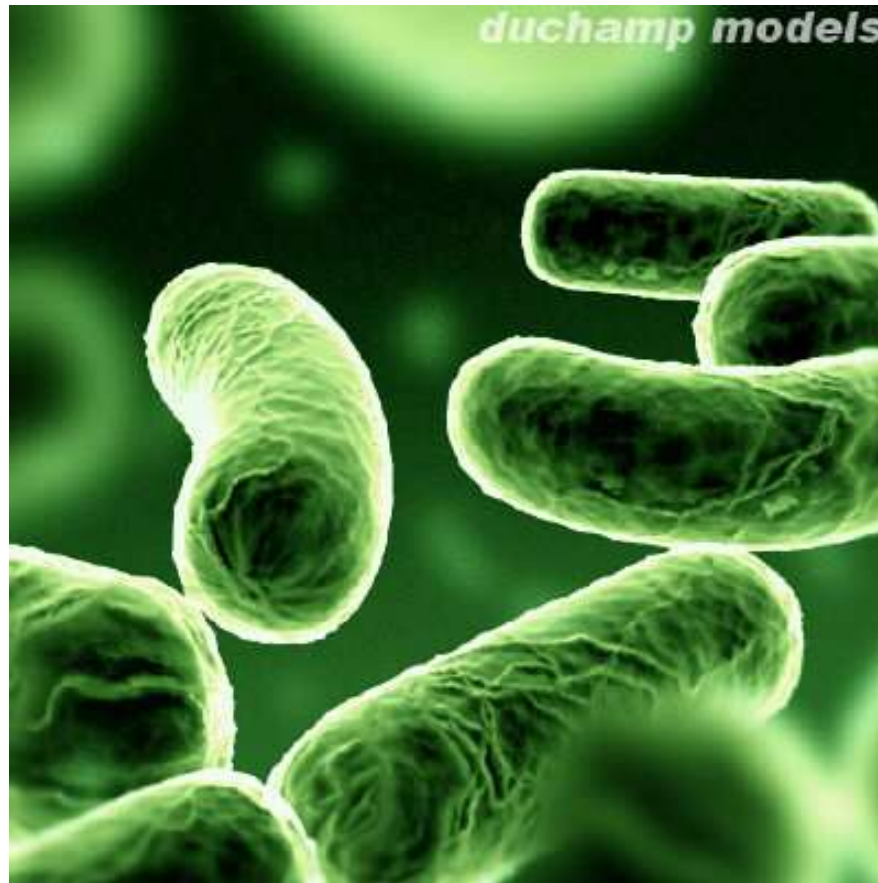


Types of Micro-Organism (Bacteria)



Origin of the Earth



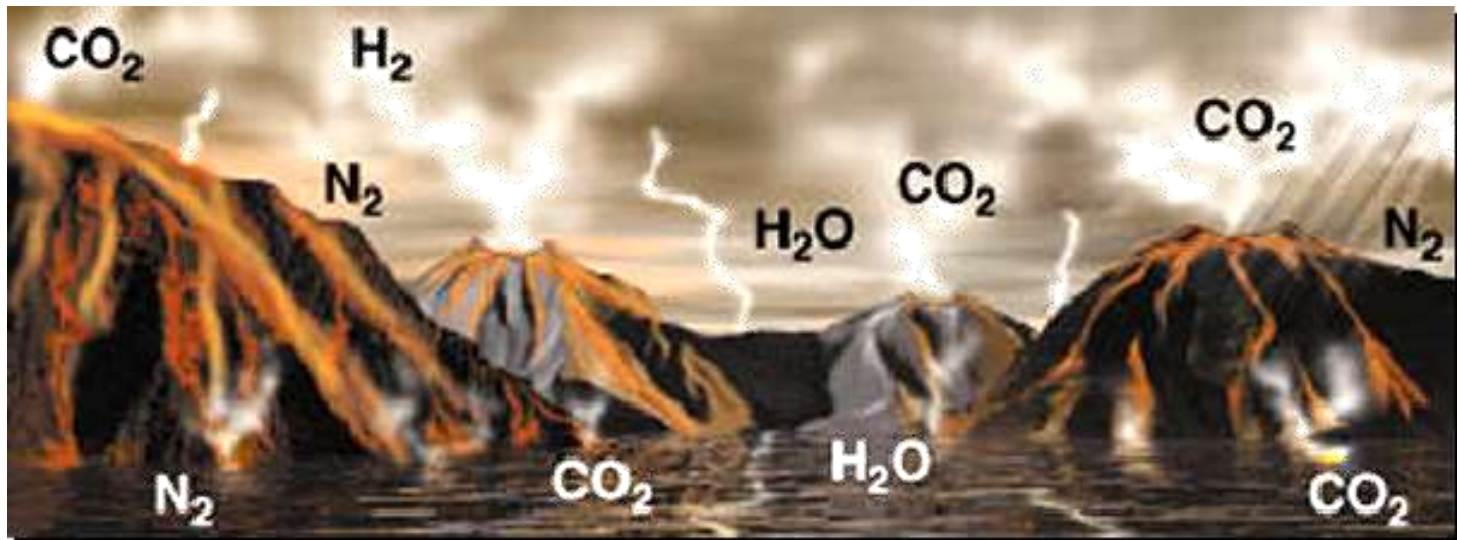
- Universe formed 15 billion years ago (Big Bang)
- Galaxies formed from stars, dust and gas
- Earth formed 4.6 billion years ago

Origin of the Atmosphere

☛ Sun's energy stripped away 1st atmosphere

☛ 2nd atmosphere formed from volcanic outgassing

☛ **Primitive atmosphere:** CO₂, water vapor, lesser amounts of CO, N₂, H₂, HCl, and traces of NH₃ and CH₄ (3.5 bya)



Origin of the Atmosphere

- O₂ came in 1.5 bya
- Autotrophic Organisms: photosynthesis
- Another environmental change
- Result in evolution

Origin of the Atmosphere

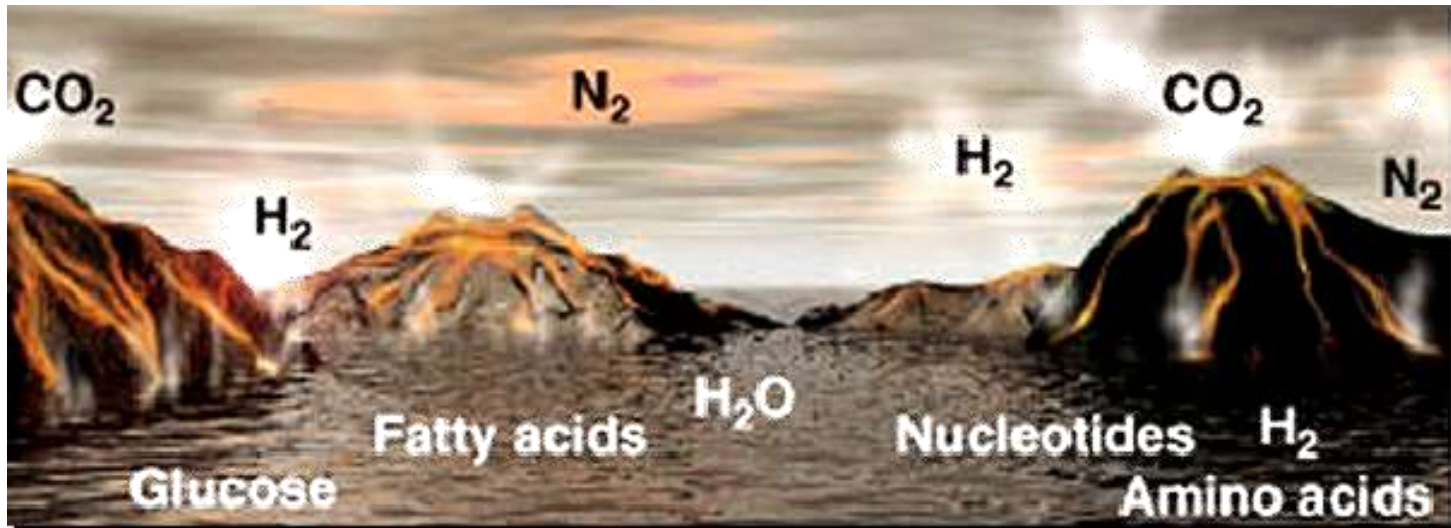
- 0.5 billion years ago
- Atmosphere O₂ to 1% current
- Compare to present: 78% N₂, 21% O₂, 0.04% CO₂, + trace gasses
- Relatively small, most single cell
- Start of multicellularity
- Increase in cell complexity

Origin of Life

Life began ~ 3.5 bya

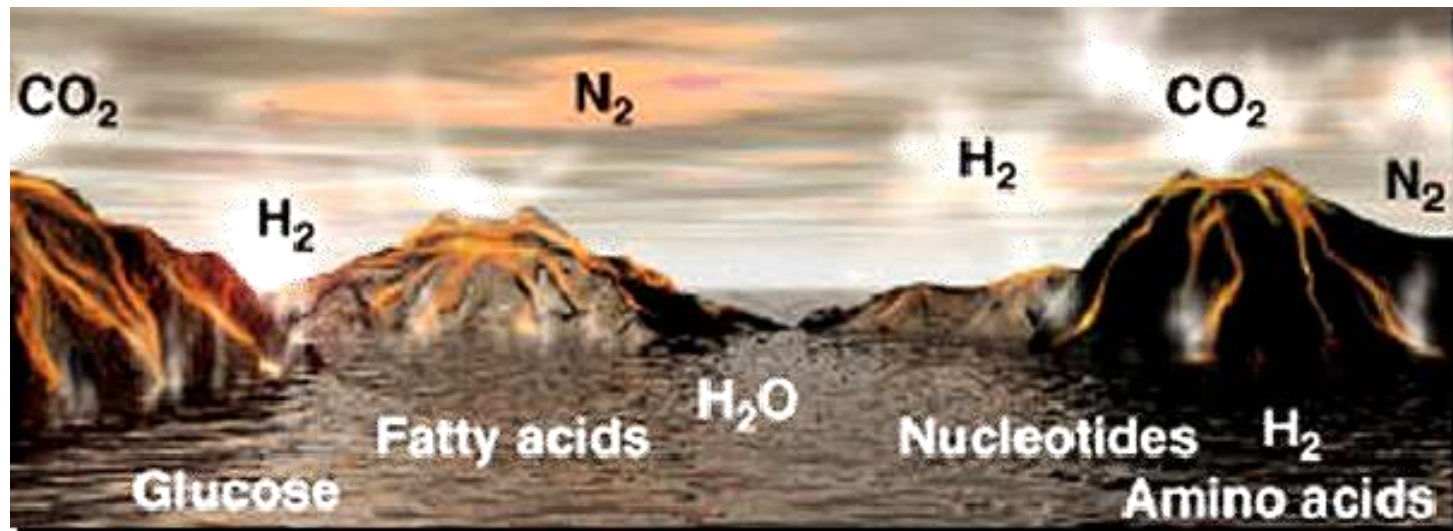
Organic molecules (C H O N P S) swimming in shallow seas

Stage 1: Abiotic synthesis of organic molecules such as proteins, amino acids and nucleotides



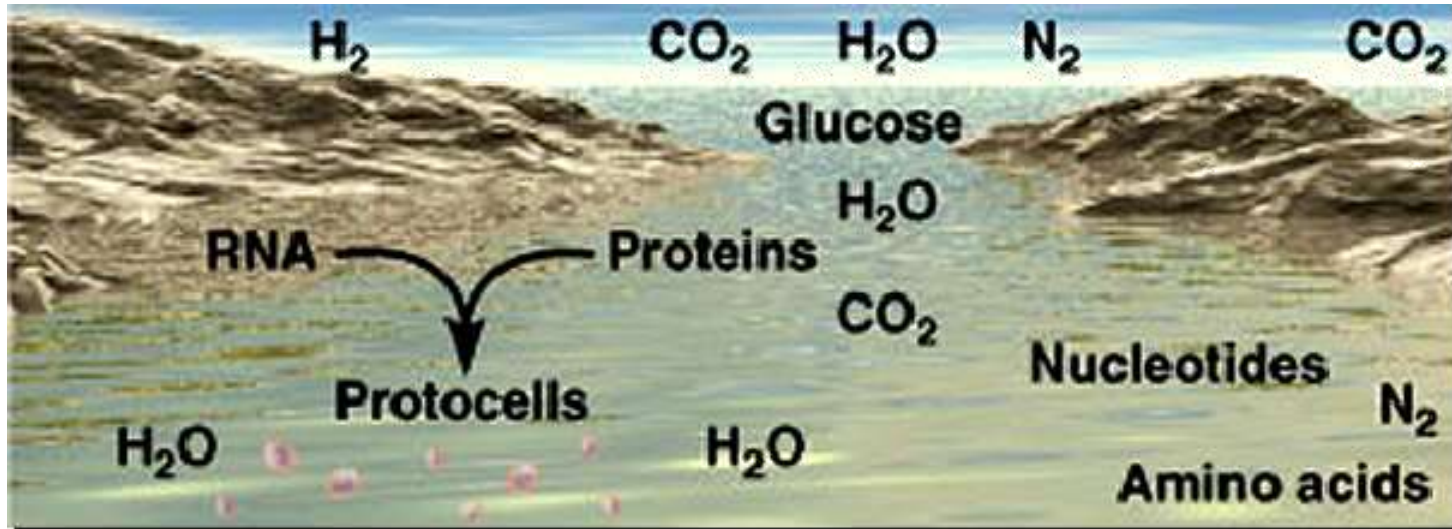
Origin of Life

Stage 2: joining of small molecules (monomers) into large molecules



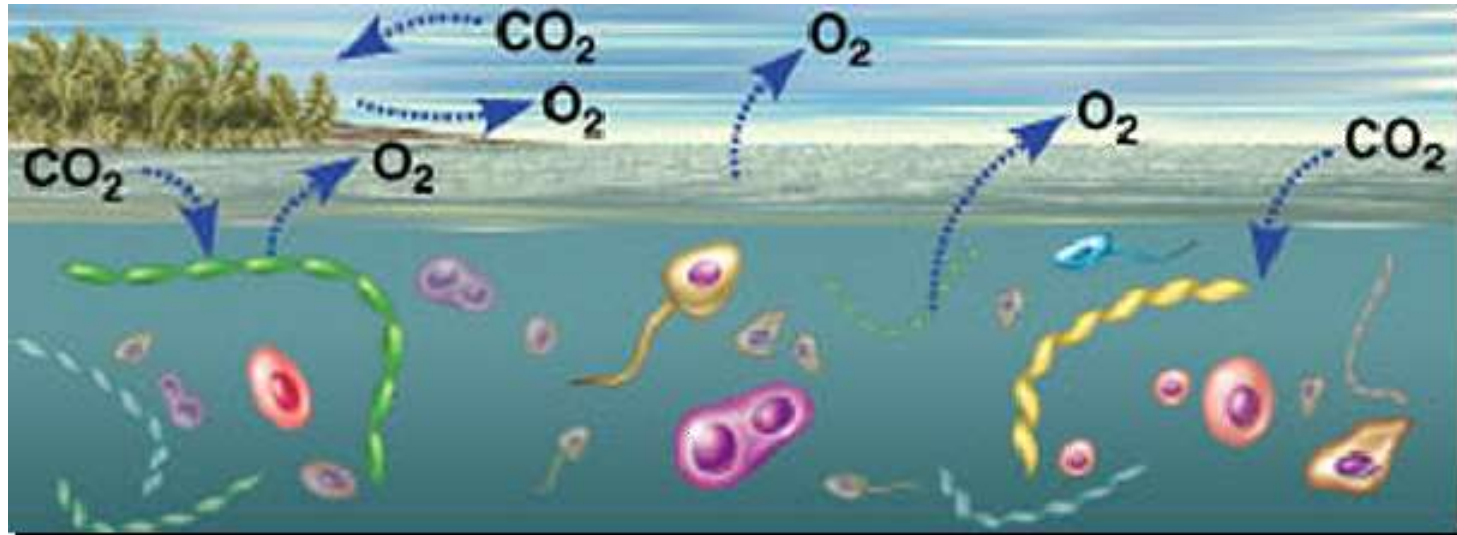
Origin of Life

Stage 3: origin of self-replicating molecules that eventually made inheritance possible



Origin of Life

Stage 4: packaging these molecules into pre-cells, droplets of molecules with membranes that maintained an internal chemistry



Origin of Life

Thomas Huxley- Search for origin of life

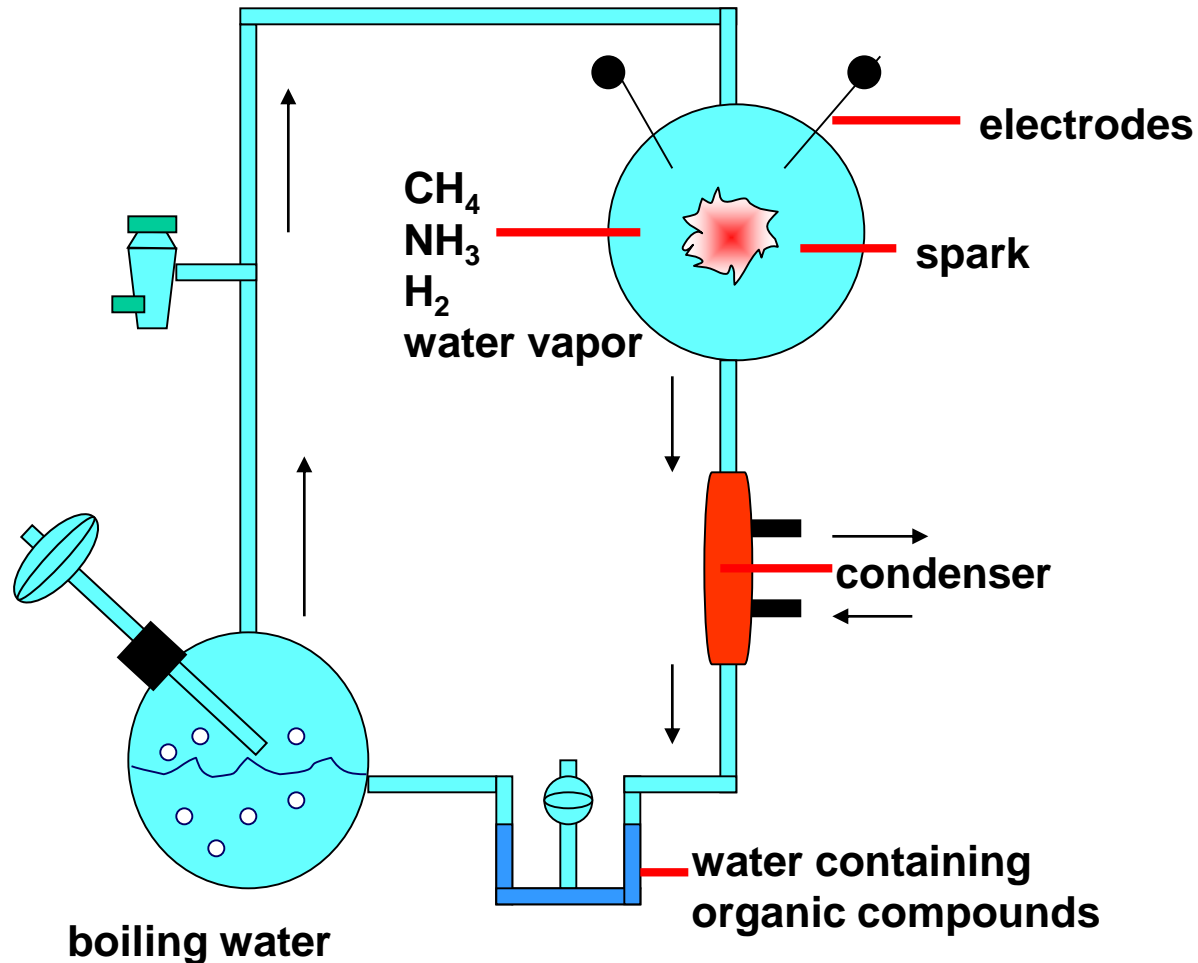
Bathybias heckali- primordial ooze

Wyville Thompson: HMS Challenger (1872-1876) found it was actually diatomaceous ooze reacting with seawater and ethyl alcohol



Origin of Life

Miller & Urey (1953)- mixed water vapor, NH_3 , CH_4 , H_2 + electric spark \rightarrow amino acids and other organic compounds



Origin of Life

Produced:

- 20 amino acids
- Several sugars
- Lipids
- Purine and pyrimidine bases (found in DNA, RNA & ATP)

Kingdom Monera

- Species number low (~17, 000), but most numerous on Earth
- 3.5 byo
- Two Divisions
 - Eubacteria
(Bacteria & Cyanobacteria)
 - Archaeobacteria

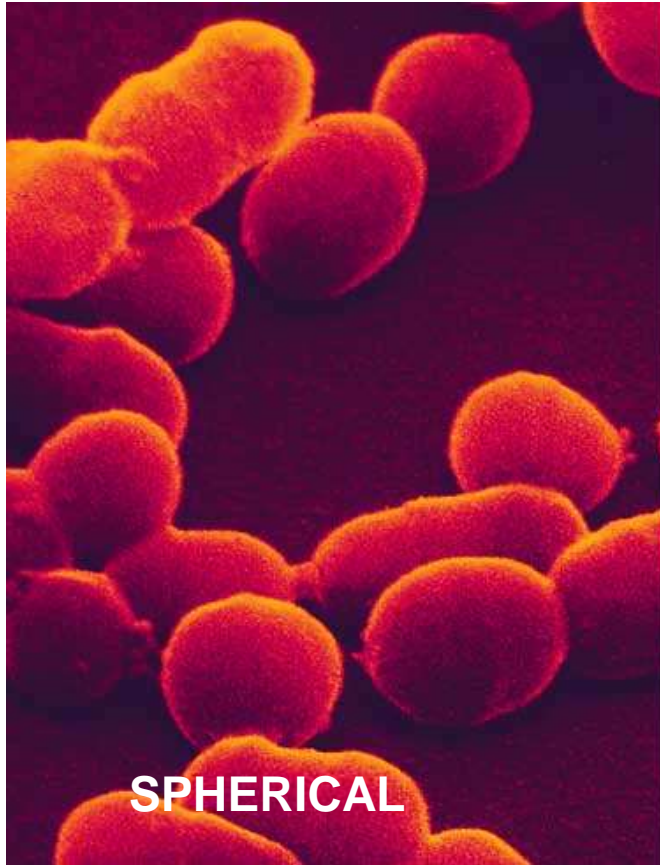
Kingdom Monera

- Prokaryotic
- Single-celled
- Diverse energy types:
 - Chemoautotrophic- Purple sulfur bacteria
 - Photoautotrophic- cyanobacteria
 - Heterotrophic- *E. coli*
 - *saprobies*
 - *parasites*

Kingdom Monera

- Some with cell walls, but cell walls composed of peptidoglycan, not cellulose (as in higher plants).
- Asexual and sexual reproduction

BASIC SHAPES OF EUBACTERIA



Most Species of Eubacteria may be Grouped Based on Staining

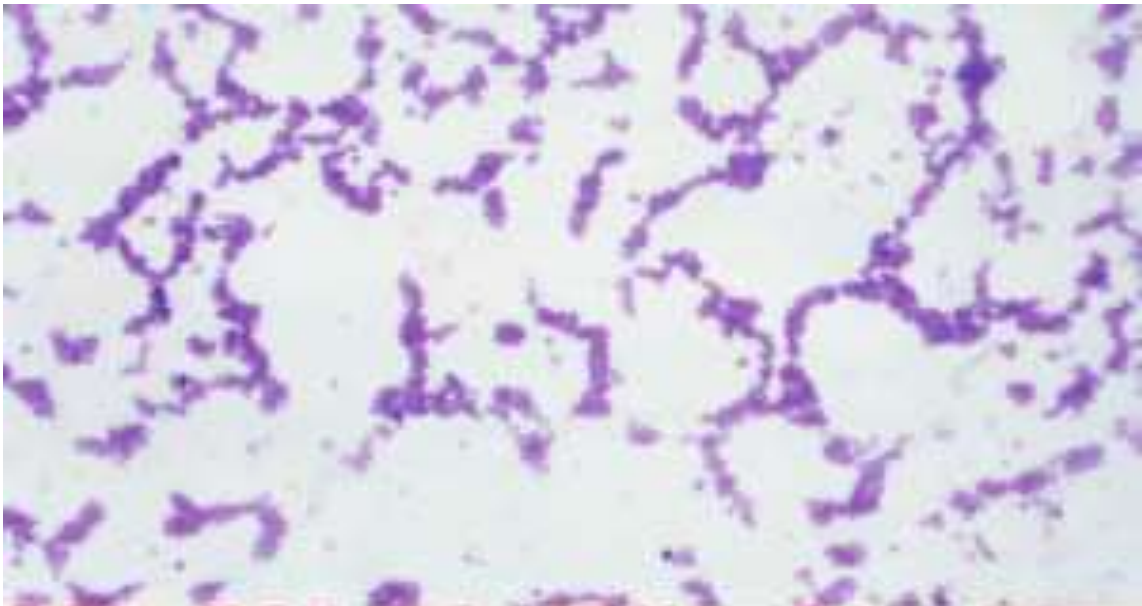
- Gram-Negative

- thin layer of peptidoglycan
- Stain pink
- Endotoxins

- Gram-Positive

- Thicker layer of peptidoglycan
- Stain purple
- Exotoxins
(released when bacteria die)

Gram +



Gram -



Kingdom Monera

Prokaryotic Cell Structure

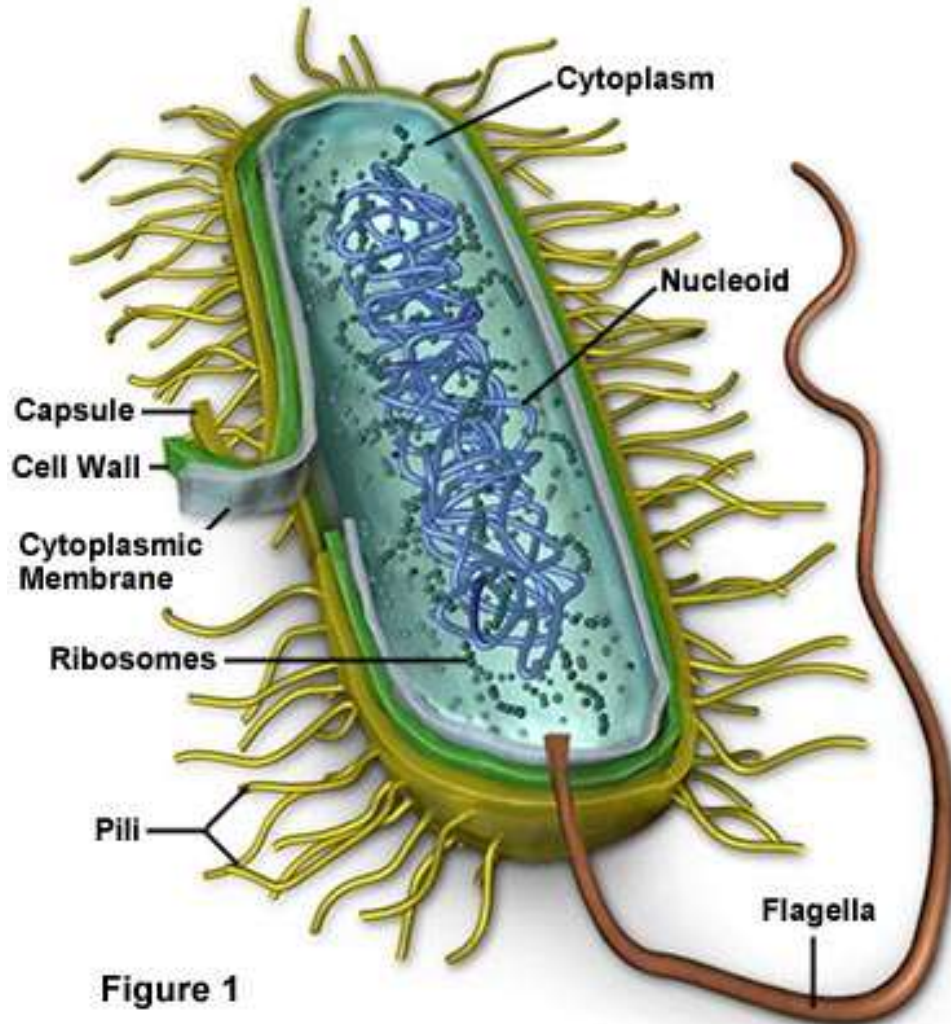
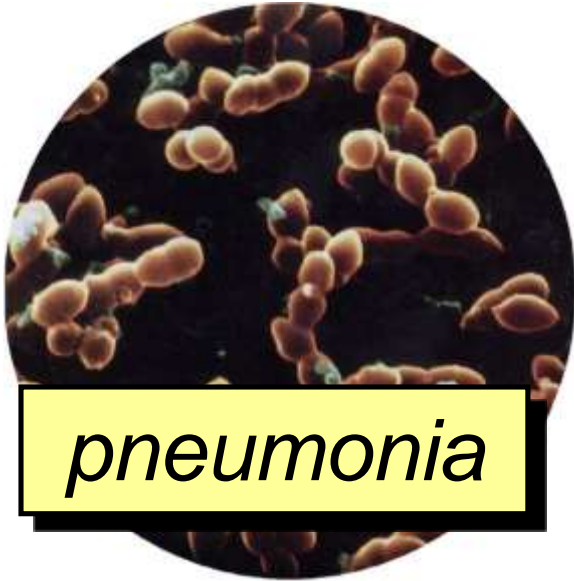
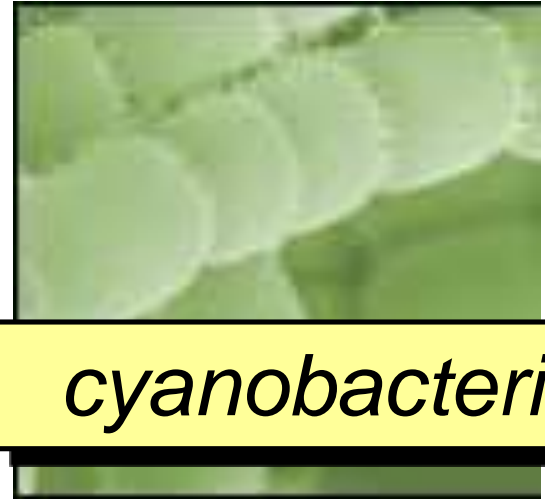


Figure 1

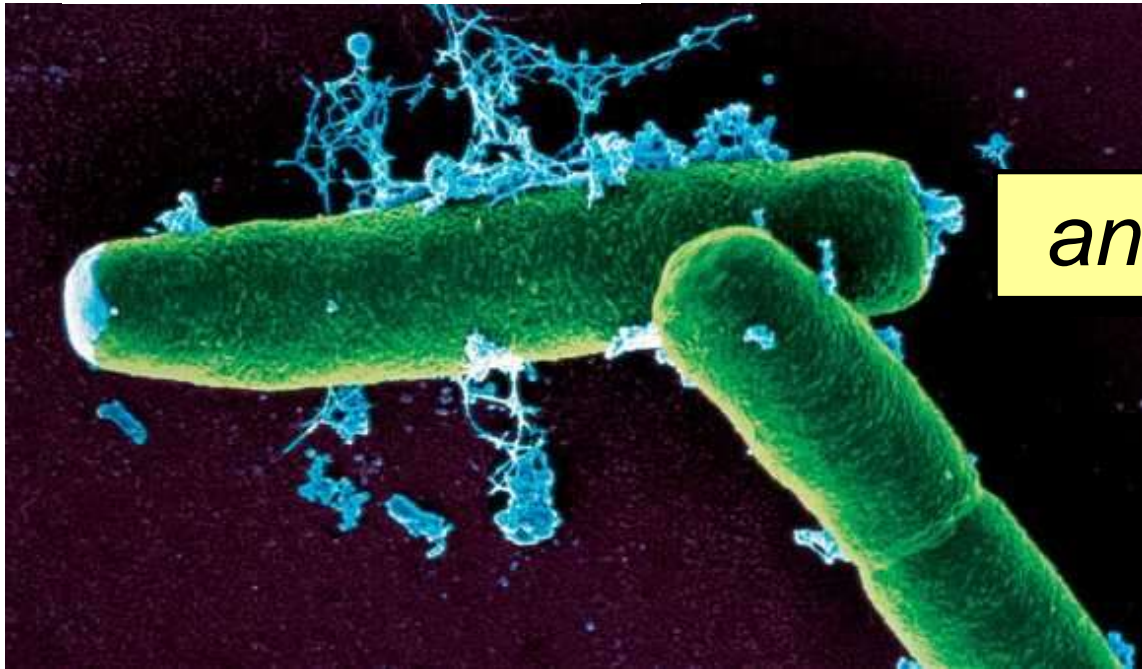
Eubacteria



pneumonia



cyanobacteria



anthrax

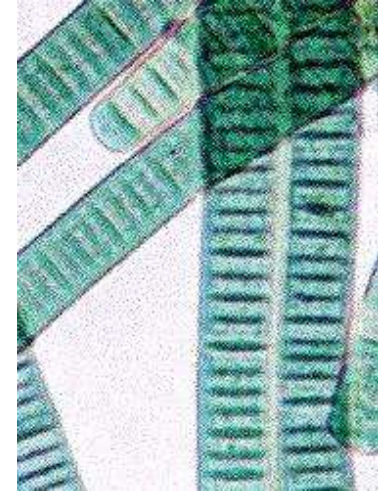
Cyanobacteria

- “Blue-green algae”
- Only 200 species?
- In different conditions they grow differently
- Lots of colors
- Photosynthetic



7,500 ? species

Cyanobacteria



● 3.5 byo

● O₂ levels increase by 1.5 bya

Cyanobacteria were the first organisms on Earth to do modern photosynthesis and they made the first oxygen in the Earth's atmosphere.

Stromatolites

- mainly cyanobacteria
- 2.8 bya in fossil record
- Dominant, no herbivores





Mats of cyanobacteria

Red Sea



Red-pigmented cyanobacteria floating on the surface

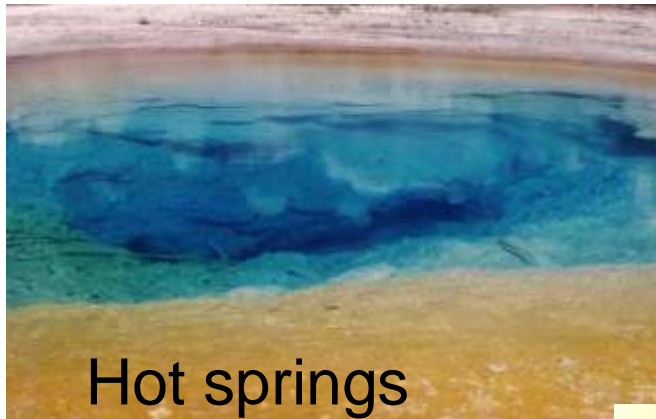
Archaeobacteria

Archaeobacteria are CHEMICALLY DISTINCT from other BACTERIA in several ways:

1. The Cell Walls, Cell Membranes, and Ribosomal RNA are different from those of other BACTERIA. No PEPTIDOGLYCAN.
2. Extremophiles
3. The PREFIX "ARCHEA" means ANCIENT.
4. Archaeobacteria live in conditions similar to when life first appeared and began to evolve.

Archaeobacteria Types

Methanogens

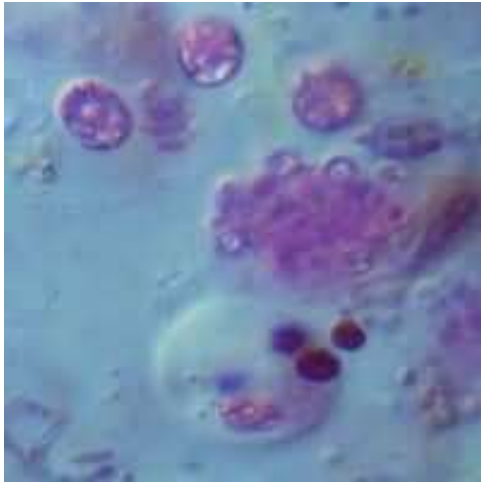


Thermoacidophiles

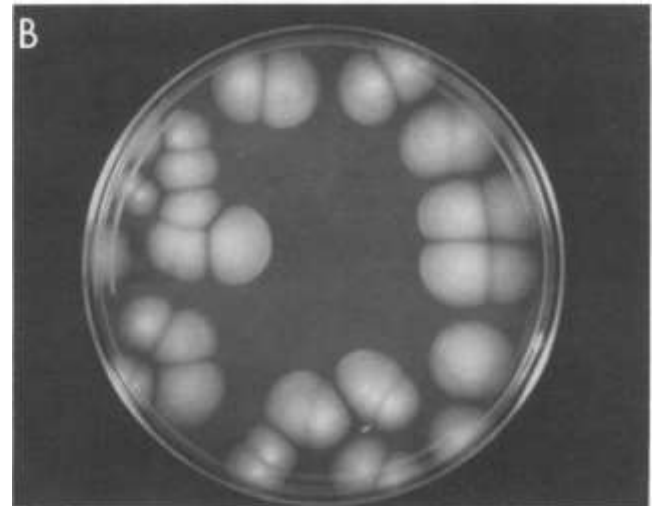
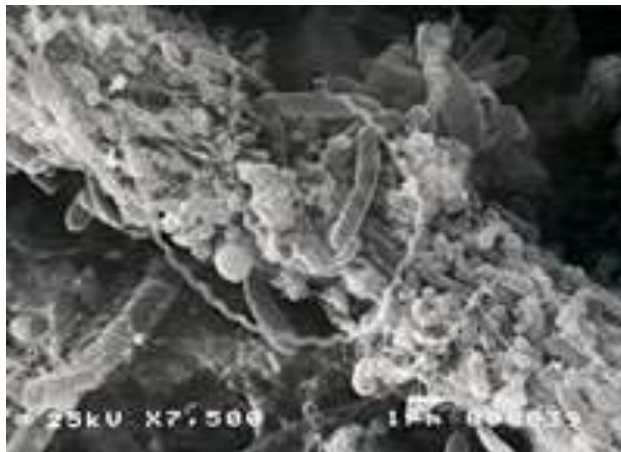
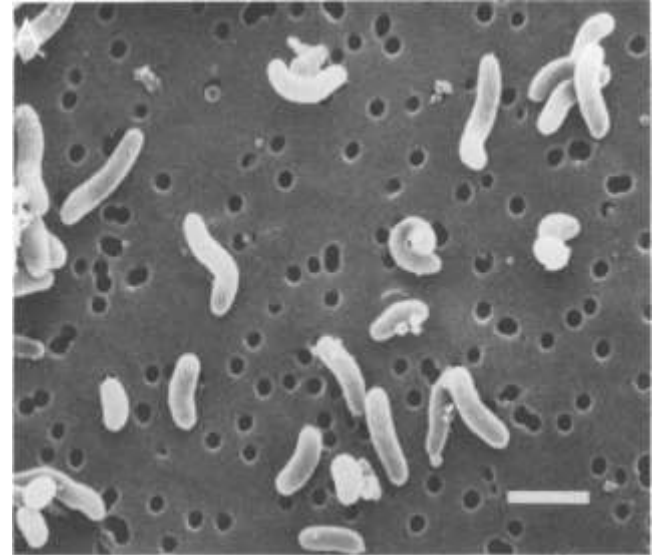


Extreme Halophiles

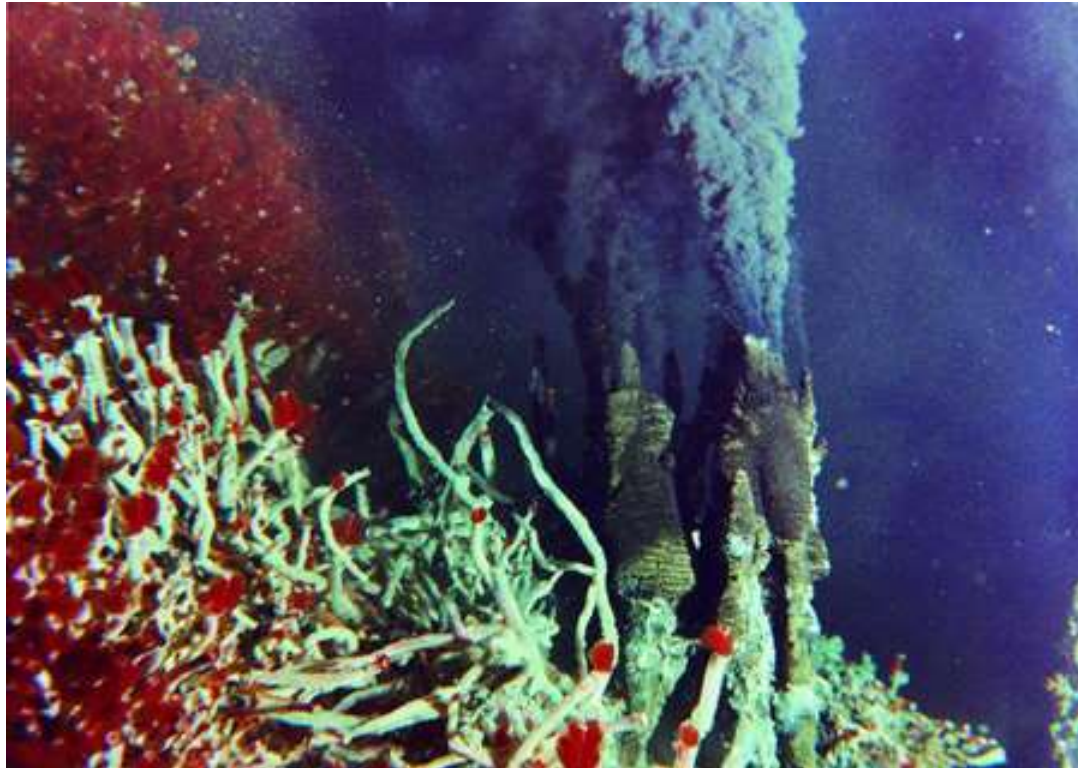
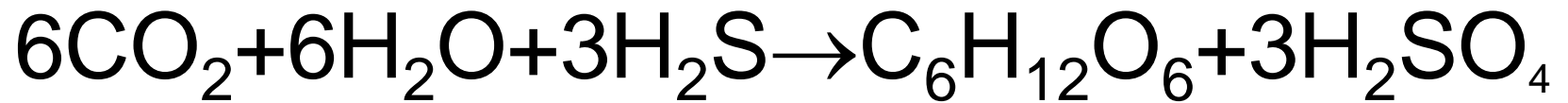
Archaeobacteria



Purple sulfur
bacteria



Chemosynthesis



Bad Bacteria!



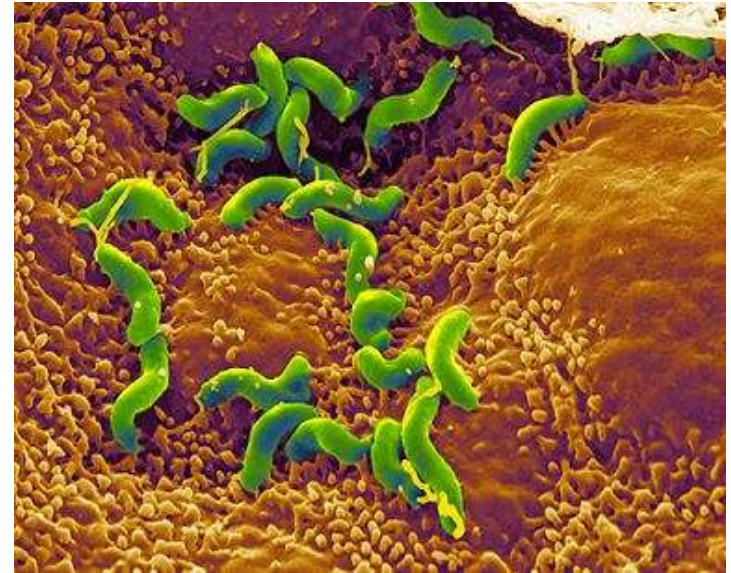
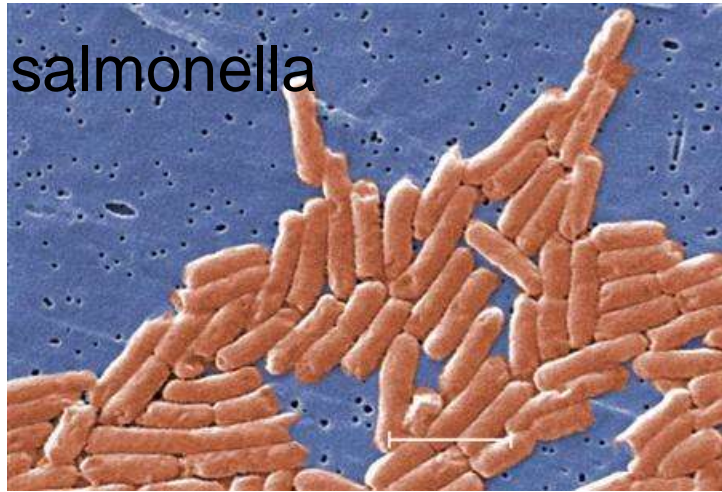
Bacteria Caused Diseases

- Bacteria can cause the following diseases:

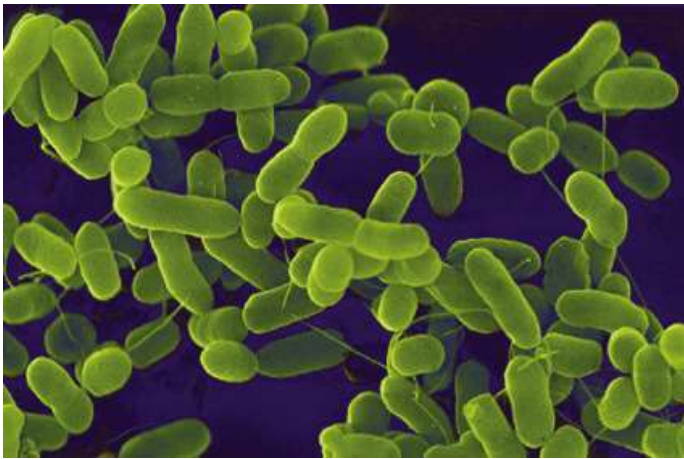
- Tuberculosis
- Pneumonia
- Strep throat
- Staph infections
- Scarlet fever
- Syphilis
- Gonorrhea
- Chlamydia
- Boils
- Tetanus
- Lyme disease
- Ear infections

Many sexually transmitted diseases (STD's) are caused by bacteria.

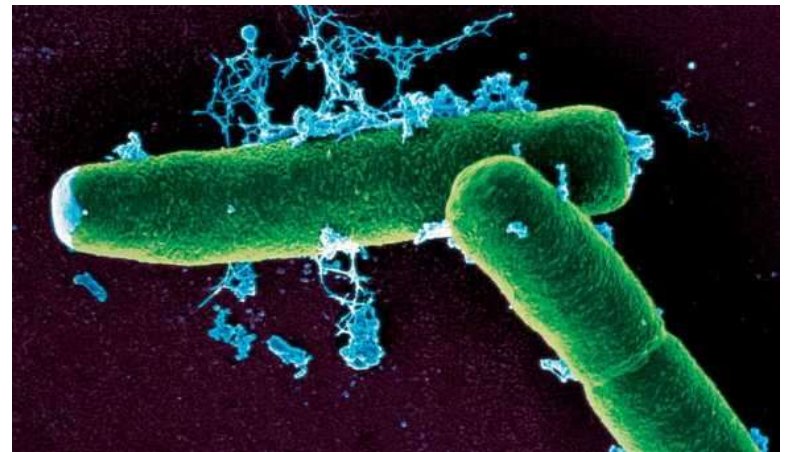
- Gonorrhea
- Syphilis
- Chlamydia



Helibacter pilori



E. coli



anthrax

Black Band disease



Botulism

- One group of bacteria called **clostridia**, can form endospores. Clostridium botulinum, produces a toxin. If canned food is not properly sterilized these endospores can become active inside a can and the disease “**botulism**” can occur.



Antibiotics

- Antibiotics are drugs that combat bacteria by interfering with cellular functions
 - Penicillin – interferes with cell wall production
 - Tetracycline – interferes with protein production
 - Sulfa drugs – produced in the laboratory
 - Broad-spectrum antibiotics will affect a wide variety of organisms



Penicillin, an antibiotic, comes from molds of the genus *Penicillium*. Notice the area of inhibition around the *Penicillium*.

Bacteria aren't all Bad!



Root Nodules

Atmospheric N₂



N “fixer”



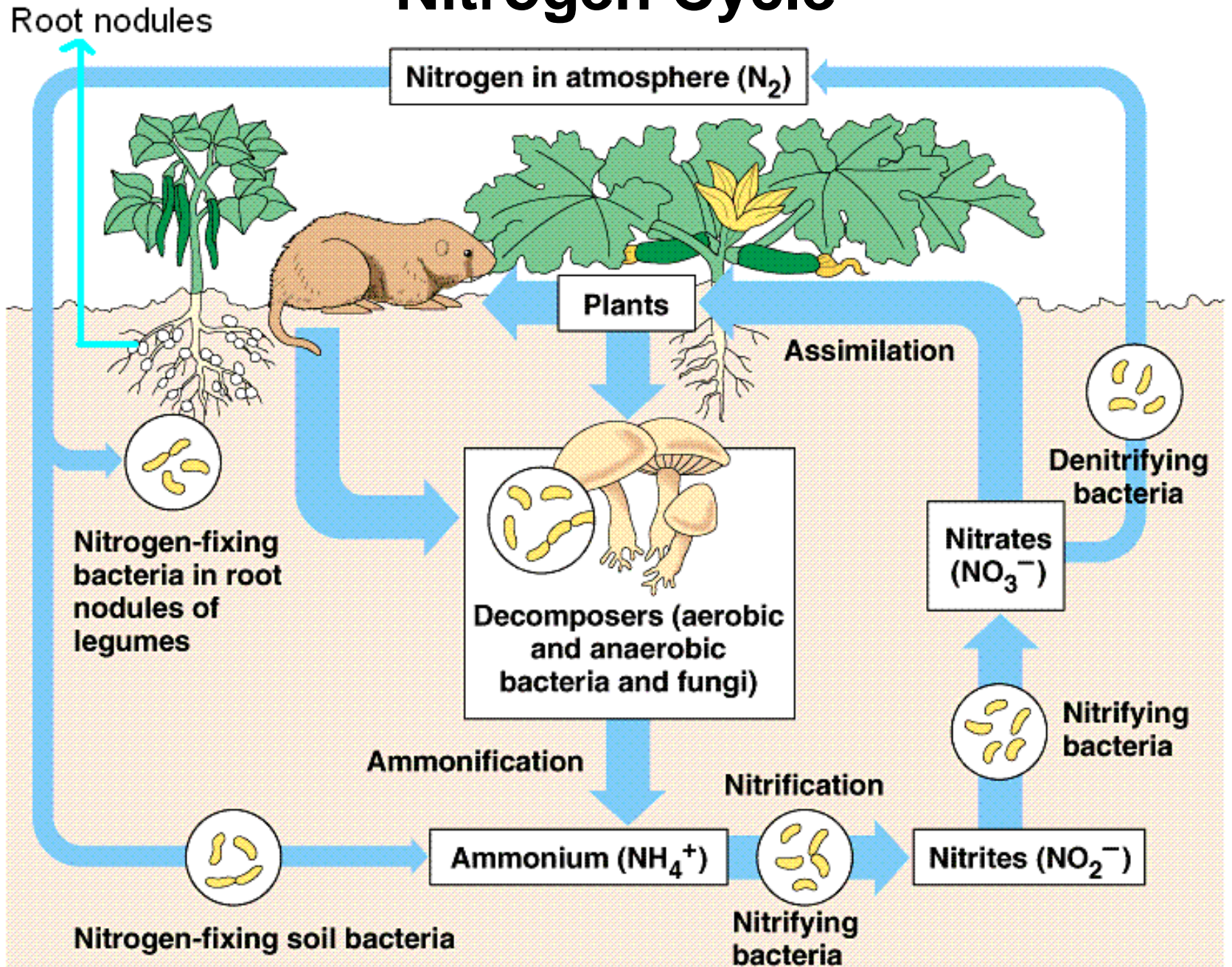
Plant roots

50% to 70% of the
biological nitrogen fixation

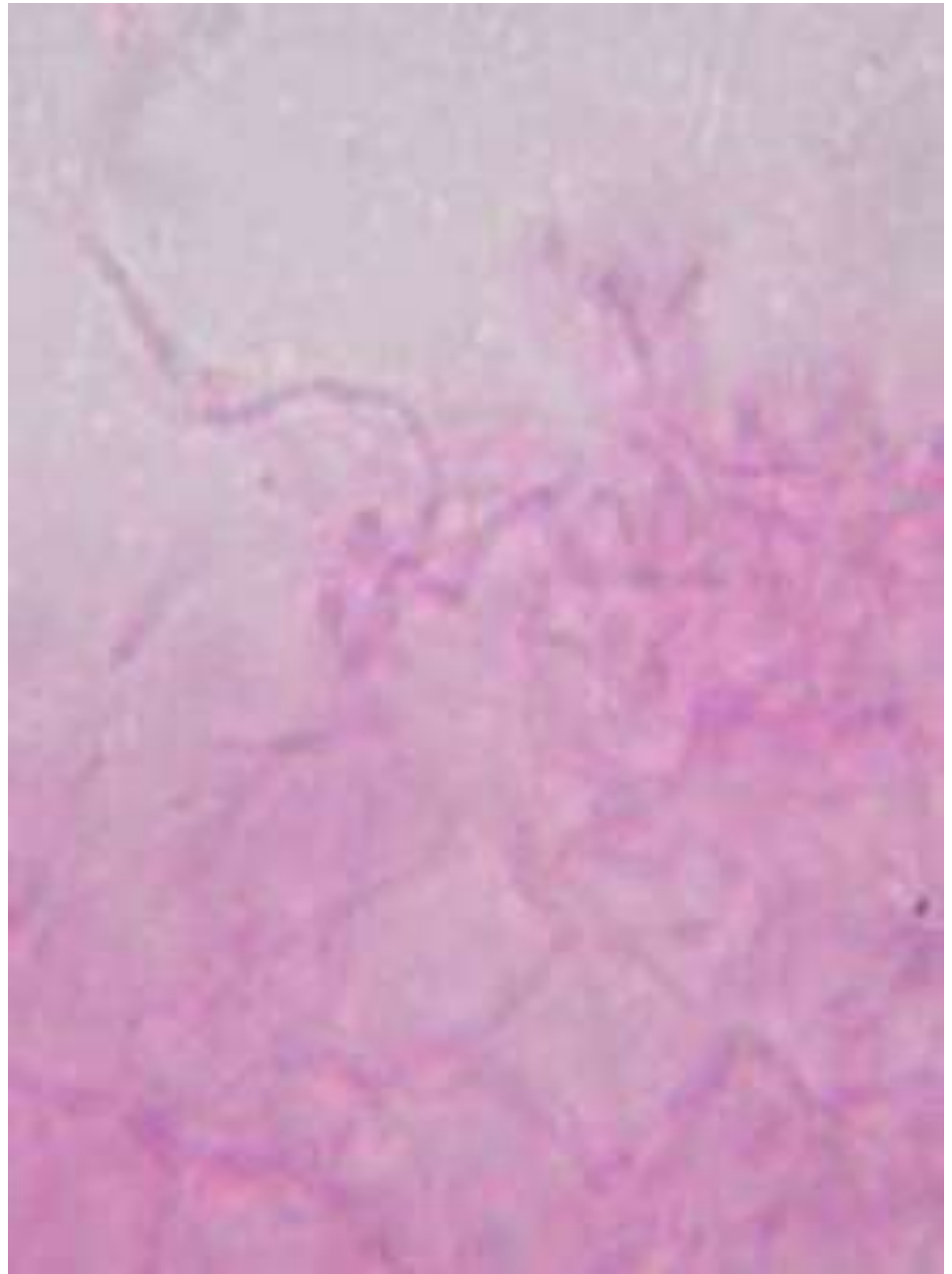
**NifTAL: Nitrogen Fixation of
Tropical Agricultural Legumes**

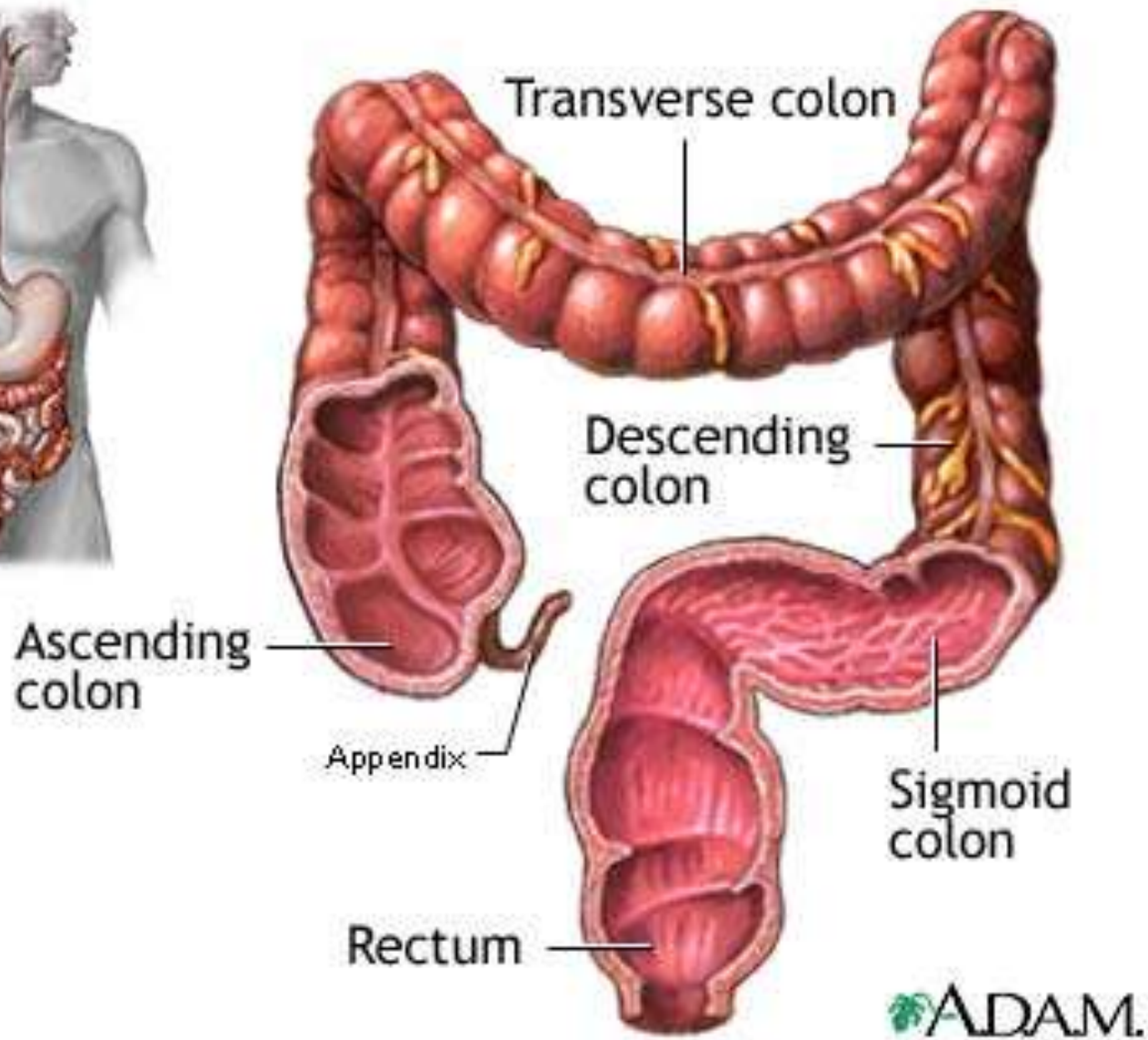
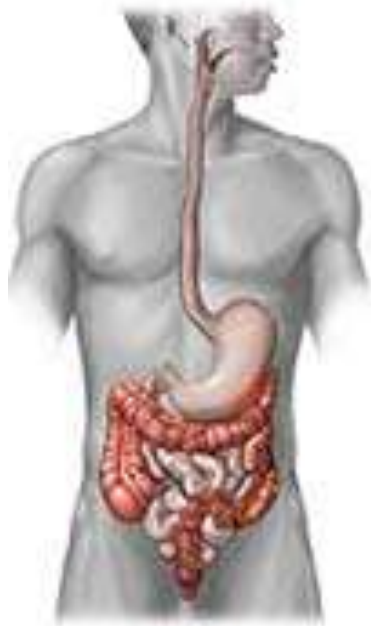


Nitrogen Cycle



- Actinomycetes, produce antibiotics such as streptomycin and nocardicin.





Bacteria make Vitamin K

- Bacteria put the tang in yogurt and the sour in sourdough bread.
- Saprobies help to break down dead organic matter.
- Bacteria make up the base of the food web in many environments.



Streptococcus thermophilus in yogurt

Sewage treatment



Oil Spills



Before adding the bacteria
微生物添加前

7 days later
7日後

Bioluminescence



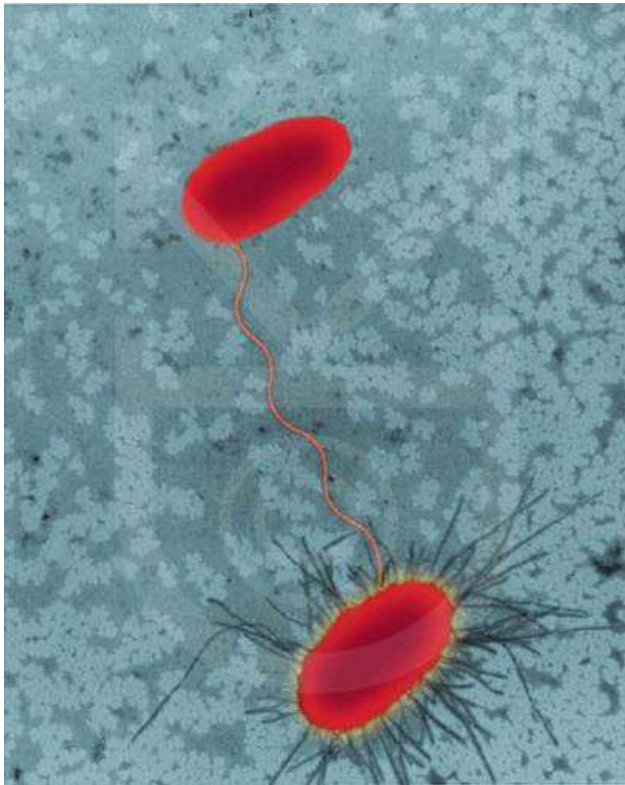
Bacteria Reproduction

- Under optimum conditions bacteria can reproduce every 20 minutes.
- Bacteria reproduction is controlled by various factors including : temperature and food availability.



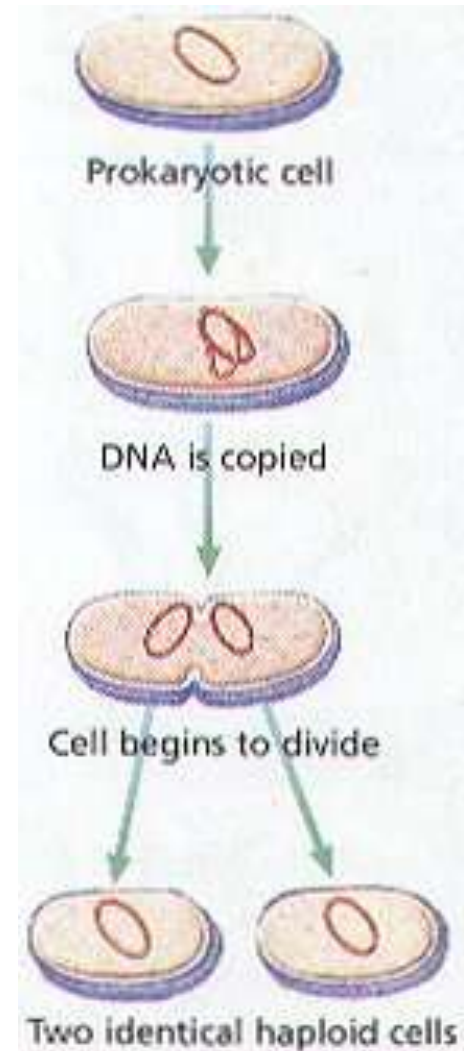
Bacteria Reproduction

Asexual: binary fission Sexual: conjugation



Binary Fission


- It involves the copying of the DNA and the splitting into two new cells.



Conjugation

- Sexual reproduction
- One bacteria is able to transfer its DNA into another bacteria by means of a pilus (pili)



A close-up photograph of a hand holding a green rose stem. The stem has several green leaves and a dark red rose bud at the top. The background is a light-colored, slightly wrinkled fabric. The text is overlaid on the right side of the image.

*It's not that easy
bein' green.....
but it is essential
for life on earth!*

Thanks.....End!