

Darwin: idea of evolutions

- Mechanism: natural selection

Carolus Linnaeus (1707 – 1778)

- Species created through hybridization as part of God's plan

Immanuel Kant

- Similar species could have similar ancestors

Erasmus Darwin (Darwin's grandpa)

- As we use and disuse body parts they evolve/disappear
 - This leads to sexual selection

Path of Darwin

- **Thomas Malthus**
 - Organisms produce more offspring than can survive
 - His book led to the idea of natural selection
 - Poverty + famine = overpopulation

Darwin and Wallace

- Darwin: meticulous observer
 - First to understand formation of coral reefs
 - Idea of natural selection
 - Held up for 20 years
 - Wallace matched idea
 - Wallace and Darwin presented idea together... Wallace eventually dropped.

Basic Idea

- All populations have heritable variations: height, speed, color...
 - Some better for survival and give sexual advantage
- **Critics:** origin of mutation
 - DNA / Genes (not discovered)

Gregor Mendel

- discovered DNA
- Genes: section of hereditary that codes for a characteristic, section of a single chromosome.
- Alleles: alternative forms of each gene.

20th Century

- Discovery of nucleus
- Chromosomes coiled in strands of DNA
 - Chromosomes come in pairs

DNA

- Backbone of sugar and phosphate
- Connected by 4 bases
- Mutation only occurs in sex cells
- Mutations are random
- Species arise from separation of populations

Changes

- occur over time, not fast
- convergent changes: development of similar characteristics in distantly related organisms

Why do geologists care about biology?

- Fossils help us determine the age of rocks
- Fossils provide clues to Paleoenvironments
- **Relative age:** qualitative age, based on events
- **Absolute age:** quantitative age: based on date

Development of Geology

- **Leonardo Di Vinci**
 - Sediments go to rivers, then to oceans, then form sedimentary rock, then get uplifted and form mountains.
 - Agreed with Aristotle: fossils are signs of ancient life.

How old is the earth?

- Biblical est.: 6-7 thousand year
- James Ussher: 4004BC

6 fundamental principles of relative dating

- 1: Superposition: in an undisturbed sequence of rock layers... the bottom is the oldest, the top is the youngest.
- 2: Original Horizontality: In a sequence of rocks, layers are deposited as flat horizontal layers.
- 3: Lateral continuity: sedimentary layers extend sideways in all directions until they reach a depositional basin (barrier that stops extension)