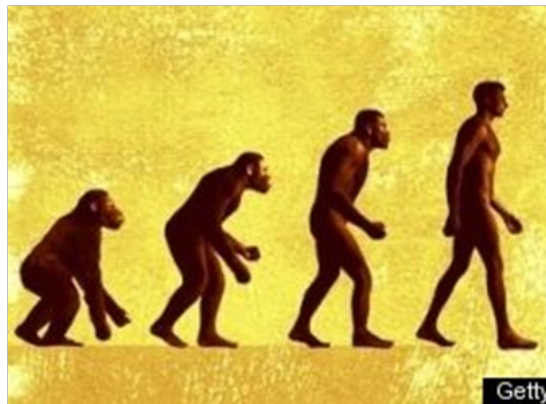


Biology 20 - Chapter 5 - Lesson 2 - Evidence for Evolution

- Today's species that exist have evolved from ancestral ones.
- This theory of evolution is supported by many different types of evidence collected by scientists

1. Evidence from Fossils

- **paleontology** is the study of fossils
- fossils provide scientists with direct physical evidence of past life
- 3 important patterns are seen when fossils are examined
 1. Different species lived on earth at different time in the past
 2. The complexity of living organisms has generally increased over time
 - seen by looking at fossils of similar species from different time periods
 3. Living species and closely matching fossils are found in the same geographical area



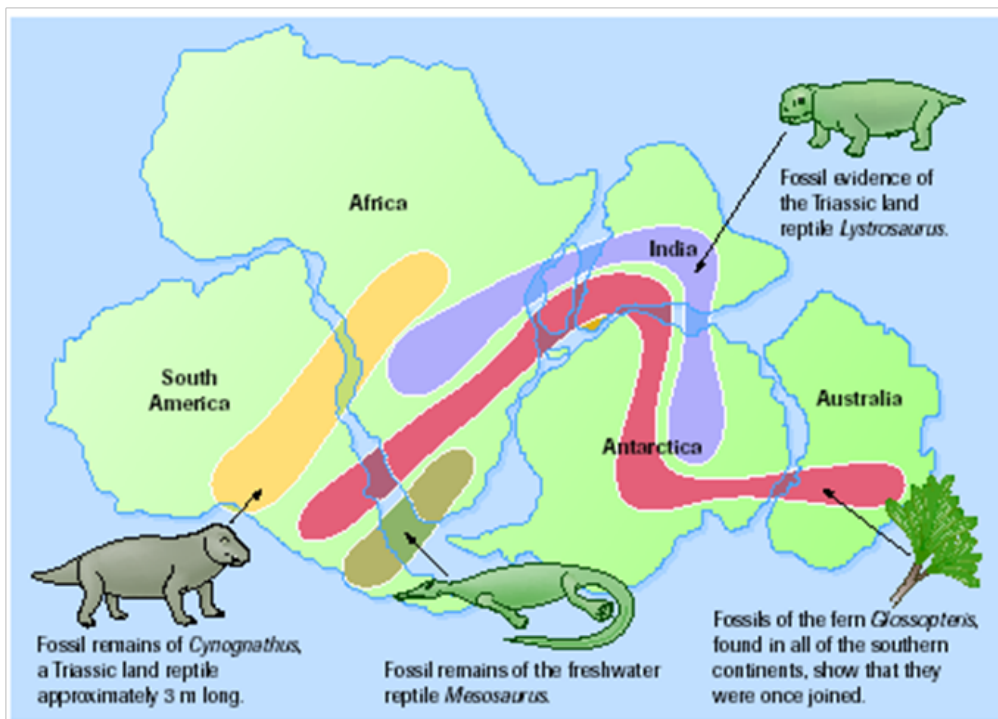
- The age of a fossil can be determined in two ways
 - What layer it is found in relative to other fossils
 - By using **radiometric dating** (pg 141-142)

Evidence from Biogeography

- **Biogeography** explores the variation and distribution of life over Earth's surface, both today and in the past.

- 225 million years ago, all earth's land existed as one land mass called **Pangea**

- The slow drift of Earth's tectonic plates eventually separated the ancient landmasses into the continents we see today.



- Fossils older than 225 million years are found on many different continents

- Fossils younger than approx 150 million years are only found on one continent

- This tells us that the species evolved after the break up of the continents

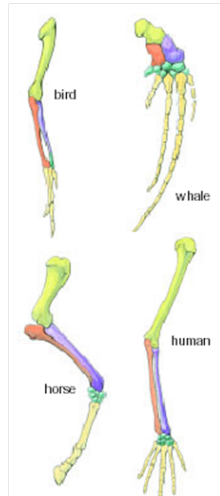
- Remote islands (like Hawaii) show us that many new species have evolved from the first organisms that inhabited the island

- Hawaii 1729 native species originated from only 272 original species

Evidence from Anatomy

- **homologous** features - similar structure, but not similar function

- o ex. The forelimb of a bird, whale, horse and human
- o suggests that they all evolved from a common ancestor

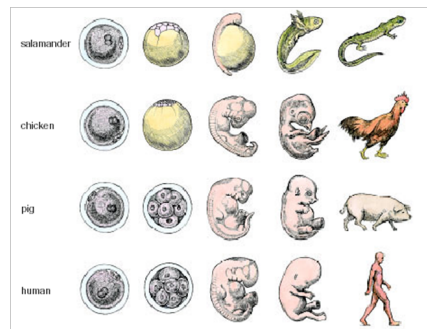


- **analogous** features - similar in appearance and in function, but do not appear to have the same evolutionary origin

- o ex. Birds wing and an insects wing

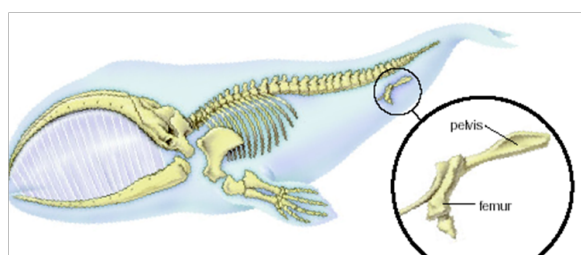
- evolutionary relationship among species is also evidenced in embryonic development

- o In the early weeks of development, human embryos possess a tail and gill slits, similar to those in chicken and fish embryos.
- o embryonic tail serves no function in humans and later forms the tailbone.
- o gill slits become modified in both humans and birds to form various internal structures, including bones of the inner ear.



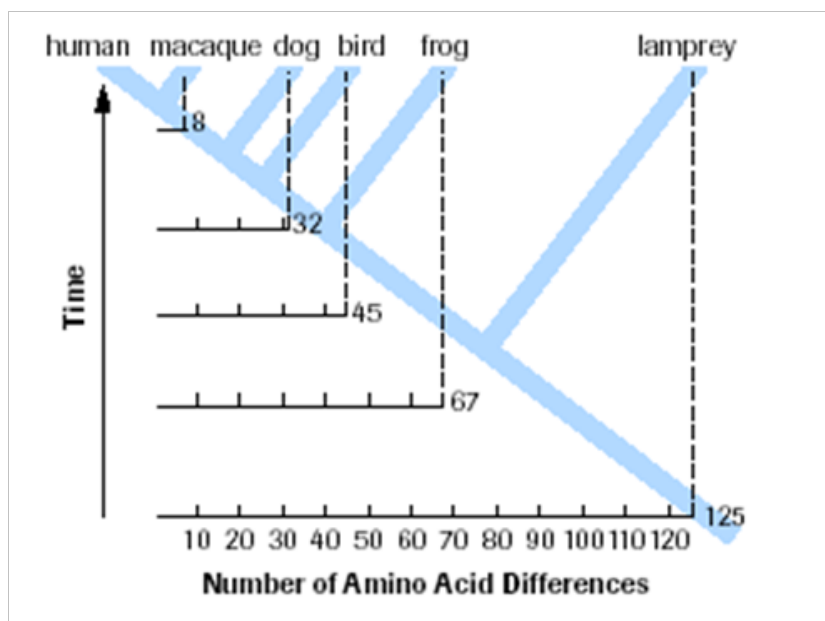
- **vestigial** features - structures which no useful function

- o ex. modern species of whales and snakes have vestigial hip and leg bones
- o evidence that suggests they evolved from ancestors that walked on four limbs
- o thought that they once served a purpose in ancient ancestors
- o Blind cave salamanders have empty eye sockets, suggesting that they evolved from salamanders with fully functioning eyes.



Evidence from Biochemistry

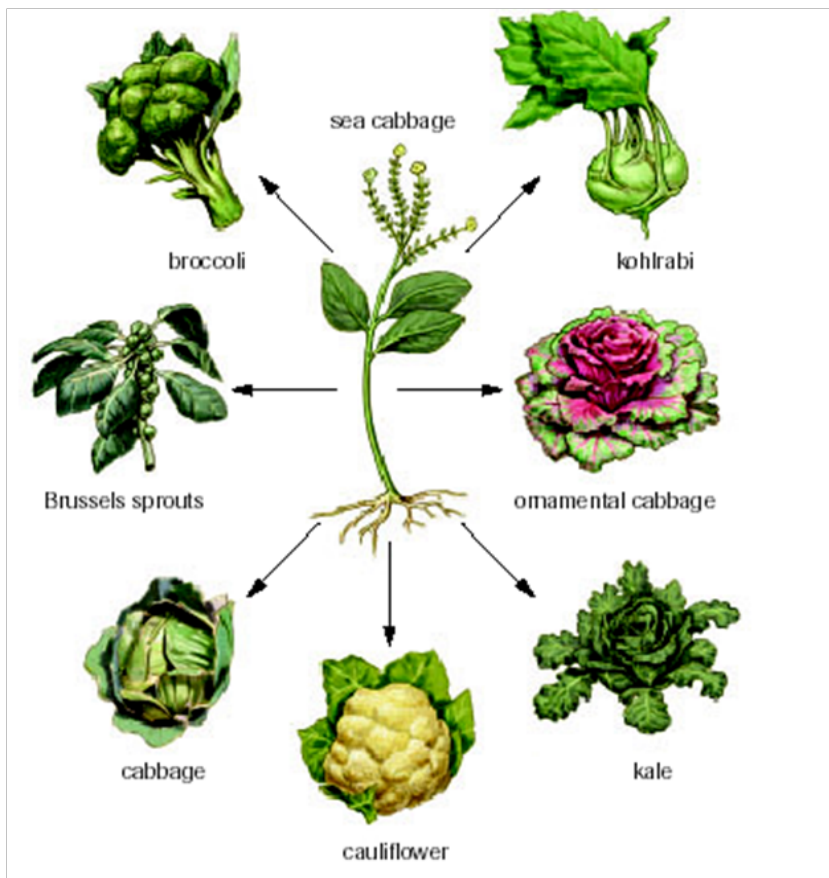
- Evidence for evolution has also been found by comparing biochemical characteristics of different species.
- Over time, similar proteins in different species become increasingly different in terms of their amino acid sequences.
- hemoglobin is an oxygen-carrying **protein** present in all vertebrates.
- Different species have a slightly different sequence of amino acids in the protein molecule
- The differences were greater between species that were less similar overall, such as a macaque and a lamprey



- Geneticists have found large numbers of both homologous and vestigial *genes* in the DNA of virtually all species.
- o We have a defective copy of gene that would allow us to create our own vitamin C

Evidence from Artificial Selection

- Artificial selection is another word for plant and animal breeding, in which people breed individuals with desired characteristics in order to get offspring with those same characteristics.
- Cauliflower, broccoli, kale, and cabbage are all the same plant
 - Over the centuries, farmers and plant breeders selected characteristics of a single plant species, the sea cabbage, to produce a range of edible and ornamental varieties



- The fact that humans can use artificial selection to produce such dramatic changes in species over relatively short periods of time provides compelling evidence that similar and even more dramatic changes occur in nature over millions of years and countless generations