

## 3.2 Cell Organelles

### I. Cells have internal structure

#### A. Cytoskeleton = *is the support structure of the cell.*

-The cytoskeleton is made up of rods called microtubules, filaments, and microfilaments.

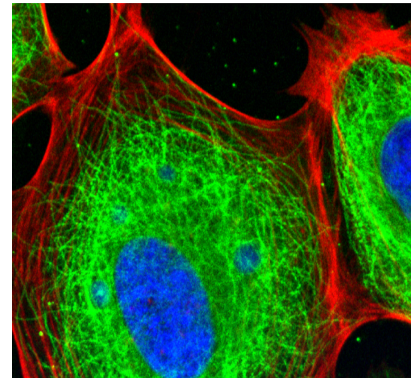
##### 1. Microtubules = are *hollow* tubes of protein.

-aid in support like *scaffolding or the poles of a tent.*

-anchor and support *organelles*

-act as highway system through *the cell.*

- aid in *dividing* the cell.

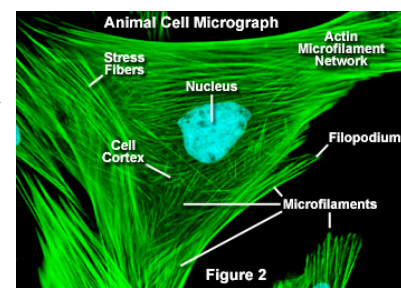


##### 2. Filaments = give added *strength* to cell

##### 3. Microfilaments = smallest of three, *solid* protein fibers.

- enable cells to *move and divide*

- *aid muscles* to contract and relax



#### B. Cytoplasm = *clear gelatinous fluid in a cell*, which is everything inside the cell *between the nucleus and the cell membrane*, which *excludes* the cell's genetic material.

**Cytosol** = portion of cytoplasm the *excludes organelles*.

- made mostly of *water (acts as solvent)*

- site of most *chemical reactions* in the cell.

## II. Organelles in making and processing proteins

### A. The nucleus is the control center of a eukaryotic cell.

*Largest organelle.*

-The nucleus contains all the directions to make *proteins*.

### B. *DNA* = is the set of directions for making proteins contained within nucleus.

- must be *protected* from damaging molecules

- must be available for use to code for proteins allowing some protein molecules near to *"turn on or off" certain genes* on DNA

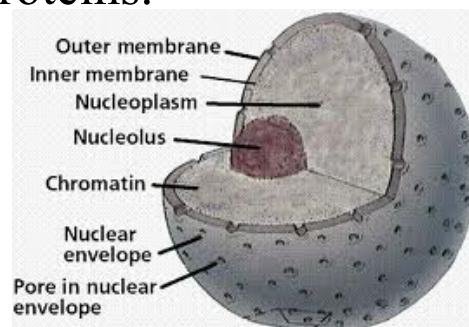
(*Nucleoid* - area where DNA is located in a **prokaryotic cell**.)

### C. Nuclear Envelope = structure that *separates the nucleus from the cytoplasm*.

*-Phospholipid bilayer*

-Contains *pores*, that allows *RNA* and *proteins* to enter and leave nucleus

### D. Nucleolus = found inside the nucleus and makes *ribosomes* from RNA and proteins.



E. **Endoplasmic Reticulum (ER)** = *folded membranes* that are the site of cellular chemical reactions. *Membranes made* similarly to the cell and nuclear membranes. *Remember what that is?*

-*Transports* substances through the cell.

-*Lumen* is the area between the folds

-Many *chemical reactions* occur on the folds and within the lumen.

1. *Rough* ER = location where ribosomes *attach* to the ER to carry out *protein* synthesis. Rough ER then finishes the protein molecule by *adding sugar chains for stability* and transporting them to areas in or outside the cell.

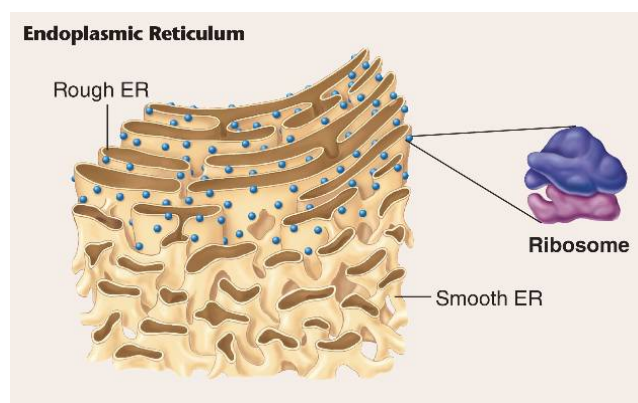
2. *Smooth* ER = ER that has no *ribosomes*. Involved in *lipid* formation, storage, and **breaking down drugs and alcohol** consumed in the body.

F. **Ribosomes** = site where cells produce (synthesize) *proteins* based on the directions contained in *DNA*.

-Made of *RNA* and proteins in the nucleolus and not bound by a membrane.

- Either **bound on Rough ER** synthesizing proteins for the *cell membrane or secreted outside the cell*

-Or are **free floating in cytoplasm** and synthesizing proteins needed in *chemical reactions inside the cell*.



**G. Golgi Apparatus (or Golgi Complex) = *processes, sorts, and delivers proteins*** into packages

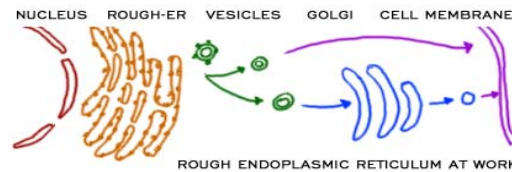
- contains *enzymes* to make further changes to proteins
- may package proteins to *other organelles* within the cell
- may package proteins and carry to the cell membrane, *secreting outside* the cell

**H. Vesicles = *small, membrane bound sacks*** (pinched off from ER)

- separates **chemical reactants** from cell until needed
- short-lived and recycled

**J. Lysosomes = organelles that contain *digestive enzymes*.**

- Lysosomes - *defend against* invading bacteria and viruses
- digest* worn out or damaged cell parts
- produced from* membrane of in Golgi

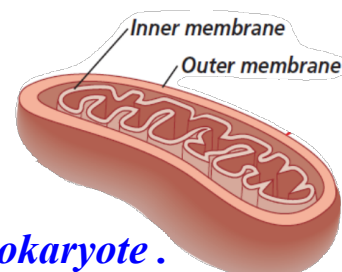


### III. Organelles of various functions

#### A. Mitochondria and Energy

-**Mitochondria** = transform sugar molecules *into energy* for the cell in respiration.

- Called the “*powerhouse*” of the cell; *converts stored* chemical energy (*glucose*) into *usable* chemical energy (*ATP*)
- Has *phospholipid* bilayer
- Has *DNA* (used in forensics)
- Has *own ribosomes*



*Theorized once a free living smaller prokaryote .*

**B. Vacuole = *membrane bound sac used for temporary storage in the cell.***

-Vacuoles store food, enzymes, and other materials the cell may need.

-In plants, vacuole is *large and central.*

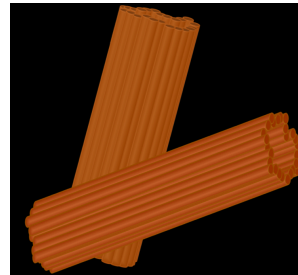
-In animals, there are *many small vacuoles.*

**C. Centrosomes - *small region of cytoplasm* that produces microtubules, such as:**

**- Centrioles**

- These organelles occur in *pairs* and are found in **animal** and some **protists**.

- They help in *cell division* (**mitosis and meiosis**)



Sometimes Centrioles organize as -

**- Cilia & Flagella**

-Cilia and flagella are both organelles that are made of microtubules and aid in *feeding and locomotion.*

**1. Cilia – *Short, numerous, hair-like structures***

-move in a rowing motion

**2. Flagella – *Long, hair-like structure***

-have a whip-like motion.

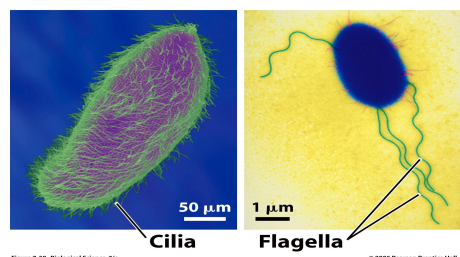


Figure 7-38 Biological Science, 2/e

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#### IV. Additional Plant Cell Organelles

- A. **Cell Wall** = a fairly *rigid structure* located outside the plasma membrane that provides additional support and protection.

**Plants, fungi, and bacteria all have cell walls. Most protists have cell walls.**

**Plants** have cell walls made of *cellulose*,

**Fungi** have cell walls made of *chitin*,

**Bacteria** have cell walls made of *peptidoglycan*

**Protists** cell walls vary, depends on the protist *classification*.

**Animals** *lack* cell walls.

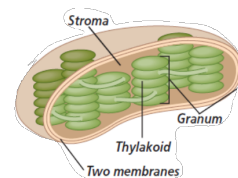
- B. **Chloroplasts** = organelles that capture light energy to *convert into* chemical energy (sugar molecules).

-Has phospholipid *bilayer*

-Chloroplasts are part of a group of *plastids*.

-Plastids are plant organelles that are used for storage, i.e. *starches, lipids, or pigments*.

-**Chlorophyll** = *the pigment* that gives plants their green color and traps light energy.

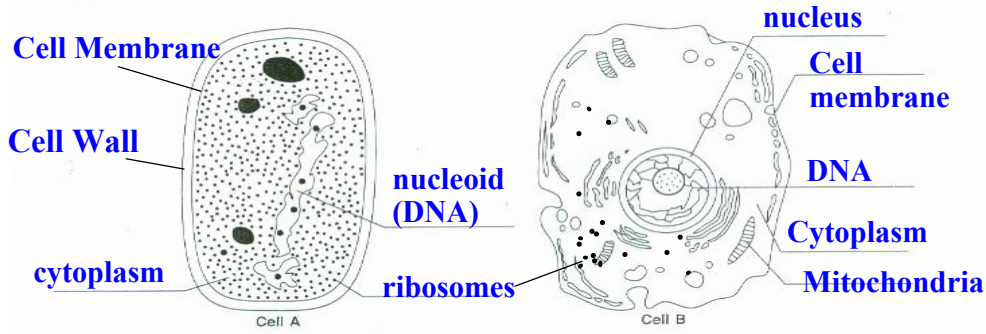




Comparing Cells

A. Prokaryotic Cells and Eukaryotic Cells

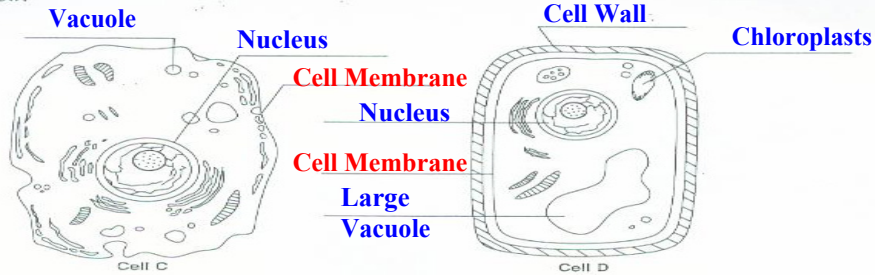
Using the diagrams of a prokaryotic cell and a eukaryotic cell below, answer the questions that follow.



1. Which diagram represents a prokaryotic cell? \_\_\_\_\_  
 A eukaryotic cell? \_\_\_\_\_
2. Using the proper terms, label the structures indicated in the diagrams.
3. List two ways in which these cells are similar. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
4. List two ways in which these cells are different. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

B. Animal Cells and Plant Cells

Using the diagrams of an animal cell and a plant cell below, answer the questions that follow.



1. Which diagram represents an animal cell? \_\_\_\_\_  
 A plant cell? \_\_\_\_\_
2. Using the proper terms, label the structures indicated in the diagram.
3. List two ways in which these cells are similar. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
4. List two ways in which these cells are different. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
5. Are these cells eukaryotic or prokaryotic? Explain your answer. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_