

Prokaryotic and Eukaryotic Cells

Presented By

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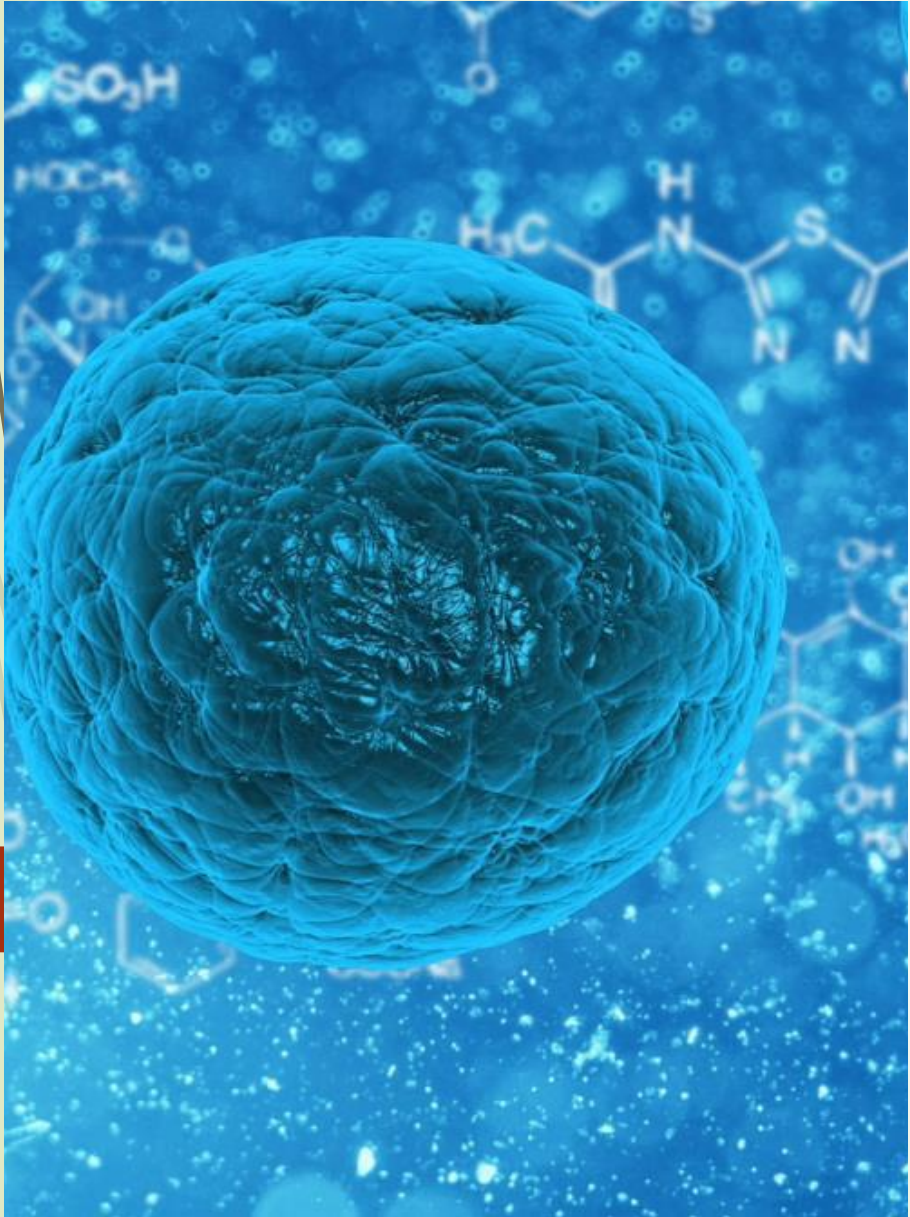
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INTRODUCTION :

- ❖ The cell is the basic functional and structural unit of life.
 - ❖ Cell plays a vital role in all biological activities and includes membrane-bound organelles, which performs several individual functions to keep the cell alive and active.
 - ❖ The cell was first discovered in the year 1665 by an English natural philosopher Robert Hooke
 - ❖ The cell theory was explained by Theodor Schwann and Matthias Jakobe Schneider in the year 1830.
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❑ A Brief History of Cell:



- ❖ **Cell**-comes from the word “small room”, it is the smallest unit of life that can replicate independently.
- ❖ Cells are often referred to as the building blocks of life.
- ❖ Without cells, we would not have life.
- ❖ All living things are made of at least 1 cell.
- ❖ Not all cells serve the same purpose or as the same size or shape.

☐ The history behind the cell's discovery :



ROBERT HOOKE



- ❖ **Robert Hooke**-discovered the cell in 1665.
- ❖ He looked at a cork under a microscope and noticed that the structure of the cork looked similar to cellula (small rooms which monks inhabited).
- ❖ The cells in cork are dead plant cells, and as a result, Hooke could only see the cell walls and none of the cell's internal structure.

ANTON VAN LEEUWENHOEK



- ❖ **Anton Van Leeuwenhoek**-first to see a living cell under a microscope.
- ❖ In 1674, he observed and described algae cells.
- ❖ His description was the first to provide insight on the inside of the cell.

SCHWANN AND SCHLEIDEN



Theodor Schwann-studied the structure of animal cells.

❖ **Matthias Schleiden**-studied the structure of plant cells.

❖ In 1838, the two compared their results and saw that their research had a lot of similarities.

❖ They Theorized:

- The cell is the unit of structure, physiology, and organization of living things.
- The cell retains a dual existence as a distinct entity and a building block in the construction of organisms.

RUDOLPH VIRCHOW



Rudolph Virchow-observed cells reproducing and adding a third tenant to the two created by Schwann and Schleiden.

- ❖ In 1858, he theorized that all cells only arise from pre-existing cells.
- ❖ This tenant and the two created by Schwann and Schleiden, are the backbone of cell theory.

❑ Cell Definition:

- ❖ *“A cell is defined as the smallest, basic unit of life that is responsible for all of life’s processes.”*
- ❖ Cells are the structural, functional, and biological units of all living beings.
- ❖ A cell can replicate itself independently.
- ❖ Hence, they are known as the building blocks of life.
- ❖ Each cell contains a fluid called the cytoplasm, which is enclosed by a membrane.

Also present in the cytoplasm are several biomolecules like proteins, nucleic acids and lipids.

Characteristics of Cell:

- ❖ Cells provide structure and support to the body of an organism.
- ❖ The nucleus(major organelle) holds genetic information necessary for reproduction and cell growth.
- ❖ Every cell has one nucleus and membrane-bound organelles in the cytoplasm.
- ❖ Mitochondria, a double membrane-bound organelle is mainly responsible for the energy transactions vital for the survival of the cell.
- ❖ Lysosomes digest unwanted materials in the cell.
- ❖ Endoplasmic reticulum plays a significant role in the internal organization of the cell. appropriate locations.

❑ Types of Cells:

- ❖ All living organisms are made up of the same basic unit – the cell.
- ❖ Cells vary with respect to their classification
- ❖ There are Two types of cells

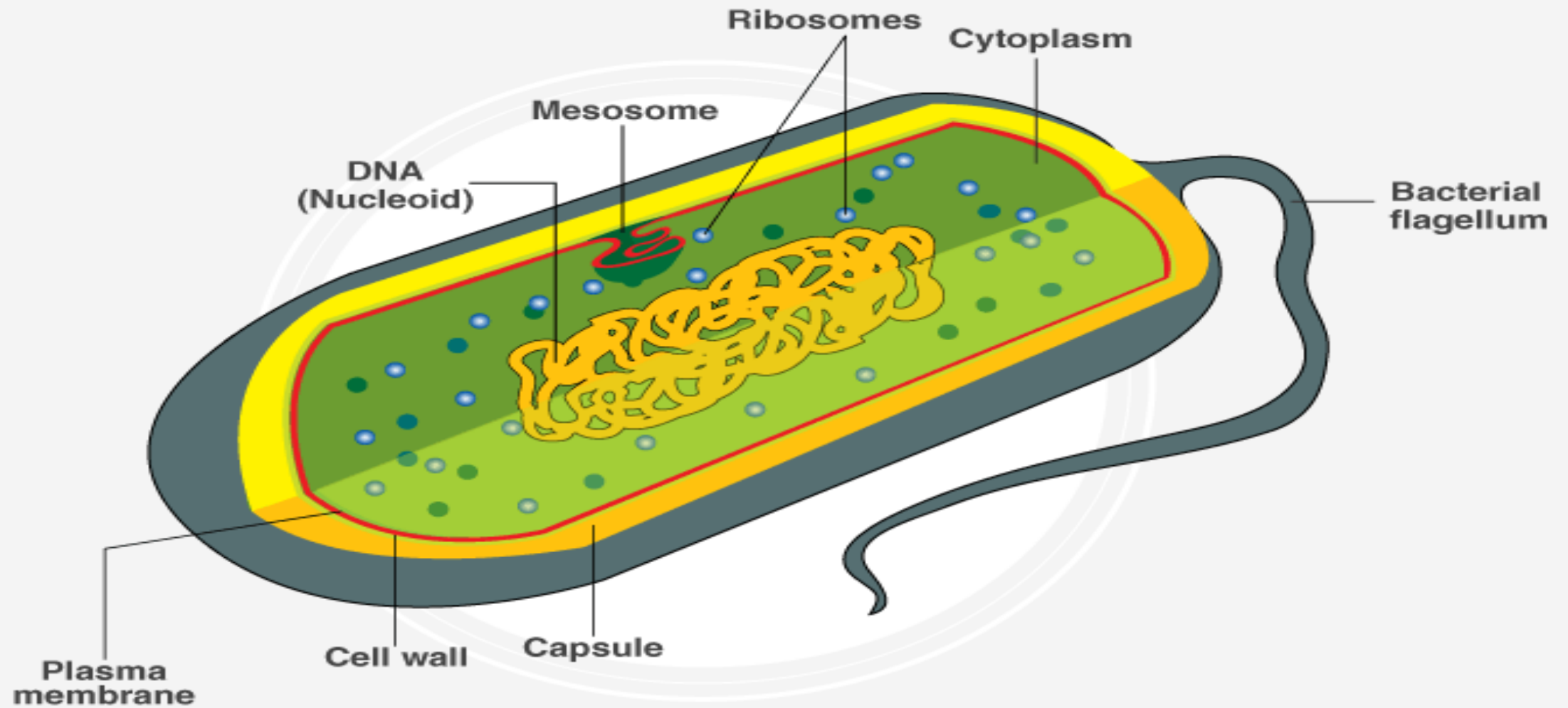
(1) Prokaryotic cell

(2) Eukaryotic cell

❑ (1) Prokaryotic Cell :

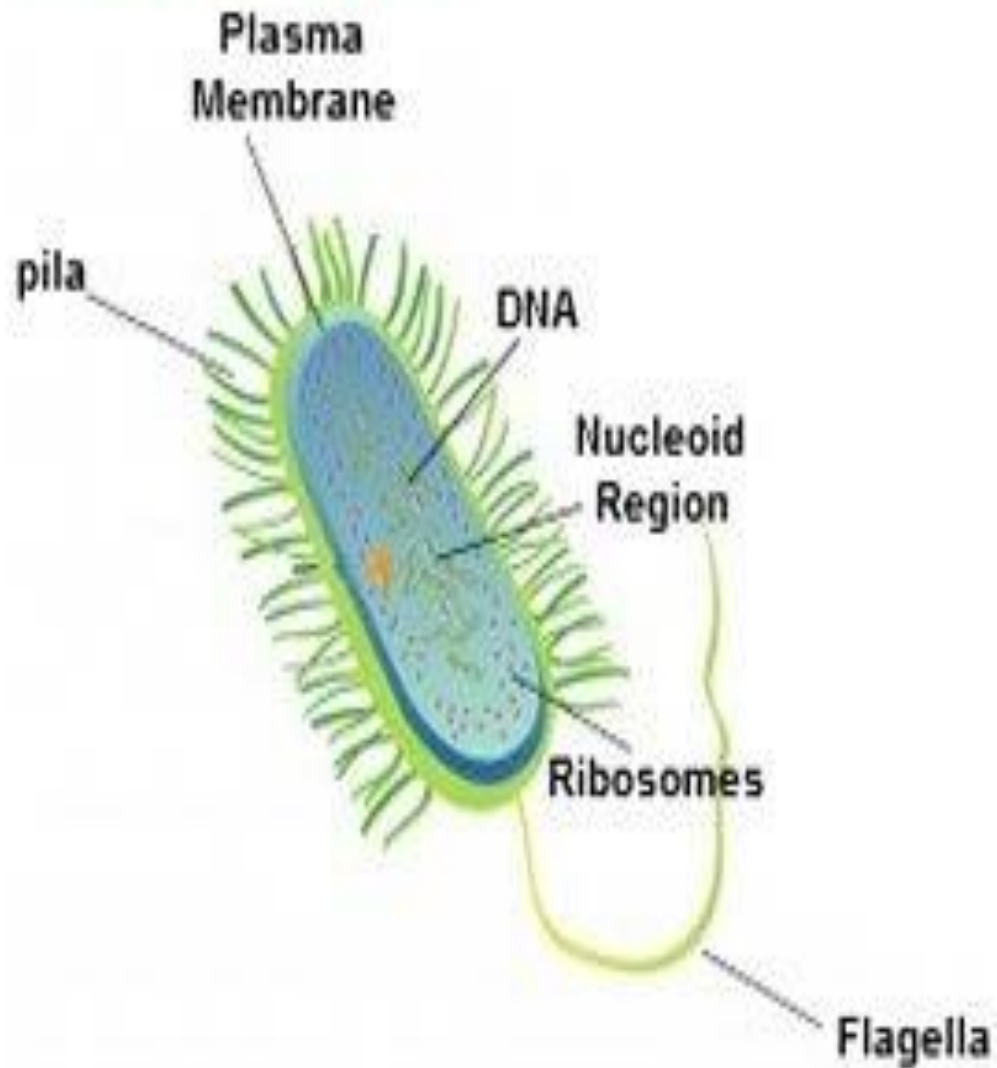
- ❖ The term “**prokaryote**” is derived from the Greek word “*pro*”(meaning: before) and “*karyon*” (meaning: kernel). It translates to “**before nuclei.**”
- ❖ Prokaryotes are one of the most ancient groups of living organisms on earth, with fossil records dating back to almost 3.5 billion years ago.
- ❖ These prokaryotes thrived in the earth's ancient environment, some using up chemical energy and others using the sun's energy.
- ❖ These extremophiles thrived for millions of years, evolving and adapting. Scientists speculate that these organisms gave rise to the eukaryotes.

PROKARYOTIC CELLS

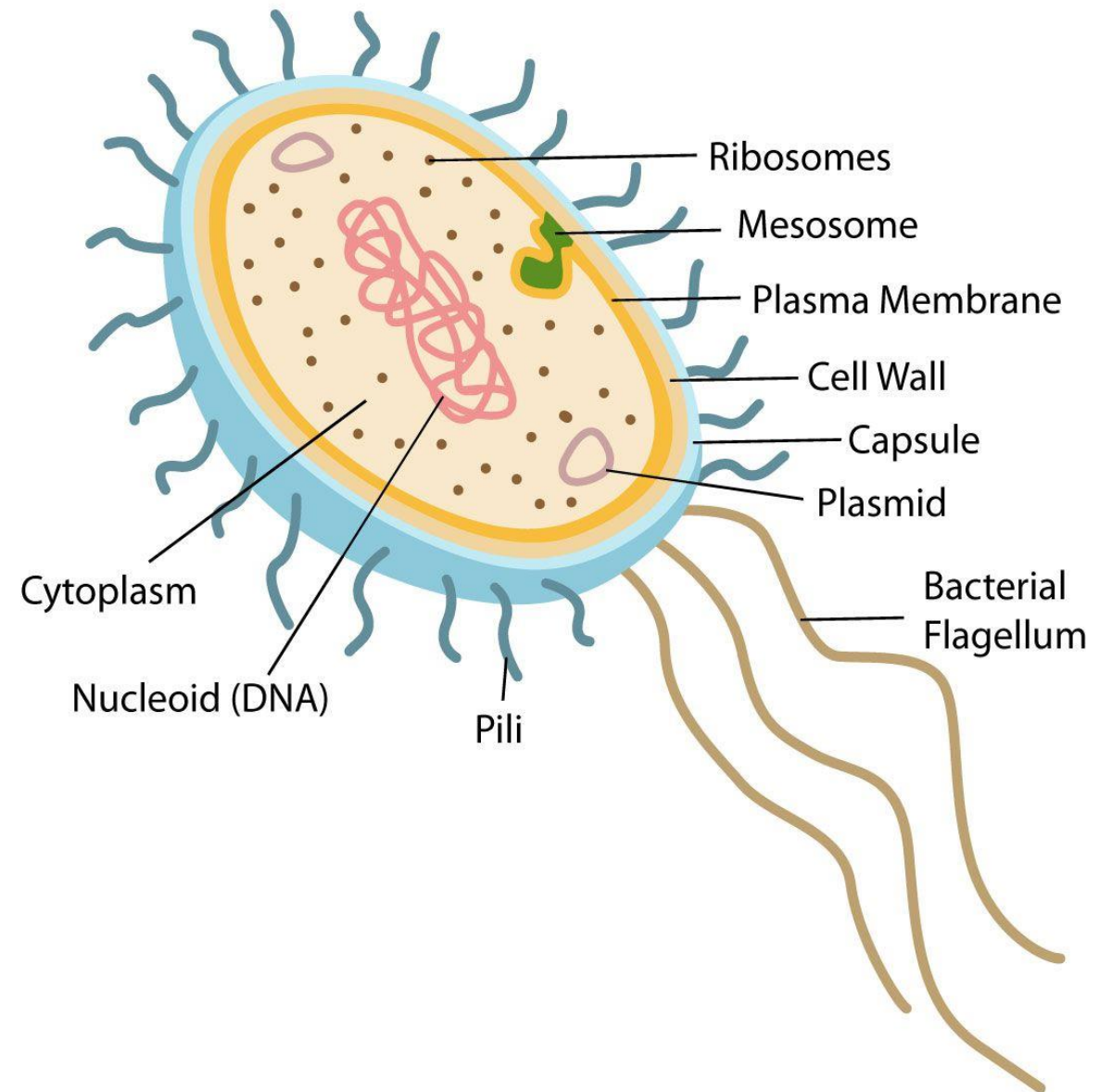


- ❖ Prokaryotic cells are smaller and much simpler.
- ❖ The other defining characteristic of prokaryotic cells is that it does not possess membrane-bound cell organelles such as a nucleus.
- ❖ Reproduction happens through the process of binary fission.
- ❖ Structurally, prokaryotes have a capsule enveloping its entire body, and it functions as a protective coat.
- ❖ This is crucial for preventing the process of phagocytosis.
- ❖ The pilus is a hair-like appendage found on the external surface of most prokaryotes and it helps the organism to attach itself to various environments.
- ❖ The pilus essentially resists being flushed, hence, it is also called attachment pili. It is commonly observed in bacteria.

Prokaryotic Cell



Bacteria Cell

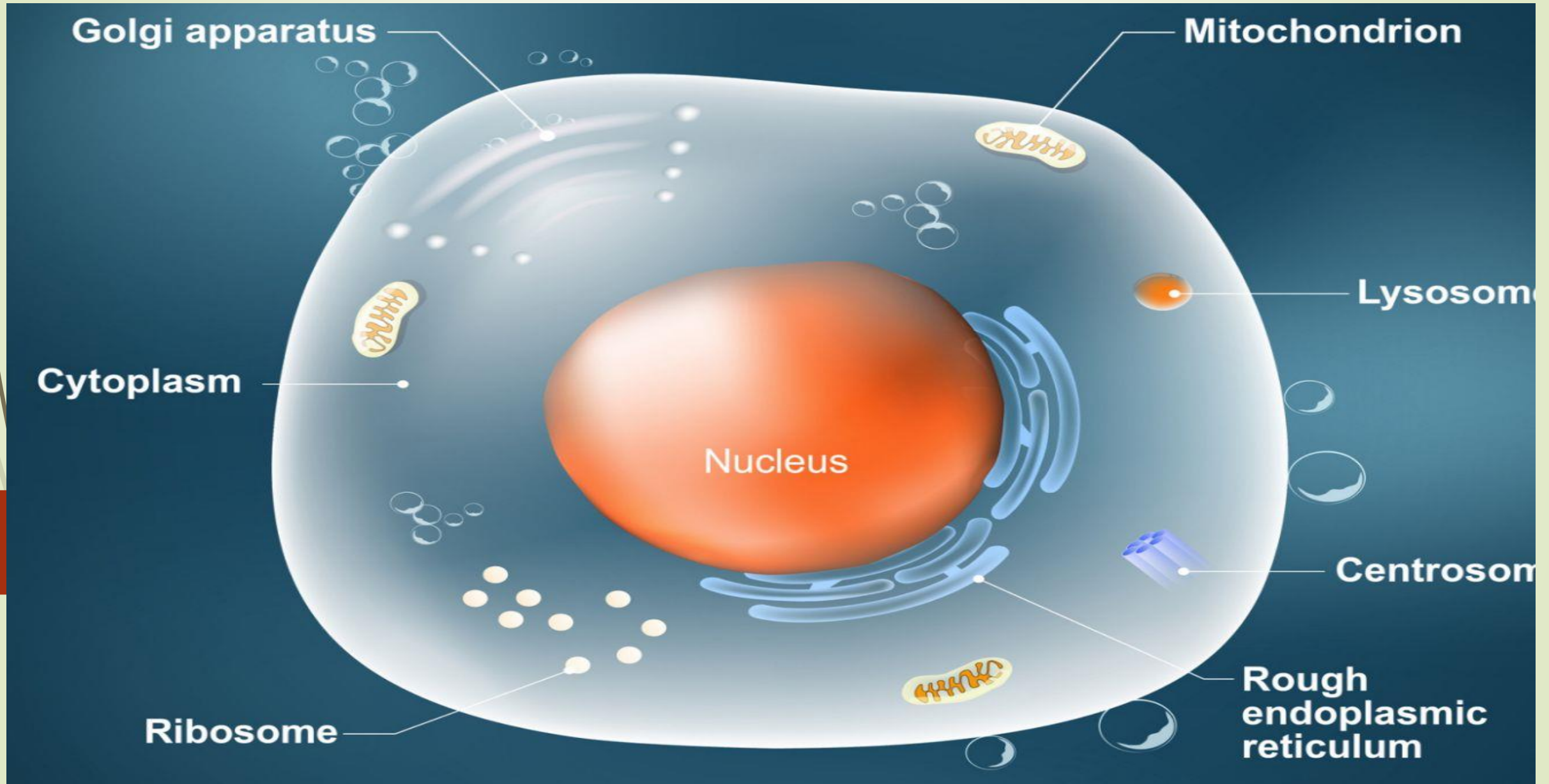


- ❖ The protective coating lies the cell wall, which provides strength and rigidity to the cell.
- ❖ The cytoplasm that helps in cellular growth, and this is contained within the plasma membrane, which separates the interior contents of the cell from the outside environment.
- ❖ Within the cytoplasm, ribosomes exist and it plays an important role in protein synthesis. It is also one of the smallest components within the cell.
- ❖ Some prokaryotic cells contain special structures called mesosomes which assist in cellular respiration.
- ❖ Most prokaryotes also contain plasmids, which contains small, circular pieces of DNA.
- ❖ The examples of Prokaryotic organisms are bacteria and archaea.

❑ (2)Eukaryotic Cell :

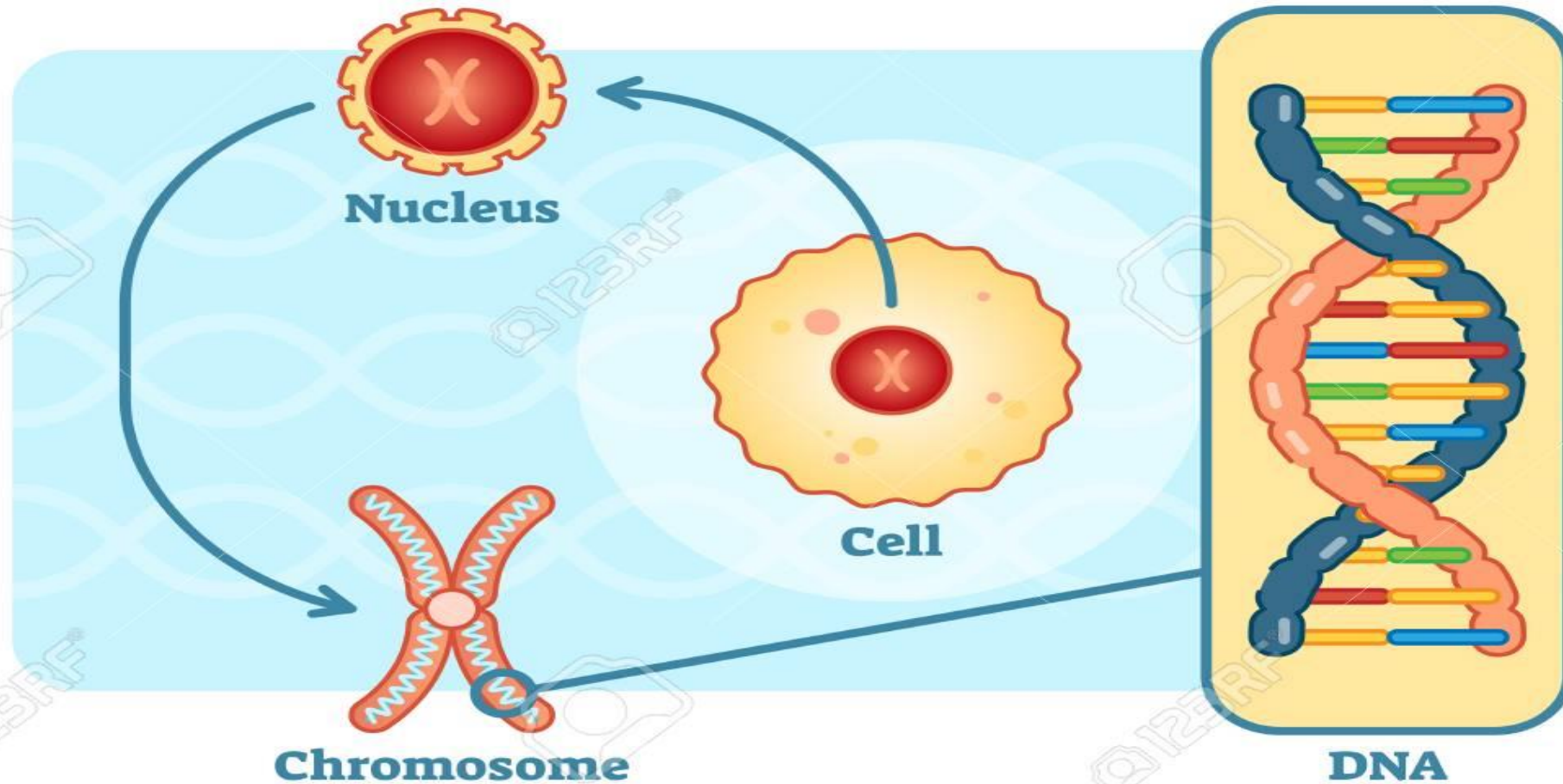
- ❖ The term “**Eukaryotes**” is derived from the Greek word “eu”, (meaning: good) and “karyon” (meaning: kernel), therefore, translating to “**good or true nuclei.**”
 - ❖ Eukaryotes are more complex and much larger than the prokaryotes. They include almost all the major kingdoms except kingdom monera.
 - ❖ Structurally, eukaryotes possess a cell wall, which supports and protects the plasma membrane.
- The cell is surrounded by the plasma membrane and it controls the entry and exit of certain substances.
- ❖ The nucleus contains DNA, which is responsible for storing all genetic information.

Animal Cell



DNA

(Deoxyribonucleic Acid)



- ❖ The nucleus is surrounded by the nuclear membrane.
- ❖ Within the nucleus exists the nucleolus, and it plays a crucial role in synthesizing proteins.
- ❖ Eukaryotic cells also contain mitochondria, which are responsible for the creation of energy, which is then utilized by the cell.
- ❖ Present in only plant cells, chloroplasts are the subcellular sites of photosynthesis.
- ❖ Endoplasmic reticulum helps in the transportation of materials.
- ❖ Besides these, there are also other cell organelles that perform various other functions and these include ribosomes, lysosomes, Golgi bodies, cytoplasm, chromosomes, vacuoles, and centrosomes.
- ❖ Examples of eukaryotes include almost every unicellular organism with a nucleus and all multicellular organisms.

❑ Difference between Prokaryotic and Eukaryotic Cells :

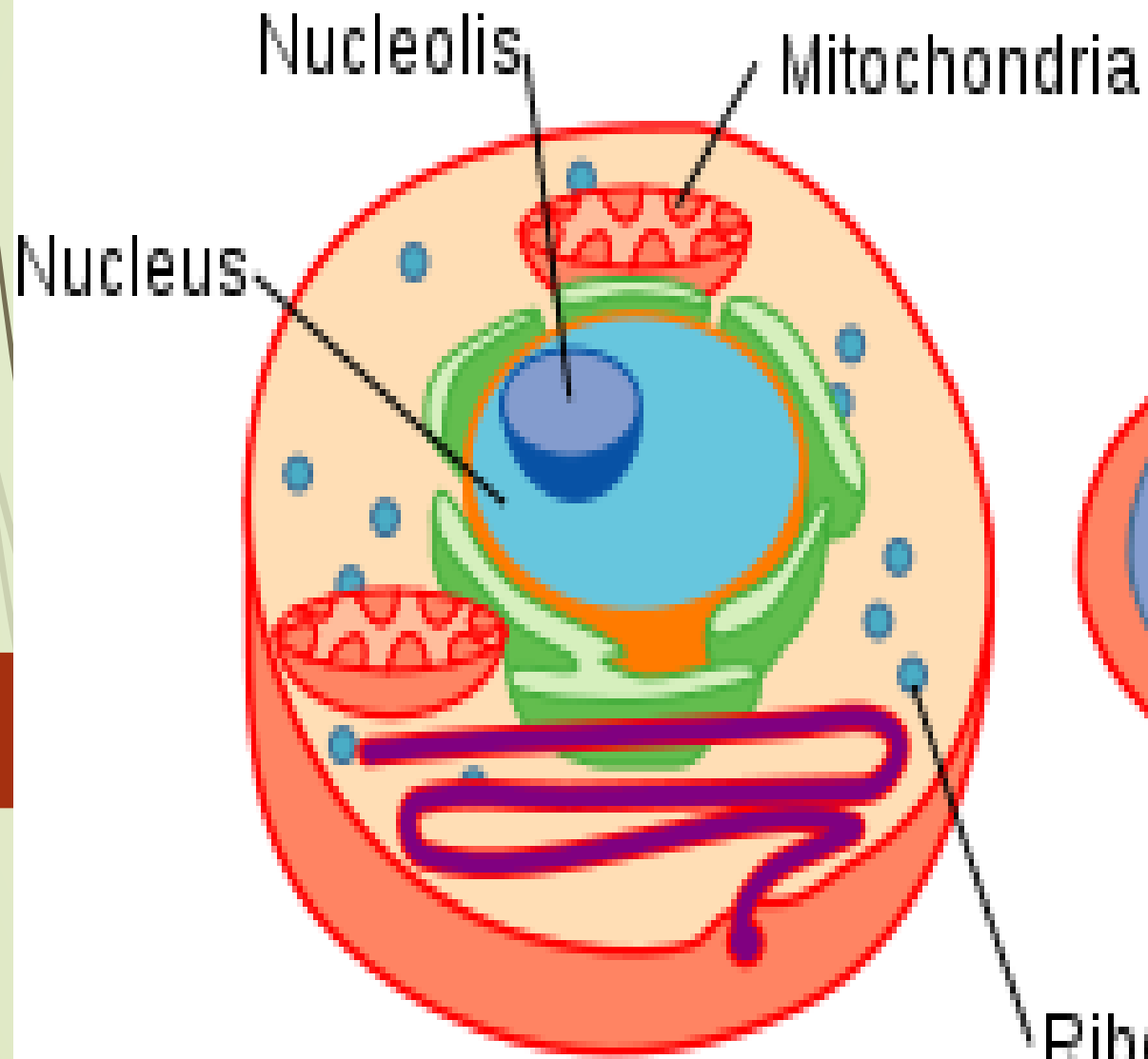
❖ The list of differences between prokaryotic and eukaryotic cells are summarized as follows:

	Prokaryotes	Eukaryotes
Type of Cell	Always unicellular	Unicellular and multi-cellular
Cell size	Ranges in size from 0.2 μm – 2.0 μm in diameter	Size ranges from 10 μm – 100 μm in diameter
Cell wall	Usually present; chemically complex in nature	When present, chemically simple in nature
Nucleus	Absent	Present

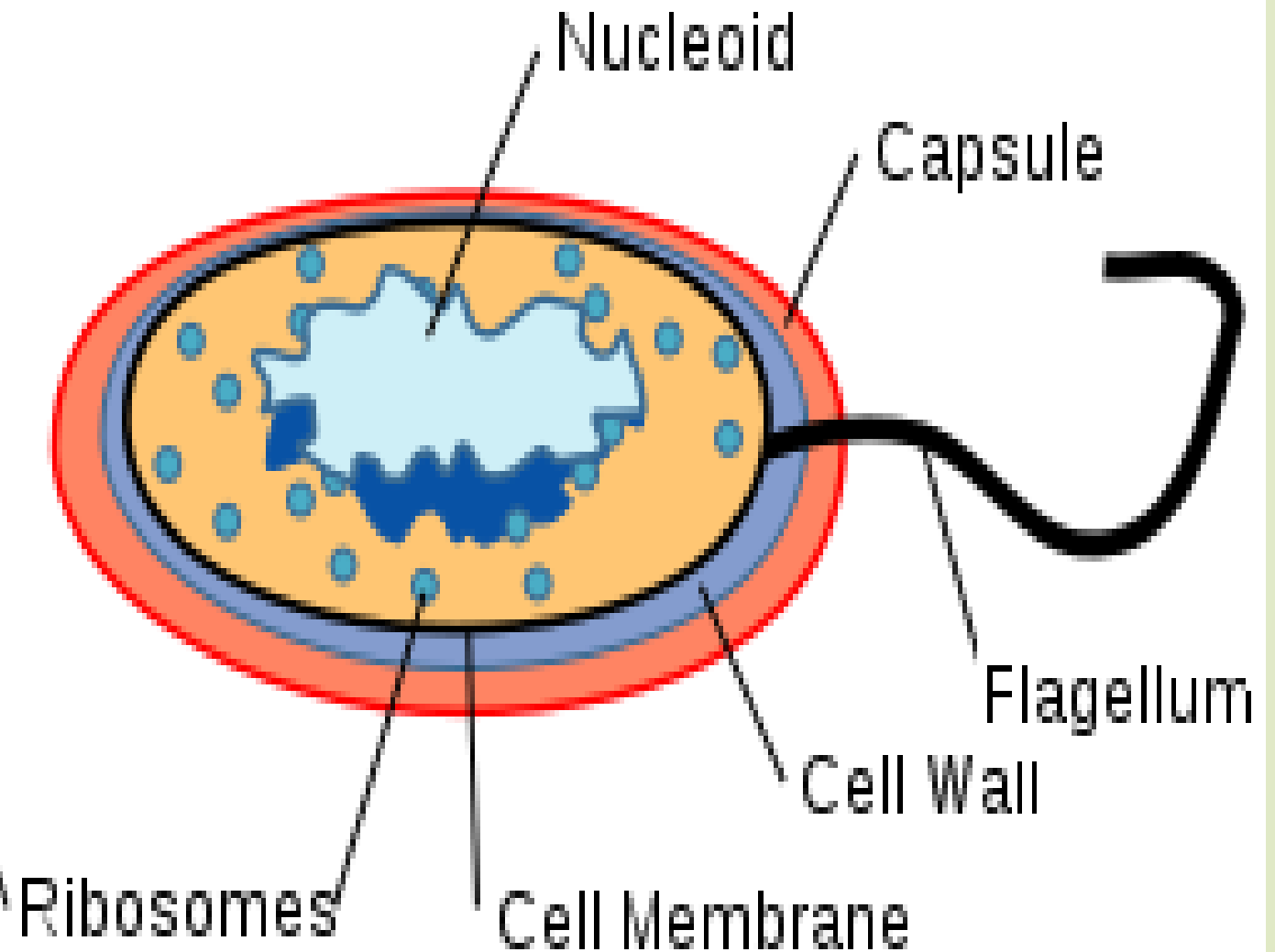
	Prokaryotes	Eukaryotes
Ribosomes	Present. Smaller in size and spherical in shape	Present. Comparatively larger in size and linear in shape
DNA arrangement	Circular	Linear
Mitochondria	Absent	Present
Cytoplasm	Present, but cell organelles absent	Present, cell organelles present
Endoplasmic reticulum	Absent	Present

Plasmids	Present	Very rarely found in eukaryotes
Ribosome	Small ribosomes	Large ribosomes
Lysosome	Lysosomes and centrosomes are absent	Lysosomes and centrosomes are present
Cell division	Through binary fission	Through mitosis
Flagella	The flagella are smaller in size	The flagella are larger in size
Reproduction	Asexual	Both asexual and sexual
Example	Bacteria and Archaea	Plant and Animal cell

Eukaryote



Prokaryote





THANK YOU

THANK YOU