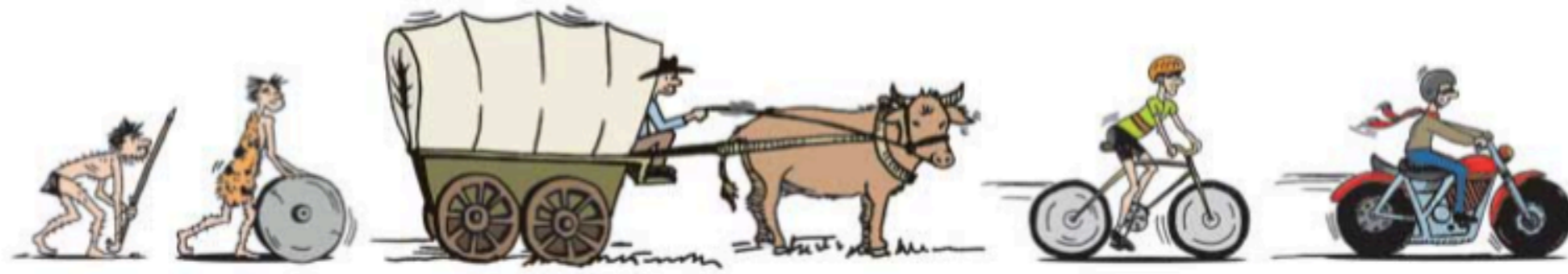


Origin of Cells



Origin of Cells & Theories of Life's origin.



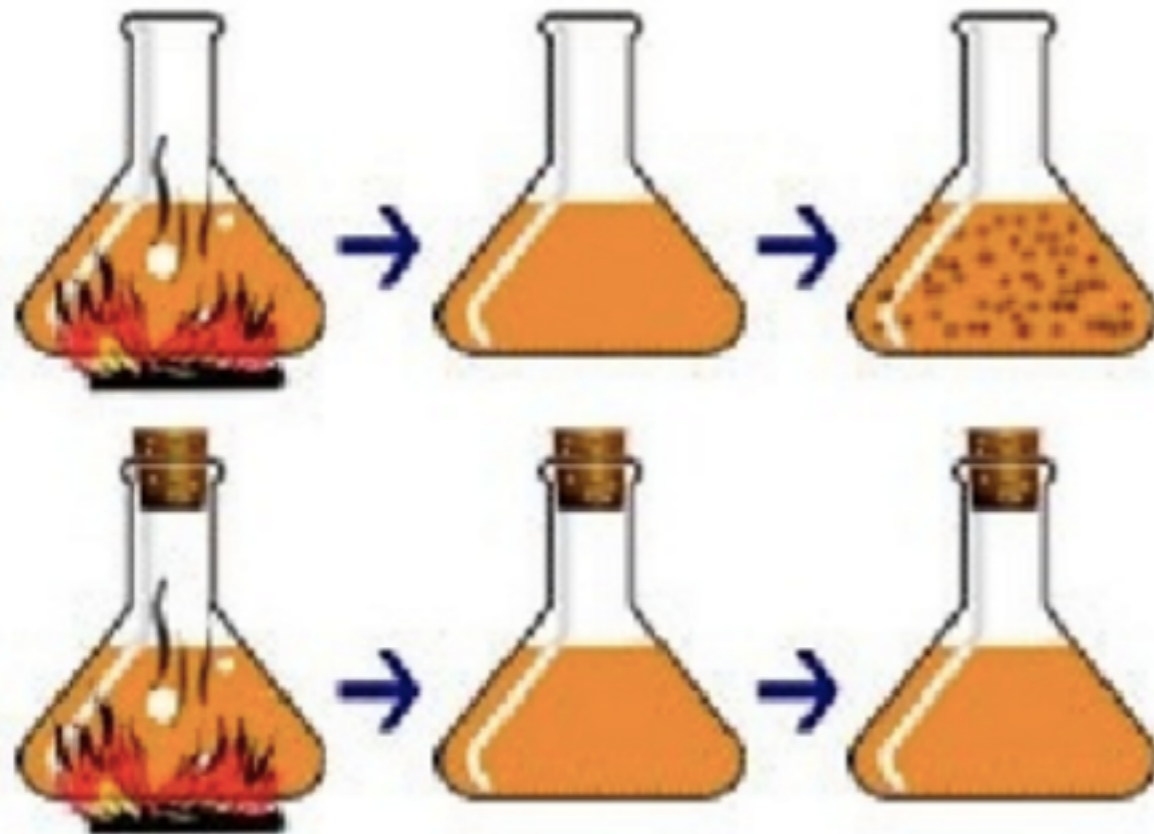
**Theophrastus- Silphium sprouts
in new location**



**Paracelsus - mice arise in grain after 21 days
- frogs arise in spring water**

Spontaneous Generation

Origin of Cells



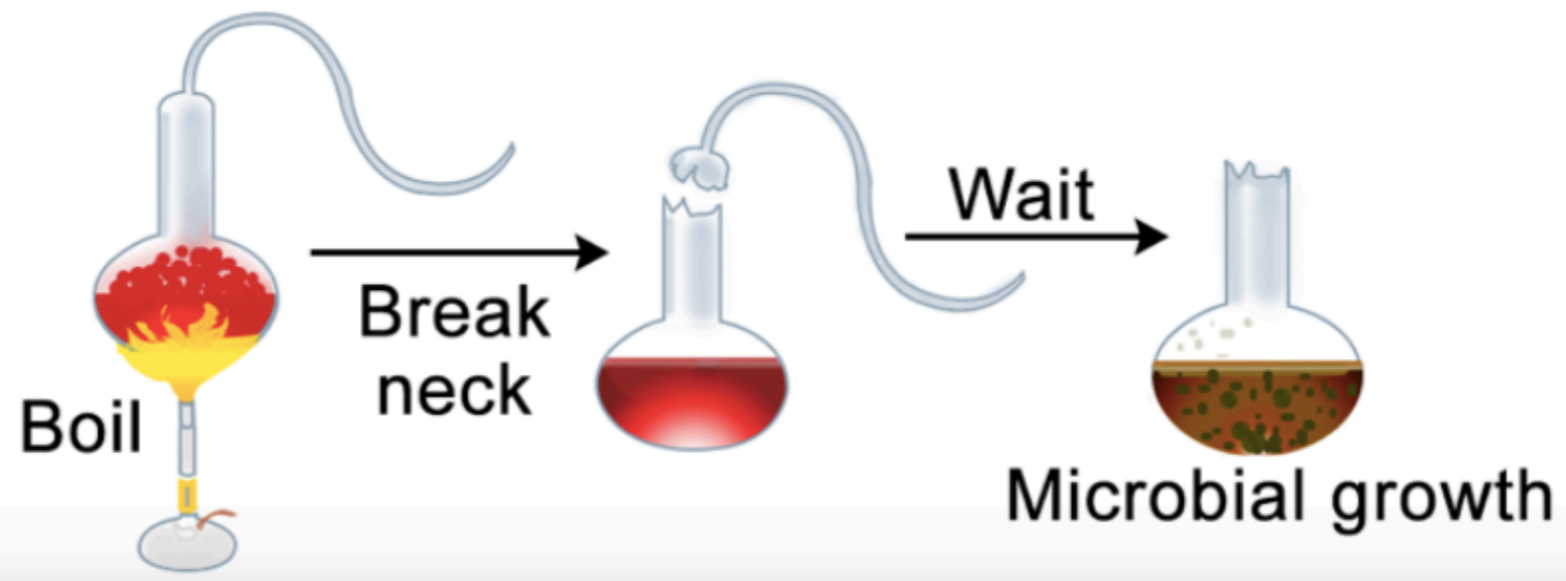
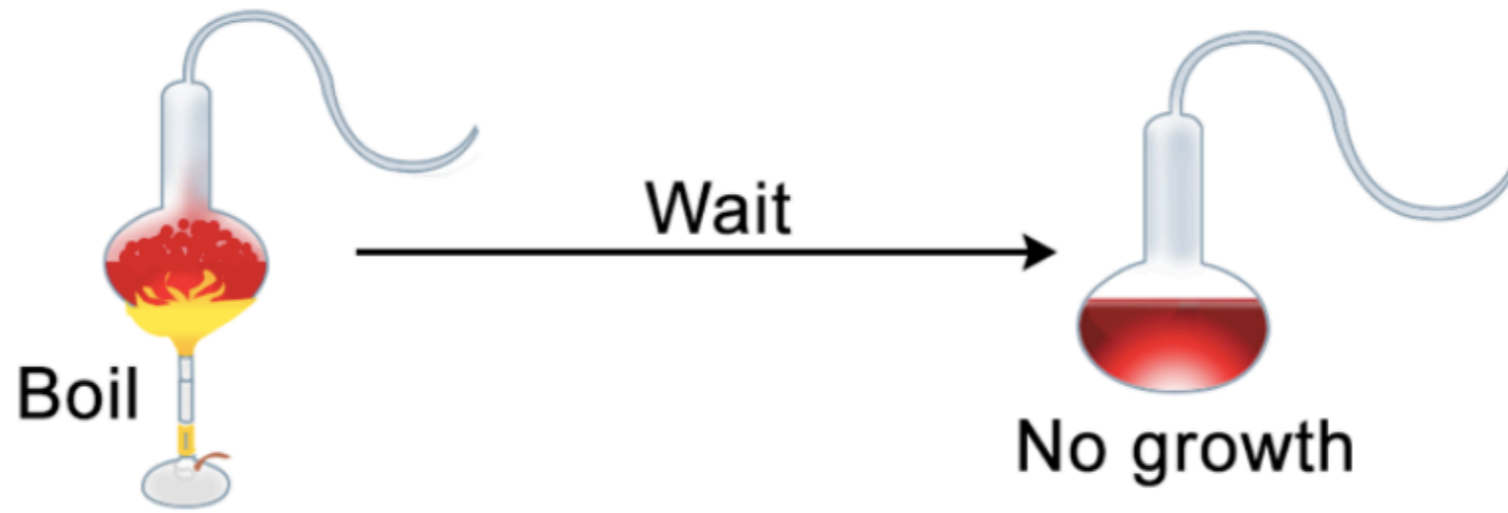
Spallanzani



Redi

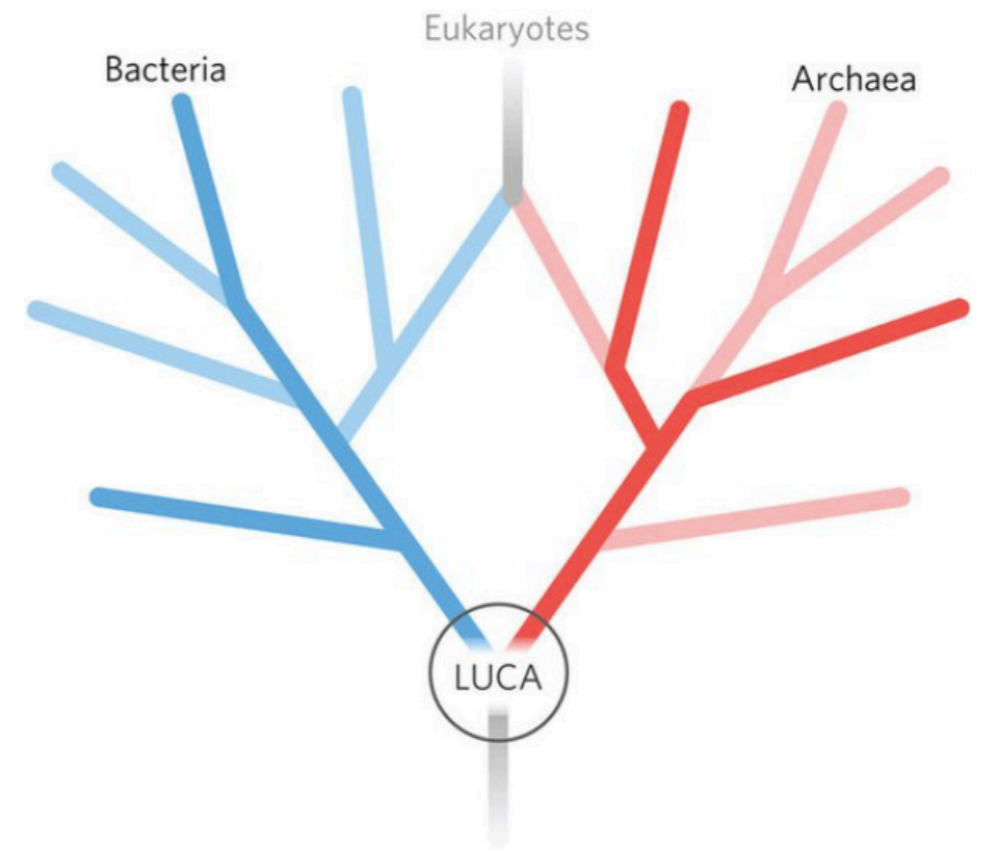
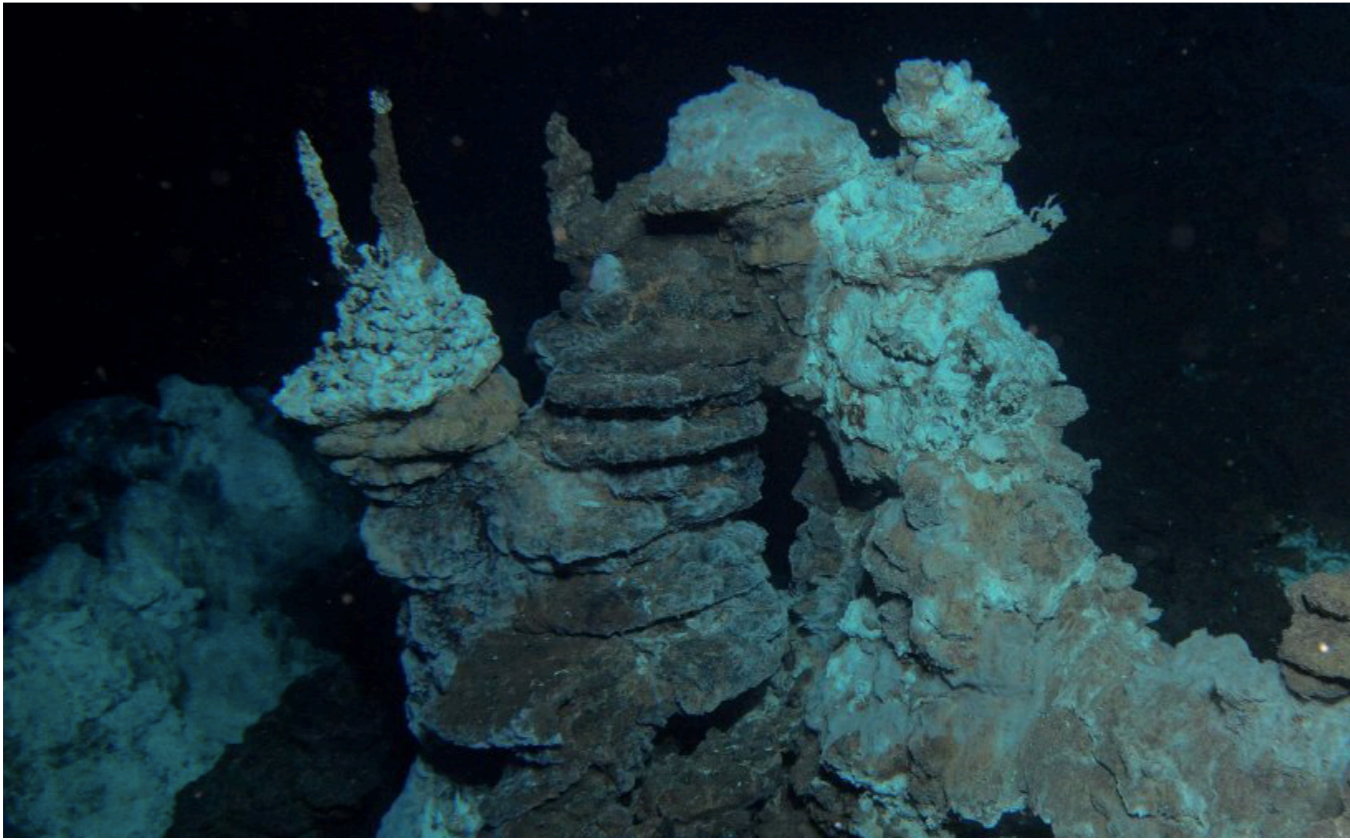
- both Spallanzani and Redi both demonstrated cases where spontaneous generation does not occur
- Scientific community rejected —> thought air to be a vital element

Pasture



Spontaneous Generation and Louis Pasteur

- Prior to 1860, a common belief of life was **spontaneous generation** - life arises from non living things
- Pasteur through experimentation, shows that cells like bacterial and fungal do not arise without being exposed to pre-existing cells in found in the air.
- Scientist today have only observed that cells arising from other cells through cellular division. (Mitosis in Eukaryotic Cells, Binary fission in Prokaryotic cells)

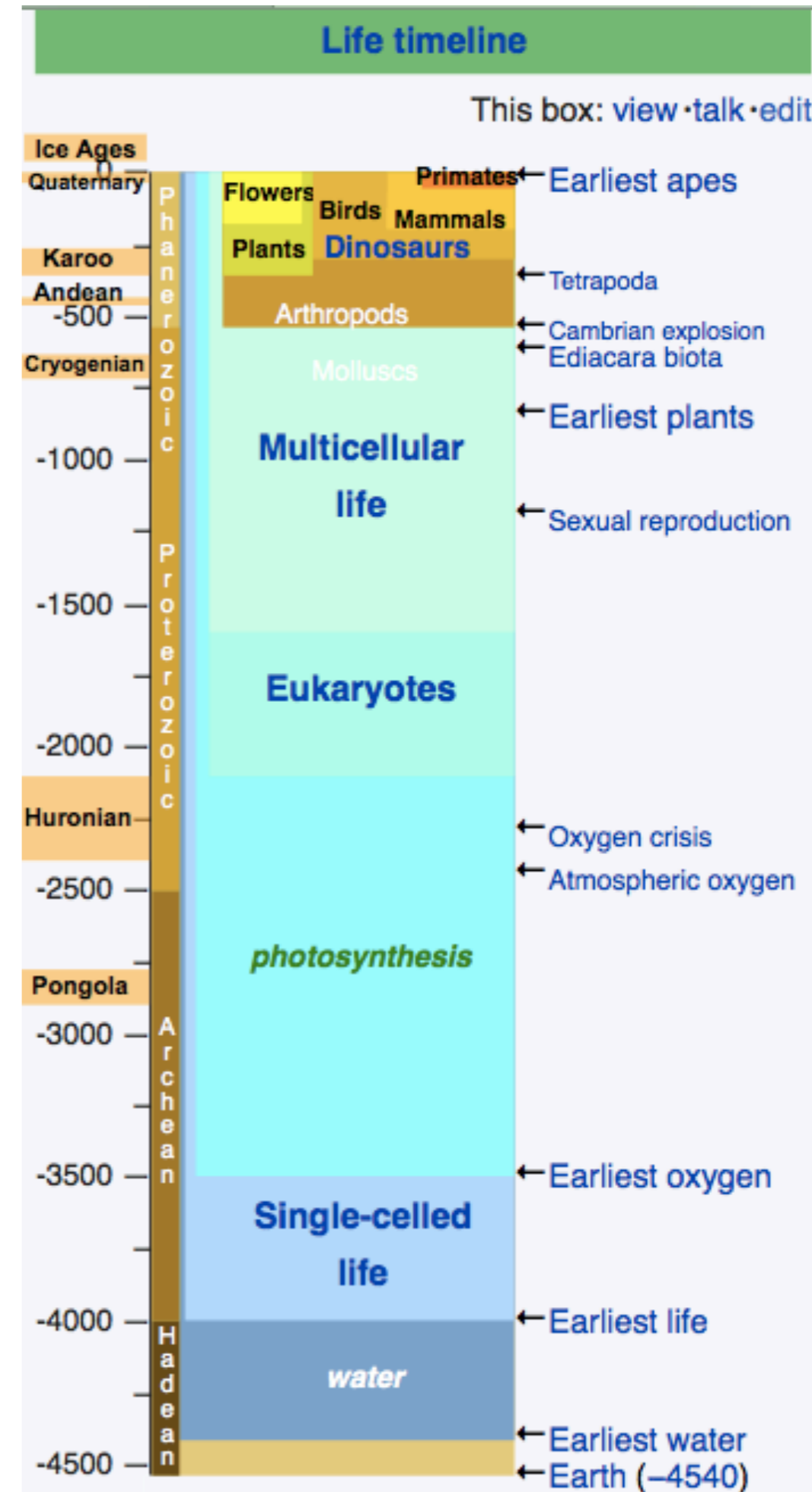


Origin of All Life .

- LUCA (Last Universal Common Ancestor)
 - had DNA and replication enzymes, RNA, and ribosomes
 - anaerobic metabolic function
 - autotroph
 - N, H, CO₂, minerals like P Fe and Cu

Origin of First Cells - Urey and Miller

- Fossil record shows that the first simplest cells appeared about 3.8 billion years ago.
- The early earth environment is proposed to be composed of simple chemical compounds such as water, hydrogen, ammonia, and methane.



As you watch, note the following...

1. Where on earth provides clues where life may have first formed?
2. Which chemical compounds does this environment provide?



Origin of Cells

Living Cells

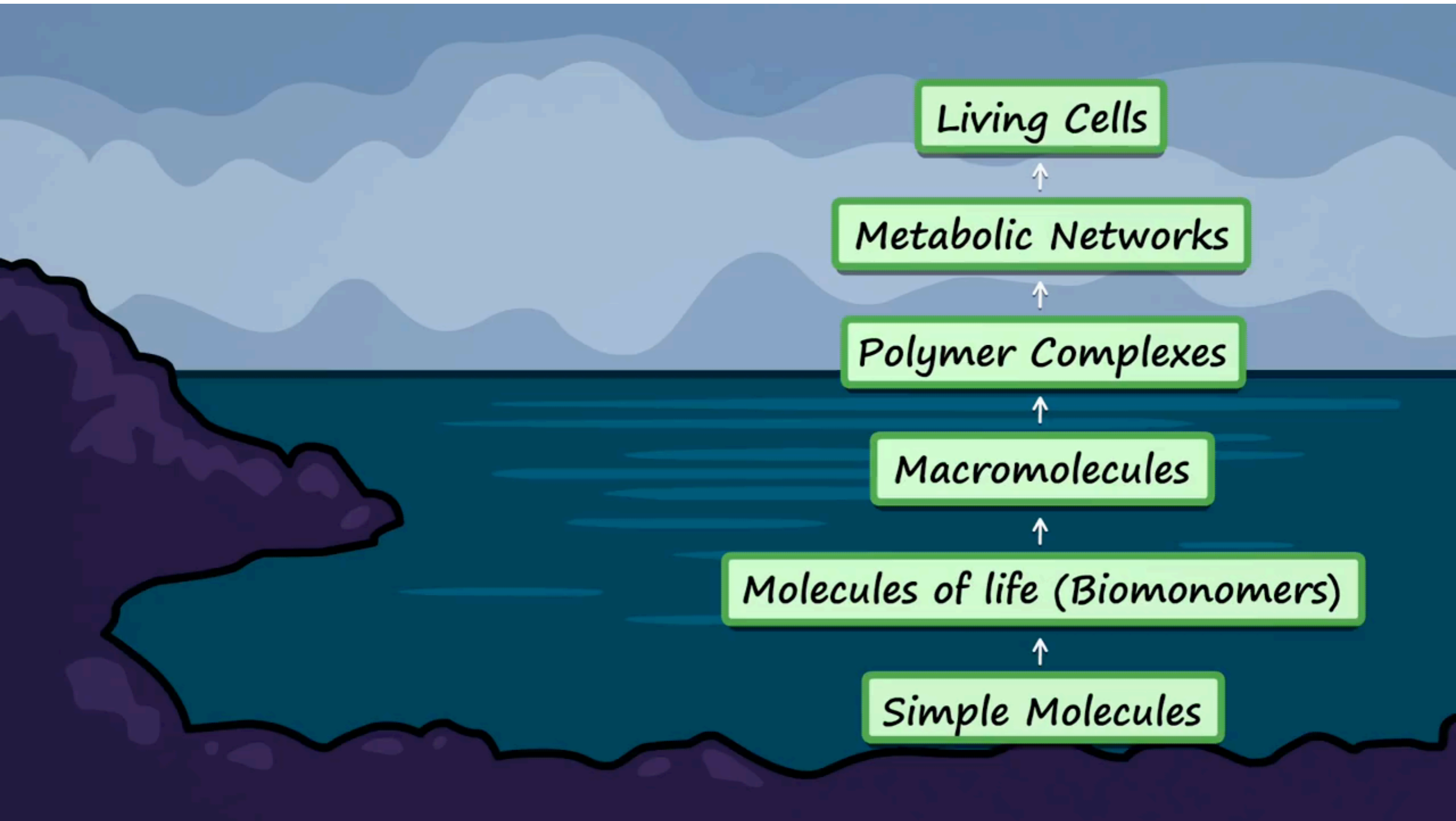
Metabolic Networks

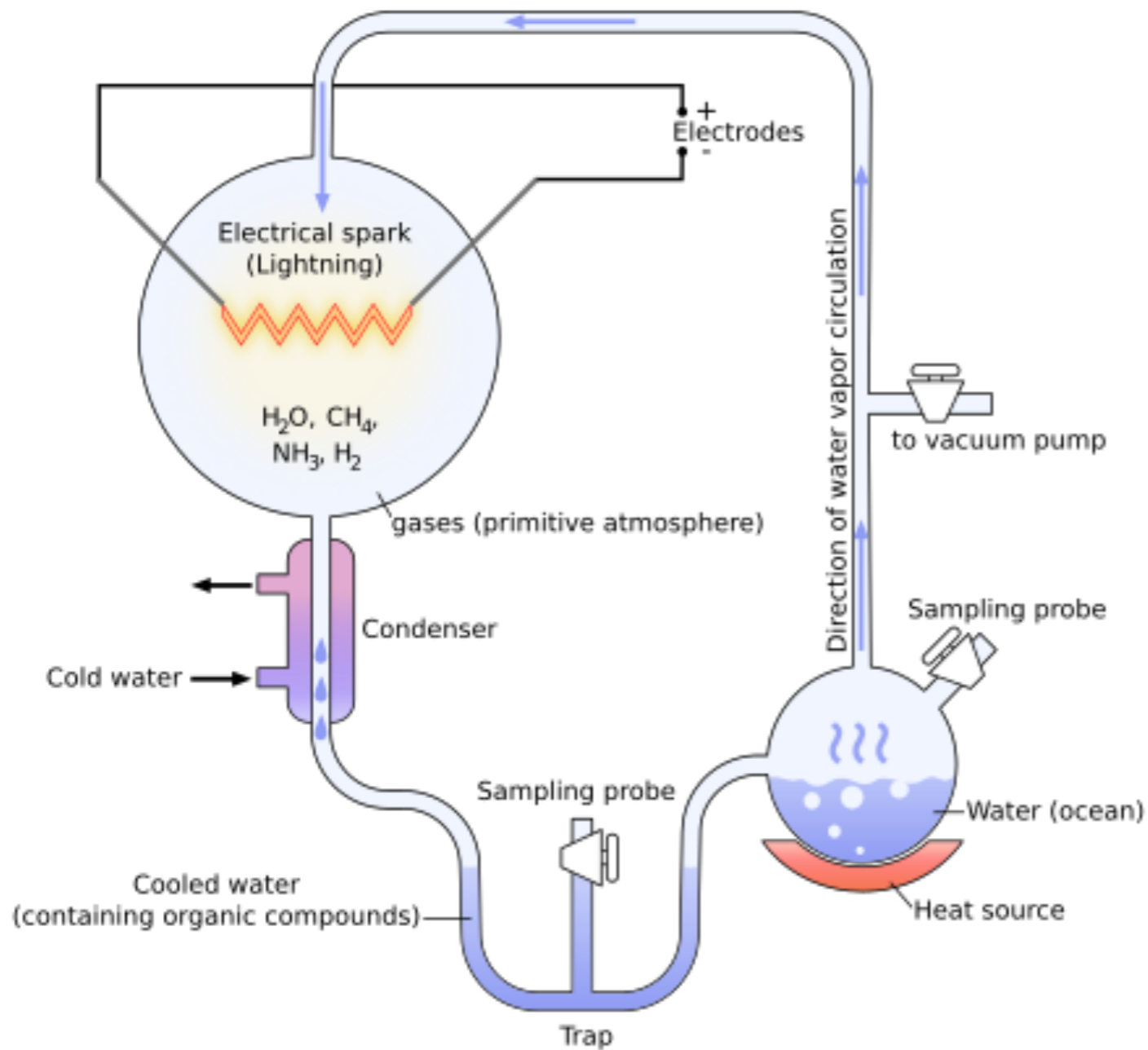
Polymer Complexes

Macromolecules

Molecules of life (Biomonomers)

Simple Molecules



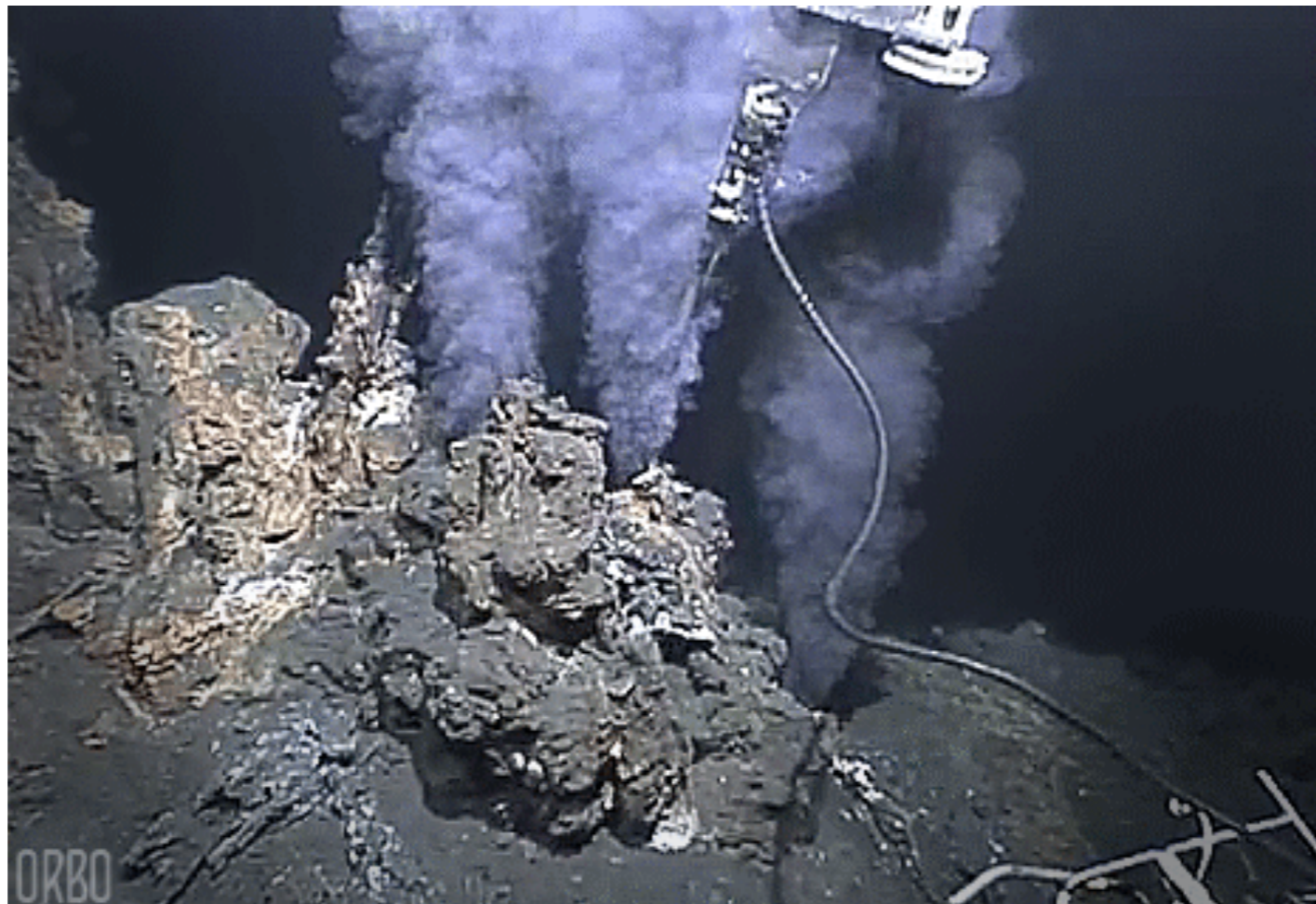


- Urey Miller experimented with the early environments using an electrical sparks to simulate lightning strikes
- Many of the common chemical compounds common to life were formed in this environment.

Urey and Miller 1952

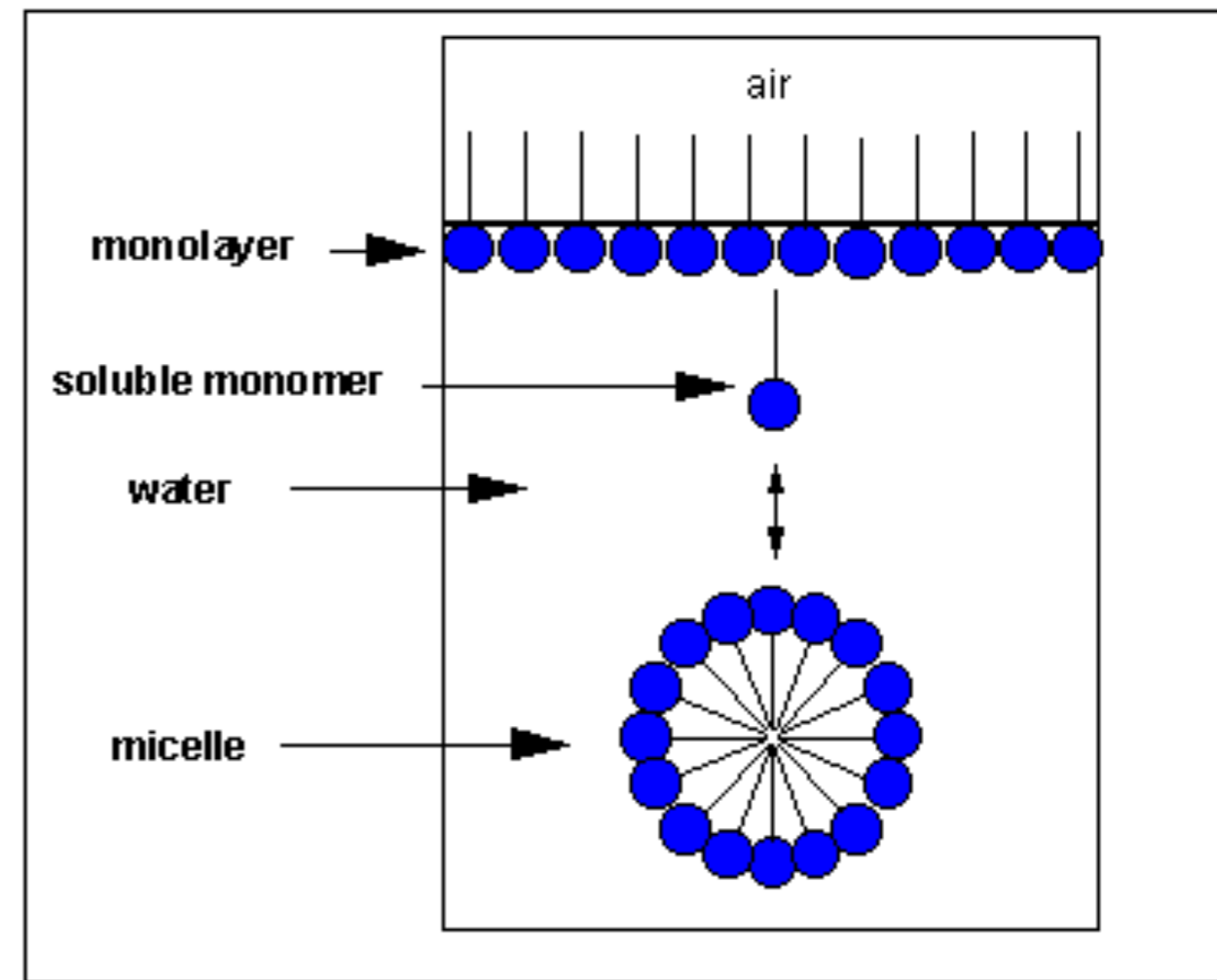
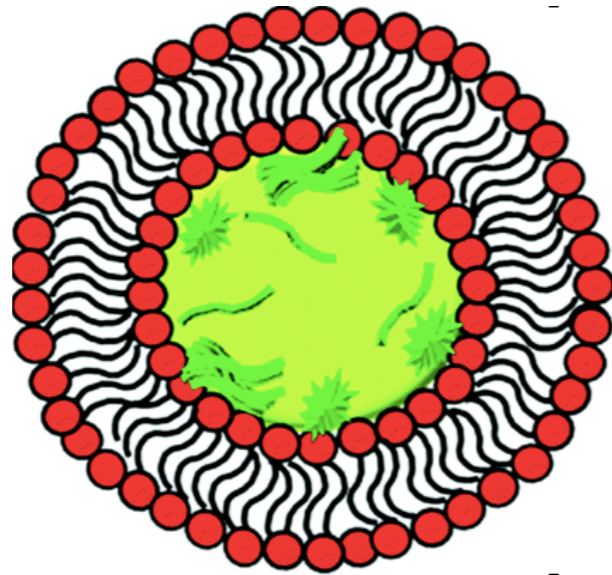
How did these early chemicals form the first proteins, compounds common to all life?

- One possible hypothesis is deep sea vents.
- High energy molecules like Iron sulphide and hot water around vents could supply the source of energy to create life molecules



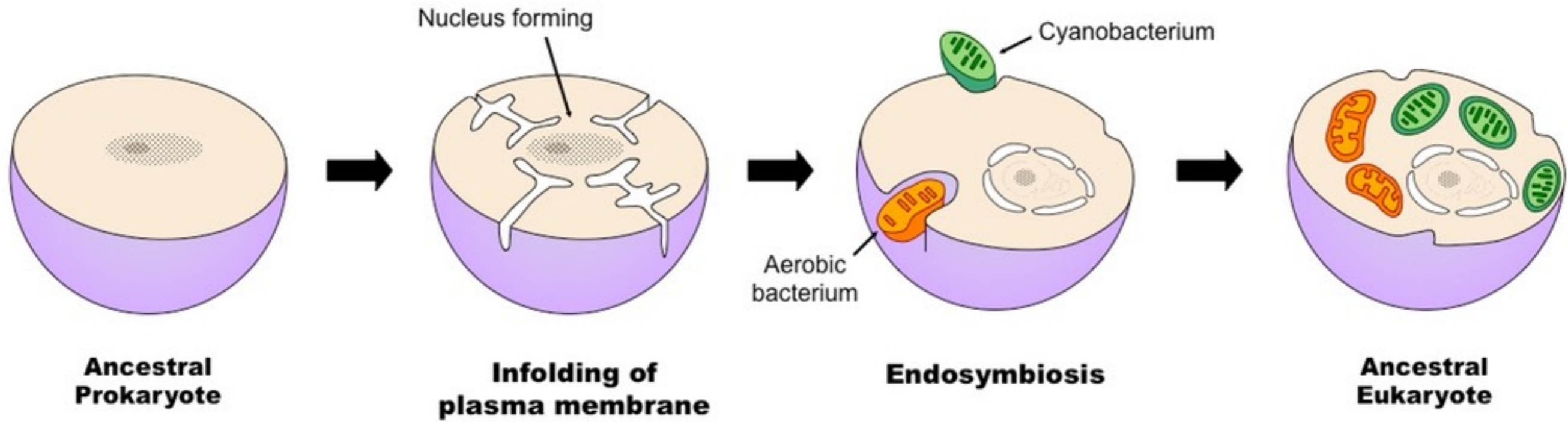
- Membranes formed from amphipathic molecules would result in contained chemical environments

Could biochemical reactions occur here?



- The formation of gene and genetic material presents a conundrum- How did genes form the bases of inheritance?

Eukaryotic cell Formation → ENDOSYMBIOSIS

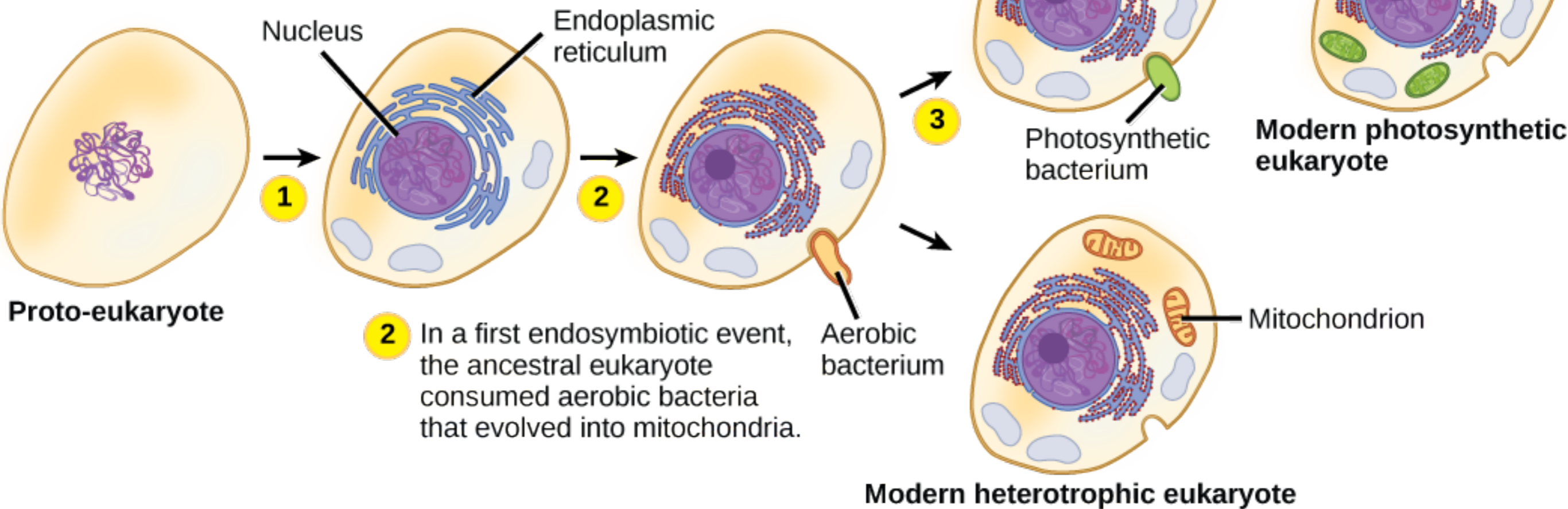


Eukaryotic cell Formation

The ENDOSYMBIOTIC THEORY

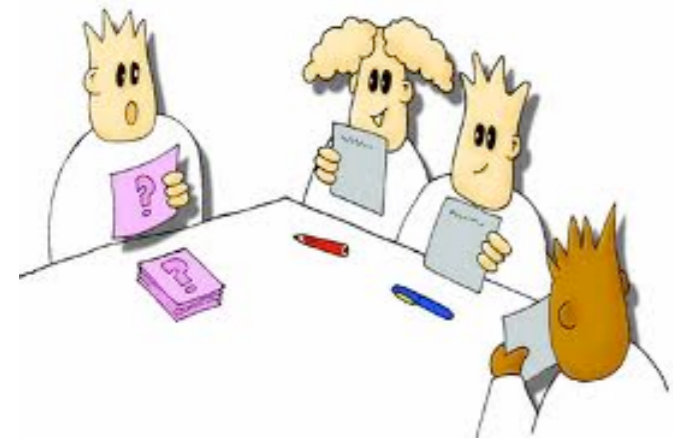
1 Infoldings in the plasma membrane of an ancestral prokaryote gave rise to endomembrane components, including a nucleus and endoplasmic reticulum.

3 In a second endosymbiotic event, the early eukaryote consumed photosynthetic bacteria that evolved into chloroplasts.



Evidence of Endosymbiosis

- Mitochondria and chloroplast have their own genes/DNA
- Like simple prokaryotes, the genes are used to make proteins
- Mitochondria and chloroplast have their own ribosomes similar to simple prokaryotes (70S)
- Mitochondria and chloroplast can only be made by the division (binary fission-like)



1. Research *Bangiomorpha pubescens* and describe it.
2. What is it and why is it important?
3. It seems unlikely that eukaryotic cell structure, multicellularity, and sexual reproduction evolved simultaneously. What sequence seems most likely to you?



4. Complete the table

Scientist	What they studied	Contributions made to the discovery of the
Parcelsus		
Redi		
Spallanzani		
Pasteur		
Darwin		
Urey/Miller		
Konstantine Mereschkowski		