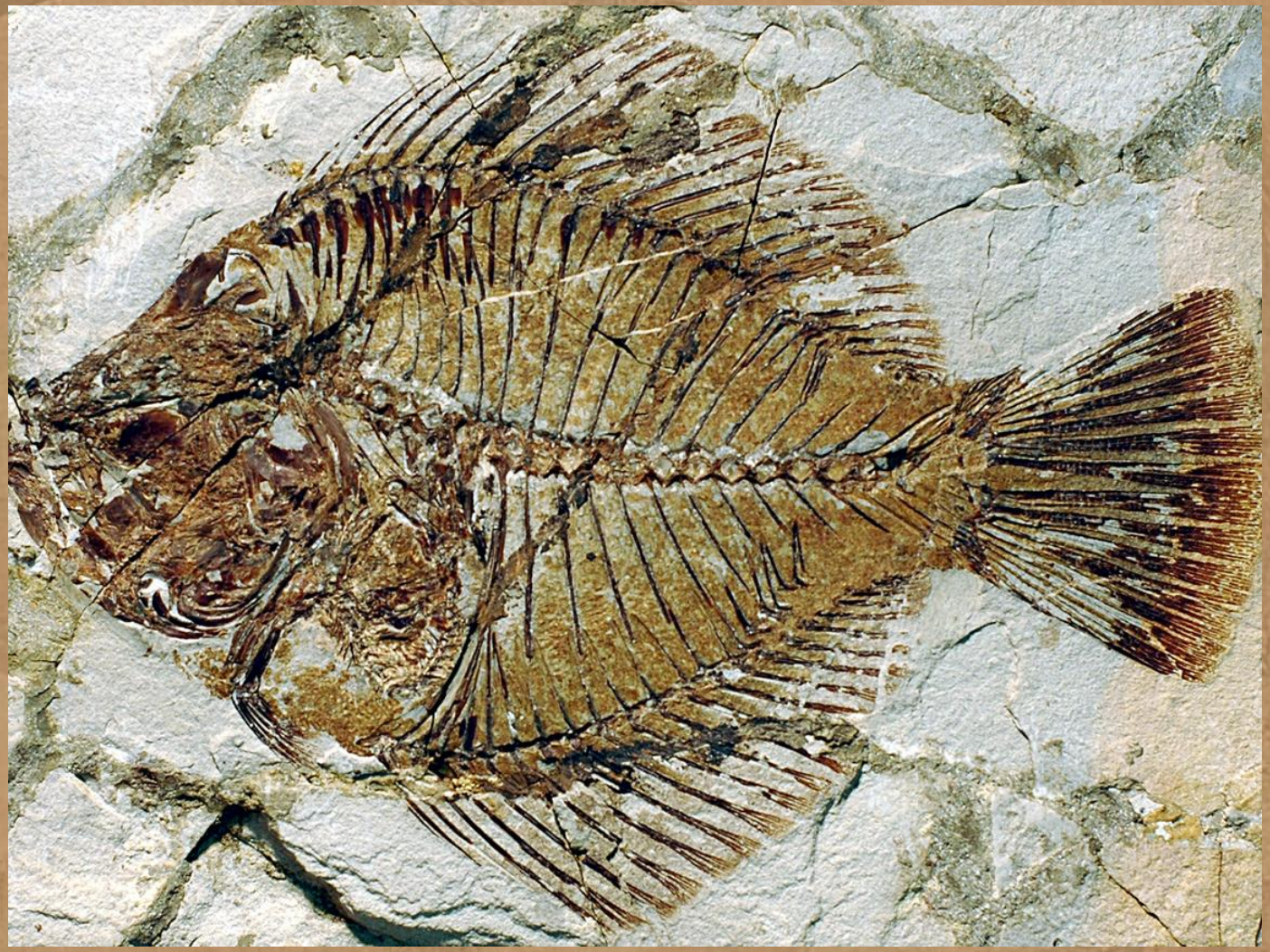


Evidence for Evolution

Evidence

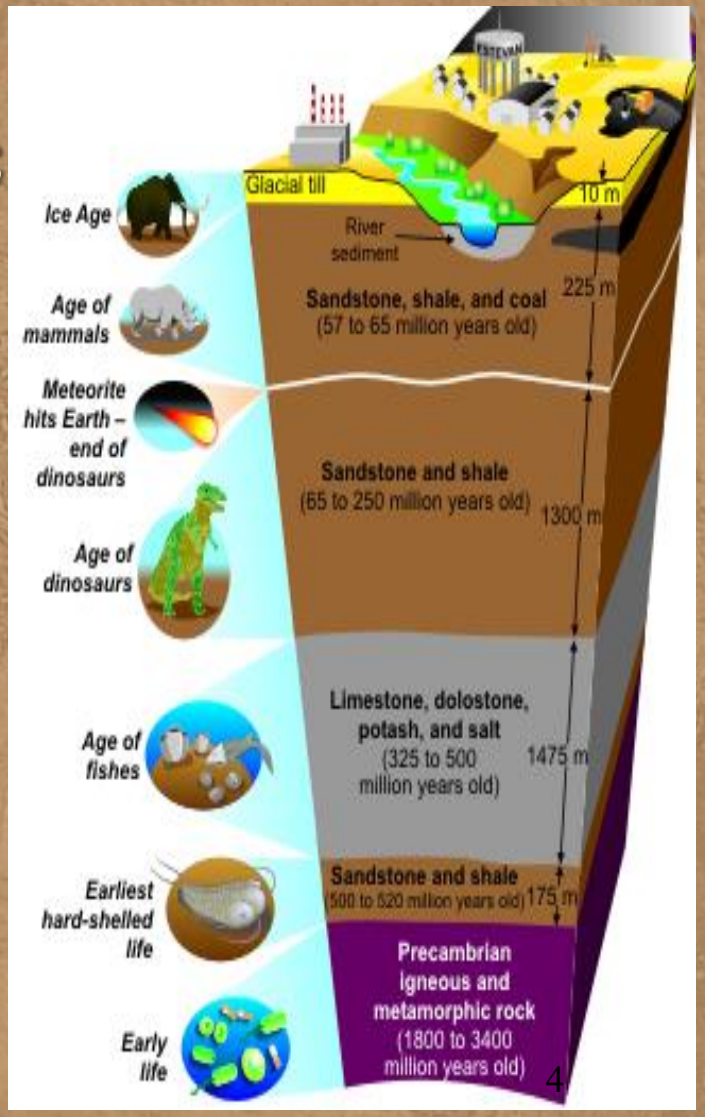
Evidence of **common ancestry** among species comes from many sources.

Five examples of Evidence for Evolution

1. Fossils
2. Geographical Distribution
3. Embryology
4. Comparative Anatomy
5. Molecular and Genetic

#1 Fossil Evidence

- **Fossils**
  - Earth is **Billions** of years old!
  - Fossils in **older layers** are **more primitive** than those in the upper layers.
  - **Extinct** Fossils resemble **modern animals**.
  - This shows a **common ancestry**.



Types of Fossils

- **Permineralization** occurs when minerals carried by water are deposited around a hard structure
- A **natural cast** forms when flowing water removes all of the original tissue, leaving an impression.

Types of Fossils

- **Amber-preserved** fossils are organisms that become trapped in tree resin that hardens after the tree is buried.
- **Fossilized insects**

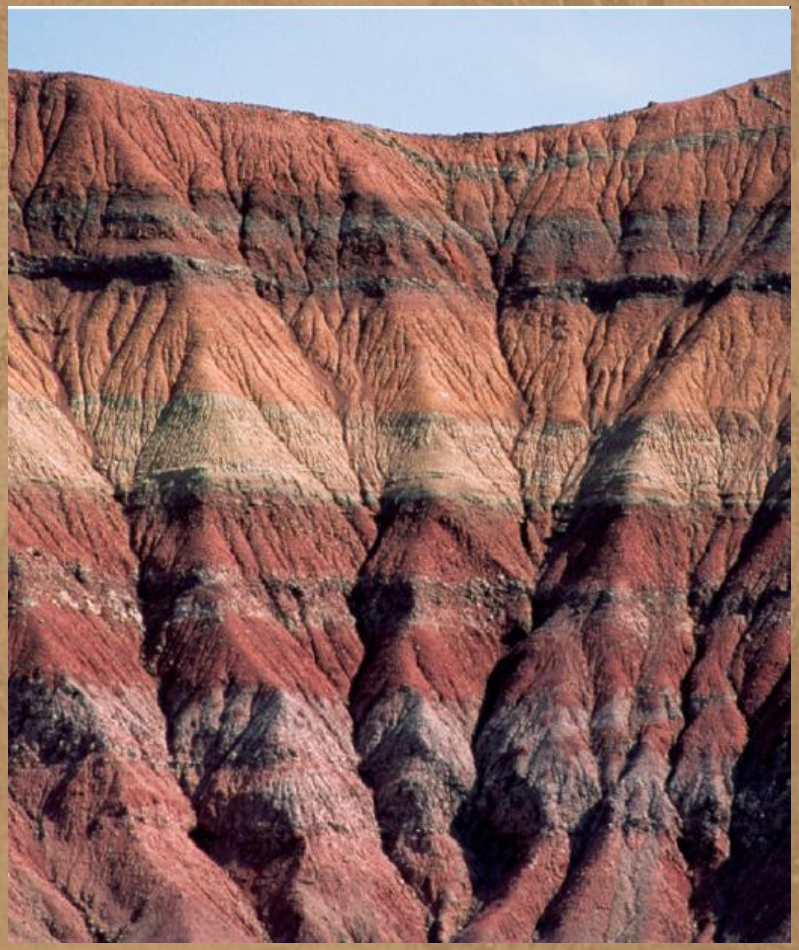
Types of Fossils

- **Impressions** are imprints left in rock
- **Preserved remains** form when an entire organism becomes encased in material such as ice, ash, tar …

Preserved Mammoth

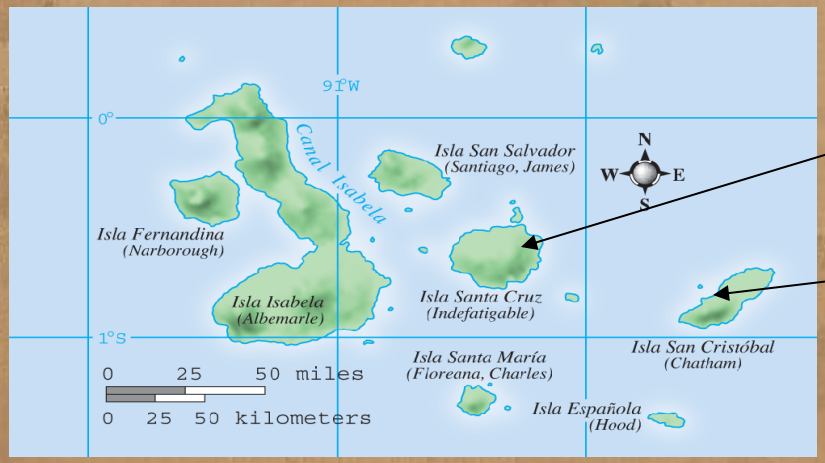
Relative Dating of Fossils

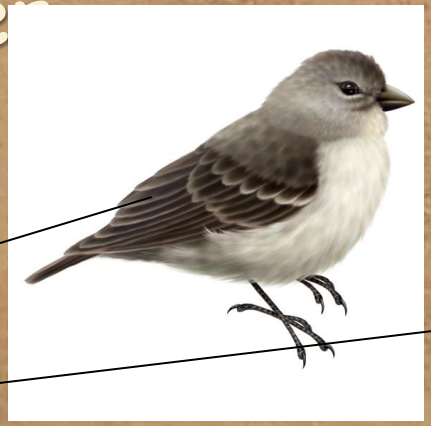
- Estimates the time during which an organism lived
- It compares the placement of fossils in layers of rock
- Scientists infer the order in which species existed



#2 Geographical Distribution

- Geography & environment gives evidence for evolution
- Island species most closely resemble nearest mainland species
- Populations can show variation from one island to another

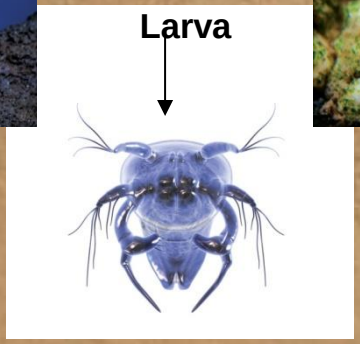




#3 Embryology

- Embryo (**early developmental stage**) gives evidence of evolution
- Identical larvae, different adult body forms
- Similar embryos, related but diverse organisms
- Shows common ancestry

Adult crab



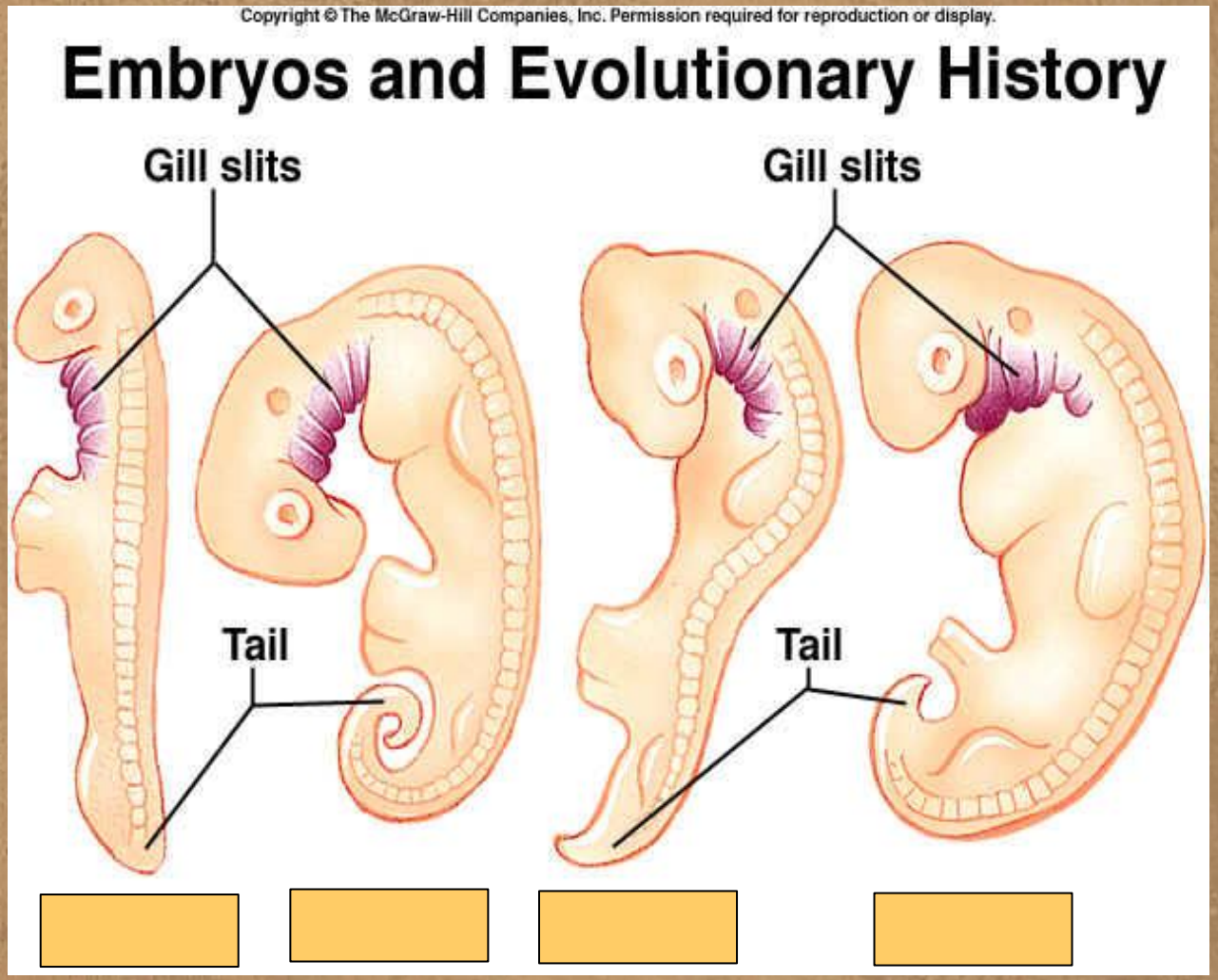
Larva

Adult barnacle

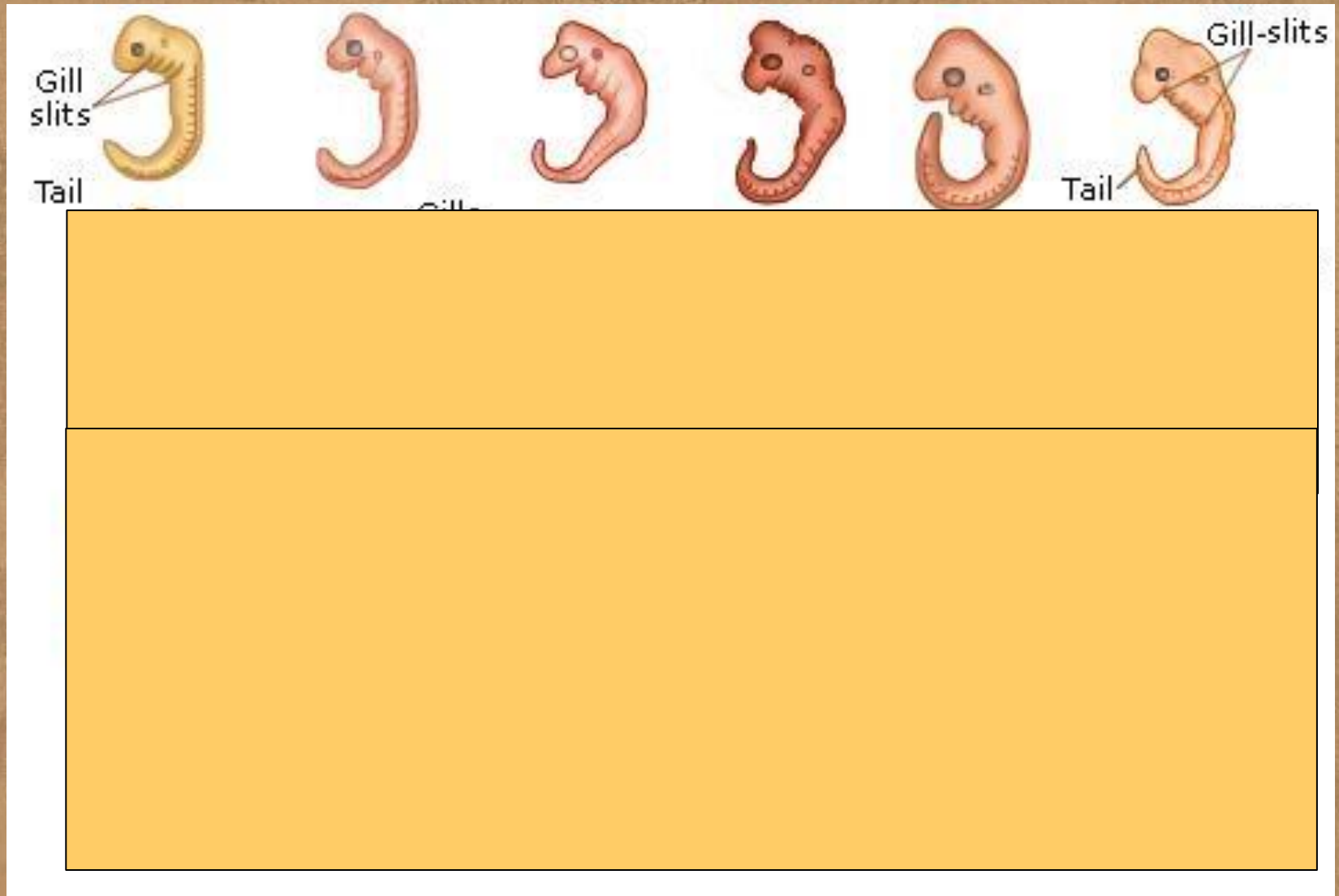
Bird, Fish, Reptile, Human

#3 Embryology

Vertebrates all share gill slits and a tail in their early embryo stage; **Share a common ancestor**



Fish, Rabbit,
Human, Chick,
Tortoise,
Salamander

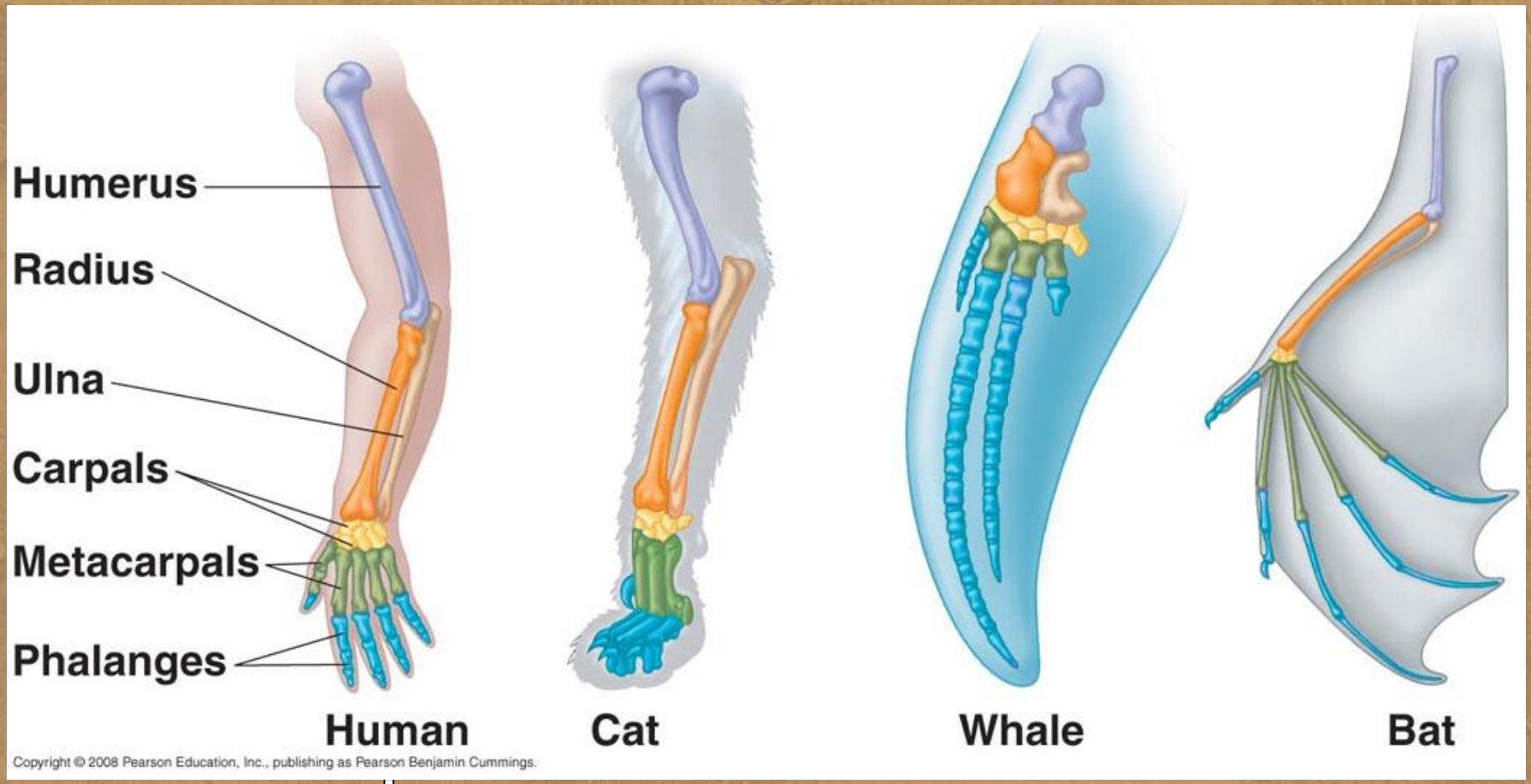


#4 Comparative Anatomy

- The study of anatomy provides evidence of evolution
- **Homologous** structures are **similar in structure but different in function**.
- Homologous structures **ARE EVIDENCE** of a common ancestor.

Homologous Structures

ARM **LEG** **Flipper** **Wing**



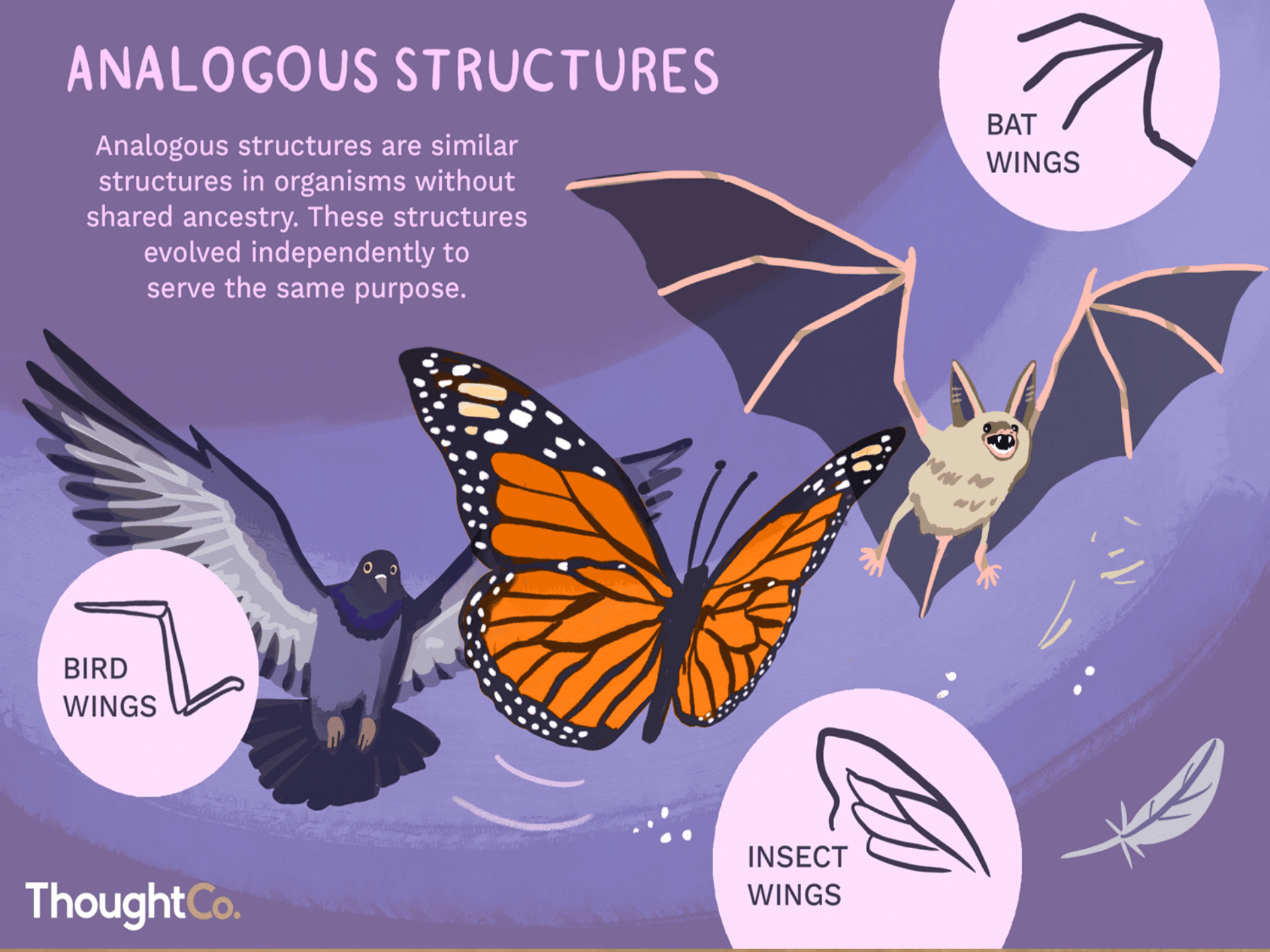
grasping walking swimming **flight**

#4 Comparative Anatomy

- **Analogous** structures are **similar in function but differ in structure**
- Analogous structures **DO NOT** show common ancestry

ANALOGOUS STRUCTURES

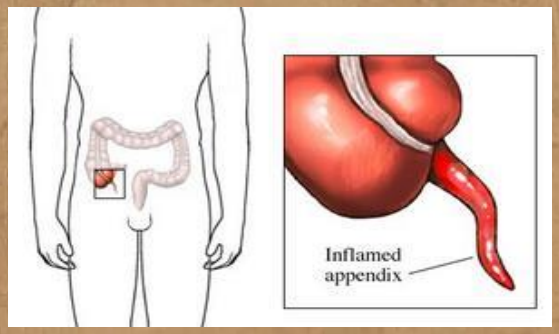
Analogous structures are similar structures in organisms without shared ancestry. These structures evolved independently to serve the same purpose.

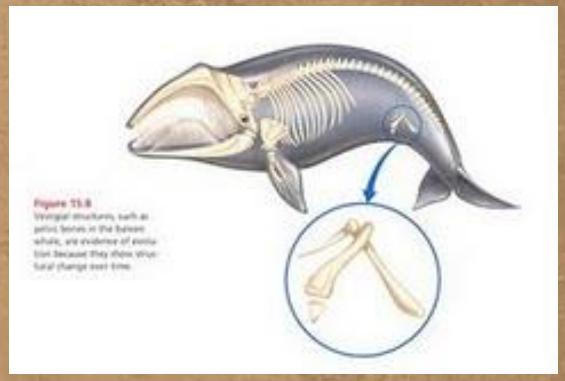


ThoughtCo.

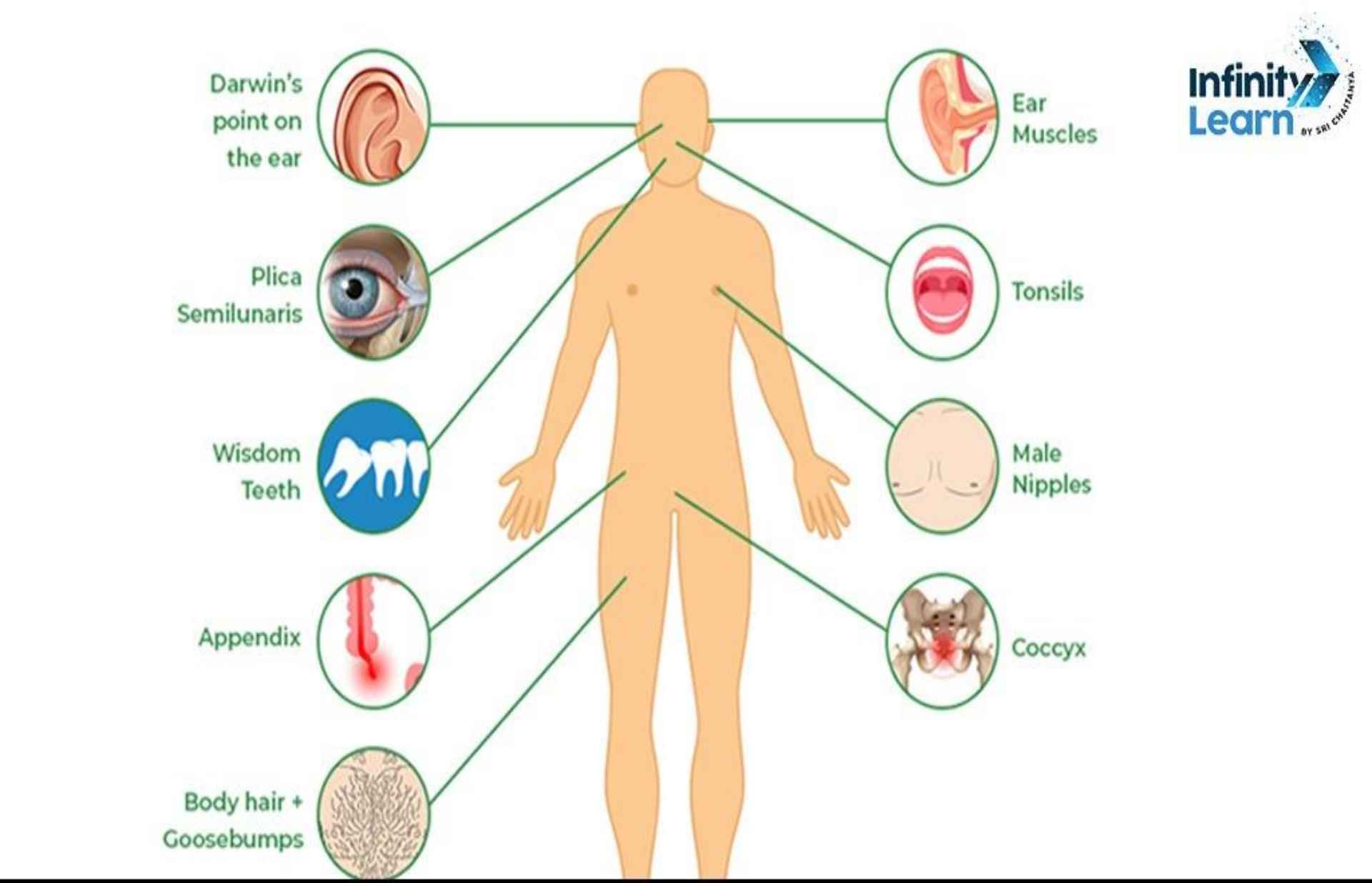
Structural patterns are clues to the history of a species.

- **Vestigial structures** are <u>remnants of organs or structures that had a function in an early ancestor</u>.
- **Examples** include ostrich wings, human appendix, and wisdom teeth, whale and snake pelvis/hind legs





Pythons have tiny femurs (leg bone)



7 VESTIGIAL FEATURES OF THE HUMAN BODY

#5 Molecular and Genetic Evidence

- AKA **Biochemical Evidence**
- Two closely-related organisms will have **similar DNA, RNA, and protein (amino acid) sequences**.
- This also gives evidence of a **common ancestor**.

Amino acids reveal evolution

Cytochrome *c* Evolution

Organism	Number of amino acid differences from humans
Chimpanzee	0
Rhesus monkey	1
Rabbit	9
Cow	10
Pigeon	12
Bullfrog	20
Fruit fly	24
Wheat germ	37
Yeast	42

A

Molecular Evidence

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

Hippopotamus	TCC TGGCA GTCCA GTGGT
Humpback whale	CCC TGGCA GTGCA GTGCT