Darwin Presents His Case

CHAPTER 15 SECTION 3

ESSENTIAL QUESTION:

HOW IS NATURAL SELECTION RELATED TO FITNESS?

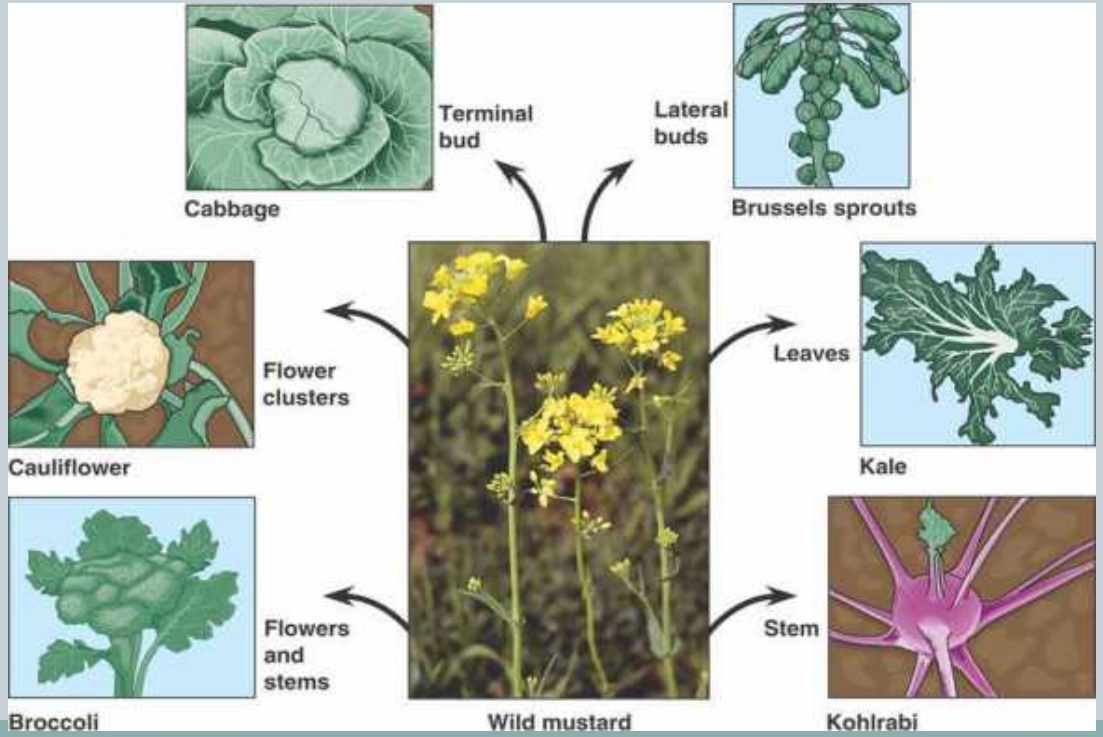
On The Origin of Species

- 1858: after receiving a short essay from Wallace that summarized the thoughts on evolutionary change that were very similar to Darwin's ideas.....he went ahead and had his book published

- book a success because it presented a mechanism to explain evolution

Artificial Selection

- Darwin used example of wild mustard plant's natural genetic variation & humans using artificial selection to yield wide variety of vegetables

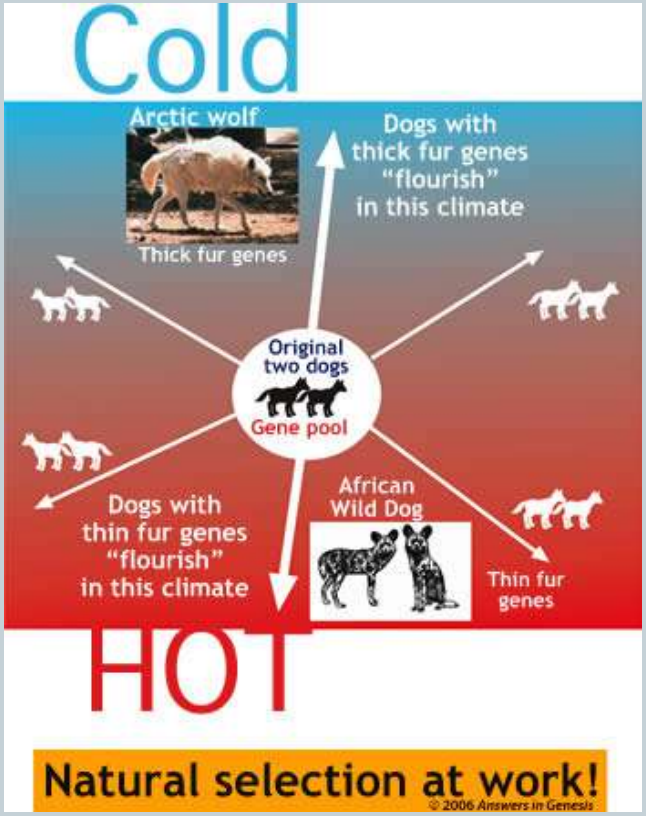


Evolution by Natural Selection

- Darwin next compared artificial selection with what is going on in nature:
  - realized what Malthus predicted about the growth of human population applied to all organisms
  - struggle for existence: limited resources give advantage for survival to those predators that are faster or those prey that are better camoflauged
  - survival of the fittest: "fitness" a measure of how successful you are surviving & reproducing
  - natural selection: results in changes in the inherited characteristics of a population; these changes increase a species' fitness

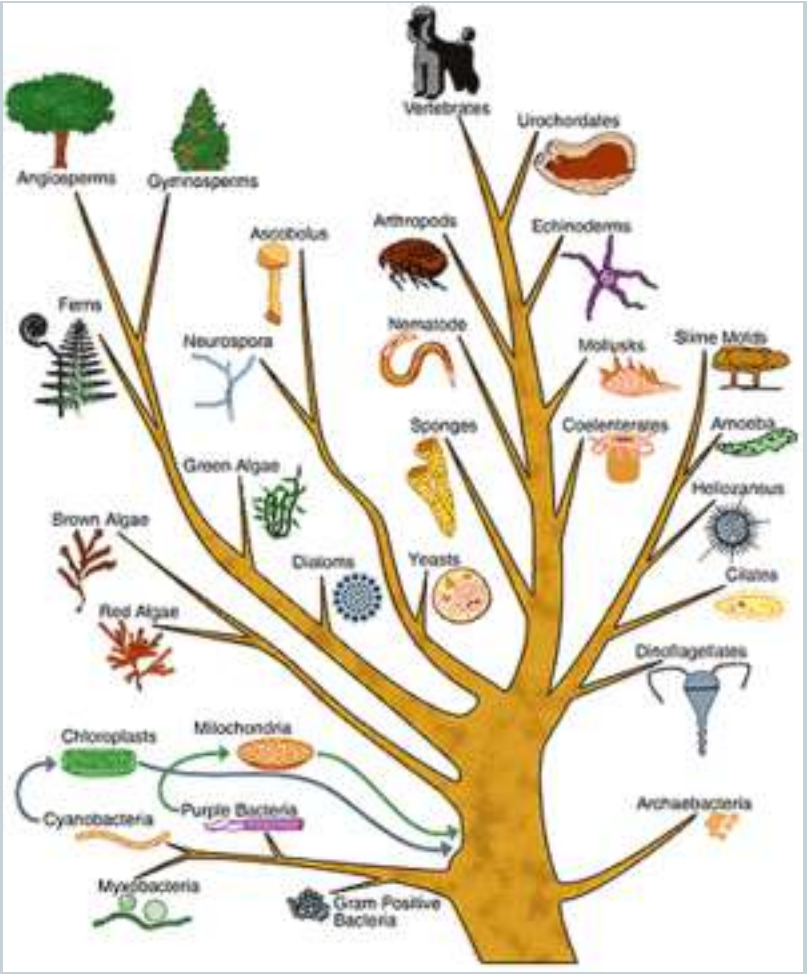
Natural Selection

- descent with modification: over time, natural selection produces organisms with different :
  - structures
  - niches
  - habitats



Descent with Modification

- implies all living organisms are related to one another
- principle of common descent: all species both living and extinct were derived from common ancestors→ Tree of Life

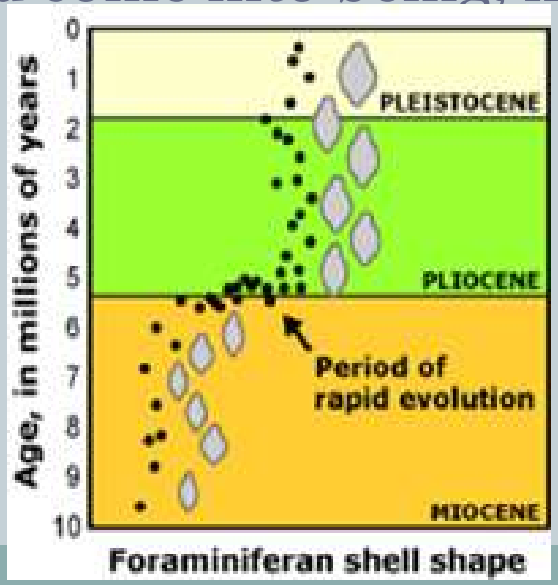


Evidence of Evolution

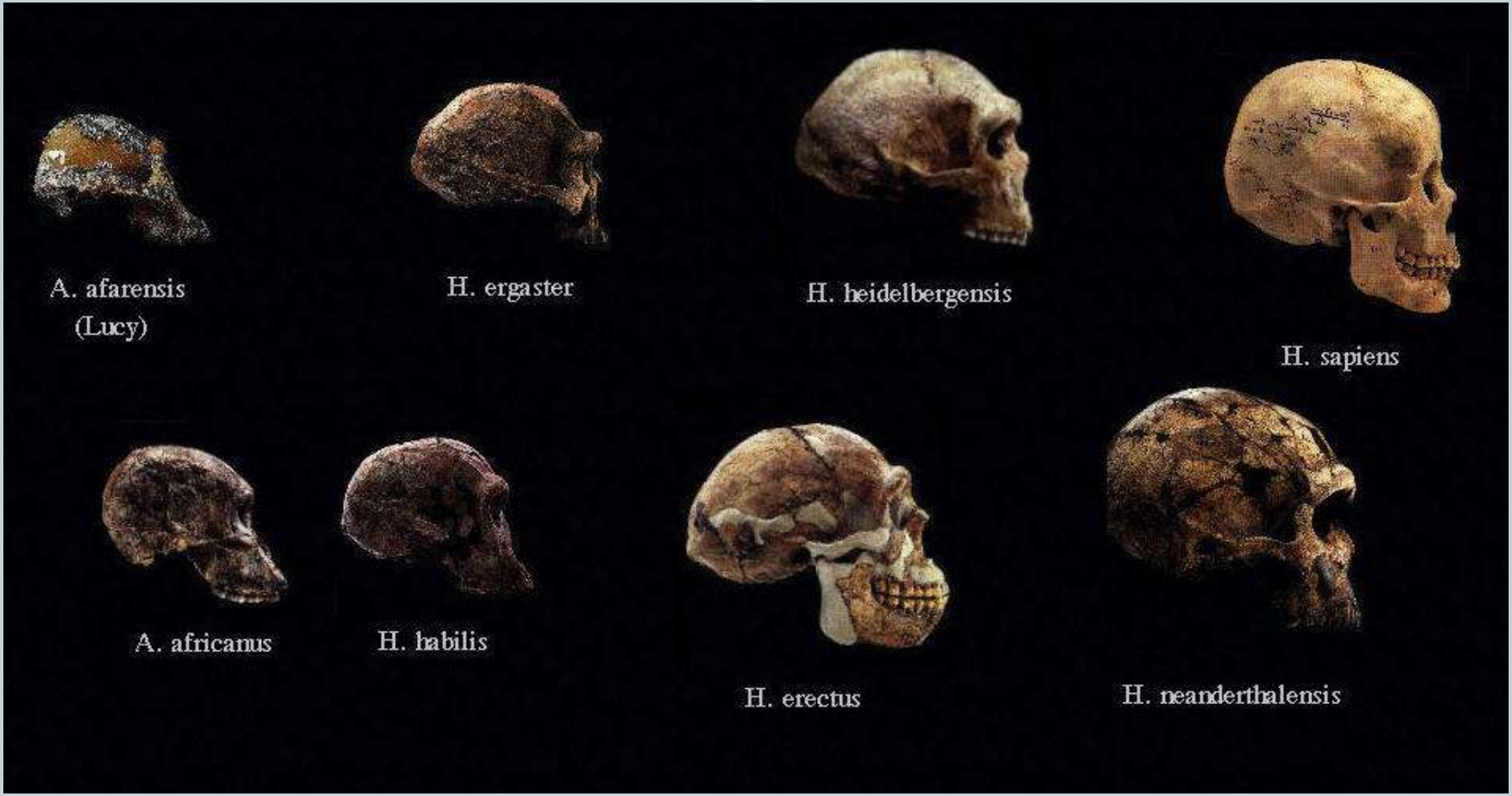
1. Fossil Record
2. Biogeography
3. Homologous Structures
4. Embryology

Fossil Record

- Darwin & scientists of his time knew:
  - fossils were remains of ancient life
  - sedimentary rock layers formed @ different times
- Darwin proposed:
  - countless species had come into being, lived for a time then vanished



Transitional Fossils



Biogeography

- species living on different continents but with similar environments shared common features
  - anatomy
  - behaviors

Darwin reasoned that animals exposed to similar forces of natural selection would evolve common characteristics

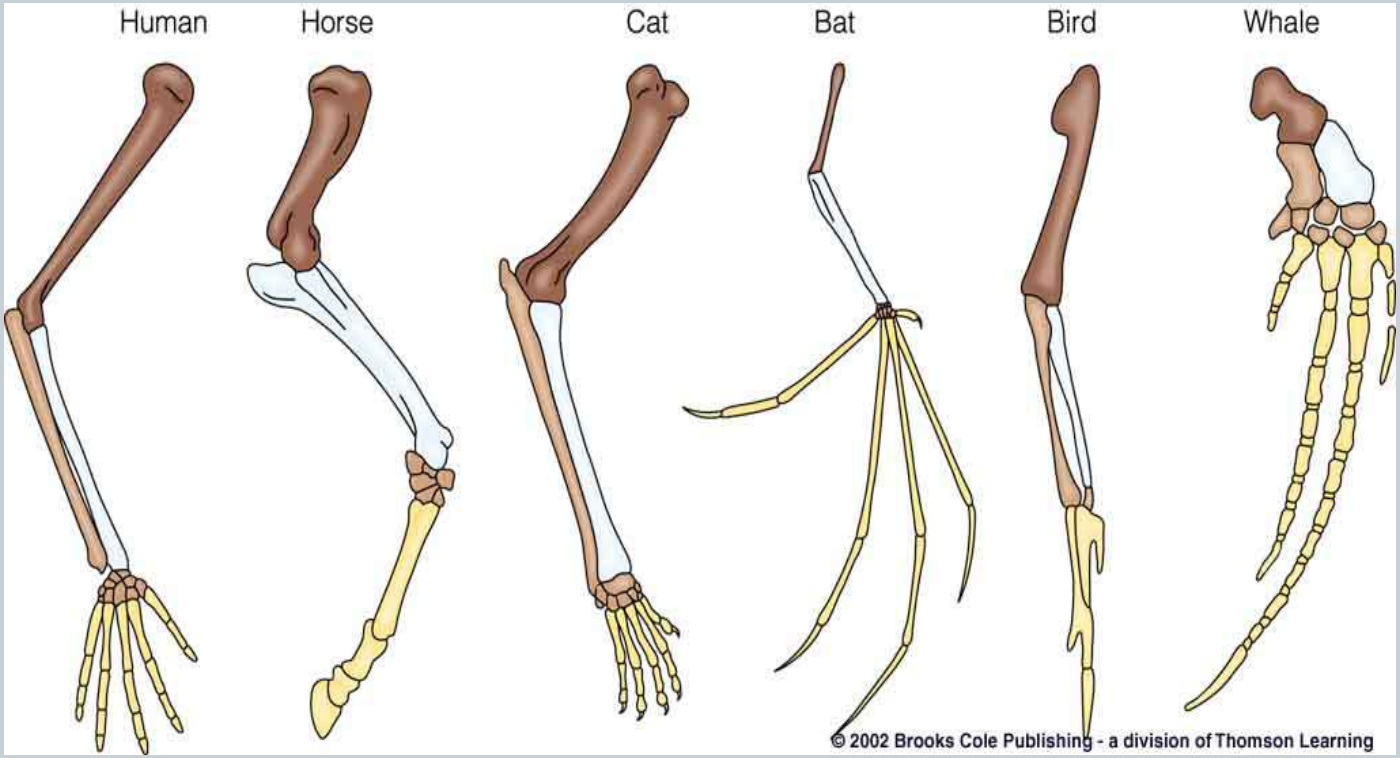

It's cold here now! I know... But according to my calculations Antarctica will be back at the equator in another 50 million years!
We should have listened to the lemurs and joined them on Madagascar!
TRAVEL
Madagascar

- How can two species that look very different from each other be more closely related than two other species that look similar to each other?

Continental Drift

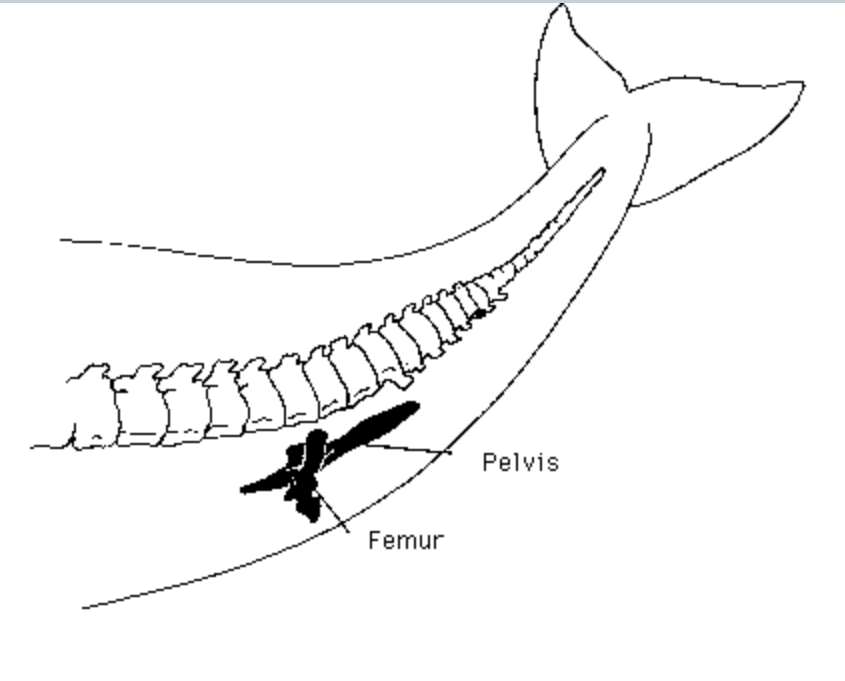
Homologous Body Structure

- structures that have different mature forms but develop from same embryonic tissues

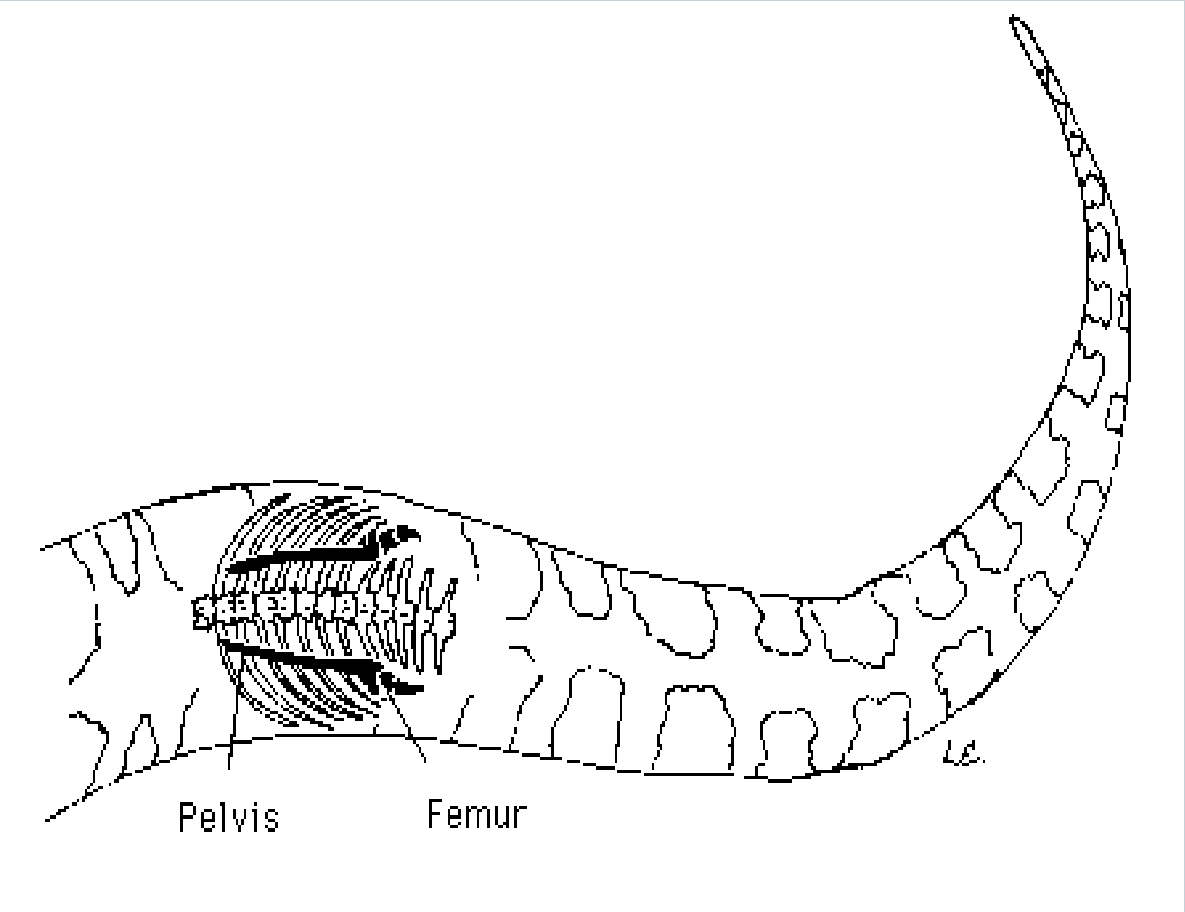


Vestigial Organs

- traces of organs that no longer serve a function
  - these organs would have had a function in an ancestor

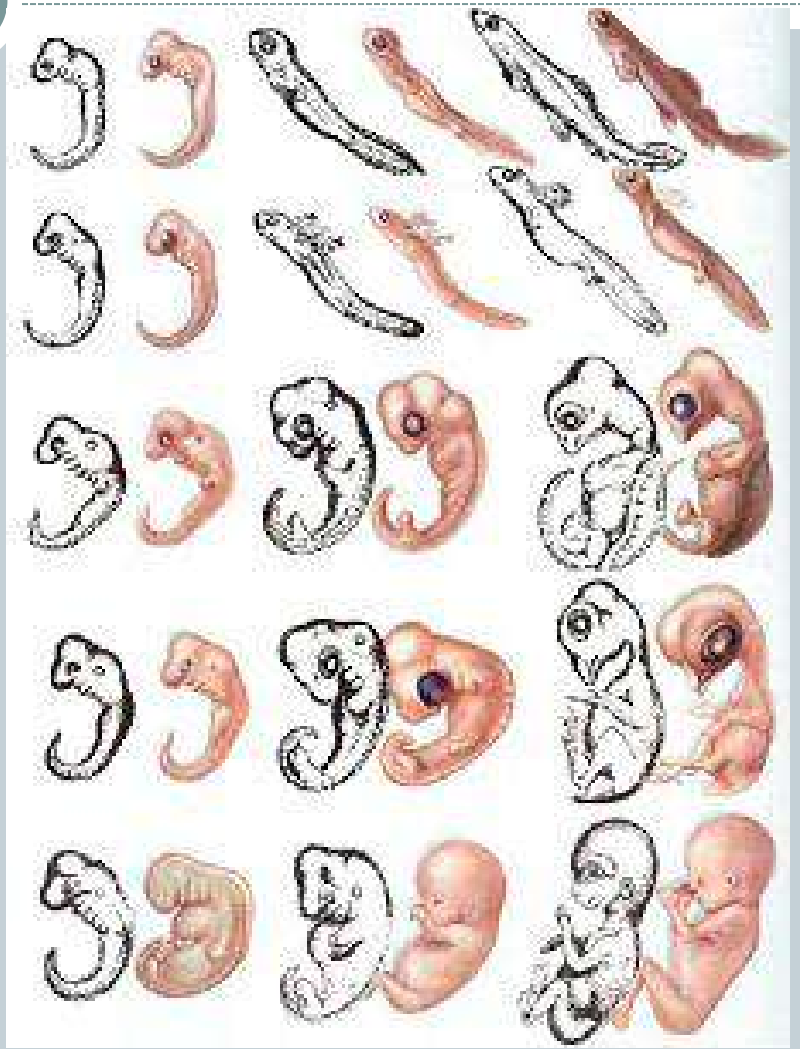


Vestigial Structures



Embryology

- many vertebrates have embryonic stages showing close similarities

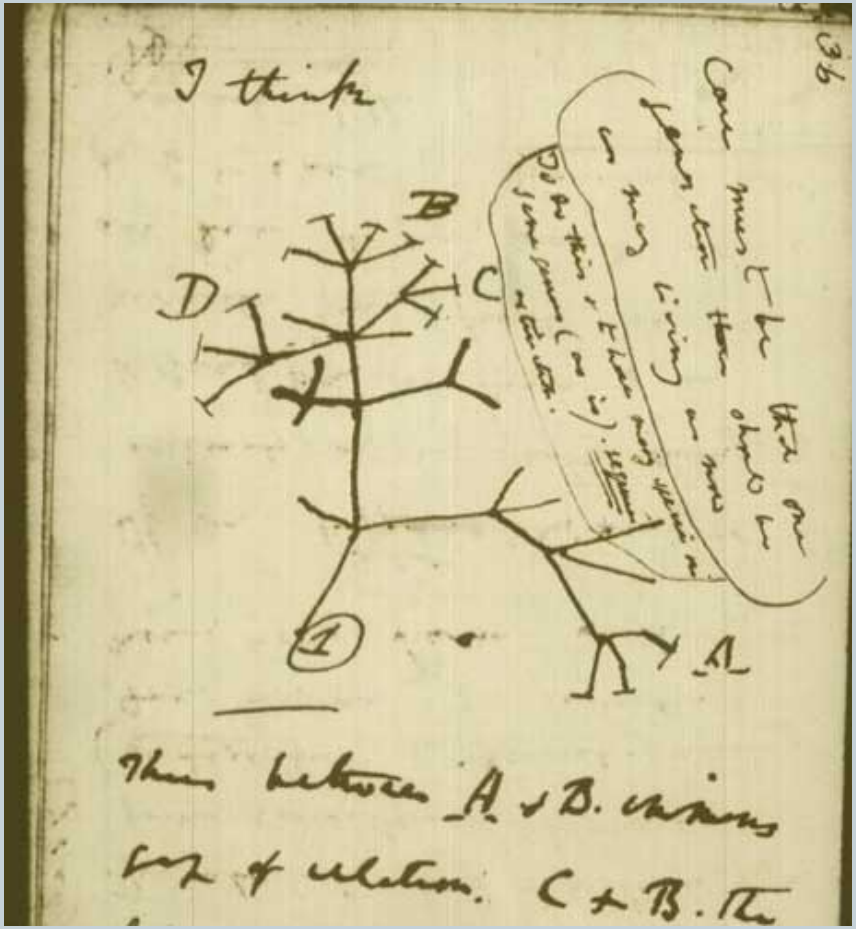


Summary of Darwin's Theory

1. Individuals of a population show genetic variation
2. Organisms produce more offspring than can survive & many that do survive do not reproduce
3. Because of #2 there is competition for limited resources
4. Each individual has different advantages & disadvantages in struggle for existence. Those best suited to their environment survive & reproduce most successfully; others less successful do not survive &/or do not reproduce as well: natural selection causes species to change over time

Summary of Darwin's Theory - 2

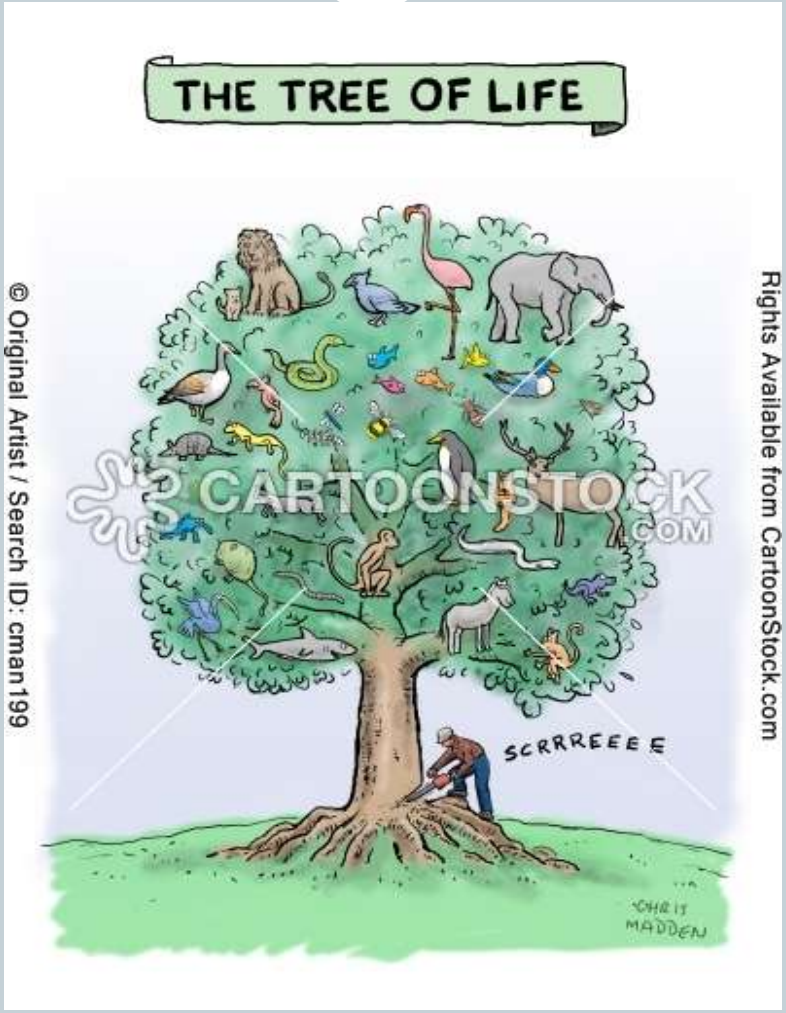
5. Species alive today are descended with modification from ancestral species: this process unites all organisms on Earth into a single Tree of Life



Darwin's Theory

Strengths	Weaknesses
• scientific advances in ecology, biology, DNA technology, physics, & geology have confirmed & expanded most of Darwin's theory • Evolution called the "grand unifying theory of life"	• How did that 1st cell become a "living" organism? • Not always clear how new species form ○ or why species become extinct

What Will You Do that Affects the Tree of Life?

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