15.2- Evidence of Evolution

The **theory of evolution** states that all organisms on Earth have descended from a single ancestor.

Recall that theories provide explanations for natural phenomena based on observation.

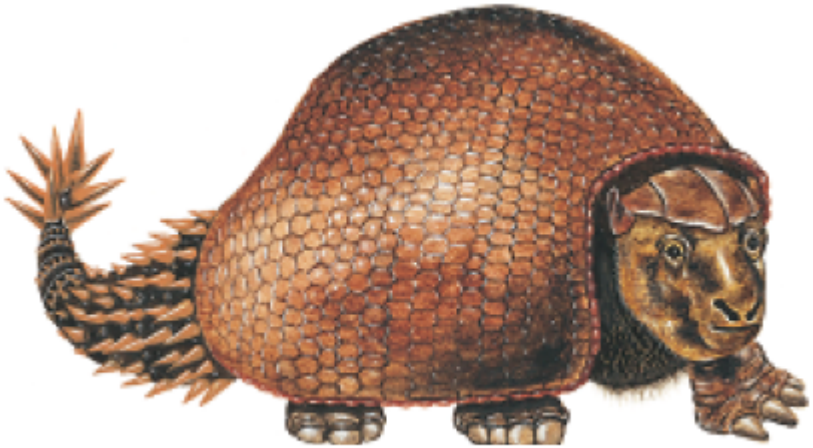
Ex: cell theory, heliocentric theory, theory of plate tectonics

Evidence for evolution comes from:

- The fossil record
- Comparative anatomy
- Comparative embryology
- Comparative biochemistry
- Geographic distribution

The fossil record is an important source of information for determining the ancestry of organisms and the patterns of evolution.

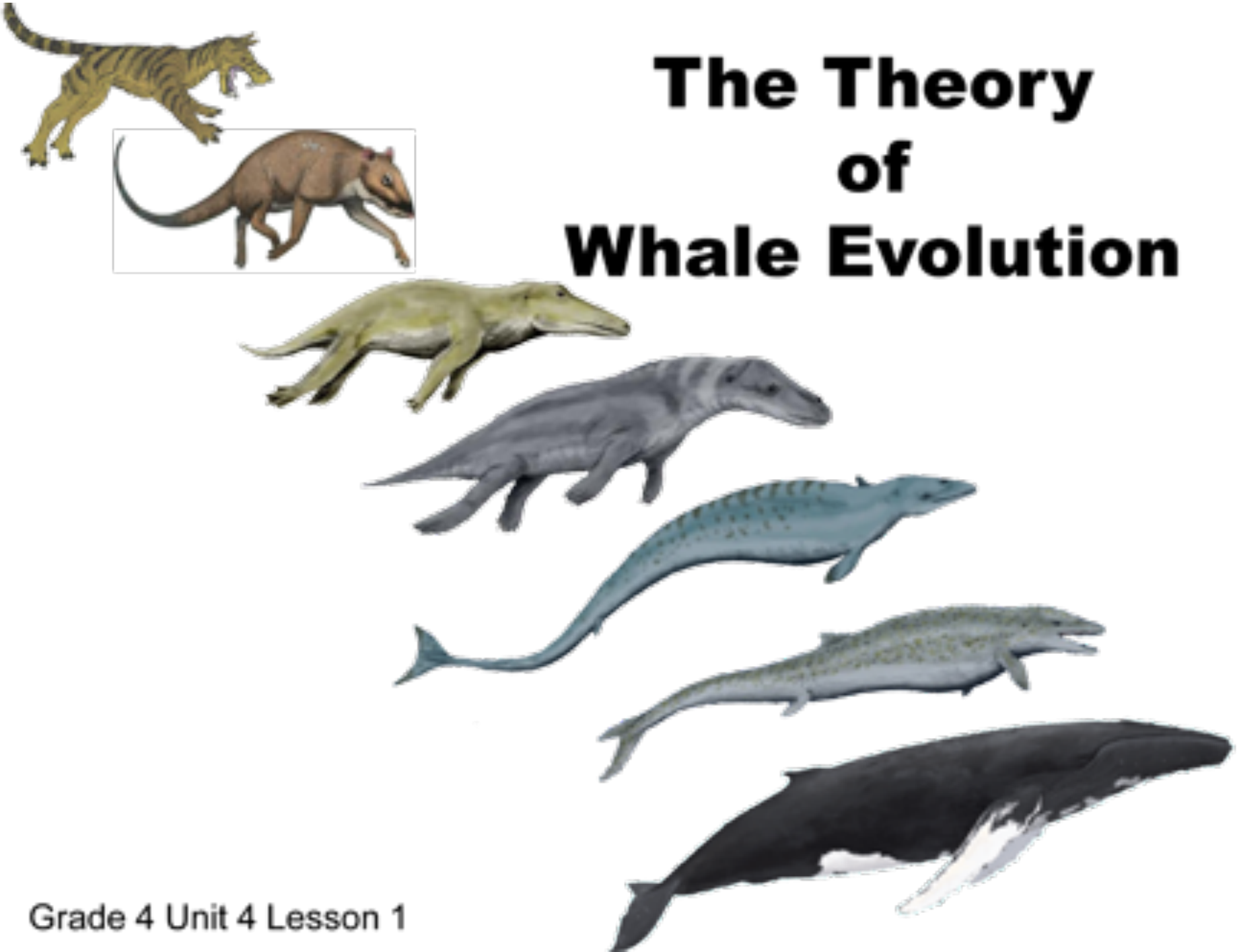
- shows how modern species resemble ancient species
- shows that some species have changed very little.



The glyptodont was an ancient ancestor of the modern armadillo.

Darwin predicted the existence of **intermediate organisms, or transitional fossils** between species, such as *Archaeopteryx*

The Theory of Whale Evolution



Grade 4 Unit 4 Lesson 1

2 types of traits :

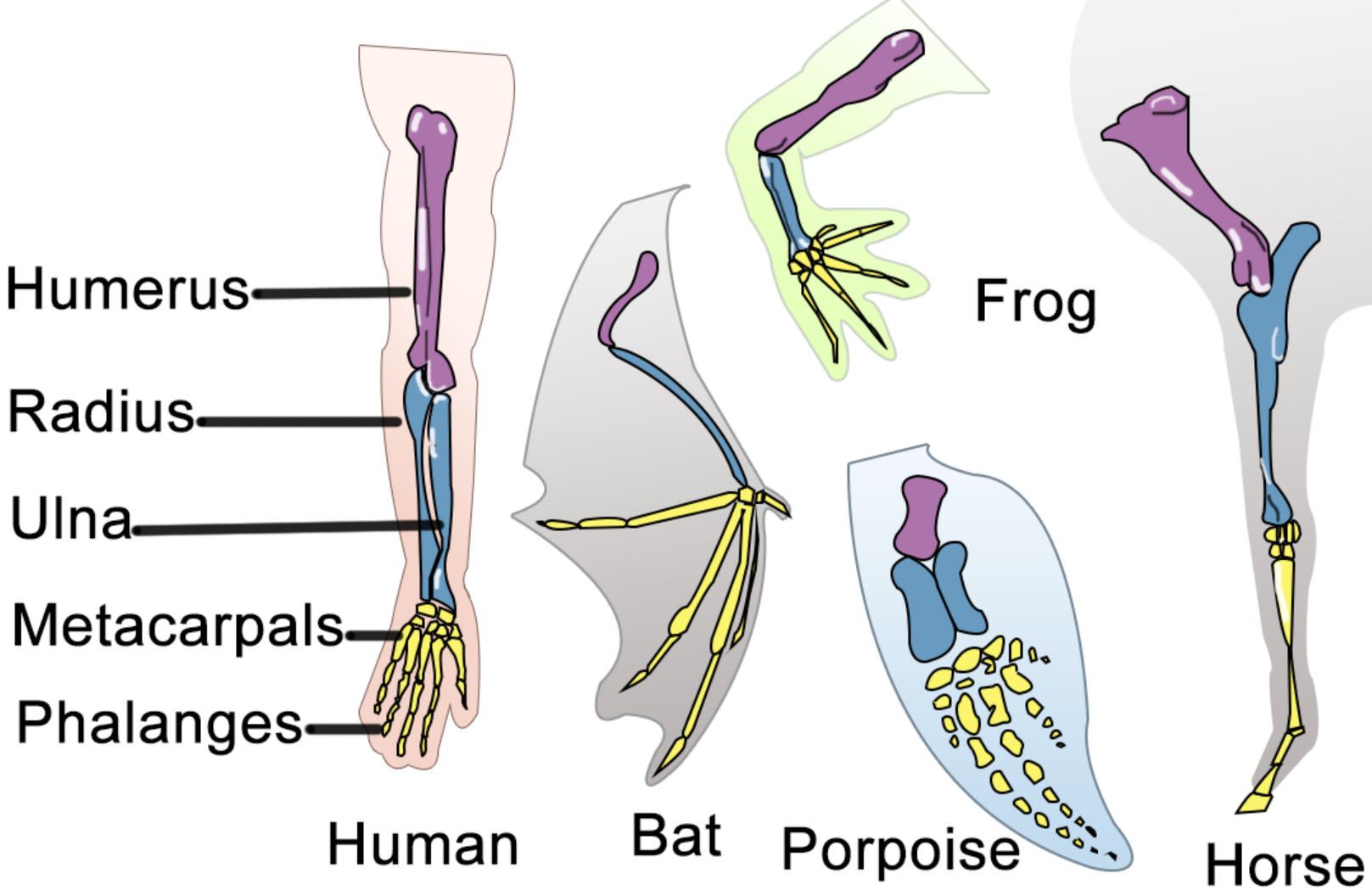
- **Derived traits** newly evolved features that aren't in the fossils of common ancestors.
- **Ancestral traits** features that do appear in ancestral forms.

Comparative anatomy

Evolutionary Theory predicts body parts are more likely to be modified from ancestral body parts than entirely new structures.

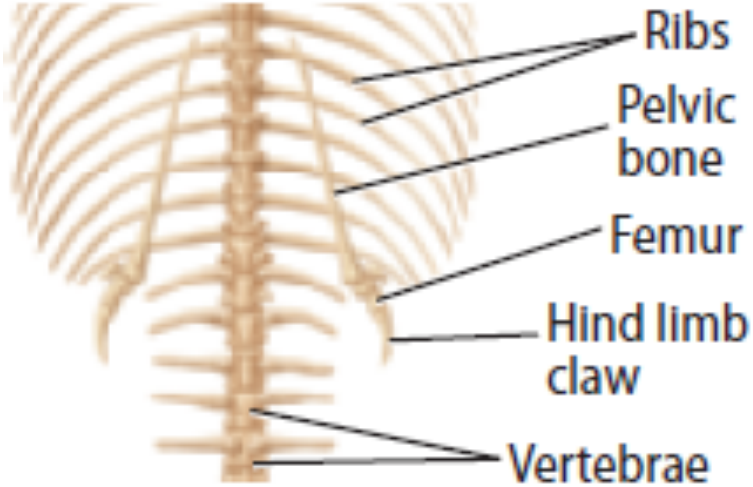
homologous structures

similar structures inherited from a common ancestor

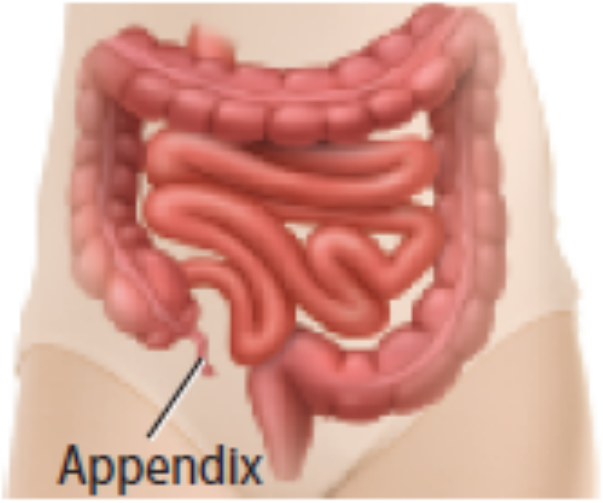

Humerus
Radius
Ulna
Metacarpals
Phalanges
Human
Bat
Frog
Porpoise
Horse
BiologyWise.com

Evolutionary theory predicts features that no longer have a use will become smaller over time until they are lost.

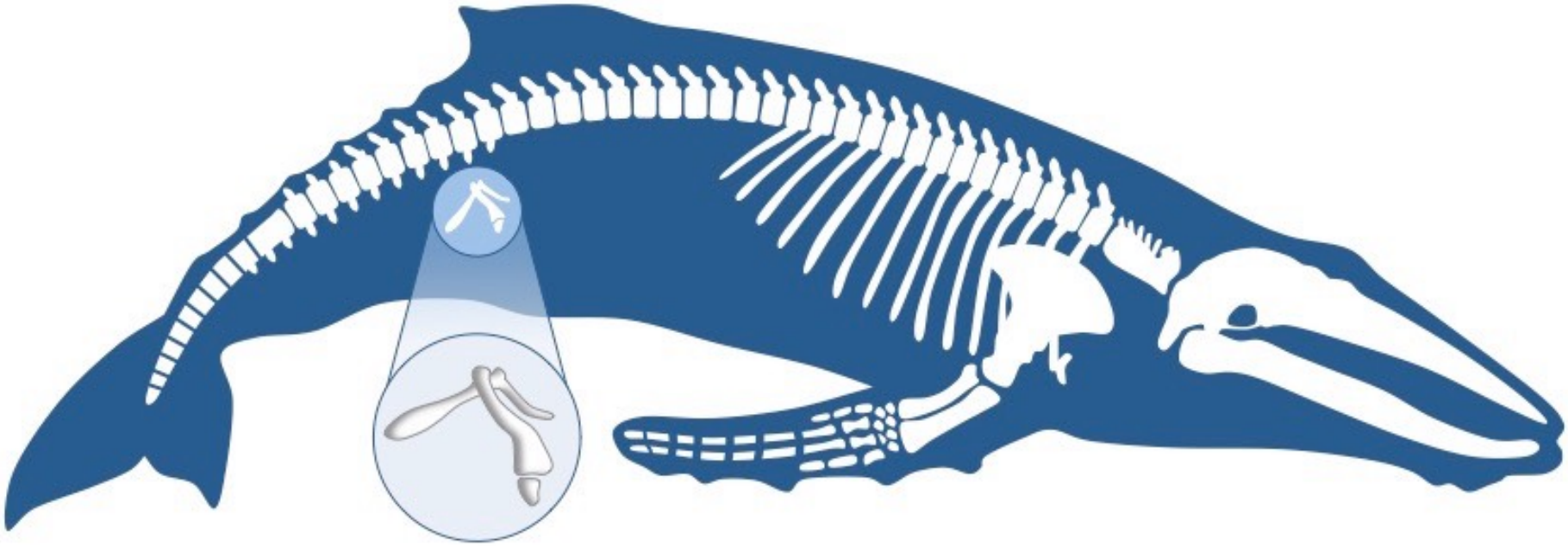
Vestigial structures reduced forms of functional structures



snake pelvis



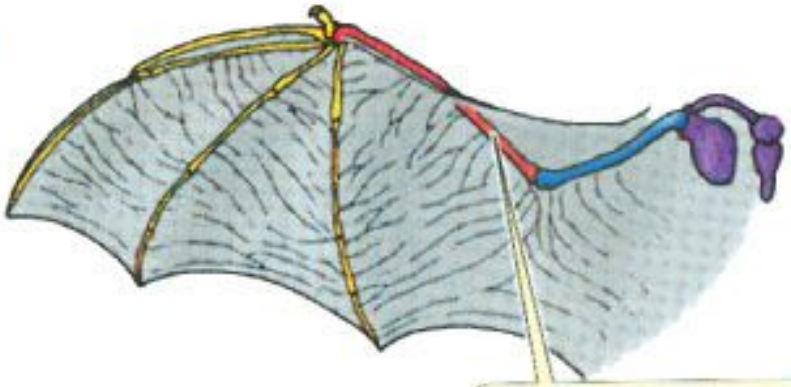
human appendix



Body parts with similar functions can evolve independently under similar conditions.

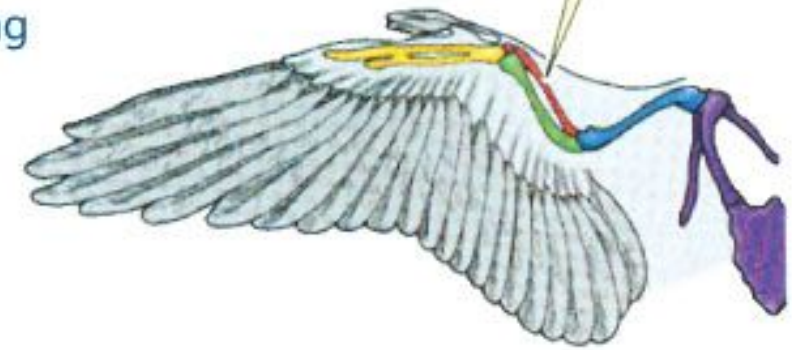
Analogous structures serve the same purpose, but are not inherited from a common ancestor

Bat wing



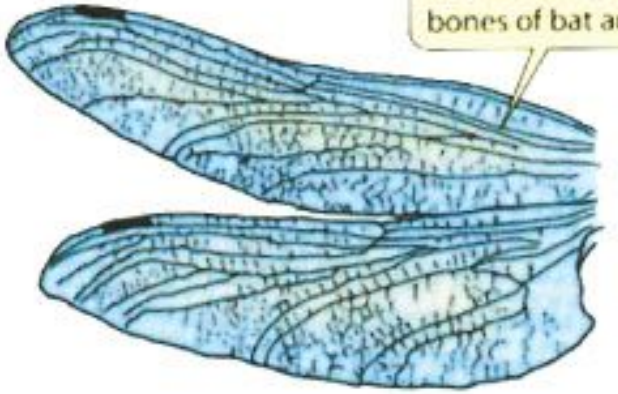
Bones shown in the same color are homologous.

Bird wing



The supports for insect wings are not homologous with the bones of bat and bird wings.

Insect wing



Comparative embryology

Embryo- an early, pre-birth stage of an organism's development.

Vertebrate embryos have homologous structures during development that become totally different structures in the adult forms.

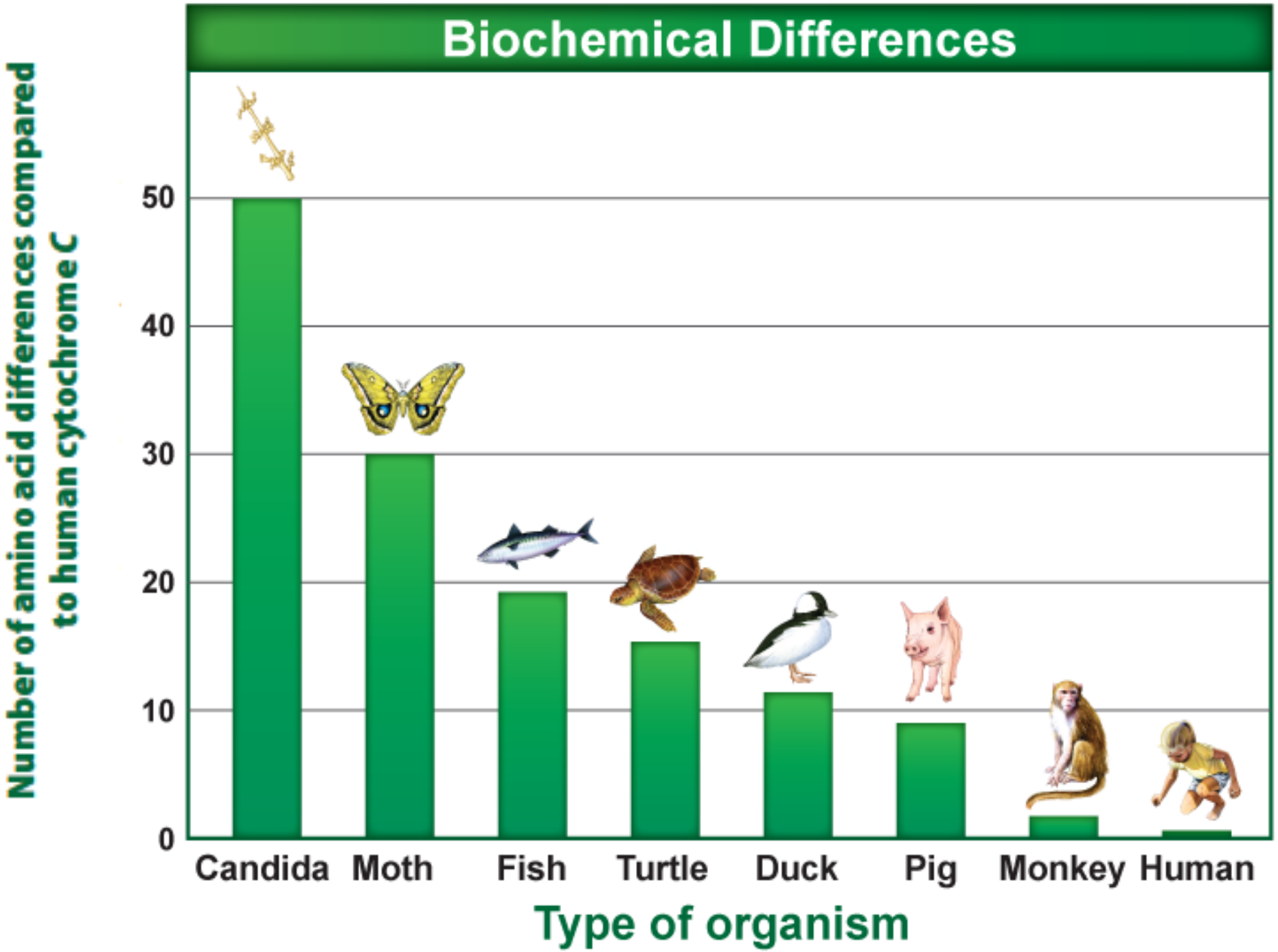

Gill slits
Tail
Gill slits
Tail
Fish
Reptile
Bird
Human

Comparative biochemistry

Common ancestry can be seen in the complex metabolic molecules that many different organisms share.

- The more closely related species are to each other, the greater the biochemical similarity.

Species	Sequence of Amino Acids in the Same Part of the Hemoglobin Molecules
Human	Lys–Glu–His–Iso
Horse	Arg–Lys–His–Lys
Gorilla	Lys–Glu–His–Lys
Chimpanzee	Lys–Glu–His–Iso
Zebra	Arg–Lys–His–Arg


Biochemical Differences
Number of amino acid differences compared to human cytochrome C
0
10
20
30
40
50
Candida
Moth
Fish
Turtle
Duck
Pig
Monkey
Human
Type of organism

Geographic distribution

Biogeography- study of the distribution of plants and animals around the world

- Evolution is linked to migration patterns, climate, and geological forces (such as plate tectonics).

Adaptation a trait that increases an organism's ability to survive

Fitness ability of an organism to survive and reproduce.

The better an organism is **adapted** to its environment, the greater its chances of **survival** and **reproductive** success.

Types of adaptations

- **Camouflage** adaptation that allows an organism to blend into its environment.
- **Mimicry** adaptation where a species resembles another species.
- **Antimicrobial resistance** develops in some bacteria in response to exposure to antibiotics.