

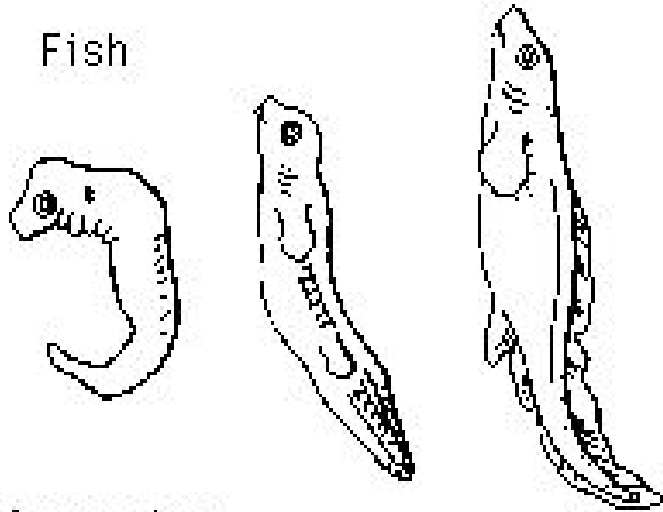
# Evidence for Evolution and traits of invertebrates and vertebrates

# Evidence for Evolution

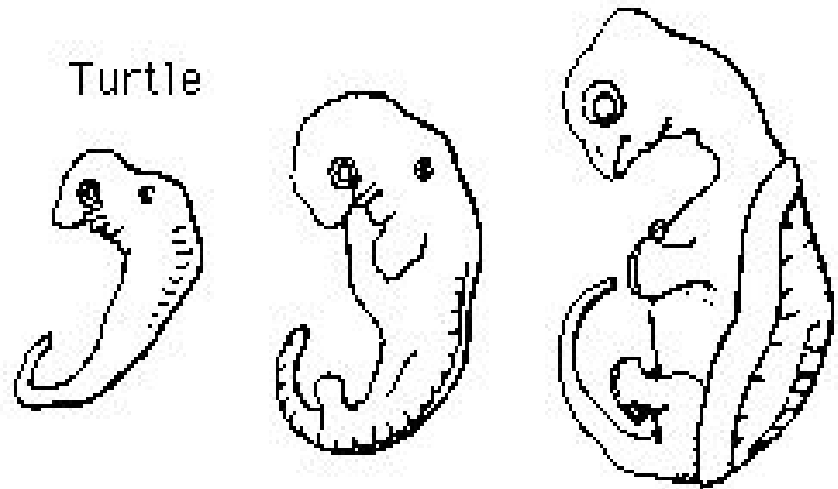
- **Vestigial Organs:** organs that serve no apparent purpose but resemble organs found in other organisms
- Examples in humans:
  - Ear moving muscles
  - Coccyx (Tail bone)
  - Appendix (or so we thought?)
  - Wings of flightless birds
  - [http://www.livescience.com/animalworld/top10\\_vestigial\\_organs.html](http://www.livescience.com/animalworld/top10_vestigial_organs.html)

# Embryological Similarities show evidence for evolution

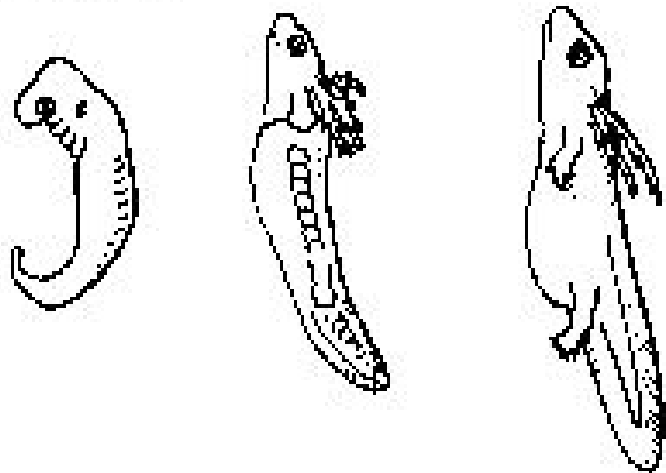
Fish



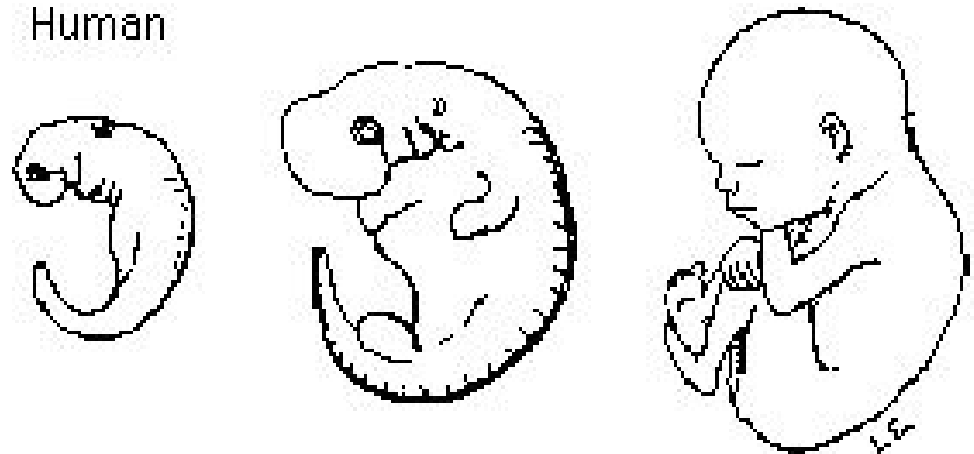
Turtle



Salamander

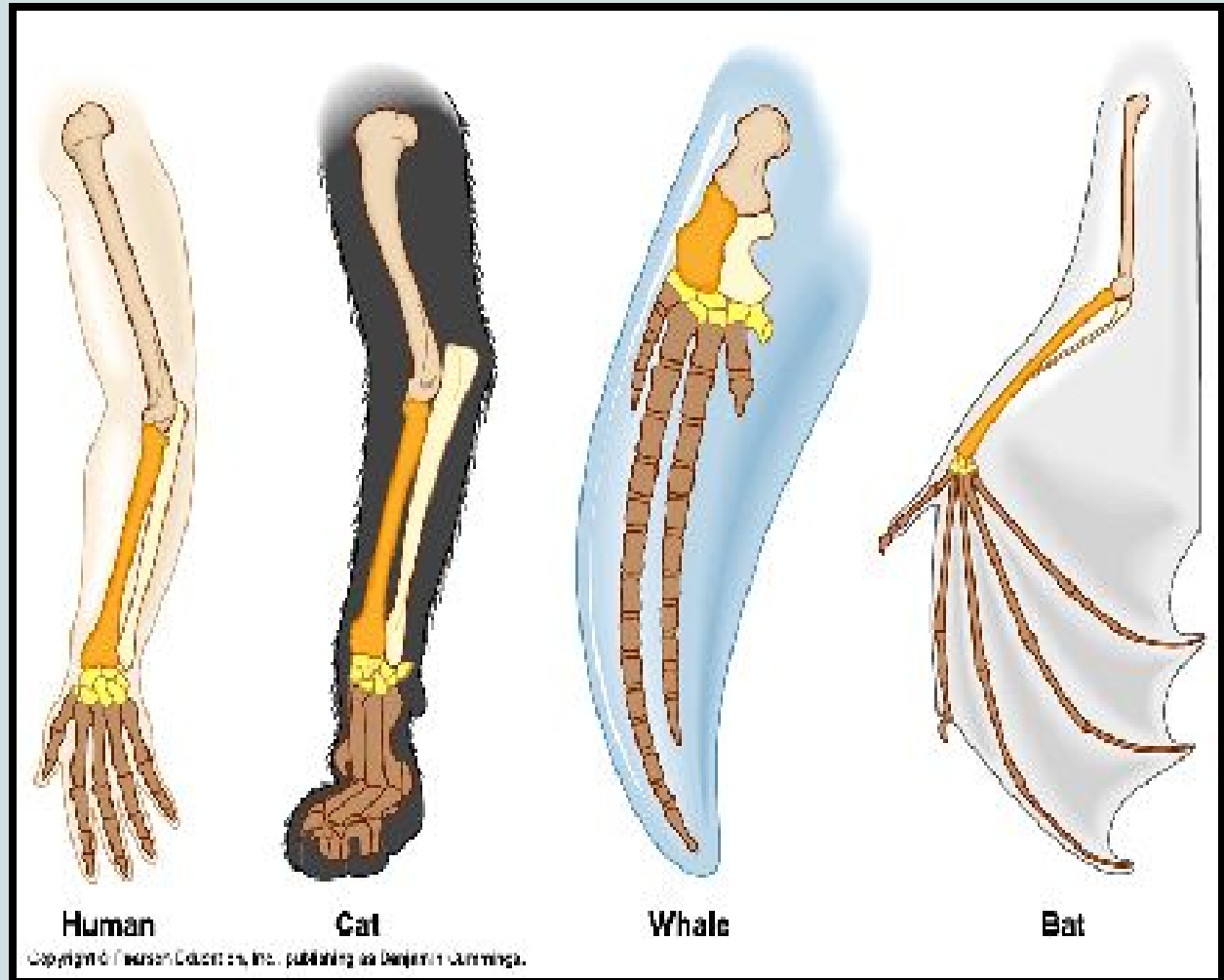


Human

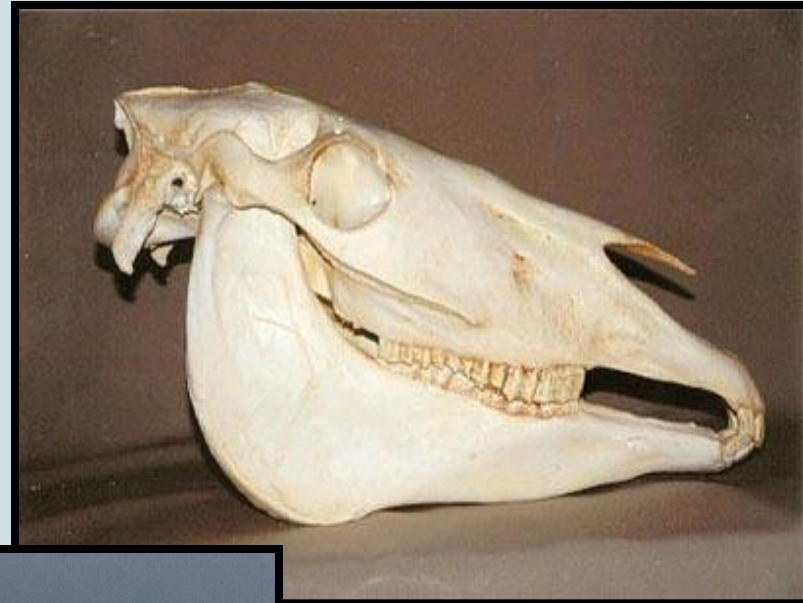


# Evidence for Evolution

- **Homology:** presence of organs that have same origin but not function



# Homology



# Charles Darwin

- Darwin knew that animals evolve in nature but needed to find the mechanism that caused it
- **Natural Selection:** the process by which environmental effects lead to varying degrees of reproductive success among individuals of a population of organisms with different hereditary characters, or traits.

# Natural Selection

- Large litters: more individuals are produced than can survive (Sea turtles)
- “Survival of the Fittest”: organisms survive by making advancements in finding food, avoiding predators, resisting disease, etc.

# Summary

- Darwin developed his theory of evolution by natural selection by gathering data while on the *Beagle*
- Evidence of theory
  - Relatedness of species in geographically close areas
  - Embryological similarities
  - Homology and vestigial organs
  - Artificial selection - Breeding dogs



# Part 2

## Traits of invertebrates & Vertebrates



# Crayfish are less evolved

## Traits:

- Exoskeleton - Molting
- Nervous system, but not a true brain (very simple & small)
- Simple appendages
- Simple digestive tube
- Less internal organization
- Simple movement - bottom dwellers



# Perch are more evolved

- Endoskeleton - bones!
- Scales - protection
- Jaws & teeth
- More organization in body system
  - Swim bladder
  - More organs - liver
  - Larger brain
  - Highly developed sense organs
- Live in water column - fins - good swimmers



# Frogs are even MORE evolved

- Endoskeletons - Bones!
- Air-breathers!
  - Access to more niches & resources (land)
- Even more organization in body system
  - Lungs
  - Digestive system
  - Excretory system- toxins
  - Nostrils
  - Tongue! (catch insects)
- Large muscle attachments on legs - predator avoidance
- Multiple life cycles
- Live in water and land





Earthworm



Clam



Shrimp



Crab



Grasshopper



Eel



Fish



Frog

Segmentation

Skeletal System

Exoskeleton

Appendages

Walking Legs

Jumping Legs

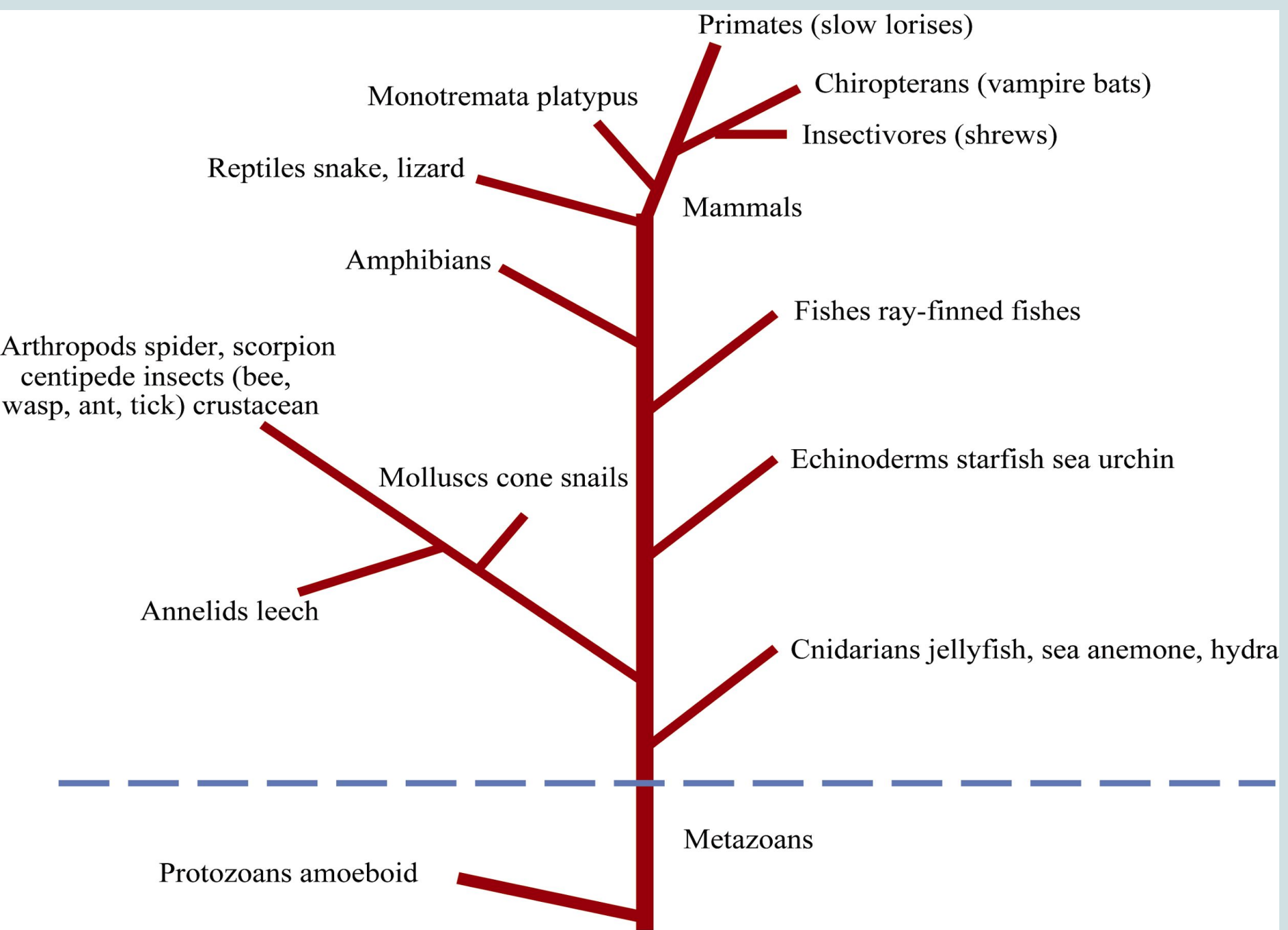
Endoskeleton

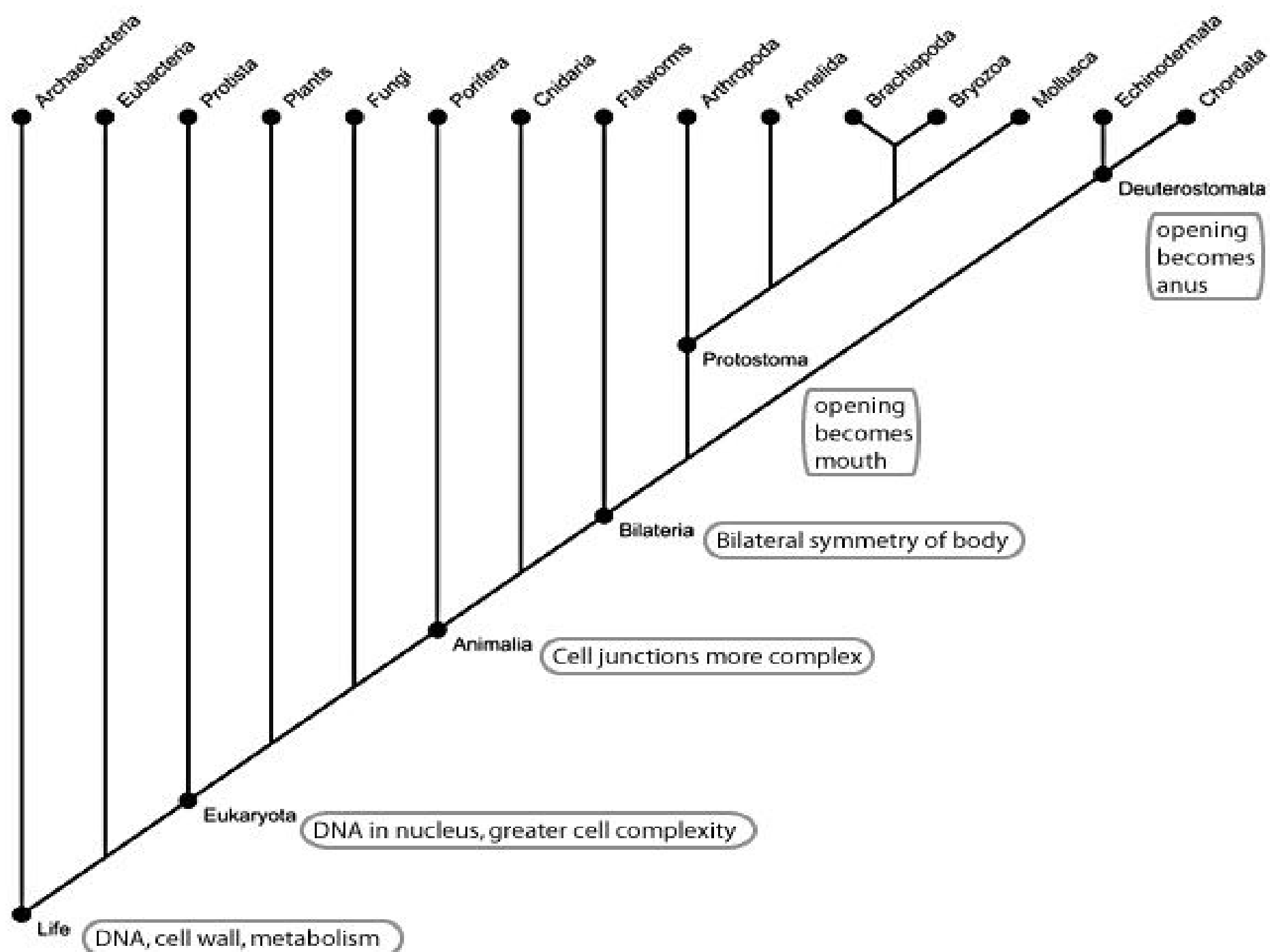
Dorsal and Pelvic Fins

Scales

Limbs

+





Archaeobacteria

Eubacteria

Protista

Plants

Fungi

Porifera

Cnidaria

Flatworms

Arthropods

Annelida

Brachiopoda

Bryozoa

Mollusca

Echinodermata

Chordata

Life

Eukaryota

Animalia

Bilateria

Protostoma

Deuterostomata

DNA, cell wall, metabolism

DNA in nucleus, greater cell complexity

Cell junctions more complex

Bilateral symmetry of body

opening becomes mouth

opening becomes anus