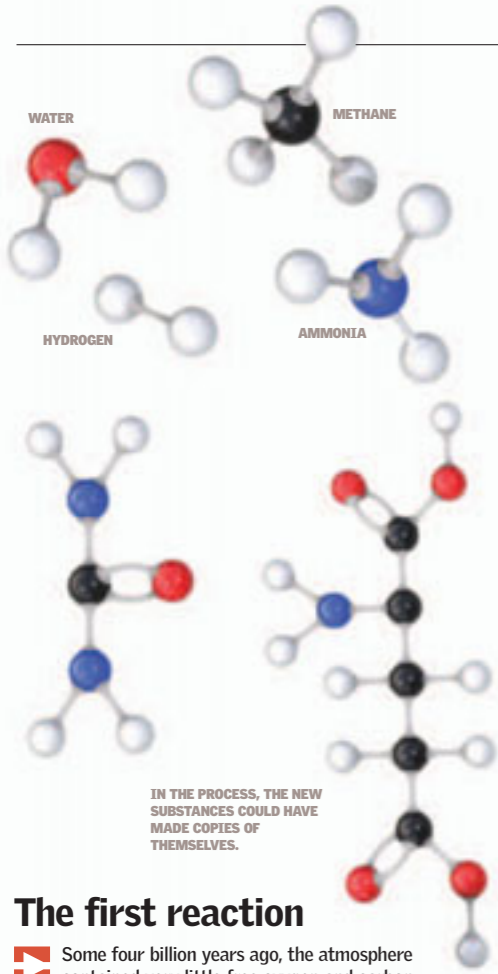


Chemical Processes

Although it is assumed today that all life-forms are connected to the presence of oxygen, life began on Earth more than three billion years ago in the form of microorganisms. They determined, and still determine today, the biological processes on Earth. Science seeks to explain the origin of life as a series of chemical reactions that occurred by chance over millions of years and that gave rise to the various organisms of today. Another possibility is that life on Earth originated in the form of microbes that reached the Earth from space, lodged, for instance, within a meteorite that fell to the Earth's surface. ●

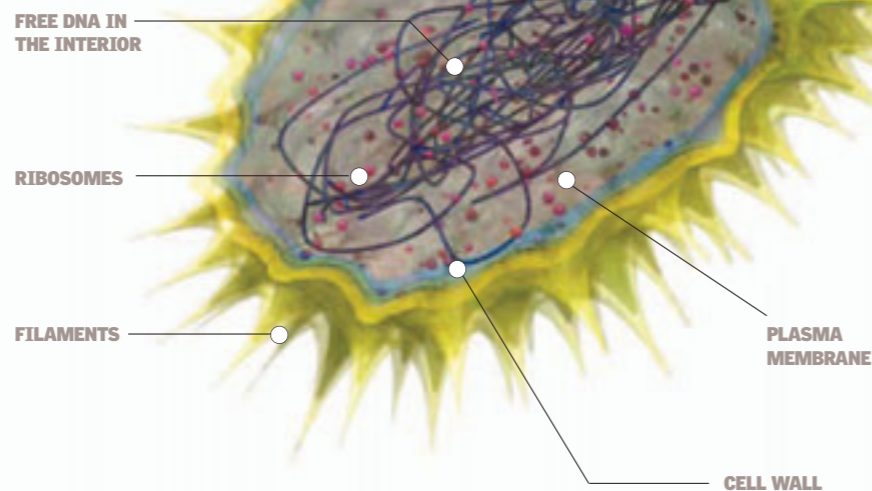


Original Cells

The origin of life on Earth can be inferred from molecular evolution. The first living organisms (prokaryotes) began to develop in groups, giving rise to a process of cooperation called symbiosis. In this way, more complex life-forms called eukaryotes emerged. Eukaryotes have a nucleus that contains genetic information (DNA). In large measure, the development of bacteria was a chemical evolution that resulted in new methods to obtain energy from the Sun and extract oxygen from water (photosynthesis).

Prokaryotes

were the first life-forms, with no nucleus or enveloping membranes. These single-celled organisms had their genetic code dispersed between the cell walls. Today two groups of prokaryotes survive: bacteria and archaeobacteria.



The first reaction

Some four billion years ago, the atmosphere contained very little free oxygen and carbon dioxide. However, it was rich in simple chemical substances, such as water, hydrogen, ammonia, and methane. Ultraviolet radiation and discharges of lightning could have unleashed chemical reactions that formed complex organic compounds (carbohydrates, amino acids, nucleotides), creating the building blocks of life. In 1953, Americans Harold Urey and Stanley Miller tested this theory in the laboratory.

Eukaryotes

have a central nucleus that contains nucleic acid (DNA). The content of the nucleus is called nucleoplasm. The substance outside the nucleus is called cytoplasm, and it contains various organelles with different functions. Many are involved in generating energy for the organism's development.

MITOCHONDRIA

Organelle that produces energy for various cellular functions

INNER MEMBRANE

OUTER MEMBRANE

CENTRIOLE

Key structure for cell division, located in the center of the cell

MICROTUBULES

LYSOSOMES

break down and eliminate harmful substances with powerful enzymes.

A

ANIMALS

Certain aerobic bacteria with respiratory enzymes converted into mitochondria and gave rise to the ancestral cells of modern animals.

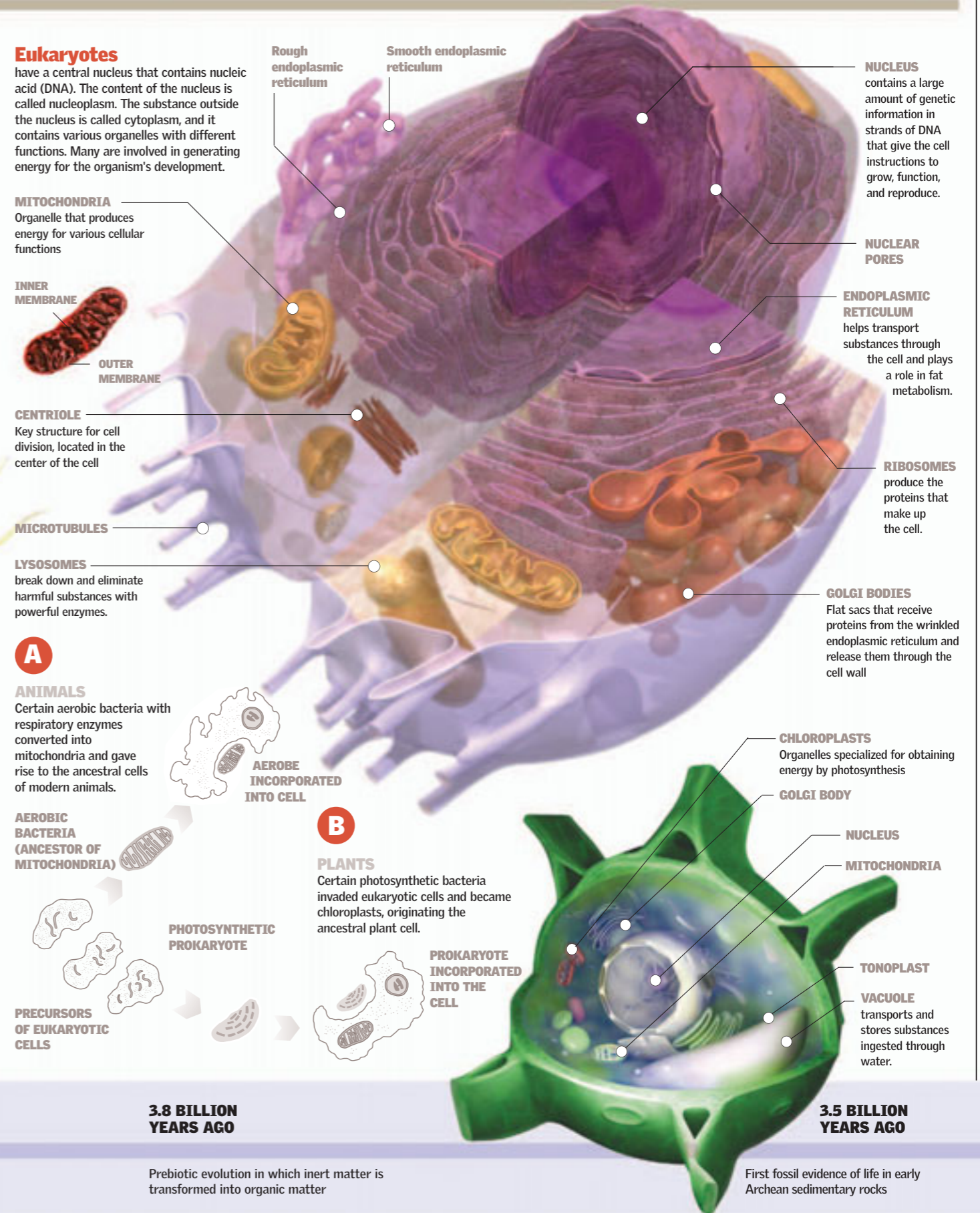
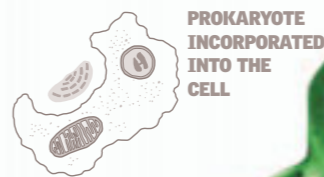
AEROBIC BACTERIA (ANCESTOR OF MITOCHONDRIA)



B

PLANTS

Certain photosynthetic bacteria invaded eukaryotic cells and became chloroplasts, originating the ancestral plant cell.



ARCHEAN
4.6 BILLION YEARS AGO

4.2 BILLION YEARS AGO

4 BILLION YEARS AGO

3.8 BILLION YEARS AGO

3.5 BILLION YEARS AGO

The Earth's atmosphere sets it aside from the other planets.

Volcanic eruptions and igneous rock dominate the Earth's landscape.

The Earth's surface cools and accumulates liquid water.

Prebiotic evolution in which inert matter is transformed into organic matter

First fossil evidence of life in early Archean sedimentary rocks