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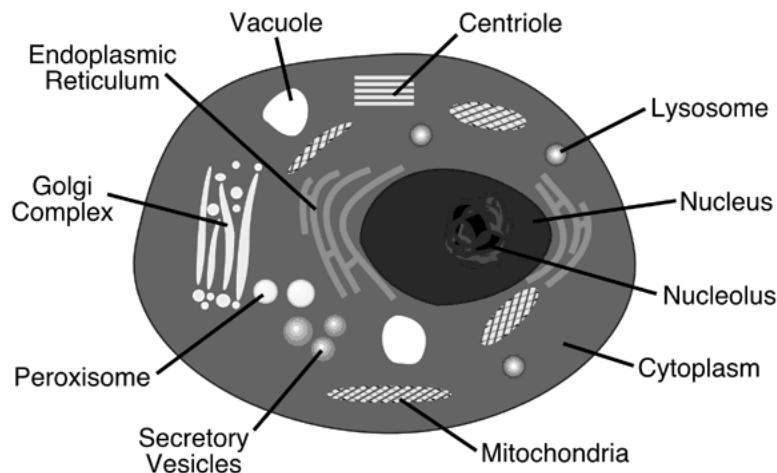
## Cell Models



**Problem:** To build a model of a “typical” cell and identify the functions of its parts.

**Background Information:** Every living thing on Earth is made up of cells. Cells keep living things organized. Some organisms, like bacteria, are only as big as a single cell. In an organism as complex as a human, there is no way you we could do everything we do and be just a single cell. We must have many different, and many different kinds of cells. One of the main functions of cells is to organize the body. We have brain cells, stomach cells, bone cells, and many other types of cells. They all do special jobs to help our bodies function the way they are supposed to. Although the cells in our bodies do many different jobs, they all contain similar parts called organelles. In the same way there are different kinds of cells inside us, different organisms have different types of cells. Trees have different cells than us and so do dogs and cockroaches. Each of those cells is different in some way. Every cell has a special job to do.

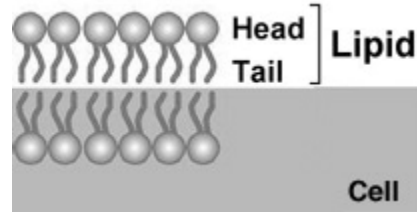
All cells have some things in common. If you were to look inside of a cell, you would be able to see all of the organelles that are labeled in this drawing of a cell.



Each of these organelles does a special job inside of the cells. Read on to find out what job each of the organelles does to keep the cell working properly.

### **Cell Membrane**

A double layer of molecules called the cell membrane surrounds the cell. The cell membrane is like the walls of your house because it gives the cell support and protects the cell from the outside environment. In addition, just like the walls of your house, the cell membrane has openings in it that let food come in and waste go out. These openings are called pores. The cell membrane can easily change shape and is able to receive signals from the outside environment. Plant cells have an added part in their cell membranes called a **cell wall**. It is made of cellulose and helps a plant keep its shape.

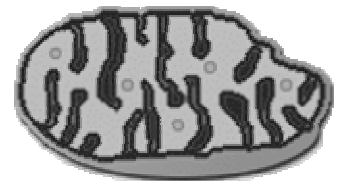


### **Cytoplasm**

The cytoplasm is everything inside the cell membrane except for the nucleus. The cytoplasm contains all of the organelles and a gel-like fluid that supports the organelles. This gel-like fluid is called the **cytosol**.

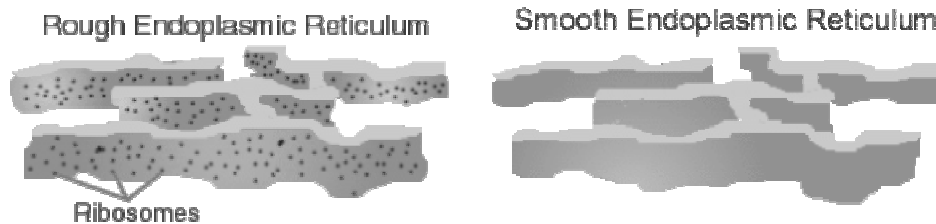
### **Mitochondria**

The mitochondria are the "power plants" of the cell because they make the cell's energy. The purpose of the mitochondria is to break down food molecules so that the cell has the energy to live. We eat and our intestines break down the food for us to use. A cell eats and the mitochondria break down sugar molecules for the cell to use. Energy is made by the mitochondria as it "digests" sugar molecules. The mitochondria also need oxygen to make energy, and gives off carbon dioxide as waste. That is why when we breathe we inhale the oxygen needed for the mitochondria and exhale the carbon dioxide waste created by the mitochondria.



## **Ribosomes**

Ribosomes are little factories that make proteins the cell needs to survive and grow. Ribosomes are found either floating free in the cytoplasm, or attached to the organelle called the endoplasmic reticulum (see below).



## **Endoplasmic Reticulum**

There are two types of endoplasmic reticulum (ER for short); rough and smooth. Ribosomes are attached to the surface of the rough ER so that the proteins they make can be released directly into the ER for transport.

The **rough ER** is the transportation system of the cell. The ER is a network of interconnected tubes that carry proteins and lipids to the organelles or to the cell membrane. The ER collects the proteins built by the cell and creates a bubble around them. That bubble is called a VESICLE. The vesicle is formed when the ER pinches off a part of its membrane. The vesicle can then move to the Golgi apparatus or the cell membrane. If the vesicle floats to the cell membrane, the proteins are going to be sent out of the cell. If they move to the Golgi Apparatus, the proteins will be used inside the cell.

**Smooth ER** creates something called steroids and stores ions. When the smooth ER stores those ions, it is so that the cell can keep the correct levels of nutrients. That ion storage is like your body's fat cells holding onto sugars just in case you need them. The thing to remember is that the smooth ER collects things and contains them.

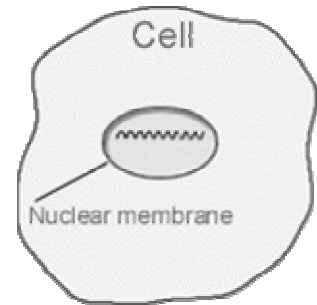
### **Lysosomes**

The lysosomes are small sacks inside of the cell that contain many enzymes. These enzymes "digest" old molecules of DNA, protein, or lipid into small pieces that can be reused to make new molecules.



### **Nucleus**

The nucleus is like the cell's brain. It contains all of the information the cell needs to do specific jobs, grow and divide. This information is stored in the DNA molecules that are found in the nucleus. The nucleus has its own membrane called the nuclear membrane that is very similar to the cell membrane. This membrane keeps the DNA separated from organelles of the cytoplasm.



### **Golgi Complex**

Sometimes called the Golgi Apparatus. It takes simple molecules, combines them, and pieces them together to make larger molecules.

### **Vacuoles**

Vacuoles are bubbles that float in the cell. Those bubbles store the different molecules a cell needs to survive. Some contain food and others hold oil. There are even vacuoles that hold onto waste products.

### **Materials:**

- |                           |  |
|---------------------------|--|
| 2 resealable plastic bags | Glass "gems" for flower arrangements     |
| Buttons                   | Beads                      Pipe Cleaners |
| Other "craft" items       | Water                                    |

**Procedure:**

1. Put one plastic bag inside of the other, this represents the *double-layered cell membrane*.
2. Pour one cup of water into the plastics bags, this represents the *cytoplasm*.
3. Use the craft objects you have been given to model the following:
  - ☆ Nucleus
  - ☆ Lysosome
  - ☆ Mitochondria
  - ☆ Rough ER
  - ☆ Smooth ER
  - ☆ Golgi Complex
  - ☆ Vacuole
4. When you are sure you have a good model of the cell and you know the function of each organelle, have your teacher check your model and sign this paper:

Cell Model	Function of Organelle
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*Teacher Initials*

**Questions & Conclusions:**

1. Why do we often depend on models? Why are models useful when discussing cells?
  
  
  
  
  
  
  
  
  
  
  
2. How is your model like a real cell?

3. How is it different?
4. What are some limitations of models in general?
5. What could we do to make this a model of a plant cell?