

Evidence for Evolution

Chapter 15

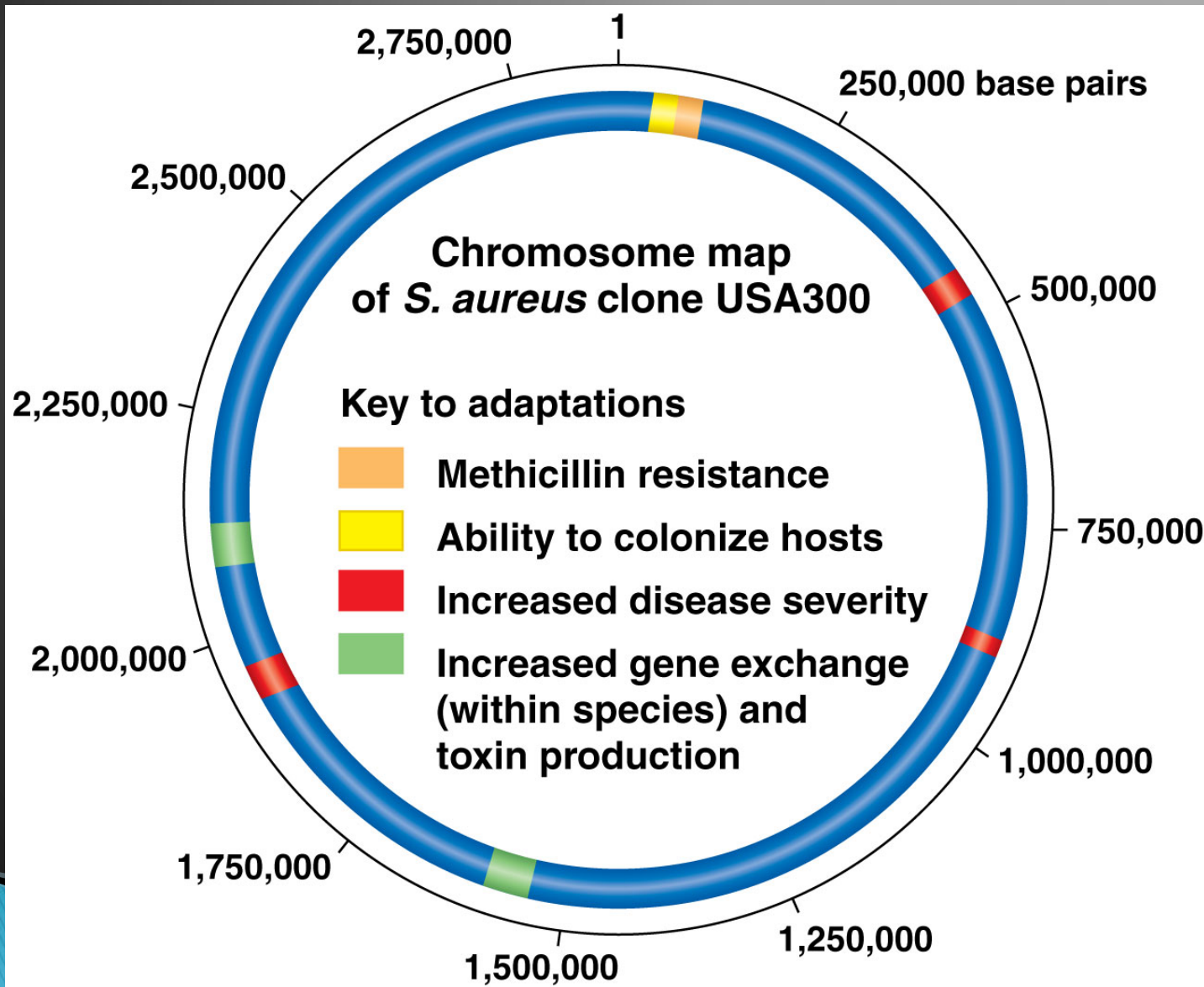
Evidence for Evolution: Direct Observations

Examples:

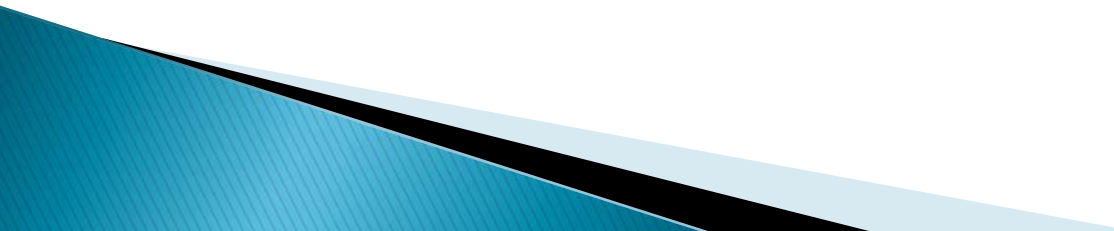
- Insect populations become resistant to pesticides (DDT)
- Antibiotic-resistant bacteria (MRSA)
- Peppered moth (pollution in city vs. country)

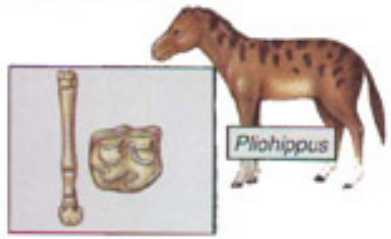
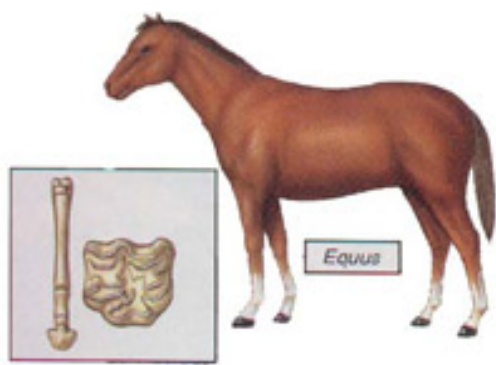


The Rise of MRSA (methicillin-resistant *Staphylococcus aureus*)



Fossil Record

- ▶ Fossils formed in layers of sediment (sedimentary rock)
 - ▶ Earth is billions of years old
 - ▶ Many different species have lived and become extinct
 - ▶ Species have changed over time through natural selection
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Recent

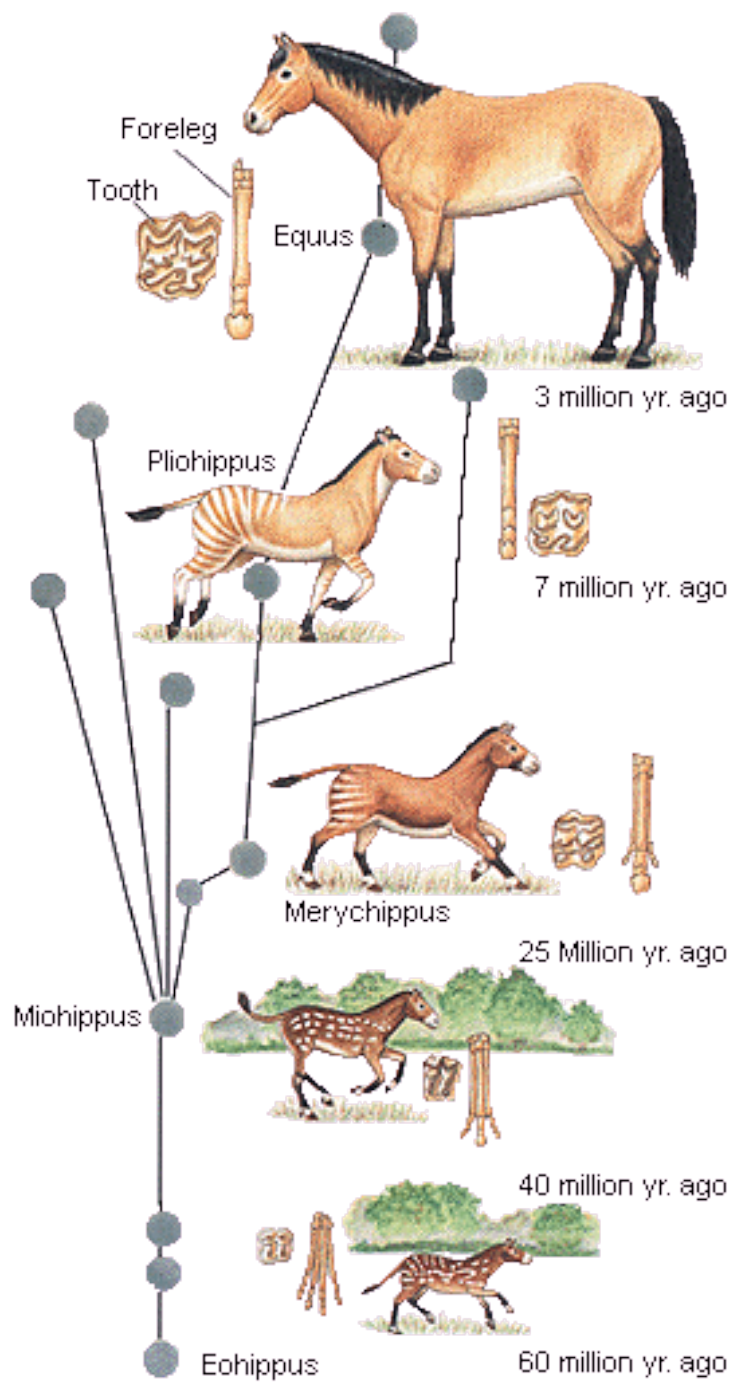
Pleistocene

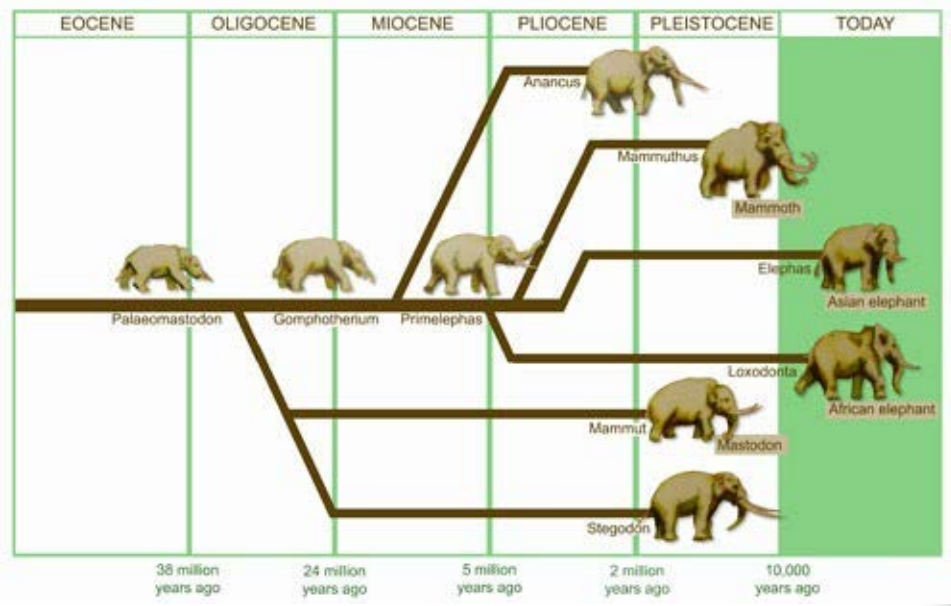
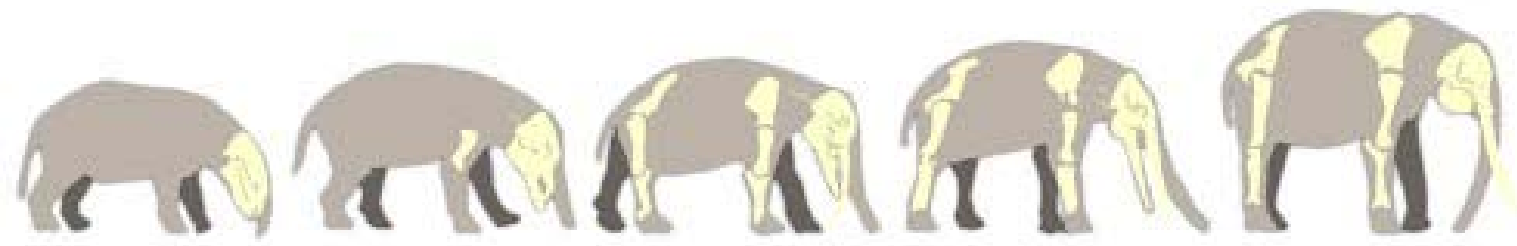
Pliocene

Miocene

Oligocene

Eocene

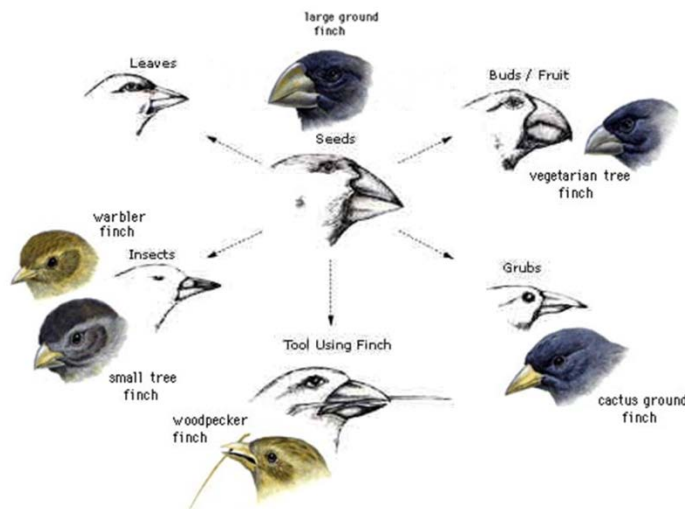


















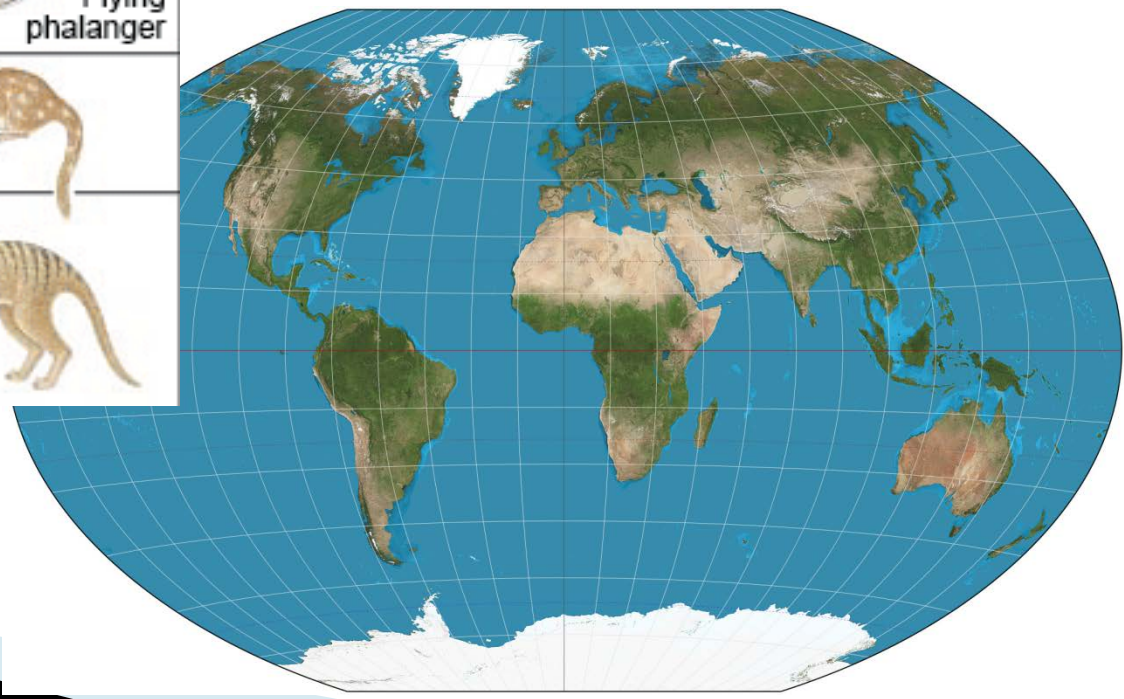
Geographic Distribution

- ▶ When related species are separated, they may develop different adaptations over time.
 - Darwin's finches
- ▶ Unrelated species can develop similar adaptations if they face similar challenges
 - Marsupial (Australia) vs. placental mammals

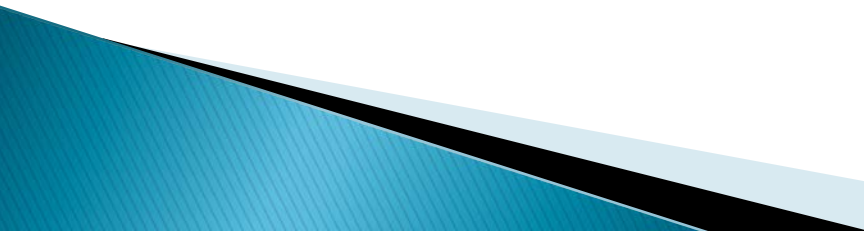
Darwin's Finches: Adaptive Radiation



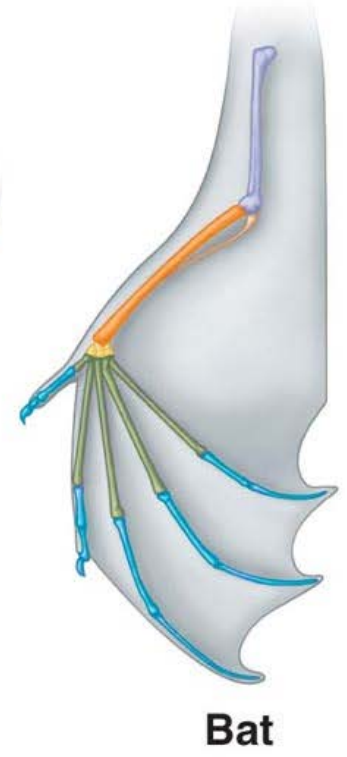
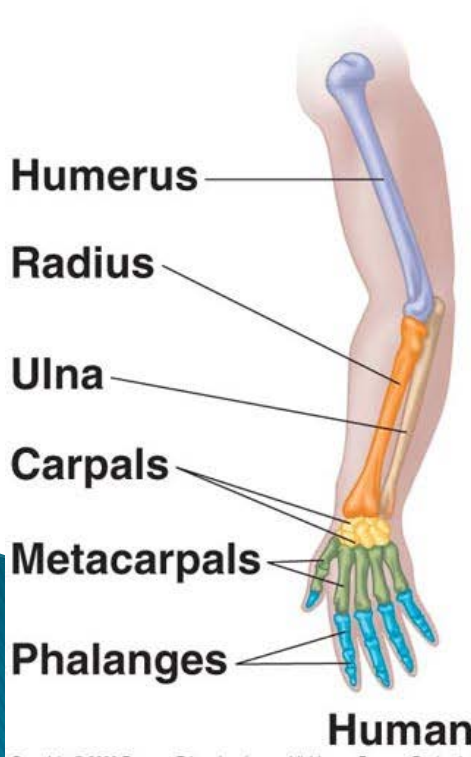
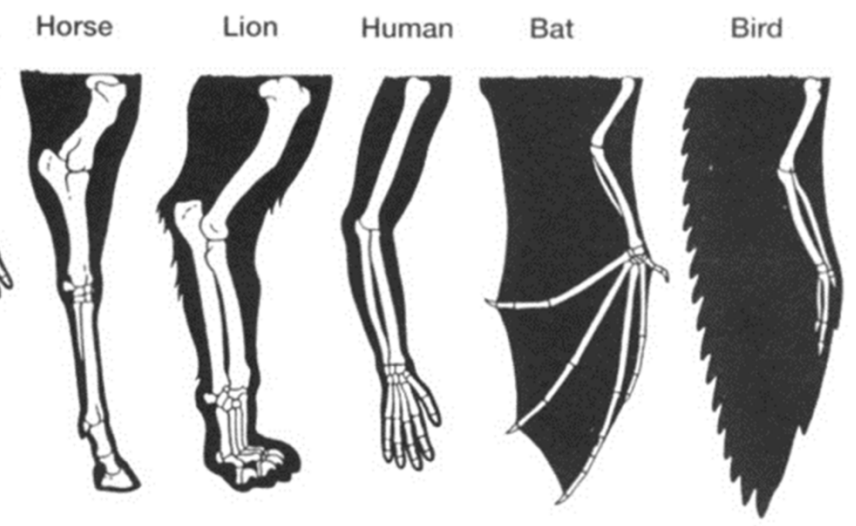
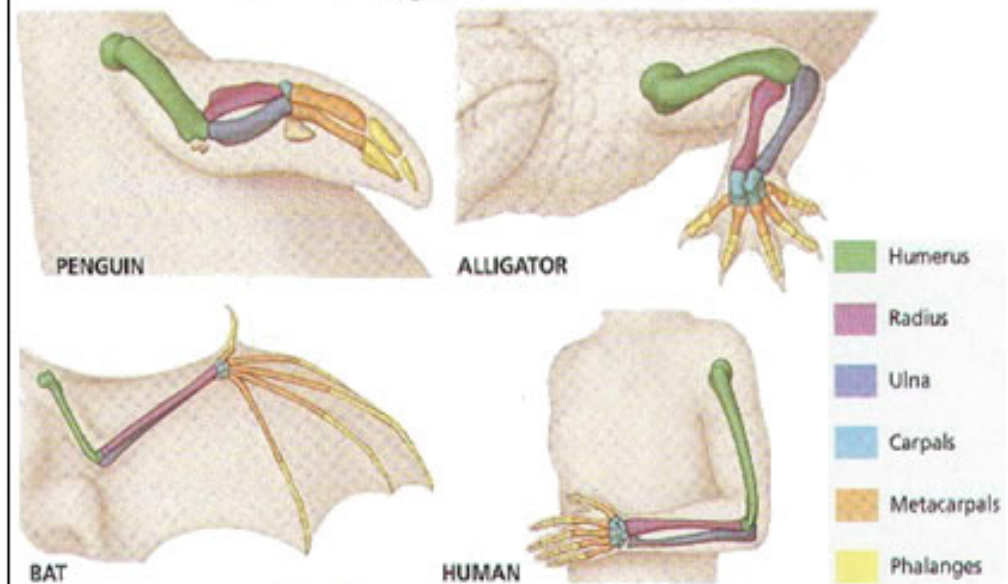
Niche	Placental Mammals	Australian Marsupials
Burrower	Mole 	Marsupial mole 
Anteater	Anteater 	Numbat (anteater) 
Mouse	Mouse 	Marsupial mouse 
Climber	Lemur 	Spotted cuscus 
Glider	Flying squirrel 	Flying phalanger 
Cat	Bobcat 	Tasmanian "tiger cat" 
Wolf	Wolf 	Tasmanian wolf 



Homologous structures

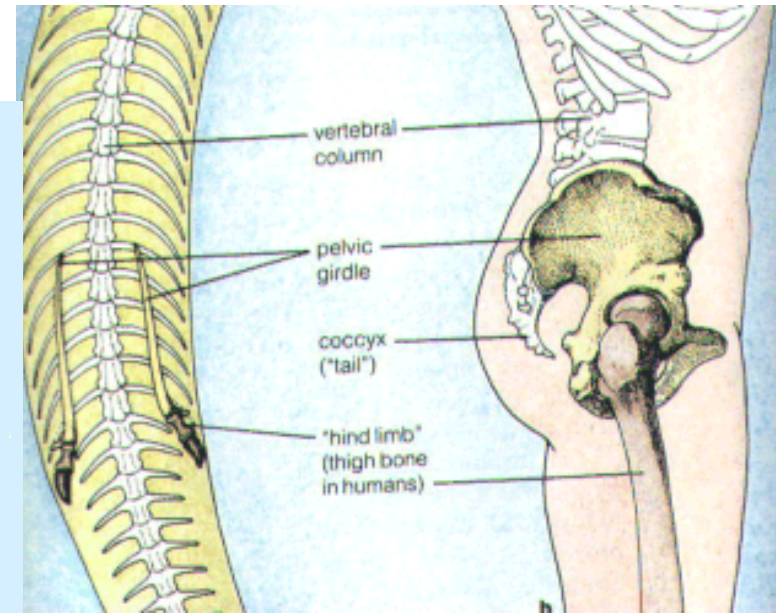
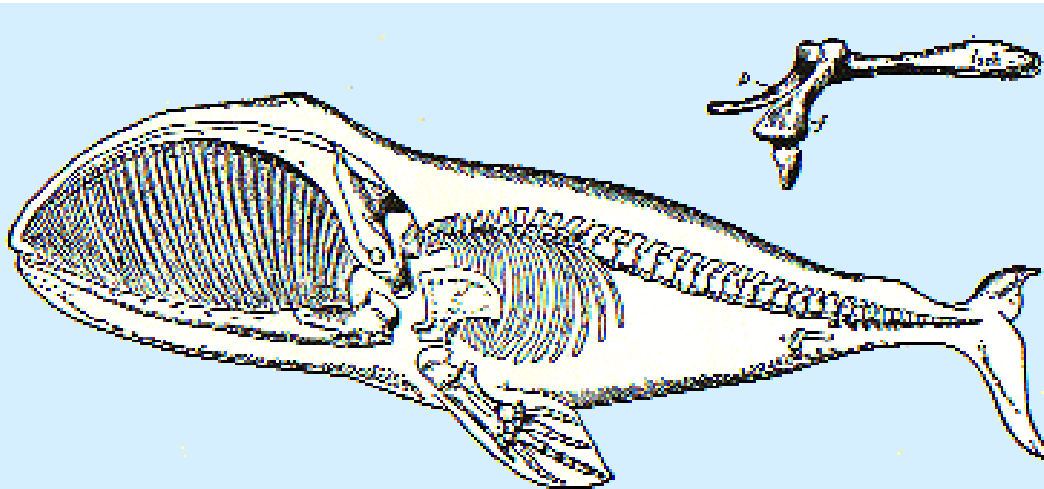
- ▶ Similar structures in different animals that have a different function
 - ▶ Develop from the same embryonic tissue
 - ▶ Help determine common ancestor
 - ▶ More closely related species will have more homologous structures
 - ▶ Bats wings are more similar to whale flippers than to bird wings
 - ▶ Bird skeleton more similar to lizard skeleton than to bat skeleton
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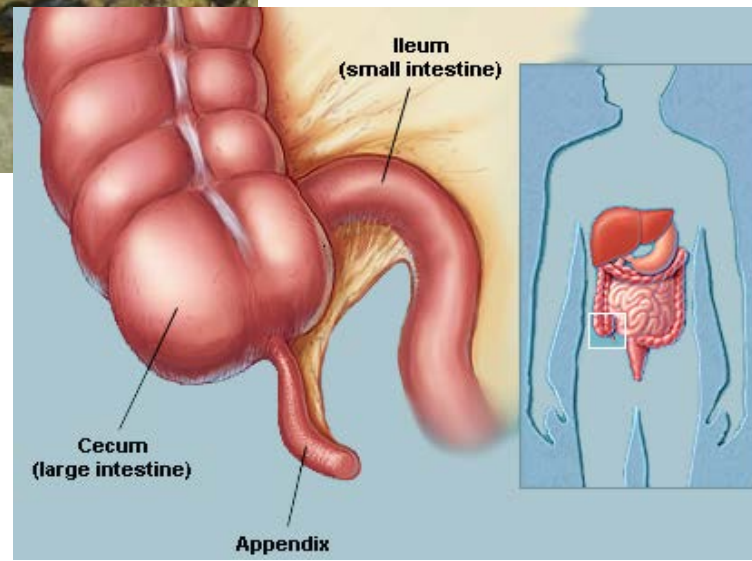
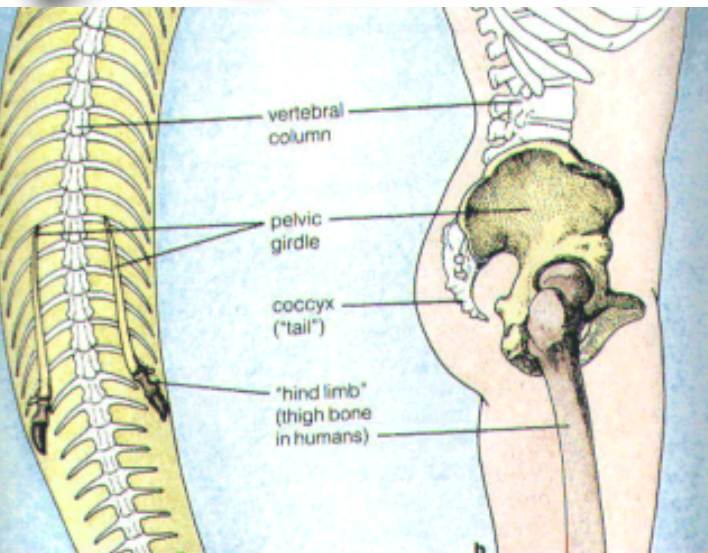
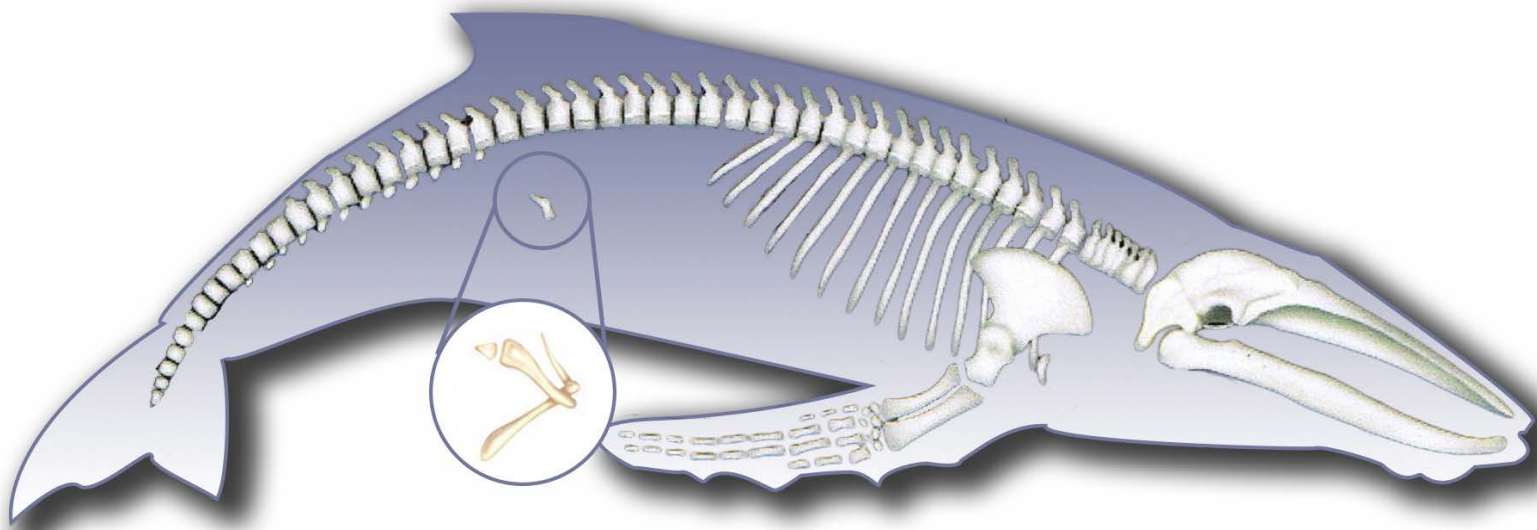
Homologous Structures



Vestigial structures

- ▶ Structures in animals that no longer serve a purpose
- ▶ Human tail bone, appendix*
- ▶ thigh bones in boa constrictors, whales





Embryonic Development

- ▶ Embryos of vertebrates look very similar
- ▶ Develop in similar ways
- ▶ Suggest common ancestor

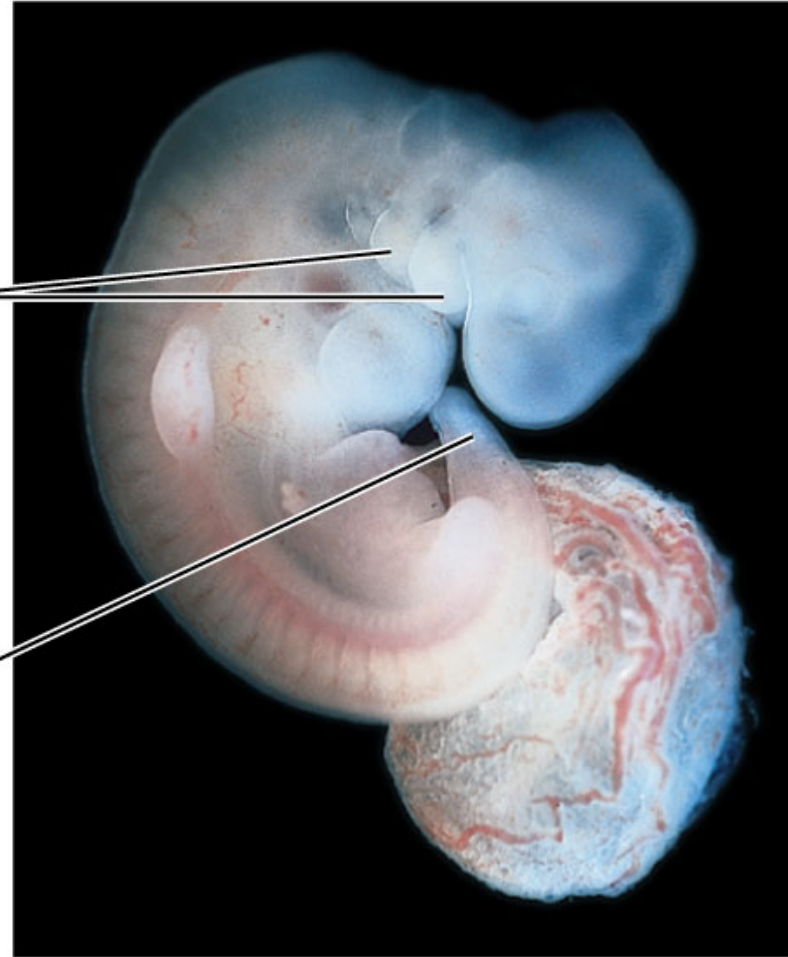


Embryonic Development



**Pharyngeal
pouches**

**Post-anal
tail**



Chick embryo (LM)

Human embryo



Dog embryo 30 days



Mouse embryo

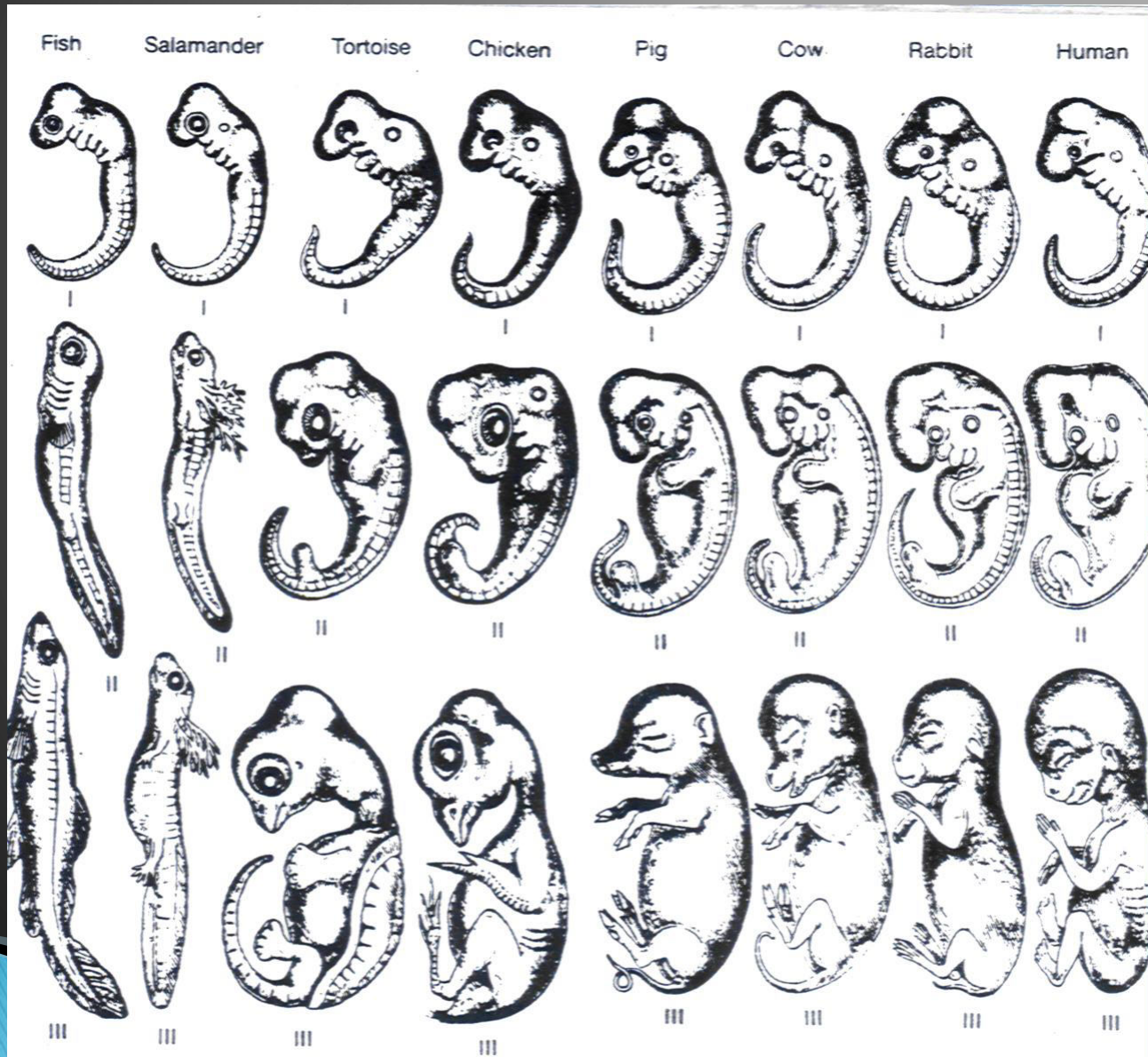


Human embryo
9 weeks

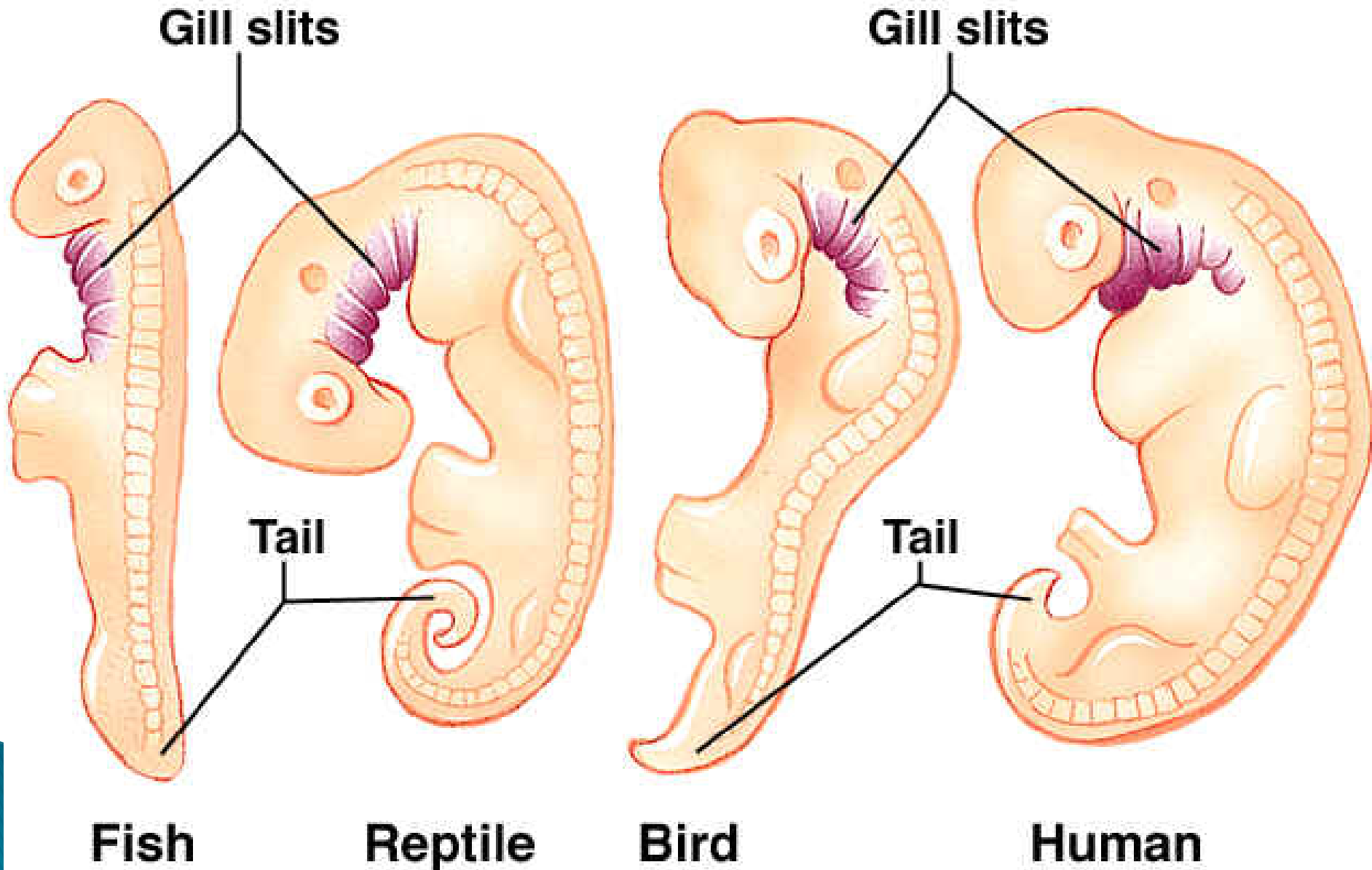


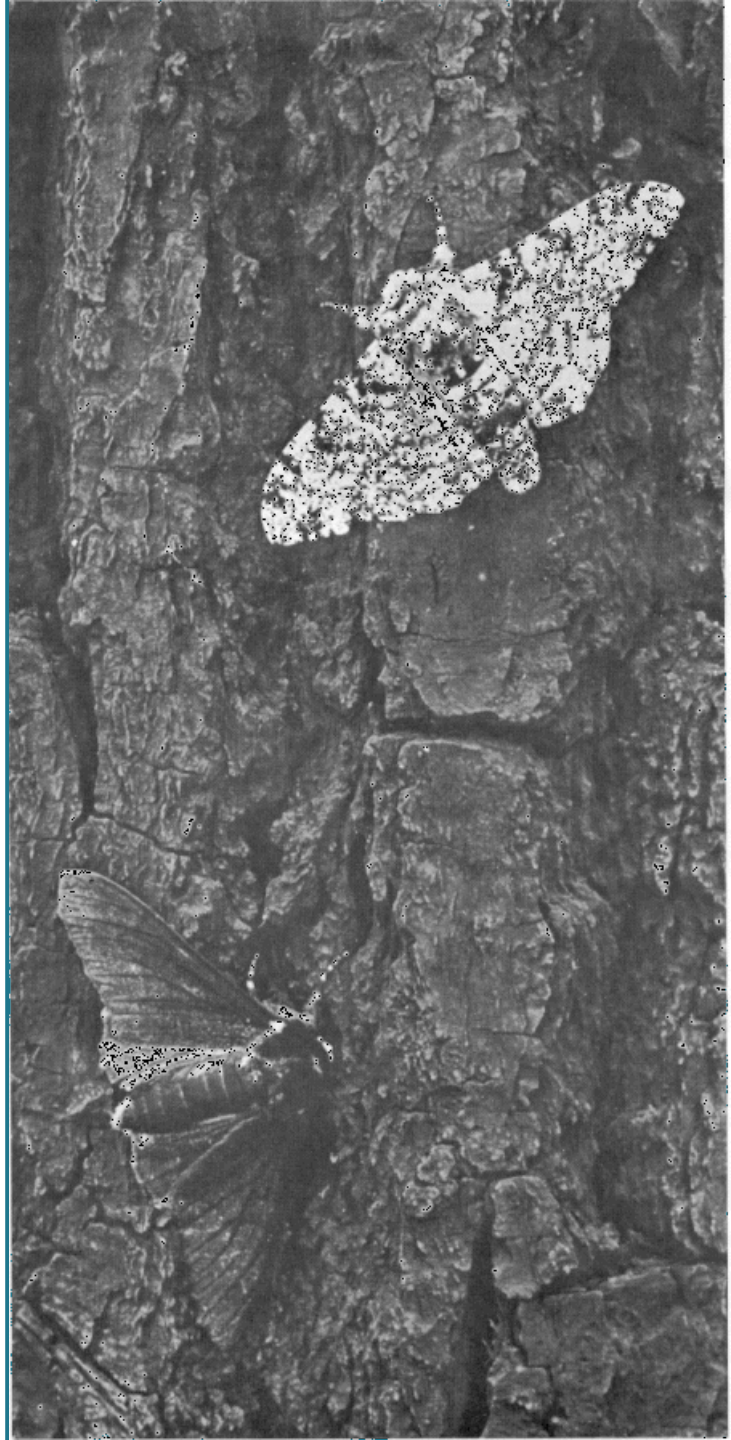
16 weeks

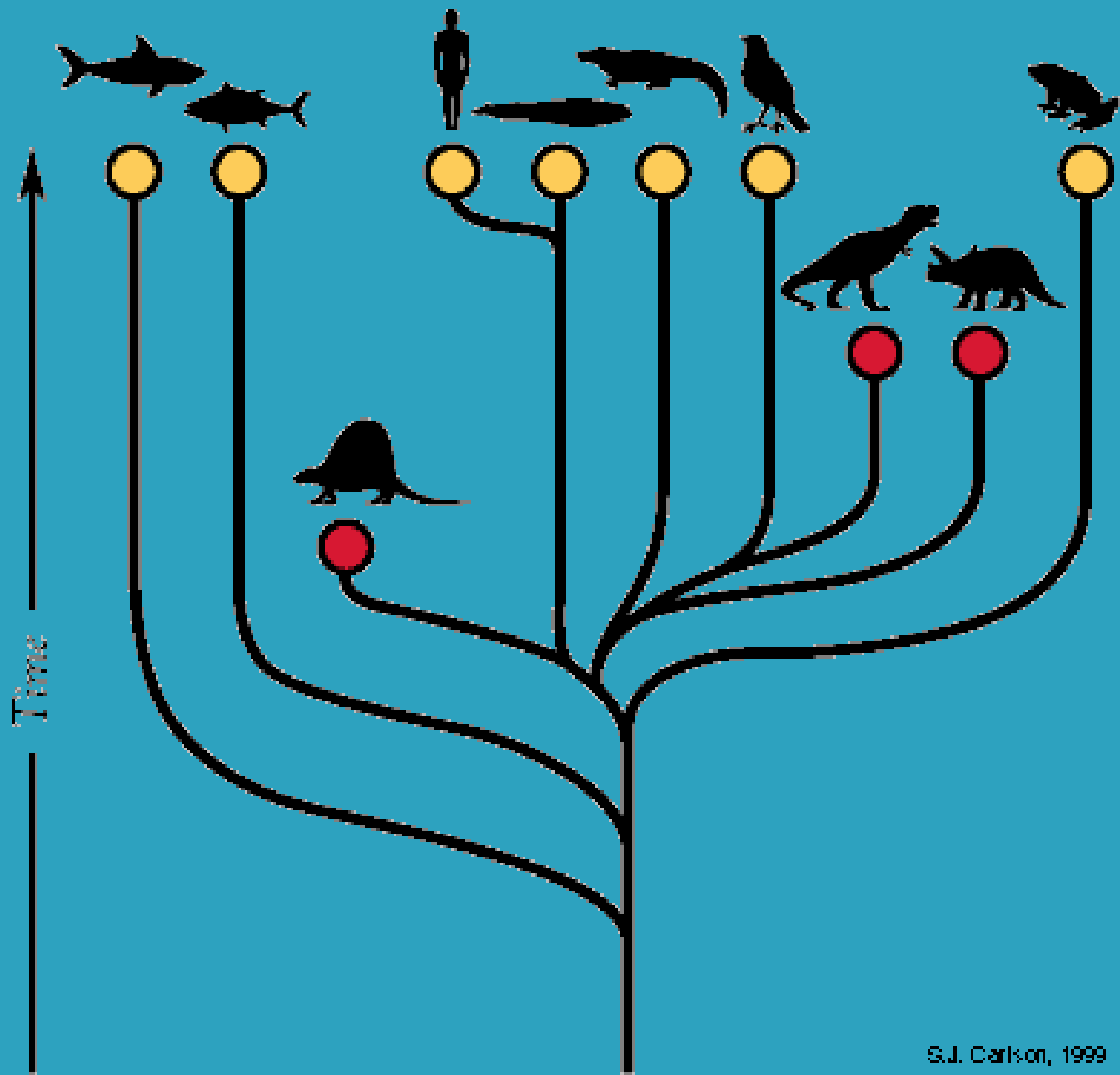
Embryonic Development



Embryos and Evolutionary History







S.J. Carlson, 1999

Figure 5. Phylogenetic tree congruent with cladogram in Figure 4. Redrawn from Carlson, 1995.