



Chapter 26:
Origin of Life



Key Events in the Origin of Life

- Key events in the history of the Earth

Prokaryotes

- Prokaryotes Dominated the Earth 3.5-2.0 bya

Fossilized Bacteria

Modern Bacteria

Stromatolites

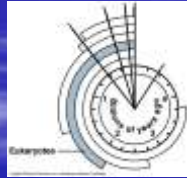
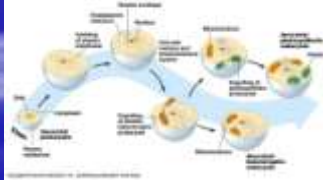
- Fossilized mats of prokaryotes that resemble modern microbial colonies

O₂ in the Atmosphere

- Oxygen begins to accumulate around 2.7 bya
 - photosynthetic bacteria
 - Cyanobacteria
 - Reducing → oxidizing atmosphere
 - Corrosive
 - Banded iron formations in rocks

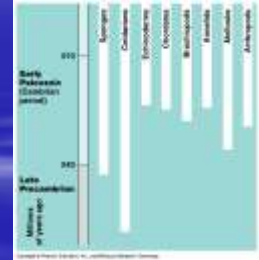
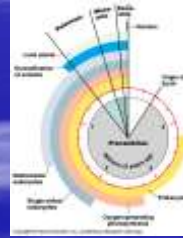
Evolution of Eukaryotes

- 2.1 bya
- Endosymbiosis – formation of membrane bound organelles
- Multicellular algae



Multicellular Organisms

- Cambrian Explosion (543 mya)



The Cambrian EXPLOSION (550mya)



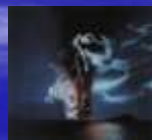
How did these first cells appear?

Origin of Life Hypothesis

- Abiotic synthesis of organic compounds
 - Amino acids and nucleotides
- Building of polymers
 - Formation of proteins and nucleic acids
- Protobionts
 - Packaging of polymers into membrane-bound droplets
 - Maintain internal chemistry
- Origin of self-replicating molecules
 - Makes inheritance possible

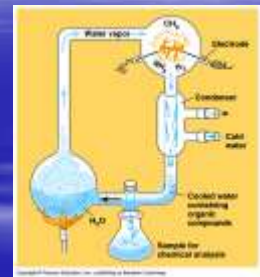
Conditions on Early Earth

- Atmosphere
 - CO_2 , H_2 , CH_4 , H_2O , CO , N_2
- Energy Sources
 - Lightning, UV radiation, Volcanic activity



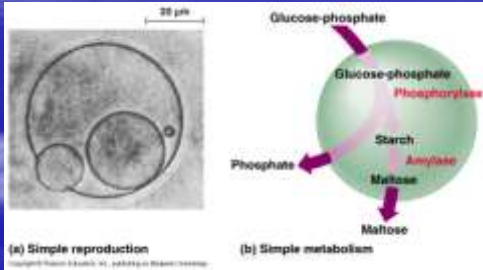
Abiotic Synthesis

- Testable Hypothesis
- 1920 - Oparin & Haldane proposed that chemical reactions synthesized organic compounds
- 1953 – Miller & Urey tested the hypothesis



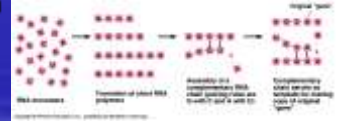
Protobionts

- Life → reproduction & metabolism



RNA World

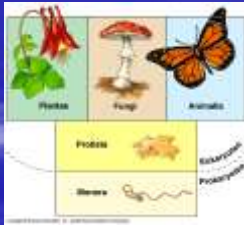
- RNA is likely to be first genetic material
- Multifunctional molecule
- Codes information
- Enzyme function
 - Ribozymes
 - Replication
- Regulatory molecule
- Transport molecule



Beginning of Natural Selection

Classification

- Linnaeus used structural similarity
- 1969: Whittaker creates 5 kingdom system
 - Monera
 - Protista
 - Plantae
 - Fungi
 - Animalia



Work in Progress

- New groupings due to molecular data
- 3 – domains: Bacteria, Archaea, Eukarya
- Monera and Protists are too divers

