

# The Origin of Life Timeline

\* Not to scale - at all.

PAST

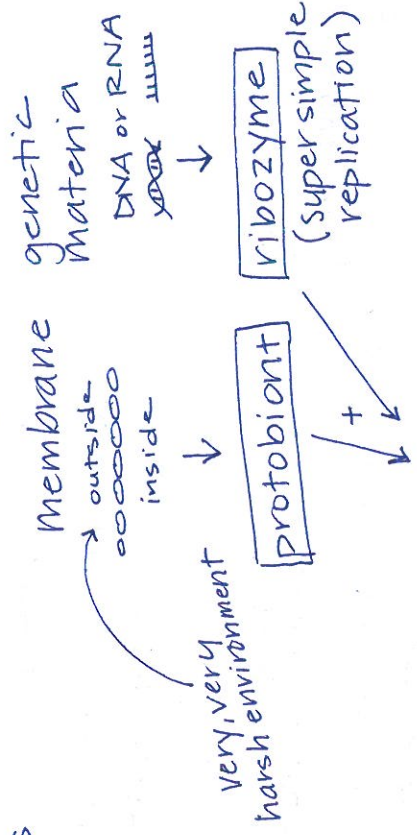
- supernova
- smash, smash
- planet cooled
- sea of chemicals

C, H, O, N

\* NO LIFE \*

Single-celled organisms

\* LIFE! \*  
needed



Multi-celled organisms

- cells combine together inside membranes
- cells started to differentiate (specialize)



Prokaryote



- simple
- ex. bacteria

endosymbiosis

"cell engulfs a cell"



- example/evidence: chloroplasts & mitochondria have different DNA than the rest of the cell.

HOW?

in folding



Eukaryotes

- compartments
- nucleus

- "cell folds on itself"
- protein inversion (flips inside-out)

- = proteins on inside of cell  
x = proteins on the outside of cell

LAND-HO!

Colonization of Land

aquatic → land



adaptations were necessary!

- avoid dehydration?
- breathe?
- eat?

1st: cyanobacteria (prokaryotes that do photosynthesis)  $CO_2 \rightarrow O_2$

2nd: Fungi, plants, animals



### Analyzing fossils

Macro-evolution: large scale

- speciation → create new species
- ↑ biodiversity

- New species have different DNA

↳ why? mutations

mutations allow adaptive radiation (new spaces available, new adaptation could survive there)

- extinction → loss of species

- 5 big specific ones
  - occur for many reasons
- environment Δ's  
asteroids  
disease  
...

Micro-evolution: small scale

\* populations & up can evolve: not individuals (gene pool)

\* Hardy Weinberg equation can tell us if a pop. is evolving by looking at p & q values over time

→ H.W. equilibrium = no evolution is occurring, (RARE!)

→ 5 things that can cause a pop. to evolve:

- Natural selection
- Migration
- Mutations
- Selective Mating
- Small pop. size

reproductively isolated from other organisms

Now! Boyer