

## ORIGIN OF LIFE



## TWO BASIC THEORIES

### Spontaneous Generation (abiogenesis)

- Life can come from something non-living

### Biogenesis

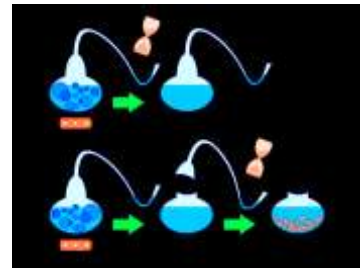
- Bio = life
- Genesis = beginning
- Life can only come from other life

## REDI'S EXPERIMENT

- Where did maggots come from?
- Which idea does this experiment support?



## PASTEUR'S EXPERIMENT



So . . .

Not spontaneous generation

But . . .

many questions left unanswered...

Let's look at what we do know...

## ORIGIN OF LIFE

- Early atmosphere had no oxygen.
  - First organisms were:
    - PROKARYOTIC
    - ANAEROBIC
    - NON-PHOTOSYNTHETIC
- Lots of competition for "sugars" (scarce resources)
  - Lots of CO<sub>2</sub> being produced

## ORIGIN OF LIFE

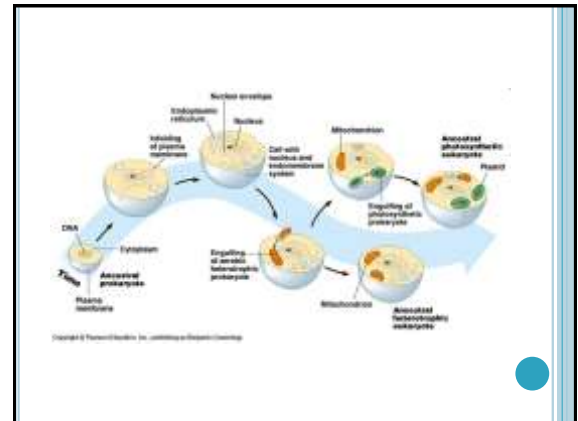
3. Random mutations → photosynthesis
4. Photosynthetic organisms became favored....LOTS OF CO<sub>2</sub>, UV light, could make own food

## ORIGIN OF LIFE

5. Change in atmosphere (oxygen) favors aerobic respiration
6. Random mutations → aerobic respiration

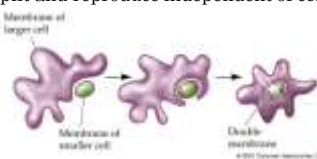
## ENDOSYMBIOTIC THEORY

- The idea that prokaryotic cells ate other prokaryotic cells
- Beneficial to host to keep cells alive...
  - Mitochondria - aerobic prokaryote; could help use oxygen
  - Chloroplast - cyanobacteria; could make food supply via photosynthesis



## EVIDENCE

- Chloroplasts/mitochondria have...
  - Double membranes
    - Original prokaryotic membrane + host membrane
  - Own DNA; more similar to bacterial DNA than to eukaryotic DNA.
  - Own ribosomes
  - Split and reproduce independent of cell



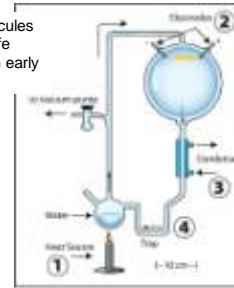
WHAT BIG QUESTION IS LEFT UNANSWERED?

## MILLER AND UREY

- Wanted to test early atmosphere to see if organic molecules could form SPONTANEOUSLY
  - very different from earth today
  - No OXYGEN
  - very hot
  - lots of lightening and UV radiation (no atmosphere)

## MILLER AND UREY'S FAMOUS SET-UP

Could the molecules necessary for life have formed on early Earth?



Yes –

- Amino acids
- Lipids
- Nucleic acids
- Sugars