The Amazing World Of Cells

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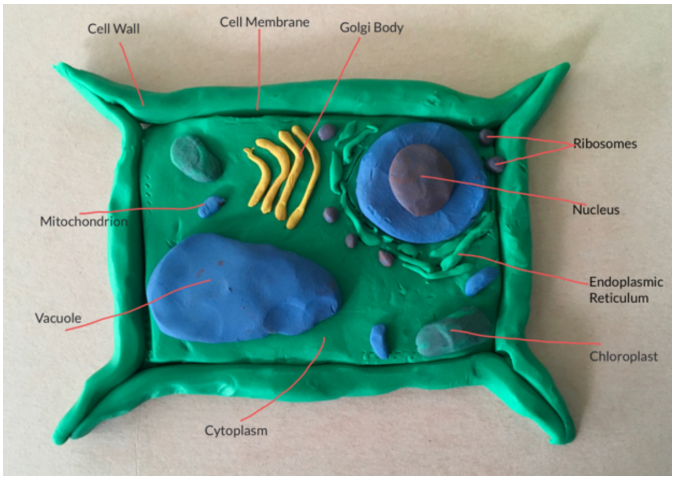
What are Cells?

Cells are truly amazing! Every living thing is made of them- you and I wouldn't be here without cells. Because cells are the building blocks of living things, it's important to understand what they are and how they work. Cells are super duper tiny, microscopic units of "magic."

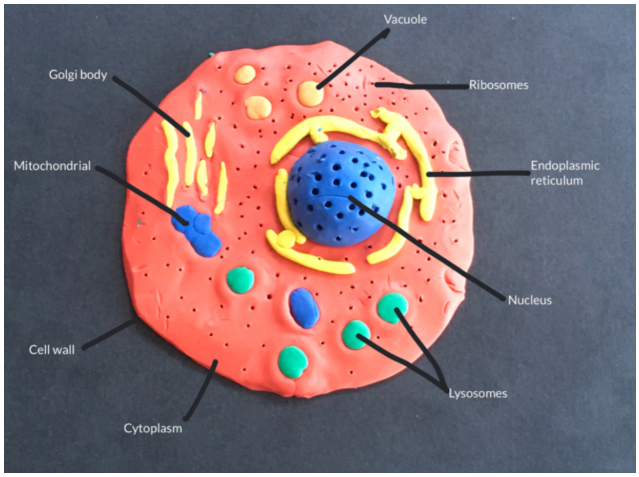


Above: Plant cell model by Renee Amado, Grade 8

Plant and Animal Cells

Plant and animal cells have a lot in common, but they also have their differences. Both types of cells have different parts called **organelles** that do different jobs**.** One of the most important organelles is the **nucleus**. The nucleus is like the brain or command center of the cell. It directs all of the cell's activities, including cell division. The nucleus also holds the cell's genetic material, or **DNA**, which is very important to living things. DNA is short for **deoxyribonucleic acid**. It's shaped like a double helix and looks like a twisted ladder. DNA is found inside the nucleus of EVERY ONE of your cells! Long strings of DNA are twisted up into **chromosomes**. You have 46 chromosomes in each of your cells, 23 from your mom and 23 from your dad. That's a lot of coiled up DNA! DNA makes you who you are and determines everything from your eye color to aspects of your personality.

You may be wondering: What is this double helix made of, anyway?

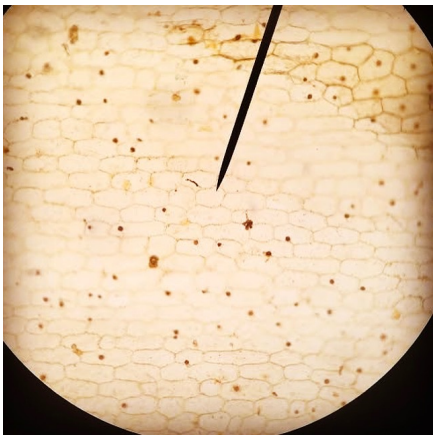


Above: Animal cell model by Clark Morrison, Grade 8

DNA's backbone is made of alternating units of sugar and phosphate. The proper name for the sugar is **deoxyribose**, hence the "D" in DNA. The "rungs" of the ladder are made of pairs of **nitrogen bases**. The pairs are very important, because they must match up in a specific way. **Thymine (T)** must pair with **Adenine (A)**. **Cytosine (C)** must pair with **Guanine (G)**. Since these pairings are specific, and there is SO much DNA in your body, mistakes can happen during cell replication and division. These mistakes, otherwise known as **mutations**, happen when A is paired with C or G, or T is paired with C or G. Mutations can be harmless, but they can also be dangerous, as they can cause cancers and genetic disorders.

Above: DNA model constructed by 7th and 8th graders at Blue Hill Consolidated School

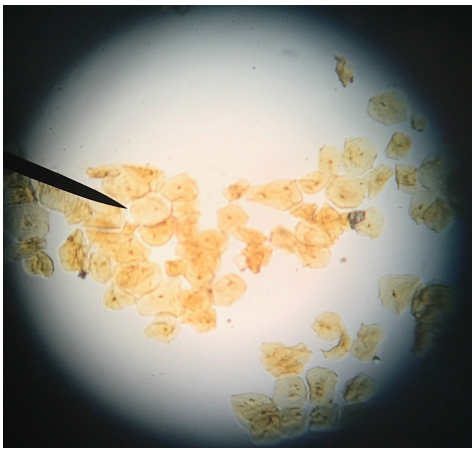
Another organelle found in both plant and animal cells is the **vacuole**. The vacuole is a big storage tank in the cell that stores food, water, waste products, and other materials. You may be wondering: do all these organelles just float around inside a cell? Plant and animal cells both have a cell membrane, a thin layer surrounding the cell that protects it and controls what enters and exits. In addition, plant cells have a **cell wall**, which gives it a rigid, boxlike shape. The cell wall is important for plant cells because it makes them rigid so they can grow straight and tall, like trees. Plant and animal cell's organelles are contained within the cell with **cytoplasm**, a gel-like fluid. The cell membrane and cytoplasm are what holds organelles in place.



Above: Onion cell microscope slide prepared and photographed by Lily Jaffray, Grade 7

Although plant and animal cells have many of the same organelles, they are not identical. In their most basic forms, plant cells have a very different appearance from animal cells. Plant cells are shaped like boxes, due to their cell walls. Animal cells, on the other hand, are typically more round because they lack cell walls. Plant cells also have a larger vacuole than animal cells, because they need to store more water, a key

ingredient for photosynthesis. Photosynthesis is the process plants use to make their own food, a type of sugar, from water and sunlight. This all happens in the **chloroplast**, an organelle not found in animal cells. Animal cells do not use photosynthesis, but instead absorb what they need through their cell membrane by using special processes like osmosis.



Above: Human cheek cell slide prepared and photographed by Zane Bulger, Grade 7

Osmosis in Cells

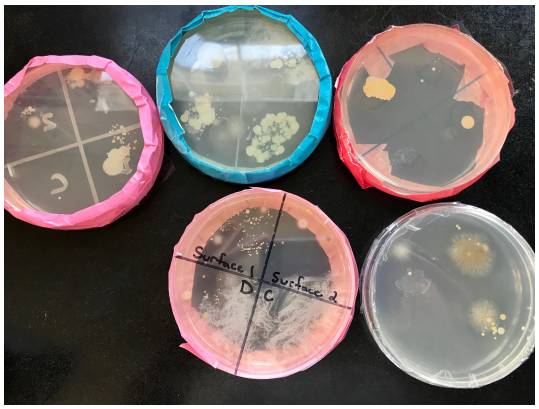
Osmosis is the movement of water through a semi-permeable membrane, like a cell membrane. Water tends to travel from areas of higher concentration to lower concentration. We demonstrated this phenomenon in science class by submerging decalcified eggs in both water and corn syrup. Since the egg surrounded by water had a lower concentration of water inside than outside, water went into the egg, making it really big and firm. The egg we put in corn syrup, though, became all shriveled and limp, because the water concentration inside the egg was higher than the water concentration outside of the egg, meaning all the water traveled outward. A similar experiment with gummy bears showed the same idea; water moves to areas of high solute concentration. Water made the gummy bears swell up because they have a lot of sugar, which is a solute.

Above: Osmosis in eggs and gummy bears by 7th and 8th graders at Blue Hill Consolidated School

The same phenomenon can happen with your cells. If water was injected into the bloodstream, it would all travel into your red blood cells and they would burst. If a solution that had a LOWER concentration of water molecules than your red blood cells was injected into your bloodstream, all of the water in your cells would exit and the blood cells would shrivel up and die. That is why when nurses and doctors put an IV into your body, they need to make sure that the solution is just right.

Eukaryotes vs. Prokaryotes

It's important to understand the difference between the cells of prokaryotes and eukaryotes. Whether an organism is a eukaryote or a prokaryote is simply a matter of whether it has a nucleus or not. An obvious example of a eukaryotic organism is a human! You and I are made up of cells with a nucleus that holds our DNA.



Above: Bacterial colonies on petri dishes prepared by 7th and 8th graders at Blue Hill Consolidated School

In contrast, prokaryotes are organisms without nuclei. A wonderful example of prokaryotic organisms is bacteria; bacteria do not have a nucleus, and their genetic material floats freely in the cytoplasm. Bacteria are **single celled** organisms, which means they are made of only one cell. They can reproduce extremely quickly, and can create big colonies fast. Some bacteria are common, while others are rare. You may have heard that bacteria can make you sick. That's true! Bacteria live almost everywhere on Earth. They even live on your skin! But wait! If bacteria live on your skin, why aren't we sick all the time? The answer is that "bad" bacteria can make you sick, but many types of bacteria are not harmful at all! In fact, there are more bacteria cells in our bodies than regular human cells! Many bacterial cells live in your intestines, and they help break down food. Bacteria can also fight off fungi!

I hope you enjoyed reading about cells. These subjects were *amazingly* fun and interesting to study!