EVIDENCE FOR EVOLUTION

Evolution by Natural Selection

- Natural selection produces in changes in the inherited characteristics of a population.
  - When the ‘stronger’ survive, they will pass on their traits.
- These changes increase a species' fitness in its environment.
  - *Fitness: ability for a species to survive and reproduce.*

Evolution by Natural Selection

- Natural selection produces organisms that have different structures, create different niches, or live in different habitats.

Descent With Modification: Each living species has descended, with changes, from other species over time.

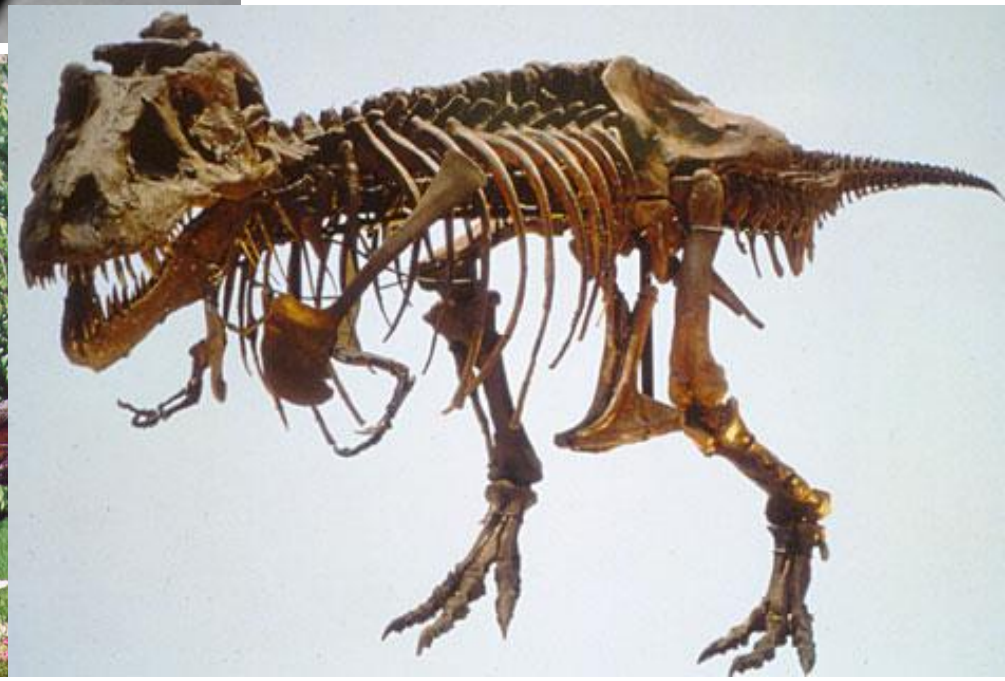
Evidence of Evolution

What Evidence is there for Evolution?

- Darwin argued that living things have been evolving on Earth for millions of years.
- Evidence for this process includes:
  1. The **fossil** record
  2. **Geographical** distribution
  3. **Comparative anatomy (homologous, vestigial** structures)
  4. Similarities in early development, or **embryology**.
  5. Similarities in **DNA**

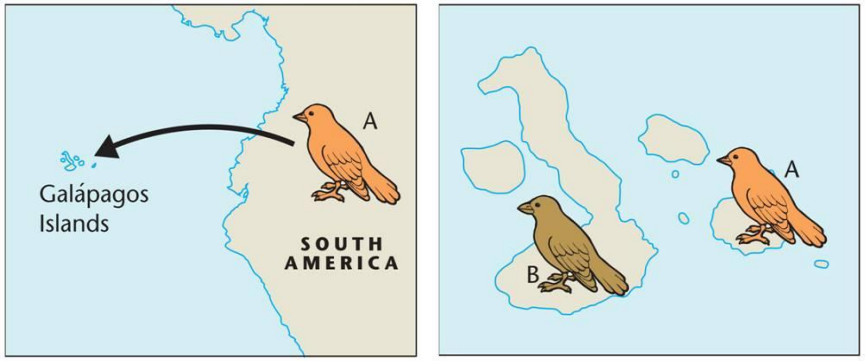
Evidence of Evolution: THE FOSSIL RECORD

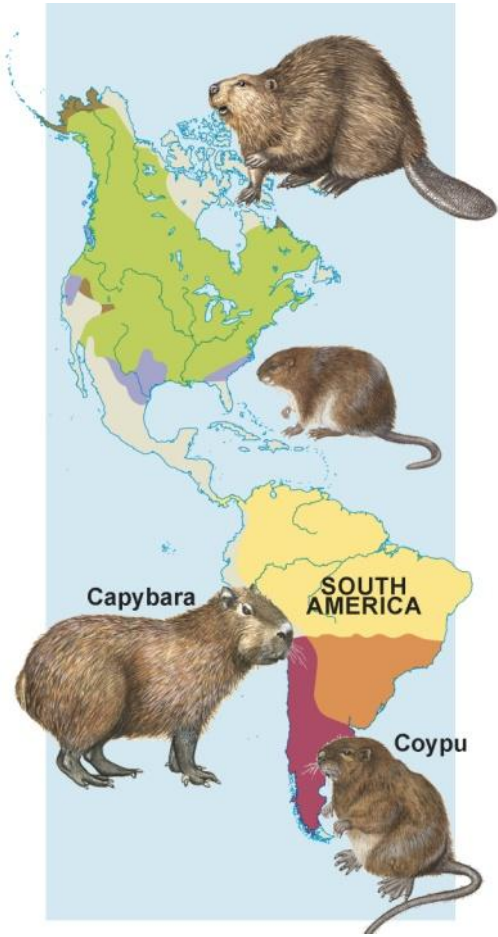
- Darwin saw fossils as a record of the history of life on Earth.
- By comparing fossils from older rock layers to fossils from younger layers, scientists could document that life on Earth has **changed over time**.



Evidence of Evolution: GEOGRAPHIC DISTRIBUTION

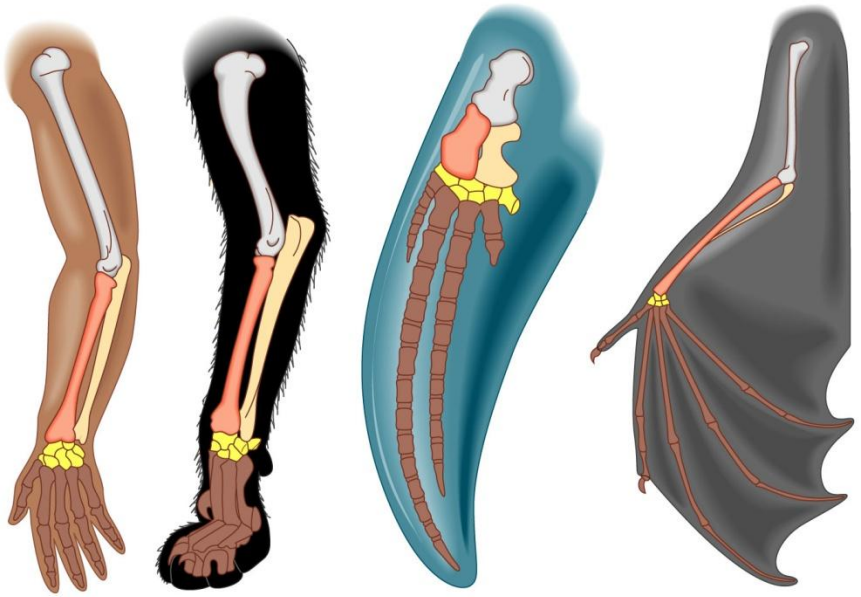
- Darwin observed species in different environments that were similar but slightly different from one another.
  - Darwin thought that these species had a **common ancestor**.
- Various populations of that ancestor were separated by geographic location and changed over time to adapt to a new and different environment.



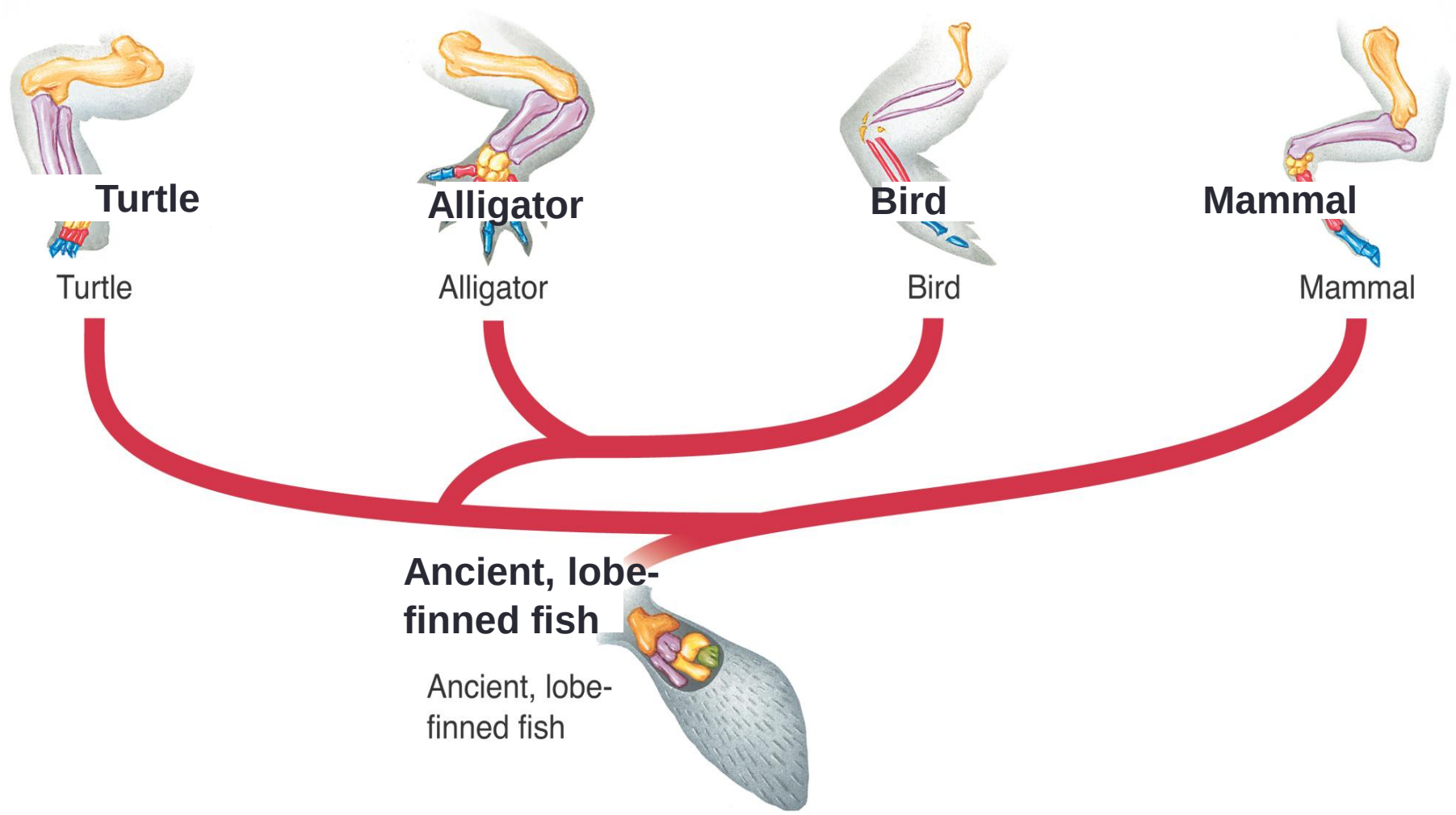


Evidence of Evolution: COMPARATIVE ANATOMY

- **Homologous structures**: structures that develop from the same embryonic tissues.
  - **same STRUCTURE, different FUNCTION**.
- These structures show that certain organisms evolved from common ancestors – but, adapted over time to survive in different environments.

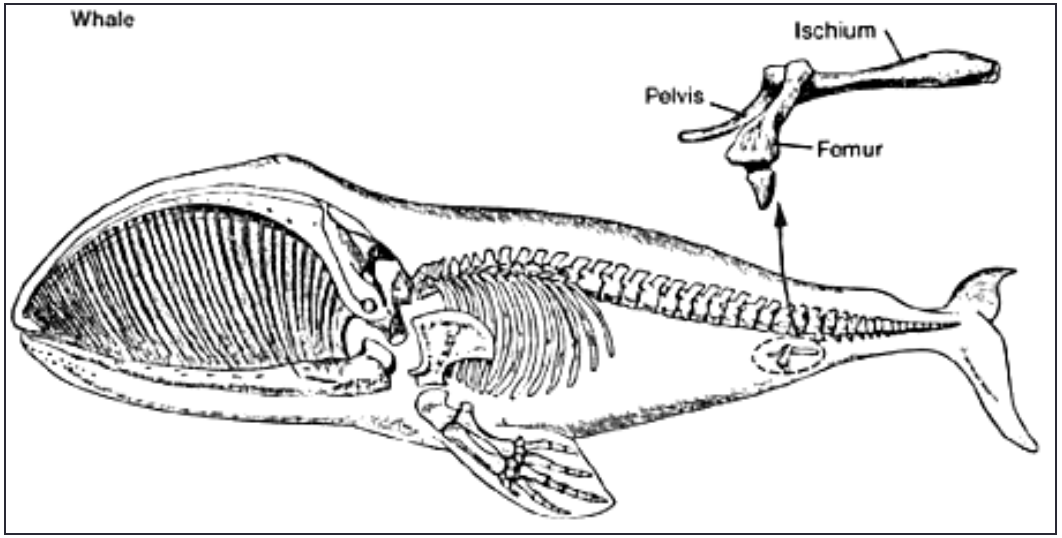


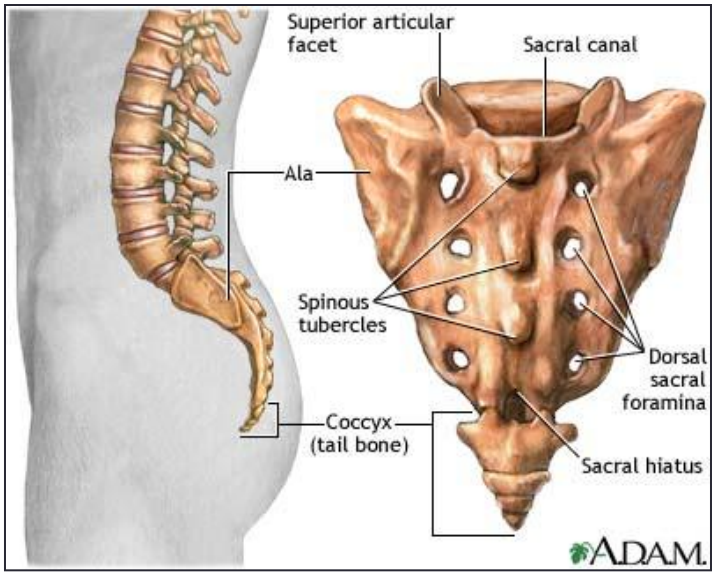
Evidence of Evolution: COMPARATIVE ANATOMY



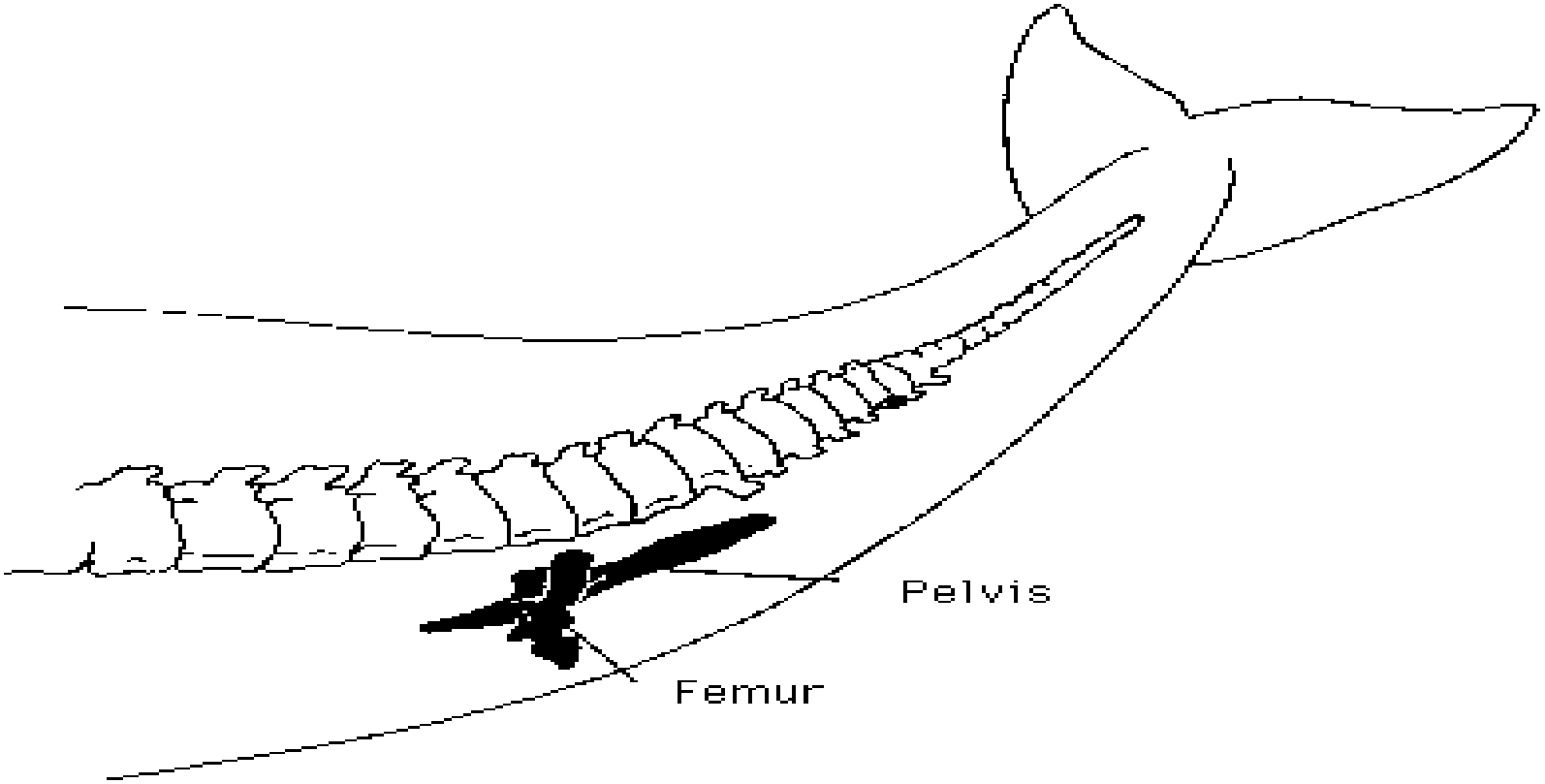
Evidence of Evolution: COMPARATIVE ANATOMY

- Some structures DO NOT serve important functions.
- The organs of many animals are so reduced in size that they are just vestiges, or traces, of homologous organs in other species: these are called **vestigial organs**.

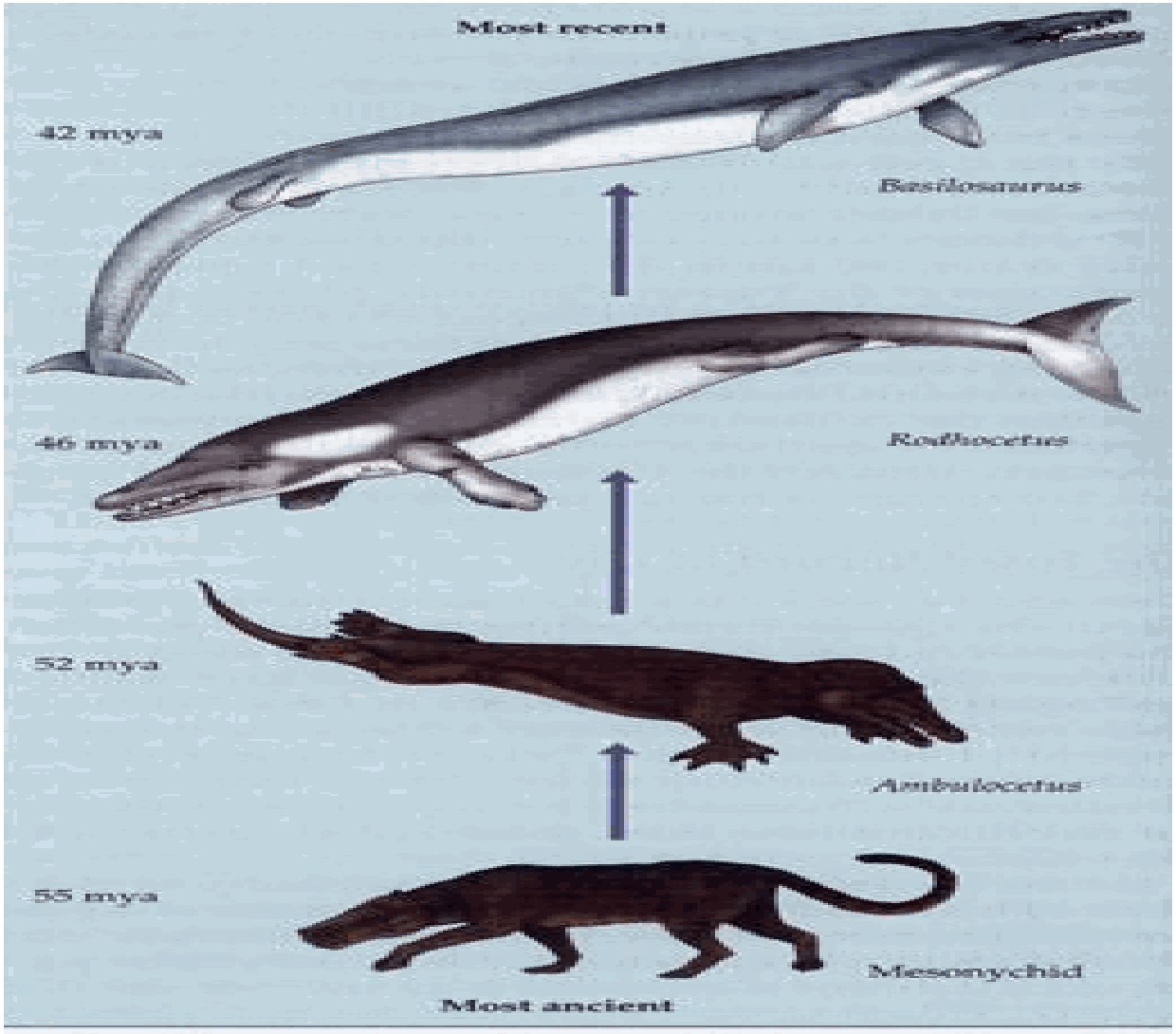




Hind Limbs of Whales



WHALE EVOLUTION



Evidence of Evolution: EMBRYOLOGY

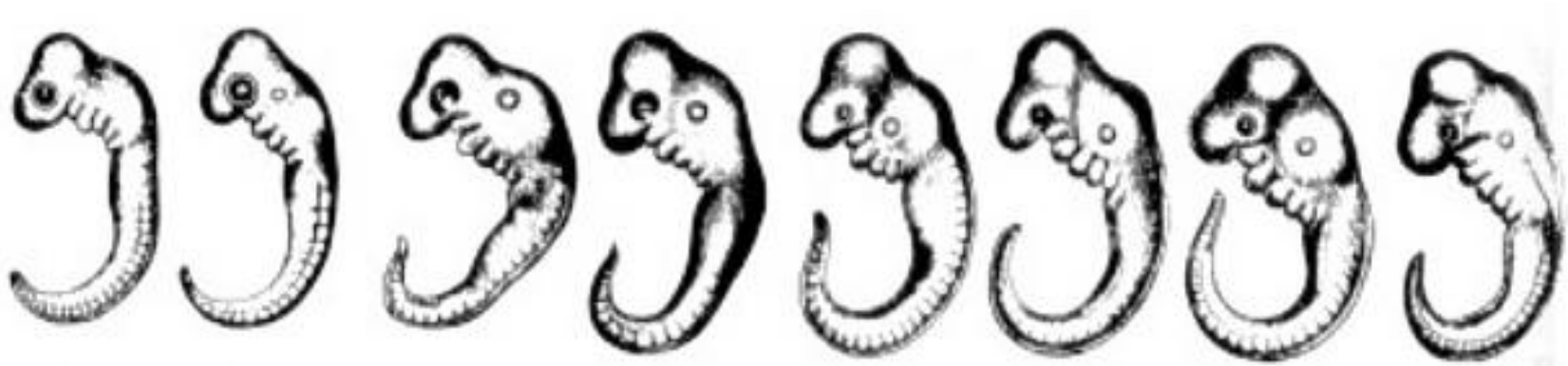
- Embryology: the study of the early stages, or embryos, of animals
- The same groups of embryonic cells develop in the same order and in similar patterns to produce the tissues and organs of all vertebrates.

Chick embryo (LM)

Human embryo

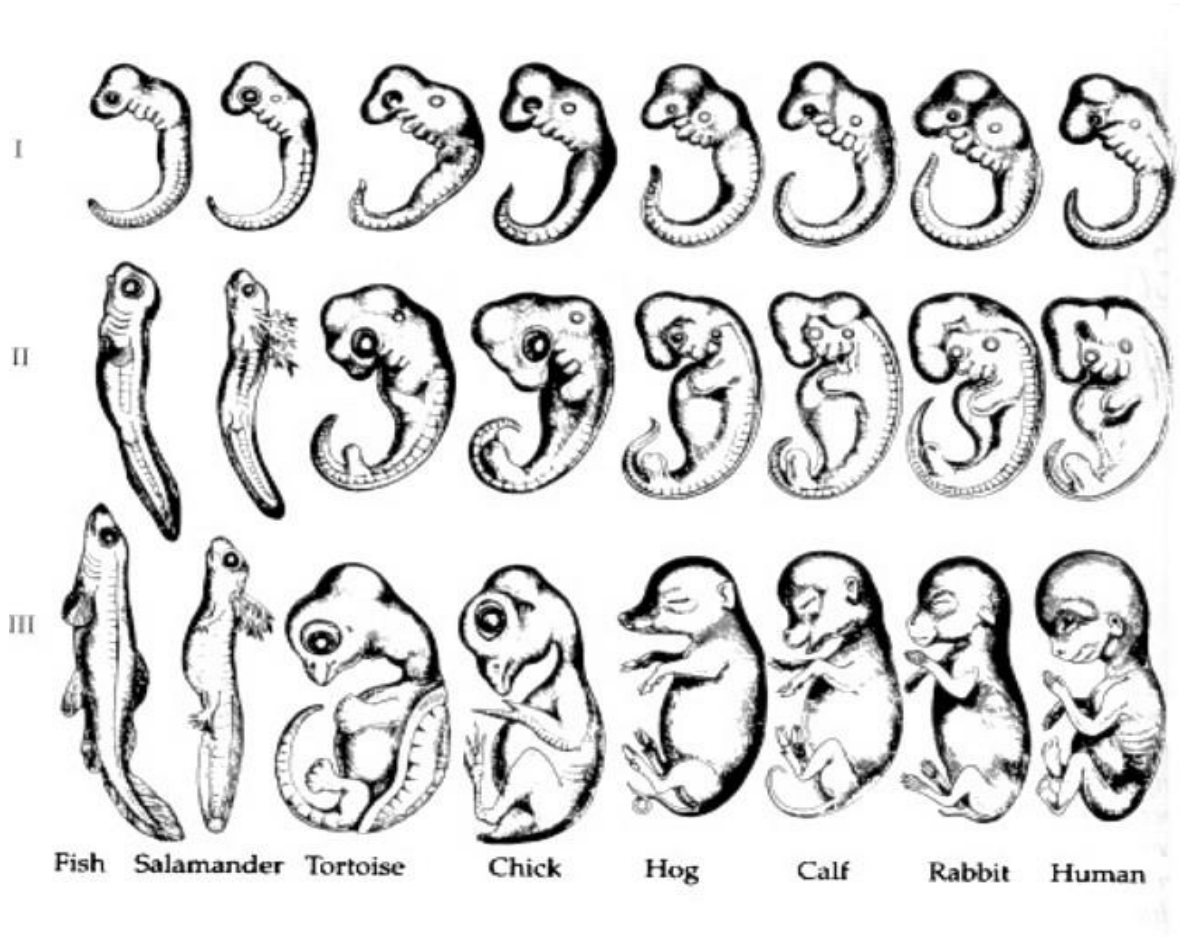
Embryology

Which one is the human in stage one of development?



Embryology

Embryology


I
II
III
Fish
Salamander
Tortoise
Chick
Hog
Calf
Rabbit
Human

Evidence of Evolution: SIMILAR DNA

- Scientists compare the nucleotide sequence of genes and see how many changes have occurred since two species diverged.