

Student Notes: Unit 3- The Structure of the Earth

Part 1 – Earth's History

Origin of the Atmosphere:

- Earth's first atmosphere was made up of mostly hydrogen and helium that were left over from the nebula that created the Sun.
- When the earth was hit by the planet Theia creating the moon it's atmosphere was blown away due to the impact.
- Earth's second atmosphere was formed from gases being emitted from continual volcanoes. By the end of the Archean Eon it was made up of gases such as CO₂, water vapor, nitrogen, etc....
- today's atmosphere contains oxygen which began to develop when plants began to photosynthesize

Origin of Oceans:

- Due to the fact that there was no atmosphere immediately after the impact from Theia when the earth began to layer and cool it caused Earth to cool at a very rapid rate.
 - It took about 150 million years for a solid crust to form while maintaining a hot mantle underneath of it.
- As the earth cooled and formed the crust it squeezed out water in the form of steam from the mantle.
 - eventually the steam cooled and became a liquid (water cycle) and rained down, cooling the crust and pooling in the depressions made from impacts from materials.
- Other water is believed to have been formed by the following ways:
 - volcanism which releases water vapor into the atmosphere
 - break down of asteroids, comets, etc when they impacted the Earth
- It is believed that the first oceans are almost as old as the Earth and began to form when the earth was only 4.2 years old.

Origin of Life:

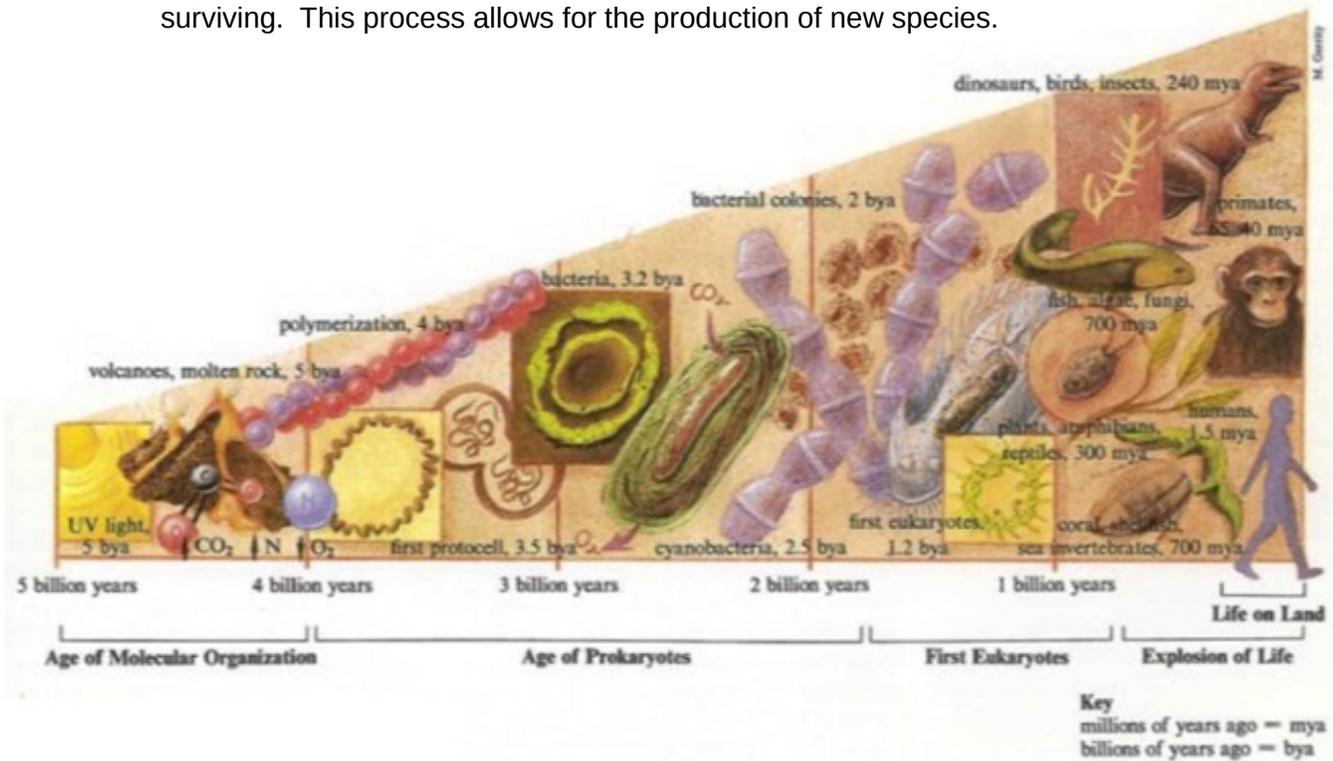
- During the earliest days there were anaerobic (non oxygen dependent) bacteria which could live off the rocks and minerals formed from the cooling of the earth's crust. Ancestors of these organisms are still found today.
- Over time the heat of Earth and lightening caused the formation of proteins through a chemical reaction that allowed for the replication of genetic coding and the ability to replicate (asexually).
- 3.5 billion years ago, molecules organized and formed simplest life forms called prokaryotes.
 - Ex: Stromatolites (single celled organisms)
- 2.1 billion years ago, more complex celled plants, animals and fungi called eukaryotes formed.
- Life remained in the water until 443 million years ago when the first land organisms were seen.

Studying the Past:

- Much of earth's past has been studied in the fossils that remain in the rocks found within earth's geosphere.
 - fossil – the remains, impression, or any other evidence of life from another geological age preserved in rocks.
 - They can include shells, bones, petrified trees, footprints and impressions made by leaves
 - Fossils are made when:
 1. a dead plant or animal is buried by sediments
 2. soft parts of the animal and plant decay, but the hard parts remain
 3. over time sediments bury it and rock forms preserving the imprint

Evolution of Organisms:

- Fossil records indicate that organisms have developed in a variety of sizes and structures over millions of years.
- Rock records show the disappearance of organisms and the appearance of new organisms.
- The reason for this to have occurred is the theory of evolution which is the process of change that produces new life forms over time.
 - Darwin's theory best explains the evidence for evolution through natural selection where organisms that survive to produce offspring are the ones that have the most favorable traits for surviving. This process allows for the production of new species.



Geological Time Scale:

- The Geological time scale is a summary of major events in earth's past that are preserved in the rock records.
- Paleontology is the study of the life that existed in prehistoric times.
- Fossils are an important part of the history as many layers have been identified based on the fossils they contain.