

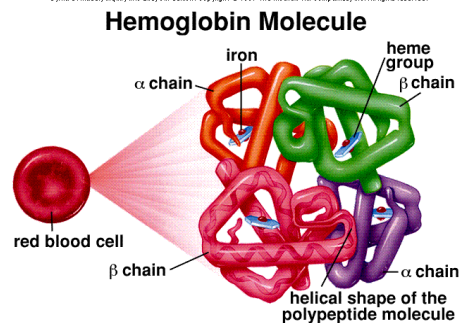
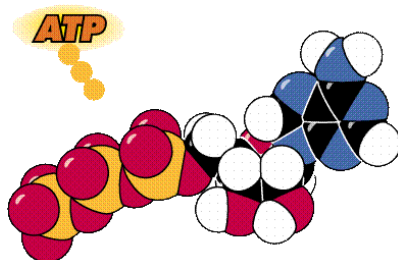
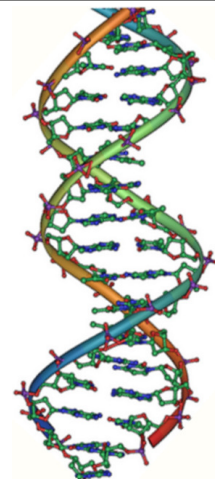
Standard: Students will evaluate the role of natural selection in the development of the theory of evolution.

Element: Explain how fossil and biochemical evidence support the theory.

EQ: What kinds of biochemical evidence support the theory of evolution?

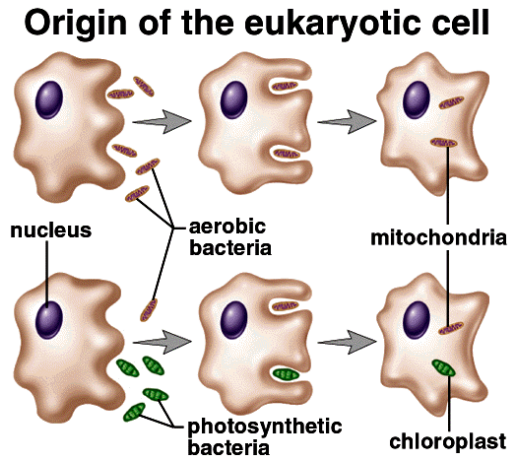
All living things share the same important molecules-

- 1) **Proteins (amino acids)**
- 2) **Genetic Material (DNA/RNA)**
- 3) **ATP for energy**



This is evidence for evolution because it suggests that all organisms had a **common ancestor** that had these chemical compounds.

If life had originated multiple different times, it is **unlikely** that all organisms would have the **same building blocks**.



How could molecules like this have formed on their own?

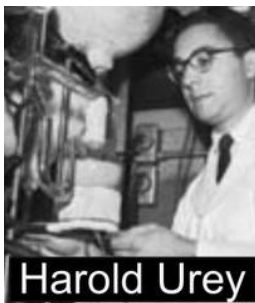
Scientists believe that conditions on early earth were quite different from today.

- Atmosphere not rich in oxygen
- Toxic gases present
- Volcanic eruptions and lightning storms
- No ozone layer to block the UV rays

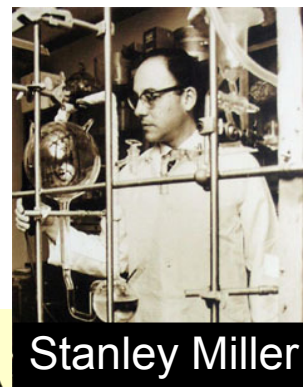
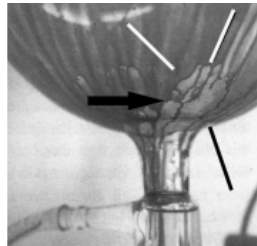
Scientists hypothesize that organic molecules like **proteins**, **nucleic acids**, and **carbohydrates** could have formed by chemical reactions using energy from **lightning strikes**.



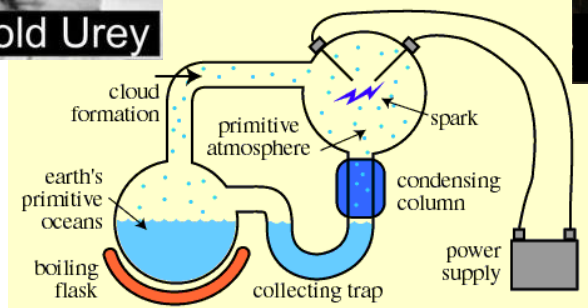
Scientists **Miller** and **Urey** conducted a famous experiment in which they showed it was possible for **organic molecules** to form in conditions similar to **early earth**.

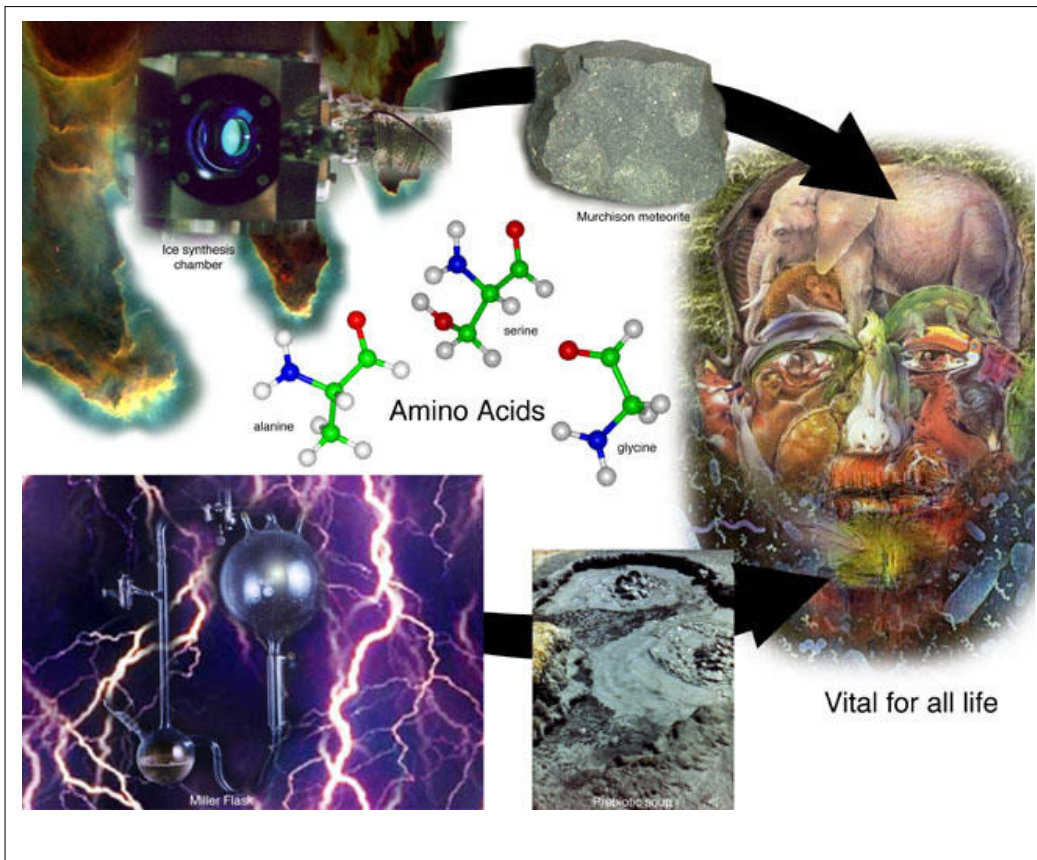


Harold Urey



Stanley Miller





You can also look at the **similarities** between molecules of different organisms to see how **closely related** they are.

Species that are closely related to each other are said to have a **common ancestor**.



CCAAGGTCACGACTACTCCAATTGTCACAACCTGTTCCAACCGTCACGACTGTTGAACGA
 CCAAGGTCACGACTACTCCAATTGTCACAACCTGTTCCAACCGTCA**T**GACTGTTGAACGA
 CCAAGGTCAC**A**ACTACTCCAATTGTCACAACCTGTTCCAACCGTCACGACTGTTGAACGA

Closely related organisms are more **similar** to one another than more **distantly related** organisms.

Comparison of the **human** genetic code with that of other organisms show that **chimpanzees** are nearly genetically identical (differ by less than **1.2%**) whereas the **mouse** differs by **≈15%**.

Genetic code of chimps and gorillas is **almost identical** to humans

Remember, the building blocks of proteins are **amino acids**. The **order** of amino acids determines what type of protein is formed.

If amino acid **sequences** are compared between different organisms, the ones with the **fewest differences** are the most closely related.

Which of these organisms is most closely related to the human?

Animal with Hemoglobin	Amino Acids that differ from human
Gorilla	1
Rhesus Monkey	8
Mouse	27
Chicken	45
Frog	67
Lamprey	125

