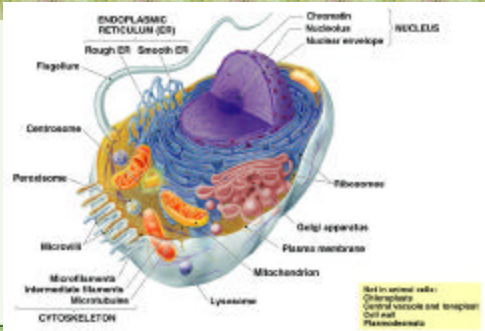
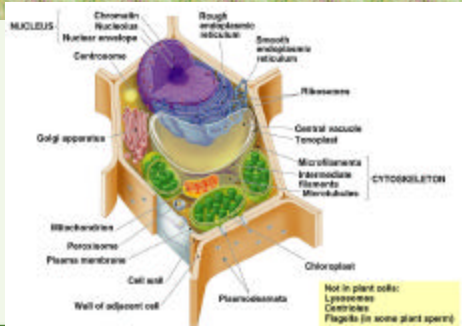


## Animal Cell:



Not in animal cells:  
Chloroplasts  
Central vacuole and tonoplast  
Cell wall  
Plasmodesmata

## Plant Cell:



Not in plant cells:  
Lysosomes  
Centrioles  
Flagella (in some plant species)

## Plastid:

- Plant organelle used for storage.
- Some store starches and lipids and pigments.
- Named according to the color or pigment that they contain.
  - Chloroplasts: contain light absorbing pigments
    - green pigment- chlorophyll
    - yellow and orange pigments- carotenoids
  - Chromoplasts: contain pigments that give flowers and fruits their characteristic colors (attract animals for pollinations and seed dispersal.)
  - Leukoplasts: unpigmented plastids that store starches.

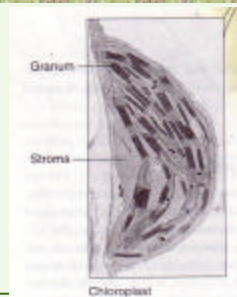
## Chloroplast:

- Unique to photosynthetic organisms.
- A Double-membraned plastid.
- Responsible for capturing the sun's energy and converting it into usable chemical energy.

## Chloroplast:

- The interior is made up of:
  - Grana stacks: disk-like structures piled on top of one another inside the chloroplast.
    - Thylakoid disks: disk-like sacs that when stacked form the grana stacks. Whose membrane contains chlorophyll (green pigment that traps light energy in photosynthesis.)
  - Stroma: fluid material inside the chloroplast surrounding the grana; holds the enzymes for the Calvin cycle.

## Chloroplast



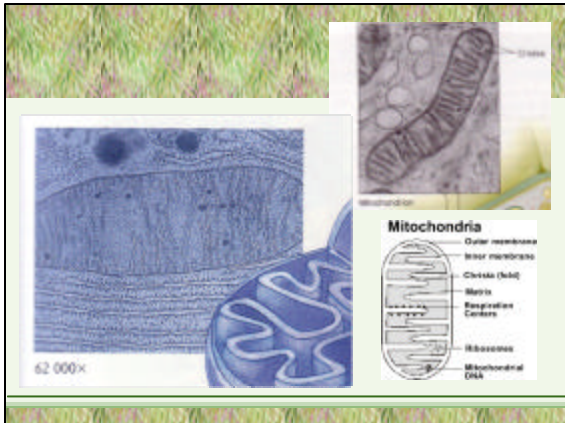
## Mitochondrion:

- Nicknames: Powerhouse or energy store
- Rod shaped organelle where cellular respiration occurs.
- Most numerous in cells that use the most energy (ie liver and muscle cells.)
- Turns food and stored chemical energy into usable energy (ATP.)
- Have their own DNA.

## Mitochondrion:



- Has an inner membrane
  - Inner membrane: called the Cristae- Folds
    - folds provide a large surface area in a small space
    - energy storing molecules are produced on the cristae
    - more cristae = more active
  - Matrix: remainder of the interior of the mitochondrion, houses the enzymes for Krebs cycle.



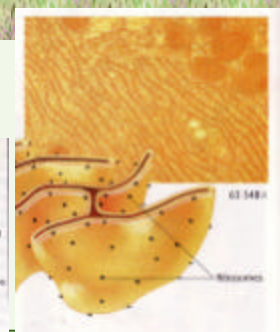
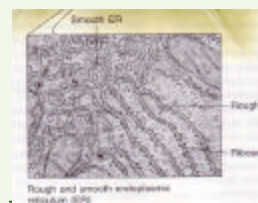
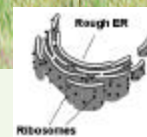
## Endoplasmic Reticulum (ER) :

- Network of folded internal membranes and folded sacs/tunnels in the cytoplasm that is attached to the outer membrane of the nuclear envelope.
- Site of lipid synthesis in the cell.
- Involved in transport of materials throughout the cell.
  - Allows proteins etc. to get from one end of the cell to the other.
  - Nicknamed the Highway system

## Endoplasmic Reticulum (ER) :

- Two types:
- Rough:
  - Has ribosomes attached to the outside.
  - Common in cells that export proteins.
  - Proteins are synthesized on rough ER.
- Smooth:
  - Has no ribosomes.
  - Site of Lipid synthesis
  - In Liver cells smooth ER is involved in detoxification of drugs and poisons.

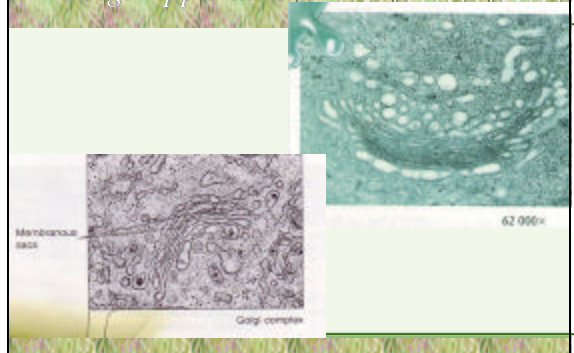
## ER:



## *Golgi Apparatus :*

- AKA: Golgi Body and Golgi Complex
- Nickname: Transport System; Packaging and Distribution Center
- Named after discoverer: Camillo Golgi
- Series of closely stacked flattened membrane sacs and vesicles that receive, chemically modifies, stores, and delivers proteins, lipids etc.
- Prepares substances for export from the cell and manufactures lysosomes.

## *Golgi Apparatus*



## *Vacuole :*

- Single-membraned fluid filled temporary storage areas for H<sub>2</sub>O, excess food, waste products, other materials needed by the cell.
- Can be formed by merging several vesicles.
- Nickname: Stomach, storage bin

## *Vacuole :*

- Can be food vacuoles, central vacuoles, or contractile vacuoles.
  - Food: food storage
  - Central: store H<sub>2</sub>O and nutrients (full=rigid, empty=wilted)
  - Contractile: stores and pumps excess H<sub>2</sub>O out of the cell
- In Plant cells:
  - Single vacuole per cell (usually)
  - Large (up to 90% of the volume of the cell)
- In Animal cells:
  - Many per cell
  - Small

## *Vesicle:*

- Small transport compartment.
- Small spherical membrane-bounded compartments within the cytoplasm that transports materials throughout the cell .
- Small transport packages that pinch off the membrane of the ER and contain proteins etc. that it is transporting to the Golgi Apparatus for export from the cell or to other areas of the cell.

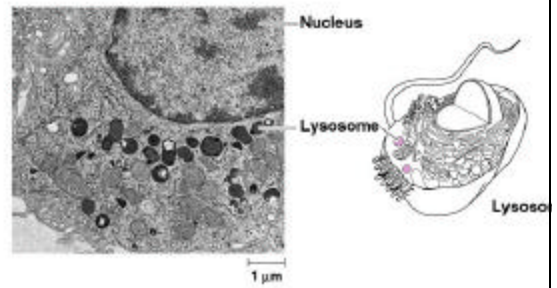
## *Ribosomes:*

- Nickname: Protein Factories
- Combinations of RNA and proteins
- Sites where the cell assembles enzymes and proteins.
- Not bound by a membrane.
- Can be free floating (free ribosomes) or attached to Endoplasmic Reticulum (bound ribosomes.)
- The most numerous organelle in all cells
  - larger in eukaryotes than in prokaryotes

### *Lysosome:*

- Nickname: Destroyer, Digestive Center
- Contains digestive enzymes which allow a cell to digest/break down foreign materials and old worn out cell organelles.
- The membrane surrounding this organelle prevents the digestive enzymes from destroying the rest of the cell.

### *Lysosome:*



(a) Lysosomes in a white blood cell

### *Centriole:*

- A pair of cylindrical structures in animal cells that organize microtubule assembly and aide in cellular reproduction.



### *Cytoskeleton:*

- Network of fibers extending throughout the cytoplasm.
- Provides support and maintains shape of the cell. provides anchorage for many organelles
- Is dynamic, dismantling in one part and reassembling in another to change cell shape
- Three main types of fibers in the cytoskeleton: **microtubules**, **microfilaments**, and **intermediate filaments**. (We will cover microtubules and microfilaments.)

### *Microtubules:*

- Hollow cylinders that make up the spindle fibers in dividing cells, determine the direction of cell expansion, and, in plants, control the growth of the cell wall.
- Made of proteins.
- Part of the cytoskeleton which forms the cell shape and provides support.
- Part of the cytoskeleton that is important in motility (cilia/flagella.)

### *Microfilaments:*

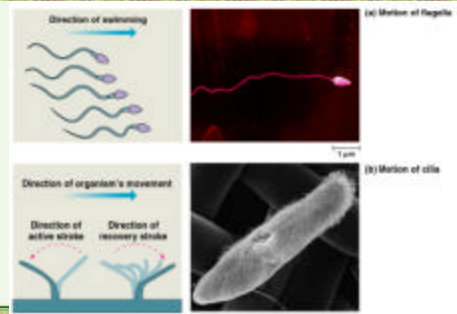
- Part of the cytoskeleton.
- Thin solid protein fibers that provide shape and support for the cell.
- AKA actin filaments



### *Locomotion:*

- A cell moves forward by expanding and forcing the cytoskeleton to form a bulge in the plasma membrane (pseudopod- false foot) or by moving cilia (small hair-like structures) and flagella (long whip-like structures.)
- Flagella and cilia are about the same width but flagella are much longer and are made of a ring of microtubules.
- Cilia and Flagella move unicellular and small multicellular organisms by propelling water past the organism.
- Cilia are usually numerous per cell and their rapid beating is very coordinated.
- There are usually only one or two flagella per cell.

### *Cilia and Flagella:*



### *Organization:*

- Unicellular or multicellular
- Tissue: Group of cells that work together to perform a function. (Cells are linked together at cell junctions.)
- Organs: Groups of two or more tissues working together to perform some function.
- Organ system: A group of organs that work together to carry out major life functions.
- Organism: Living thing able to carry out all life processes.