

# ORIGIN OF LIFE

# Origin of Life

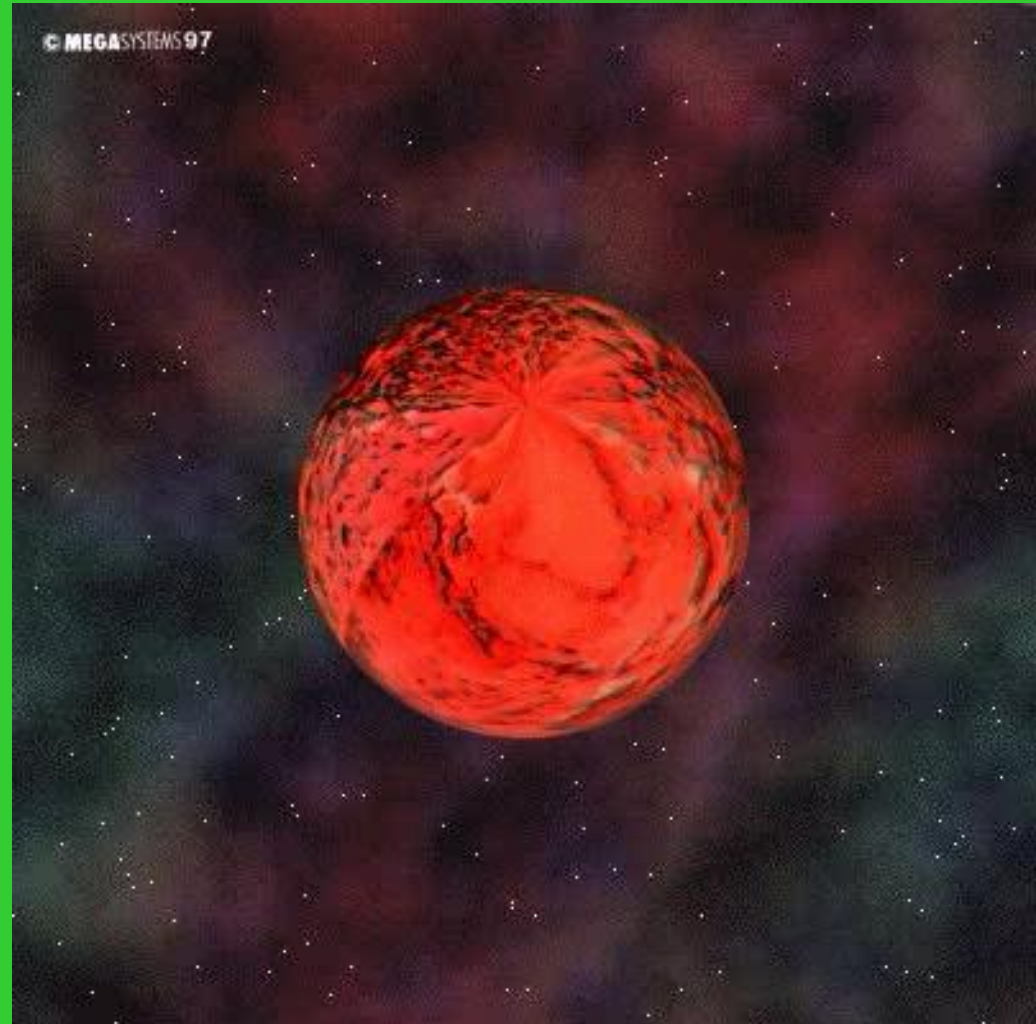
- Earth-4.6 billion years old



- Life-3.5 billion years old

# Ancient Earth

- Atmosphere contents:
  - Ammonia, H<sub>2</sub>O vapor, Methane, CO<sub>2</sub>
- Climate:
  - Extreme heat due to meteor impacts & volcanic activity
- Eventually Cooling:  
Water vapor condensed  
(oceans formed)



Click on picture to play video clip

# How did life begin?

## A. Extra-Terrestrial Origin-



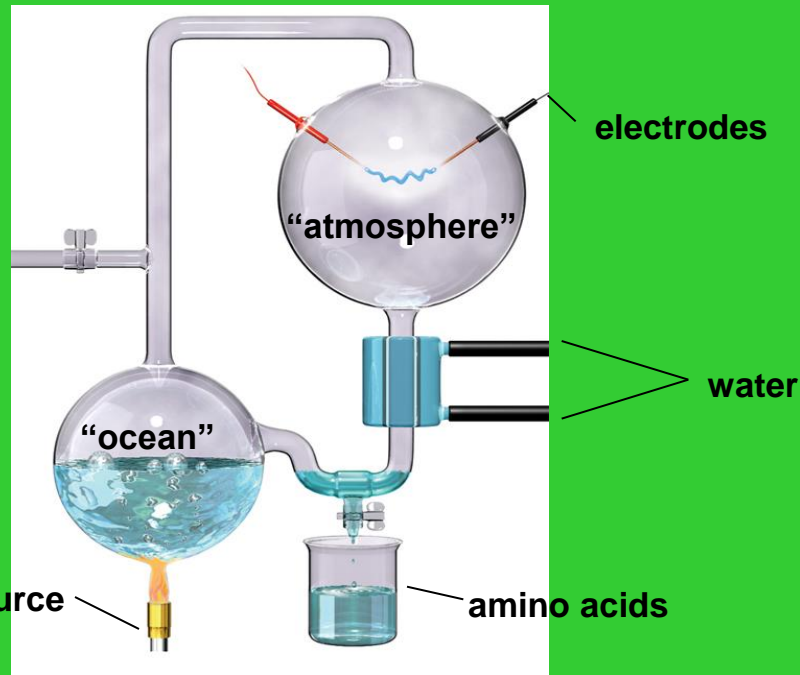
Creation-



# From Non-Living Matter-



# Miller and Urey's Big Experiment



- Hypothesis: Energy from lightning created organic materials from inorganic ingredients
- Experimental Set-Up:
  - Ammonia, H<sub>2</sub>O vapor, Methane, CO<sub>2</sub> gases added
  - Electricity added (simulate lightning)
- Result: Amino Acids & later nucleotides

# Origin of Chemicals

“Primordial Soup”-  
chemicals  
necessary for life  
were present in the  
oceans. Chemical  
reactions caused  
them to join  
together into the 4  
macromolecules  
necessary for life.

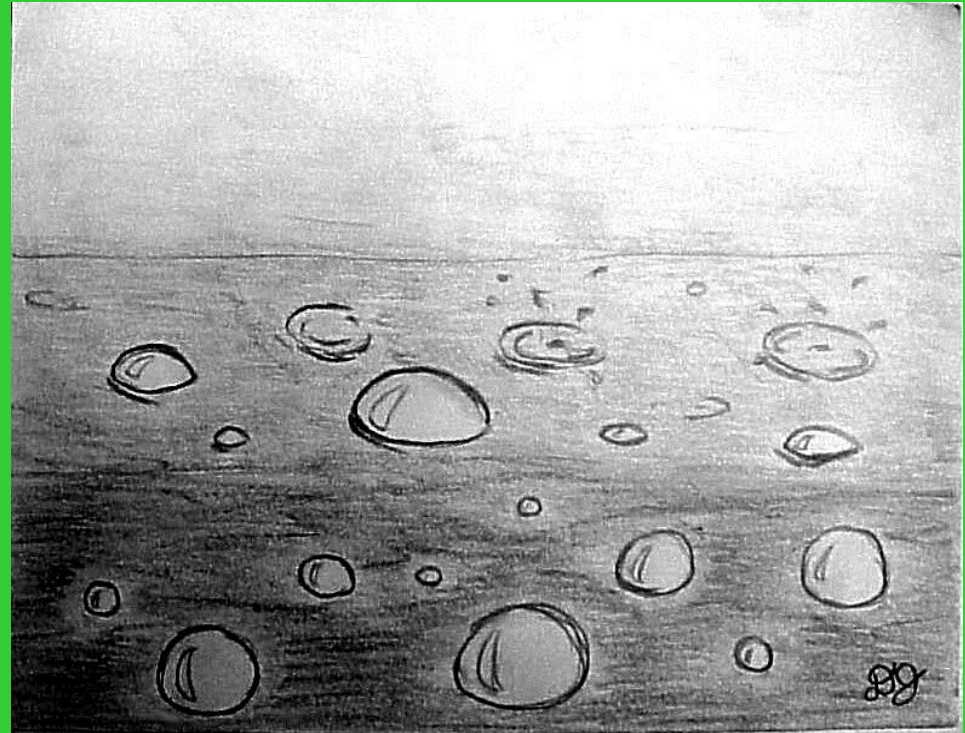




# Origin of Chemicals

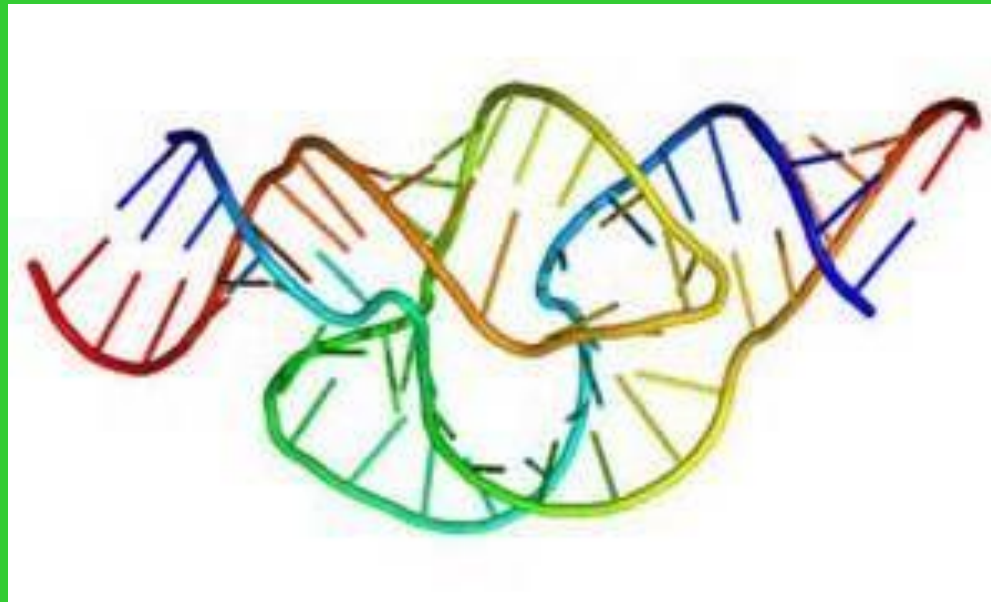
“Bubble Model”-

These chemical reactions actually happened inside the bubbles on the surface of the ocean.



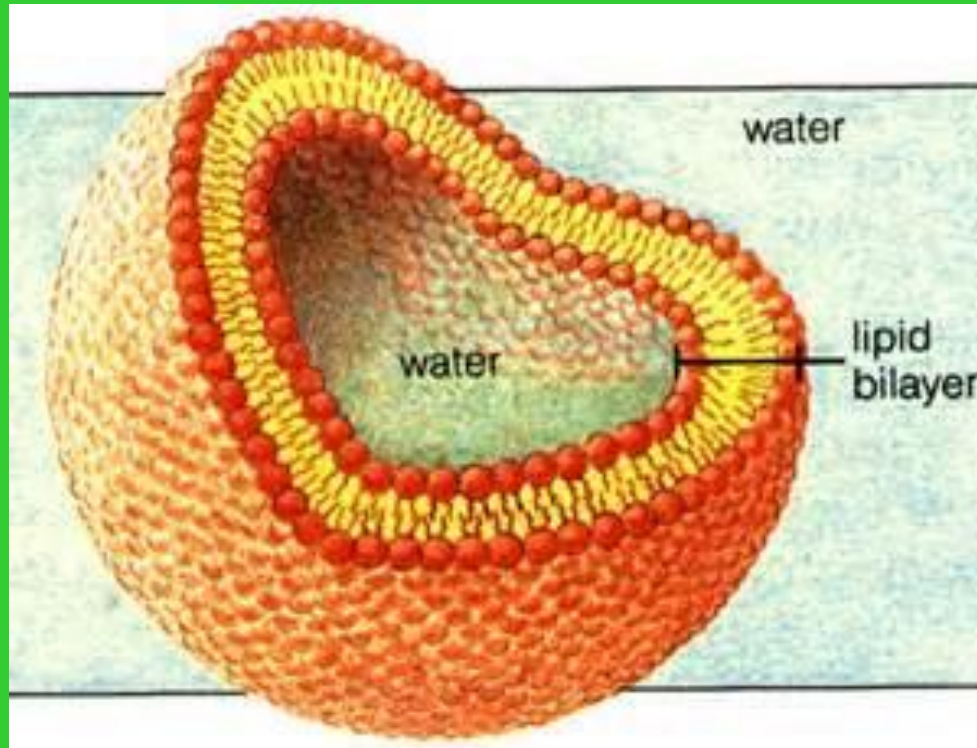
# Origin of Chemicals

RNA-first genetic molecule was a self-replicating RNA molecule.



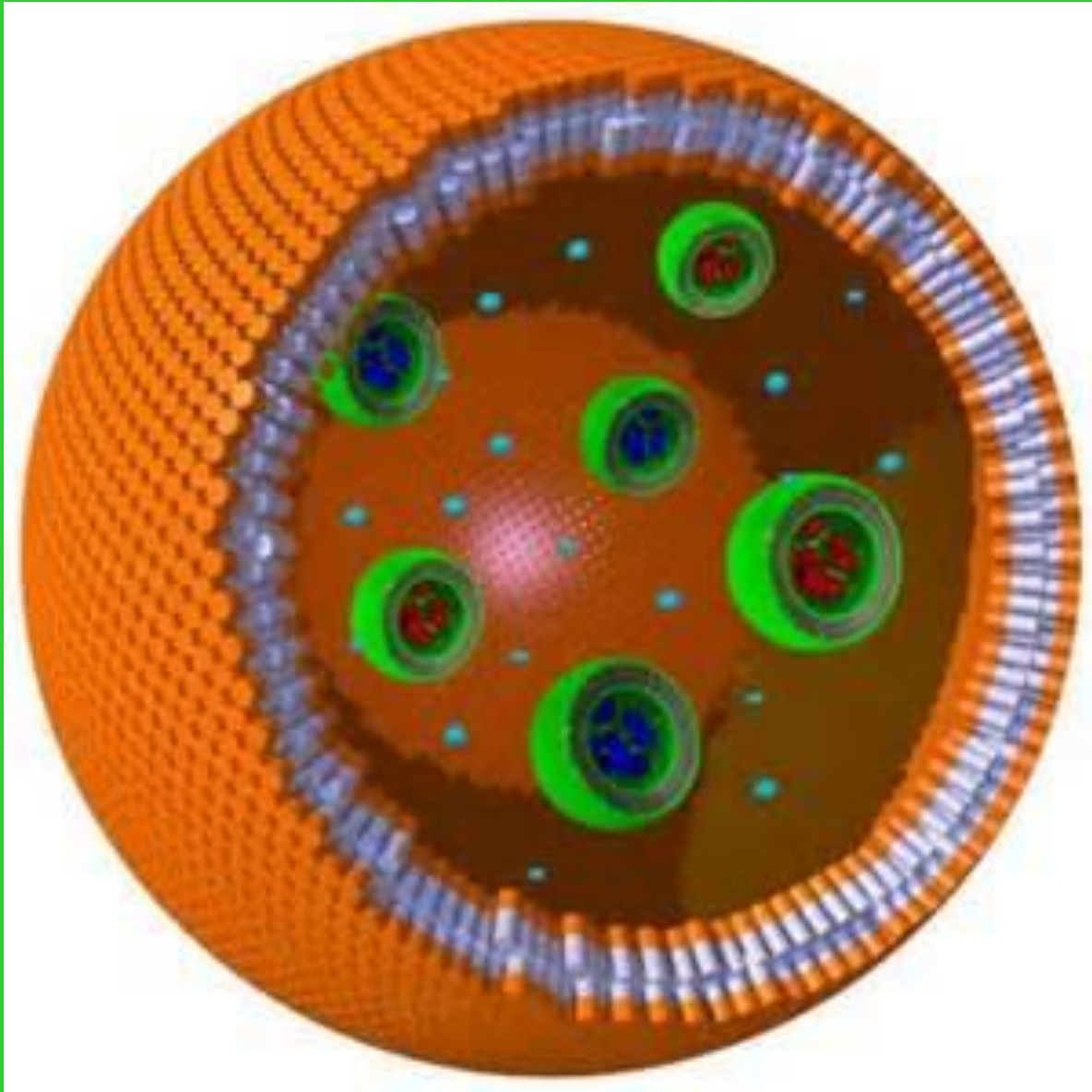
# Origin of First Cells

Cell membrane is made of lipids (oils)



# Origin of First Cells

- A. Cell membrane is made of lipids (oils)
- B. Tiny lipid circles formed naturally in the water.
- C. Spheres that had other molecules trapped inside survived longer.
- D. Spheres that had self-replicating RNA trapped inside could reproduce and life had begun.



# Eukaryotic cells may have evolved through endosymbiosis.

- Endosymbiosis is a relationship in which one organism lives within the body of another.
- Mitochondria and chloroplasts may have developed through endosymbiosis.

# Endosymbiosis in a nutshell:

1. Start with two independent bacteria.



2. One bacterium engulfs the other.



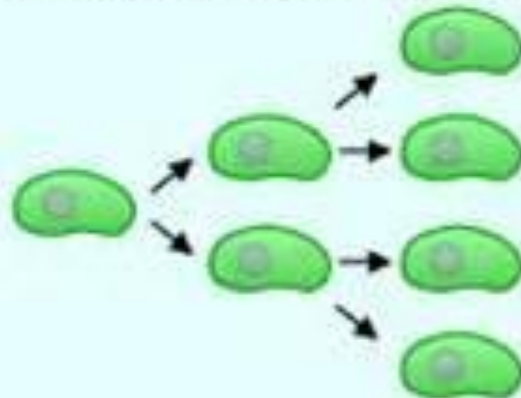
3. One bacterium now lives inside the other.



4. Both bacteria benefit from the arrangement.



5. The internal bacteria are passed on from generation to generation.



# The evolution of sexual reproduction led to increased diversity.

- Genetic variation is an advantage of sexual reproduction.
- Sexual reproduction may have led to the evolution of multicellular life.