Biology: Cell

Lab. 2
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A **cell** is the smallest unit of life that can replicate independently, and cells are often called the "building blocks of life".

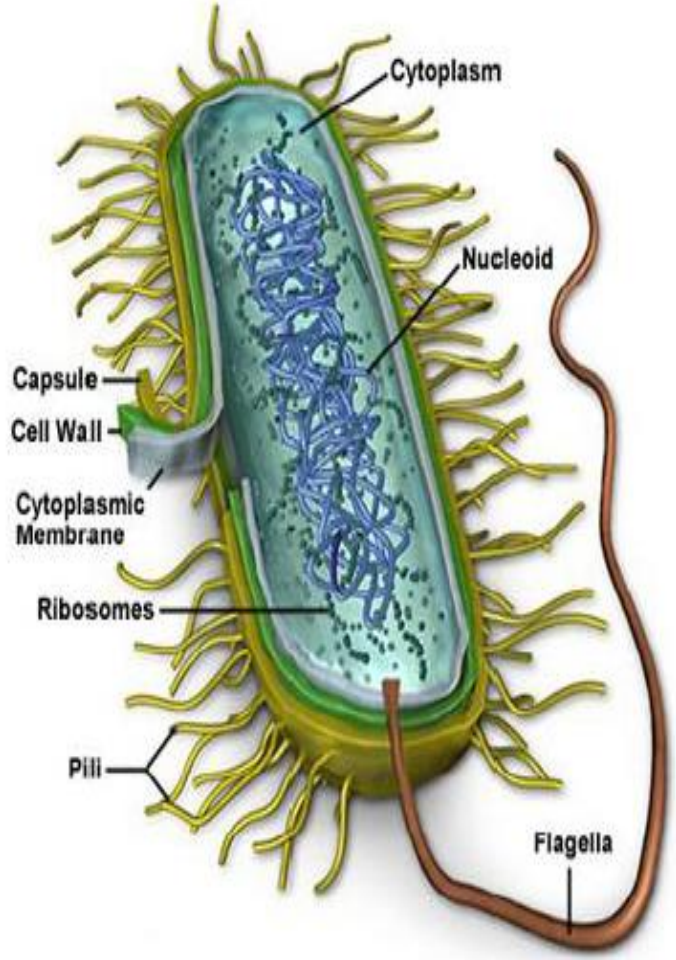
The study of cells is called **cell biology**.

Cells consist of **cytoplasm enclosed** within a **membrane**, which contains many biomolecules such as proteins and nucleic acids. **Organisms** can be classified as **unicellular** (consisting of a single cell; including bacteria) or **multicellular** (including plants and animals).

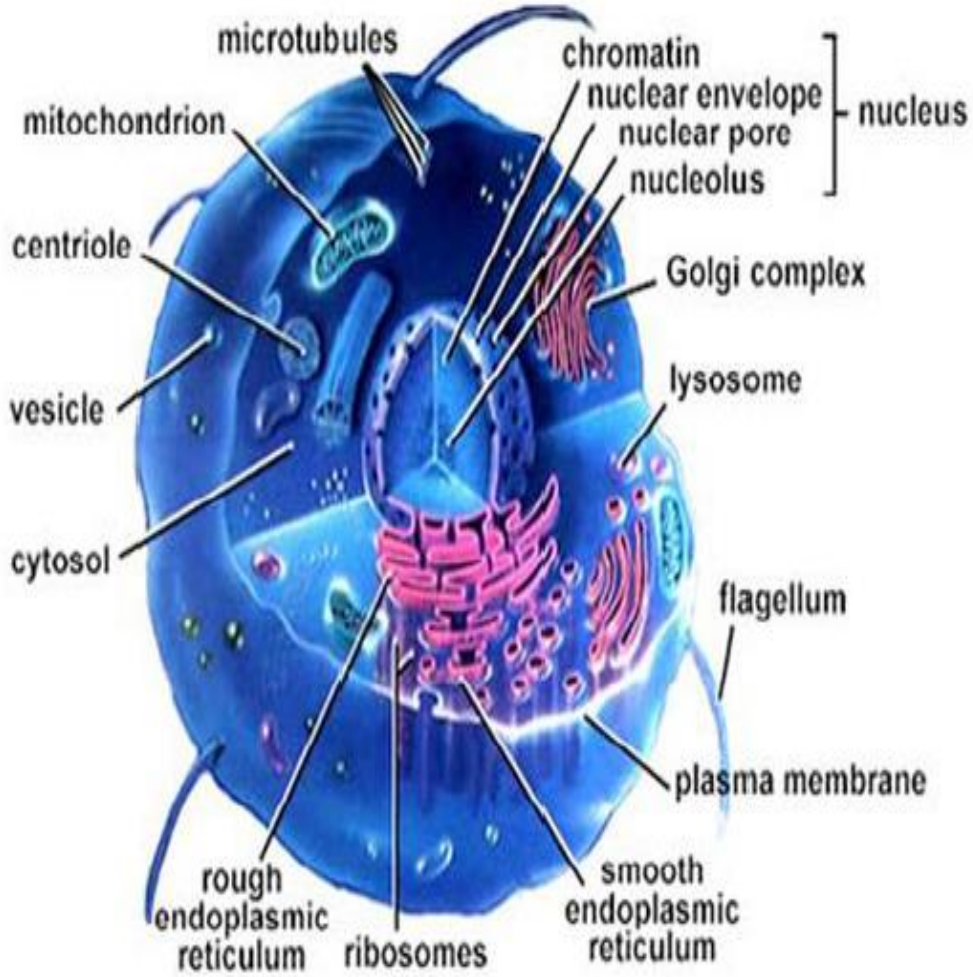
While the number of **cells** in **plants** and **animals** varies from species to species, humans contain more than 10 trillion (1012) cells. Most plant and animal cells are visible only under a **microscope**.

Organelle

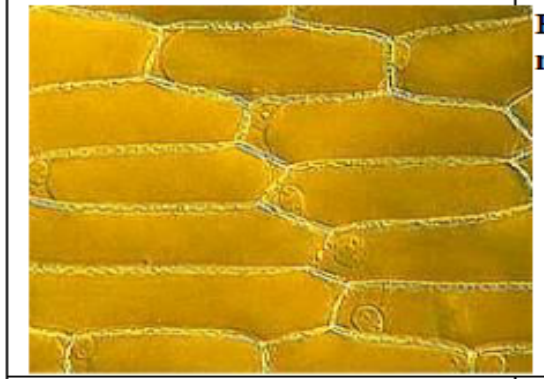
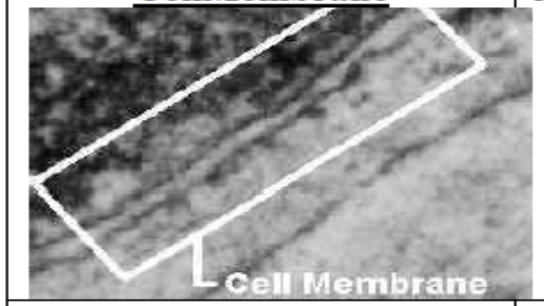
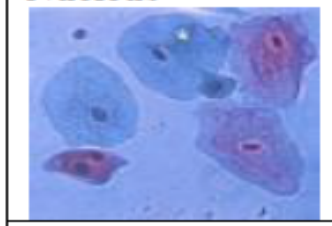
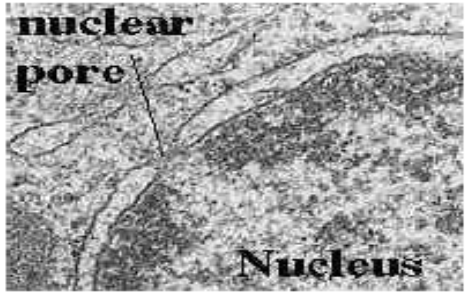
Organelles are parts of the cell that are adapted and/or specialized for carrying out one or more vital functions, analogous to the organs of the human body (such as the heart, lung, and kidney, with each organ performing a different function). Both eukaryotic and prokaryotic cells have organelles.

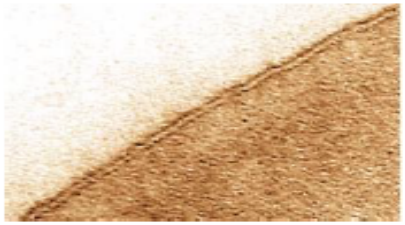
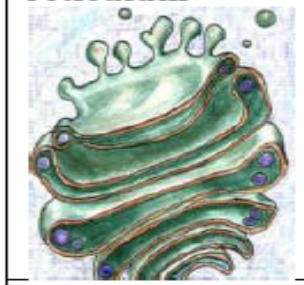
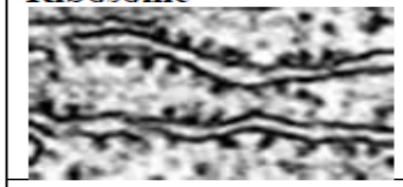
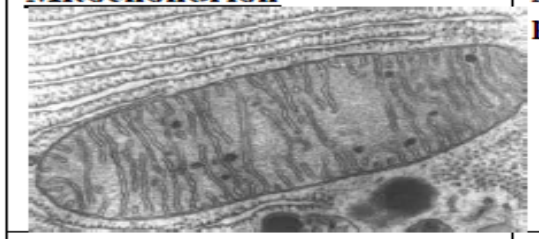
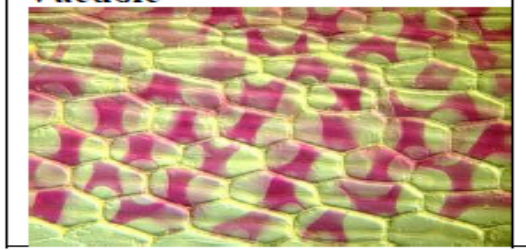


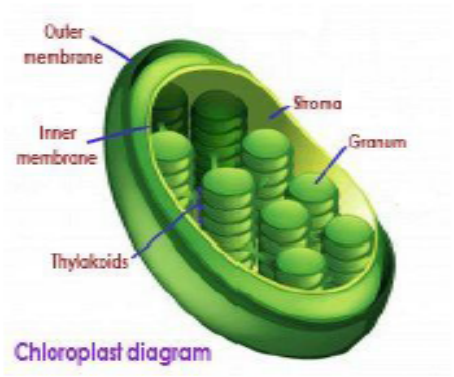
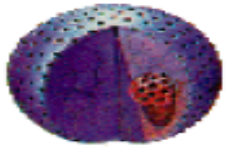
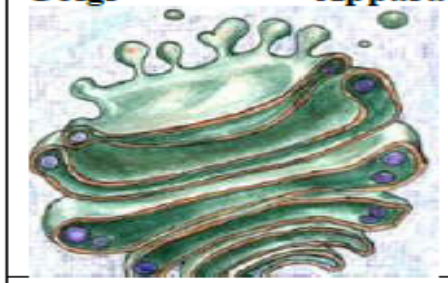
prokaryotic cell
(bacteria)

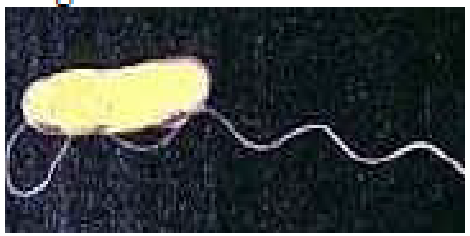
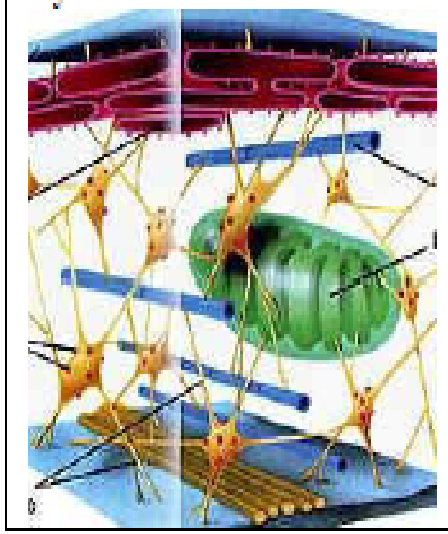


eukaryotic cell
(protists, fungi, animals, plants)

CELL STRUCTURE	LOCATION	DESCRIPTION	FUNCTION
Cell Wall 	Plant, Fungi, & Bacteria, but not animal cells	• Outer layer • Rigid & strong • Made • of cellulose	• Support (grow tall) • Protection • allows H_2O, O_2, CO_2 to diffuse in & out of cell
CellMembrane 	All cells	• Plant - inside cell wall • Animal - outer layer; cholesterol • Double layer of phospholipids with proteins • Selectively permeable	• Support • Protection • Controls movement of materials in/out of cell • Barrier between cell and its environment • Maintains homeostasis
Nucleus 	All cells except prokaryotes	• Large, oval • May contain 1 or more nucleoli • Holds DNA	• Controls cell activities • Contains the hereditary material of the cell
 Nuclear membrane	All cells except prokaryotes	• Surrounds nucleus • Double membrane • Selectively permeable	• Controls movement of materials in/out of nucleus

Cytoplasm 	**All cells**	• **Clear, thick, jellylike material (cytosol)** • **Organelles found inside cell membrane** • **Contains the cytoskeleton fibers**	• **Supports and protects cell organelles**
Endoplasmic reticulum (ER) 	**All cells except prokaryotes**	• **Network of tubes or membranes** • **Smooth w/o ribosomes** • **Rough with embedded ribosomes** • **Connects to nuclear envelope & cell membrane**	• **Carries materials through cell** • **Aids in making proteins**
Ribosome 	**All cells**	• **Small bodies free or attached to ER** • **Made of rRNA & protein**	• **Synthesizes proteins**
Mitochondrion 	**All cells except prokaryotes**	• **Peanut shaped** • **Double membrane** • **Outer membrane smooth** • **Inner membrane folded into cristae**	• **Breaks down sugar (glucose) molecules to release energy** • **Site of aerobic cellular respiration1111**
Vacuole 	**Plant cells have a single, large vacuole** **Animal cells have small vacuoles**	• **Fluid-filled sacs** • **Largest organelle in plant cells**	• **Store food, water, metabolic & toxic wastes** • **Store large amounts of food or sugars in plants**

Lysosome 	**Plant – uncommon** **Animal – common**	• **Small and round with a single membrane**	• **Breaks down larger food molecules into smaller molecules** • **Digests old cell parts**
Chloroplast 	**Plants and algae**	• **Green, oval containing chlorophyll (green pigment)** • **Double membrane with inner membrane modified into sacs called thylakoids** • **Stacks of thylakoids called grana & interconnected** • **Gel like innermost substance called stroma**	• **Uses energy from sun to make food (glucose) for the plant** • **Process called photosynthesis** • **Release oxygen**
nucleolus 	**All cells except prokaryotes**	• **Found inside the cell's nucleus** • **May have more than one** • **Disappear during cell division**	• **Make ribosomes**
Golgi Apparatus 	**All cells except prokaryotes**	• **Stacks of flattened sacs**	• **Have a *cis* & *trans* face** • **Modify proteins made by the cells** • **Package & export proteins**
Cilia 	**Animal cells, Protozoans**	• **Have a 9-2 arrangement of microtubules** • **Short, but numerous**	• **Movement**

Flagellum 	Bacterial cells & Protozoans	• Have a 9-2 arrangement of microtubules • Long, but few in number	• Movement
Centrioles 	Animal cells	• Paired structures near the nucleus • Made of a cylinder of microtubule pairs	• Separate chromosome pairs during mitosis
Cytoskeleton 	All cells	• Made of microtubules 7 microfilaments	• Strengthen cell & maintains the shape • Moves organelles within the cell

Plant and **animal cells** have several differences and similarities. For example, animal cells do not have a cell wall or chloroplasts but plant cells do. **Animal cells** are round and irregular in shape while **plant cells** have fixed, rectangular shapes.

Plant and **animal cells** are **both eukaryotic** cells, so they have several features in common, such as the presence of a cell membrane, and cell organelles, like the nucleus, mitochondria, and endoplasmic reticulum.

Animal Cell versus Plant Cell comparison chart		
	Animal Cell	Plant Cell
Cell wall	Absent	Present (formed of cellulose)
Shape	Round (irregular shape)	Rectangular (fixed shape)
Vacuole	One or more small vacuoles (much smaller than plant cells).	One, large central vacuole taking up 90% of cell volume.
Centrioles	Present in all animal cells	Only present in lower plant forms.
Chloroplast	Animal cells don't have chloroplasts.	Plant cells have chloroplasts because they make their own food.
Cytoplasm	Present	Present
Ribosomes	Present	Present
Mitochondria	Present	Present
Plastids	Absent	Present
Endoplasmic Reticulum (Smooth and Rough)	Present	Present
Golgi Apparatus	Present	Present
Plasma Membrane	Only cell membrane	Cell wall and a cell membrane
Microtubules/ Microfilaments	Present	Present
Flagella	May be found in some cells	May be found in some cells
Lysosomes	Lysosomes occur in cytoplasm.	Lysosomes usually not evident.
Nucleus	Present	Present
Cilia	Present	Most plant cells do not contain cilia.

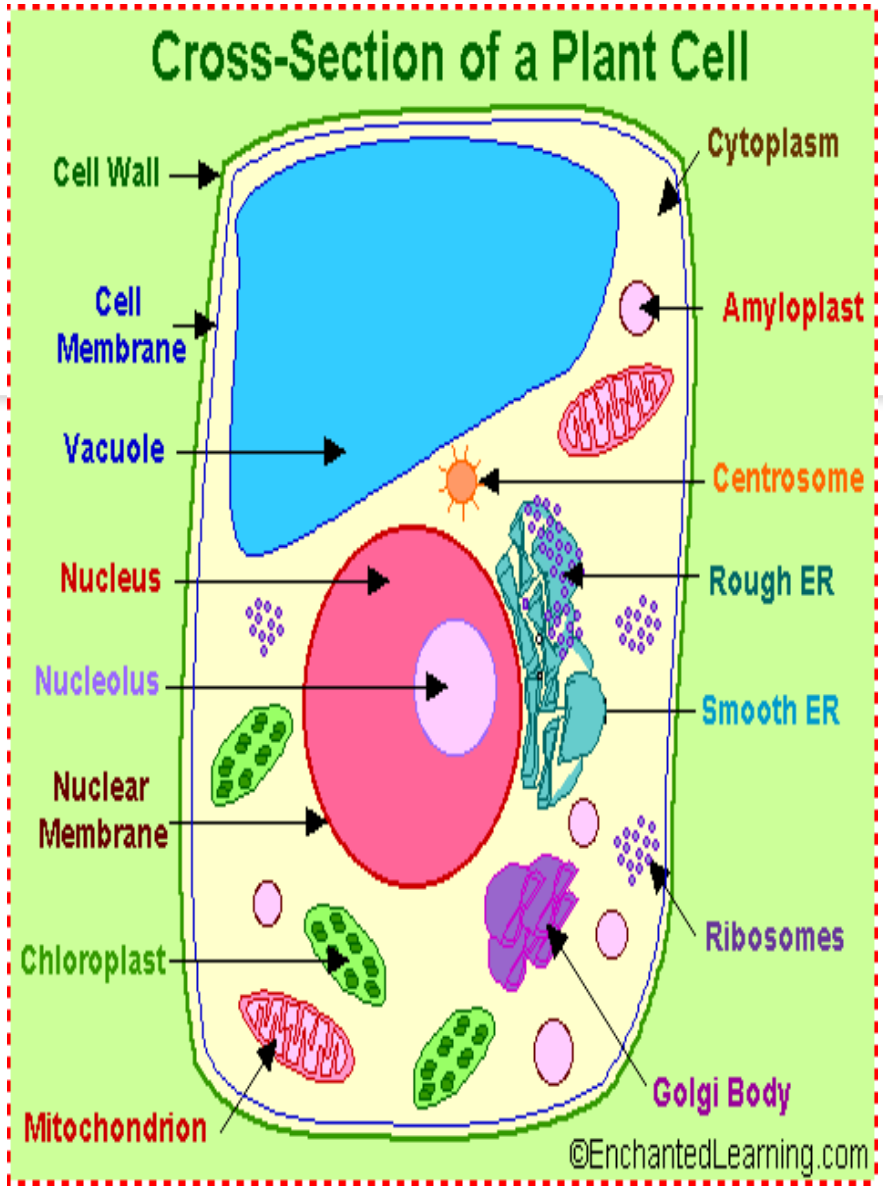
Cells are of two types :

Eukaryotic: which **contains** a nucleus and membrane-bound structures called organelles. Ex.(plants , animals ,& fungi).

Prokaryotic: which **do not contain** a nucleus and membrane-bound structures called organelles. Ex.(bacteria).

Prokaryotes are single-celled organisms, while **eukaryotes** can be either single-celled or multicellular.

Eukaryotes	**Prokaryotes**
1. Has a nucleus with a nuclear envelope. 2. Bigger and more complex than prokaryotes. 3. Have membrane bound Organelles (golgi, ER, lysosomes…etc) 4. DNA – double-stranded and forms chromosomes (highly organized) 5. Can be uni- OR multicellular organisms 6. Ex: animals, plants, fungi	1. NO nucleus 2. NO membrane bound organelles 3. ALL are unicellular 4. Smaller than eukaryotic cells 5. DNA – single strand and circular 6. Ex: ALL Bacteria


Cross-Section of a Plant Cell
Cell Wall
Cytoplasm
Cell Membrane
Amyloplast
Vacuole
Centrosome
Nucleus
Rough ER
Nucleolus
Smooth ER
Nuclear Membrane
Ribosomes
Chloroplast
Golgi Body
Mitochondrion
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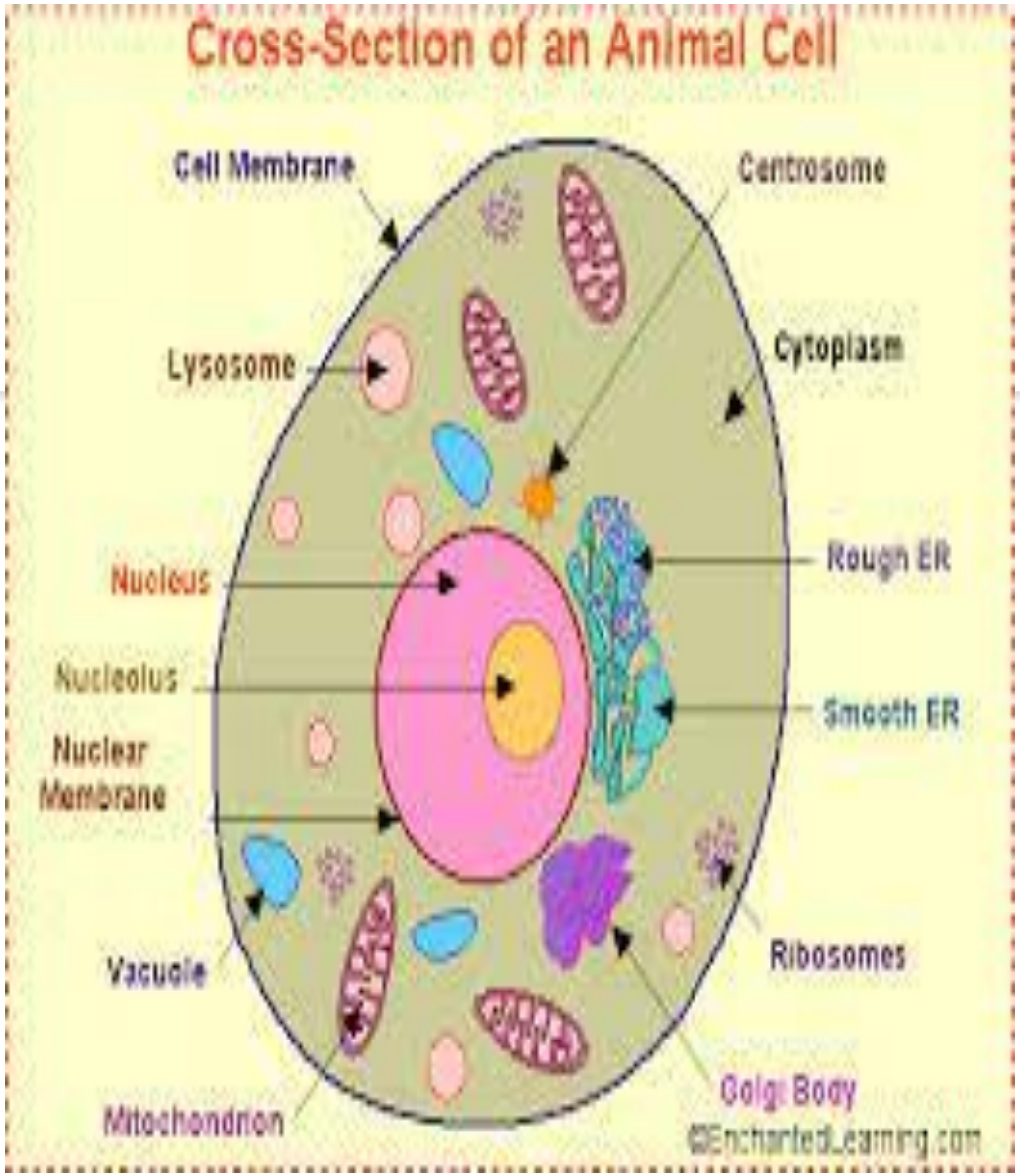
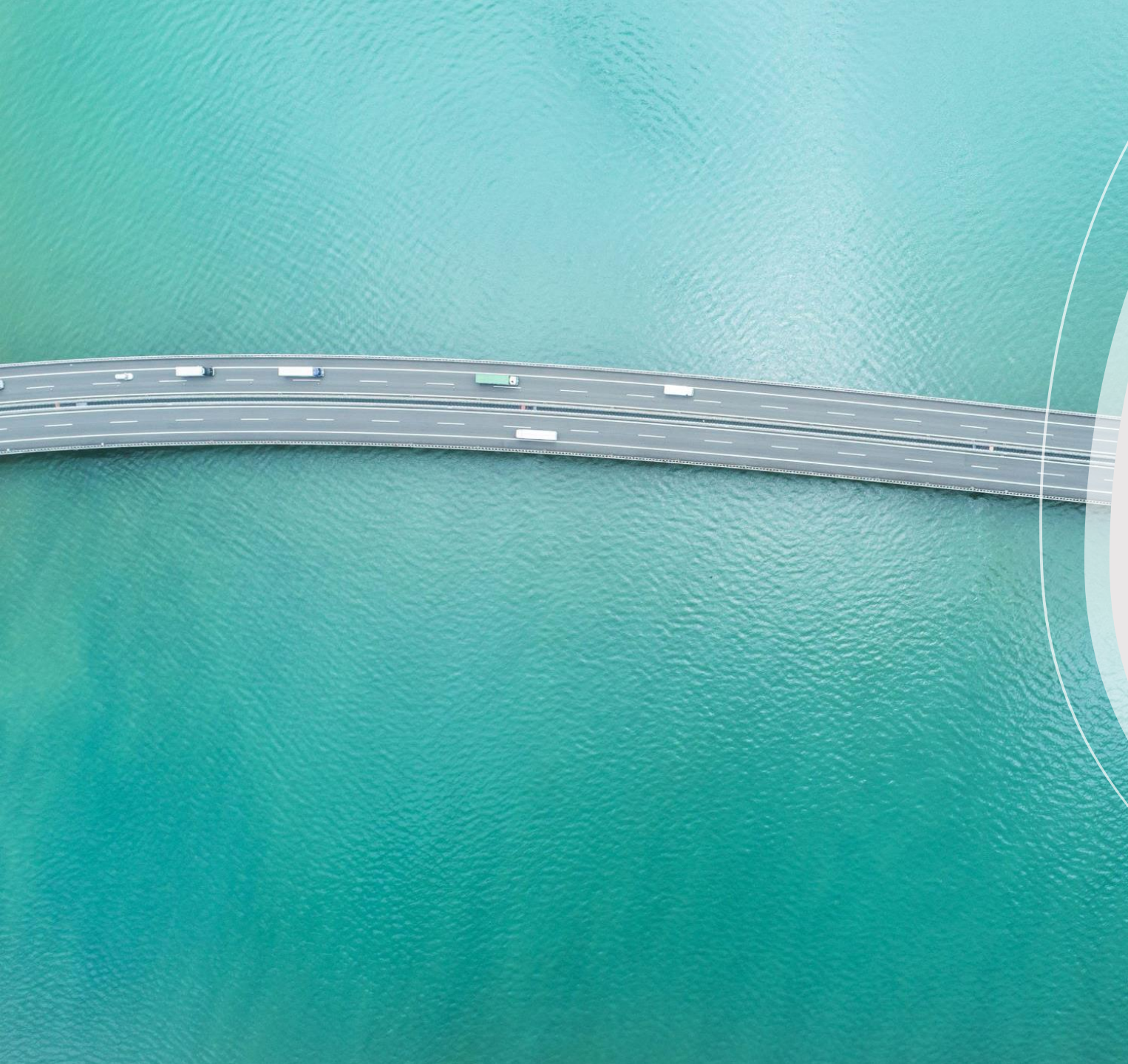

Cross-Section of an Animal Cell
Cell Membrane
Centrosome
Lysosome
Cytoplasm
Nucleus
Rough ER
Nucleolus
Smooth ER
Nuclear Membrane
Vacuole
Ribosomes
Golgi Body
Mitochondrion



Thank you