

# Theories on the Origin of Life



# Learning Objectives

- Describe Miller and Urey's Experiment
- Describe the transformation of chemicals to living matter

# The Beginning



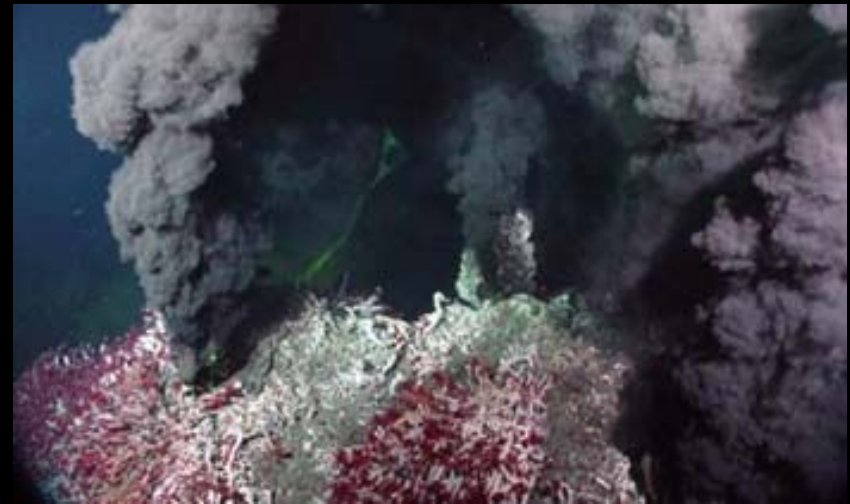
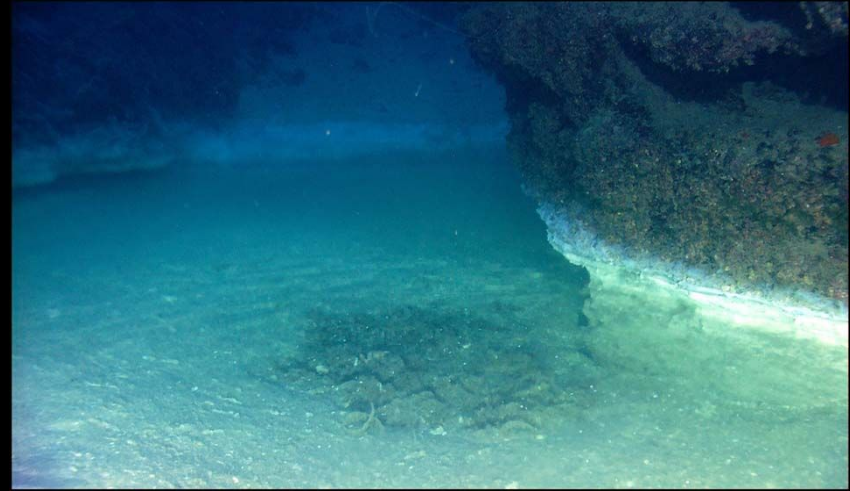
- Earth - **4.6 billion** years old
- Oldest rocks – 3.8 – 4 billion years old
- Oceans established ~ 3.8 billion years ago

# Where did life form?

Rule out lands of the Earth

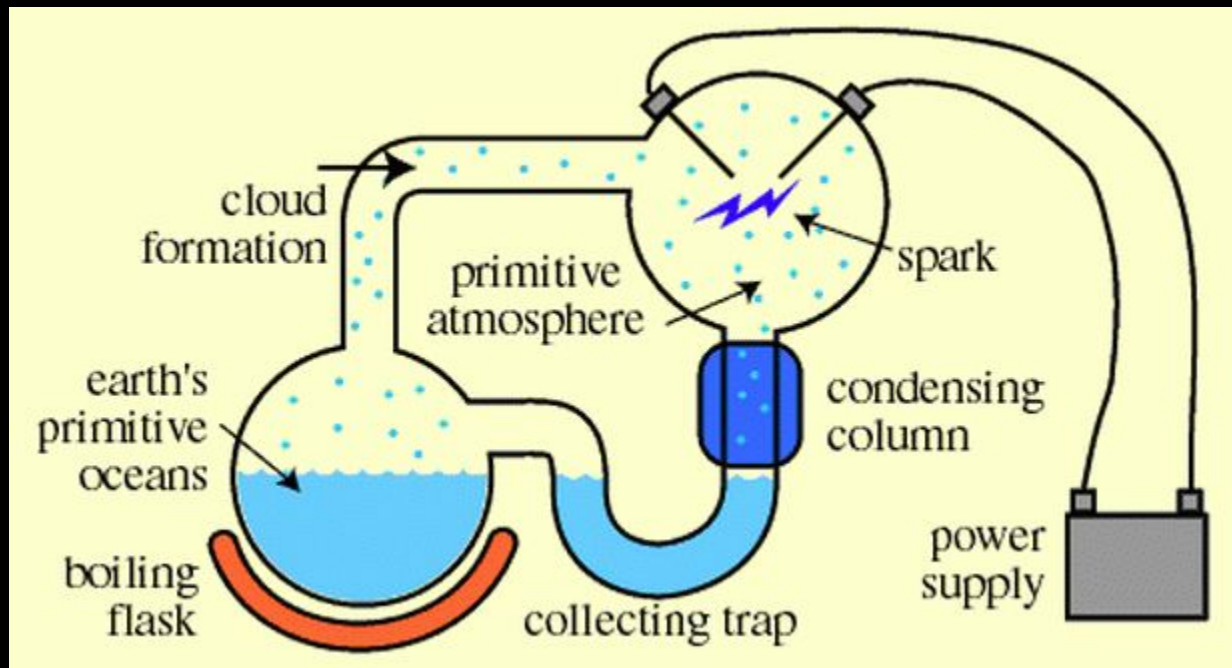
Possibly oceans, lakes, ponds, other bodies of water

Possibly deep ocean thermal vents



# Miller and Urey's Expt.

Combine the ingredients found on early Earth and replicate the conditions.



Condensed mixture collected contained amino acids and complex organic molecules

# Comets



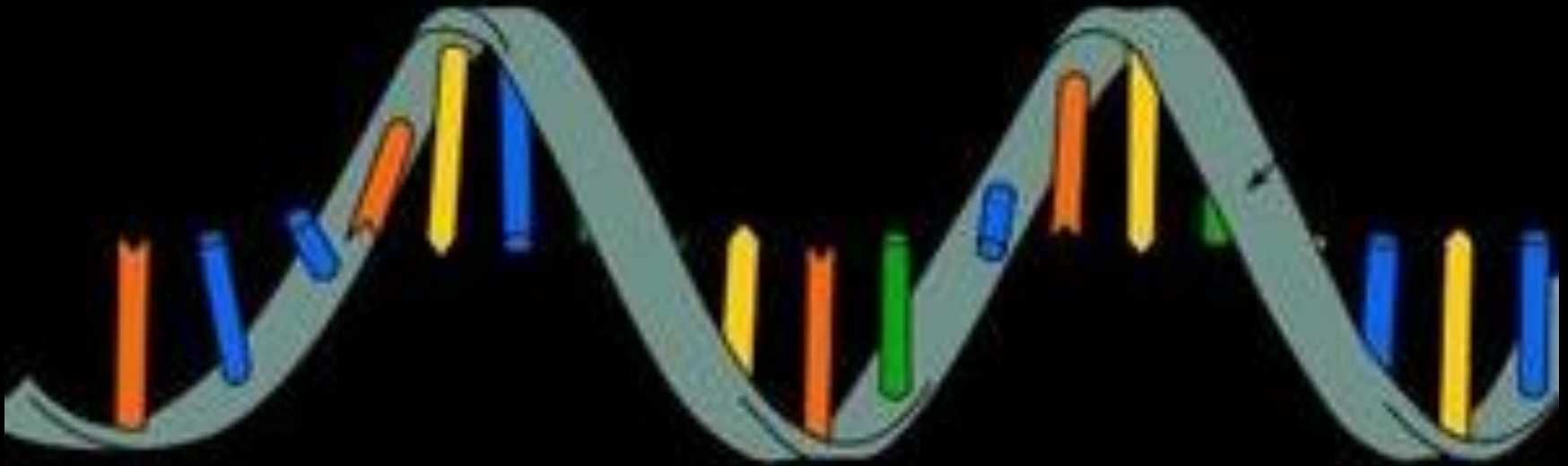
Comets contain amino acids and other organic molecules found in living things

# Clay



Clay may have helped bring small molecules like nucleotides together to form larger polymers like RNA

# RNA

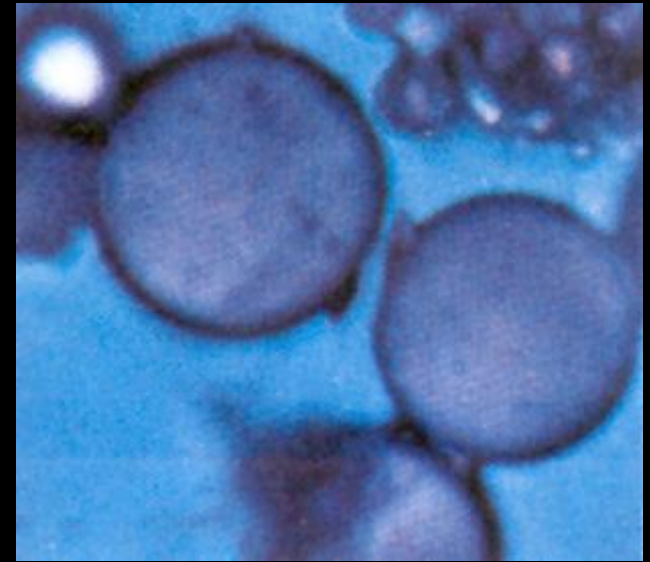


RNA was probably the first hereditary molecule by having the ability to copy itself



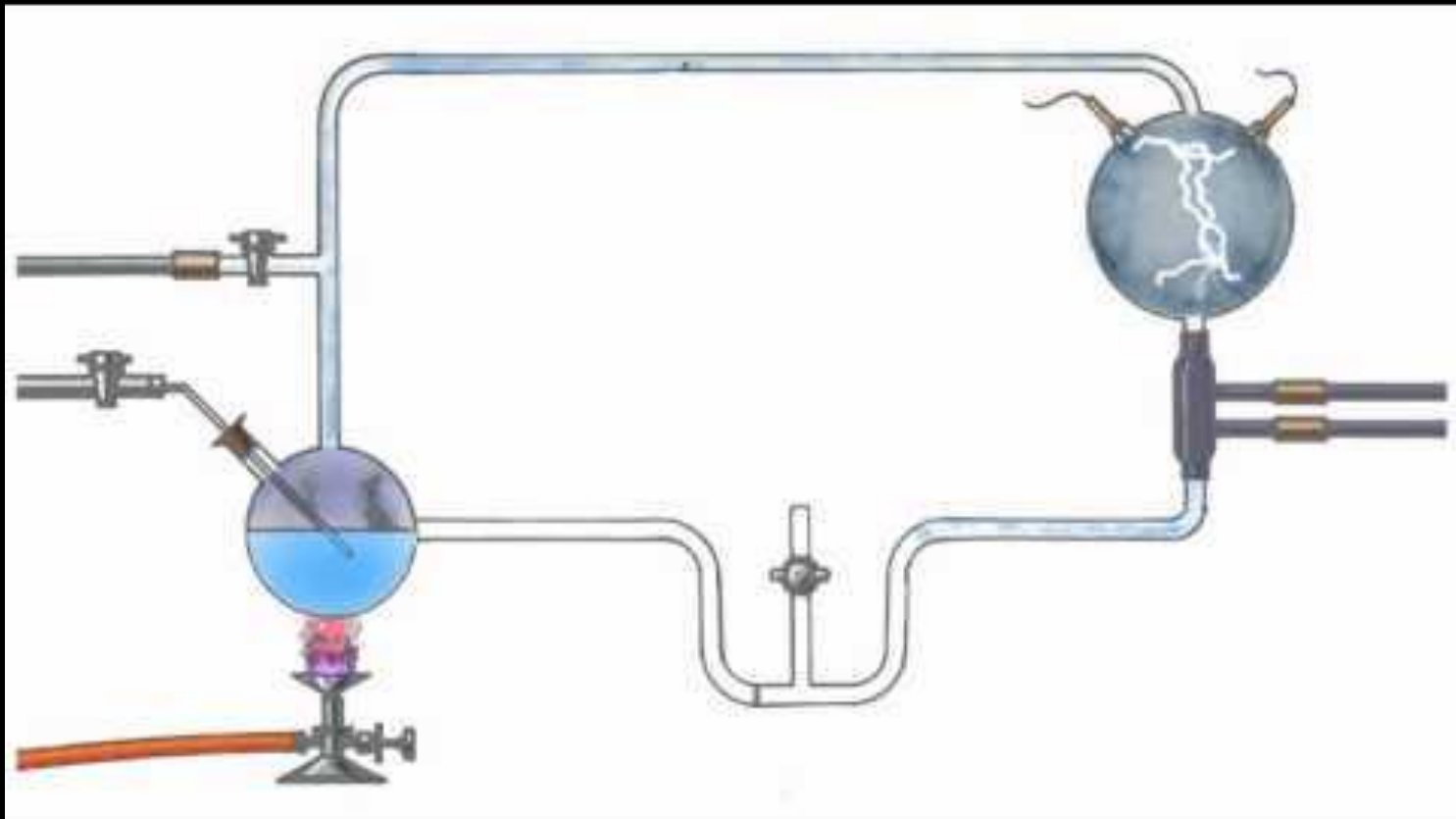
# Early Cell-like structures

Cooling a warm-water solution of amino acids forms an enclosed structure



Lipids mixed with water spontaneously form membrane droplets

# Miller and Urey



YouTube

The RNA Origin of Life

YouTube  
Origins of Life

# Stop Here

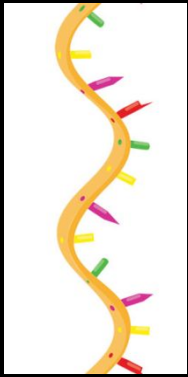


# How Does Chemistry Lead to Biology?

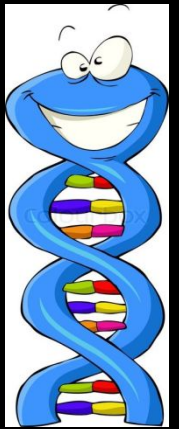
Step 1: Essential organic molecules are available.

Step 2: Creation of more complex molecules such as polymers

Step 3: Ability to reproduce



# What came first, the chicken or egg?



DNA is too complex to be the original self replicating molecule

RNA is less complex but still contains the hereditary information

RNA has enzyme activity, which allows it to self replicate

# How did life form?





# Essential Questions

Where did organic molecules come from?

How does chemistry become biology?

How did self replication begin?

