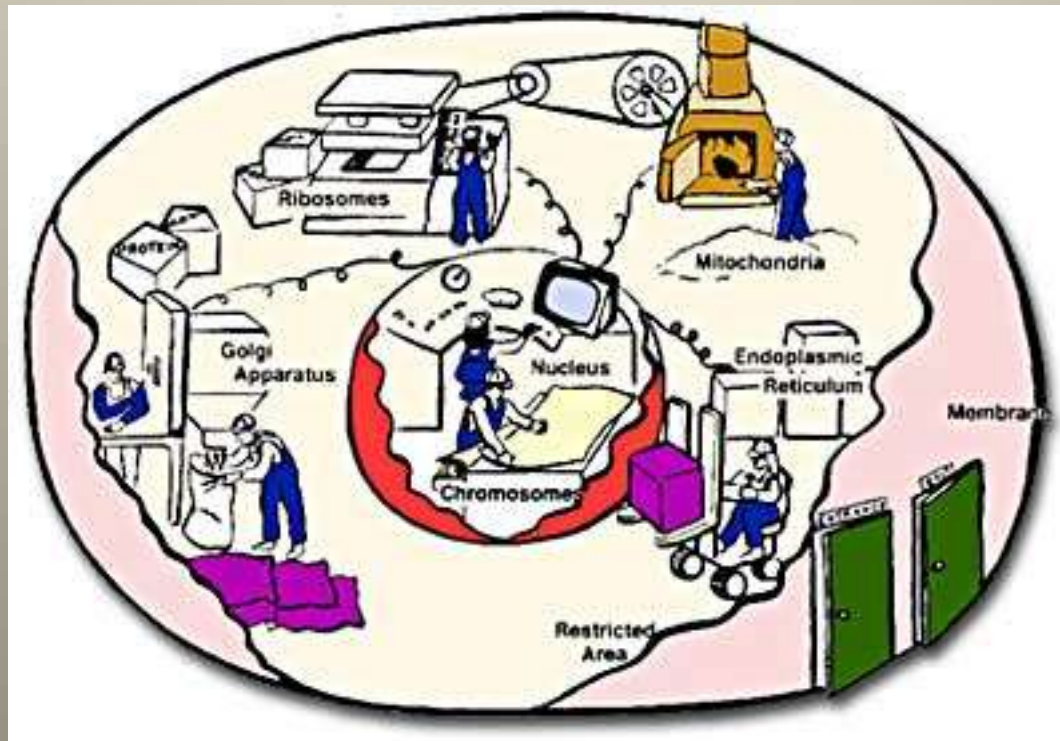




# Cells: A Busy Factory

Adapted from:

<http://www.beyondbooks.com/lif71/4a.asp>





Imagine a bustling factory manufacturing the latest must-have gadget. Whether they make bicycles, cell phones, or hot air balloons, most factories are set up in essentially the same way.

All factories have exterior walls that protect and support them and interior walls that create separate work areas. They usually have some kind of production line where a product is assembled and an executive department that decides what product is made. A finishing department processes and prepares the product for shipping, and a packaging department wraps the product.





In addition, a factory has a receiving department that brings in the components it needs to make its product, a communications department that allows it to contact suppliers, and a power plant that provides the energy it needs to run. Finally, a custodial staff keeps everything clean and in good working order.

Cells are very similar to factories. To stay alive and function properly, cells have a division of labor similar to that found in factories. Here, we will examine cells as protein-producing factories.





# Cell Structure: An Overview

All eukaryotic cells are composed of a plasma membrane, a nucleus, and cytoplasm. These structures can be compared with a factory's departments.



The **PLASMA MEMBRANE** regulates what enters or leaves the cell. It is like the shipping and receiving department of a factory. The plasma membrane also functions as the communications department because it is where the cell contacts the external environment.



The **NUCLEUS** (or the executive department) runs the cell factory and controls all cell activity. It determines what proteins are to be made and stores all the plans for any proteins that the cell currently makes or has made in the past.





The **CYTOPLASM** includes everything between the cell membrane and the nucleus. It contains various kinds of cell structures and is the site of most cell activity. The cytoplasm is similar to the factory floor where most of the products are assembled, finished, and shipped.





## **The Cytoplasm: The Factory Floor**

The real work of the cell occurs in the cytoplasm, the cell's "factory floor." The term "cytoplasm" refers to everything between the cell membrane and the nuclear membrane. It consists mostly of water, salts, some proteins, and many small structures called organelles (or little organs). These structures perform several different functions for the cell which generally fall under the categories of production, maintenance, and energy transformation. This tour of the cell includes several stops on the "factory floor." Let's start with the production team.





In a factory, the assembly of parts takes place on the factory floor. The highly skilled craftspeople who assemble these components sit hour after hour at their stations, plugging away at their work.

These workers are highly compensated because they can read plans and use that information to make different kinds of products.

The smooth ER helps transport materials within the cell. The cell has its own assembly line and workers. Within the cytoplasm is a series of large, flattened membranes that fold back and forth on each other and have a very large surface area. This collection of membranes is called the **ENDOPLASMIC RETICULUM**, or **ER**.



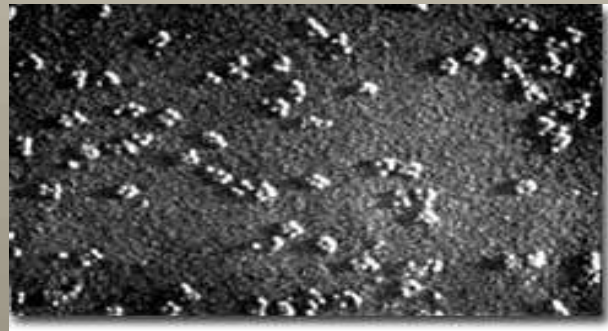


The ER can be divided into two parts: the rough ER and the smooth ER.

The rough ER has ribosomes attached to it and provides a surface along which the process of protein assembly can occur. The smooth ER does not have ribosomes and is much more tubular in appearance.



Ribosomes, the workers that build proteins, are manufactured by the nucleolus. Look at the picture of a ribosome below!



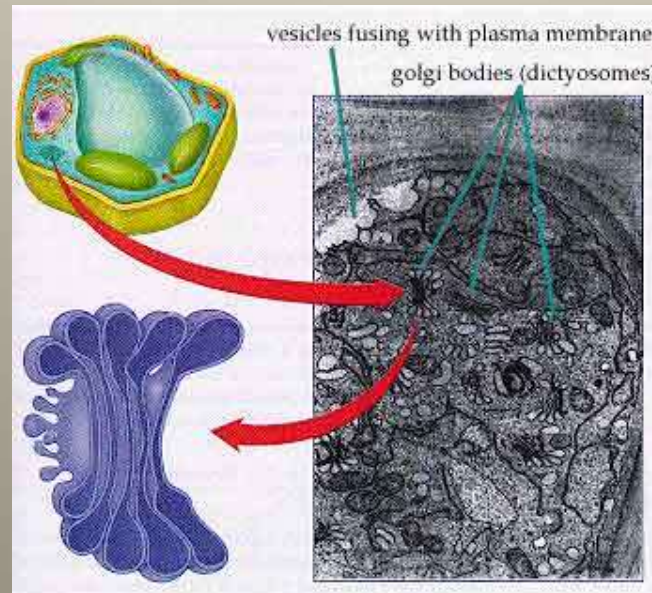


# The Golgi Apparatus



What happens to all the products that are built on the assembly line of a factory? The final touches are put on them in the finishing and packing department. Workers in this part of the plant are responsible for making minor adjustments to the finished products. They inspect the products for flaws, clean them of any extra material added during their manufacture, wrap them, and target them for packing. The Golgi apparatus performs all these tasks in the cell.

The Golgi apparatus is like a finishing and packaging room. It prepares the proteins to be used or exported. Here is a picture below:





## **Lysosomes and The Cytoskeleton**

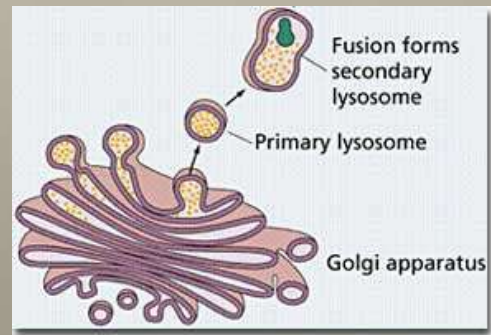
Any factory needs a good maintenance crew to keep everything orderly, to get rid of the trash, and to dismantle and dispose of outmoded machinery. The maintenance crew also functions as a second line of defense. If someone gets past the security guard at the front door, it is usually the maintenance crew who catches the trespassers and chases them out. In a cell, the role of building maintenance crew is filled by the lysosomes.





**LYSOSOMES** are organelles produced by the Golgi apparatus that contain powerful protein digesting enzymes. Lysosomes are responsible for the breakdown and absorption of materials taken in by the cell. Maintenance crews do not get the glory of chief executive officers, or even that of the production worker, but they serve a very important purpose.

Without lysosomes, the cell would accumulate too much junk and would not be able to function for very long

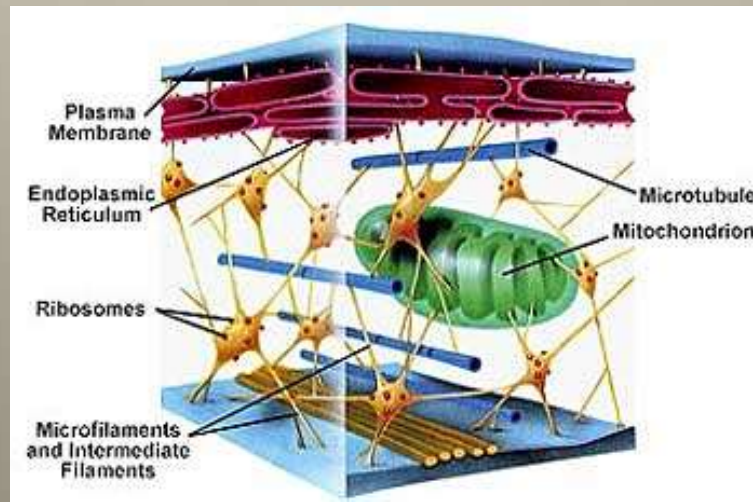




There is another major department in a cell factory, although it usually isn't given a department name in a regular factory. It's the walls, floors, and ceilings of a factory.



The **CYTOSKELETON** maintains the cell's shape and can be used to move the cell membrane.





Any factory needs some sort of energy source. This energy must be in a usable form. Most factories have power plants in which generators burn fuel to produce heat.

Building proteins is the main function of cells. But for this to occur, a cell must have an energy source, and that energy must be in a form that the cell can use. The mitochondrion and the chloroplast are the two organelles responsible for energy *transformation* (neither organelle truly produces energy).



Like our factory's power plant, **mitochondria** transforms one form of energy to another.





Here concludes this tour of a cell. Stops along the way have included a large number of the structures and functions of the cell. Remember that the cell is an incredibly complex unit of life. Why?

It needs to carry out all the functions of life.

**The End!**

