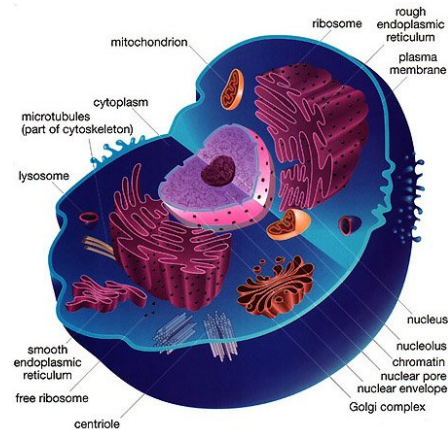


# Chapter 7 - Cell Structure

## Learning objectives

- To be familiar with the parts of the light microscope and be able to use it
- To be aware of the transmission electron microscope
- To recognise the components of plant cells and animals cells, as seen under a microscope, and describe their function
- To define and understand the terms 'prokaryotic' and 'eukaryotic'
- To prepare one plant cell and one animal cell (stained and unstained) and examine them using a light microscope.



# Chapter 7 - Cell Structure

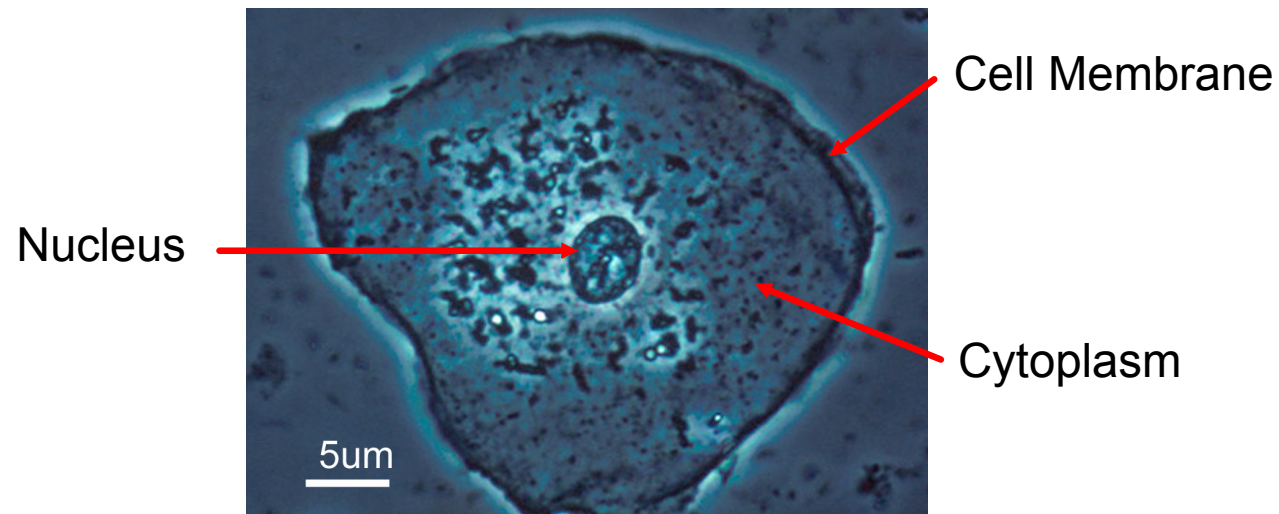
**All living things are made of cells.**

Cells are made up of 3 main parts,

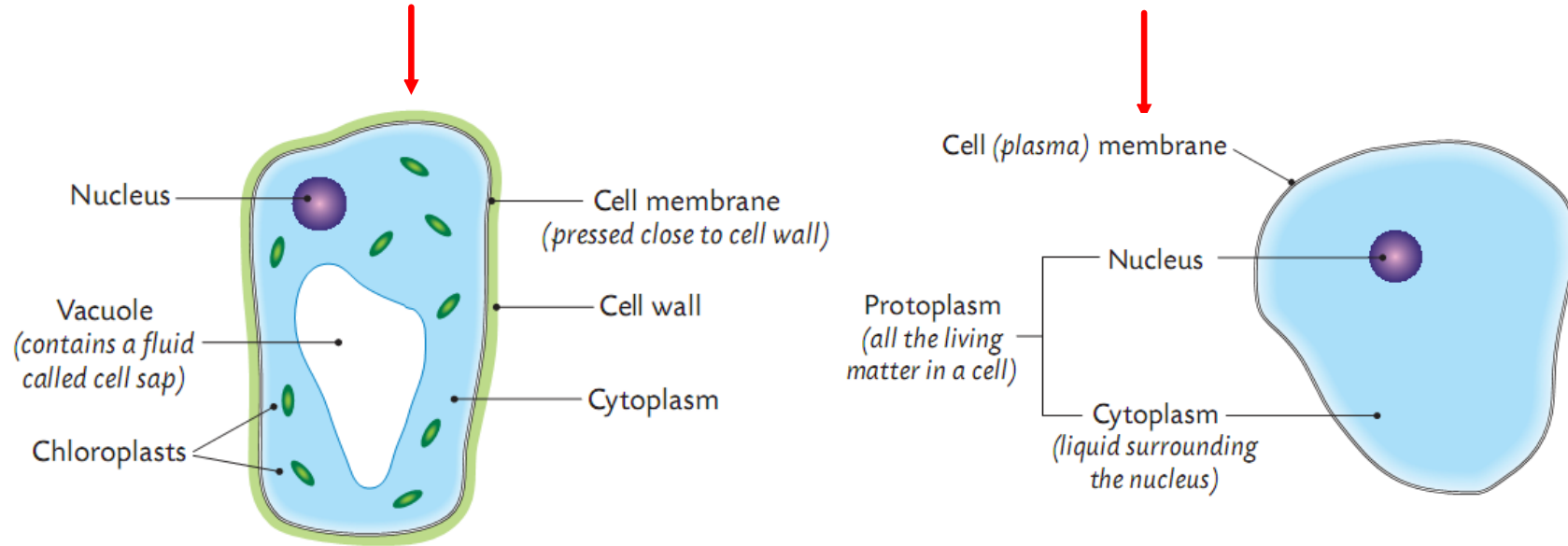
**Cell Membrane** - A skin that controls what enters the cell.

**Cytoplasm** - Watery substance that has proteins and sugar.

**Nucleus** - the control centre of the cell. It contains DNA.



# Plant Cells and Animal Cells



Cell Wall - Protection	No Cell Wall
Chloroplasts - make food	No Chloroplasts
Large Vacuole - store food/waste	Small Vacuoles

# Plant Cells

These cells are usually rectangular in shape.

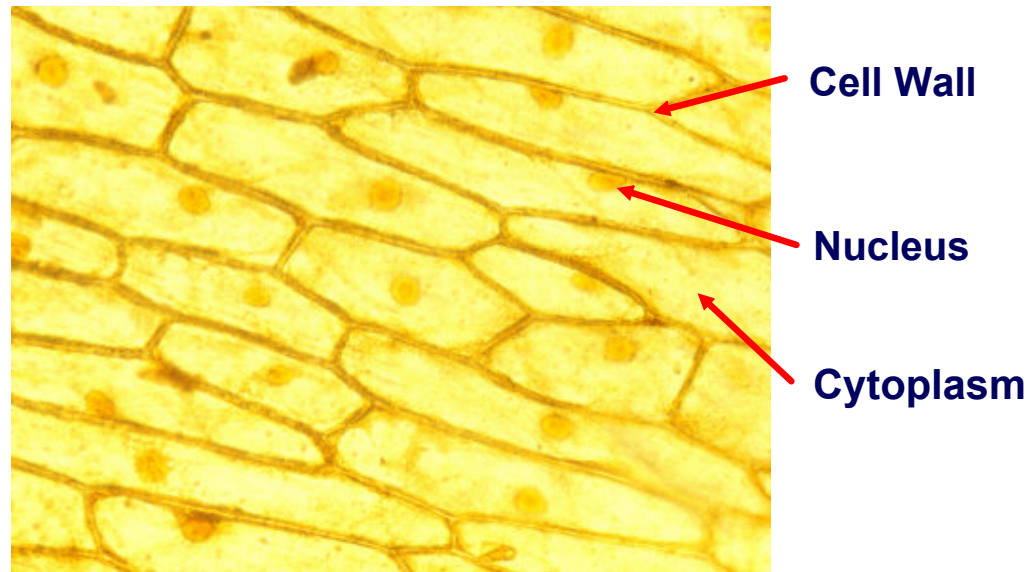
They have a large central **vacuole** and have green Chloroplasts.

**Chloroplasts** are small factories that make food.

They catch sunlight and mix it with carbon dioxide and water to turn it into sugar.

**Chlorophyll** is the green pigment (chemical) in the chloroplast that catches sunlight

An example of a plant cell is the onion cell (with **iodine** stain).

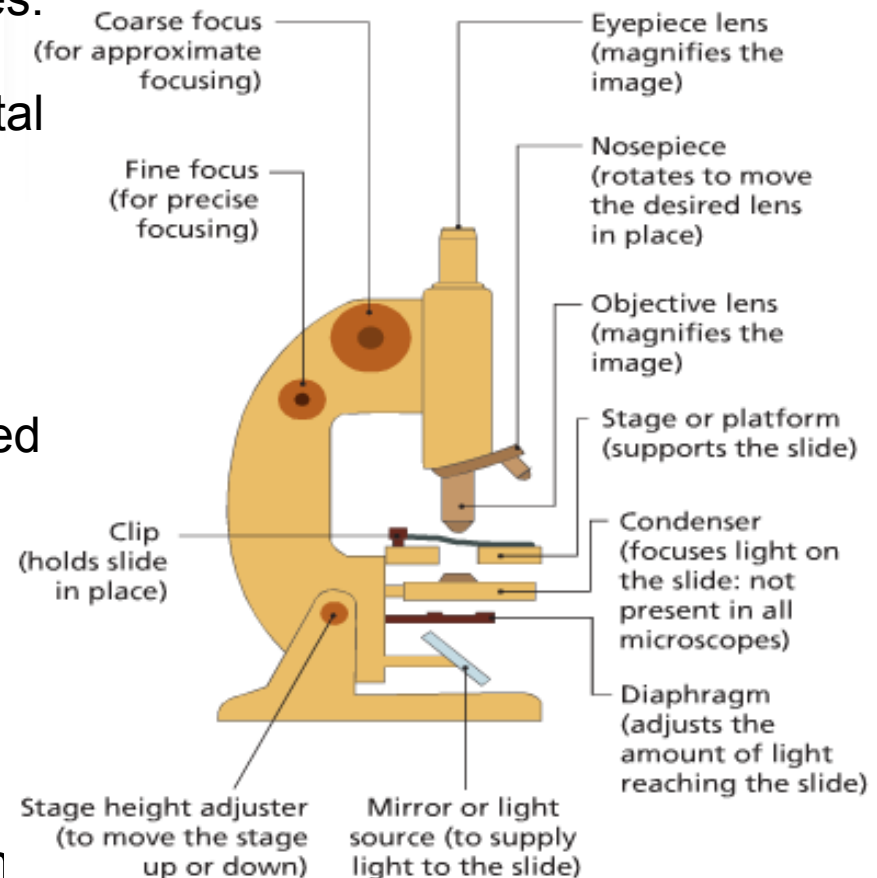


# Microscope

A compound microscope uses 2 lenses.  
The **eyepiece** lens and the **objective** lens powers are multiplied to give a total magnification.  
e.g. 10x by 40x = 400x

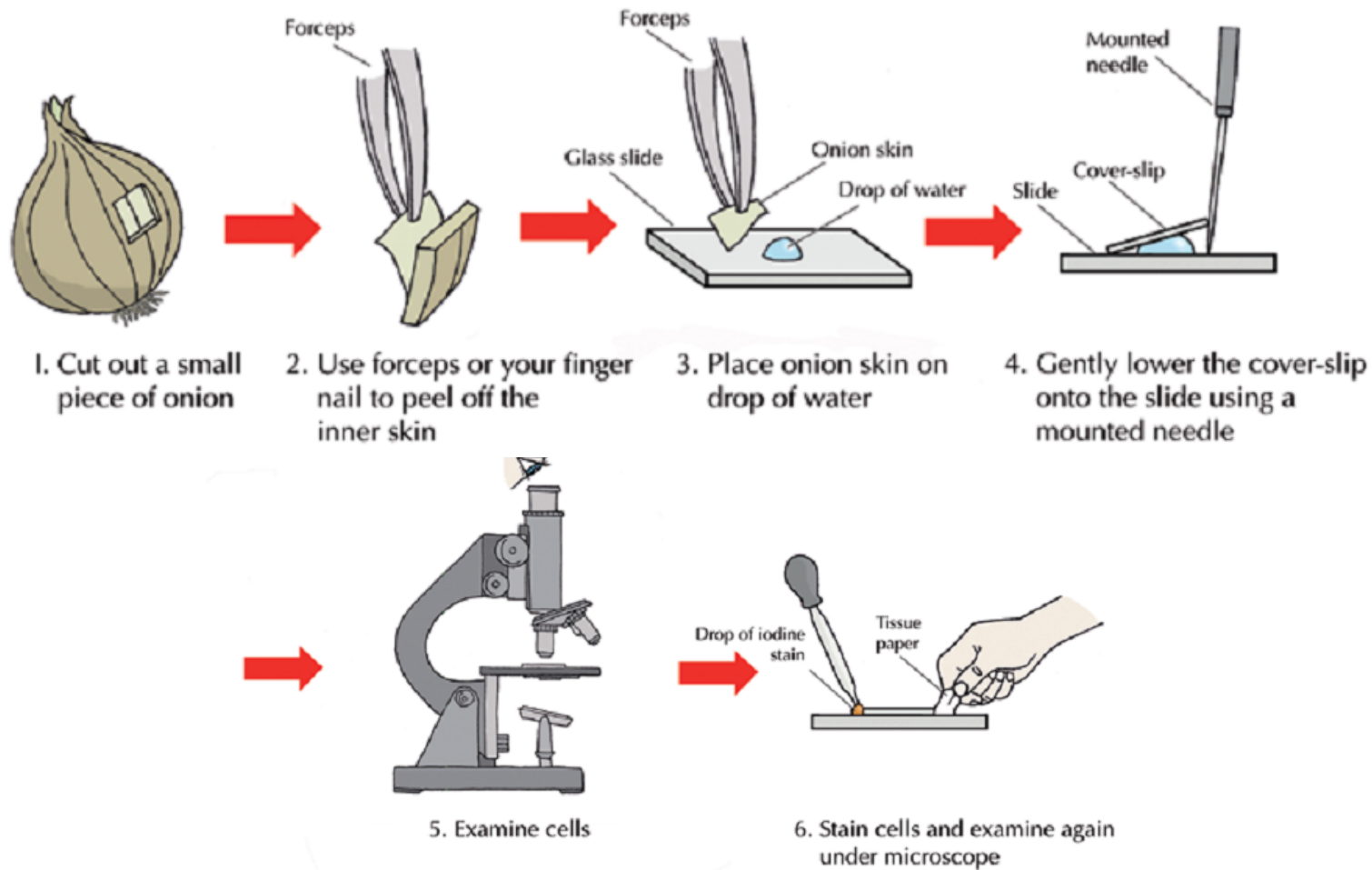
The first person to discover microscopic life was a Dutch man called Antonie van Leeuwenhoek.  
In 1665 Robert Hooke first used the word 'Cell'.

Cells are measured in **micrometers**  
The symbol  **$\mu\text{m}$**  is used.  
There are 1000 micrometers in 1mm  
An animal cell is about 25 $\mu\text{m}$  in length.



# Mandatory Experiment

To prepare a slide from plant tissue and sketch the cells





# Results

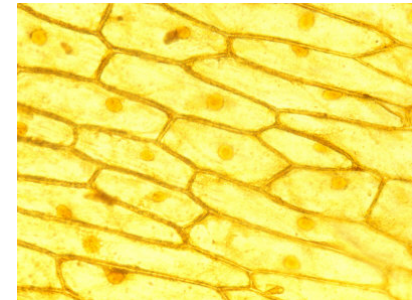
**With no stain it is difficult to see the cells.**

## Onion Cell

The onion cell is stained with Iodine.

The cell wall and the nucleus are visible and yellow/brown.

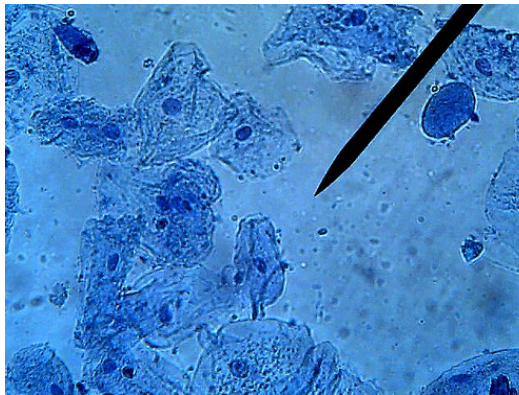
No chloroplasts or vacuoles.



## Animal Cell

The cheek cell is stained with Methylene Blue.

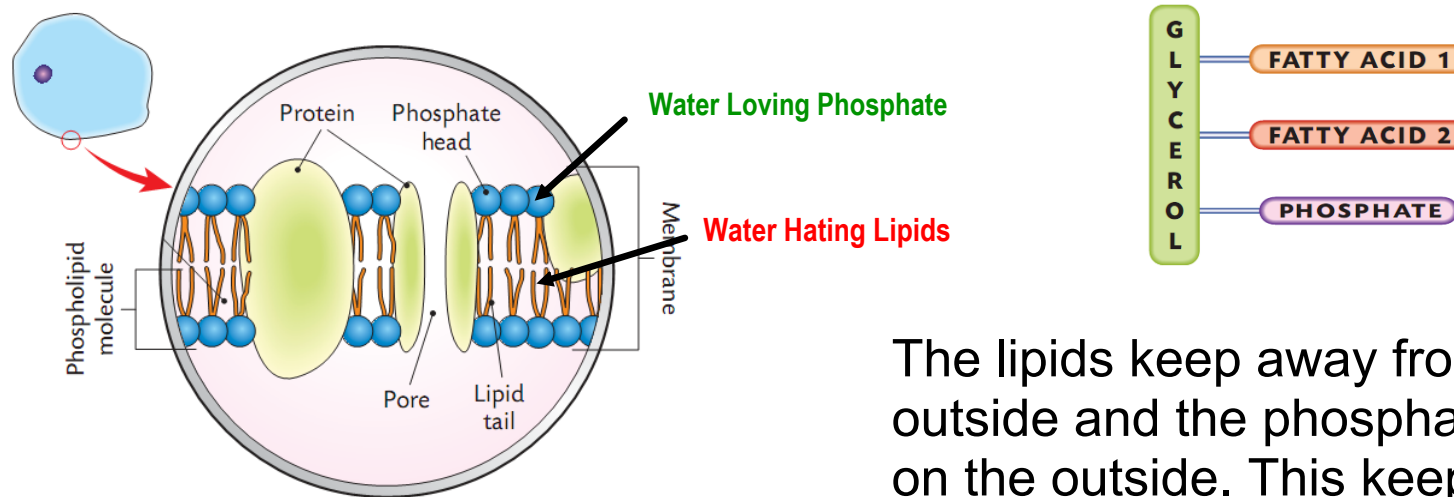
The nucleus is dark blue and the cytoplasm is light blue.



# Cell Ultrastructure

This is the fine detail of the cell seen by an Electron Microscope.

The membrane is made of a **phospholipid** and a protein.  
The phospholipids have a water-loving and water-hating end.



The lipids keep away from the outside and the phosphates stay on the outside. This keeps the membrane together.

## Functions

1. Membranes retain the cell contents.
2. Membranes control what enters and leaves the cell.
3. Membranes recognise molecules that touch them.



## Nucleus

Contains strands of DNA (Deoxyribonucleic Acid) called chromosomes.

Humans have **46** chromosomes with about 25,000 genes.

The chromosomes are usually found as **Chromatin**.

Genes make an enzyme which control a function in the body.

Nuclear pores allow RNA to travel out into the cytoplasm.

## Nucleolus

This is where ribosomes are made. **Ribosomes make proteins** for the cell.

## Mitochondria

These are the **energy factories** for the cell and the whole organism.

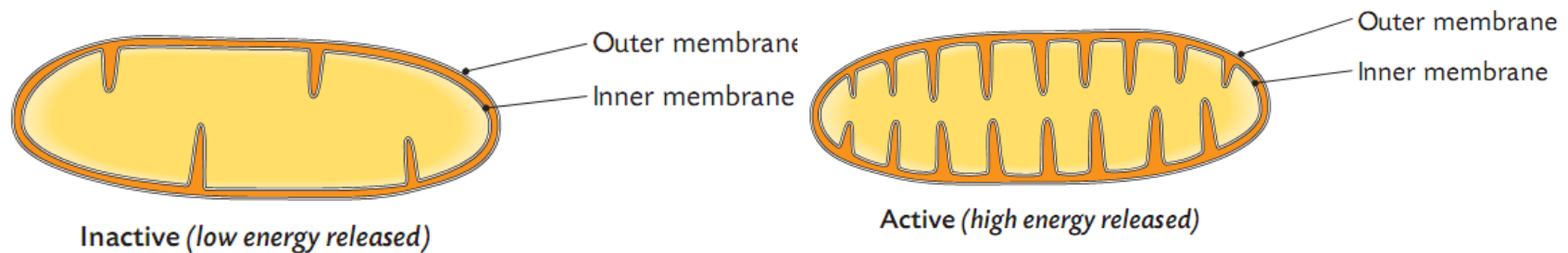
Mitochondria have their own DNA and are passed on only from the mother.

**Respiration** (Food + Oxygen  $\longrightarrow$  Energy) happens in the mitochondria.

The more infoldings a mitochondria has the more energy it makes.

When you are sick your mitochondria have less infoldings, so you feel weak.

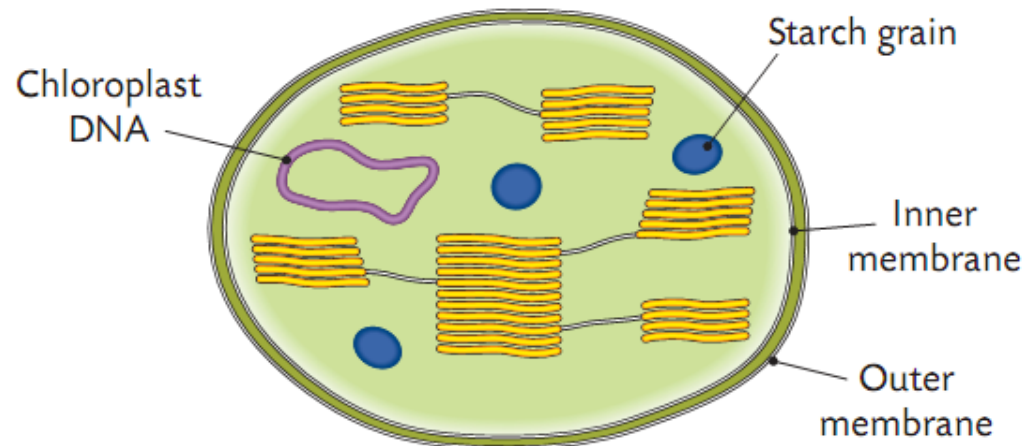
As you get better the infoldings increase and you get more energy.



# Chloroplasts

Chloroplasts make glucose. They do this by catching sunlight in a green pigment called **Chlorophyll**. The energy from the sunlight is mixed with  $\text{CO}_2$  and  $\text{H}_2\text{O}$  to make  $\text{C}_6\text{H}_{12}\text{O}_6$ , which is stored as starch.

Chloroplasts have their own DNA, which means they were once a separate living thing from plants.



# Prokaryotes and Eukaryotes

## What's the difference?

Prokaryotic cells have no nucleus or membrane-enclosed organelles. They are single celled, such as bacteria and monera. DNA is found in a loop.

Eukaryotic cells have a nucleus and membrane-enclosed organelles. They are multi-celled and evolved from prokaryotes around 3 billion years ago.

