

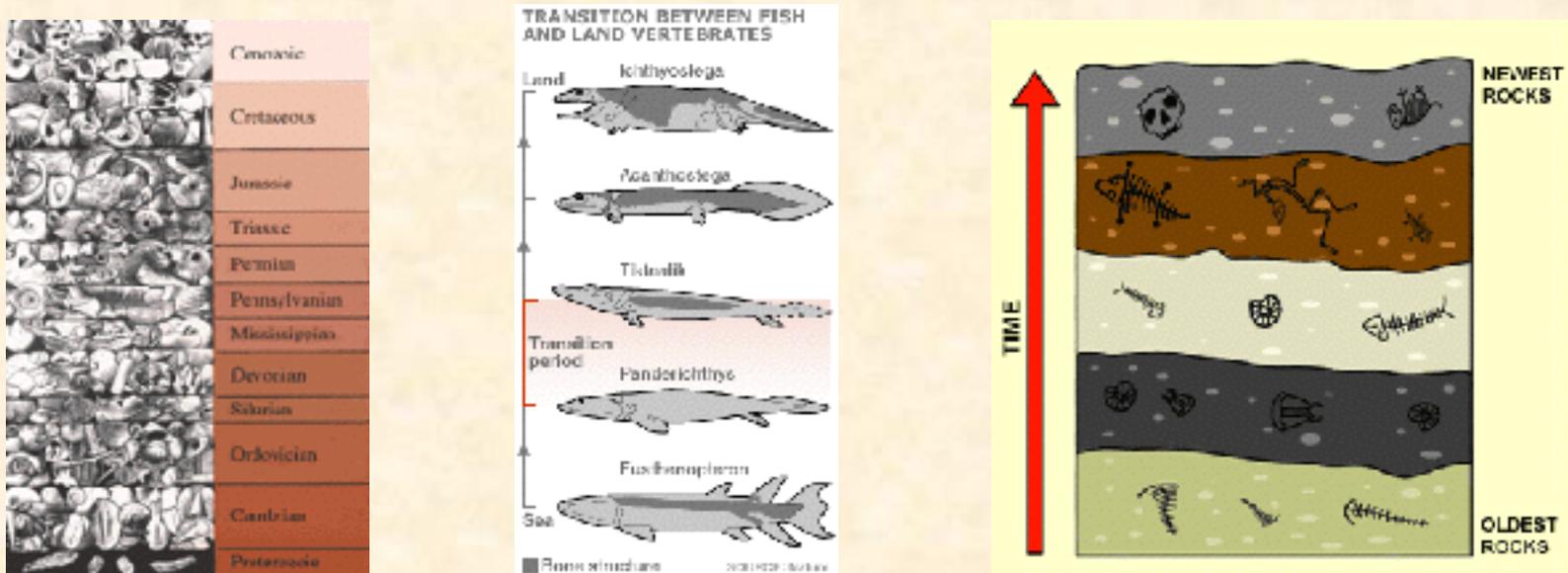
Evidence for Evolution

Evidence

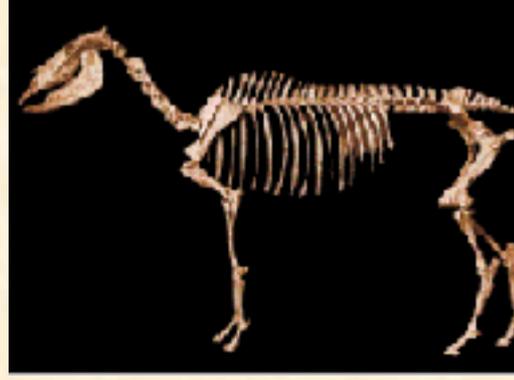
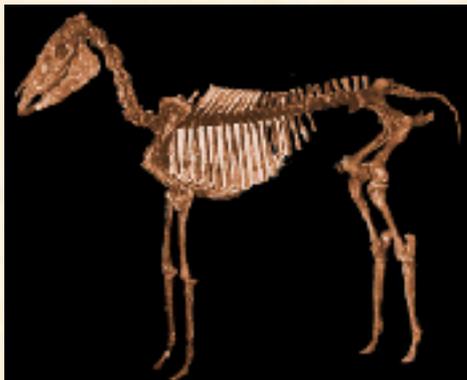
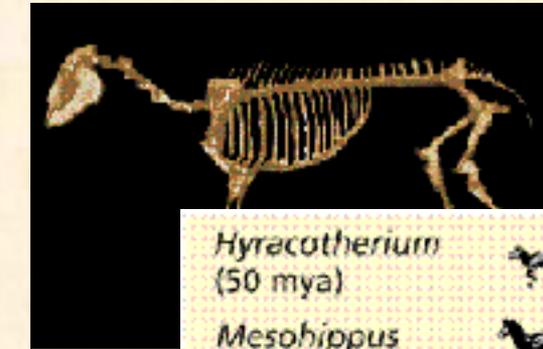
- Fossil Record
- Geographic Distribution of Living Species
- Homologous Structures of Living Organisms
- Vestigial Structures
- Similarities in Embryology
- Molecular Biology

Fossil Record

- By comparing fossils from older rock layers with fossils from younger rock layers, scientists can see how life on Earth has changed over time.
- Hundreds of transitional fossils have been found which show intermediate stages of evolution of modern species from species now extinct
this is an “incomplete record” with many gaps



Evolution of the Horse



<i>Hyracotherium</i> (50 mya)	
<i>Mesohippus</i> (25 mya)	
<i>Hipparion</i> (8 mya)	
<i>Pliohippus</i> (4 mya)	
<i>Equus</i> (recent)	

Geographic Distribution of Living Species

- Species living in different places with similar environments have similar anatomies and behaviors, even though they are unrelated
- They are exposed to similar pressures of natural selection so they evolve similar characteristics

Homologous Body Structures

- Homologous: develops from the same part of the embryo but have a different forms and functions (modified between groups)
- Analogous: parts with similar functions which develop from different parts of the embryo (similar function, different structure)
- (embryo is the early stage of development)

Homologous Body Structures

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Homology and analogy

Homology

Bat wing

Human arm

Mouse forelimb

Analogy

Bat wing

Butterfly wing

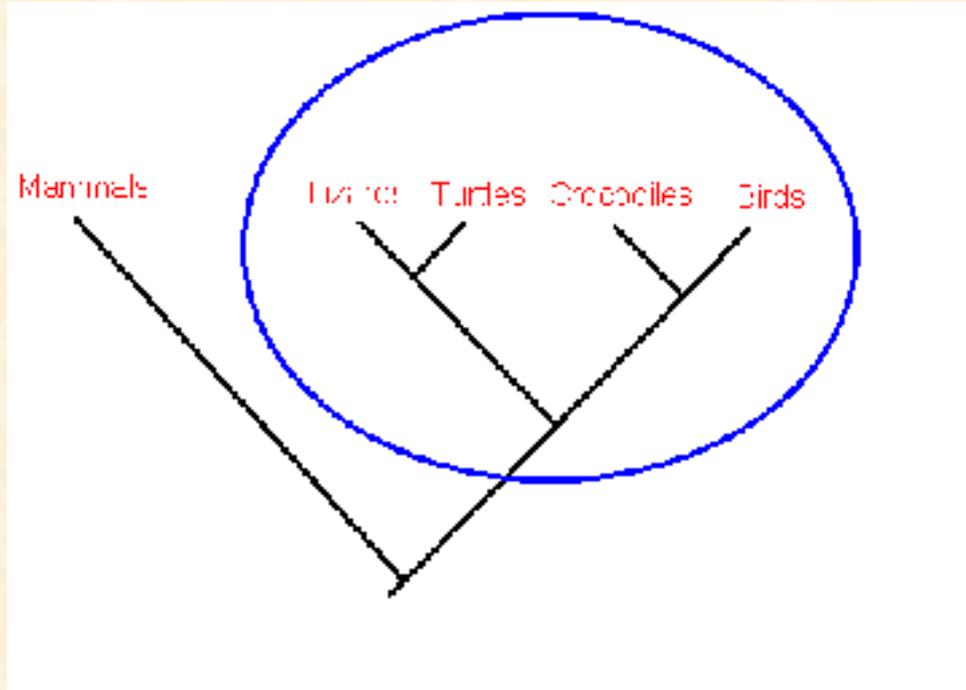
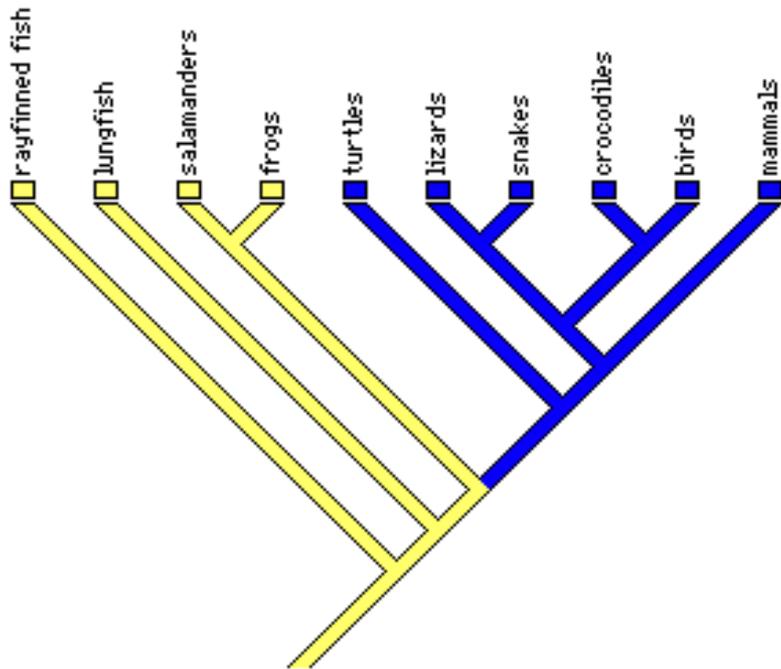
Bird wing



Homologous Body Structures

- Helps biologists group animals according to how recently they shared a common ancestor
- Dolphins look more like fish but their homologies show they are mammals. They have lungs rather than gills and obtain oxygen from air, not water. (evolved from land mammals, not fish)
- Phylogenetic trees show evolutionary relationships

Phylogenetic Tree

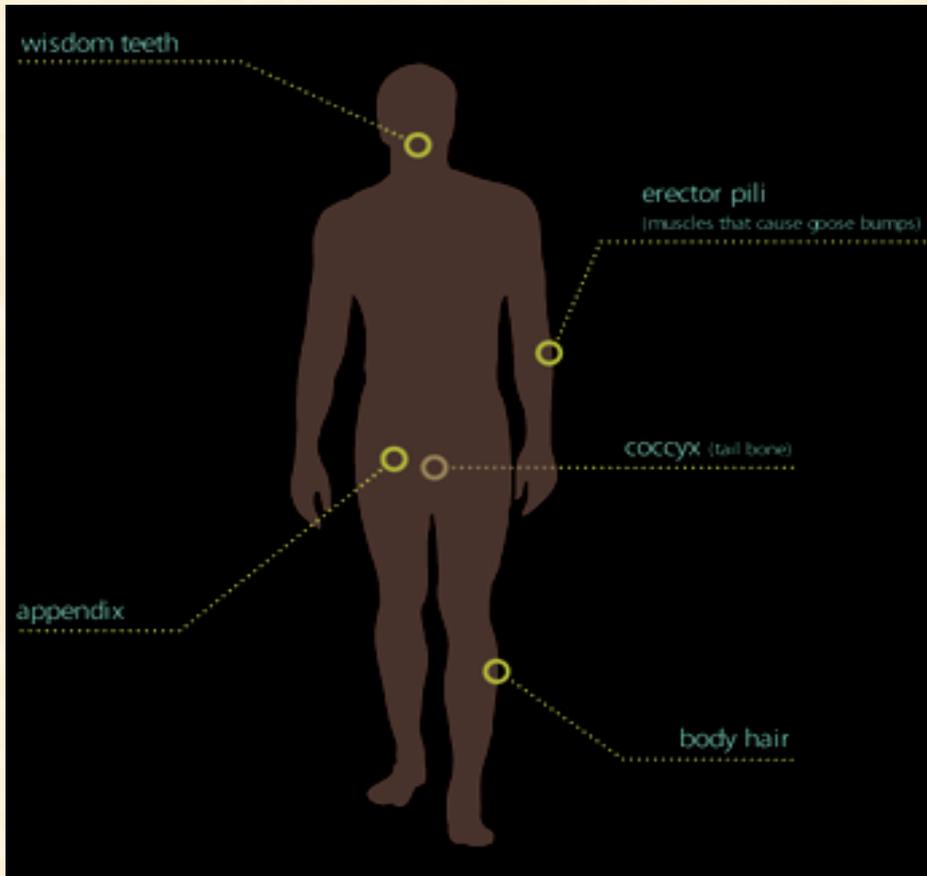


Vestigial organs

- Organs so reduced in size that they no longer serve the function of homologous organs in related species
- The presence of the organ does not affect its ability to survive and reproduce, so natural selection does not eliminate it

Vestigial Structures

- Examples: wings on flightless birds, human coccyx and appendix



The appendix, for instance, is believed to be a remnant of a larger, plant-digesting structure found in our ancestors.

Similarities in Embryology

- All embryos develop similarly
- Similar genes that define their basic body plan
- ‘Tails’ as embryos
- Embryos of all vertebrates especially similar; same groups of cells develop in same order and in similar patterns (homologous structures)

Molecular Biology

- All organisms use DNA and RNA to transmit genetic information
- ATP is an energy carrier in all organisms.
- You can compare the similar amino acid sequences (i.e. proteins)