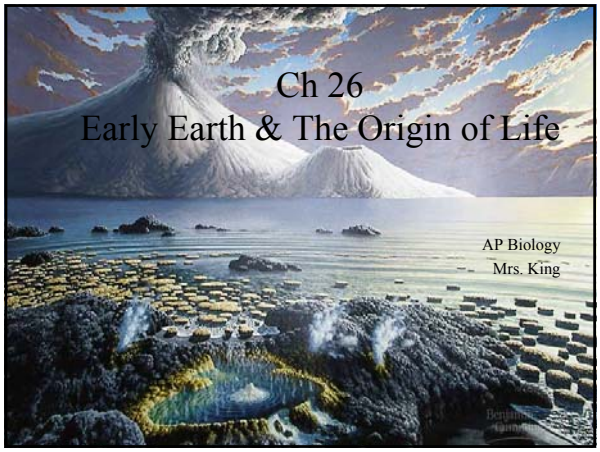
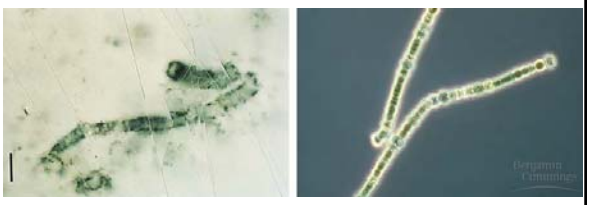


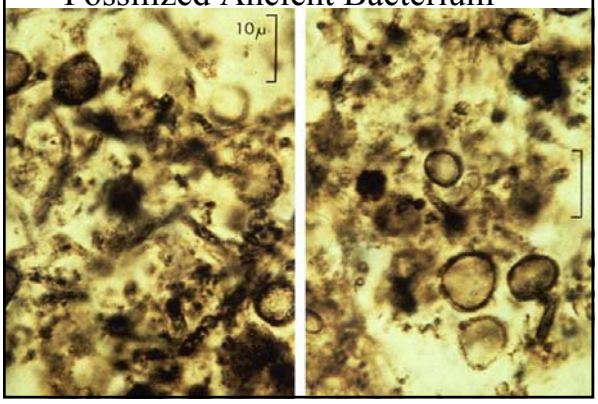
History of Life

- Originated 3.5-4.0 billion years ago
- Fossil evidence: *stro**mat**olites*
  - Fossilized mats
    - ie. Similar to layered microbial mats certain groups of prokaryotes still form today in salt marshes and lagoons
    - Lasagna mats in video

Early (left) and modern (right) prokaryotes



Fossilized Ancient Bacterium



Major Episodes in the History of Life

- Prokaryotes-
  - 3.6 billion years ago
- Prokaryotes diverged into Bacteria and Archaea
  - 2-3 billion years ago
- Photosynthetic bacteria began producing O_2
  - 2.5 billion years ago
- Eukaryotes emerged
  - 2 billion years ago

Some major episodes in the history of life

Timing is based on fossil evidence.

Other dates are based on chemical evidence or molecular clocks.

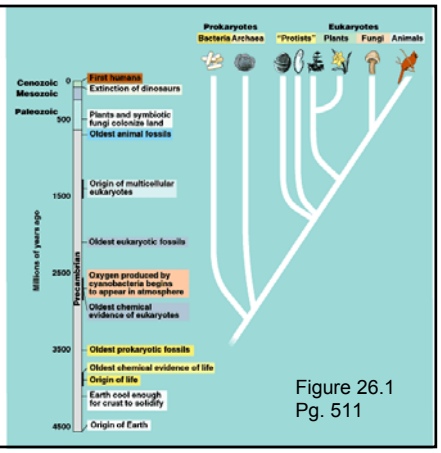


Figure 26.1
Pg. 511

Prebiotic Chemical Evolution

- Abiotic synthesis and accumulation of monomers
- Formation of polymers
- Formations of *protobionts*
- Origin of heredity during or before protobiont appearance

- In 1969, R.H Whittaker argued for a five-kingdom system: Monera, Protista, Plantae, Fungi, and Animalia.

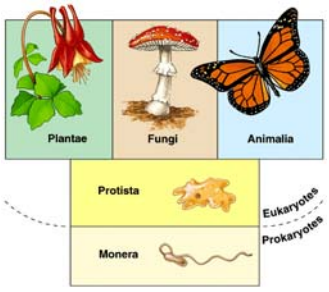
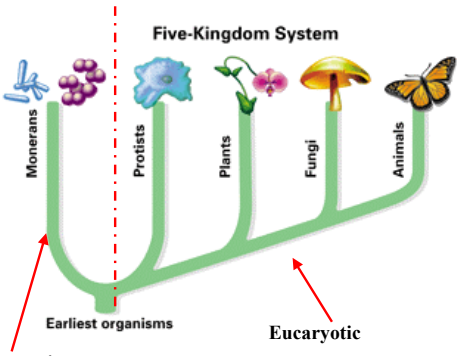
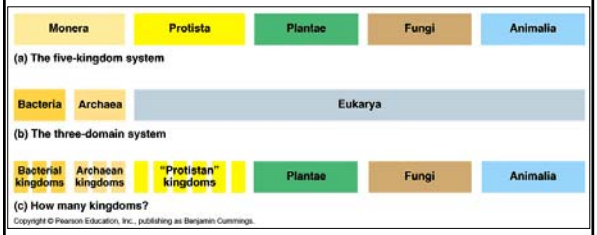


Fig. 26.15



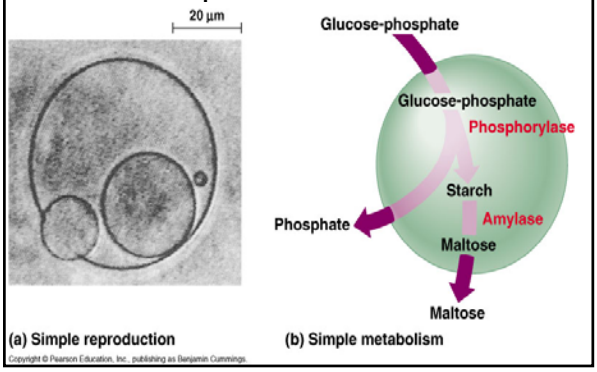
Procaryotic – no nucleus



Protobionts

- Aggregates of abiotically produced molecules
- Maintain internal environment, different from surroundings
- Exhibit some life properties
  - irritability and metabolism
- Self-assemble
- Microspheres and liposomes

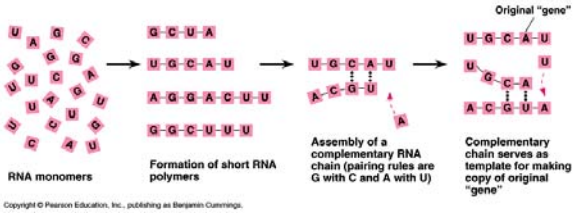
Laboratory versions of protobionts



RNA was probably the First Genetic Material

- If DNA, a primer would be necessary
- RNA can self-replicate
- RNA is *autocatalytic*
- Achieves unique tertiary structure (different *phenotypes)*-diversity!

Abiotic Replication of RNA



Hereditary Material Enabled Darwinian Evolution

If Protobionts:

1. Incorporated genetic information
2. Selectively accumulated monomers
3. Used enzymes programmed by genes to make polymers
4. Grew and split

Then:

- Variations would lead to natural selection
- Refinements would have accumulated
- Lead to the appearance of DNA