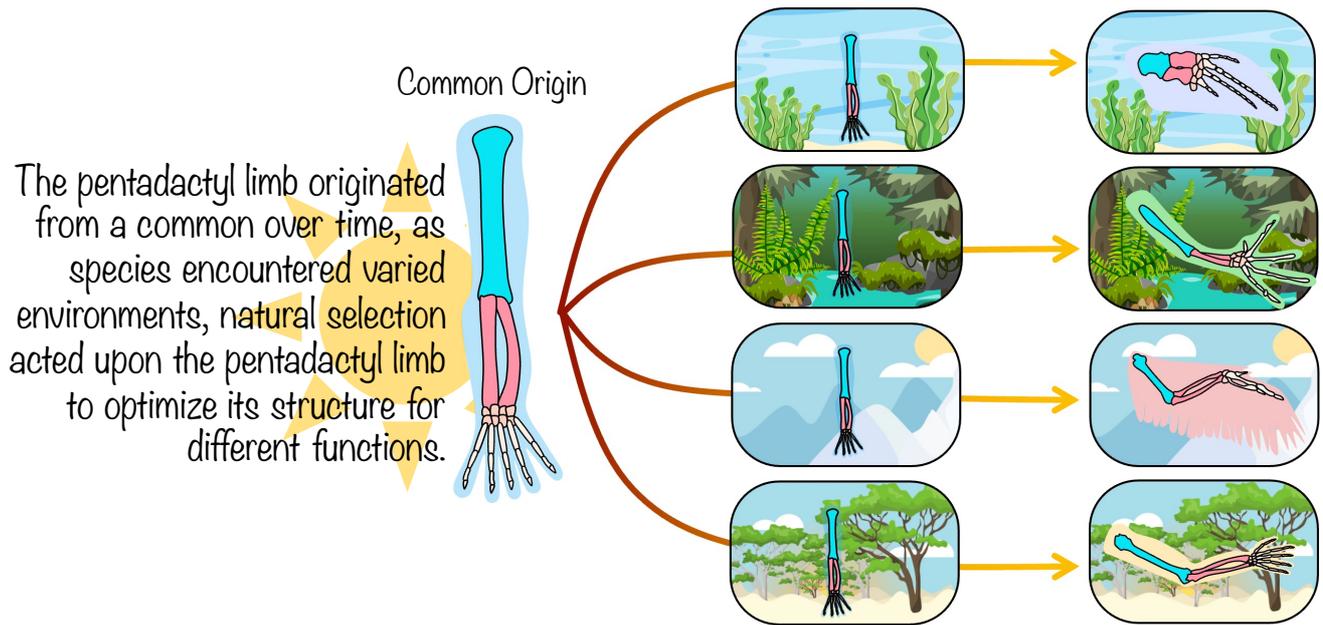
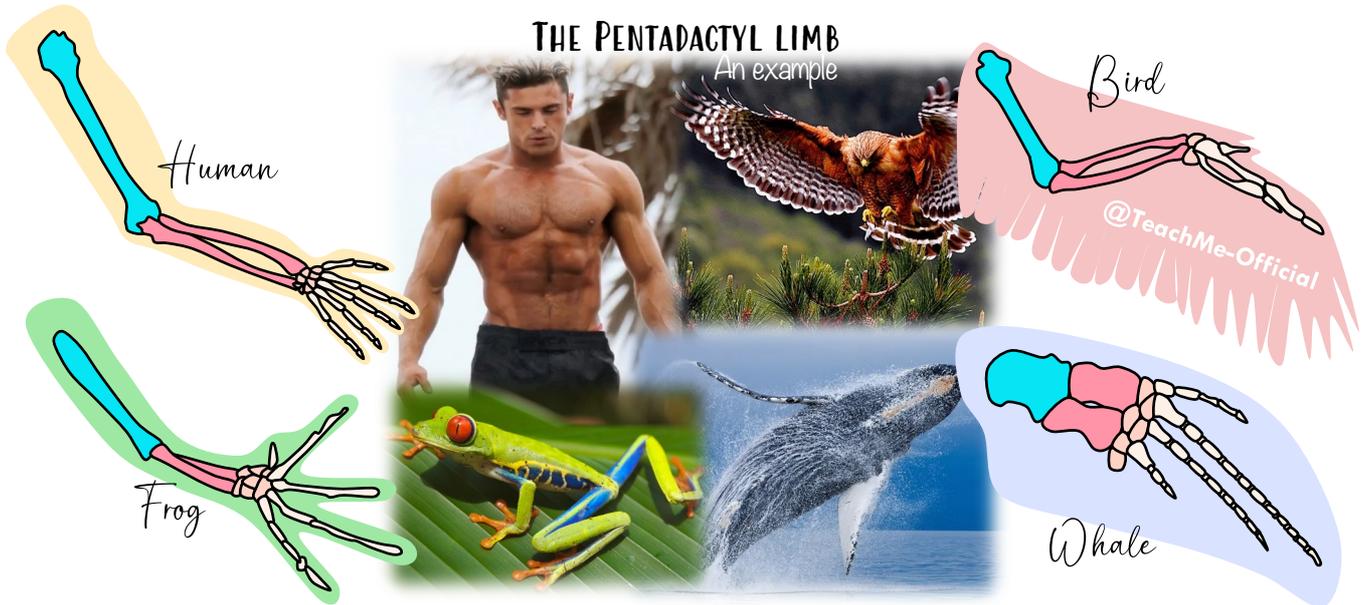
- 1 Homologous Structures (Morphological)
- 2 Selective Breeding (Experimental)
- 3 Genetics (Molecular Level)



Evolution & Speciation

1 HOMOLOGOUS STRUCTURES (MORPHOLOGICAL)

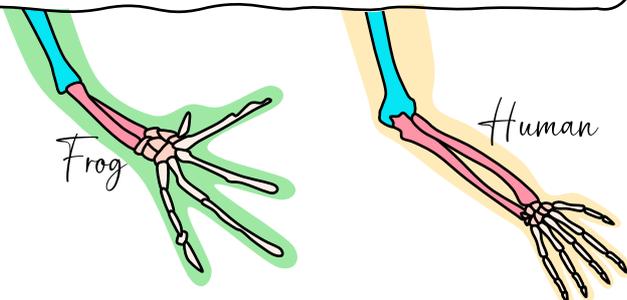
Homologous structures are **ANATOMICAL FEATURES** showing **SIMILARITIES IN STRUCTURE**, but **DIFFERENCES IN FUNCTION**.
Common ancestor.



The pentadactyl limb originated from a common over time, as species encountered varied environments, natural selection acted upon the pentadactyl limb to optimize its structure for different functions.

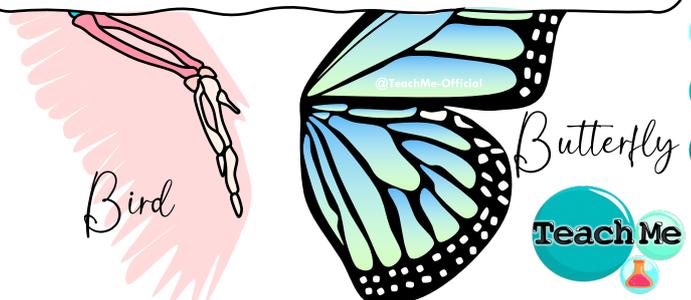
HOMOLOGOUS STRUCTURES

Homologous structures are **ANATOMICAL FEATURES** showing **SIMILARITIES IN STRUCTURE**, but **DIFFERENCES IN FUNCTION**. Recent common ancestor.



ANALOGOUS STRUCTURES

Analogous structures are **ANATOMICAL FEATURES** showing **DIFFERENCES IN STRUCTURE**, but **SIMILARITIES IN FUNCTION**. No recent common ancestor.

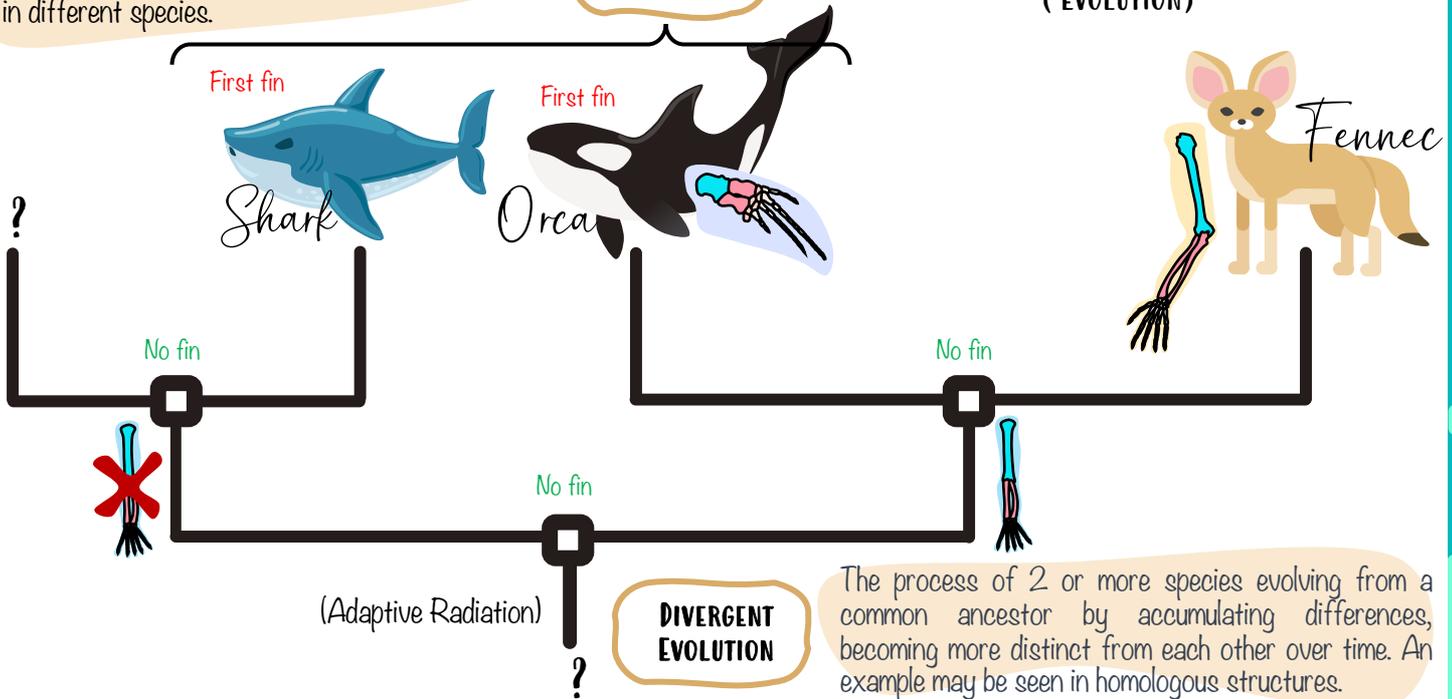


Evolution & Speciation

The process by which similar traits (features) arise in unrelated species (not a recent common ancestor). It often results in analogous structures in different species.

CONVERGENT EVOLUTION

CONVERGENT & DIVERGENT (EVOLUTION)



The process of 2 or more species evolving from a common ancestor by accumulating differences, becoming more distinct from each other over time. An example may be seen in homologous structures.

2 SELECTIVE BREEDING (EXPERIMENTAL)

A process of breeding organisms together for a desired trait. Can occur naturally or guided by humans.

EXAMPLES

- Artificial selection (human intervention) to create dog breeds.
- The formation of maize from teosinte
- Breeding cows that produce the best and highest quality milk
- Good quality wool
- Plants that survive the harshest condition
- Plants that are the easiest to harvest

3 GENETICS (MOLECULAR LEVEL)

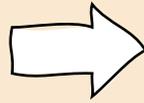
DNA changes occur with evolution. Over time organisms start changing along with genetics. Differences between DNA sequences can be examined to determine evolutionary relationship among different species.

Specific Species	Amino Acid Sequence (For a specific gene)
	SL--ALALS LG GPLSAGELELHPPNFPWSHG GL SALDHASVRRGFQVYRQVCSACHSM
	SLAVALS LS LG GG PPV S AGELELHPPGLPWSHG GL LSALDHASVRRGFQVYRQVCSACHSM
	GLAVALH-----SAV S AGELELHPPSPFPWSHSGPLSSLDHSSVRRGYQVYKQVCSACHSM
	GLALALH-----TAVSASDLELHPPSYAWSHNGLLASLDHSSIRRGYQVYKQVCAACHSM

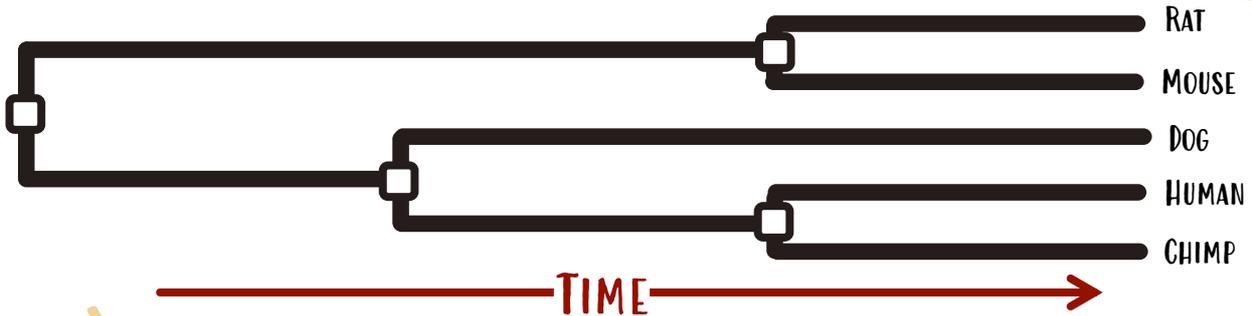


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“Another way to assess the similarities and differences between organisms is through their **DNA & PROTEINS**”



Not convenient, hence phylogenetic trees (another chapter)



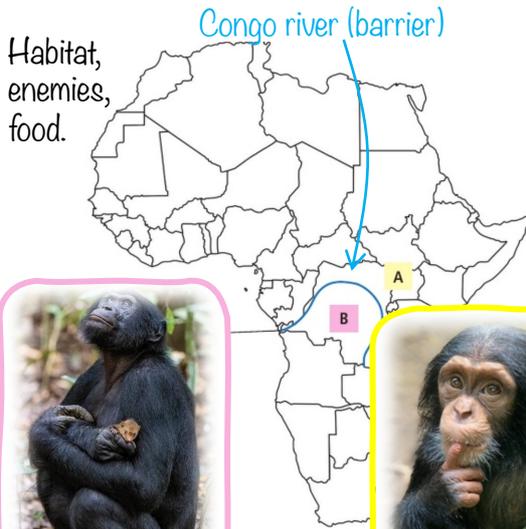
PART II

SPECIATION

— Formation of new species (not gradual)
Occurs by **REPRODUCTIVE ISOLATION**

- Geographical barrier
- Behavioral barrier (HL)
- Temporal barrier (HL)

A. [Congo River Example]

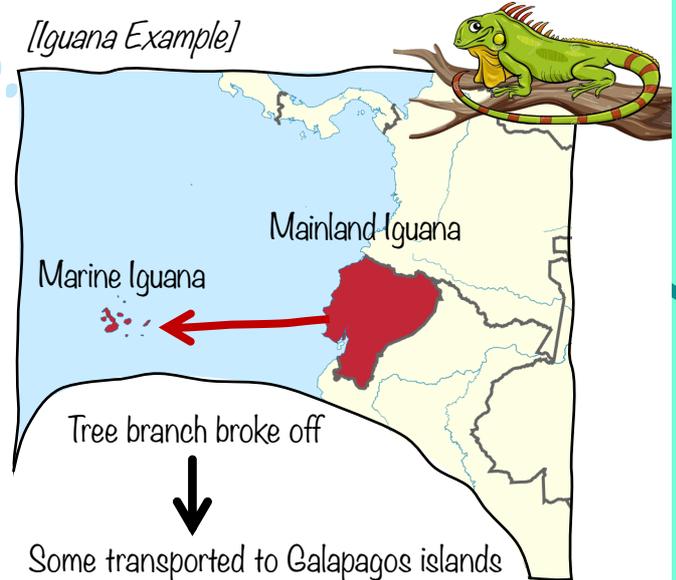


BONOBOS (matriarchal) are more peaceful and nomadic.



CHIMPANZEES (male dominated) are more aggressive and territorial.

B. [Iguana Example]



Different food, predators etc

Over time form Marine iguana (speciation split)

EXTINCTION — When the last individuals of a species dies out.



99.99% OF SPECIES THAT HAVE EVER LIVED ARE NOW EXTINCT.



