Erasmus+
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ALIVE

Evolution

OUTLINE

- The Theory of Evolution
- Natural selection
- Variation – Adaptation – Selection
- Descent with modification
- Artificial selection
- Evidence for the theory of evolution
- Summary

THEORY OF EVOLUTION

(Scientific) Theory = System of ideas –supported by scientific evidence– that explain a domain of the natural world.

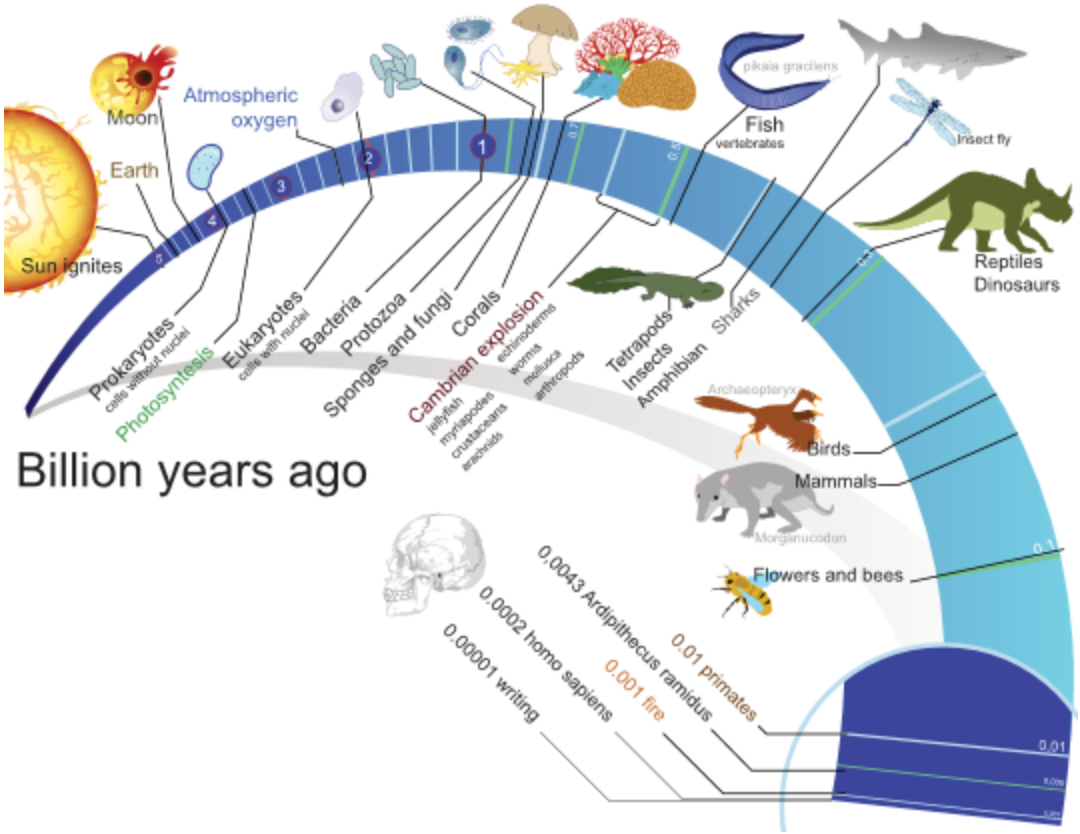
THEORY OF EVOLUTION

Evolution =

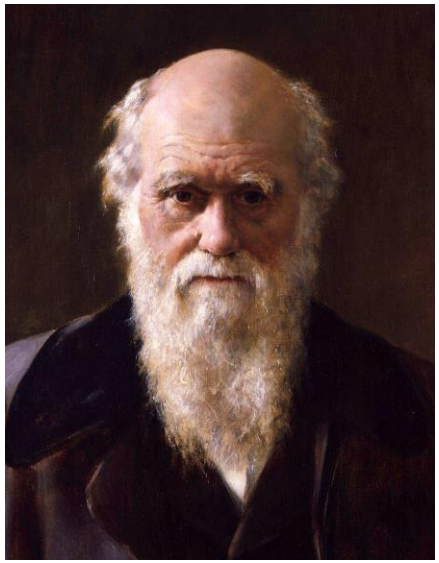
The process of change over time

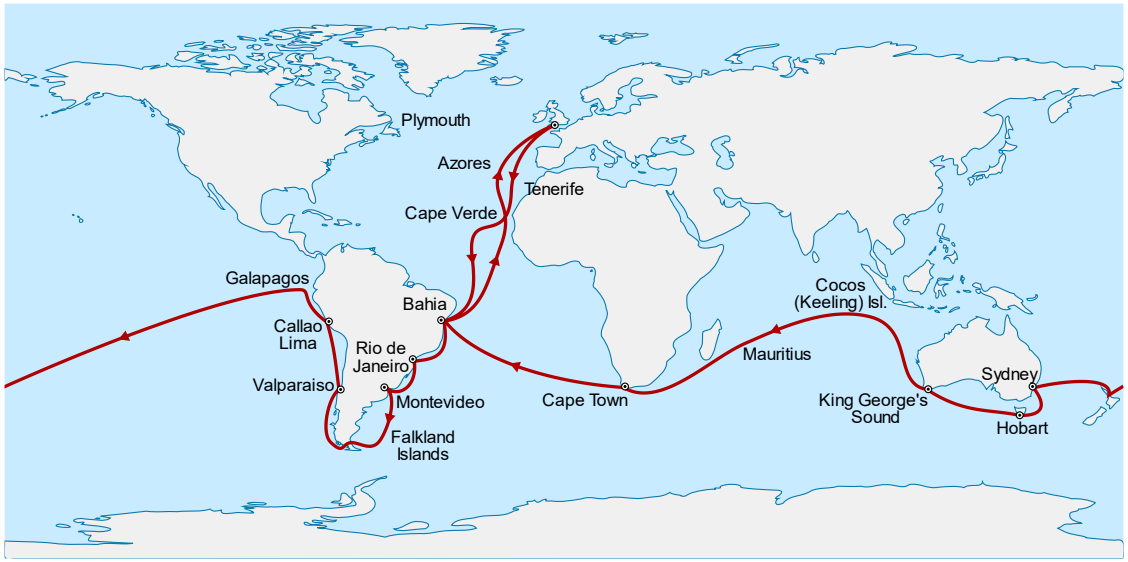
- accounts for the diversity of life

- modern organisms have descended from ancient organisms



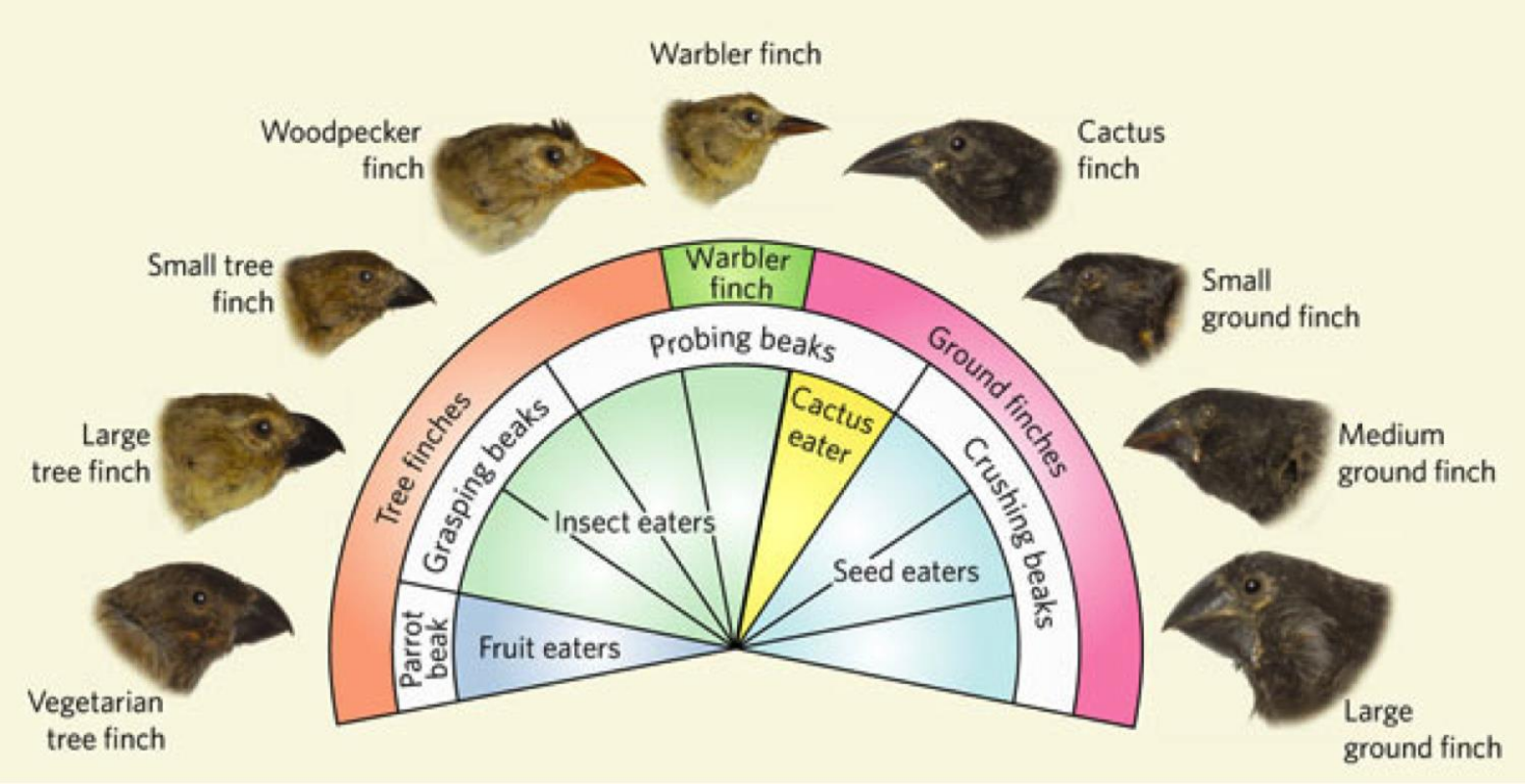
CHARLES DARWIN AND THE HMS BEAGLE VOYAGE





- **5 years (1831-1836)**
- **Survey expedition around the globe**
- **Geological and Biological observations**

DARWIN'S FINCHES



Diversity of beak shape and size corresponds to adaptation for exploiting different food sources.

NATURAL SELECTION

Natural selection is a mechanism of evolution.

Organisms that are more **adapted** to their *environment* are more likely to **survive** and **reproduce,** passing on the traits/genes that aided their success.

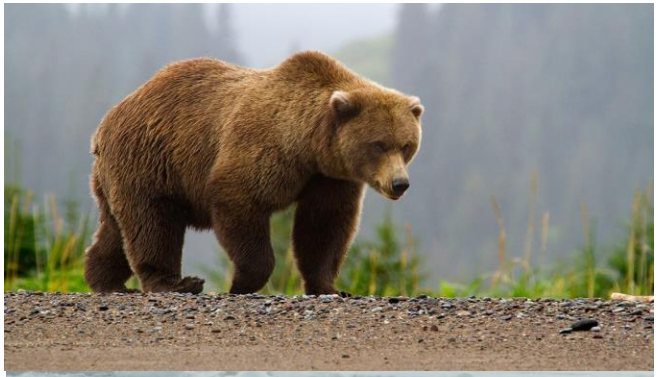
VARIATION

… is random

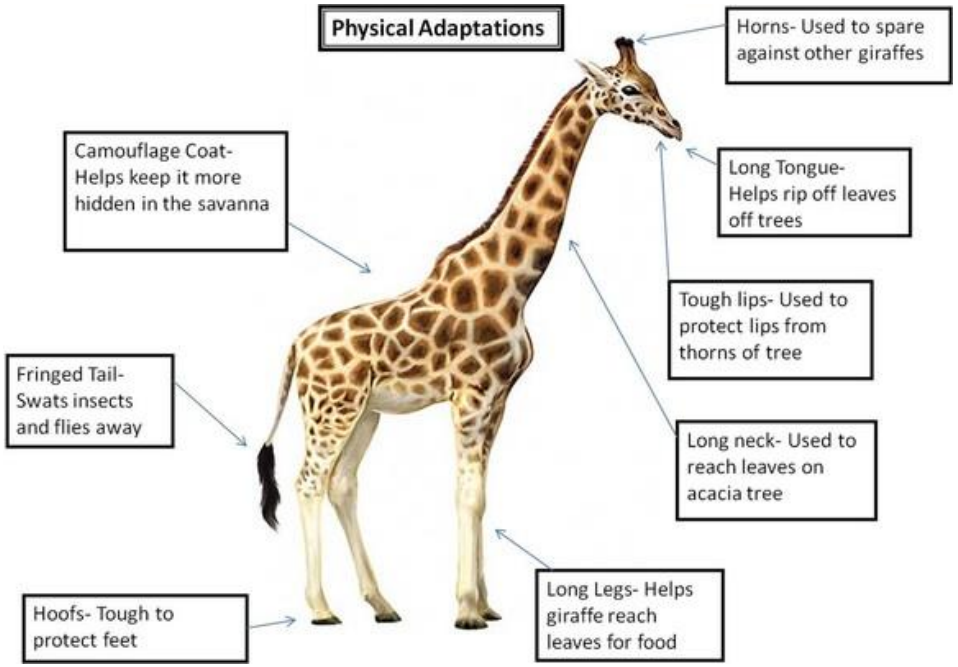
… is important because the environment changes

CAN YOU SPOT ANY ADAPTATIONS?

ALIVE



MORE ADAPTATIONS



- **physical characteristics (see the giraffe!!)**
- **physiological and behavioral characteristics (any guess??)**

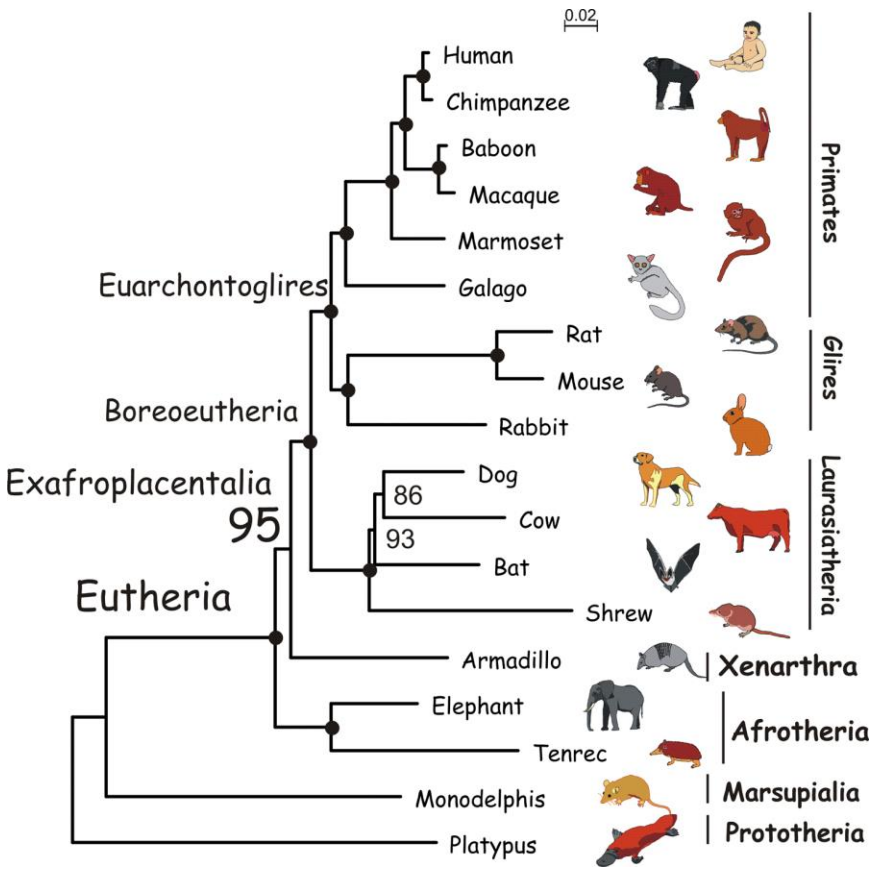
SELECTION

Individuals with the best traits to their environment will more frequently survive and reproduce

- **More chances for the traits to be inherited**
- **Natural selection acts on the PHENOTYPE**

Over many generations "good" traits tend to become more frequent in the population and "bad" ones tend to be eliminated

DESCENT WITH MODIFICATION



- **Each species has descended (with changes) from other species over (long) time**
- **Species share a common ancestor**

ARTIFICIAL SELECTION

Human-driven selection

Species of agricultural or economical importance (often animals or plants)

Selection of individuals with desirable traits

Practiced for millenia!

- **Examples (Livestock, Dogs, Wheat)**
- **Often linked to domestication**
- **Ethical issues**

EVIDENCE FOR THE THEORY OF EVOLUTION

ALIVE

- Fossil record
- Anatomy
- Embryology
- Biogeography
- Molecular (genetics) evidence

FOSSILS PROVIDE CLUES FOR THE HISTORY OF LIFE ON EARTH

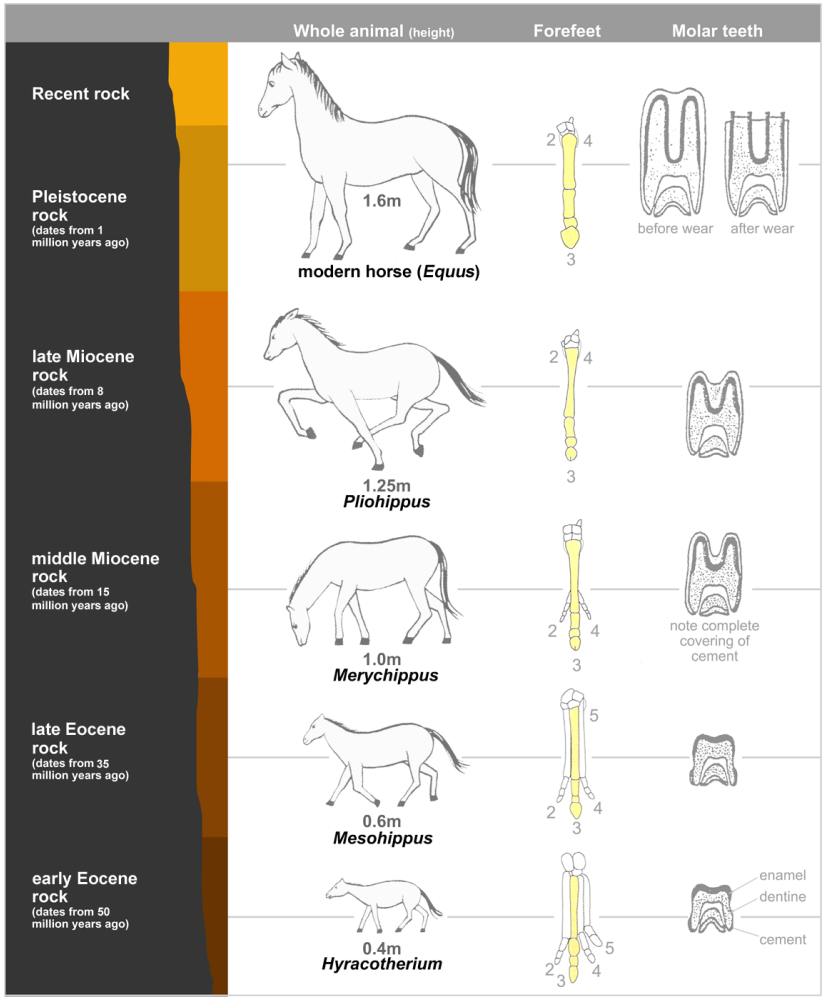
ALIVE

Newer layers

Time

Older layers

FOSSILS PROVIDE CLUES FOR THE HISTORY OF LIFE ON EARTH

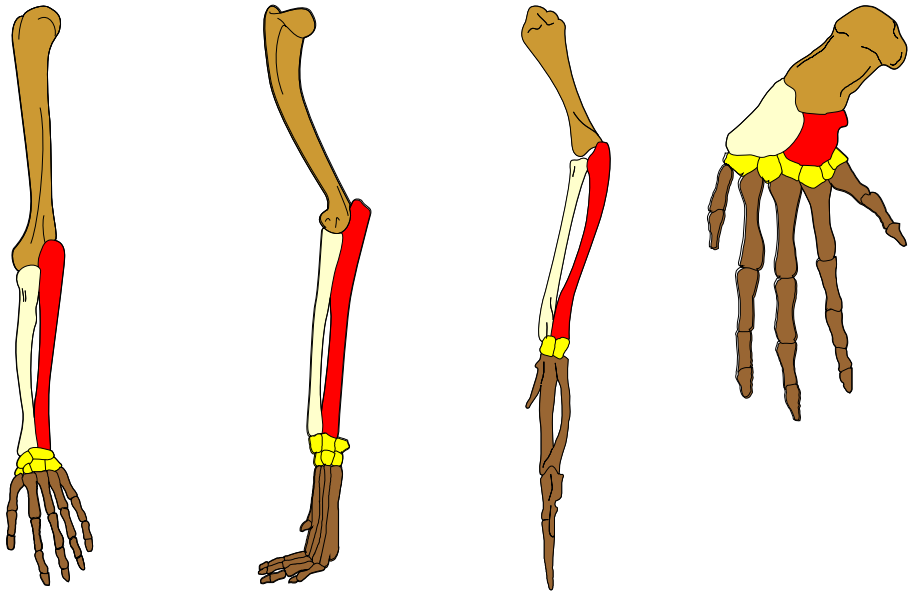


Archaeopterix: the missing link

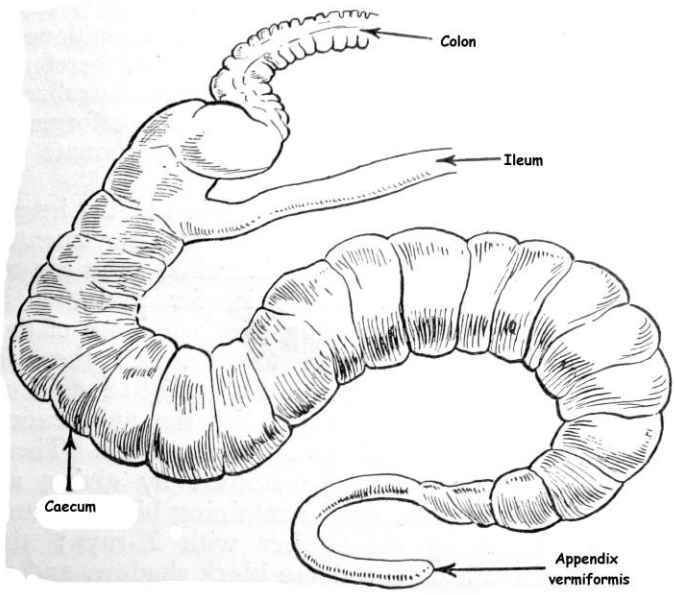
HOMOLOGOUS ANATOMICAL FEATURES AND VESTIGIAL ORGANS

ALIVE

UPPER LIMBS IN VERTEBRATES



RESIDUALS OF ANCESTRAL STRUCTURES



Homologous and vestigial structures are evidence of descent from a common ancestor.

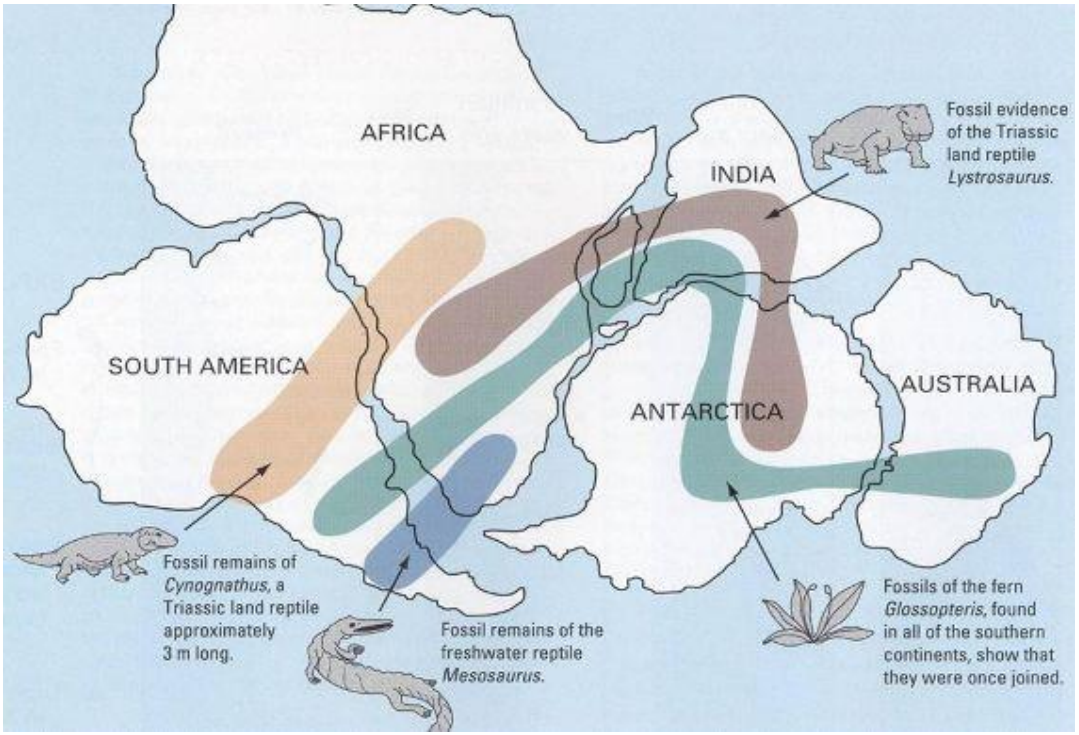
COMPARATIVE EMBRYOLOGY

- Embryo formation in widely-divergent groups of organisms tends to be conserved.
- Embryos look similar in their early stages: the differences between species become more obvious as they develop.
- These similarities point to a conserved process present in the last common ancestor.

BIOGEORGAPHY

Species that evolved before the breakup of the supercontinent are distributed worldwide.

Species that evolved more recently are more localized.



MOLECULAR EVIDENCE

- Common genetic material (DNA), genetic code, and protein composition across all cellular life forms.
- The evolutionary history of species is reflected in their genetic material.
- Genomic DNA sequences enable scientists to suggest which species are more closely related.

SUMMARY

- All species have evolved from previous life forms
- Evolution acts by descent with modification through long periods of time
- Natural selection is a driving force of evolution
- Artificial selection is used for practical applications but still raises ethical issues
- Complementary scientific evidence support the Theory of Evolution

PICTURES – USED SOURCES

ALIVE

https://commons.wikimedia.org

https://www.nature.com/articles/442515a

https://journals.plos.org/plosgenetics/