

# **Cell Parts and Functions**

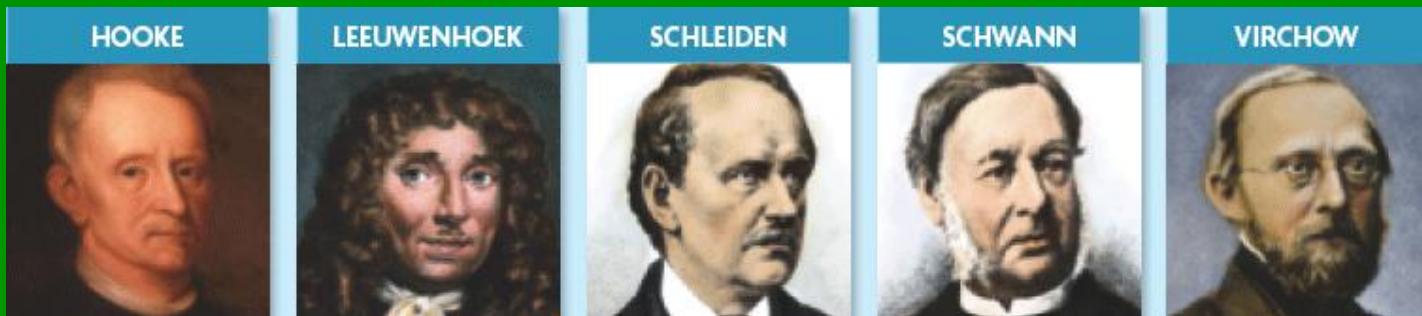


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# Microscopes



- Cells were invisible to the naked eye until microscopes were invented in the 1600's.
  - (1665) Robert Hooke saw rows of little boxes in a slice of tree bark = dead plant cells
  - (1675) Anton van Leeuwenhoek saw living, moving 1-celled organisms in pond water.



# Cell Theory

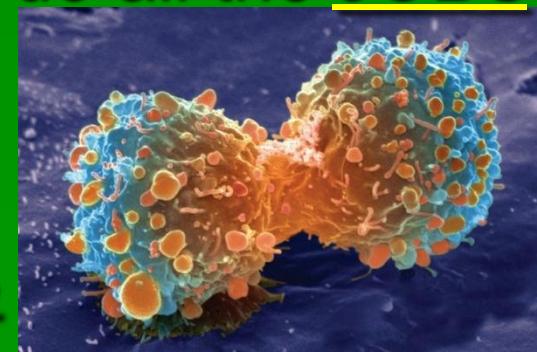
- The following **3 Key Ideas** about how life works resulted from the work of many biologists using their microscopes:

1) All living things are made of one or more cells

2) Cells are the basic units of **structure** and **function** in all organisms

- (i.e., cells make all the PARTS and do all the JOBs in living organisms)

3) All cells come from existing cells



# Unicellular Organisms

- Composed of only 1 cell
- Cells are versatile and must perform ALL functions necessary for life
  - 1 celled bacteria = kingdoms Archaeabacteria & Eubacteria
  - 1 celled plants and animals = kingdom PROTISTA

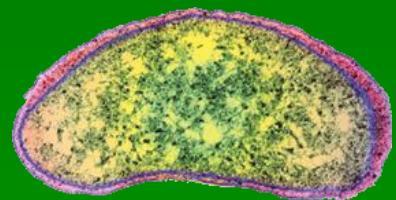


# Multicellular Organisms

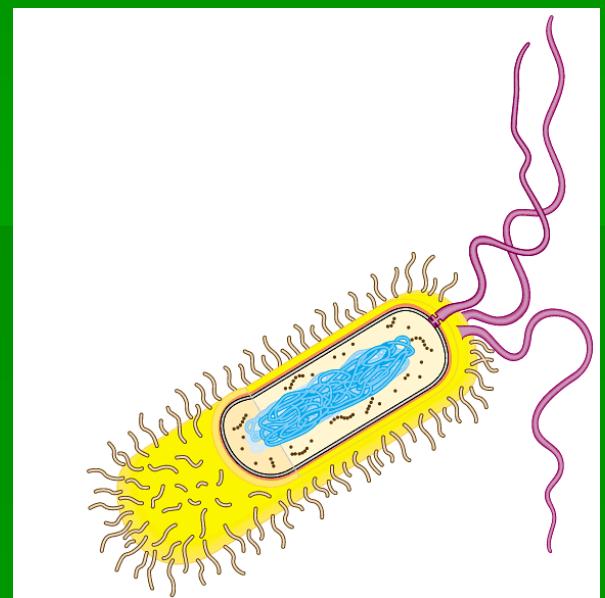
- Composed of many cells
- Cells are specialized to perform specific functions and they work in teams of tissues or organs to perform more complicated tasks.
- Members of the kingdoms: PLANT, ANIMAL, FUNGI

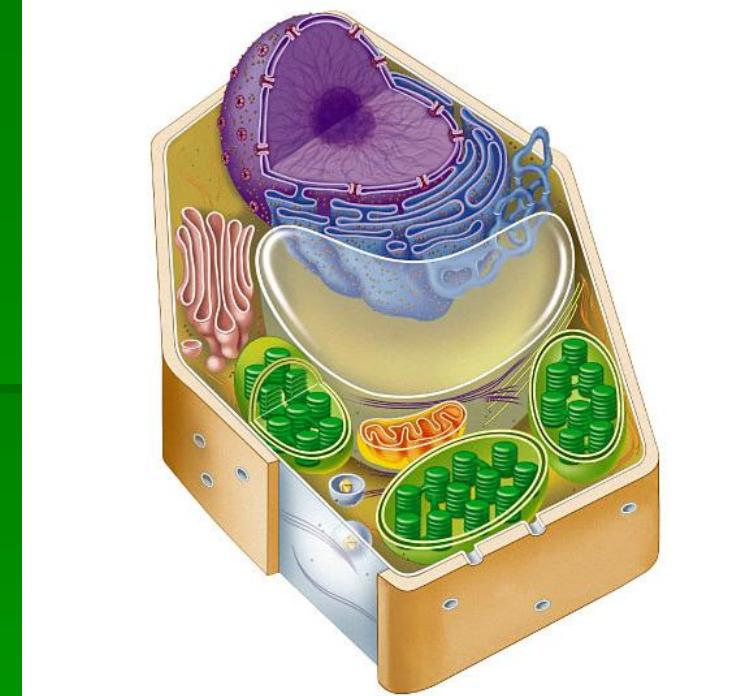
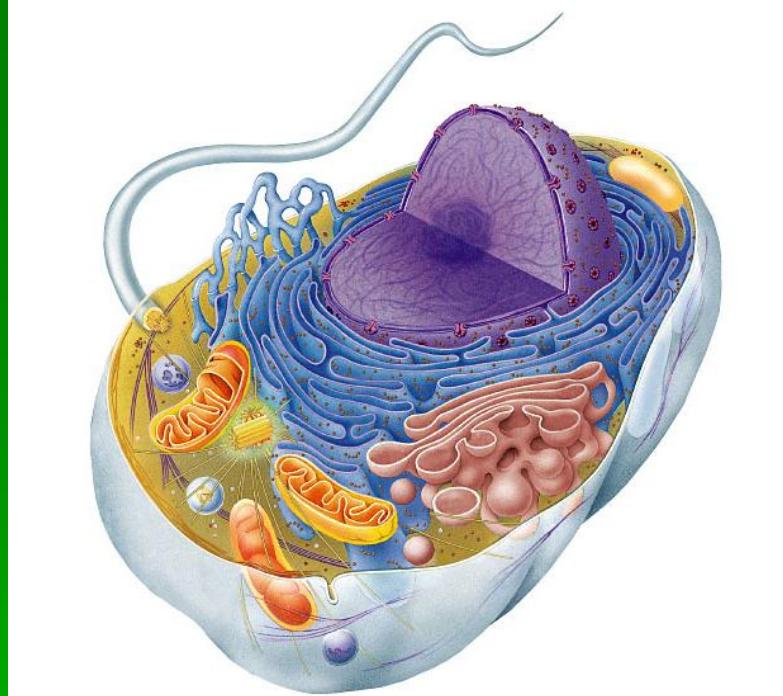


# Prokaryotic Cells



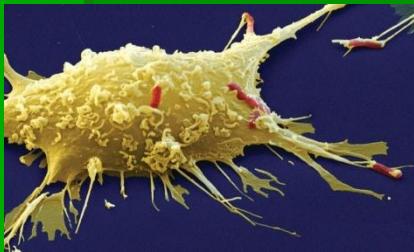
- NO NUCLEUS
- NO membrane –wrapped organelles
  - Bacteria is the most common and is found everywhere, even crawling on your skin as we speak.
- A typical prokaryotic **BACTERIA** cell
  - Inside the cell is DNA and a few simple parts





# Eukaryotic Cells

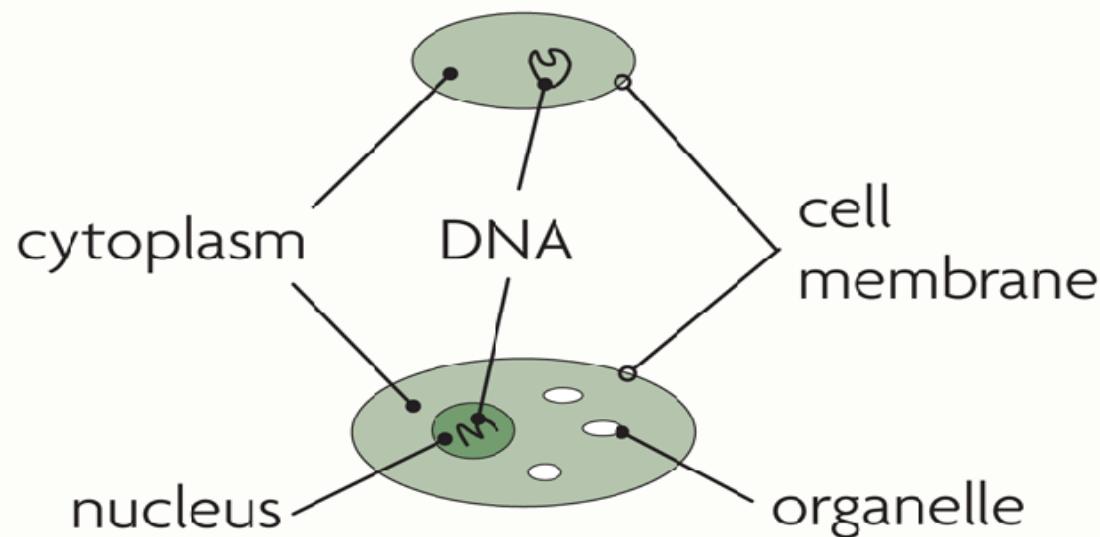
- Contain membrane-wrapped nucleus and organelles
- Examples: plant, animal, fungi



# Let's Compare Prokaryotic and Eukaryotic

## VISUAL VOCAB

**Prokaryotic cells** do not have a nucleus or other membrane-bound organelles.



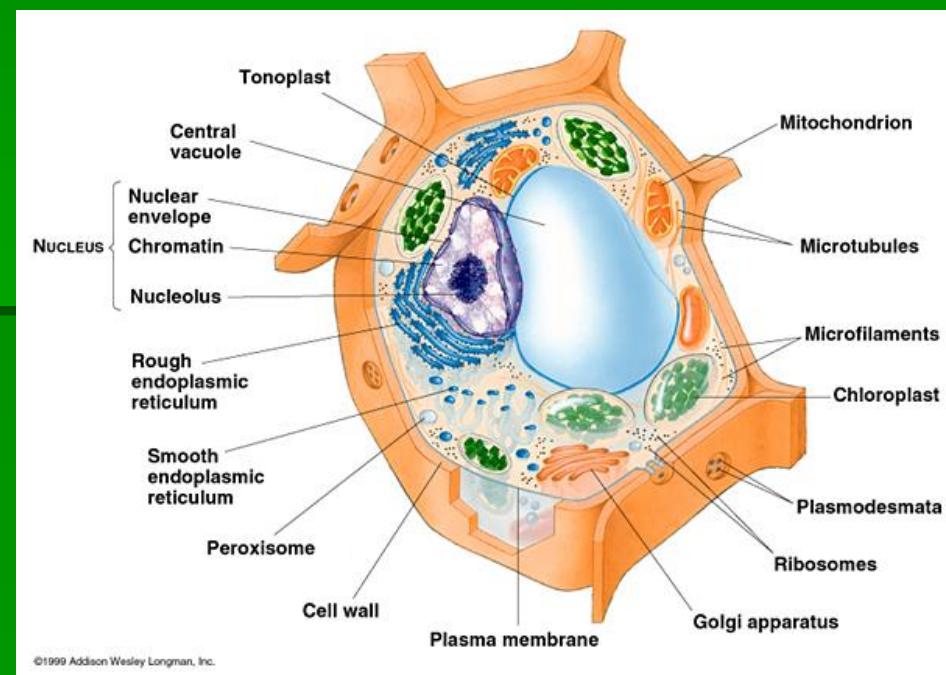
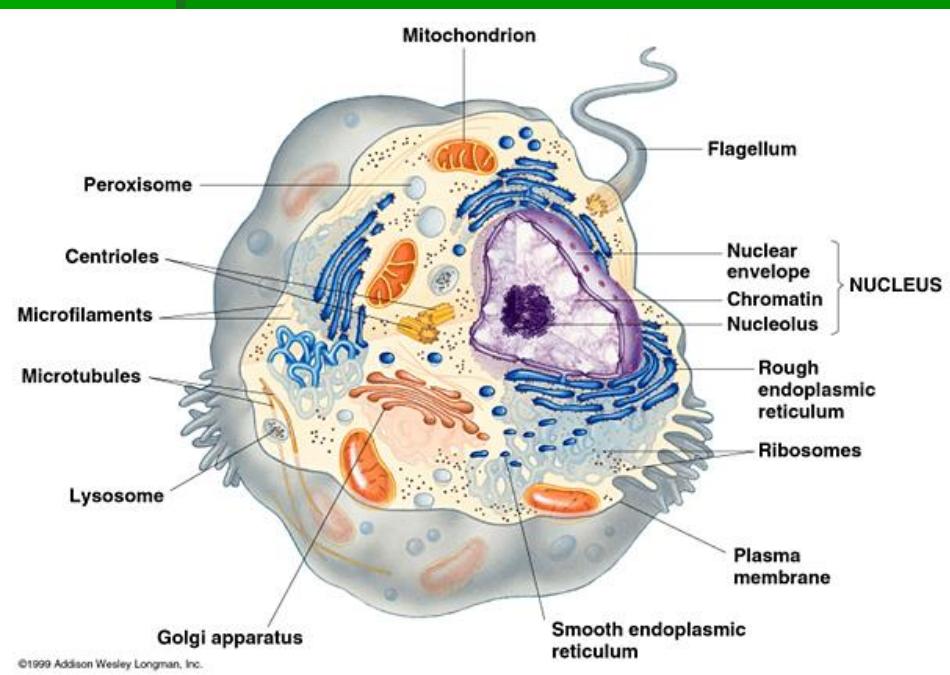
**Eukaryotic cells** have a nucleus and other membrane-bound organelles.

# Lets compare Cell Types

Cell Characteristics	Bacteria	Fungus	Plant	Animal
These cells contain a <b>nucleus</b> :		X	X	X
Considered <b>eukaryotic</b> :		X	X	X
Cells are considered <b>unicellular</b> :	X			
These organisms are <b>prokaryotic</b> :	X			
Cells are <b>multicellular</b> :		X	X	X
Cells are all purpose and do ALL jobs	X			
Contain <b>DNA blueprints</b>	X	X	X	X
Cells are specialized to do specific jobs		X	X	X

# Do you know what organelles are?

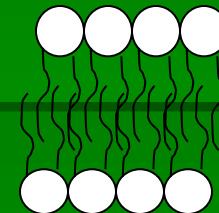
Well, we have *organs*... cells have *organelles*.  
We have a heart, lungs, and kidneys; they  
have a nucleus, mitochondria, etc.



# Organelles found in ALL cells

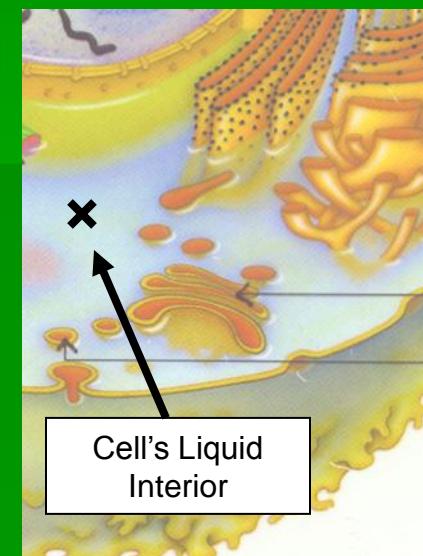
## Cell Membrane

- S: 2 rows of **lipids** and protein molecules
- L: outside perimeter of cell
- F: Regulates movement of substances IN/OUT—like a “**BOUNCER**”. Surface proteins allow for **identification** and cell to cell **communication and response**

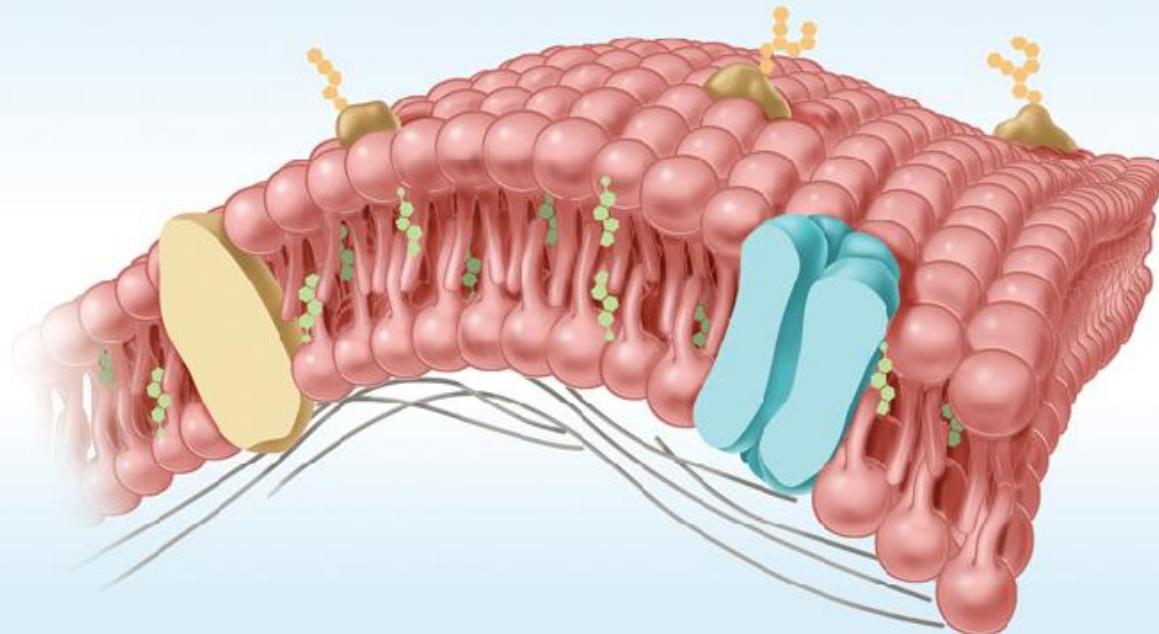


## Cytoplasm

- S: “soupy,” gel-like liquid interior with water and dissolved **nutrients** and building materials
- L: everywhere between nucleus and plasma membrane
- F: dissolves cellular nutrients and allows for **transportation** of materials among organelles. Life’s chemistry happens here!

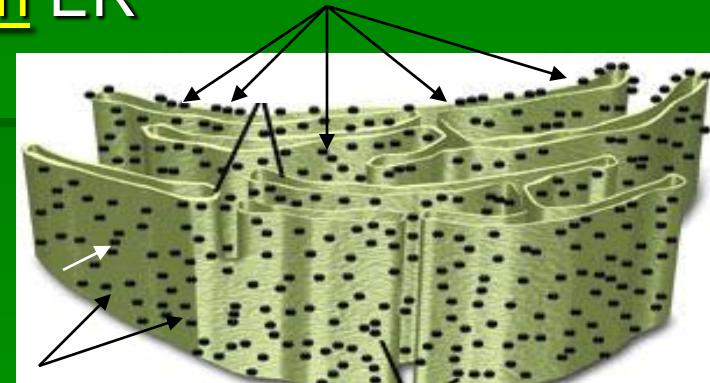


# A closer look at the cell membrane



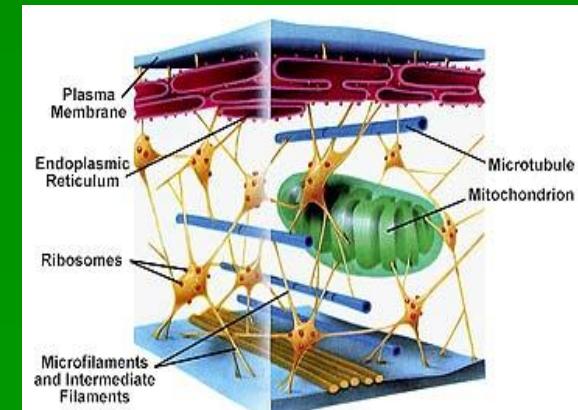
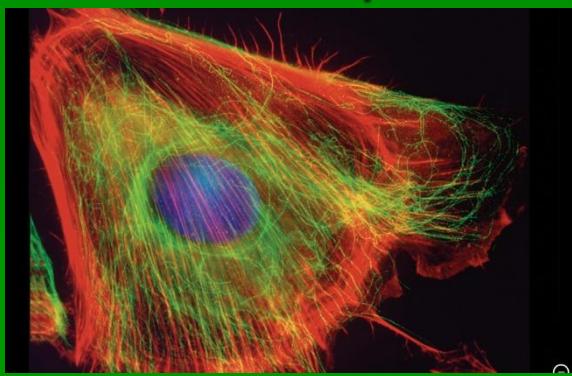
# Ribosome

- S: Small spheres or tiny **dots**
- L: in cytoplasm or attached to Rough ER
- F: Make protein



# Cytoskeleton

- S: Spiderweb -like inner **frame** made of 2 proteins:  
**microtubules** and **microfilaments**
- L: Everywhere throughout the cell between nucleus and plasma membrane
- F: gives the cell shape and support



# Found in EUKARYOTIC Cells

## Nucleus

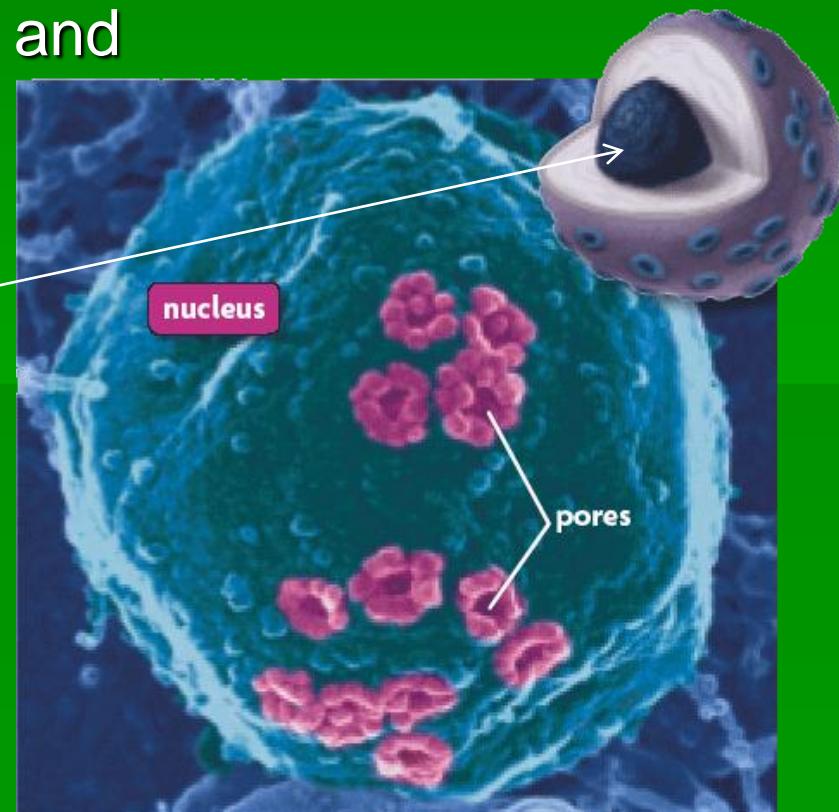
S: large **sphere** surrounded by nuclear membrane with **pores**

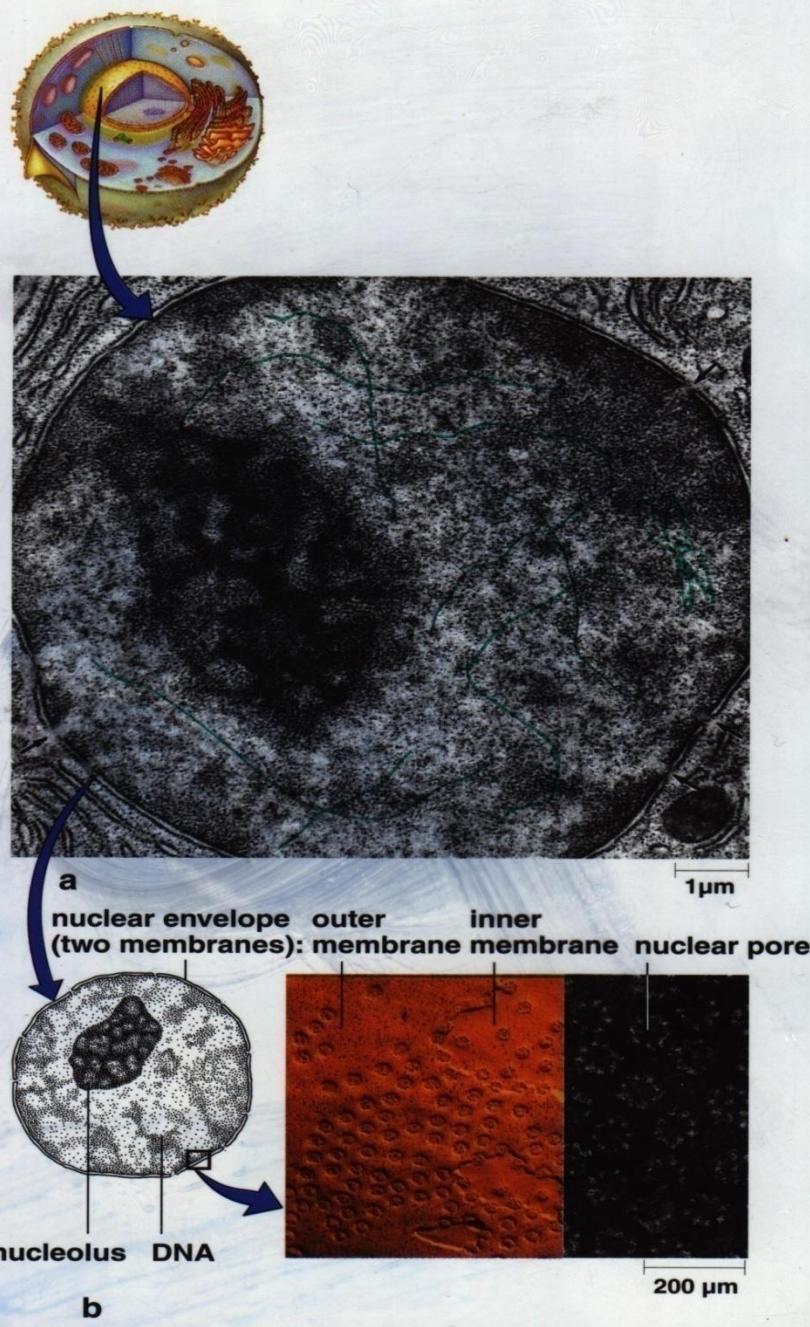
L: often in the center except in plants

F: protects the **DNA** blueprint codes and regulates cellular activities (command center)

## Nucleolus (Nucleoli)

- S: Small sphere
- L: inside the nucleus
- F: Makes **ribosomes**

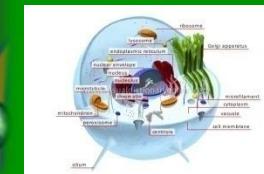
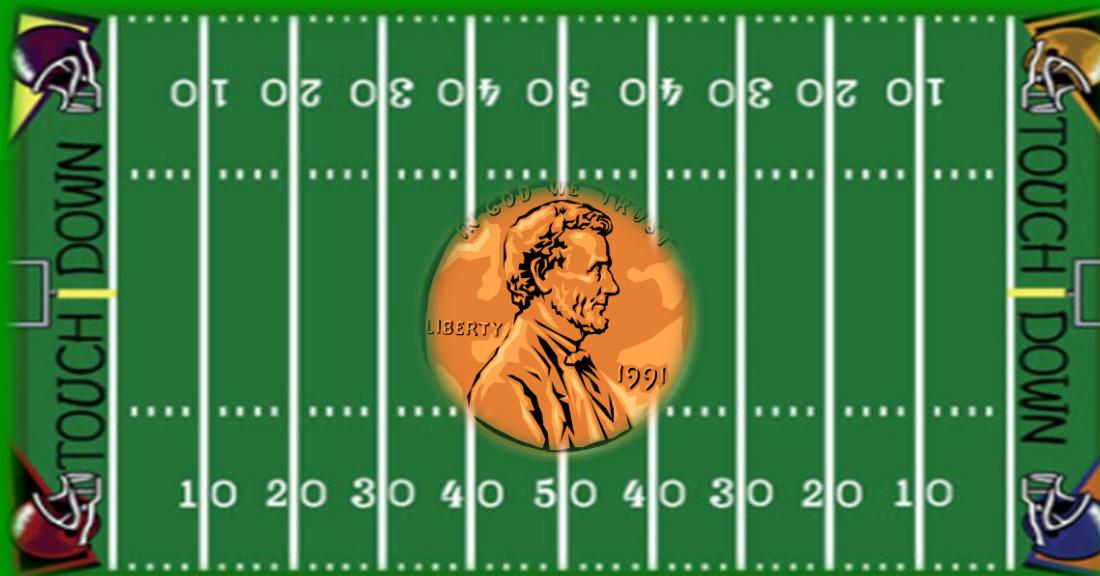




**Fig. 3.16 Fine structure of the animal cell nucleus.**

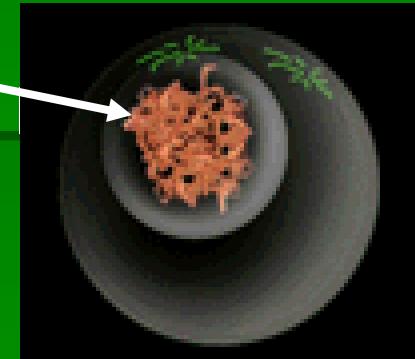
# INTERESTING FACT!

If the nucleus were the size of a penny then the rest of the cell would be the size of a football field!



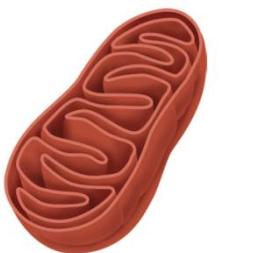
# DNA (Chromatin/Chromosomes)

- S: chromatin—uncoiled chromosomes; tangled, spaghetti -like mass of DNA and proteins  
Chromosomes = packages of coiled DNA and usually X - shaped
- L: in nucleus
- F: carries the inherited genetic “blueprint” codes



## Mitochondria \*\*has its own DNA codes inside\*\*

- S: peanut or kidney bean shape with inner folded membrane
- L: random in cytoplasm; more in muscle cells
- F: “power center” of cell—converts glucose into ATP energy = (1\$ of energy)  
works like an ATM banking machine



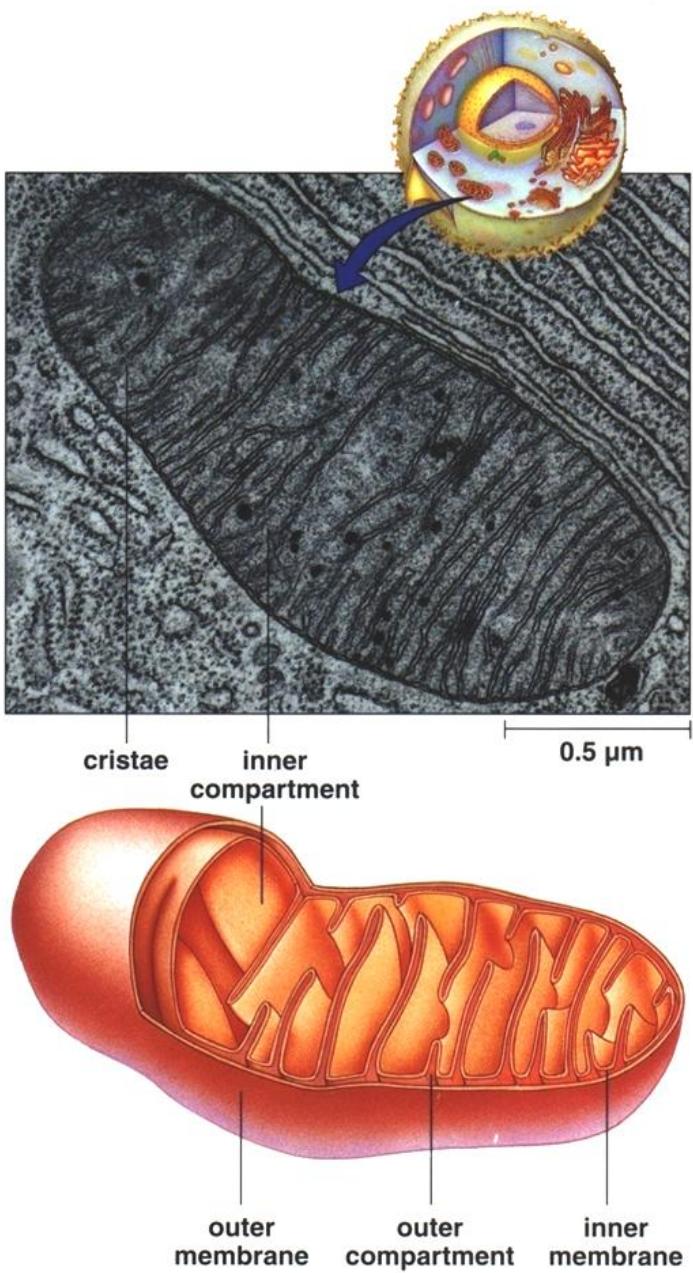


Fig. 3.20 Diagram and micrograph of a mitochondrion.

# Cellular Respiration

We use the food that we eat (sugar) to give us energy! Without this energy, we would die. This process occurs in the **mitochondria**.

## Reactants

Oxygen



Sugar



## Products

Carbon  
Dioxide



Water

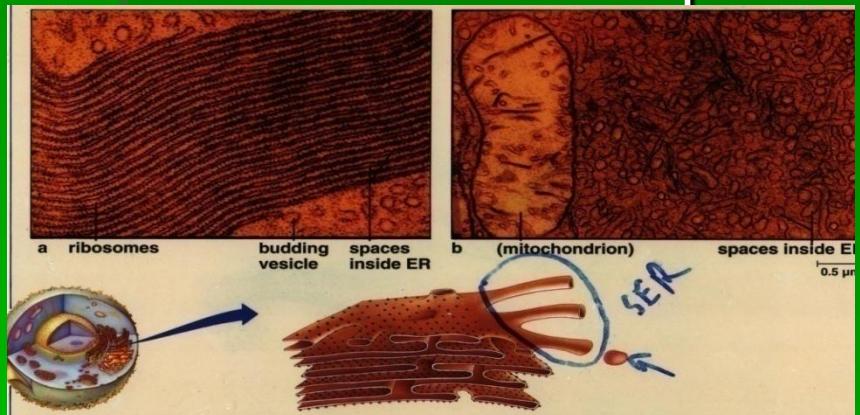


Energy



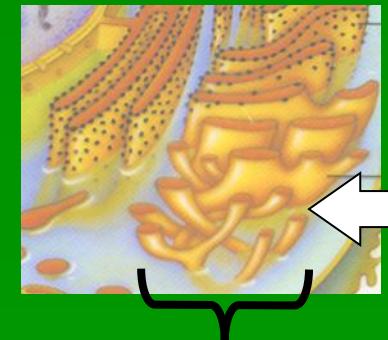
# Rough Endoplasmic Reticulum (R.E.R.)

- S: broad, flattened tube network studded by ribosomes
- L: twists and turns from nucleus to plasma membrane
- F: protein production and a pathway where proteins are modified and transported

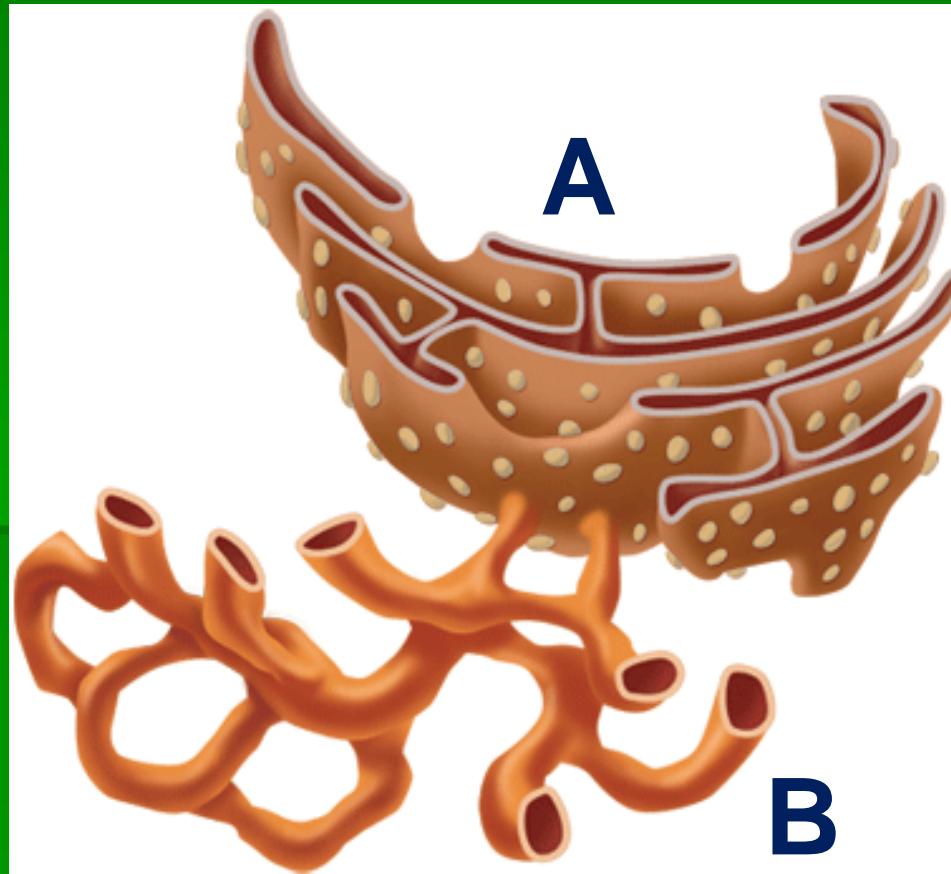


# Smooth Endoplasmic Reticulum (S.E.R.)

- S: branching round tubule network
- L: between RER and Golgi Apparatus
- F: detoxify harmful substances; produces lipids
- Donates membrane pieces for vesicle sacs to wrap materials for transport

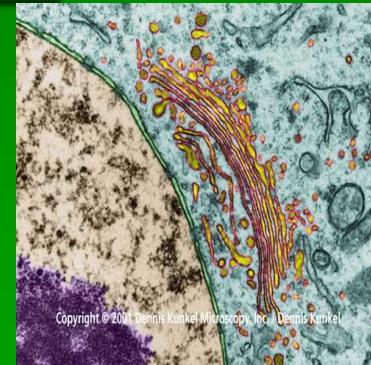
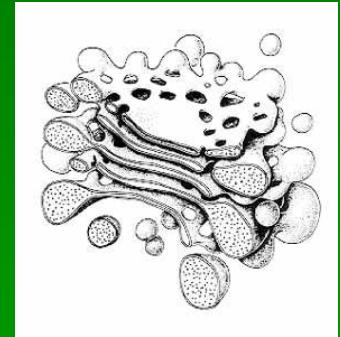


# Let's Review the ER



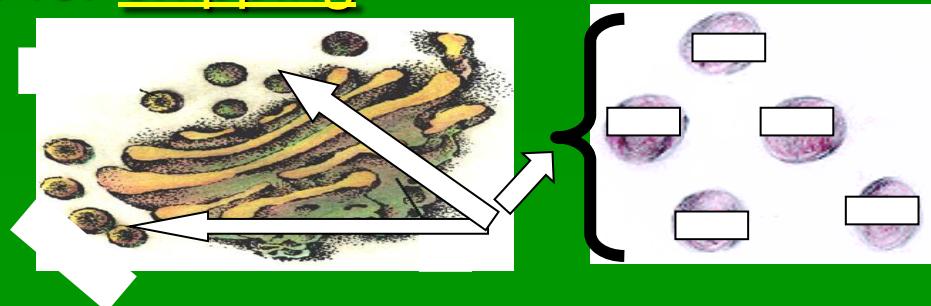
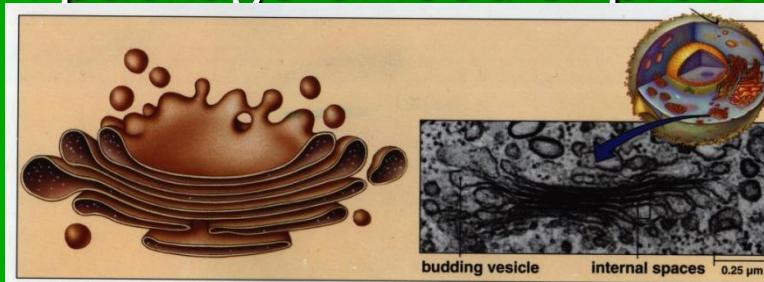
# Golgi Apparatus

- S: Series of flattened, slightly curved membrane sacs
- L: near the nucleus and ER
- F: “shipping center” packages and sorts cell materials into vesicles for transport within or out of the cell  
works like a “Post Office” or UPS

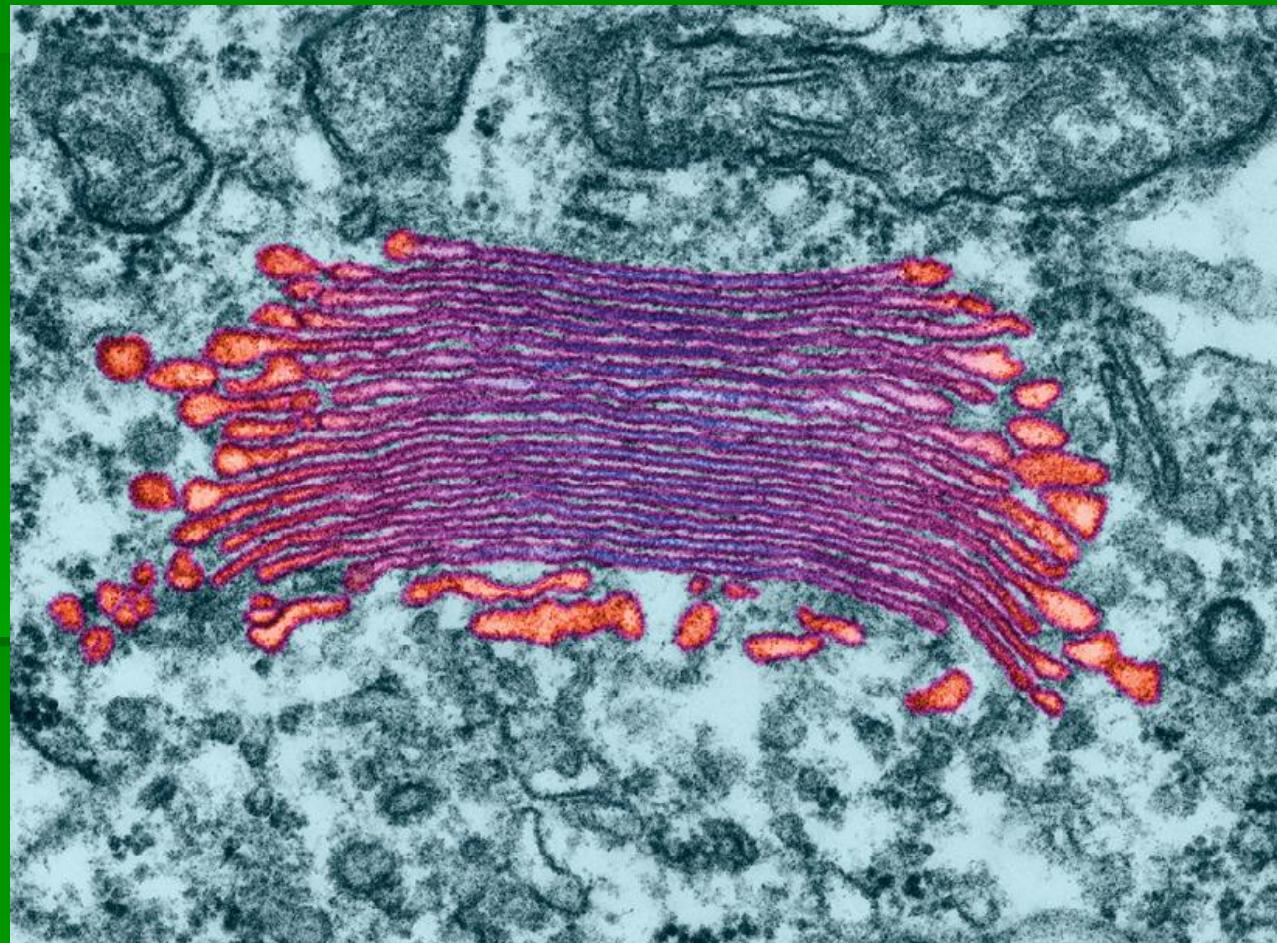


# Vesicle

- S: round membrane sacs
- L: anywhere, but usually near the golgi body
- F: package of food or proteins for shipping

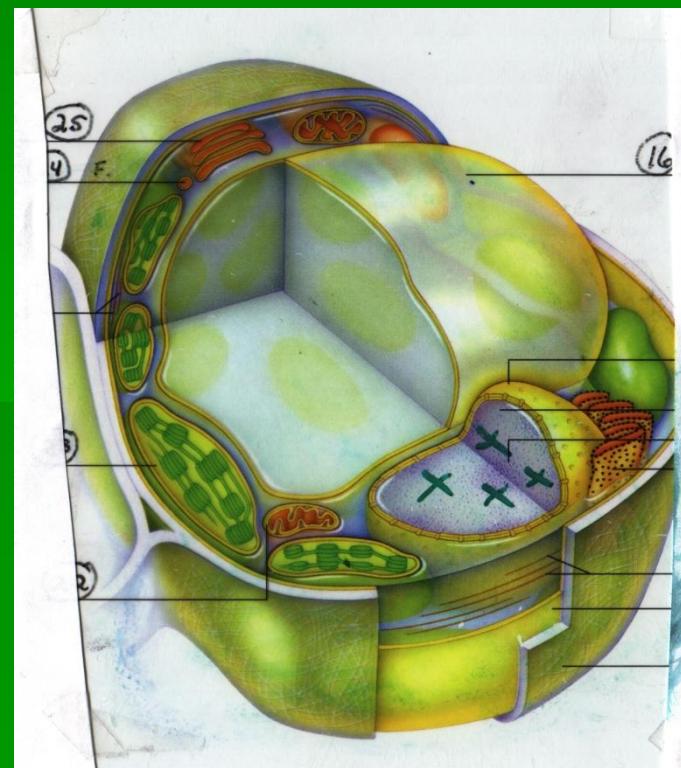


# Another look at Golgi and Vesicles

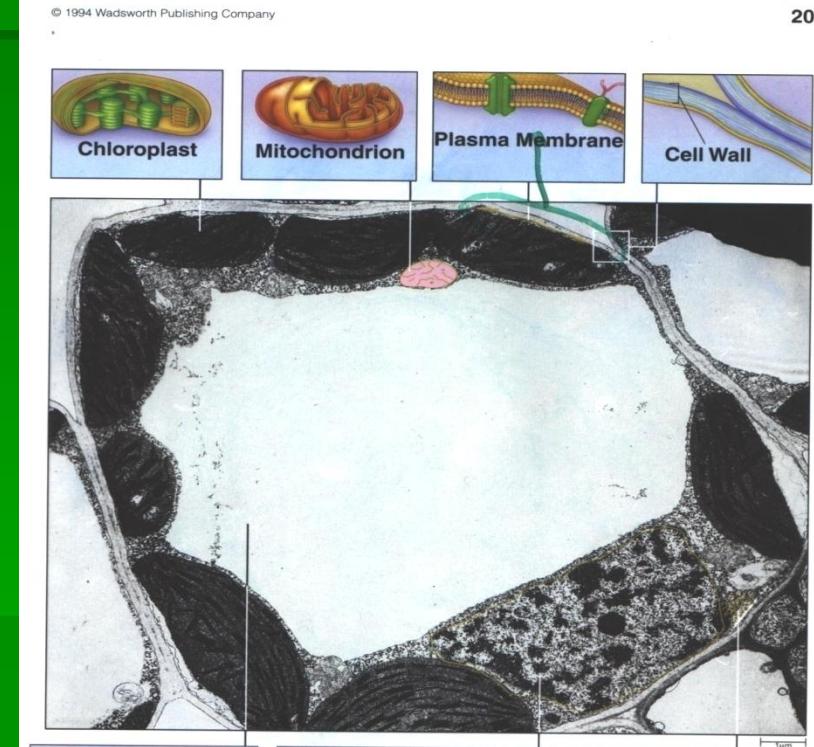
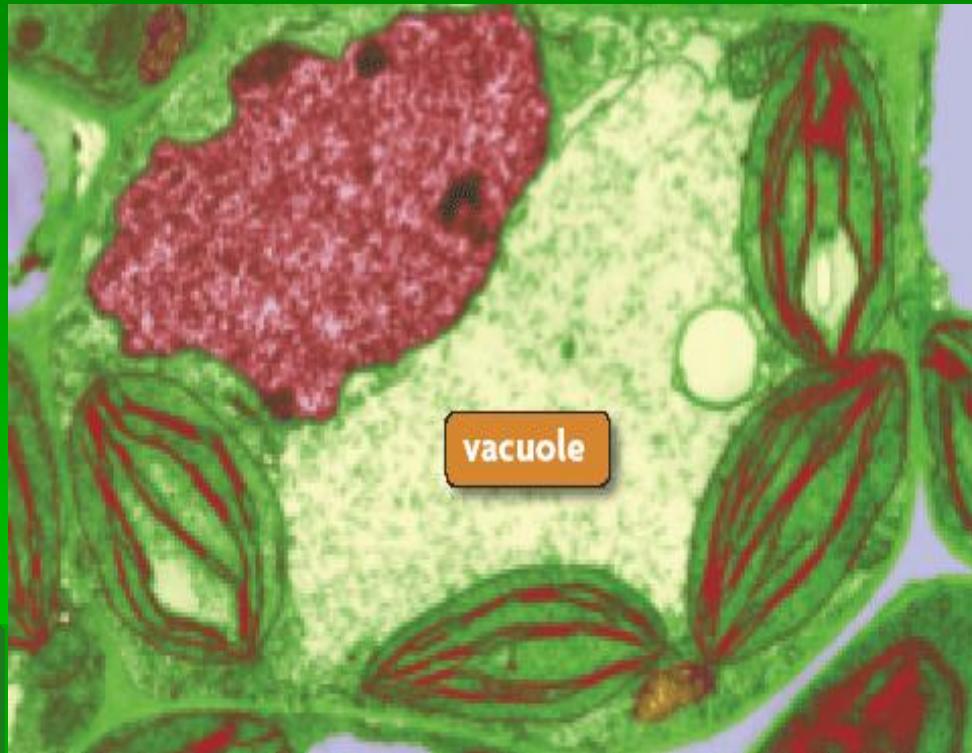


# Vacuole

- S: vesicle sac filled with liquid
- L: in ANIMALS → small size and random; in PLANTS → one large central vacuole
- F: stores water, minerals and wastes



# A closer look at a plant vacuole

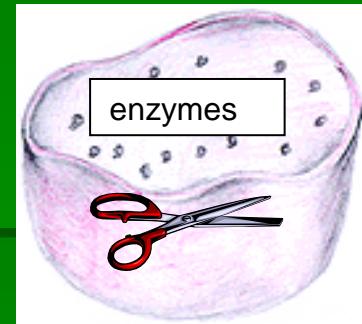


**NOTE: Vacuole water pressure  
(turgor pressure) add structural support for plants**

# Found ONLY in Animal Cells

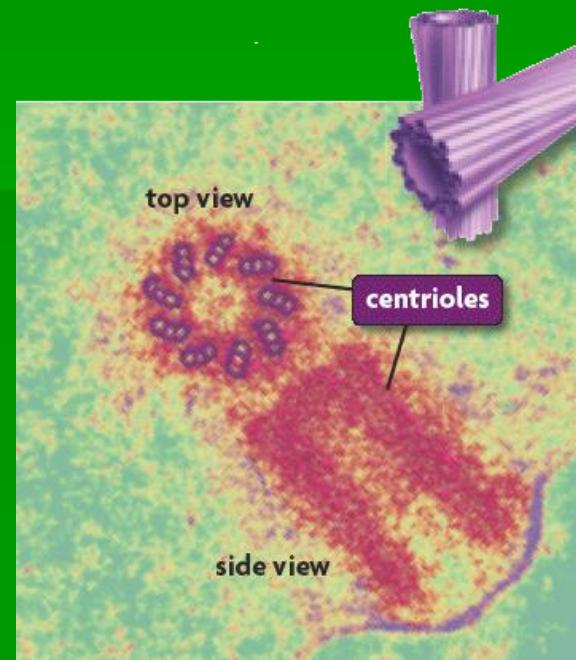
## Lysosome

- S: vesicle sac filled with digestive enzymes
- L: random in cytoplasm
- F: break down food materials; digest foreign invaders and old, worn down cell parts for recycling



## Centrioles

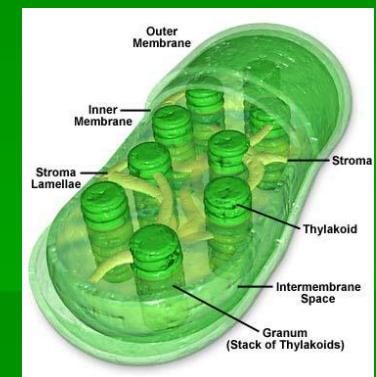
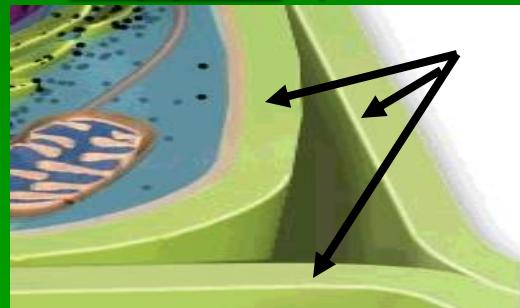
- S: 2 microtubule bundles at a right angle to form an "L" shape
- L: near the nucleus
- F: build the spindle to assist in cell division



# Found ONLY in Plant cells

## Cell Wall

- S: thick layers of cellulose fibers which form a rectangle shape
- L: just OUTSIDE the cell membrane
- F: helps give the cell shape, support, protection AND connects them to neighboring cells.



## Chloroplast \*\*has its own DNA codes\*\*

- S: vesicle sac or sphere
- L: random in cytoplasm, but usually closer to cell membrane
- F: stores green chlorophyll pigments for photosynthesis

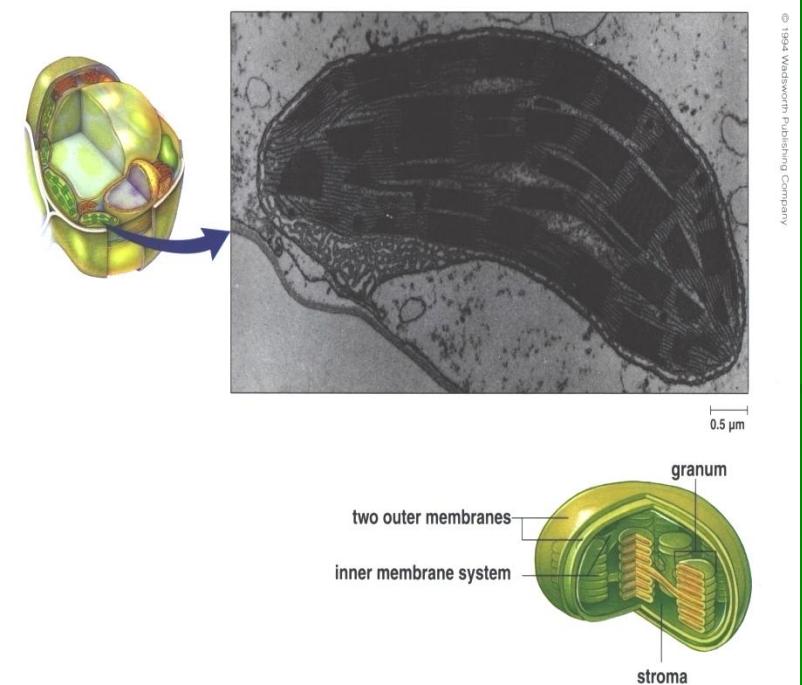
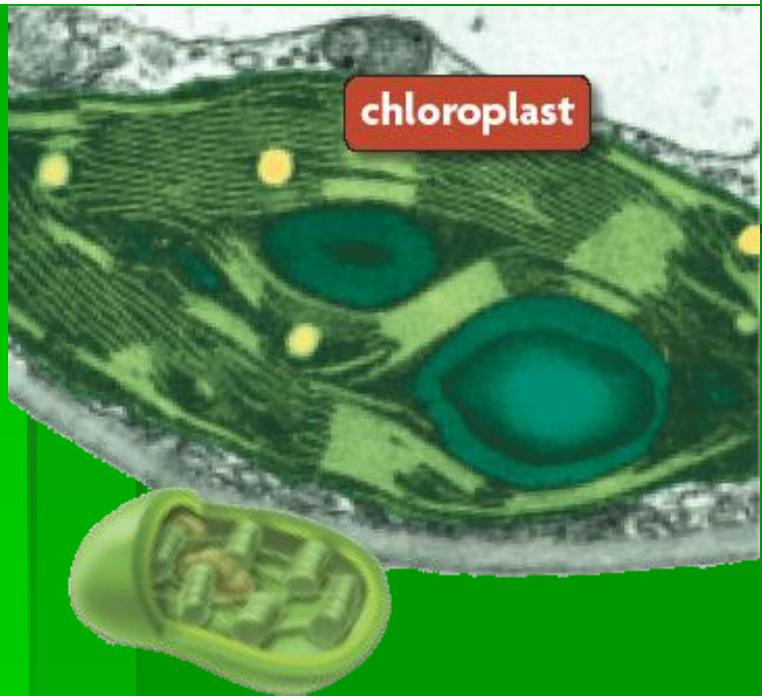
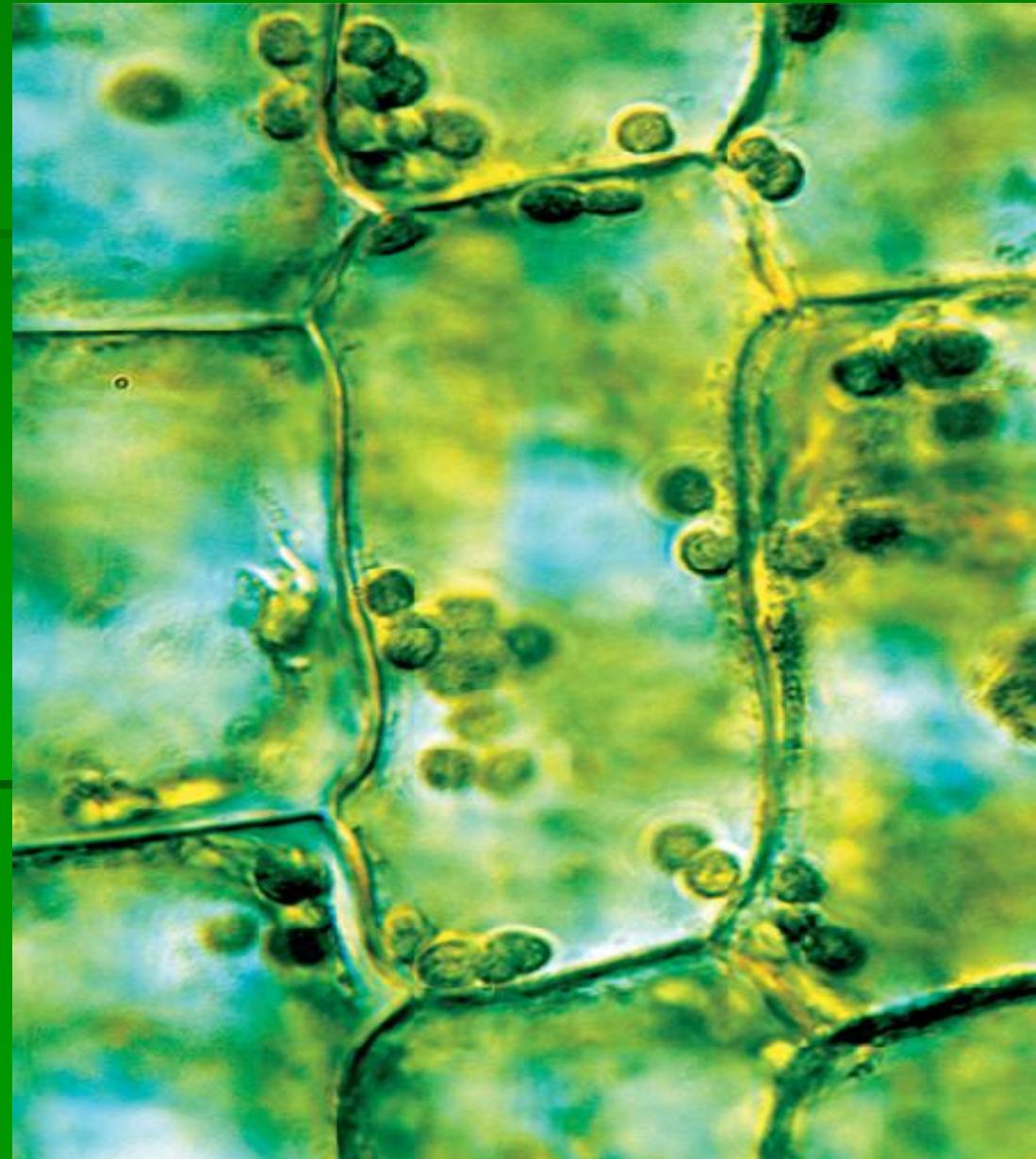


Fig. 3.21 Diagram and micrograph of a chloroplast.



# Plants Store Energy in Sugars = Photosynthesis

- Plants catch sunlight energy with their green chlorophyll pigments and then store this energy inside GLUCOSE molecules. This process happens inside the chloroplast organelle.



# Photosynthesis

## Reactants

Carbon  
Dioxide

Water

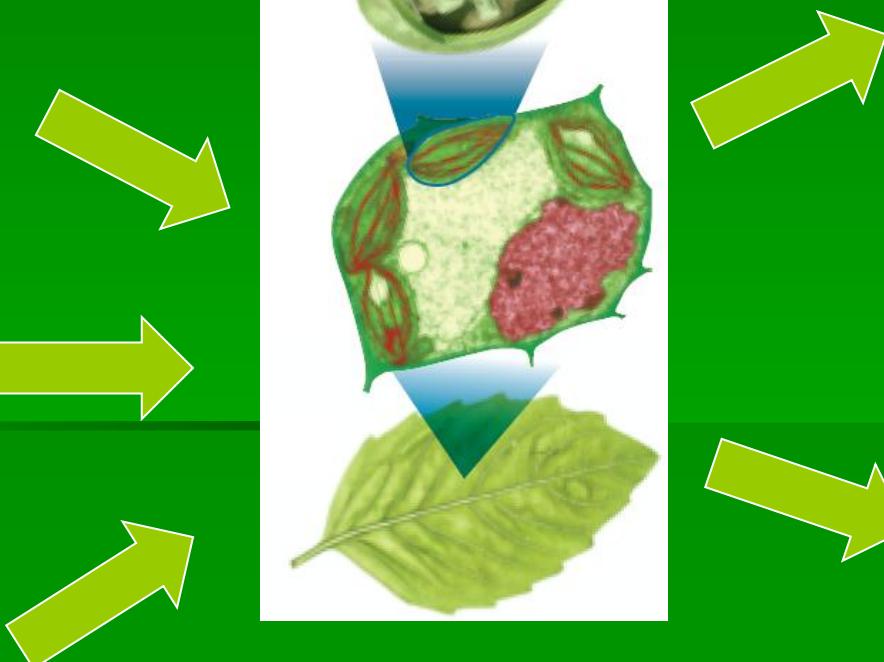
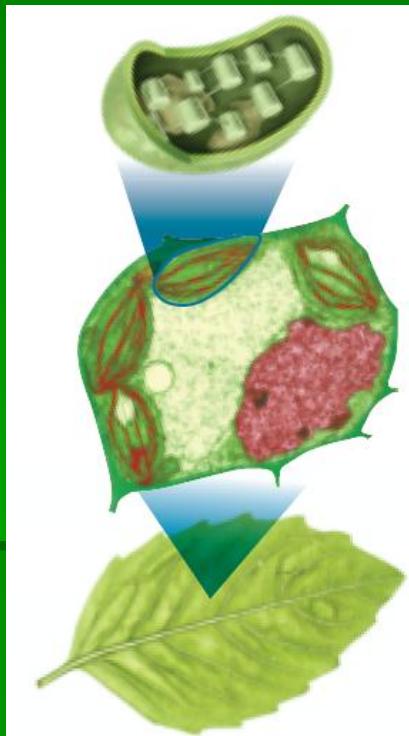


Energy

## Products

Oxygen

Sugar



# Photosynthesis

## REACTANTS

light energy

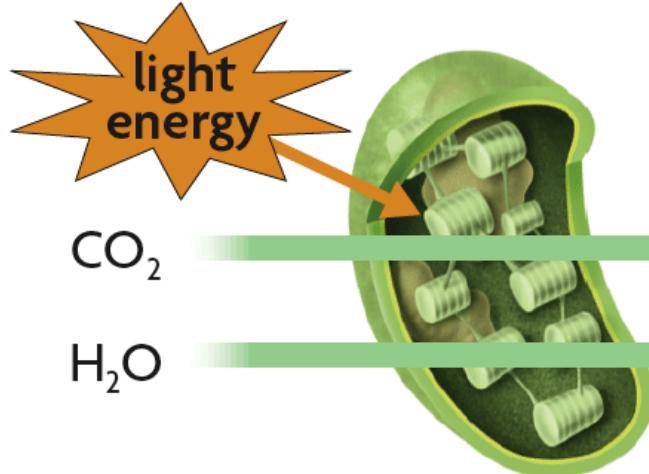
$\text{CO}_2$

$\text{H}_2\text{O}$

## PRODUCTS

Sugars ( $\text{C}_6\text{H}_{12}\text{O}_6$ )

$\text{O}_2$



# Cellular Respiration

## PRODUCTS

$\text{CO}_2$

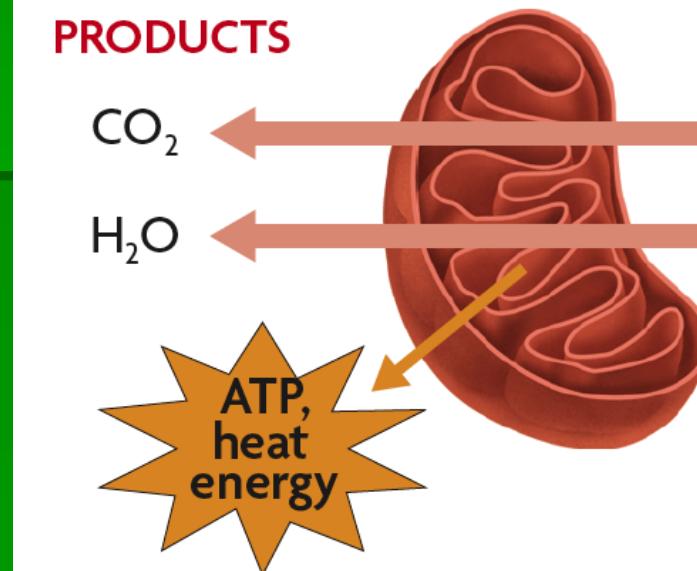
$\text{H}_2\text{O}$

## REACTANTS

Sugars ( $\text{C}_6\text{H}_{12}\text{O}_6$ )

$\text{O}_2$

ATP, heat energy



# Let's Compare Photosynthesis and Cellular Respiration

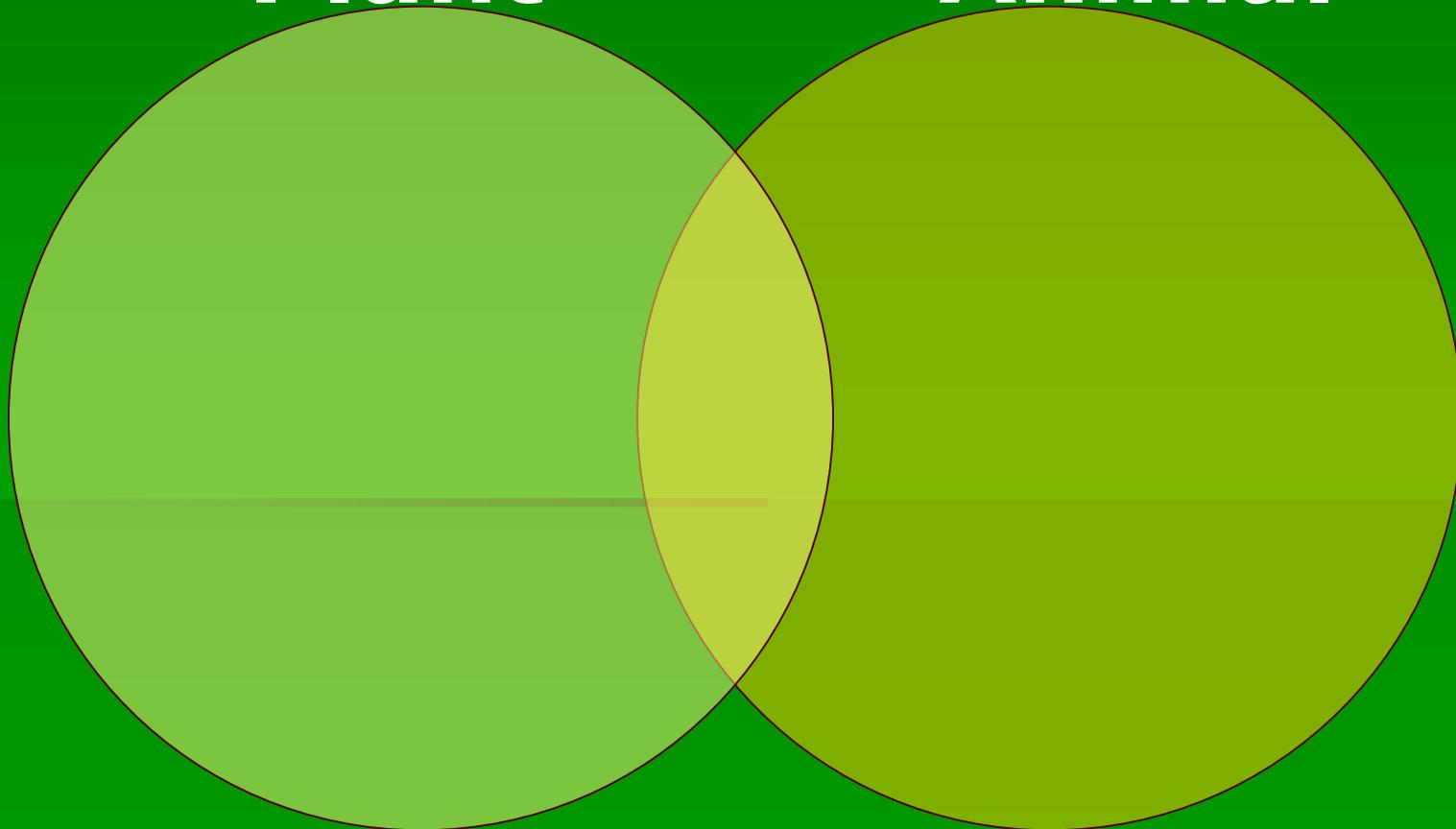
Topics	Photosynthesis	Cell Respiration
1) INPUT material?	$\text{CO}_2$ $\text{H}_2\text{O}$	Glucose $\text{O}_2$
2) OUTPUT material?	Glucose $\text{O}_2$	$\text{CO}_2$ $\text{H}_2\text{O}$
3) Energy direction?	Absorbed	Released
4) Energy TERM?	Endergonic	Exergonic
5) Chemical bonds are?	formed	broken
6) Organelle needed?	Chloroplast	Mitochondria
7) Cell type?	Plant Only	Both Plant & Animal

# **Plant vs. Animal Cell**

**Using the questions on the next slide as your guide, create your own Venn diagram comparing plant and animal cells!**

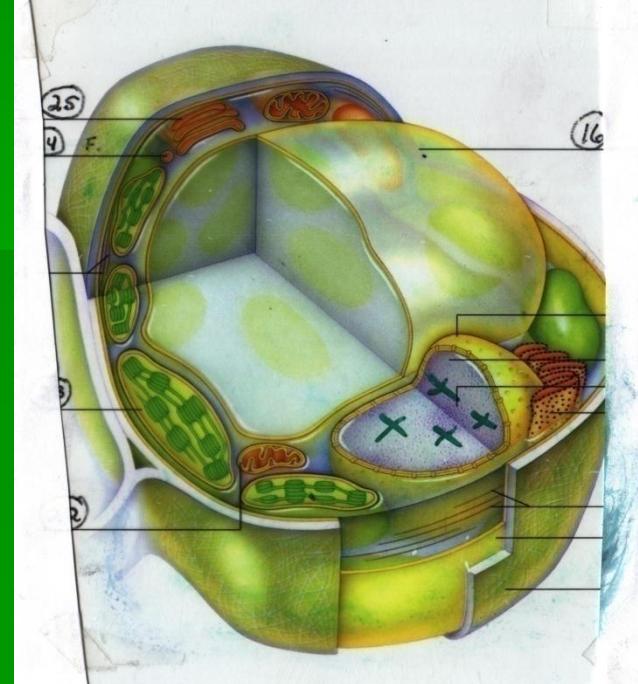
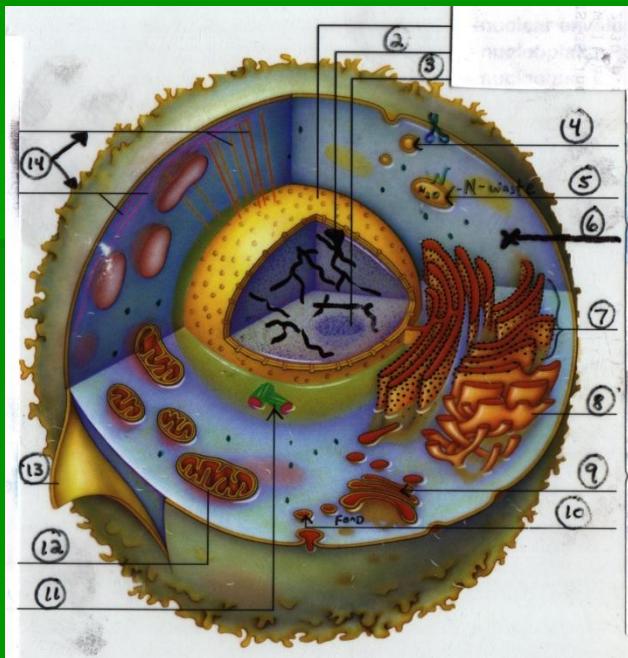
**Plant**

**Animal**



# Topics to consider:

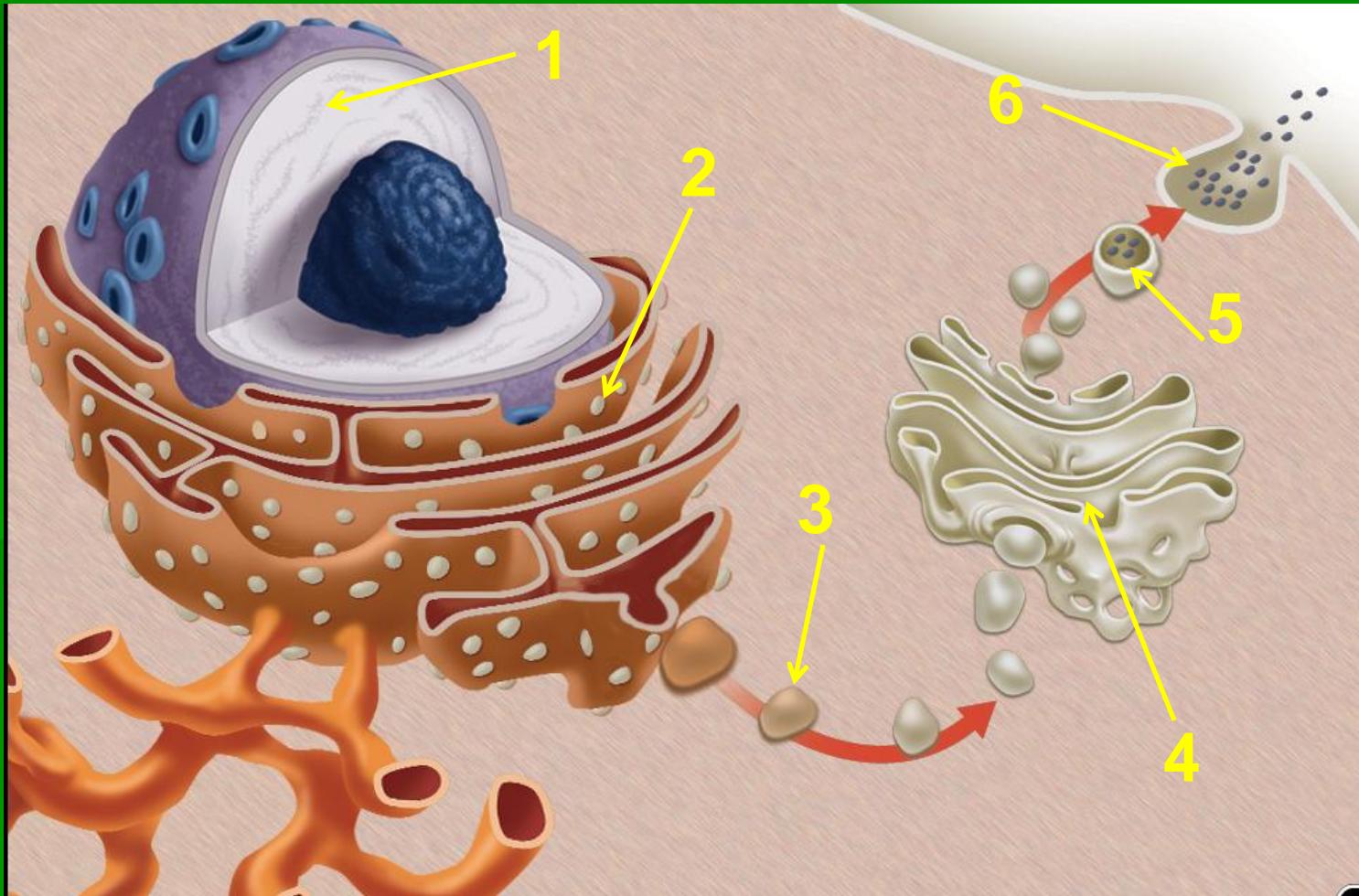
- 1) Plant ONLY organelles ?
- 2) Animal ONLY organelles ?
- 3) Organelles found in BOTH plant & animal cells? \_\_\_\_\_
- 4) Organelles that look different in a plant vs an animal cell?
- 5) How does the cell obtain nutrients and energy?
- 6) Cell shape ?
- 7) Use Photosynthesis? Use Cellular Respiration?



# Let's Compare Cell Types

	Bacteria	Fungus	Plant	Animal
Make their own food			X	
Cell walls are found here:	X some		X	
Contain <b>chloroplasts</b> :			X	
Contain <b>lysosomes</b> :		X		X
Contain <b>mitochondria</b> :	X	X	X	X
Contain <b>chromosomes</b> :	X	X	X	X
Have a large, central <b>vacuole</b> :			X	
Have a box-like <b>rectangular shape</b>			X	
Has a <b>cytoskeleton</b> :	X	X	X	X
Contain <b>ribosomes</b> :	X	X	X	X

# Let's Review the Journey of a Protein



- Cells Cells Song
- Mr. Ws Cell Song
- Cells, Cells, Cells Song
- Say What ???
- Trio Cell rap