What is life?

Life as a Flow of Information through Time

Martin Jacoby

Retired naturalist

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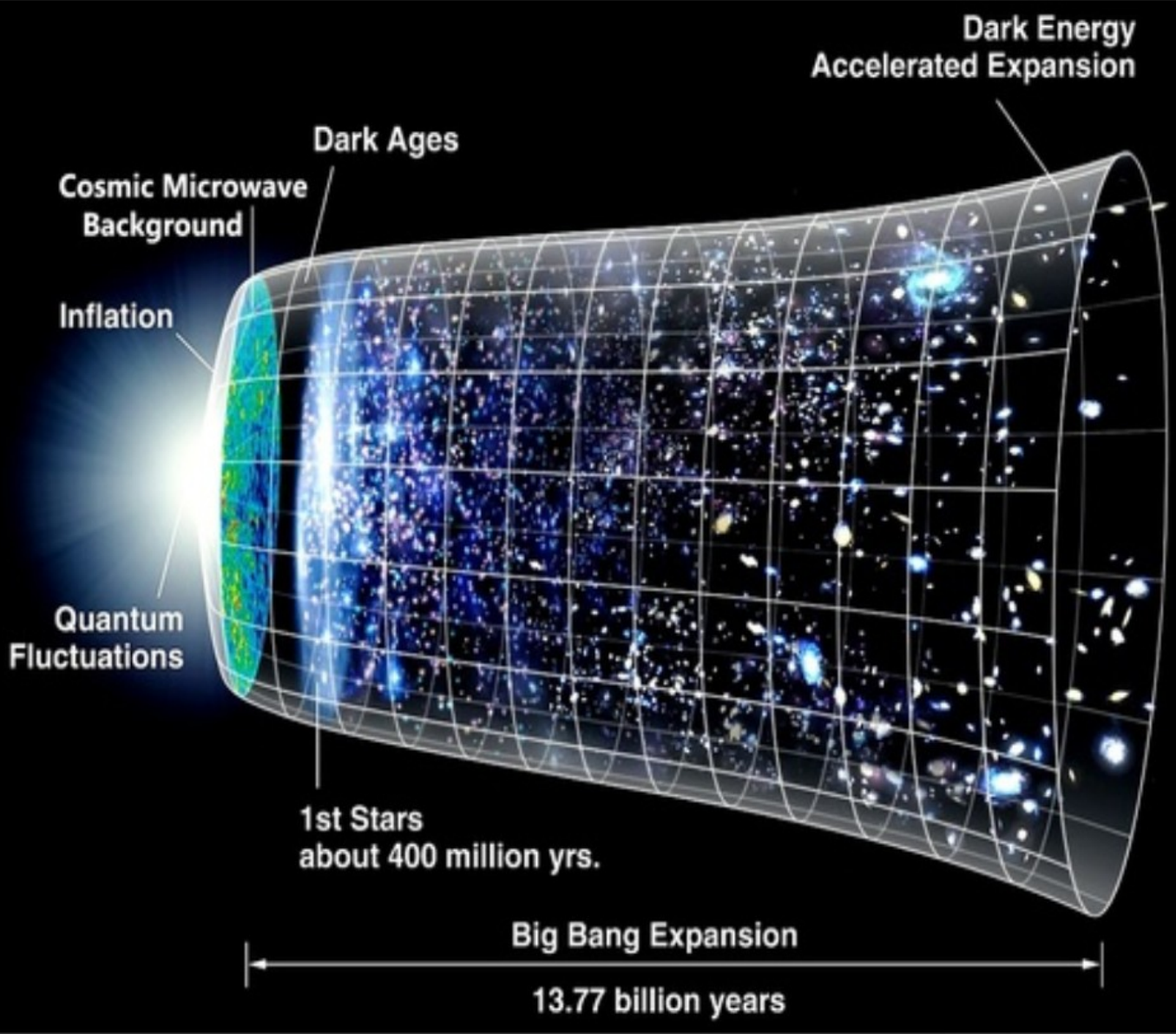
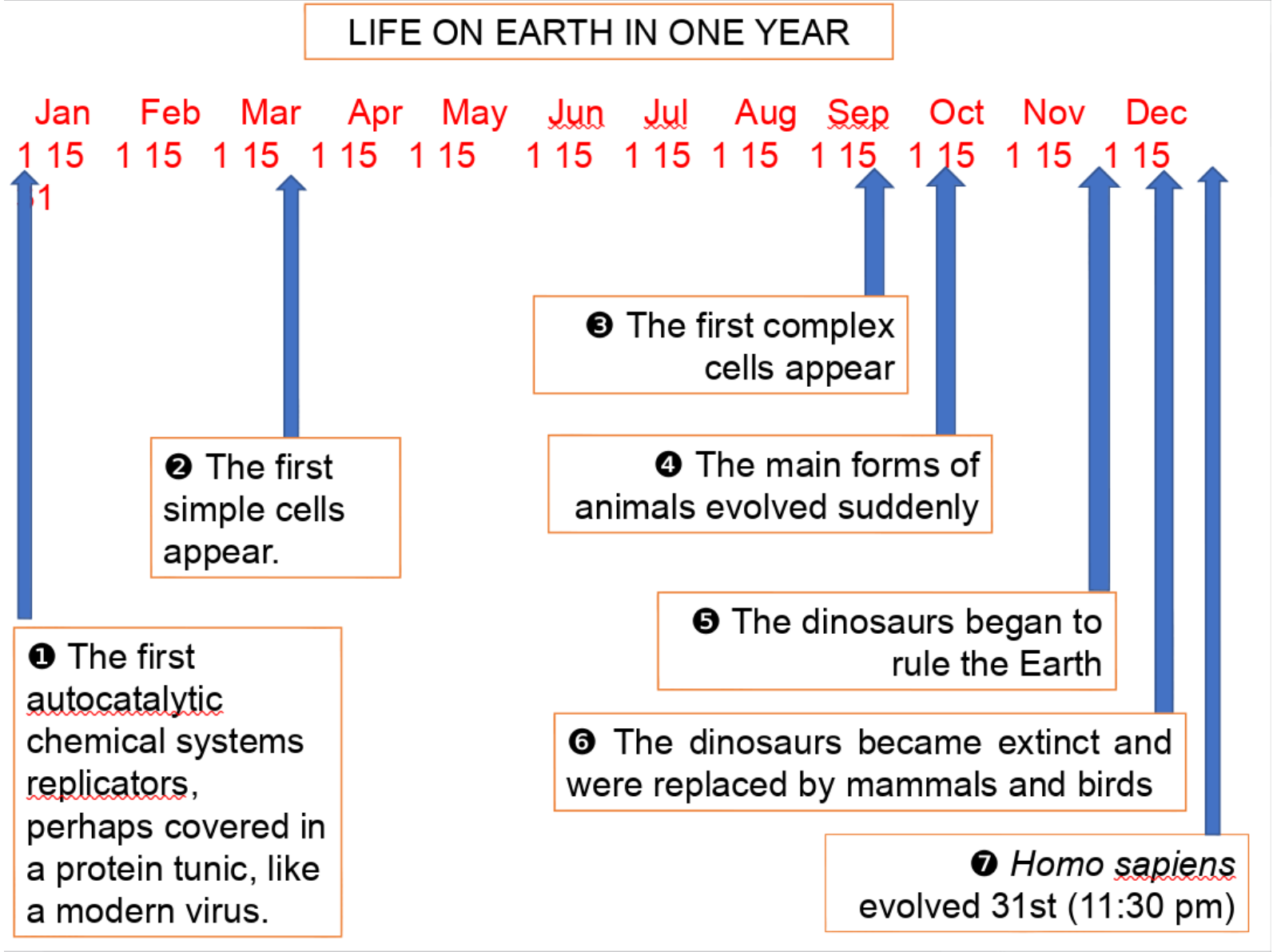
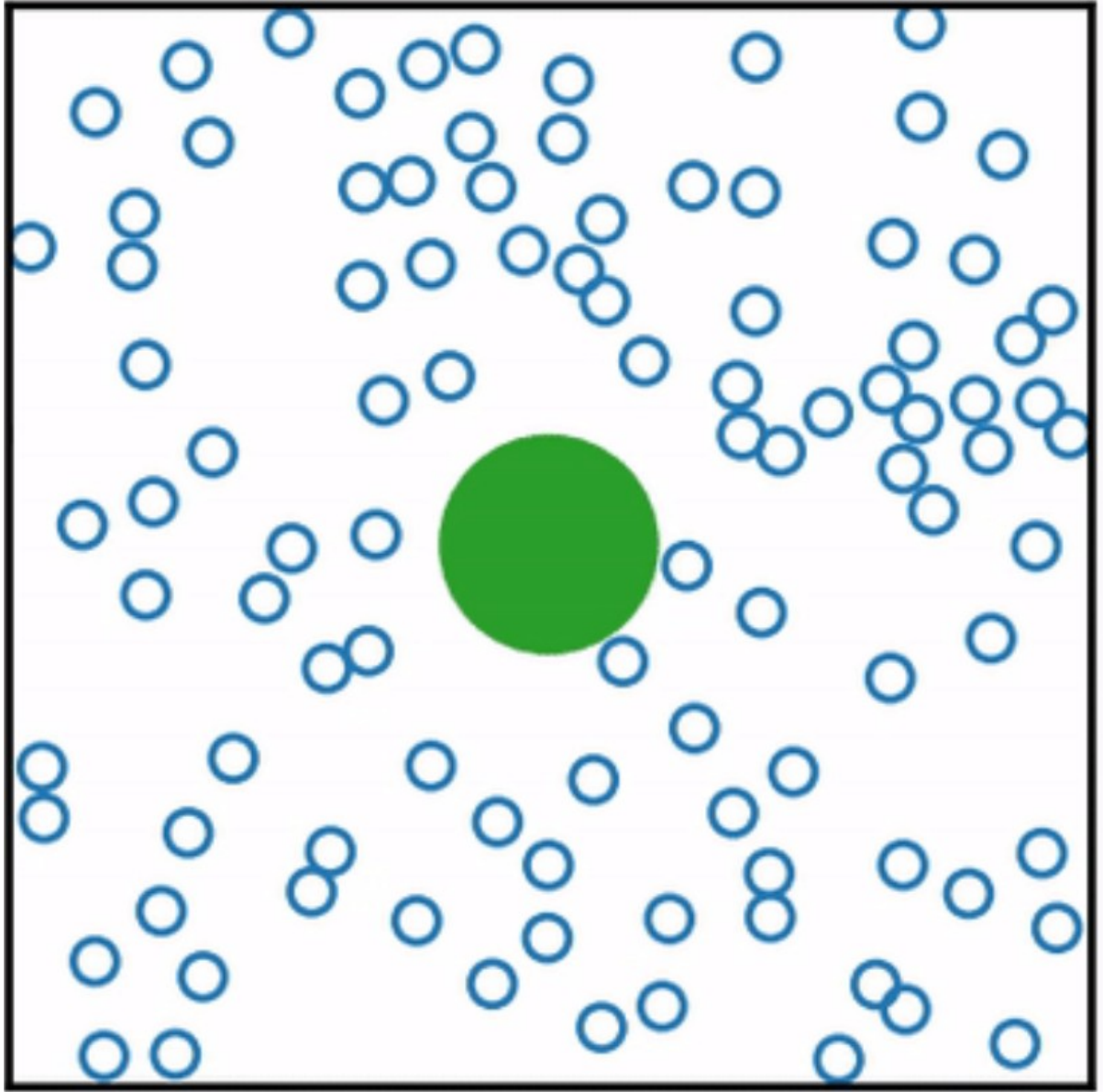
An entity is deemed to be alive if it replicates the information which controls how it does so.

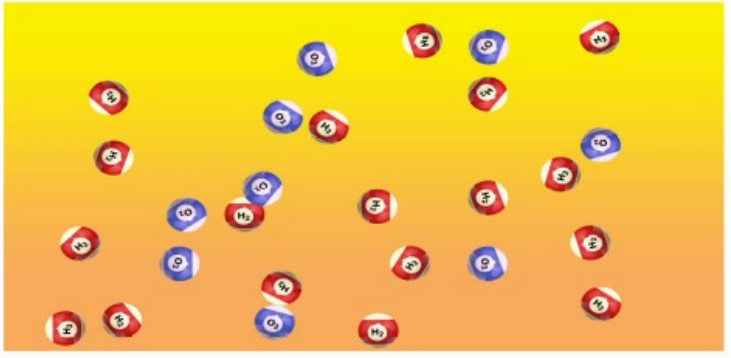

Dark Energy
Accelerated Expansion
Dark Ages
Cosmic Microwave
Background
Inflation
Quantum
Fluctuations
1st Stars
about 400 million yrs.
Big Bang Expansion
13.77 billion years


LIFE ON EARTH IN ONE YEAR
Jan
1 15
1
Feb
1 15
Mar
1 15
Apr
1 15
May
1 15
Jun
1 15
Jul
1 15
Aug
1 15
Sep
1 15
Oct
1 15
Nov
1 15
Dec
1 15
❶ The first autocatalytic chemical systems replicators, perhaps covered in a protein tunic, like a modern virus.
❷ The first simple cells appear.
❸ The first complex cells appear
❹ The main forms of animals evolved suddenly
❺ The dinosaurs began to rule the Earth
❻ The dinosaurs became extinct and were replaced by mammals and birds
❼ Homo sapiens evolved 31st (11:30 pm)

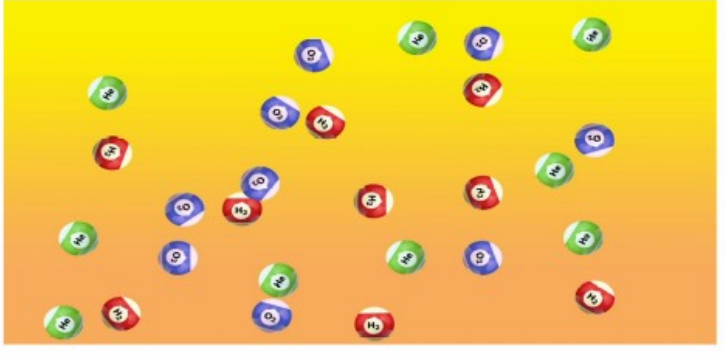


Brownian Motion

Hydrogen (red) and helium (green) competing for collision with oxygen (blue)



No helium, collision starts chain reaction and explosion

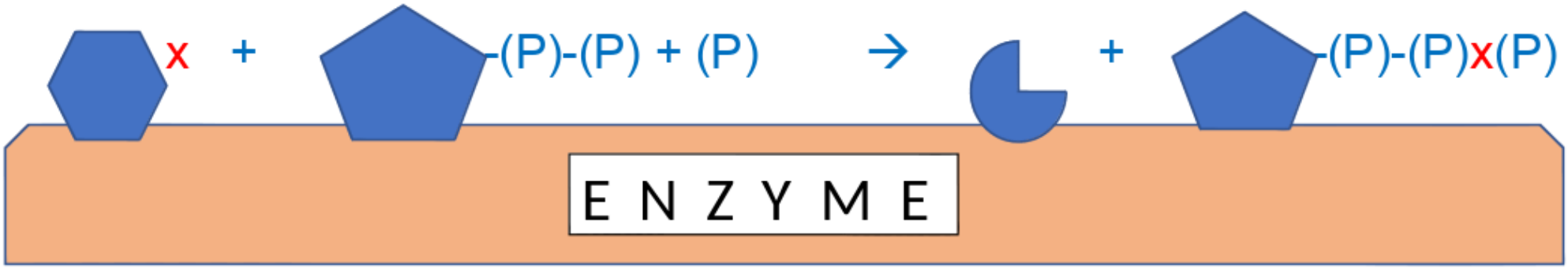


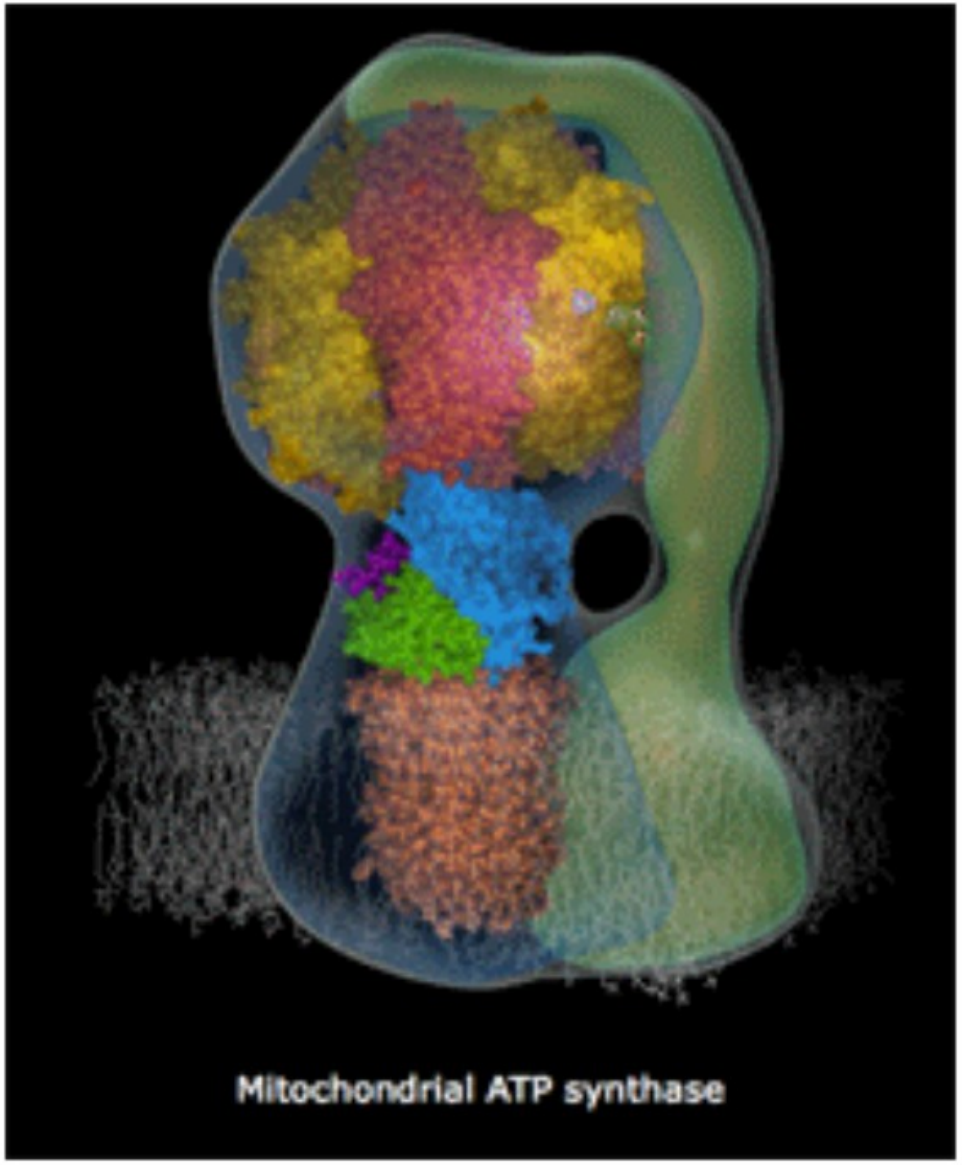
Helium obstructs hydrogen, blocking chain reaction and preventing explosion

Molecules cooperating

glucose + adenosine diphosphate + phosphate →

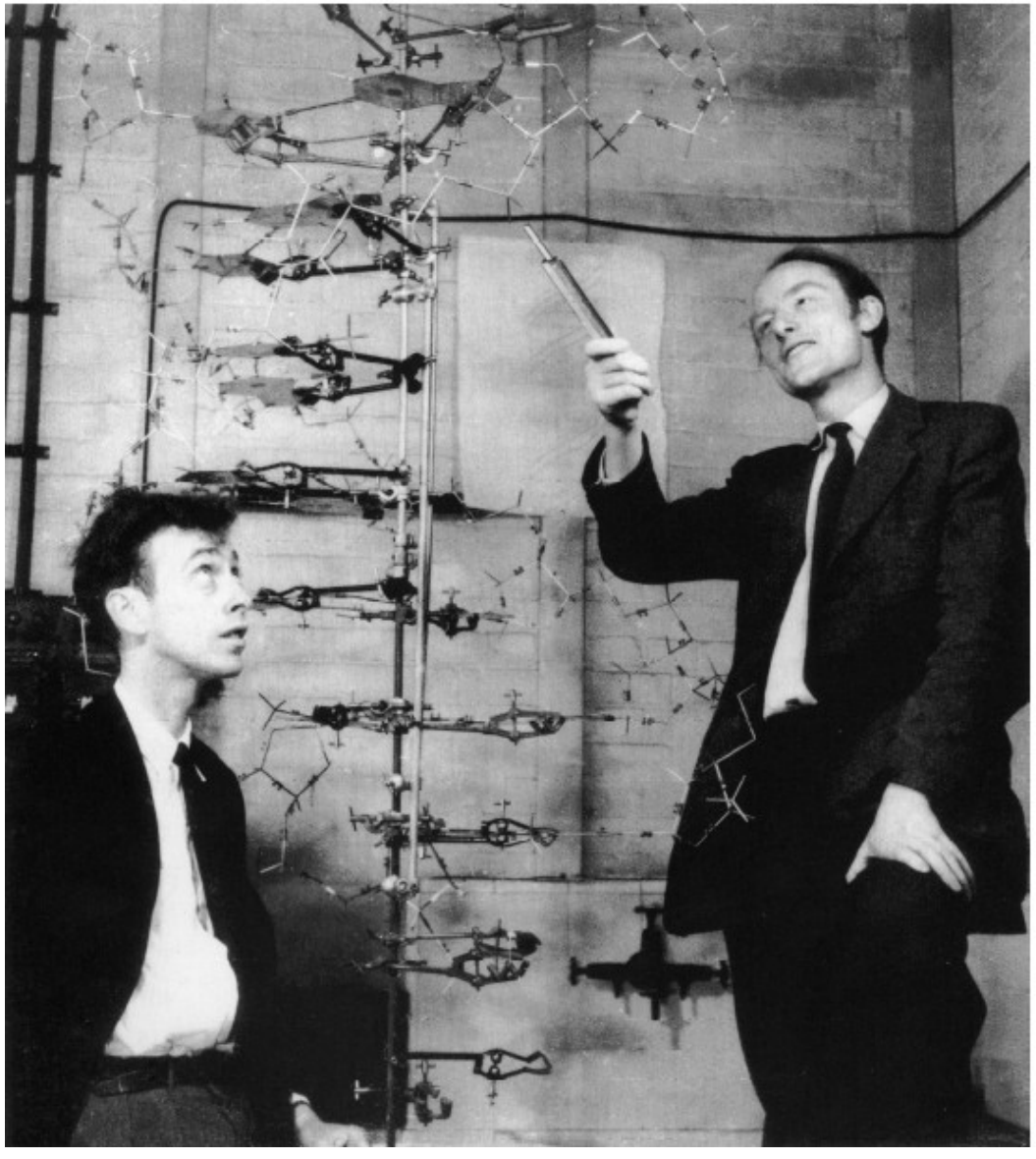
lactic acid + adenosine triphosphate





Mitochondrial ATP Synthase is the highly complex enzyme that combines ADP (the blue 'moths' entering) with a phosphate ion to form ATP (the pink 'bats' leaving).

Stanley Miller with his apparatus.



Jim Watson (left) and Francis Crick in 1953 with their double-helix model of DNA

Autocatalysis

(Catalyst D)

A+B----------->C+D

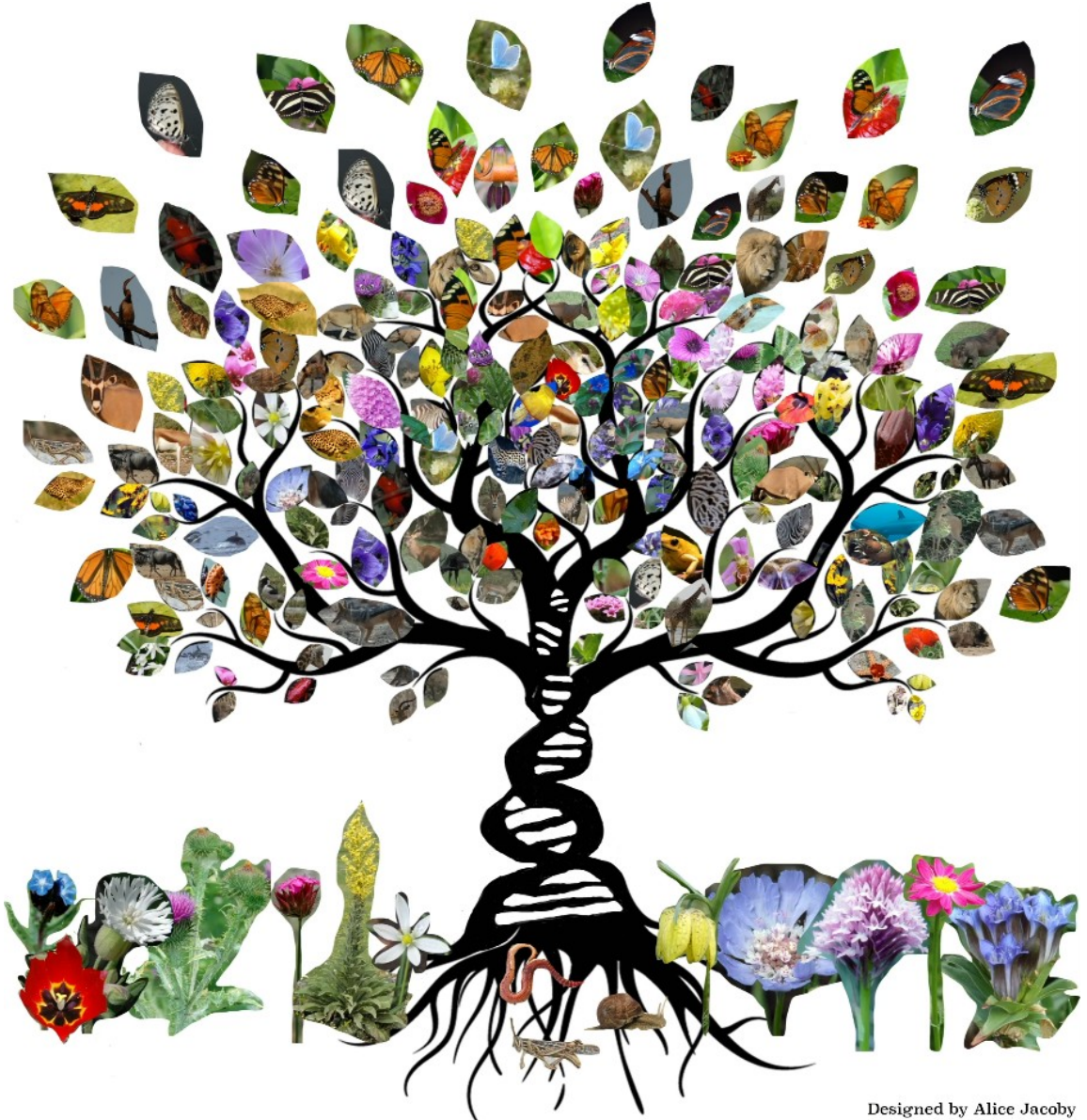
A chemical system

(Catalyst H)

A+B----------->C+D

(Catalyst D)

E+F----------->G+H



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SUMMARY OF EVIDENCE FOR LIFE BEING A FLOW OF INFORMATION THROUGH TIME

1. The origin of the universe is understandable
2. The chemical principles and pathways leading to life are feasible
3. Individual cells and individual animals are composite
4. There is a continuous flow of materials through living things
5. Altruism sacrifices materials for information.

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COMPARISON BETWEEN DNA AND IDEAS

feature ↓	DNA/gene	ideas
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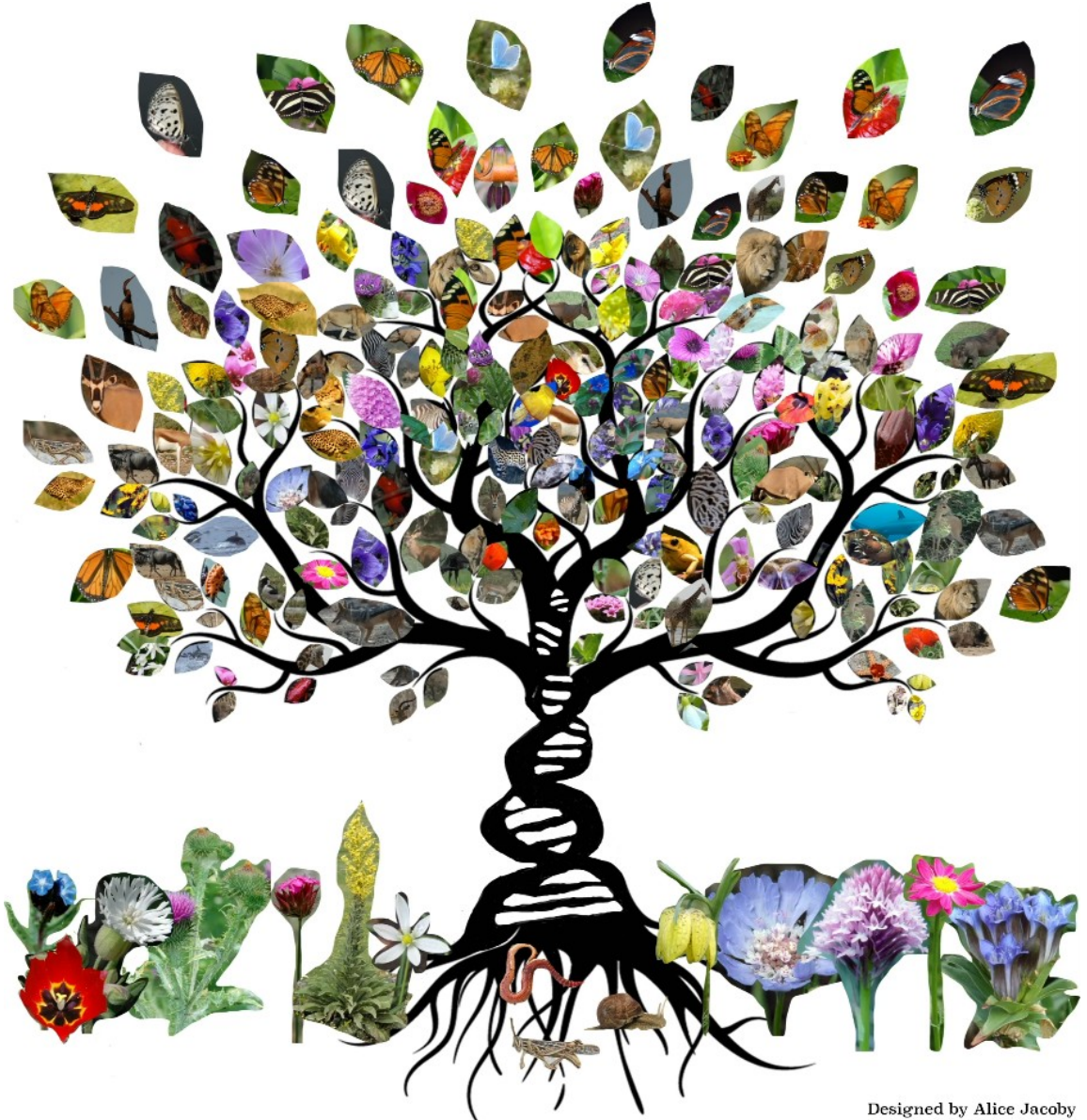
Are the effects of the information they carry under conscious control?	no	yes



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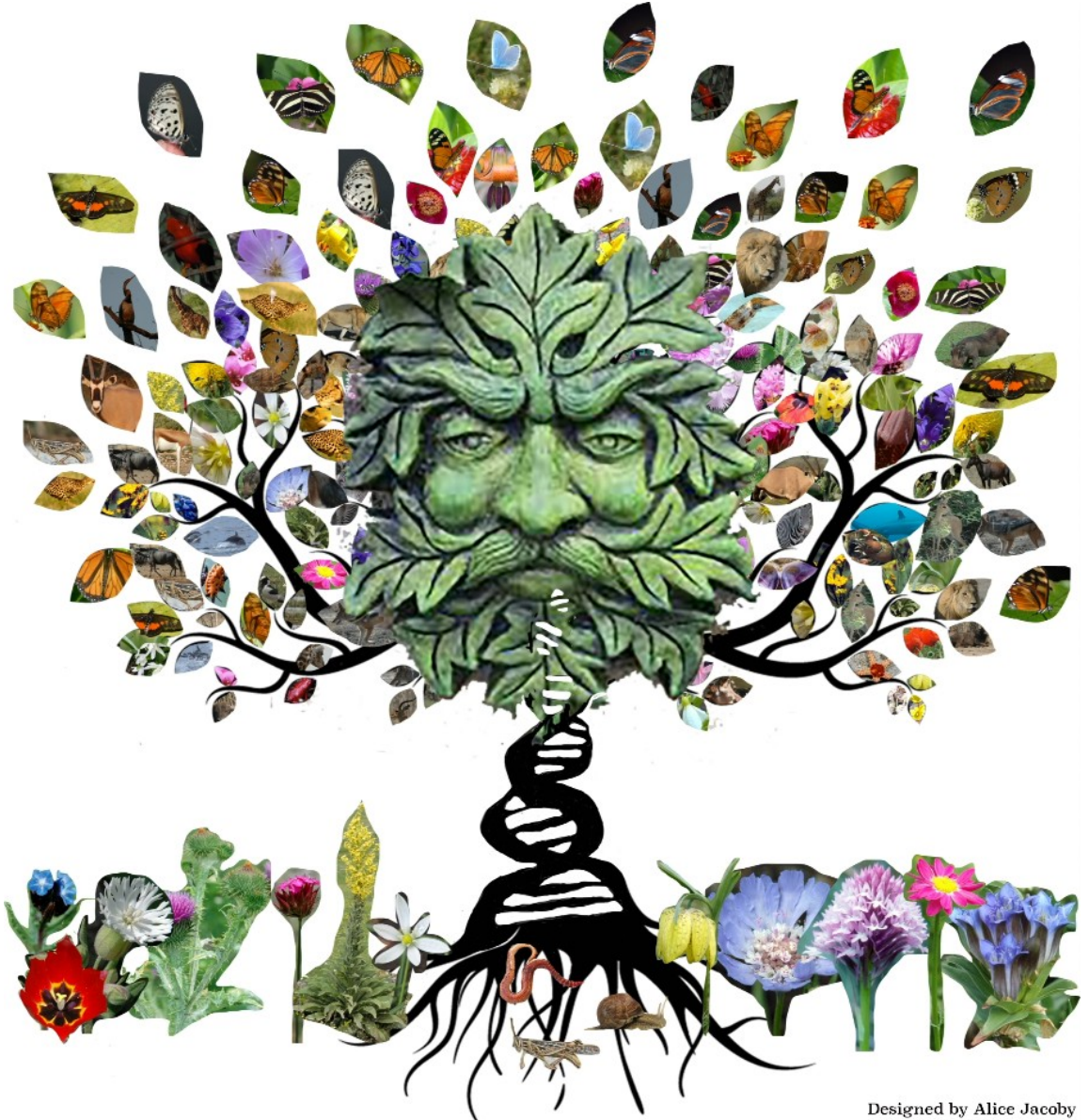

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