

EVOLUTION

KEY CONCEPT

There were theories of biological and geologic change before Darwin.



“Nothing in biology makes sense except in the light of evolution.”

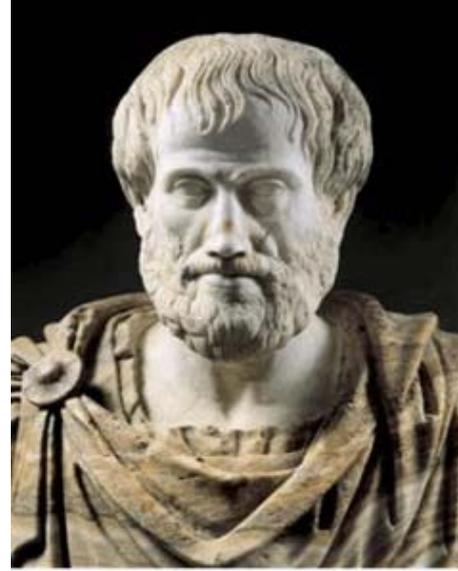
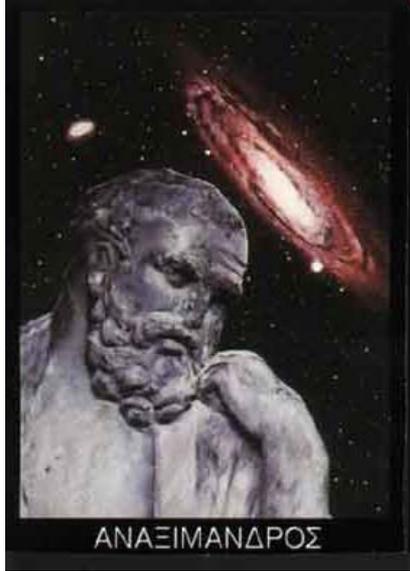
-T. Dobzhansky

Early scientists proposed ideas about evolution.

- Evolution is the biological change process by which descendants come to differ from their ancestors.
- A species is a group of organisms that can reproduce and have fertile offspring.

HORSE ANCESTOR (55 MYA)





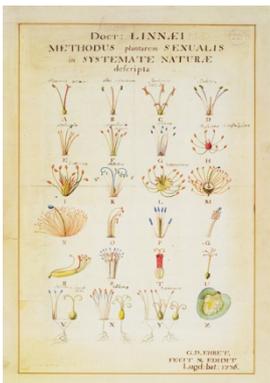
ΑΡΙΣΤΟΤΕΛΕΣ

- **Early Greek philosophers held various views. Anaximander (about 2,500 years ago) suggested that life arose in water and that simpler forms preceded more complex forms of life. On the other hand, Aristotle, who strongly influenced later thinkers, believed that species were fixed and did not evolved.**
- **This latter view was advanced by the Judeo-Christian tradition that all species were created in a single act of creation about 6,000 years ago.**

- There were many important naturalists in the 18th century.

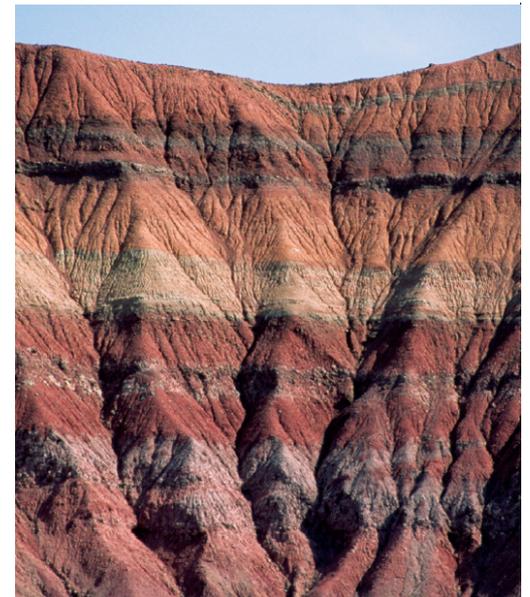
On Test

- Linnaeus: classification system from kingdom to species
- Buffon: species shared ancestors rather than arising separately
- E. Darwin: more-complex forms developed from less-complex forms
- Lamarck: environmental change leads to use or disuse of a structure (inheritance of acquired characteristics)

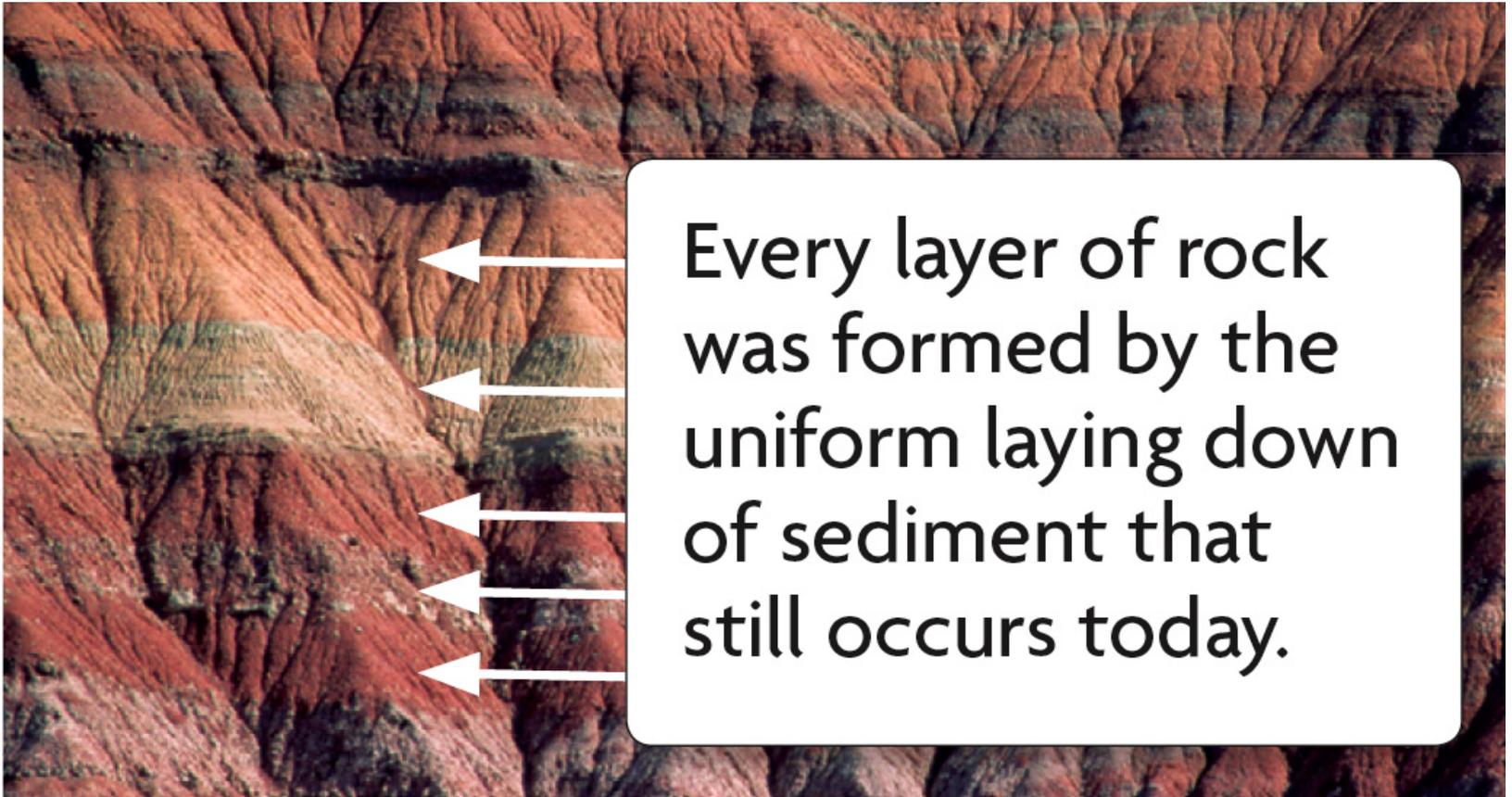


Theories of geologic change set the stage for Darwin's theory.

- There were three theories of geologic change.
 - catastrophism
 - gradualism
 - uniformitarianism

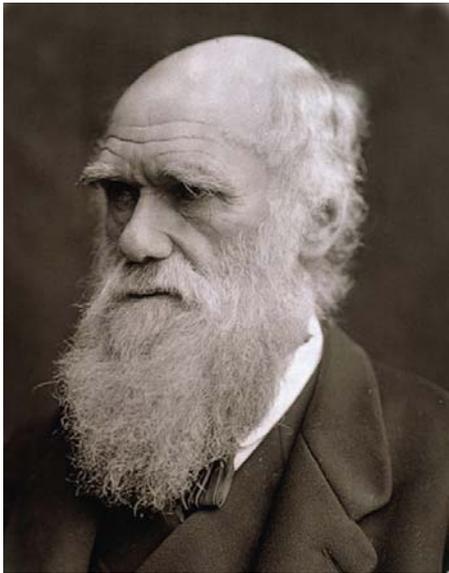


- Uniformitarianism is the prevailing theory of geologic change.



Darwin observed differences among island species.

- Variation is a difference in a physical trait.
 - Galápagos tortoises that live in areas with tall plants have long necks and legs.
 - Galápagos finches that live in areas with hard-shelled nuts have strong beaks.



- An adaptation is a feature that allows an organism to better survive in its environment.
 - Species are able to adapt to their environment.
 - Adaptations can lead to genetic change in a population.

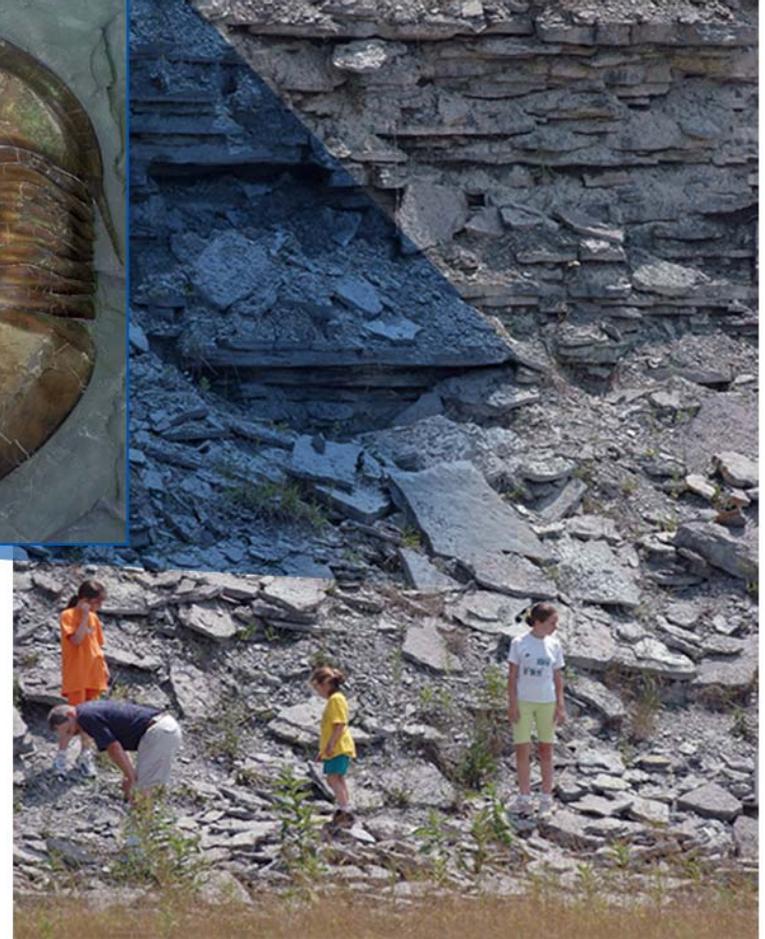


Darwin observed fossil and geologic evidence supporting an ancient Earth.

- Darwin found fossils of extinct animals that resemble modern animals.
- Darwin found fossil shells high up in the Andes mountains.



- He saw land move from underwater to above sea level due to an earthquake.
- Darwin extended his observations to the evolution of organisms.



– The fossil record

- Reveals that organisms have evolved in a historical sequence



Figure 13.3H

- Many fossils link early extinct species
 - With species living today

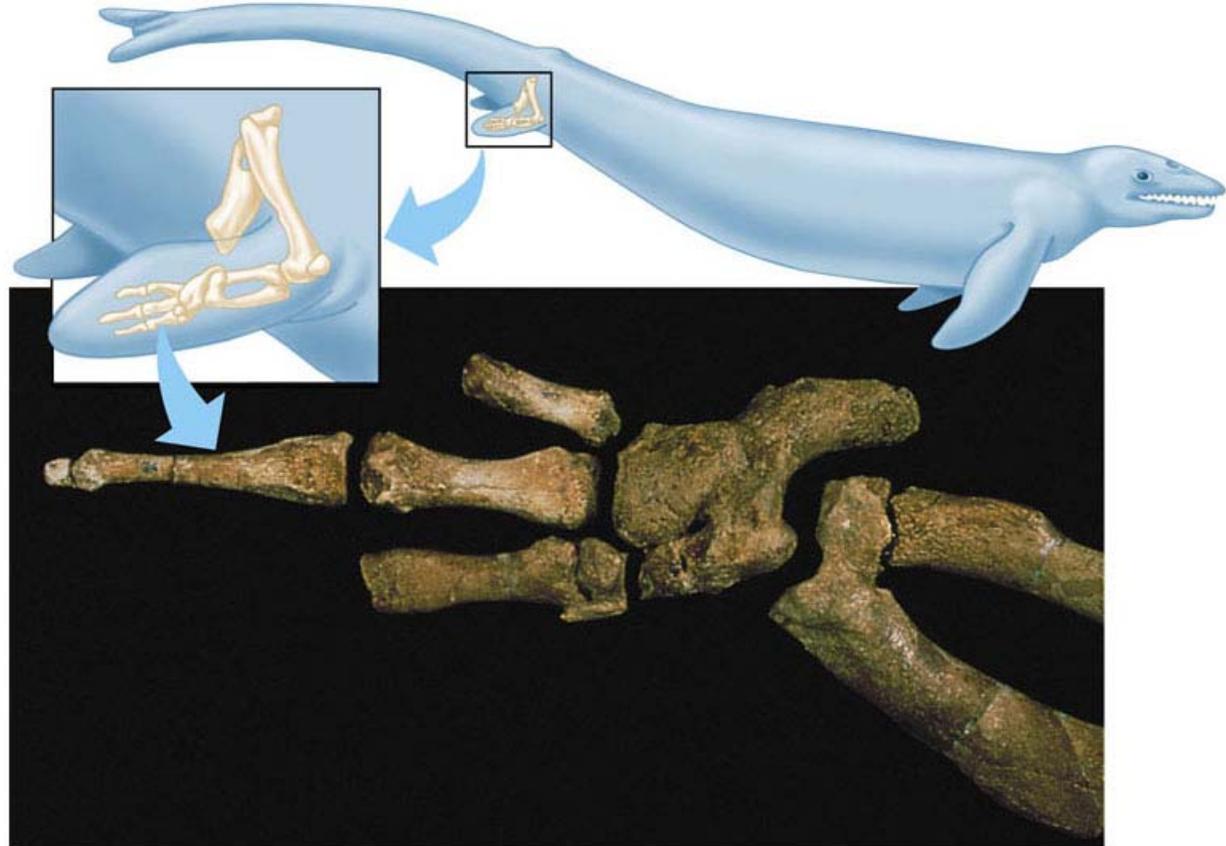
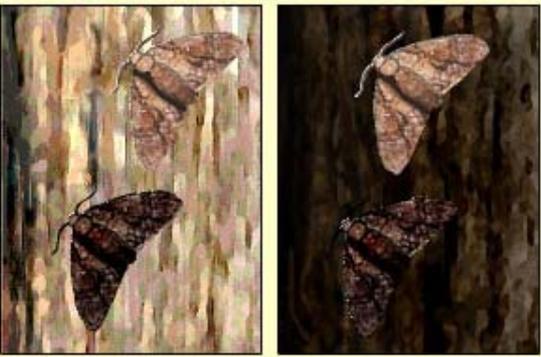
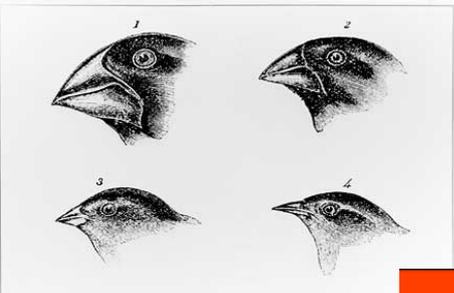
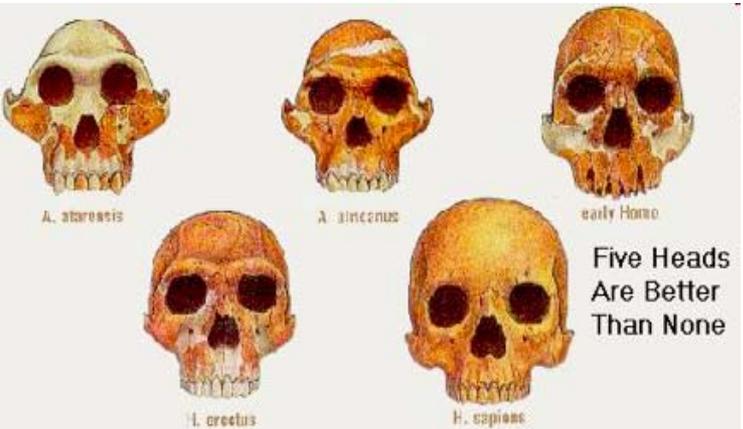
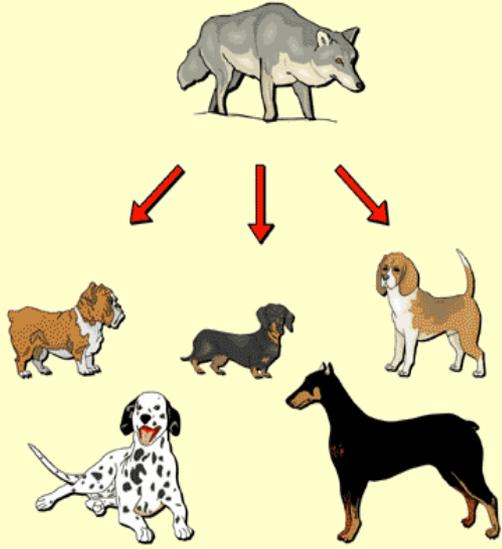
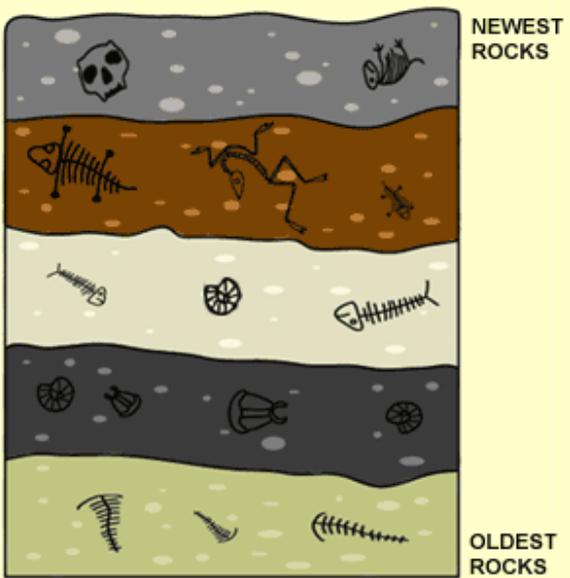


Figure 13.31

A mass of other evidence reinforces the evolutionary view of life



TIME ↑



1 million years ago	modern horse		Height: 1.6 m
10 million years ago	Plihippus		Height: 1.0 m
30 million years ago	Merychippus		Height: 1.0 m
40 million years ago	Mesohippus		Height: 0.6 m
60 million years ago	Eohippus		Height: 0.4 m



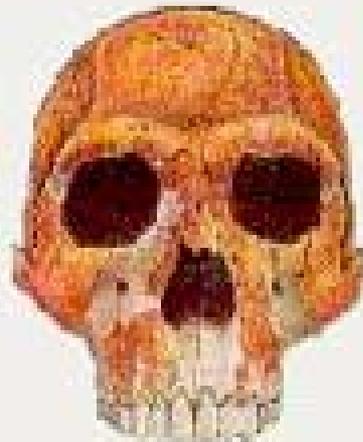
A. africanus



A. africanus



early Homo



I. erectus



H. sapiens

Five Heads
Are Better
Than None

• *Biogeography*

- Biogeography, the geographic distribution of species
 - Suggested to Darwin that organisms evolve from common ancestors
- Darwin noted that Galápagos animals
 - Resembled species of the South American mainland more than animals on similar but distant islands



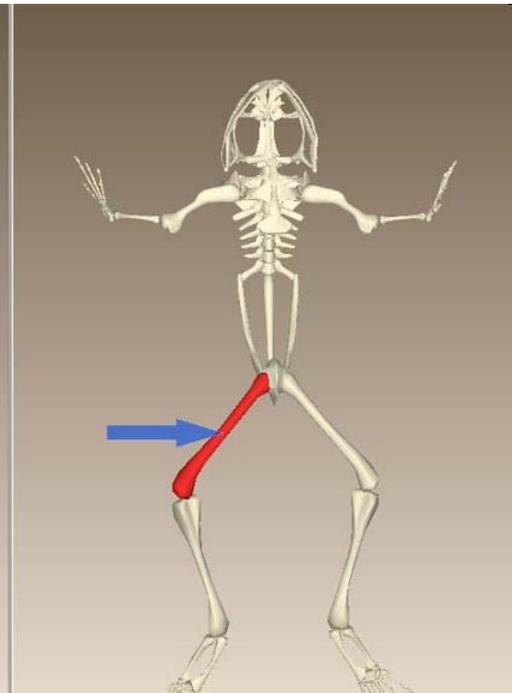
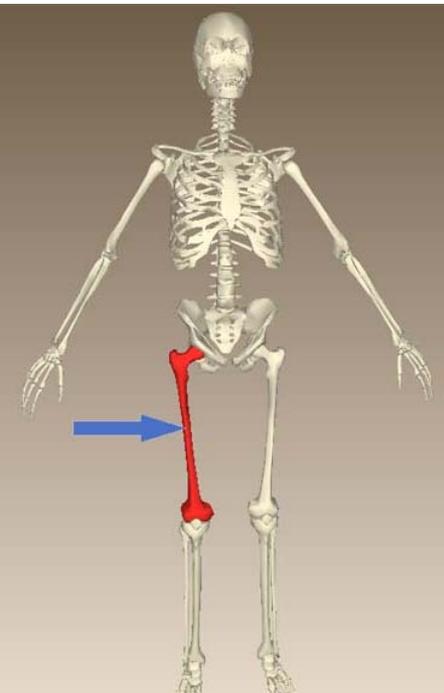
- *Comparative anatomy*

- Comparative anatomy

- Is the comparison of body structures in different species

- Homology

- Is the similarity in characteristics that result from common ancestry



– Homologous structures

- Are features that often have different functions but are structurally similar because of common ancestry

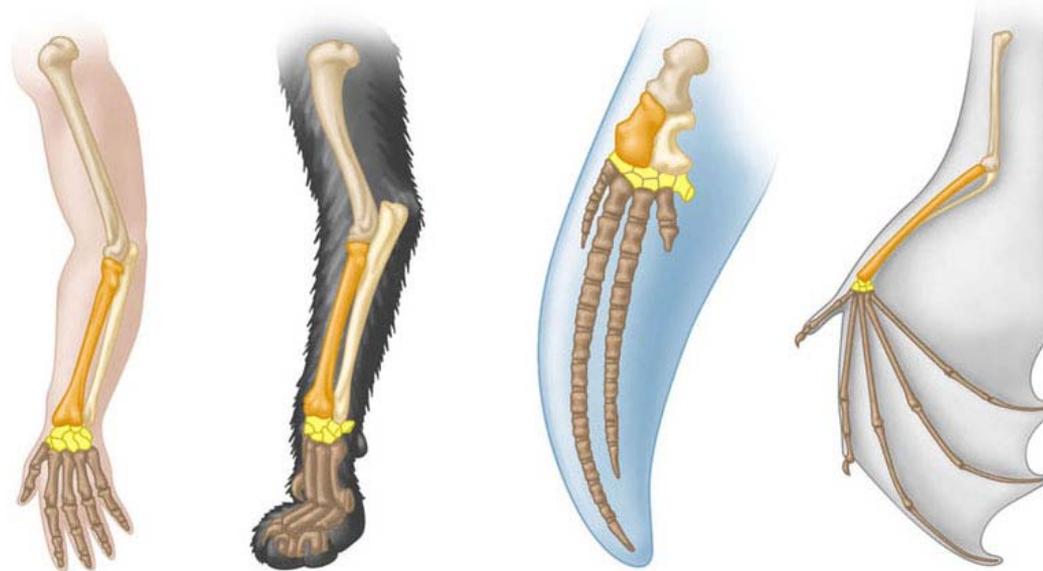


Figure 13.4A

Human

Cat

Whale

Bat

• *Comparative Embryology*

– Comparative embryology

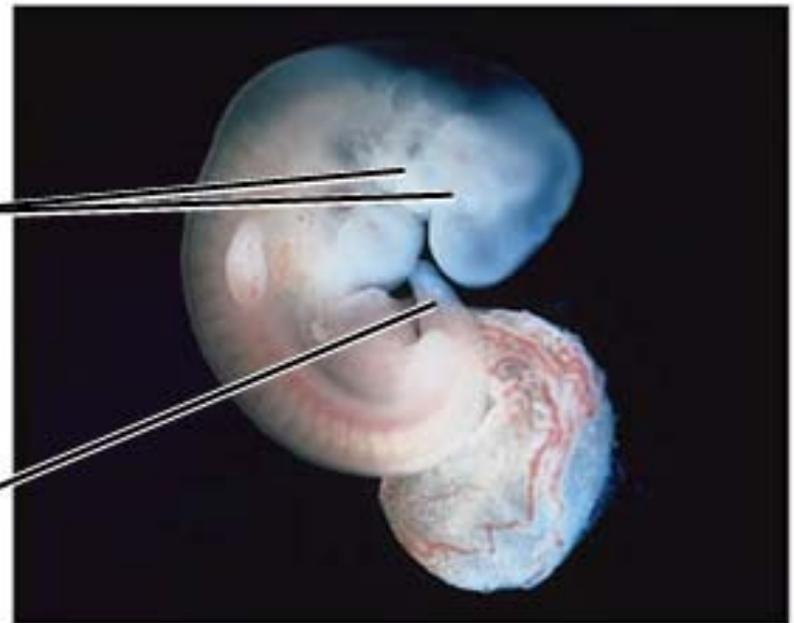
- Is the comparison of early stages of development among different organisms
- Many vertebrates have common embryonic structures



Chick embryo

Pharyngeal
pouches

Post-anal
tail



Human embryo

• *Molecular Biology*

- Comparisons of DNA and amino acid sequences between different organisms
 - Reveal evolutionary relationships

