Plant and Animal Cells

"Because there are so many different kinds of organisms, there must be at least as many different kinds of cells." Do you agree with this hypothesis? Surprisingly, there are more similarities than differences among cells. The cells of all plants and the cells of all animals have many structures in common.

Using a microscope, it is quite easy to tell plant cells from animal cells, as you will discover. However, it is difficult to tell which plant cell came from which plant, and which animal cell came from which animal. It is much easier to tell what the cell does, and in what part of the animal or plant it was found. The features of cells that you can see through a light microscope are shown in **Figure 1.**

Figure 1
Features of cells that can be seen using a light microscope

Animal Cell Structures

Most animal cells have these structures.

1. Control: The Nucleus

The **nucleus** is the control centre. It directs all of the cell's activities.

2. Control: Chromosomes

Chromosomes are found inside the nucleus. **Chromosomes** contain genetic information, which holds "construction plans" for all of the pieces of the cell.

3. Materials: The Cell Membrane

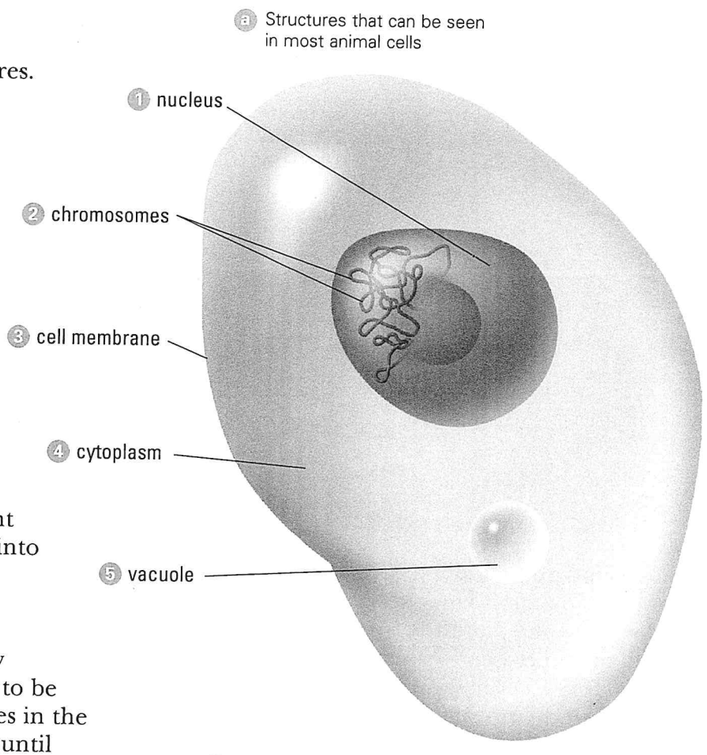
The **cell membrane** acts like a gatekeeper, controlling the movement of materials like nutrients and waste into and out of the cell.

4. Materials: The Cytoplasm

Most of the cell is cytoplasm, a watery fluid. The **cytoplasm** allows materials to be transported quickly between structures in the cell. The cytoplasm also stores wastes until they can be disposed of.

5. Materials Storage: The Vacuole

Each vacuole is filled with fluid. A **vacuole** is used to store water and nutrients, such as sugar and minerals.



Plant Cell Structures

Plant cells contain the same features as animal cells, but they also have some special structures not found in animal cells. (As you look at a plant cell, it may appear that the cell doesn't have a cell membrane. The cell membrane is just hard to see.)

5. Materials Storage: The Vacuole

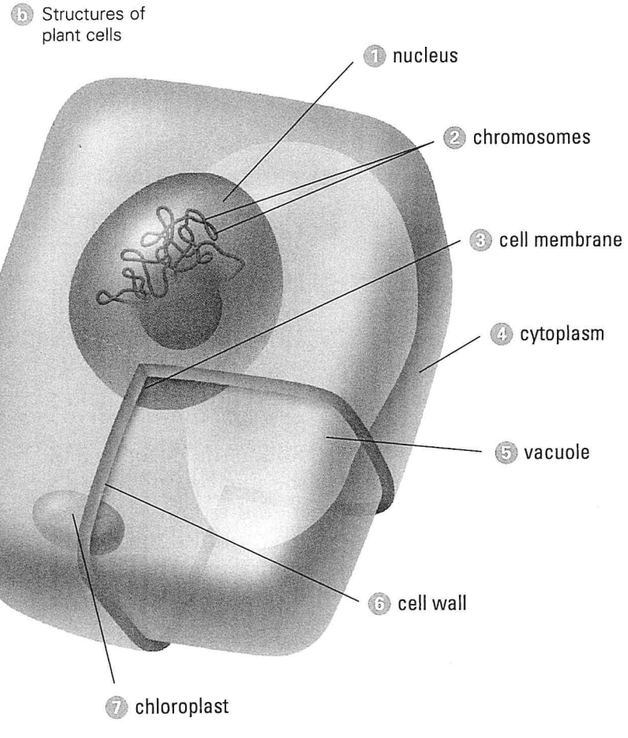
Just as in animal cells, the **vacuole** is filled with nutrients. However, the vacuole takes up a much larger part of the cytoplasm of a plant cell.

6. Protection: The Cell Wall

The **cell wall** protects and supports the plant cell. Gases, water, and some minerals can pass through small pores (openings) in the cell wall.

7. Food Production: Chloroplasts

Chloroplasts contain many molecules of a green chemical called chlorophyll. Chlorophyll allows plant cells to make their own food, using light from the sun. Animal cells cannot do this.



Understanding Concepts

1. Construct a table summarizing the similarities and differences of animal and plant cell structures.

Structure	Plant Cell	Animal Cell	Function
nucleus	yes	yes	• control centre
?	?	?	• directs cell activities

2. Where in a cell is genetic information found?

Making Connections

3. A biologist finds a cell with what appears to be two nuclei (plural of nucleus). What conclusion might you make about why this cell appears to have two nuclei?
4. Predict what might happen to a cell if the cell membrane were replaced by a plastic coat that prevented molecules from entering or leaving the cell.

Structures for Movement

Some cells must move. They may have special structures to help them move.

8. Movement: The Flagellum

The flagellum is a whiplike tail that helps some cells to move. They are not found on all cells.

9. Movement: Cilia

Cilia are tiny hairs that work together to move a cell or to move the environment surrounding the cell. They are not found on all cells.

Design Challenge

When you are building your model cell, what structures will you have to include? How can you represent them in the model?

Parts of a Cell Seen with an Electron Microscope

The cytoplasm, the working area of every cell, contains special structures called **organelles**. Many of these tiny structures can be seen only with a transmission electron microscope. The organelles described below are found in both plant and animal cells, although **Figure 1** shows an animal cell.

1. Energy: Mitochondria

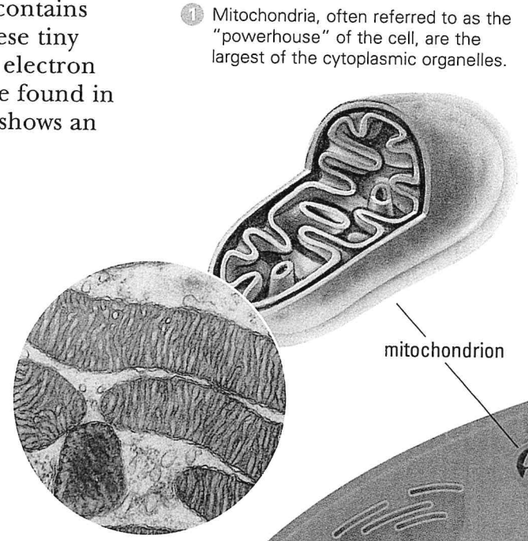
Mitochondria (singular is mitochondrion) provide the cells with energy. In a process called **respiration**, mitochondria release energy by combining sugar molecules with oxygen to form carbon dioxide and water. This energy is used in almost every other function of the cell.

2. Protein Manufacturing: Ribosomes

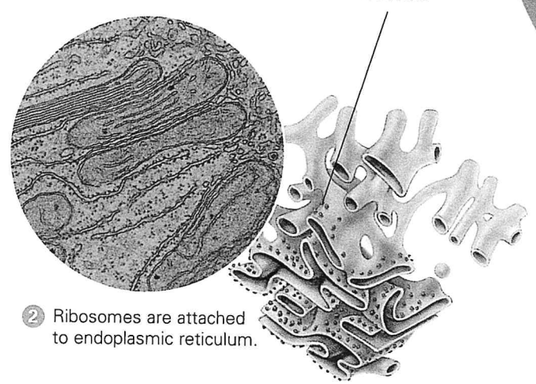
Proteins are put together on **ribosomes** using information from the nucleus and molecules from the cytoplasm. Proteins are large molecules that are needed for cell growth, for repair, and for reproduction.

3. Material Transport: Endoplasmic Reticulum

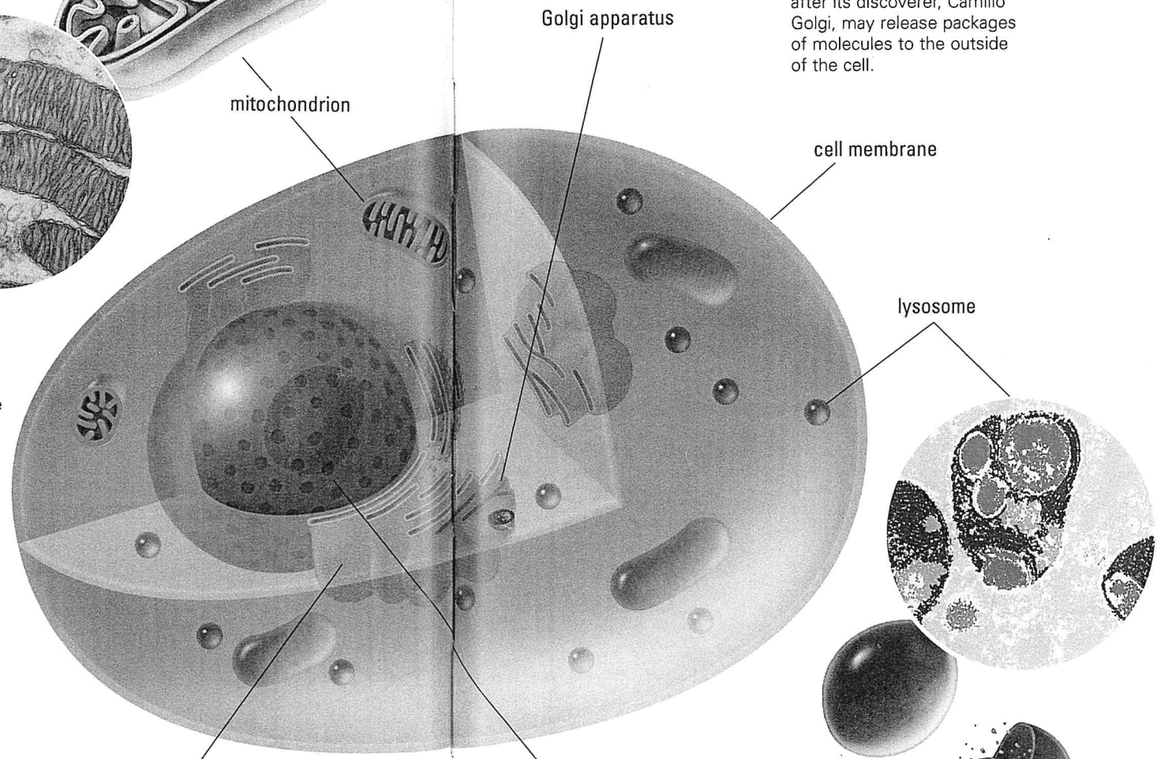
A series of folded membranes, called **endoplasmic reticulum**, carry materials through the cytoplasm. "Rough" endoplasmic reticulum has many ribosomes attached to it.



1 Mitochondria, often referred to as the "powerhouse" of the cell, are the largest of the cytoplasmic organelles.

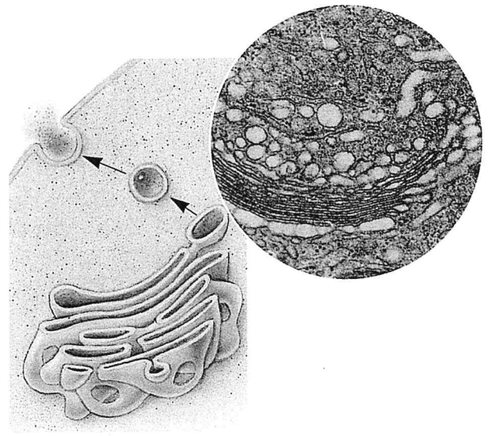


2 Ribosomes are attached to endoplasmic reticulum.



3 Endoplasmic reticulum may appear rough or smooth. It looks rough when it is supporting ribosomes.

Figure 1
These organelles are found in animal and plant cells.



4 The Golgi apparatus, named after its discoverer, Camillo Golgi, may release packages of molecules to the outside of the cell.

5 Damaged and worn-out cells are destroyed by their own lysosomes. Therefore, lysosomes are sometimes referred to as "suicide sacs."

4. Protein Storage: The Golgi Apparatus

Proteins are stored inside the **Golgi apparatus**. This organelle also puts proteins into packages, called vesicles. Vesicles carry the protein molecules to the surface of the cell, where they are released to the outside. The proteins in the vesicles vary, depending on their function.

5. Recycling: Lysosomes

Lysosomes patrol the cytoplasm, cleaning up. They contain special proteins that are used to break down large molecules into many smaller molecules. The smaller molecules can be reused as building blocks for other large molecules. In humans and other animals, lysosomes are also used to kill and digest invading organisms.

Understanding Concepts

1. What are organelles?
2. Make a concept map showing cell structures and their functions. Include the structures that are visible with a light microscope and an electron microscope.
3. Predict what would happen to a cell if its mitochondria stopped working.

Making Connections

4. Cells lining the stomach release enzymes that aid digestion. Digestive enzymes are protein molecules. Explain why many Golgi apparatuses are found in stomach cells.

Design Challenge

You have learned about the organelles inside a cell. When you build a specialized cell, should your design include some of these organelles? Explain.