



Evidence for Evolution

Evidence

Evidence of
common
ancestry
among species
comes from
many sources.

Dorudon 40 million years ago



Ambulocetus natans 50 million years ago



Pakicetus 52 million years ago



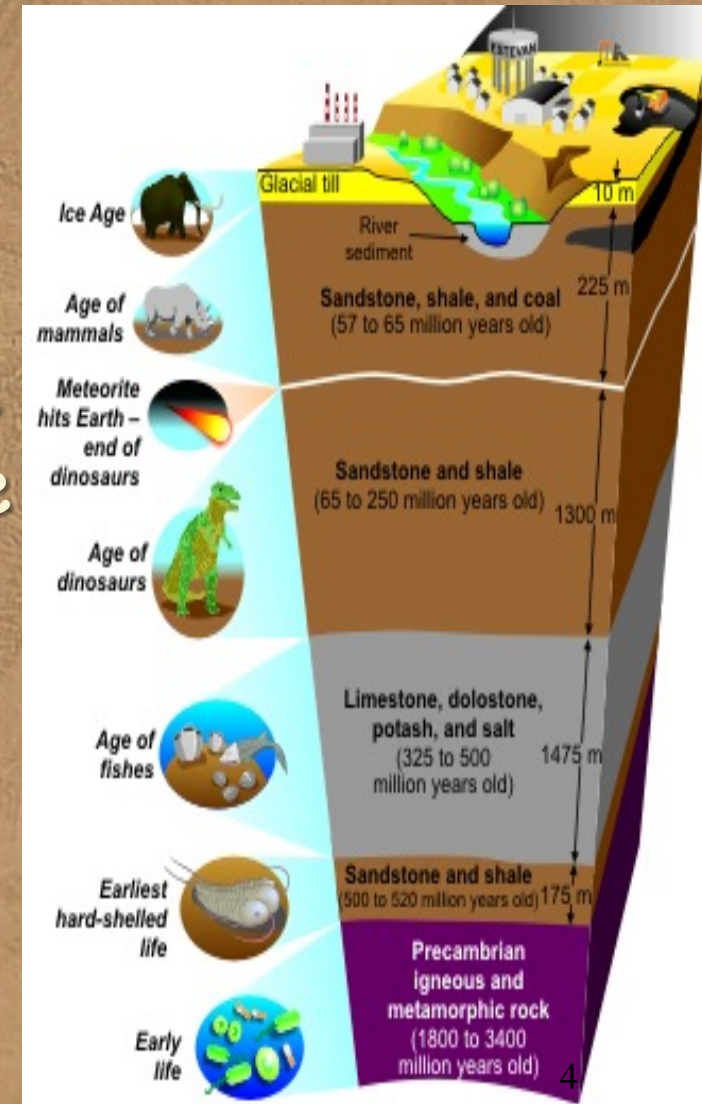
Five examples of Evidence for Evolution

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



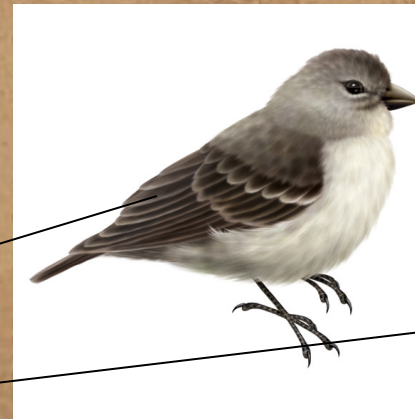
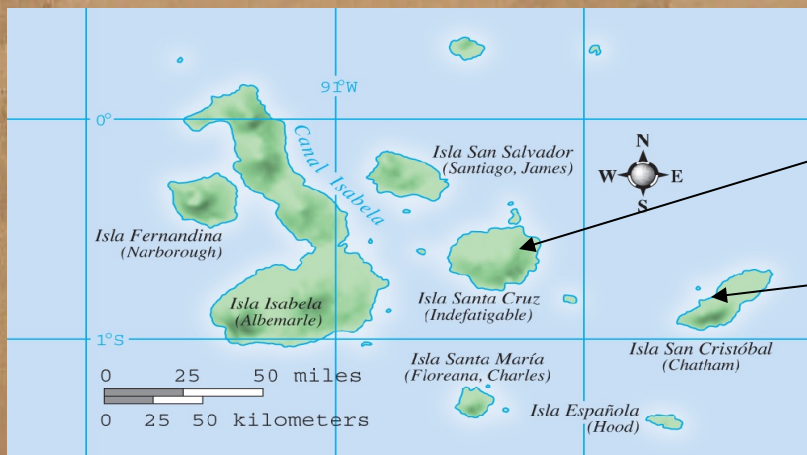
Relative Dating of Fossils

- ❑ 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

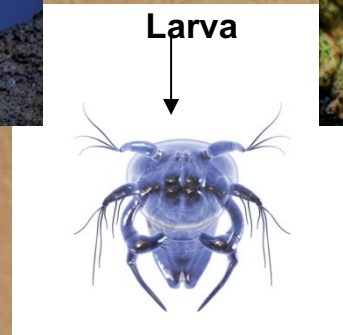


#3 Embryology

- ❑ 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

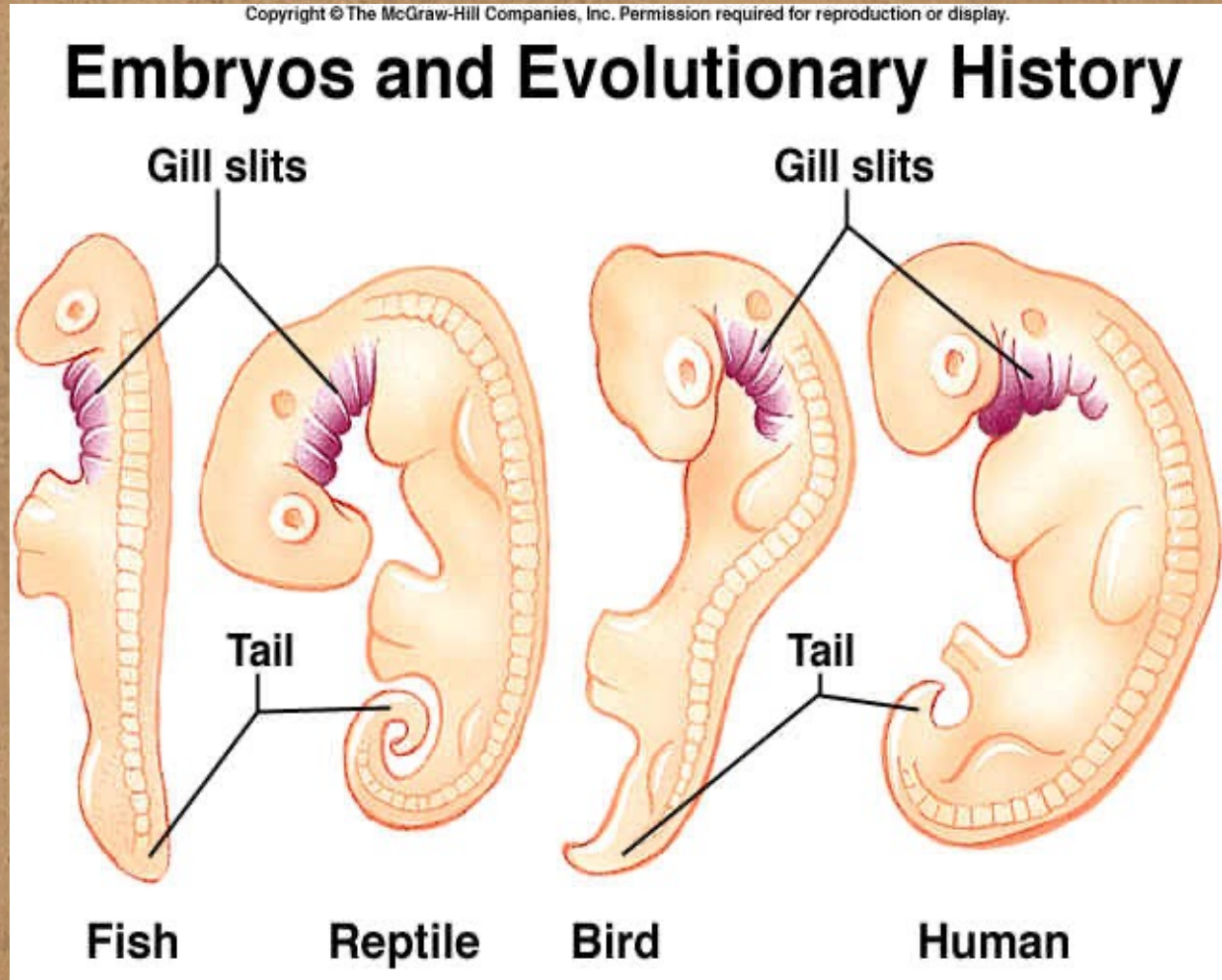


↑
Adult barnacle

#3 Embryology

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

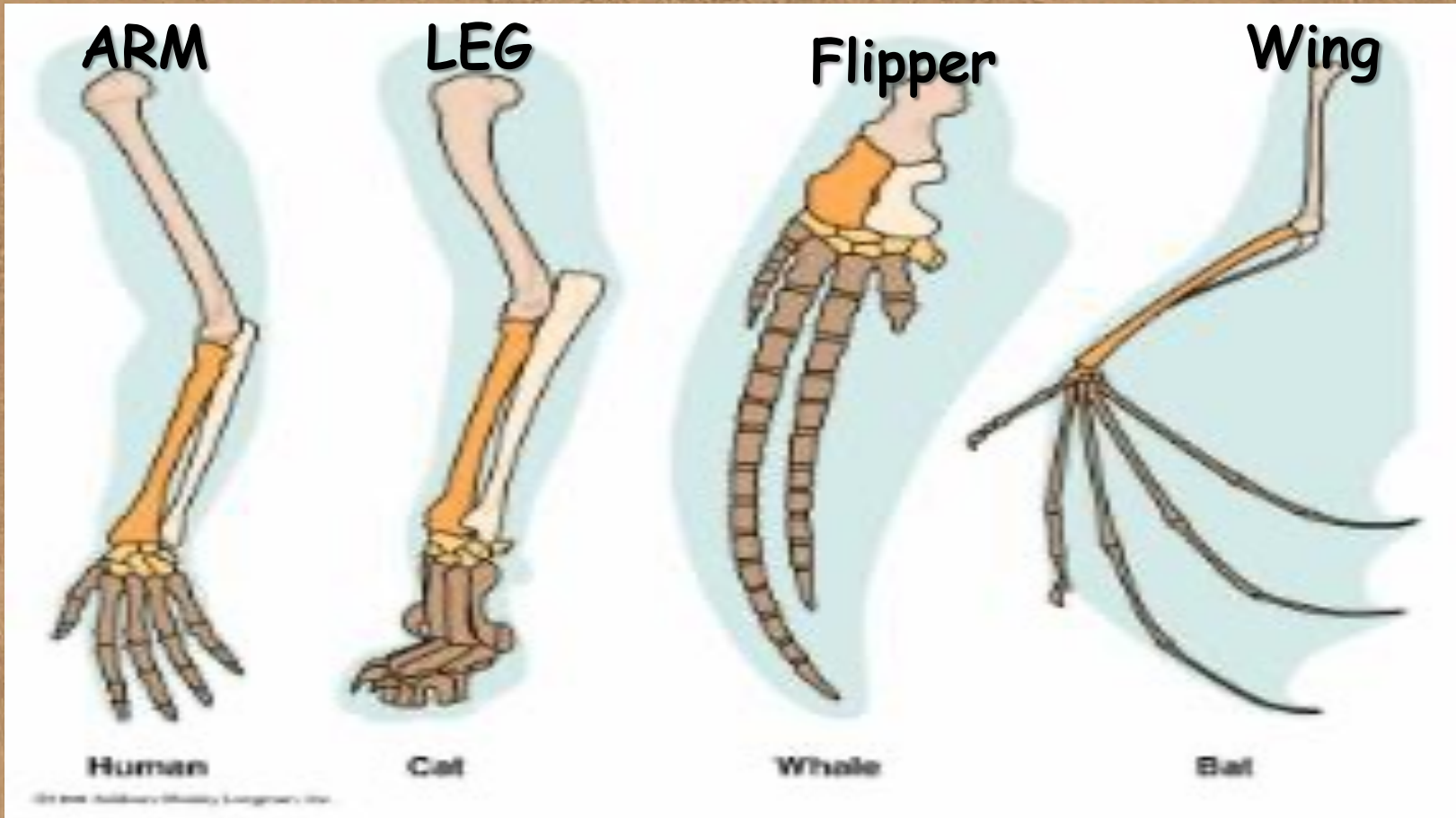
Bird, Fish,
Reptile,
Human



#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



grasping

walking

swimming

flight

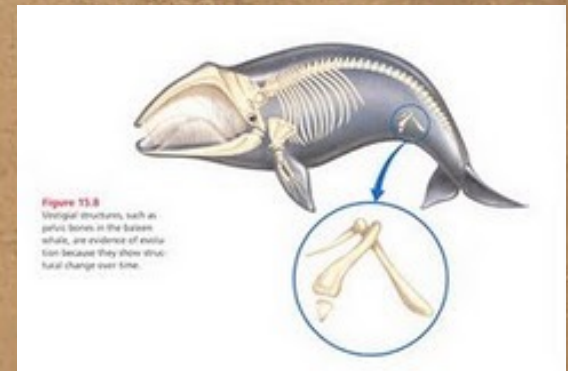
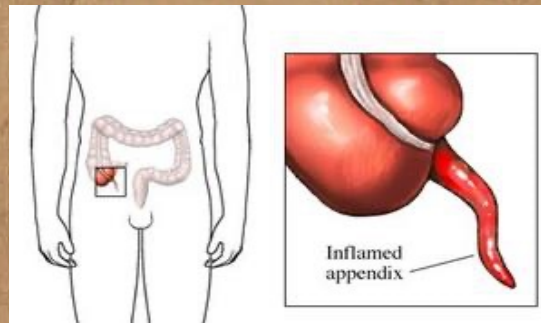
#4 Comparative Anatomy

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



Structural patterns are clues to the history of a species.

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












Pythons have tiny femurs (leg bone)



#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

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**

