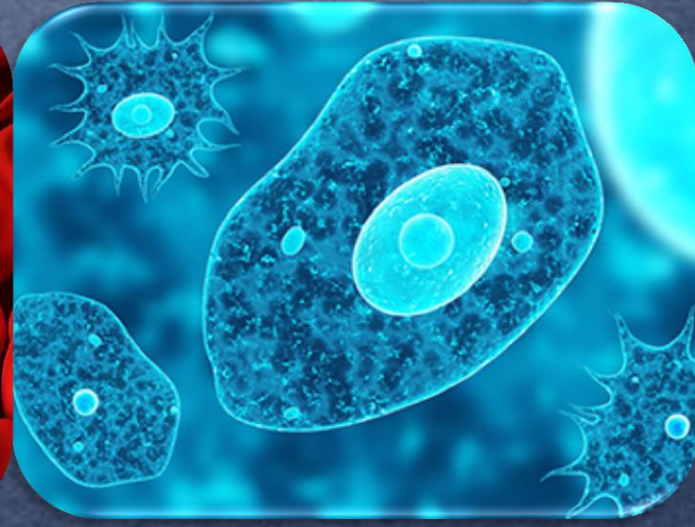
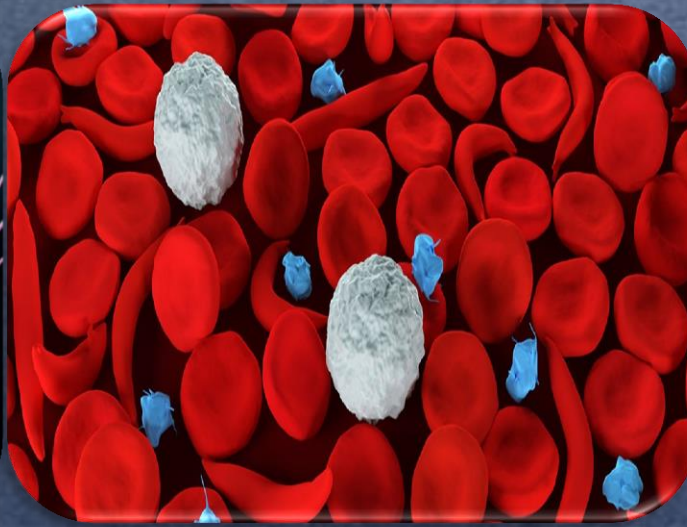


Cells: Prokaryote vs Eukaryote



Second Lecture

Dr. Warqaa Al- Sheikh

Cell Theory

- ❖ Cells are the basic units of living organisms.
- ❖ The cell theory states that:
 1. All living things are made of one or more cells.
 2. Cells are the basic unit of structure and function in living things.
 3. All cells come from other cells.

Sizes of Living Things

1m	10cm	1cm	1mm	100 μ m	10 μ m	1 μ m	100nm	10nm	1nm	0.1nm
1m	10 ⁻¹ m	10 ⁻² m	10 ⁻³ m	10 ⁻⁴ m	10 ⁻⁵ m	10 ⁻⁶ m	10 ⁻⁷ m	10 ⁻⁸ m	10 ⁻⁹ m	10 ⁻¹⁰ m



Eye



Light Microscope



Electron Microscope



child



hand



finger



hair



blood cell



bacteria



virus



DNA

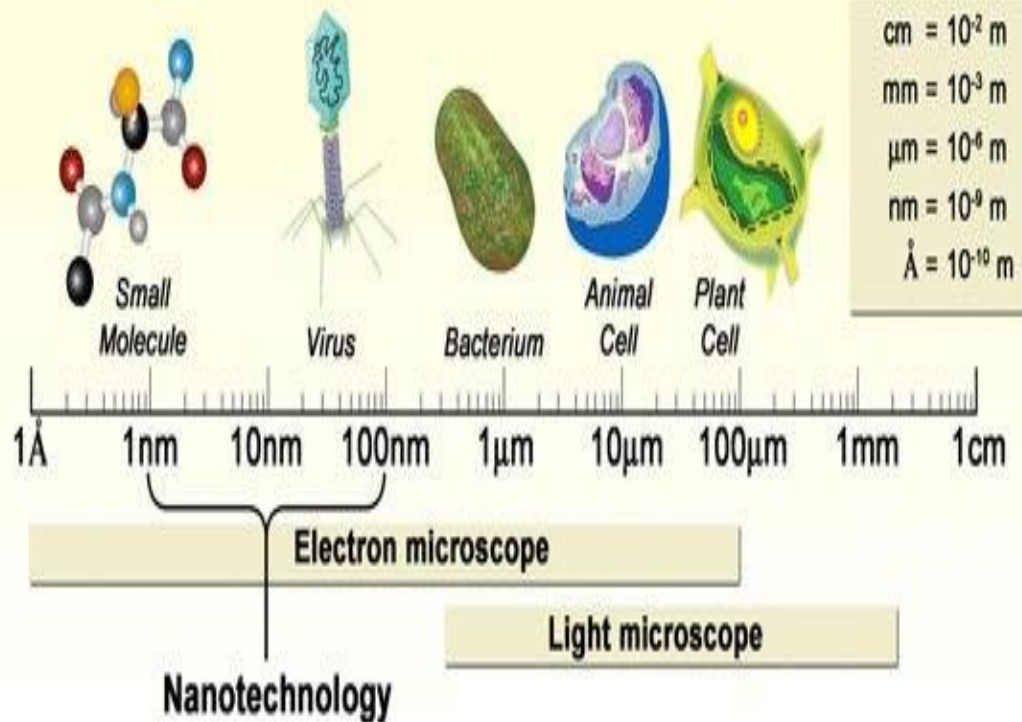


glucose



atom

Relative sizes of cells and their components



ORGANISMS

Unicellular Organism

Multicellular Organism

**Organism that only
have a single cell**

**Organism consisting
of many cells**

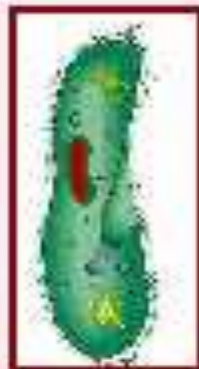
Amoeba

Bacteria

Paramecium

Plants

Animals



Classification of Life

Cells have evolved two different architectures:

Prokaryote “style”

Eukaryote “style”

Prokaryotic

Eukaryotic



Bacteria



Archaea



Eukarya

Earliest organisms

Cell Types:-

■ Two categories:

1. Cells that **do not** have membrane-bound organelles called **prokaryotic cells**

➤ **Unicellular** organisms such as **bacteria** are examples of prokaryotes.

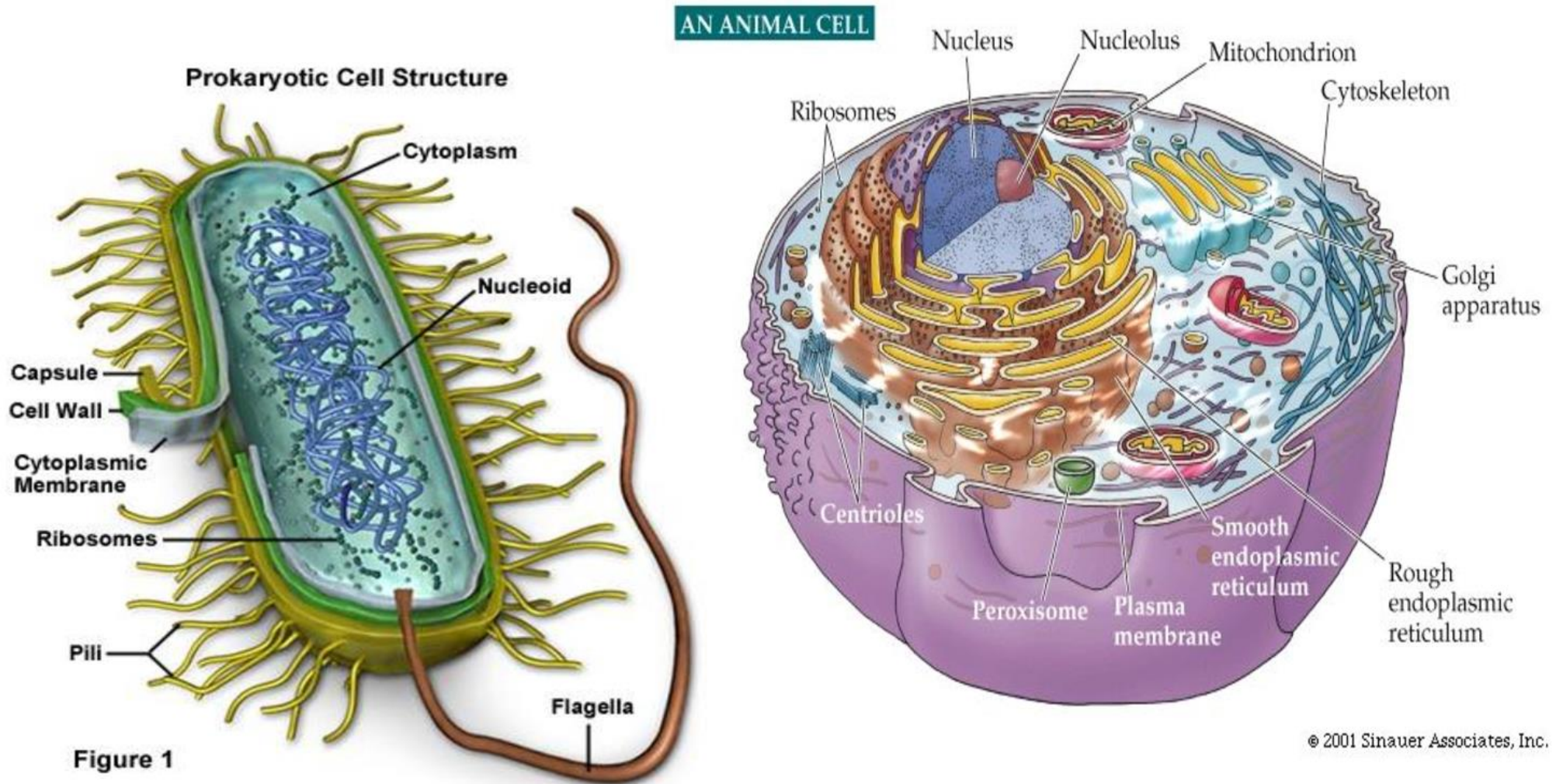
Or, Prokaryotes are organisms whose cells lack a nucleus.

2. Cell that **have** membrane-bound organelles called **Eukaryotic Cells.**

Or, Eukaryotes are organisms with cells that contain a nucleus.

The four kingdoms of **Eukaryotes**: Protista, Fungi, Plants, & Animals.

Prokaryotic vs Eukaryotic Cells



Cell Types:-

1. Prokaryotic cells

1. Most ancient and abundant type of cells which commonly known as bacteria
2. Structurally smaller and simpler than eukaryotic cells (which have a nucleus)
3. 10-100 microns in size
4. Single-celled(unicellular) or Filamentous (strings of single cells).
5. Lack a membrane-bound nucleus
6. Prokaryotic cells are placed in two taxonomic domains:

➤ Bacteria

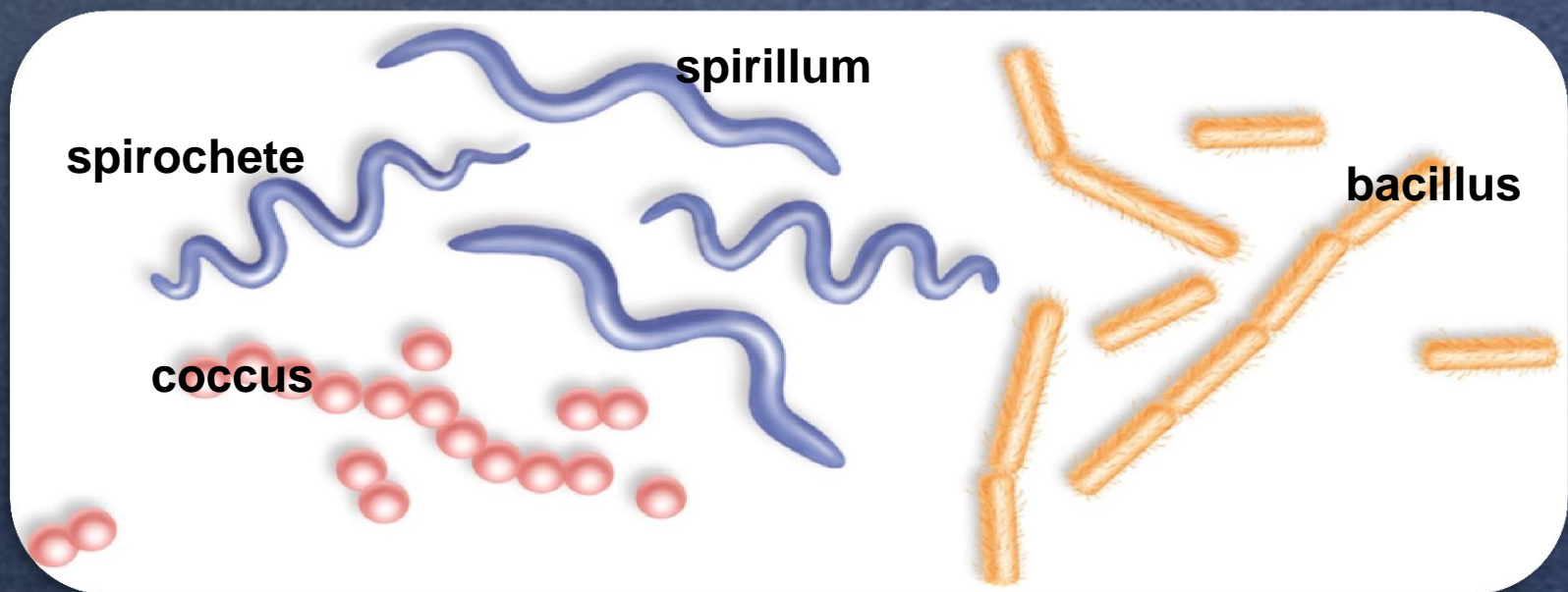


➤ Archaea

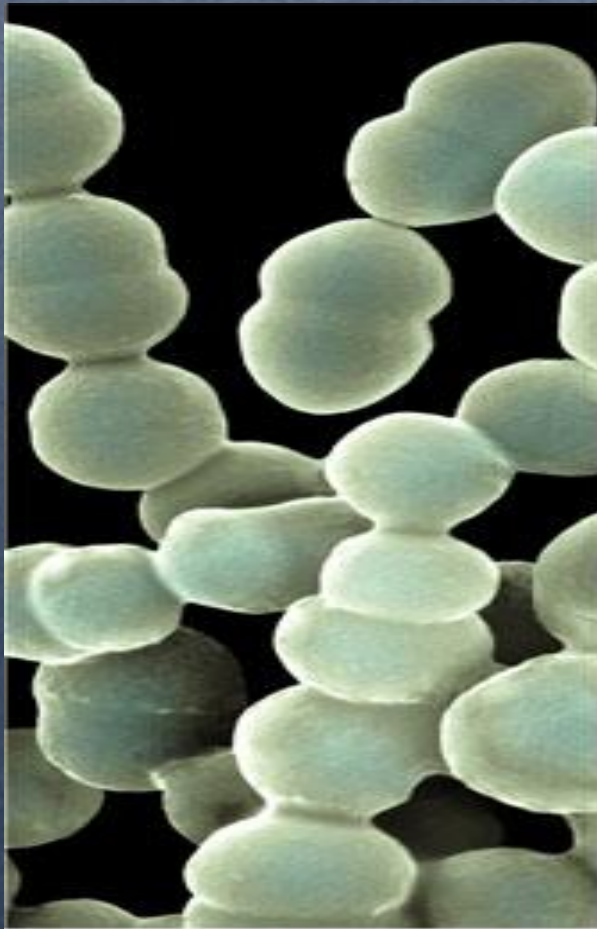


The Structure of Bacteria

- Extremely small - 1–1.5 μm wide and 2–6 μm long
- Occur in three basic shapes:
 1. Spherical coccus,
 2. Rod-shaped bacillus,
 3. Spiral spirillum (if rigid) or spirochete (if flexible).



Bacteria shapes



1 μm

(a) Spherical (cocci)



2 μm

(b) Rod-shaped (bacilli)



5 μm

(c) Spiral

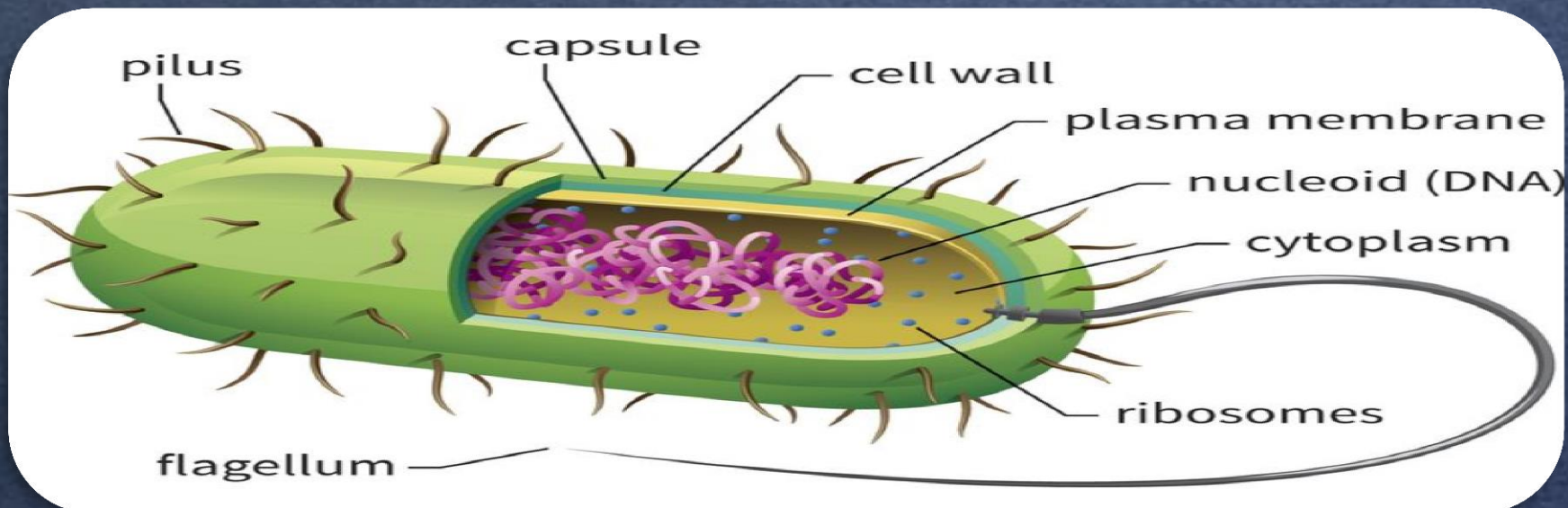
Prokaryotic Cell Structure

Prokaryote cells are simply built

1. **capsule**: slimy outer coating
2. **cell wall**: tougher middle layer
3. **cell membrane**: delicate inner skin

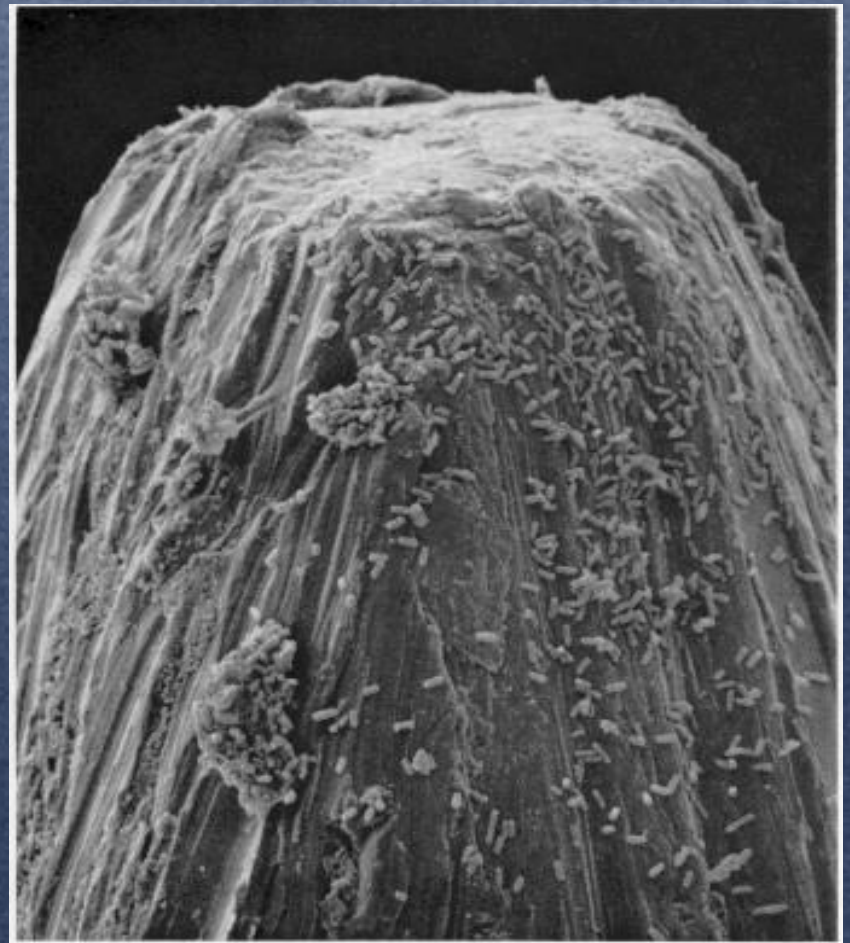
Prokaryote cells are simply built

1. **cytoplasm**: inner liquid filling
2. **DNA** in one big loop
3. **pilli**: for sticking to things
4. **flagella**: for swimming
5. **ribosomes**: for building proteins



These are prokaryote:

E. coli bacteria on the head of a steel pin

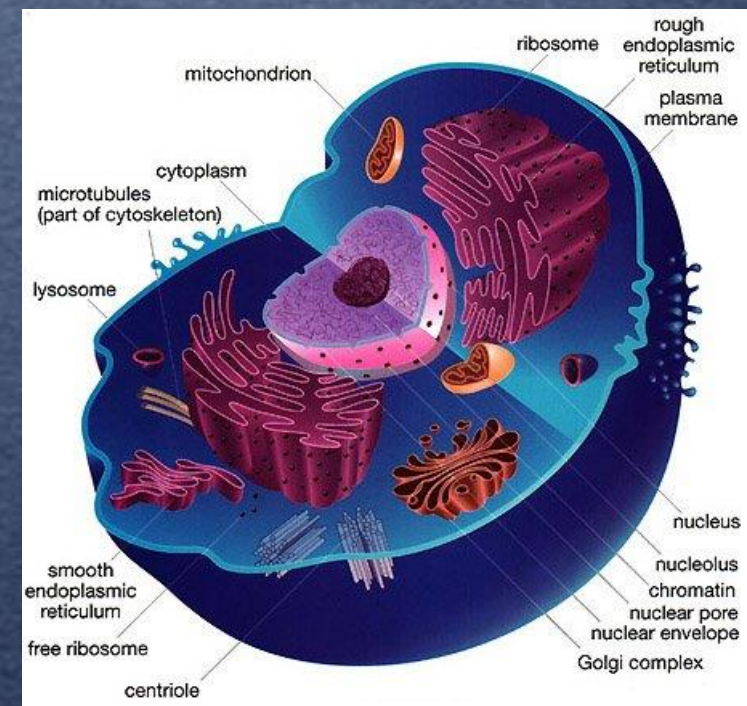


Cell Types

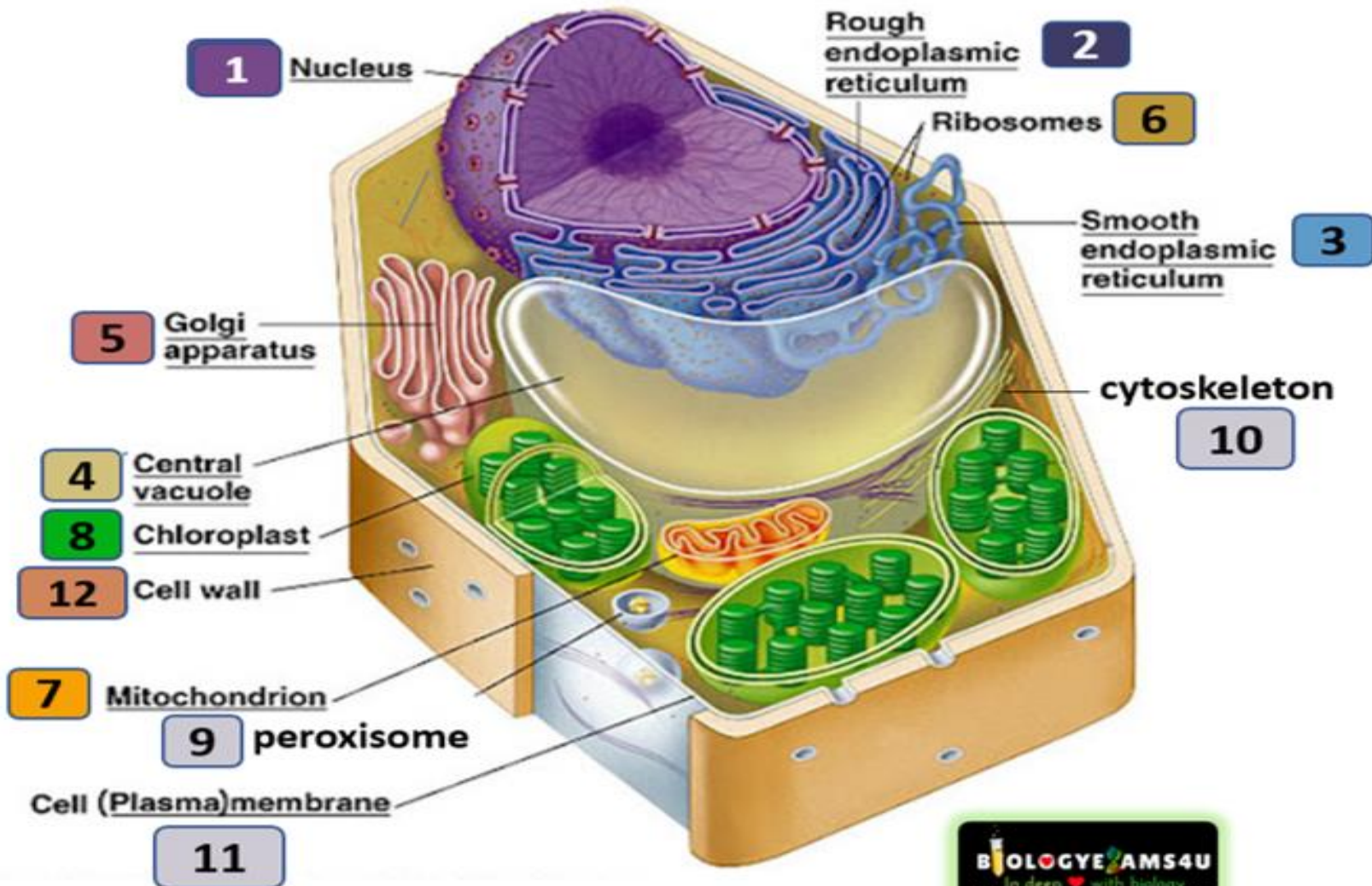
2. Eukaryotic cells-

Cells that contain organelles which are held together by membranes
Examples include plant and animal cells.

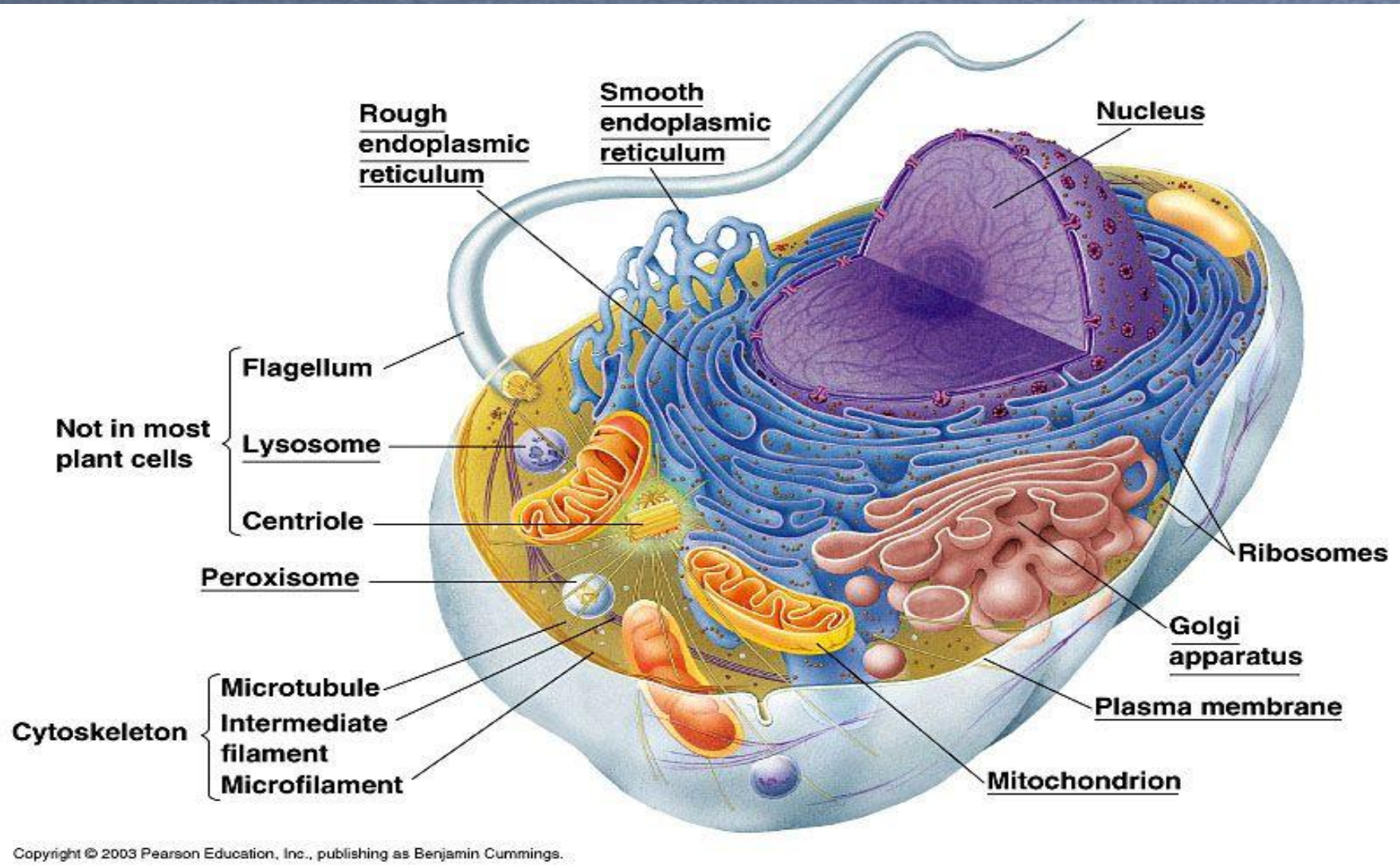
- The **plasma membrane**/cell membrane
 1. the flexible boundary of a cell
 2. separates a cell from its surroundings.
- Cell Organelles
- Cytoplasm



Plant Cell structure

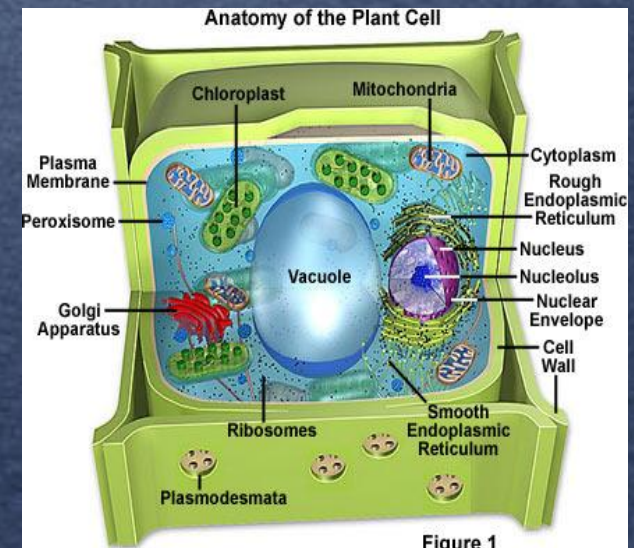
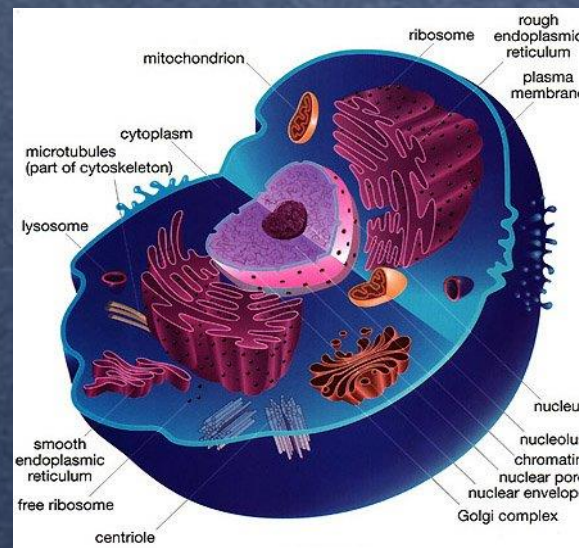


Animal Cell structure



Eukaryotes are bigger and more complicated

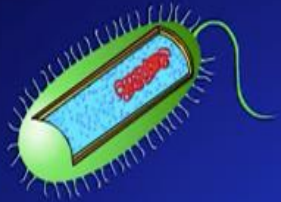
1. Have organelles
2. Have chromosomes
3. can be multicellular
4. include animal and plant cells



Prokaryote vs Eukaryote

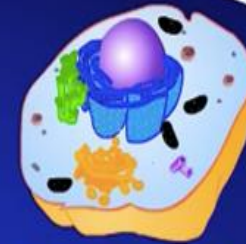
Prokaryotic cells	Eukaryotic cells
no true nucleus, only an area where DNA is found	distinct nucleus, with a nuclear envelope
(Pro) DNA is not associated with proteins	DNA is associated with proteins called histones.
some DNA may be in the form of circular strands called plasmids	There are no plasmids and DNA is linear.
no membrane-bounded organelles	membrane-bounded organelles, such as mitochondria, are present
no chloroplasts, only bacterial chlorophyll associated with the cell-surface membrane in some bacteria	chloroplasts present in plants and algae
ribosomes are smaller (70S)	ribosomes are larger (80S)
cell wall made of murein (peptidoglycan)	where present, cell wall is made mostly of cellulose (or chitin in fungi)
may have an outer mucilaginous layer called a capsule	no capsule

Prokaryote vs Eukaryote



PROKARYOTES

- oldest cell type
- small and simple
- lack nucleus
- lack organelles
- single-celled
- single circular chromosome



EUKARYOTES

- evolved from prokaryotes
- larger and more complex
- contain nucleus
- contain organelles
- single-celled or multicellular
- multiple linear chromosomes

BOTH

- have DNA
- have ribosomes
- have cytoplasm
- have plasma membrane

Differences in structure & function in Plant Cell & Animal Cell

Differences in structure

Feature	Plant cell	Animal cell
Cell wall	Cellulose cell wall present	Cell wall absent
Chloroplast	Present in large numbers in the thin cytoplasm lining	absent
Number and size of vacuoles	One large permanent vacuole	Numerous small temporary vacuoles
Relative size	Large	Small

Differences in function

Feature	Plant cell	Animal cell
Shape	Regular elongated cylindrical shape	Irregular shape
Ability to make food	Makes their own food by trapping sunlight in a process known as photosynthesis	Cannot make their own food
Turgidity	Can become turgid	Cannot become turgid

Plant Cell Vs Animal Cell

