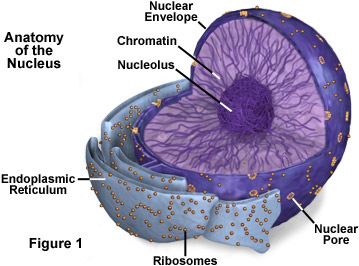
**Cell Structure Information Package**

Nucleus

* ****Largest Organelle.
* Control the cell's **functions**
* Surrounded by a double-layered membrane (the **nuclear envelope**).
* Membrane has **pores** through which larger molecules pass (Nuclear Pores)**.**
* Contains a fluid called the **nucleoplasm.**
* Contains chromatin (DNA strands which form chromosomes during cell division).

Nucleolus

* Dark region in the Nucleoplasm.
* One or more found in the nucleus.
* Site where ribosomal RNA (rRNA) is produced or stored.
* Involved in interactions between the nucleus and the cytoplasm.

Chromatin

* Thin strands of protein and DNA that is our hereditary (genetic) material of the cell.
* Condenses to form **chromosomes** during cell division.

### Chromosomes[chromosomes](https://bclearningnetwork.com/mod/glossary/showentry.php?eid=10972&displayformat=dictionary)

* Rod - shaped bodies in the nucleus, particularly during cell division.
* Contains the hereditary information (genes in our DNA).
* Condensed chromatin

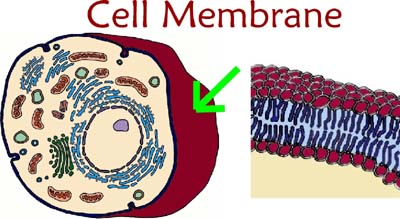
Each eukaryotic species has a characteristic number of chromosomes.

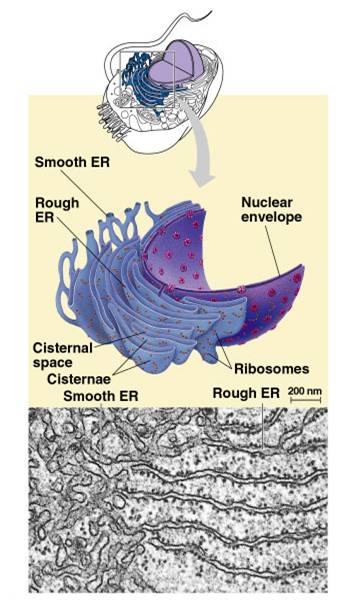
A typical human cell has 46 chromosomes, but sex cells (eggs and sperm) have only 23 chromosomes.

### cytoplasmCytoplasm

* A jelly-like substance, which can change from the solid to the liquid state with the addition of heat or change in metabolic activity.
* **Contains** and **supports** all the cells organelles.

### Cell Membrane or Plasma Membrane

* **Surrounds cell** and is composed of proteins and phospholipids (fats with Phosphorous).It acts as skin around the cells contents.
* It is a **selectively permeable** membrane that **regulates movement** of materials in and out of the cell.
* A **Single membrane** also surrounds many organelles: the vacuoles, lysosomes, E.R., Golgi Apparatus. A *double membrane* surrounds the *nucleus* and *mitochondria.*

**Endoplasmic Reticulum – Smooth and Rough:**

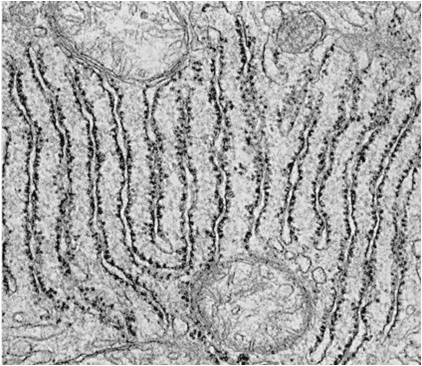
* System of interconnected flattened tubes, sacs, or **canals**
* Move molecules from one area to another.- Sections of ER can break free "blebbing" to produce small membrane bound sacs of either proteins or lipids called vesicles**.**
* Amount of ER in a cell increases or decreases depending on the cell's activity.

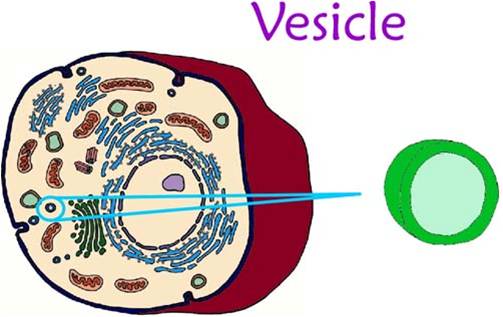
**Smooth Endoplasmic Reticulum**

* System of interconnected flattened tubes, sacs, or **canals** that begins at the nuclear envelope and branches throughout the cytoplasm to the cell membrane.
* Manufactures **lipid**s (fats). Cells that produce steroid hormones have abundant Smooth ER.
* Also seems to have other enzymes in the Smooth ER of the liver that help detoxify drugs and poisons. These include alcohol and barbiturates.
* Frequent exposure to toxic molecules leads to the proliferation of smooth ER, increasing tolerance to the target and other drugs.

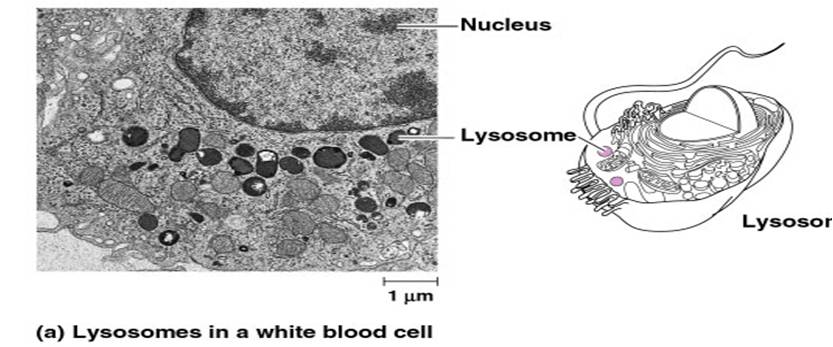
## **Rough Endoplasmic Reticulum**

* Like Smooth ER, but with attached **ribosomes**.
* Stack of a half dozen or more **flattened sacs**.
* Abundant in cells that produce large amounts of **protein** for export from the cell

 **Golgi Apparatus (Golgi Body)**

* The Golgi is a center of manufacturing, warehousing, sorting, and shipping.
* On one side receives protein-filled vesicles from the E.R**.**
* Sorts the proteins and packages them in vesicles at the other side.
* From here the vesicles move to different locations in the cell**.**
* Many *transport vesicles* from the ER travel to the Golgi apparatus for modification of their contents.
* The Golgi apparatus is especially extensive in cells specialized for secretion. ****

Vacuoles, Vesicles and Lysosomes

* **Vacuoles** - Storage area for water, nutrients, and wastes.
* **Vesicle** - a small vacuole
* Storage sitefor various kinds of molecules
* Can be made by the Golgi Apparatus or from an in-folding ****of the cell membrane

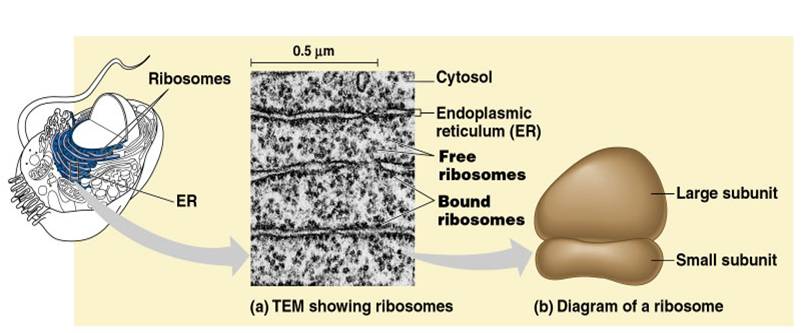
Lysosomes

* Special vacuoles formed by the golgi body (double membrane).
* Contains powerful hydrolytic enzymes used to digest substances entering the cell or organelles that are of no further use (autodigestion).

Several inherited diseases affect lysosomal metabolism.

* These individuals lack a functioning version of a normal hydrolytic enzyme.
* These diseases include Pompe's disease in the liver and Tay-Sachs disease in the brain.

## **Ribosomes**

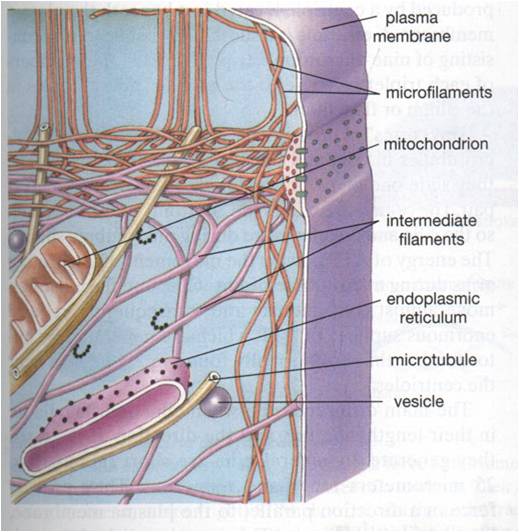
* Contain rRNA and protein subunits.
* Function as sites for **protein synthesis** (making of)**.**
* Found on **E.R.** (proteins for export) or in the **cytoplasm** (proteins for use in the cell).

## **mitochondriaMitochondria**

* Burn glucose to produce **energy** for the cell, in the form of adenosine triphosphate (ATP)**.**
* Use up oxygen an give off carbon dioxide(this process is called **cellular respiration).**
* Equation for Cellular Respiration:

C6H12O + 6O2 --> 6CO2 + 6H2O + Energy

* Composed of two membranes.
* Considered the powerhouse of the cell.
* The inner membranes loop back and forth through the inner fluid, matrix, of the mitochondria increasing its surface area and producing shelf-like structures called cristae.
* This inner membrane is the site of cellular respiration.

**Cytoskeleton**

* Composed of tiny tube-like structures **microfilaments** and **microtubules.**
* Provides internal structure to maintain the cell's **shape,** *anchor* the organelles, and *allow them to move* when appropriate.

**Cilia**

* Short, numerous, hair-like projections that are used for locomotion by many unicellular organisms**.**
* Membrane-bound collections of microtubules

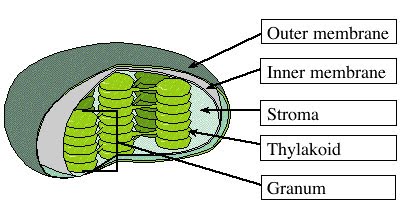
**Flagella**

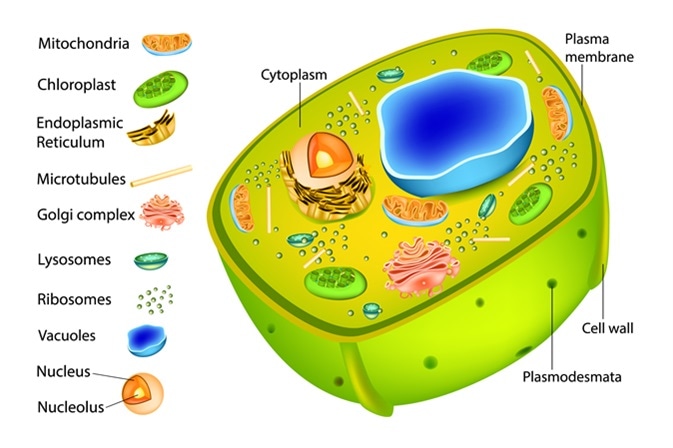
* Like cilia but can be much longer.
* Also for locomotion of organisms and gametes (sperm).

# Cilia and flagella - YouTube

# Plant and Animal Cells

As you worked through the last topic, you may have noticed some differences between plant and animal cells:

* In **PLANTS**, the **cell wall** surrounds the entire cell and provides support and protection. Plants are able to stand upright because of their cell walls. *Animal cells do not have a cell wall.*
* Plant cells have **chloroplasts.** Chloroplasts are involved in **photosynthesis**. Plants use this process to make their own food using light energy, carbon dioxide, and water.
* Plant cells have a **much larger vacuole** than animal cells (many small vacuoles). This large vacuole helps support the cell by creating pressure against the cell wall.

**Plant Cell:**

# Prokaryote Cell Structure & Function - ppt download

# Prokaryotic Vs Eukaryotic Cells

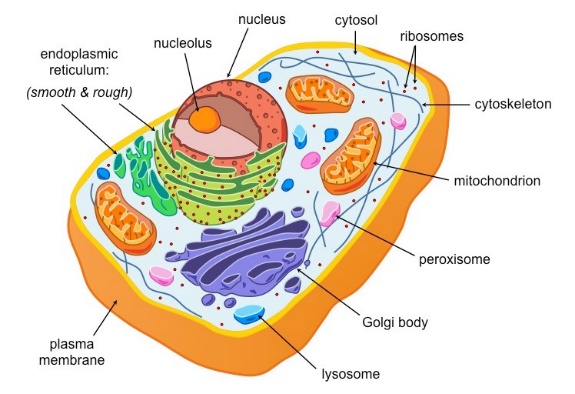
## **Prokaryotic Cells**

## Simple, Primitive cells.

**Do not** contain **a nucleus**or many cell organelles, other than ribosomes, because prokaryotic cells lack internal membranes.

Prokaryotic cells tend to be **much smaller** than eukaryotic cells. All are **Unicellular** organisms. The only known Kingdom to consist of prokaryotic cells is Monera (**Bacteria).**

## **Eukaryotic Cells - Complex cells**

* Larger, more complex. Have a **nucleus** and many organelles.
* Organelles are bound by **membranes**. Can be either **unicellular** or **multicellular. Examples include plant, animal, protist and fungi cells.**

*Prokaryotic cells are considered to be less efficient than Eukaryotic cells because the chemical reactions occur all over the cytoplasm rather than in areas of specialization.*

## **Plant and Animal Cell Organelles**

The cells of eukaryotes (protozoa, plants and animals) are highly structured. These cells tend to be larger than the cells of bacteria, and have developed specialized packaging and transport mechanisms that may be necessary to support their larger size. Use the following interactive animation of plant and animal cells to learn about their respective organelles.

**Nucleus**: The nucleus is the most obvious organelle in any eukaryotic cell. It is enclosed in a double membrane and communicates with the surrounding cytosol via numerous nuclear pores. Within each nucleus is nuclear chromatin that contains the organism’s genome. The chromatin is efficiently packaged within the small nuclear space. Genes within the chromatin are made of deoxyribonucleic acid (DNA). The DNA stores the organism’s entire encoded genetic information. The DNA is similar in every cell of the body, but depending on the specific cell type, some genes may be turned on or off - that's why a liver cell is different from a muscle cell, and a muscle cell is different from a fat cell. When a cell is dividing, the nuclear chromatin (DNA and surrounding protein) condenses into chromosomes that are easily seen by microscopy. For a deeper understanding of genetics, visit our companion site, [GeneTiCs Alive!](http://www.geneticsalive.com/)

**Nucleolus**: The prominent structure in the nucleus is the nucleolus. The nucleolus produces ribosomes, which move out of the nucleus and take positions on the rough endoplasmic reticulum where they are critical in protein synthesis.

**Cytosol**: The cytosol is the "soup" within which all the other cell organelles reside and where most of the cellular metabolism occurs. Though mostly water, the cytosol is full of proteins that control cell metabolism including signal transduction pathways, glycolysis, intracellular receptors, and transcription factors.

**Cytoplasm**: This is a collective term for the cytosol plus the organelles suspended within the cytosol.

**Centrosome**: The centrosome, or MICROTUBULE ORGANIZING CENTER (MTOC), is an area in the cell where microtubules are produced. Plant and animal cell centrosomes play similar roles in cell division, and both include collections of microtubules, but the plant cell centrosome is simpler and does not have centrioles.

During animal cell division, the centrioles replicate (make new copies) and the centrosome divides. The result is two centrosomes, each with its own pair of centrioles. The two centrosomes move to opposite ends of the nucleus, and from each centrosome, microtubules grow into a "spindle" which is responsible for separating replicated chromosomes into the two daughter cells.

**Centriole** (animal cells only): Each centriole is a ring of nine groups of fused microtubules. There are three microtubules in each group. Microtubules (and centrioles) are part of the cytoskeleton. In the complete animal cell centrosome, the two centrioles are arranged such that one is perpendicular to the other.

**Golgi**: The Golgi apparatus is a membrane-bound structure with a single membrane. It is actually a stack of membrane-bound vesicles that are important in packaging macromolecules for transport elsewhere in the cell. The stack of larger vesicles is surrounded by numerous smaller vesicles containing those packaged macromolecules. The enzymatic or hormonal contents of lysosomes, peroxisomes and secretory vesicles are packaged in membrane-bound vesicles at the periphery of the Golgi apparatus.

**Lysosome**: Lysosomes contain hydrolytic enzymes necessary for intracellular digestion. They are common in animal cells, but rare in plant cells. Hydrolytic enzymes of plant cells are more often found in the vacuole.

**Peroxisome**: Peroxisomes are membrane-bound packets of oxidative enzymes. In plant cells, peroxisomes play a variety of roles including converting fatty acids to sugar and assisting chloroplasts in photorespiration. In animal cells, peroxisomes protect the cell from its own production of toxic hydrogen peroxide. As an example, white blood cells produce hydrogen peroxide to kill bacteria. The oxidative enzymes in peroxisomes break down the hydrogen peroxide into water and oxygen.

**Secretory Vesicle**: Cell secretions - e.g. hormones, neurotransmitters - are packaged in secretory vesicles at the Golgi apparatus. The secretory vesicles are then transported to the cell surface for release.

**Cell Membrane**: Every cell is enclosed in a membrane, a double layer of phospholipids (lipid bilayer). The exposed heads of the bilayer are "hydrophilic" (water loving), meaning that they are compatible with water both within the cytosol and outside of the cell. However, the hidden tails of the phosopholipids are "hydrophobic" (water fearing), so the cell membrane acts as a protective barrier to the uncontrolled flow of water. The membrane is made more complex by the presence of numerous proteins that are crucial to cell activity. These proteins include receptors for odors, tastes and hormones, as well as pores responsible for the controlled entry and exit of ions like sodium (Na+) potassium (K+), calcium (Ca++) and chloride (Cl-).

**Mitochondria**: Mitochondria provide the energy a cell needs to move, divide, produce secretory products, contract - in short, they are the power centers of the cell. They are about the size of bacteria but may have different shapes depending on the cell type. Mitochondria are membrane-bound organelles, and like the nucleus have a double membrane. The outer membrane is fairly smooth. But the inner membrane is highly convoluted, forming folds (cristae) when viewed in cross-section. The cristae greatly increase the inner membrane's surface area. It is on these cristae that food (sugar) is combined with oxygen to produce ATP - the primary energy source for the cell. The Wellcome Trust Centre for Mitochondrial Research provides further answers to "[What Do Mitochondria Do](http://www.newcastle-mitochondria.com/mitochondria/what-do-mitochondria-do/)"?

**Vacuole**: A vacuole is a membrane-bound sac that plays roles in intracellular digestion and the release of cellular waste products. In animal cells, vacuoles are generally small. Vacuoles tend to be large in plant cells and play several roles: storing nutrients and waste products, helping increase cell size during growth, and even acting much like lysosomes of animal cells. The plant cell vacuole also regulates turgor pressure in the cell. Water collects in cell vacuoles, pressing outward against the cell wall and producing rigidity in the plant. Without sufficient water, turgor pressure drops and the plant wilts.

**Cell Wall (plant cells only)**: Plant cells have a rigid, protective cell wall made up of polysaccharides. In higher plant cells, that polysaccharide is usually cellulose. The cell wall provides and maintains the shape of these cells and serves as a protective barrier. Fluid collects in the plant cell vacuole and pushes out against the cell wall. This turgor pressure is responsible for the crispness of fresh vegetables.

**Chloroplast (plant cells only)**: Chloroplasts are specialized organelles found in all higher plant cells. These organelles contain the plant cell's chlorophyll responsible for the plant's green color and the ability to absorb energy from sunlight. This energy is used to convert water plus atmospheric carbon dioxide into metabolizable sugars by the biochemical process of photosynthesis. Chloroplasts have a double outer membrane. Within the stroma are other membrane structures - the thylakoids. Thylakoids appear in stacks called "grana" (singular = granum). Estrella Moumtain Community College provides a [good source of information on photosynthesis](http://www2.estrellamountain.edu/faculty/farabee/BIOBK/BioBookPS.html).

**Smooth Endoplasmic Reticulum**: Throughout the eukaryotic cell, especially those responsible for the production of hormones and other secretory products, is a vast network of membrane-bound vesicles and tubules called the endoplasmic reticulum, or ER for short. The ER is a continuation of the outer nuclear membrane and its varied functions suggest the complexity of the eukaryotic cell.  
The smooth endoplasmic reticulum is so named because it appears smooth by electron microscopy. Smooth ER plays different functions depending on the specific cell type including lipid and steroid hormone synthesis, breakdown of lipid-soluble toxins in liver cells, and control of calcium release in muscle cell contraction.

**Rough Endoplasmic Reticulum**: Rough endoplasmic reticulum appears "pebbled" by electron microscopy due to the presence of numerous ribosomes on its surface. Proteins synthesized on these ribosomes collect in the endoplasmic reticulum for transport throughout the cell.

**Ribosomes**: Ribosomes are packets of RNA and protein that play a crucial role in both prokaryotic and eukaryotic cells. They are the site of protein synthesis. Each ribosome comprises two parts, a large subunit and a small subunit. Messenger RNA from the cell nucleus is moved systematically along the ribosome where transfer RNA adds individual amino acid molecules to the lengthening protein chain.

**Cytoskeleton**: As its name implies, the cytoskeleton helps to maintain cell shape. But the primary importance of the cytoskeleton is in cell motility. The internal movement of cell organelles, as well as cell locomotion and muscle fiber contraction could not take place without the cytoskeleton. The cytoskeleton is an organized network of three primary protein filaments:

* microtubules
* actin filaments (microfilaments)
* intermediate fibers