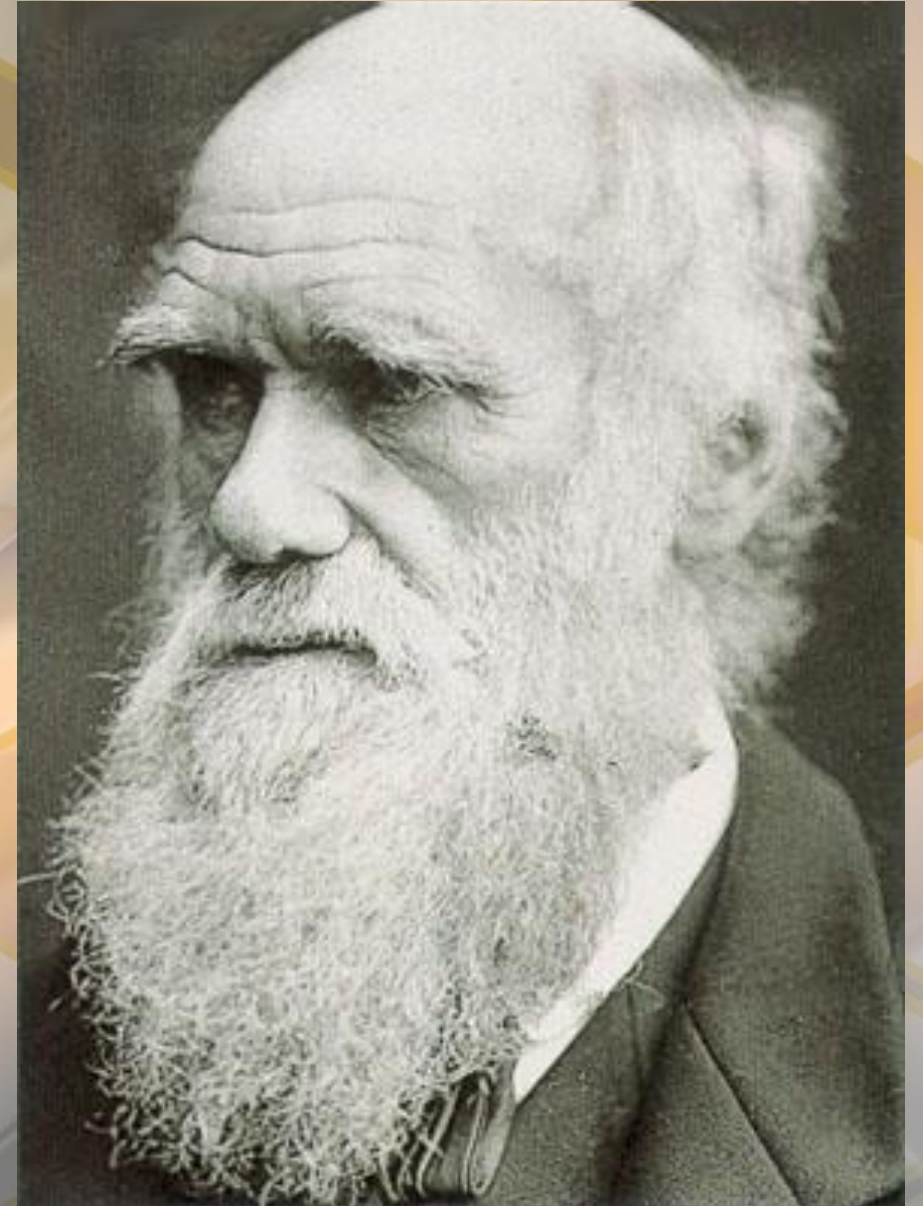


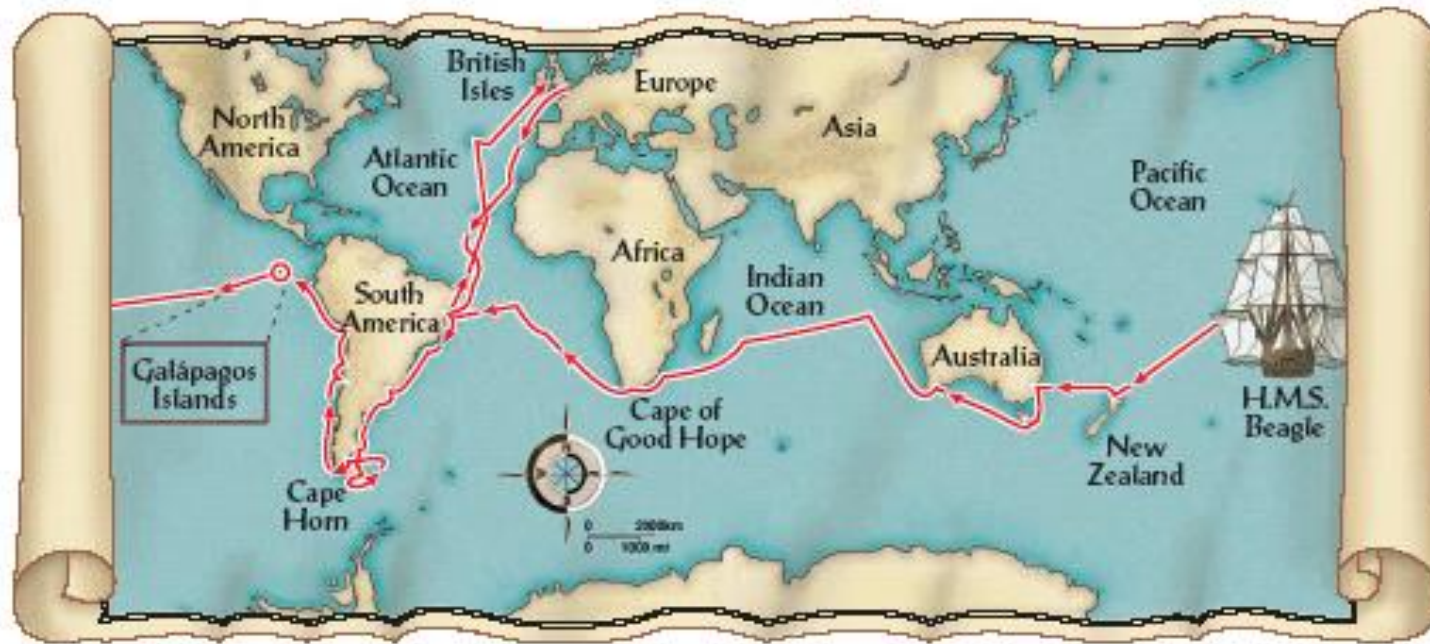
# Charles Darwin

- “The Father of Evolution”
- The Theory of Evolution – theory that all various species of living organisms originate from common ancestors, and that the differences are due to heritable modifications.
- Not the first to speak of the theory of evolution, but was the first to describe natural and artificial selection



# How did Darwin come up with evolution?

- In 1831, he began a 5 year voyage on the HMS Beagle that would change his life.



**Darwin's Voyage** On a five-year voyage on the *Beagle*, Charles Darwin visited several continents and many remote islands. 🌍 Darwin's observations led to a revolutionary theory about the way life changes over time.



# BIOGEOGRAPHY

# What were Darwin's observations?

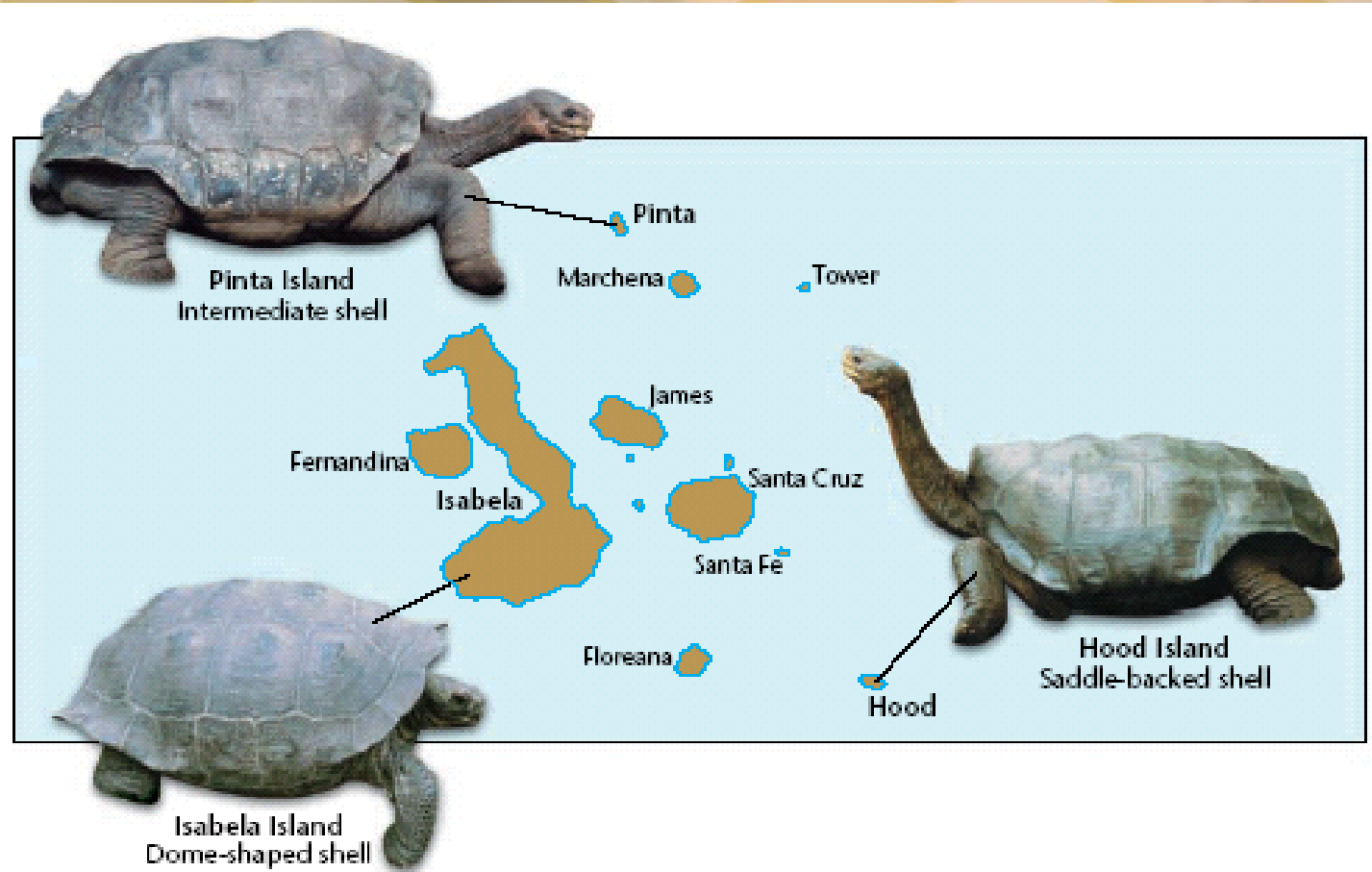
## Species Vary Globally

- Different, but similar, animals inhabited separate, but similar, habitats
  - Ex. Ostrich in Africa, Rhea in South America, Emu in Australia
- That some similar environments have very different animals.
  - Ex. Kangaroos in Australia but not England.



# Darwin's Observations Cont...

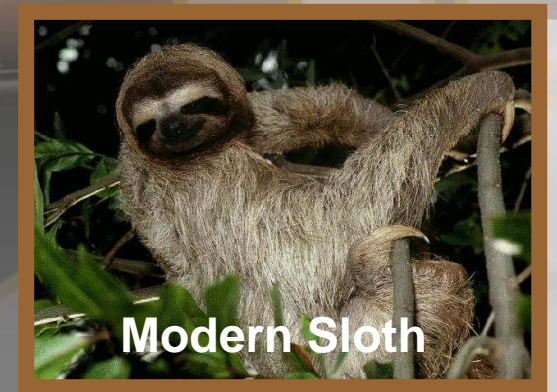
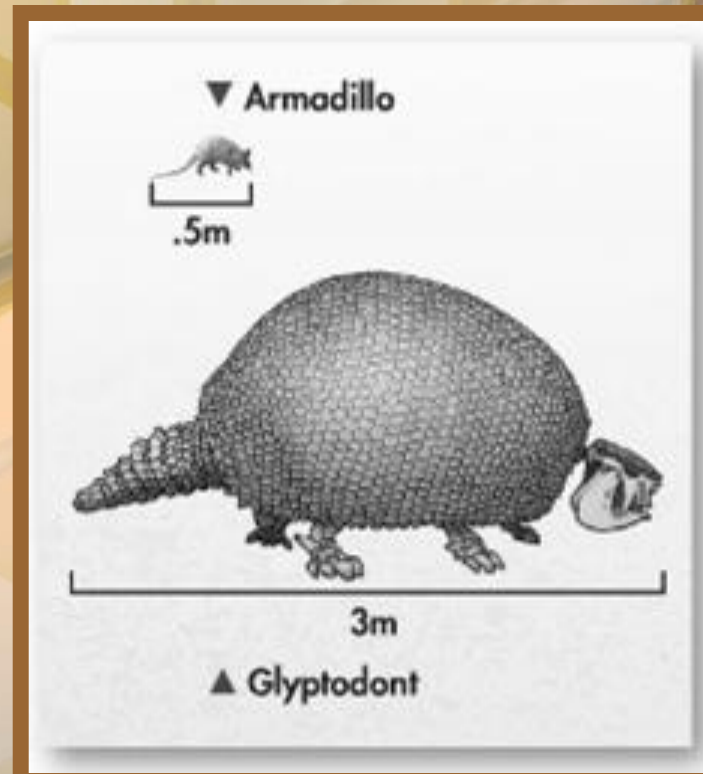
- **Species Vary Locally**
- Different, yet related, animals occupied different habitats within a local area
  - Exs. – Tortoises and Birds in the Galapagos Islands varied from island to island



**Variation Among Tortoises** 🇺🇸 Darwin observed that the characteristics of many animals and plants varied noticeably among the different Galapagos Islands. Among the tortoises, the shape of the shell corresponds to different habitats. The Hood Island tortoise (right) has a long neck and a shell that is curved and open around the neck and legs, allowing the tortoise to reach the sparse vegetation on Hood Island. The tortoise from Isabela Island (lower left) has a dome-shaped shell and a shorter neck. Vegetation on this island is more abundant and closer to the ground. The tortoise from Pinta Island has a shell that is intermediate between these two forms.

# Darwin's Observations Cont...

- Species Vary Over Time
- Some fossils of extinct animals were similar to living species
  - Ex. - Extinct giant armored Glyptodont is similar to and lived in the same area as the Armadillo



# What was Darwin's Conclusion?

- Darwin thought about the patterns he'd seen on his voyage
- He realized that there were many similarities between the animals he'd seen
- There was evidence that suggested that species were not fixed and that they could change by some natural process



What Darwin didn't know about natural selection

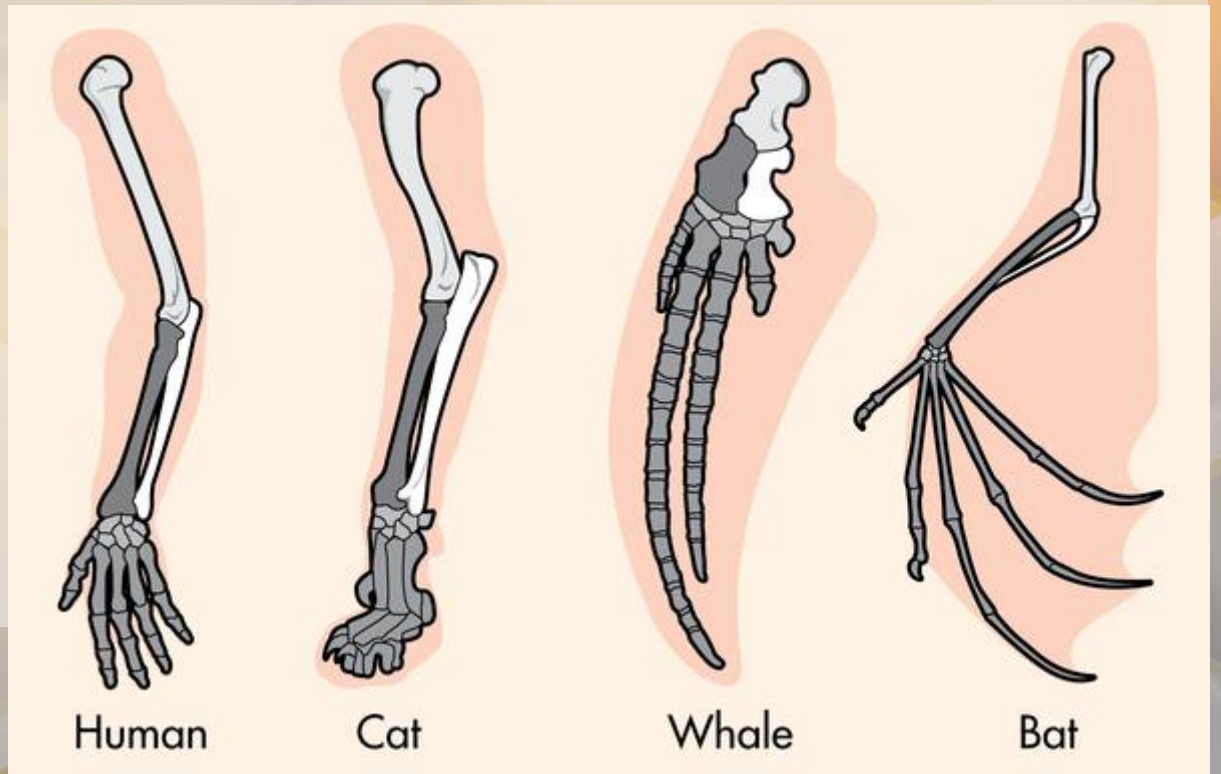
The background features a repeating pattern of hexagons in shades of yellow, orange, and grey. Overlaid on this pattern is a semi-transparent, stylized anatomical structure, possibly a wing or a set of membranes, rendered in a light, ethereal color.

# Comparative Anatomy



# Homology

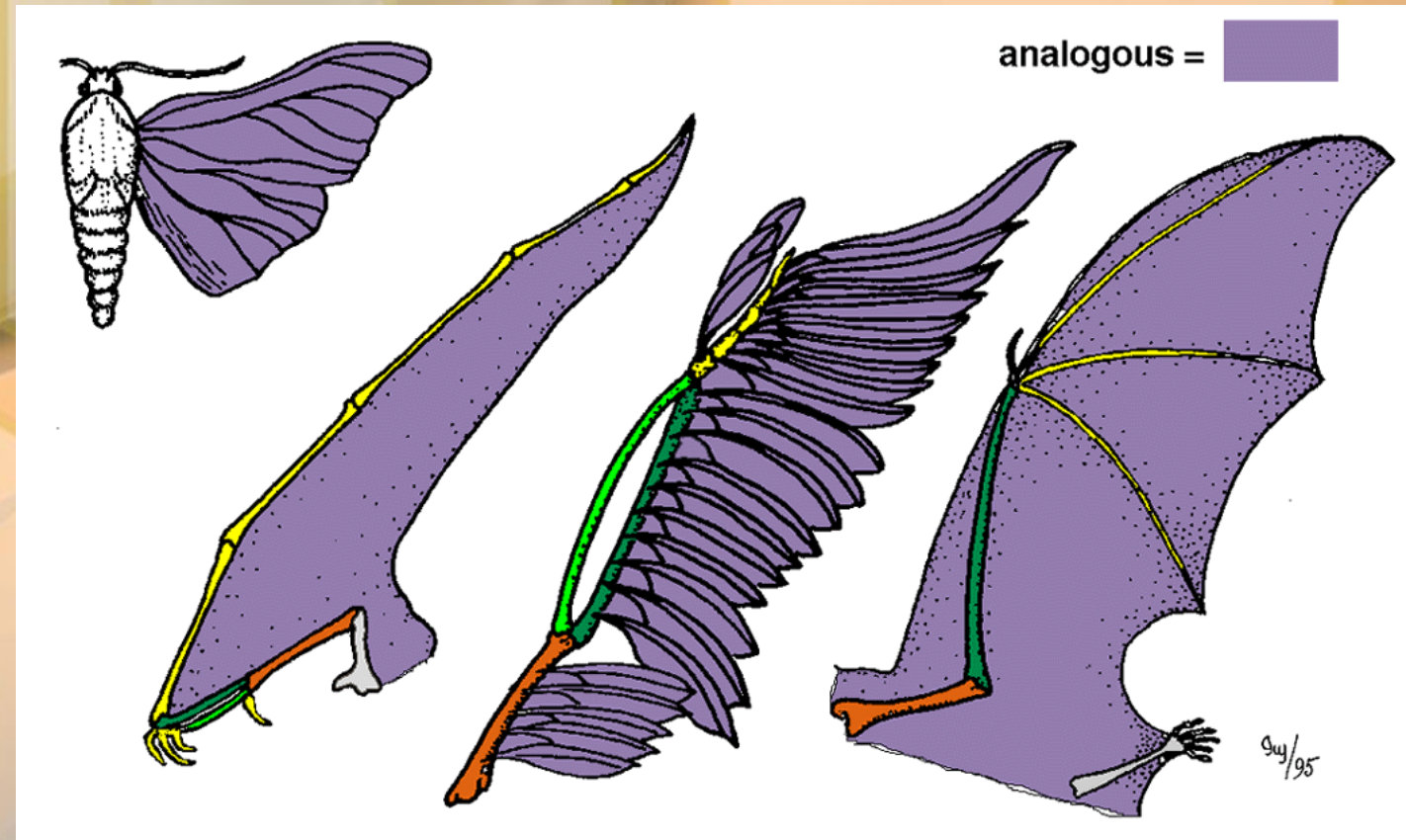
- Homology – similarity in anatomical features resulting from common ancestry
  - Same structure but different function – Homologous Structures
- Species that share a common ancestor will exhibit similar features that have evolved differently / changed as each organism faced different environmental conditions. (**Divergent Evolution**)



# Analogous Structures

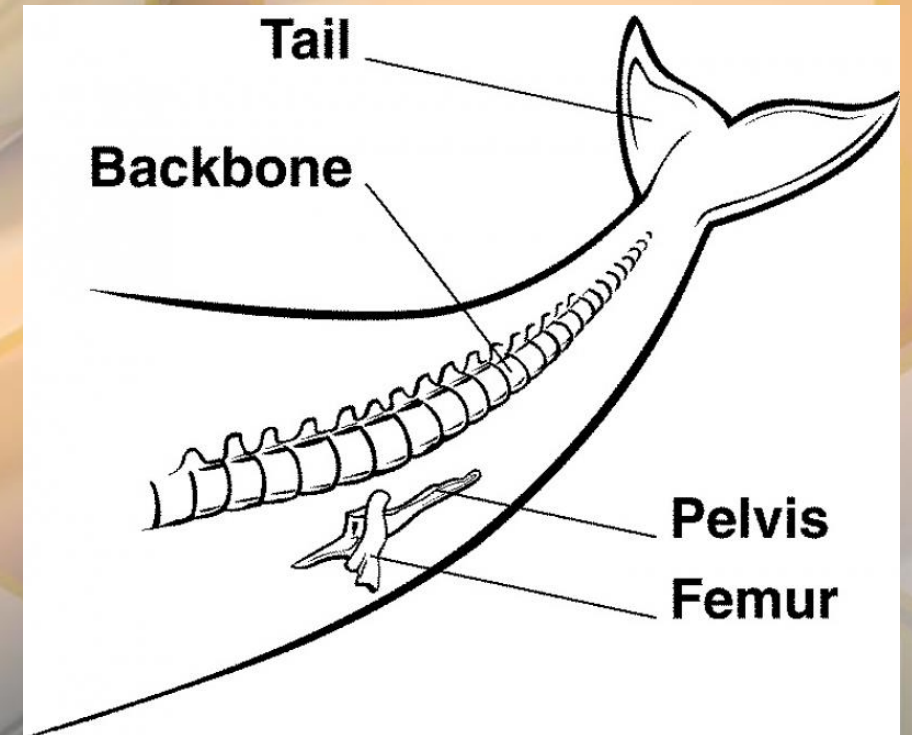
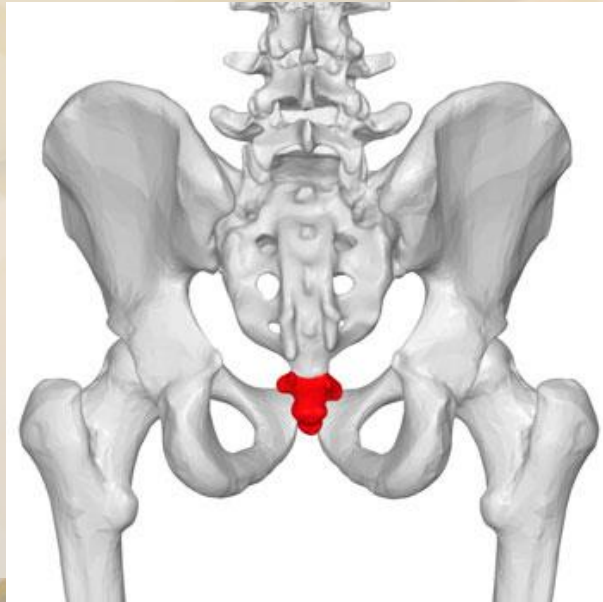
Some structures have the same function but not the same structure this is called analogous structures.

Organisms face similar pressures to adapt to, so they develop similar features, but do not share common ancestors. (Convergent Evolution)



# Vestigial Structures

- Vestigial structures are those structures that are similar but are reduced in size and remain unused
- Humans have a vestigial structure. Can you name it?

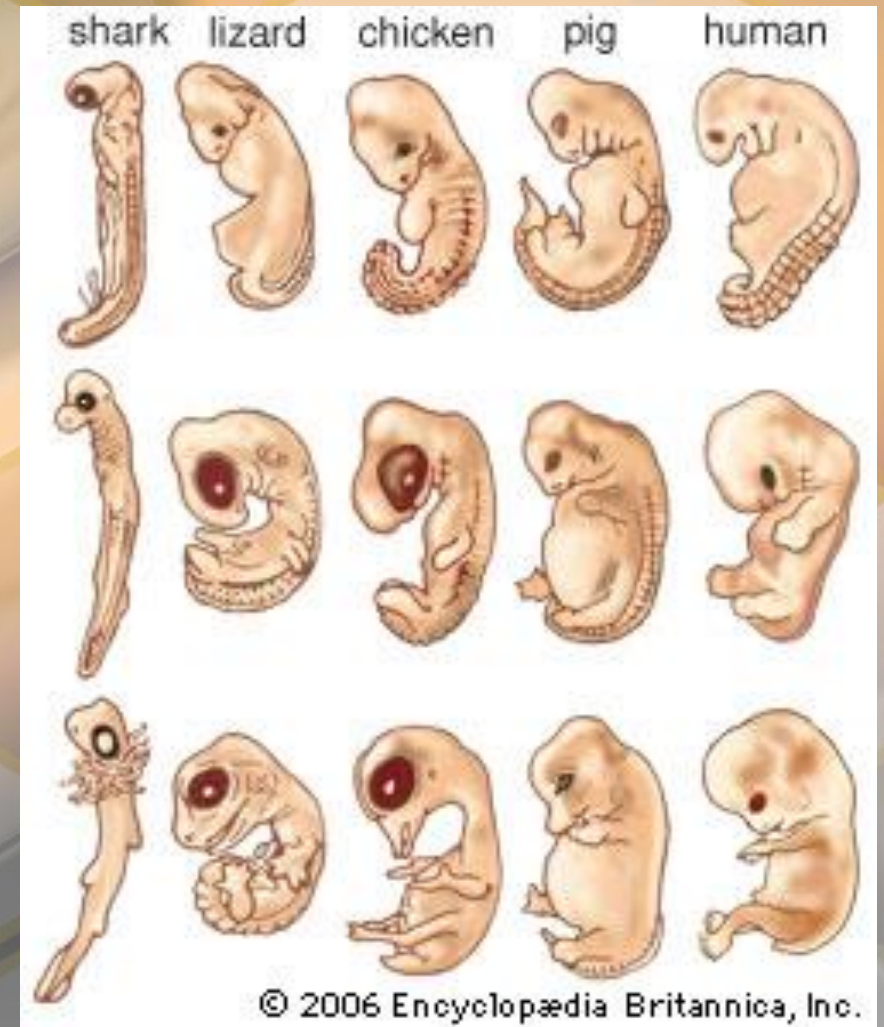


# Embryology

The background features a repeating pattern of hexagons in shades of yellow and gold. A large, semi-transparent sphere with a glowing, ethereal surface is positioned on the right side, partially overlapping the hexagonal pattern. The overall aesthetic is clean, modern, and scientific.

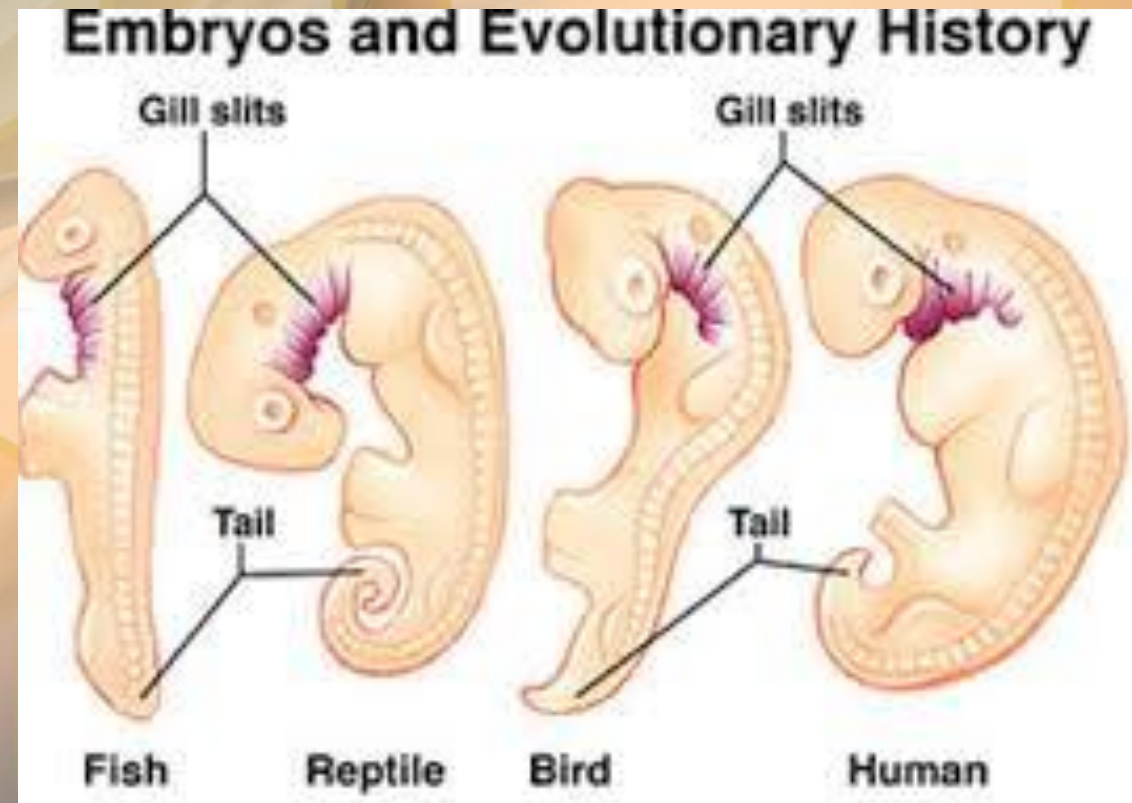
# Embryology

- Embryology is the study of the early stages of development of an organism
- Researchers noticed a long time ago that vertebrate embryos look very similar
- The same groups of embryonic cells develop in the same order and in similar patterns



# Embryology

- Vertebrate embryos have fold of tissue in the neck region called gill pouches
- In fish these develop into gills
- In human these same pouches develop to form inner ear bones.



# DNA/ Molecular Sequencing

- AKA Biochemical Evidence
- Two closely-related organisms will have similar DNA, RNA, and protein (amino acid) sequences.
- The more closely related organisms are, the more similar is the biochemical makeup
- Examples:
  - Similar chemistry & structure of chromosomes among Eukaryotes
  - Chlorophyll is the same basic molecule in all photosynthetic organisms

## Molecular Evidence

The DNA sequences of whales and ungulates are very similar, as demonstrated by the DNA fragments below.

Hippopotamus	<b>TCC TGGCA GTCCA GTGGT</b>
Humpback whale	<b>CCC TGGCA GTGCA GTGCT</b>