

**There are 2 types of cells.**

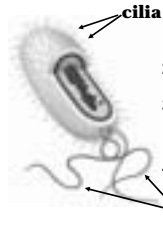


**Prokaryotic**



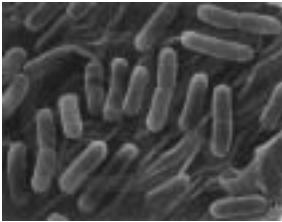
**Eukaryotic**

**Prokaryotic cells are the simplest.**

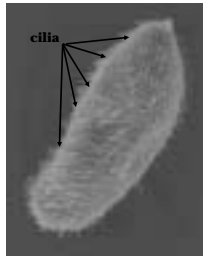


1. they lack nuclei
2. they are single cells
3. they include:
  - bacteria
  - blue-green algae
4. some move using:
  - or
  - flagella

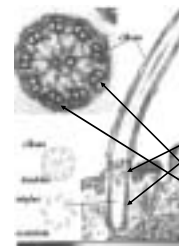
**These bacteria are Prokaryotes**



**Some bacteria are covered with cilia.**

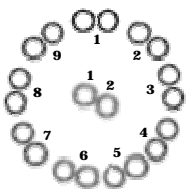


**Cilia**



- This close-up of a cilium shows that it is attached to the cell membrane.
- The point of attachment is called the basal body.
- The cross section shows that a cilium is made of 10 pairs of microtubules.

**This arrangement is often called the 9 + 2 pattern.**

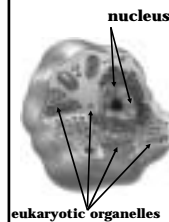


9 pair of microtubules on the outside, and 2 microtubules in the middle.

**The 9 + 2 pattern is easily seen in this cross-section of several cilia.**



**Eukaryotic cells are more complex.**



1. they have nuclei
2. they have many organelles not found in prokaryotes
3. they are the cells of:
  - protists
  - fungi
  - plants
  - and animals

**Plants and Animals have Eukaryotic Cells**

**Plant Cell      Animal Cell**

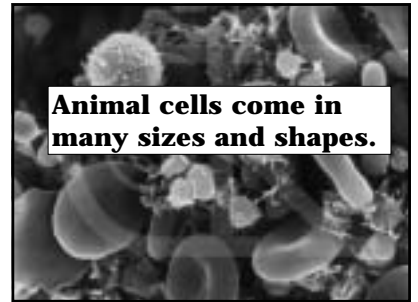
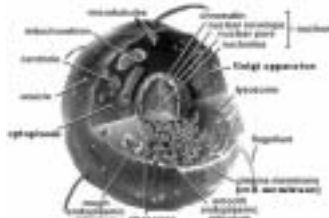


straight edges



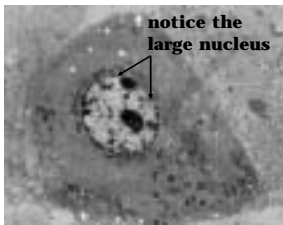
curved edges

**Structures of Animal Cells**



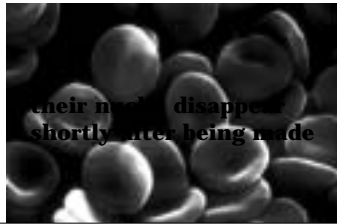
**Animal cells come in many sizes and shapes.**

**This is a liver cell.**



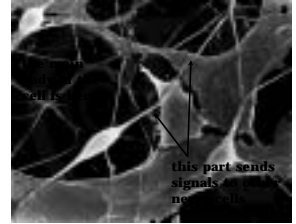
notice the large nucleus

**Here are red blood cells.**



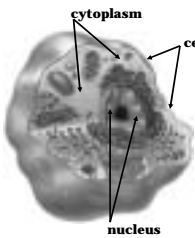
their nuclei disappear shortly after being made

**These are nerve cells.**



this part sends signals

**Animal Cell Structures**

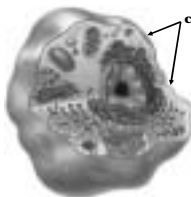


animal cells have 3 main parts:

1. cell membrane
2. cytoplasm
3. nucleus

nucleus

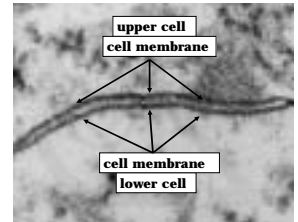
**Cell Membrane**



cell membrane

the cell membrane is the outer boundary of a cell that controls what enters and leaves

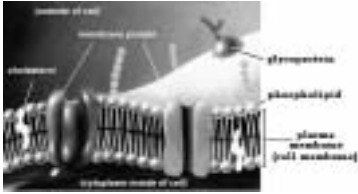
**Here are 2 cells with their cell membranes next to each other.**



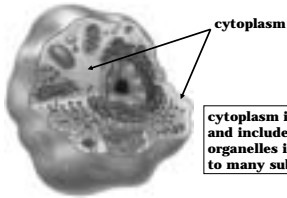
upper cell  
cell membrane

cell membrane  
lower cell

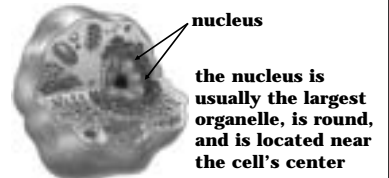
The cell membrane is actually quite complicated.



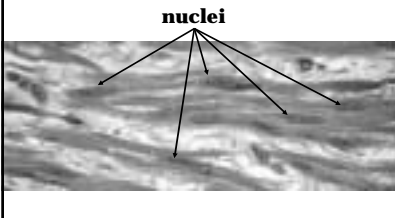
## Cytoplasm



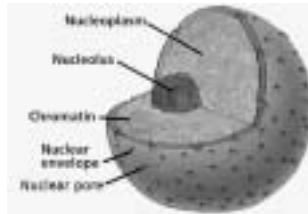
## Nucleus



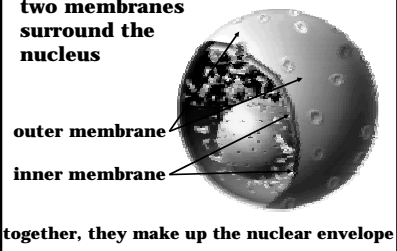
These long, thin muscle cells have long, thin nuclei.



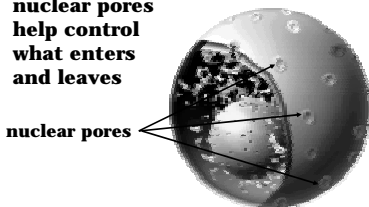
The nucleus has many parts.



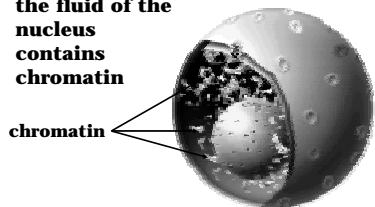
two membranes surround the nucleus



nuclear pores help control what enters and leaves

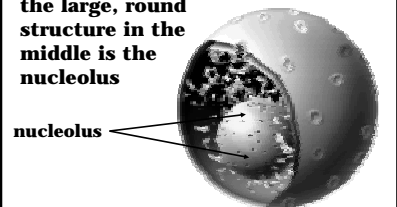


the fluid of the nucleus contains chromatin



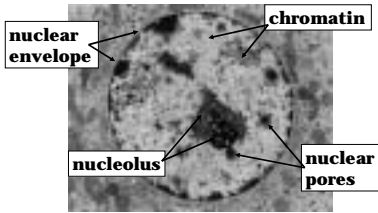
chromatin is made of DNA and proteins

the large, round structure in the middle is the nucleolus

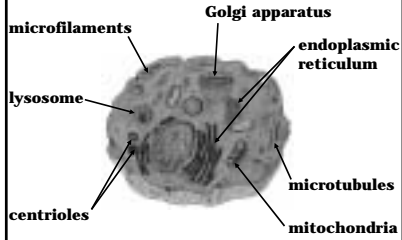


the nucleolus makes ribosomes

## Liver Cell Nucleus

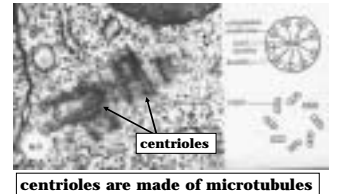


## The cytoplasm contains many organelles.

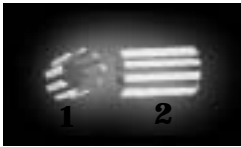


## Centrioles

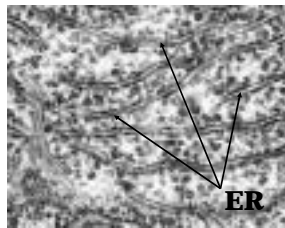
centrioles are used only during cell division to help separate chromosomes



Two centrioles appear when a cell is ready to divide.



## Endoplasmic Reticulum



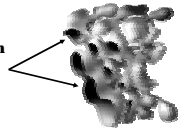
endoplasmic reticulum is abbreviated ER

ER may be rough (covered with ribosomes)

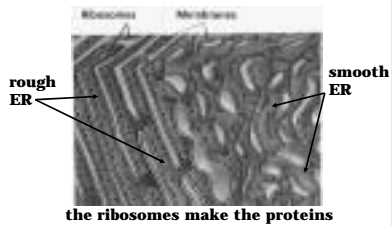


OR

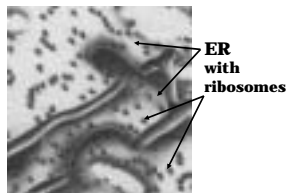
ER may be smooth (not covered with ribosomes)



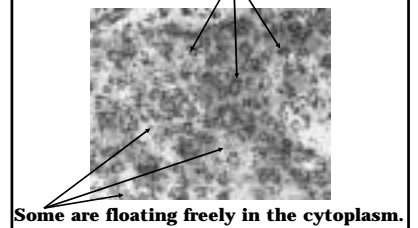
ER acts as tunnels for transporting proteins.



Ribosomes are very small objects.

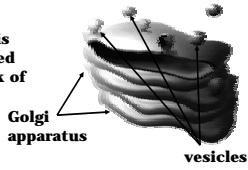


Most of these ribosomes are attached to ER (the yellow).



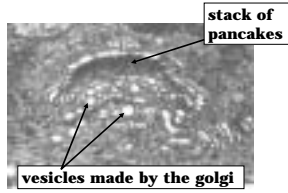
# Golgi Apparatus

the Golgi apparatus is often shaped like a stack of pancakes

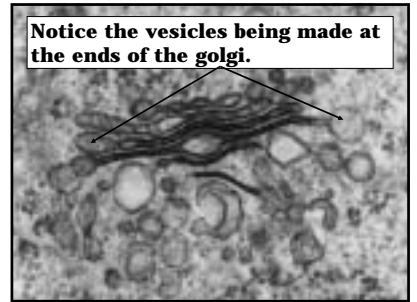


it makes vesicles, therefore, they are often nearby

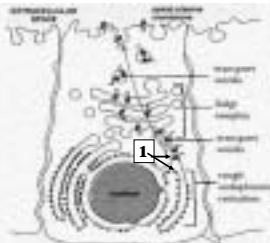
Individual sacs of the golgi are often very close together.



Notice the vesicles being made at the ends of the golgi.

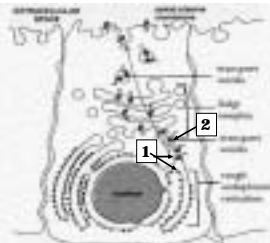


The relationship between ribosomes, the ER, the golgi, and vesicles.



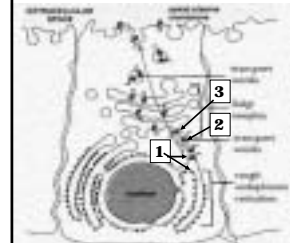
1. ribosomes make the protein

The relationship between ribosomes, the ER, the golgi, and vesicles.



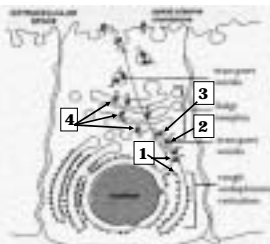
2. A vesicle transports the protein to the golgi

The relationship between ribosomes, the ER, the golgi, and vesicles.



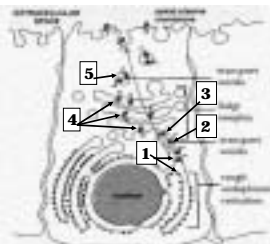
3. The golgi receives the protein

The relationship between ribosomes, the ER, the golgi, and vesicles.



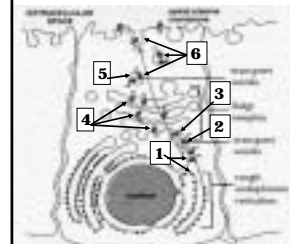
4. The golgi processes the protein

The relationship between ribosomes, the ER, the golgi, and vesicles.



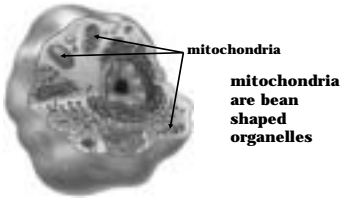
5. The golgi packages the protein in a vesicle

The relationship between ribosomes, the ER, the golgi, and vesicles.

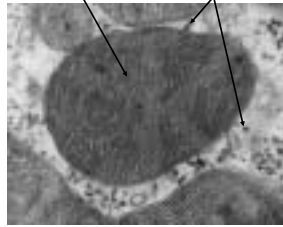


6. The vesicle transports the protein

## Mitochondria



This shows the size difference between a mitochondrion and ribosomes.



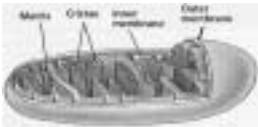
Mitochondria may be long and thin.



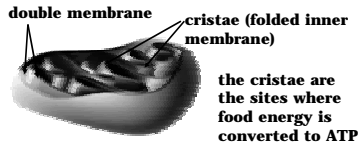
Mitochondria - the "Powerhouse" of the Cell

mitochondria take the energy in food particles and use it to make ATP

Parts of a mitochondrion

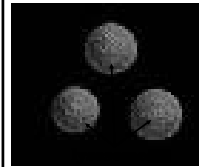


## Parts of a Mitochondrion



ATP provides energy for all cell activities

## Lysosomes

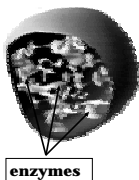


lysosomes are sacs containing enzymes for digesting unwanted substances

## Lysosomes clean up cells

Their enzymes digest:

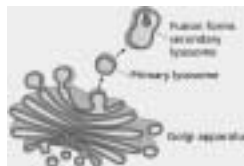
1. worn out cell parts
2. large food particles
3. invading bacteria



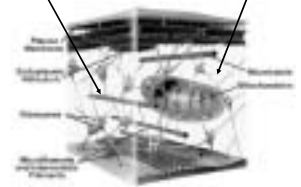
Lysosomes are made by the Golgi

lysosomes are vesicles

the proteins in them are enzymes

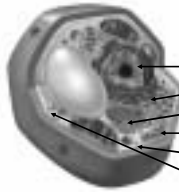


## The Cytoskeleton (microtubules and microfilaments)



function: support and movement

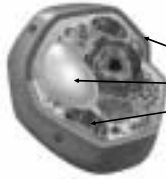
## Plant Cells



Like animal cells, plant cells have:

1. nuclei
2. ER (ribosomes)
3. golgi (vesicles)
4. mitochondria
5. lysosomes
6. cytoskeleton

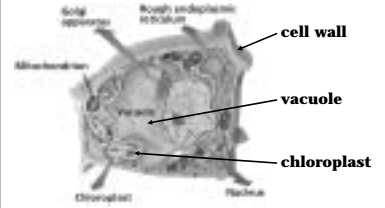
## Plant Cells



In addition, plant cells have:

1. cell walls
2. vacuoles
3. chloroplasts

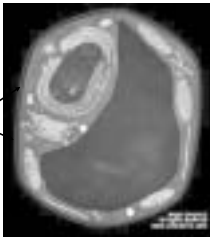
## Plant Cell Structures



## Cell Wall

the cell wall contains cellulose and gives shape and support to the cell

cell wall

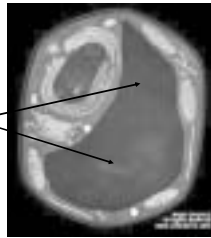


it is the plant's skeleton

## Vacuoles

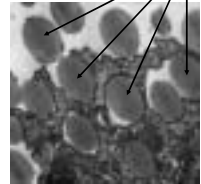
many plant cells have one large vacuole

vacuole



vacuoles are usually used to store food, waste, or water

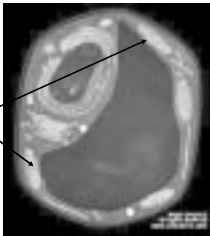
Some cells have several vacuoles.



## Chloroplasts

the chloroplast makes food (glucose) for plant cells

chloroplast



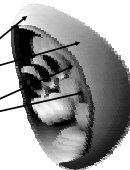
they are green because they contain chlorophyll

## Parts of a Chloroplast

the chloroplast also has a double membrane

outer membrane

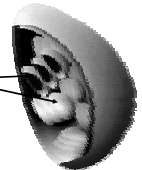
inner membrane



## Parts of a Chloroplast

inside the chloroplast are stacks of grana

grana

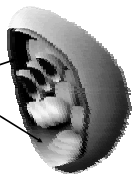


grana are the sites where sunlight is trapped

## Parts of a Chloroplast

the space around the grana is called the stroma

stroma



the stroma is the site where food (glucose) is made

This one-celled protist is not a plant.

However, it does have a vacuole and chloroplasts



Contractile Vacuoles

the vacuole fills with water and then contracts to send it outside the cell

