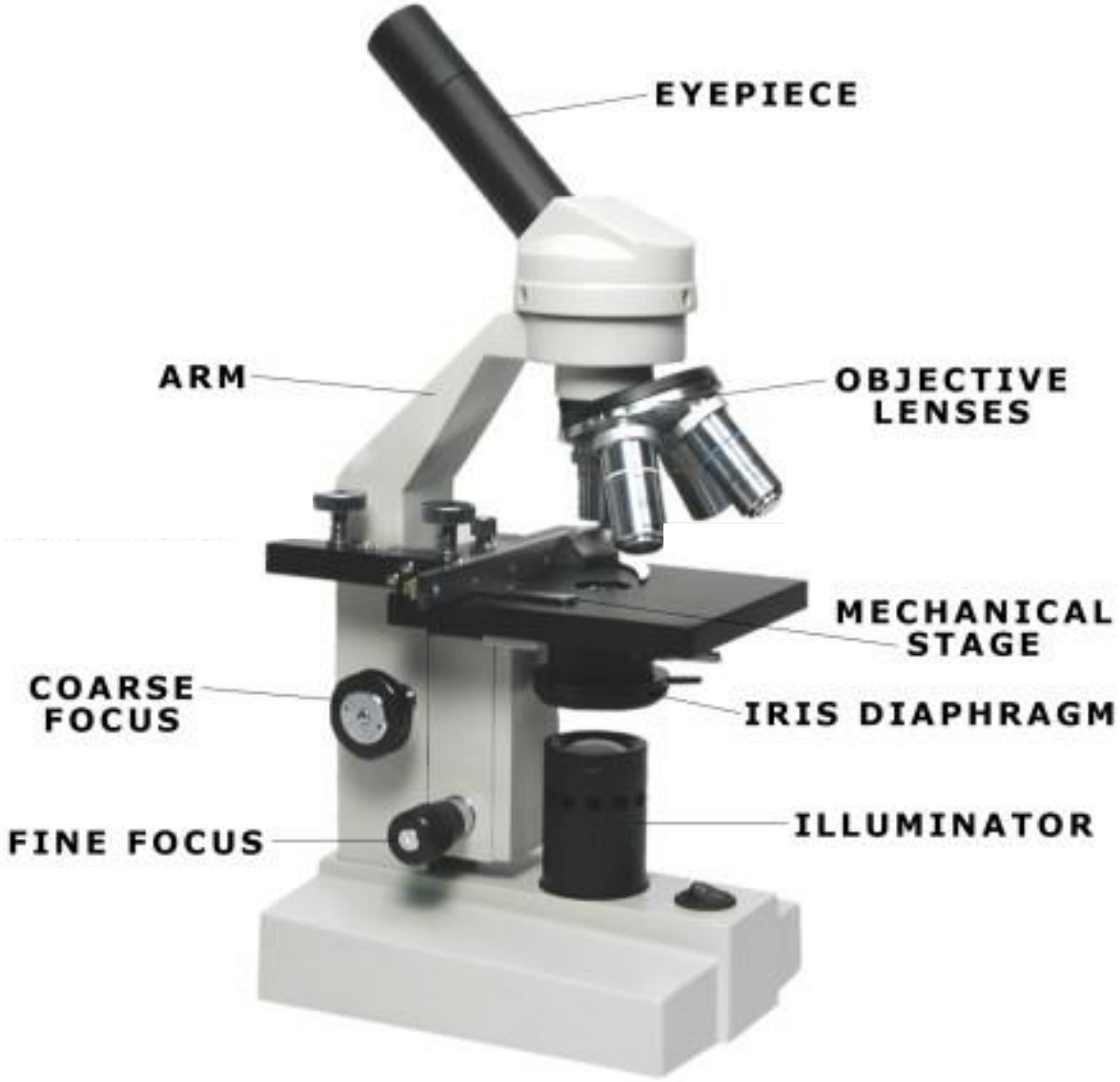
A microscope is a piece of equipment used by biologists to make objects **appear bigger**.

It **magnifies** the obect.

It works by shining light up through the objects, so they must be **thin** enough to let light through.

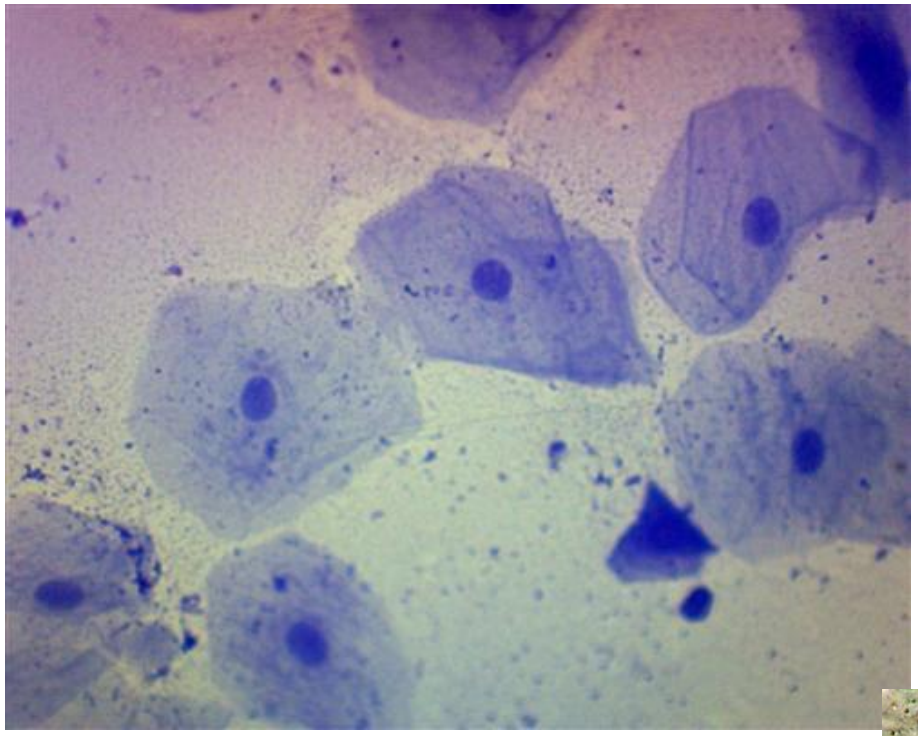

EYEPIECE
ARM
OBJECTIVE LENSES
MECHANICAL STAGE
COARSE FOCUS
IRIS DIAPHRAGM
FINE FOCUS
ILLUMINATOR

***Using the microscope***

1. Place the **slide** and cover slip over the window in the **stage**.
2. Select the **smallest objective lens**
3. Use the focus control to **move the stage up to the top**
4. Put your **eye** to the **eyepiece**
5. **Focus** slowly by moving the stage and lens **apart**.
6. **Centre** the object and **change objective** if required.
7. **Re-focus** using fine focus control.

The total magnification is the eyepiece **times** the objective

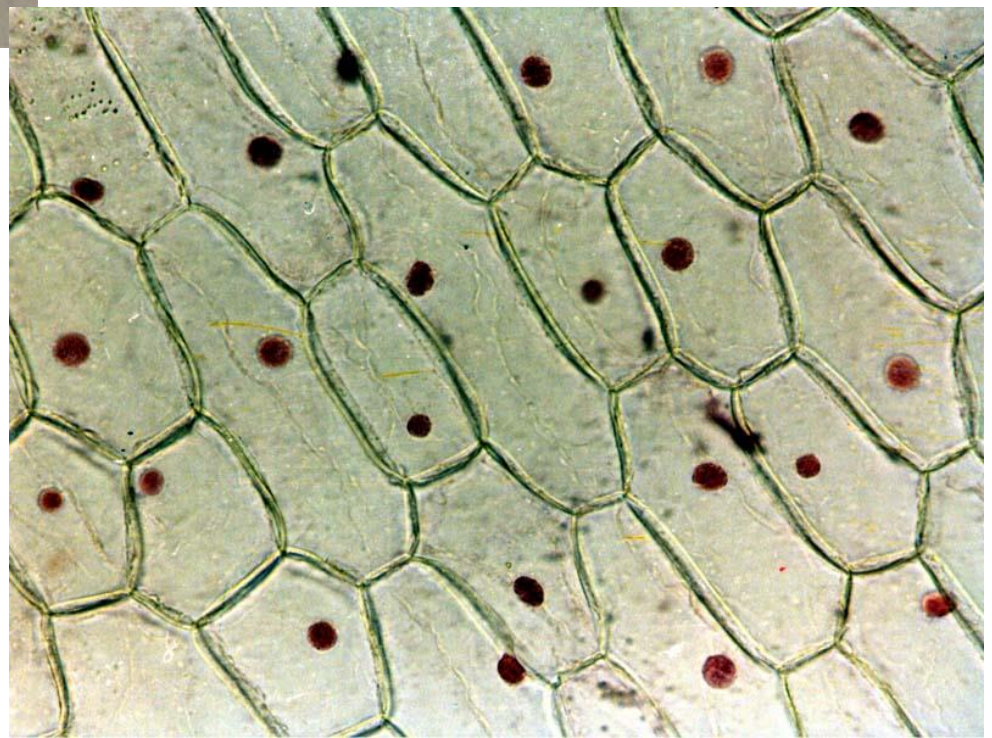
| Lens | Size | eyepiece | objective | Total magnif-ication |
|---|---|---|---|---|
| Low power | smallest | x10 | X4 | x40 |
| Medium power | medium | x10 | X10 | x100 |
| High power | biggest | x10 | X40 | x400 |



x400

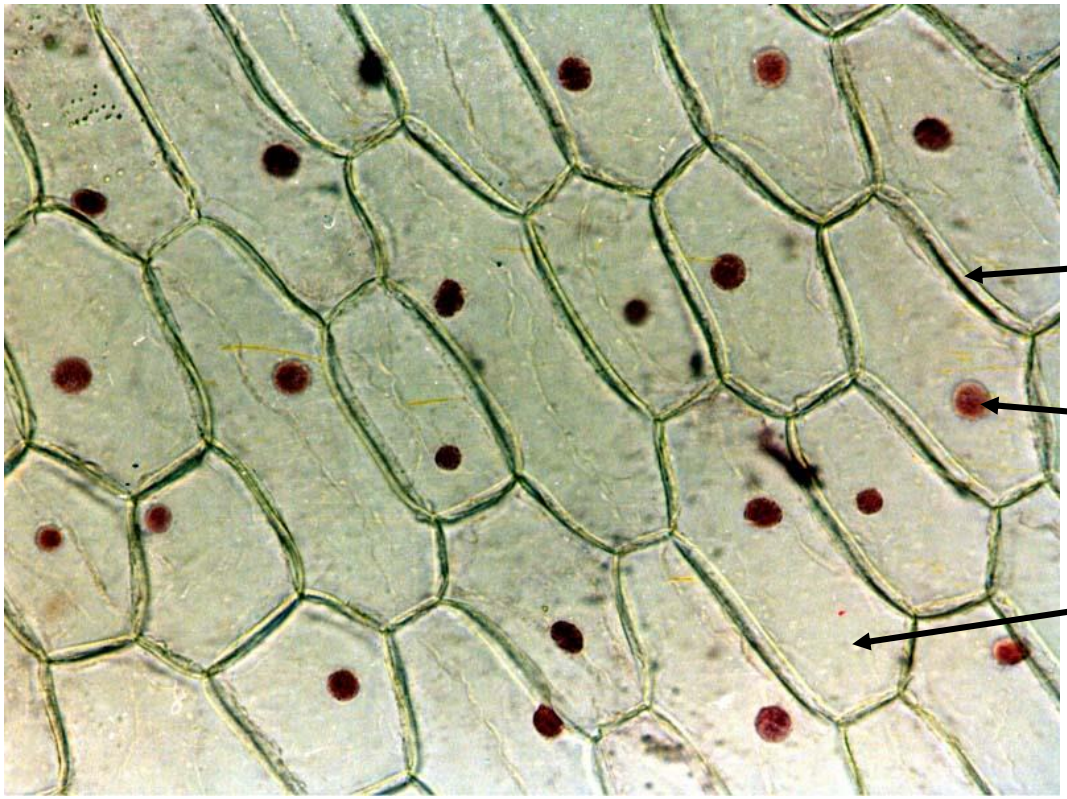
When you draw cells always write the magnification. This gives you an idea of how big the cells were

x40

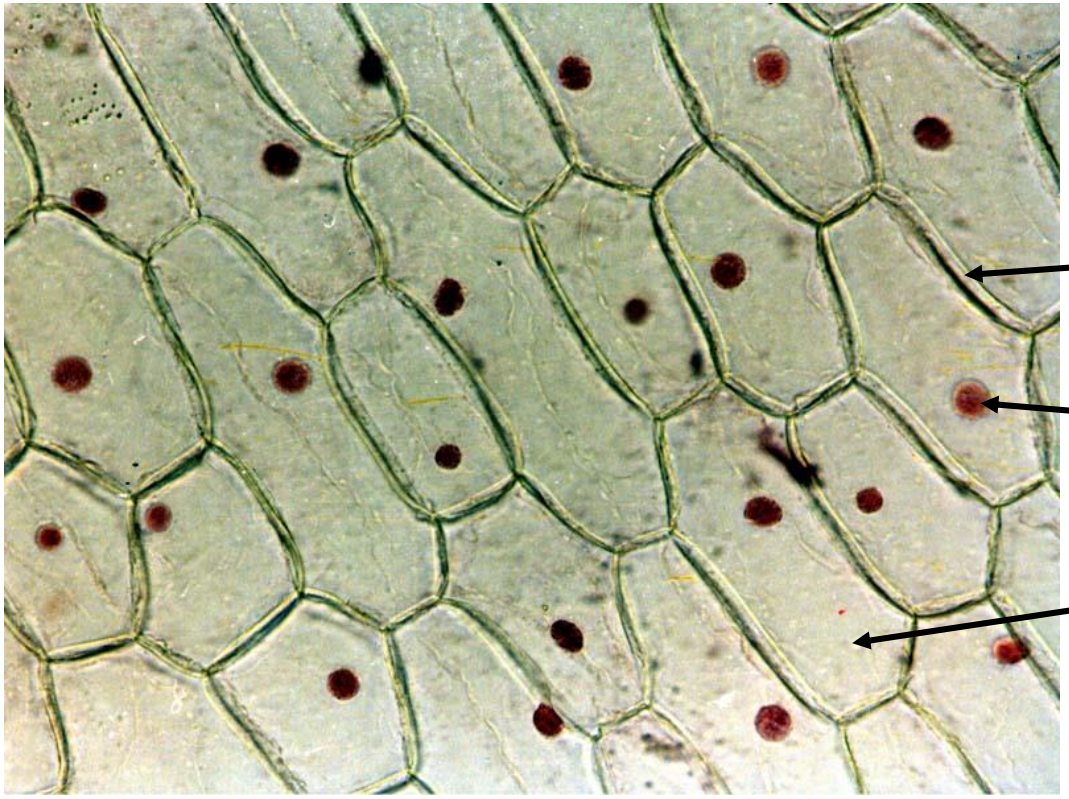


# Cell theory

- All living things are made up of smaller units called **cells**
- Nothing smaller than a cell is a living thing
- Cells have some features in common, but may have different features to carry out different jobs
- Cells are different in animals and plants
- Cells reproduce by **dividing**




The **cell wall** is a thick, dark line around the cells. It is fairly rigid and helps the cell keep its regular shape. As plants have no skeletons, the cell wall is very important to strengthen the plant as a whole.



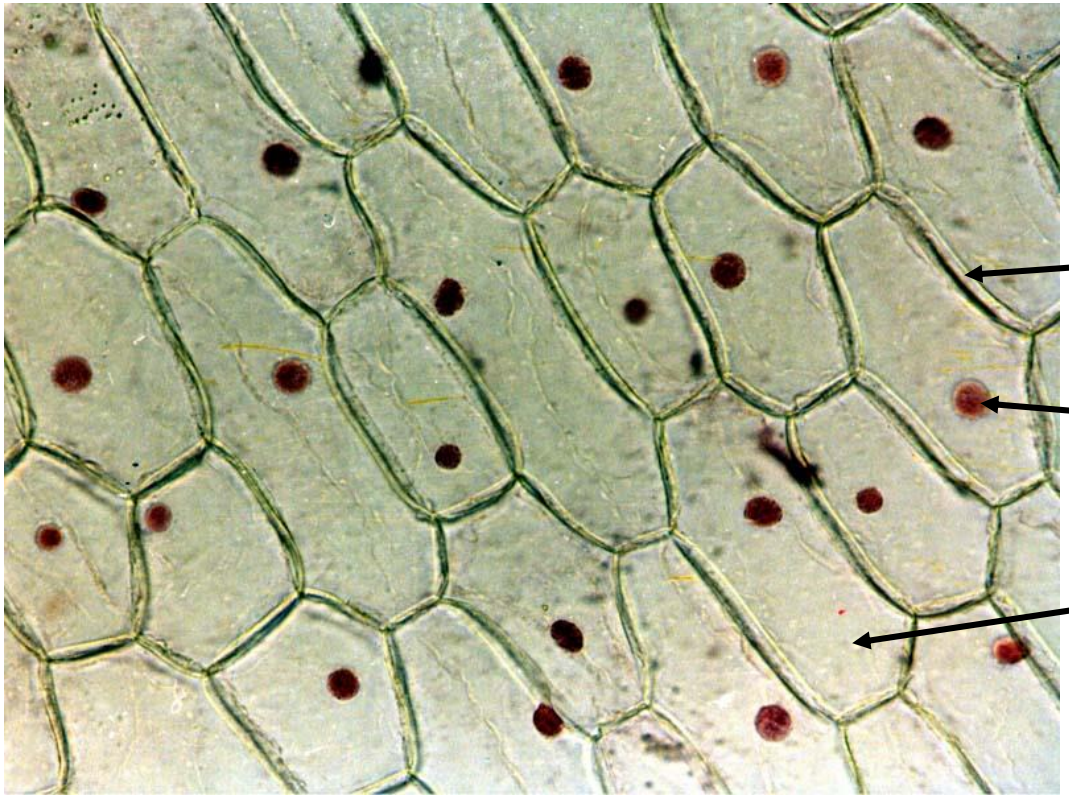
**Parts -**

Cell wall

**nucleus**

vacuole

The nucleus is a dark ‘blob’ inside each cell. Each cell has one, and only one nucleus. Its job is to **control** the cells activities and to store the **genetic** or inherited information.



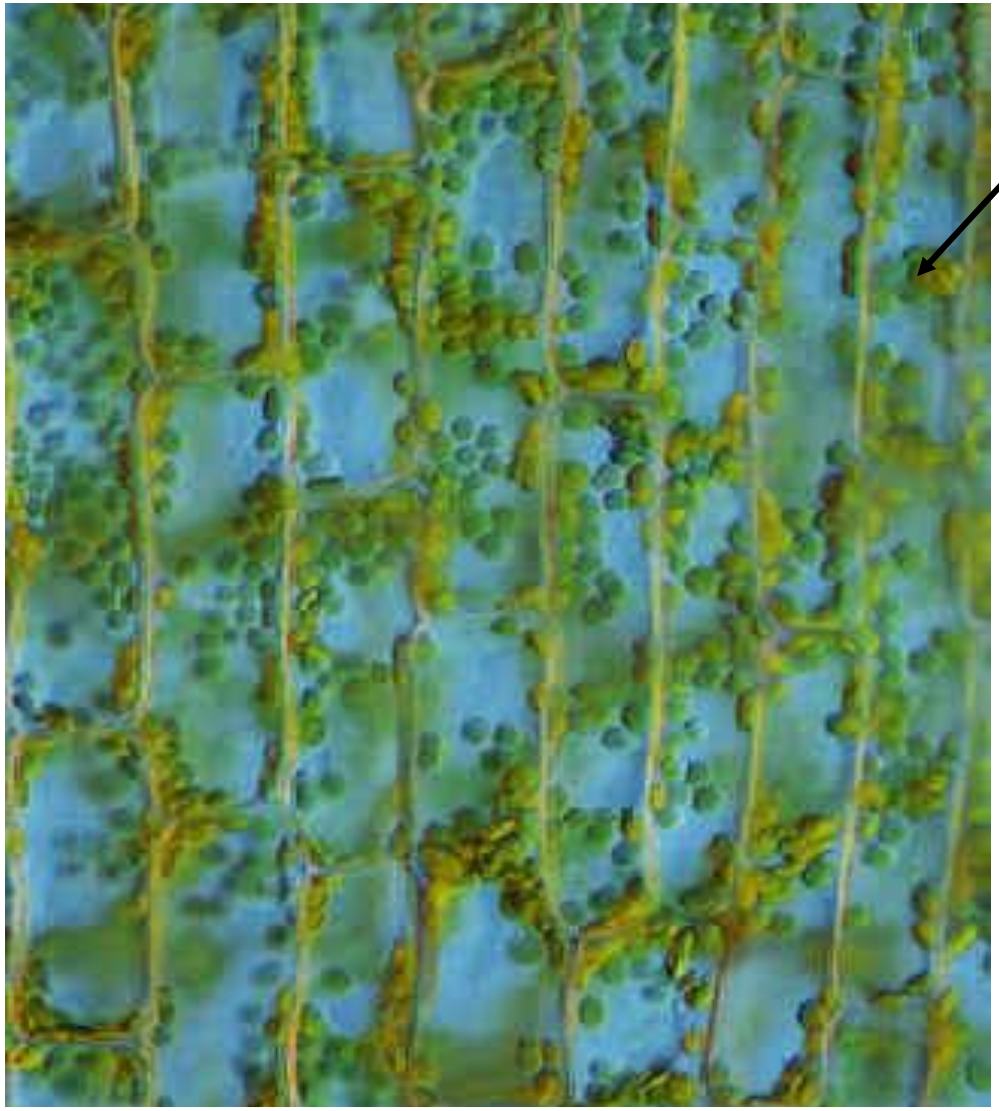
**Parts -**

Cell wall

nucleus

**vacuole**

The **vacuole** does not show up, even with stain. It is a large, **water-filled** sack in the centre of the cell. It takes up most of the cell and often pushes the nucleus out to the side.

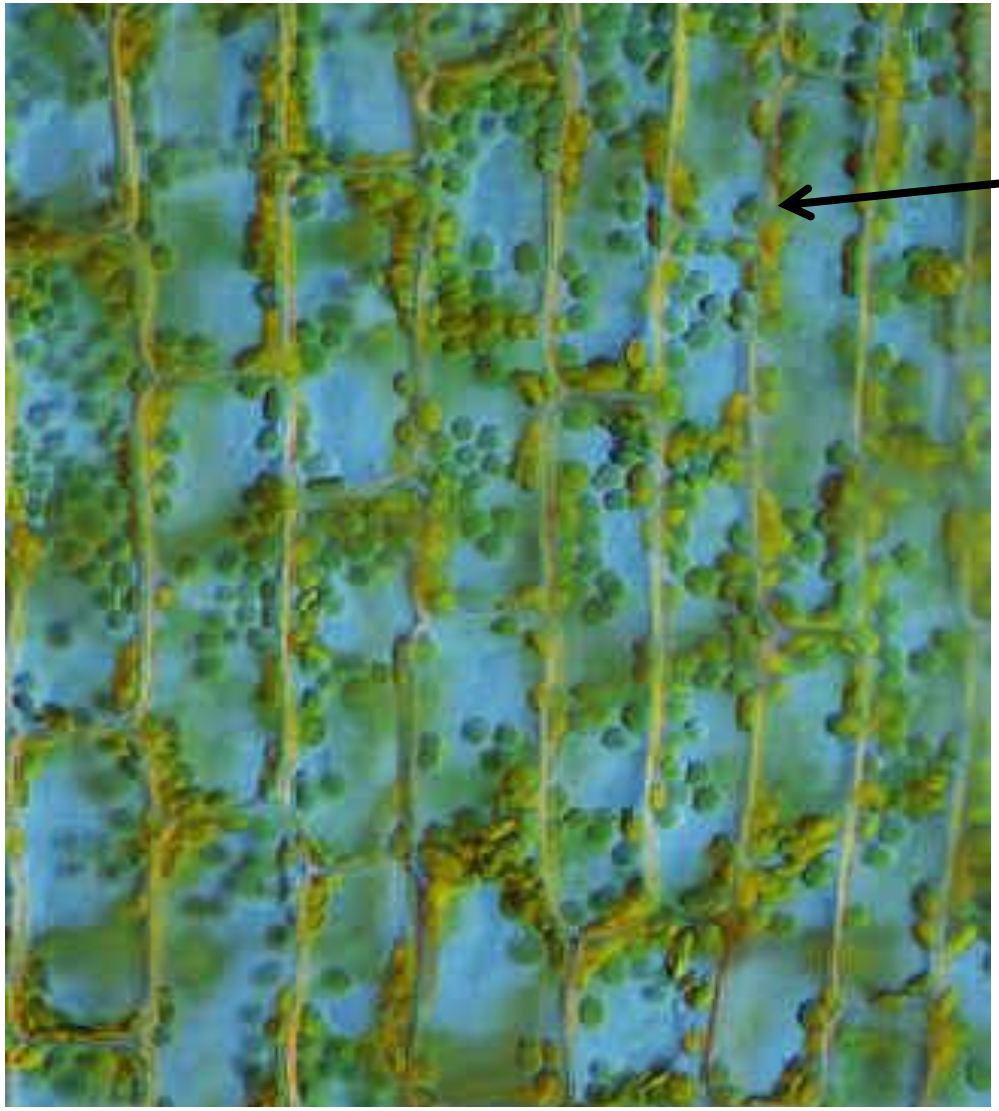


These are **chloroplasts**.

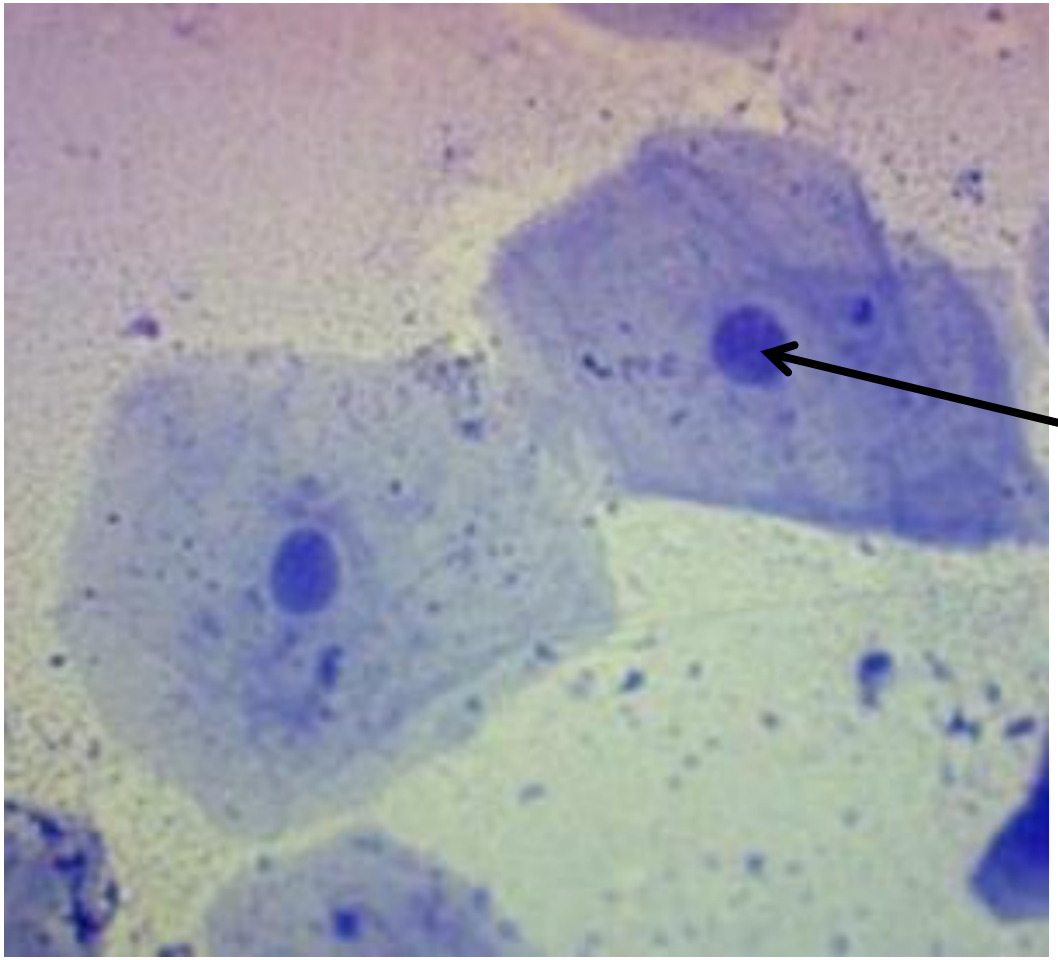
The chloroplasts are filled with a special green chemical called **chlorophyll**.

This green pigment helps the cell trap light energy for **photosynthesis**.

Onion cells are not green. They get no light, so do not need chloroplasts.

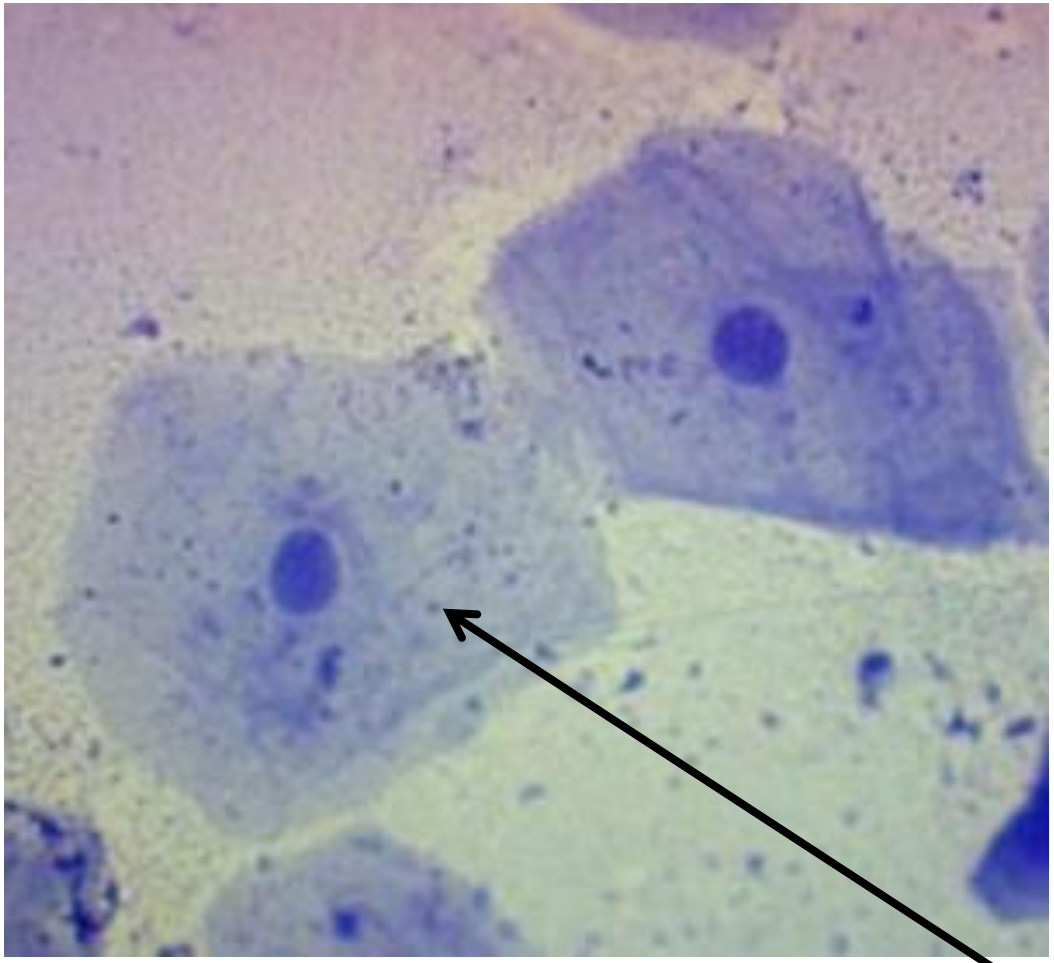


The **chloroplasts** appear mainly around the outside of the cell because the central vacuole takes up most of the space and pushes them to the outside.

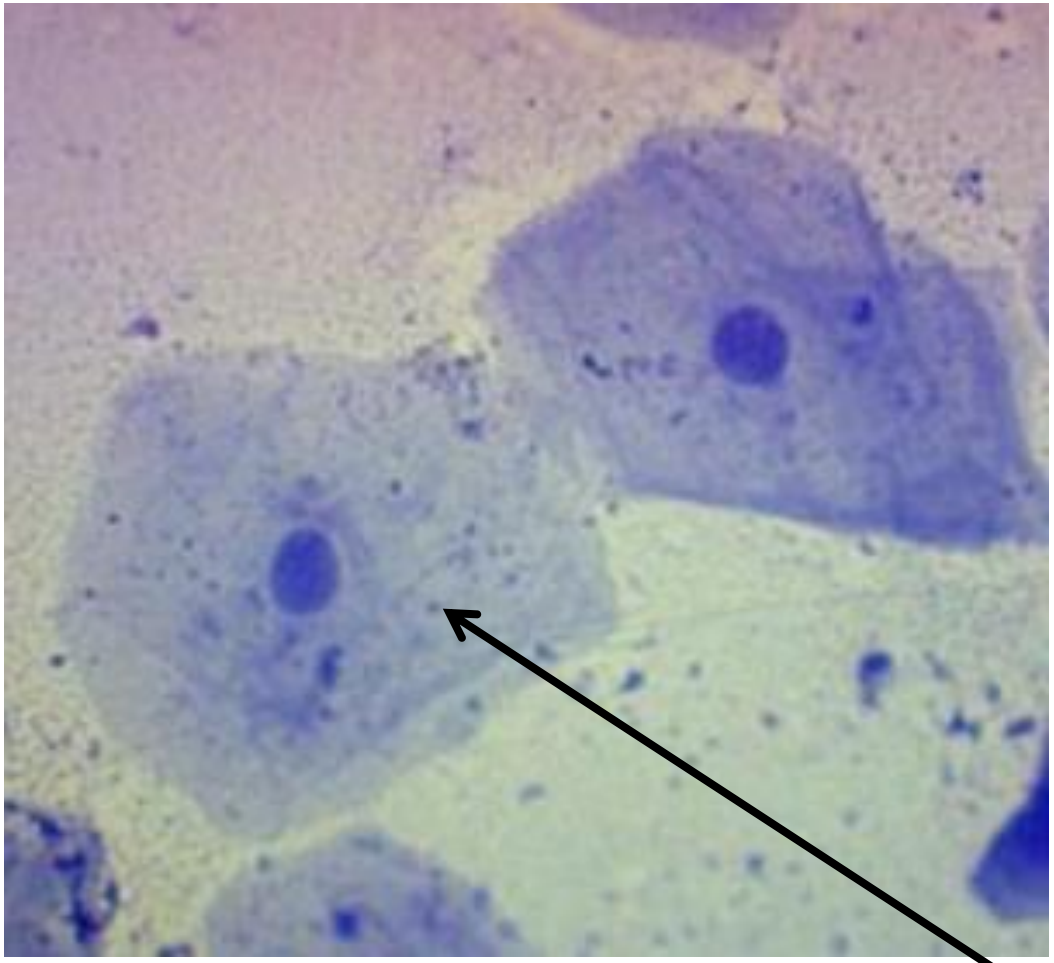


The animal cell you looked at were **cheek cells**.

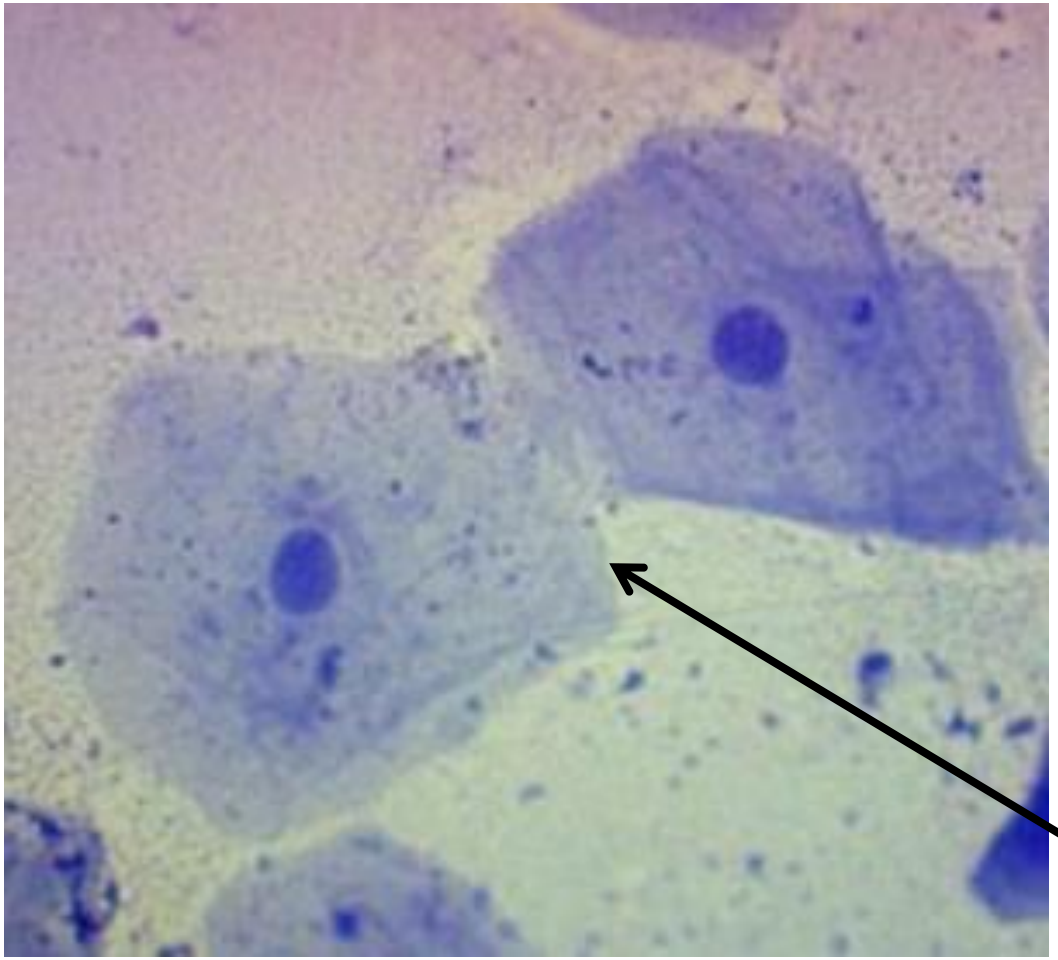
The rule about the **nucleus** is still the same. Each cell has exactly one nucleus. This still shows up as a dark blob, but takes up more of the cell than in plants



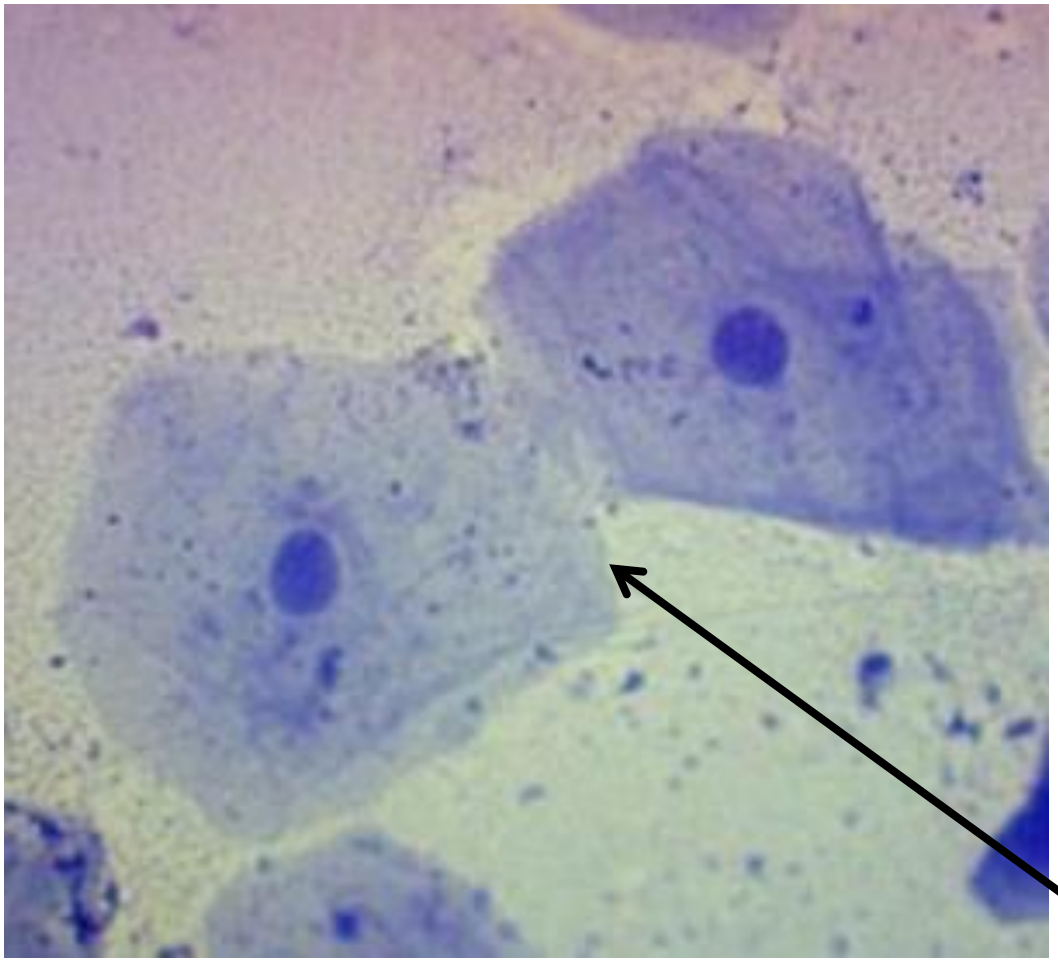
The contents of the cell look different though. There is no clear water filled space in the middle of the cell. Animal cells have no vacuole. Instead, the cell is filled up with a grainy looking **cytoplasm**



The cytoplasm is a vital part of the cell. It does not have an obvious structure, but it is where all the work of the cell goes on. This work is millions of **chemical reactions** – the cell's **metabolism**.

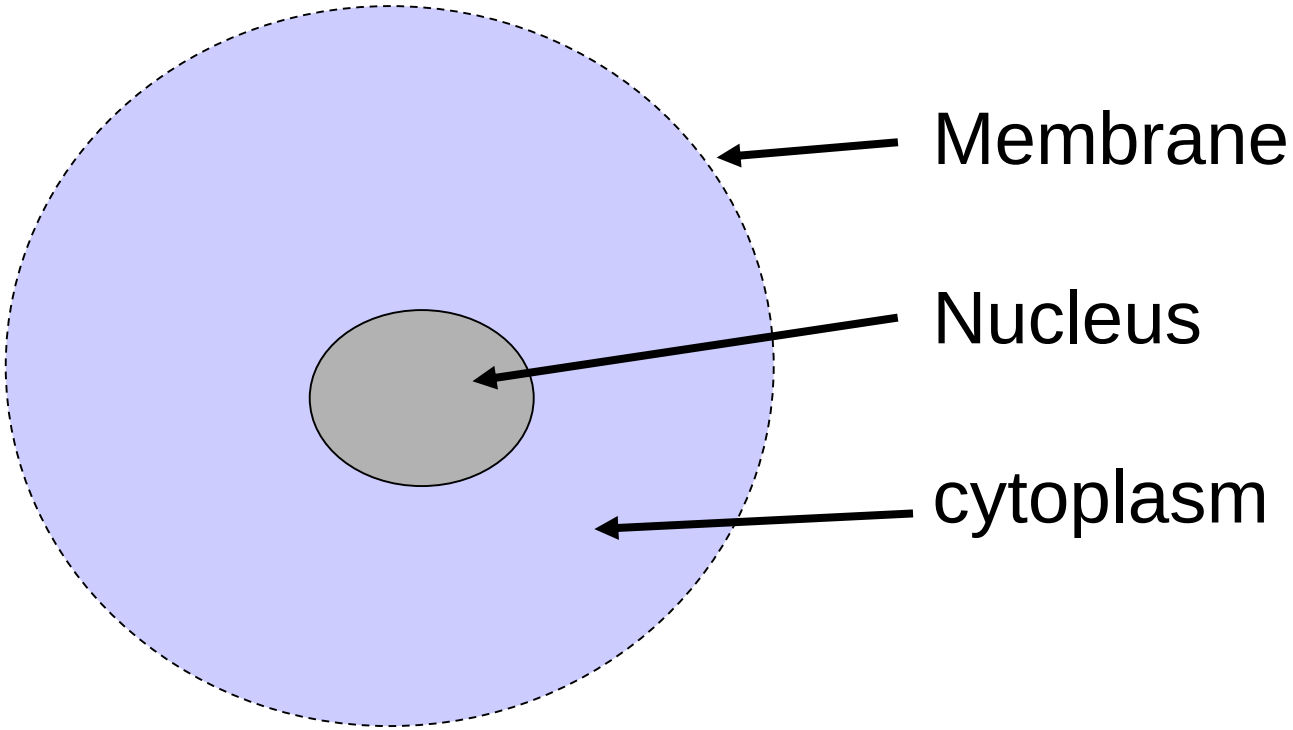


The outside of the cell also looks different to a plant cell. There is no big, thick cell wall. There is not really a clear divide between the inside oan outside – it is a very thin **membrane**

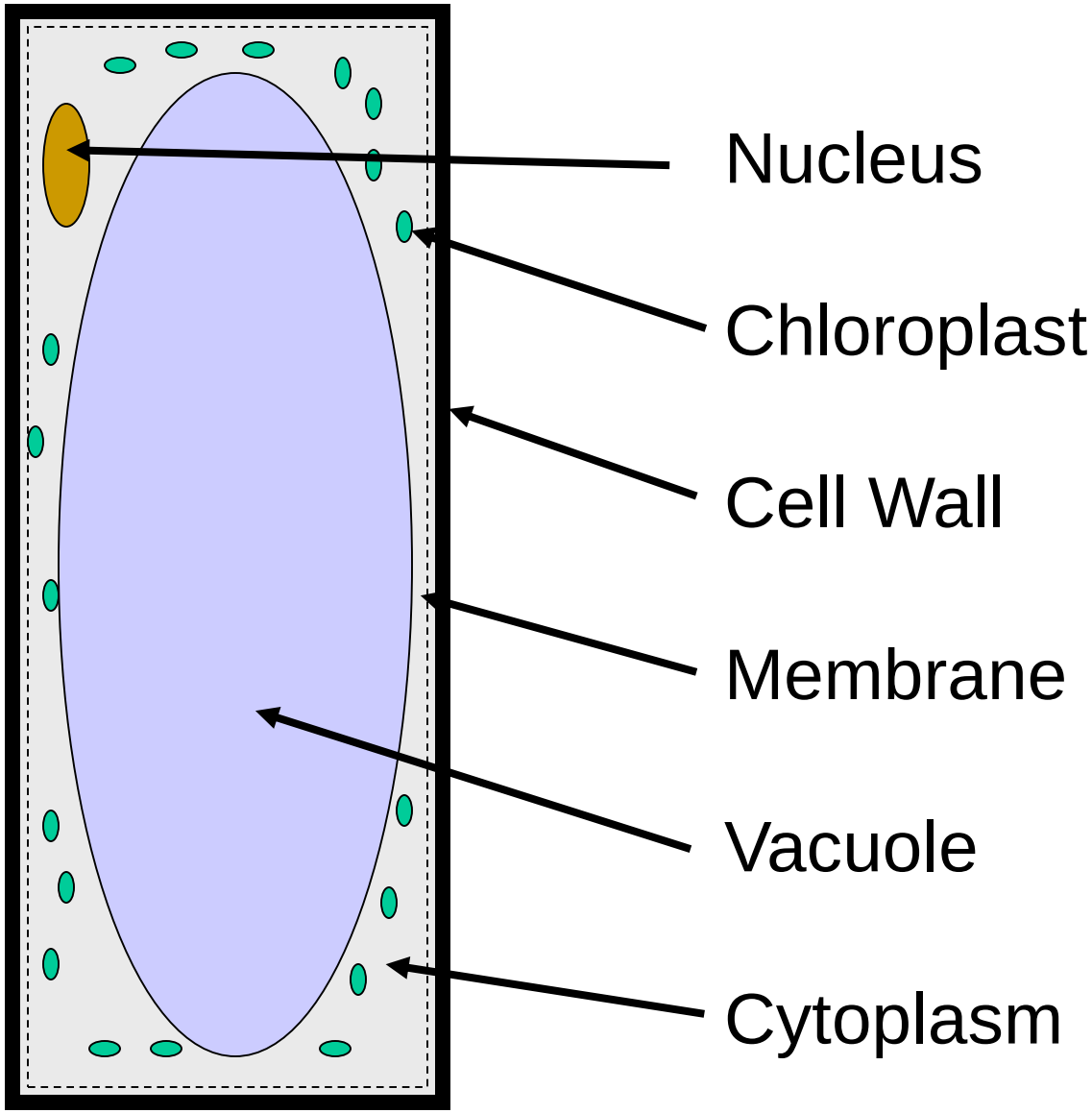


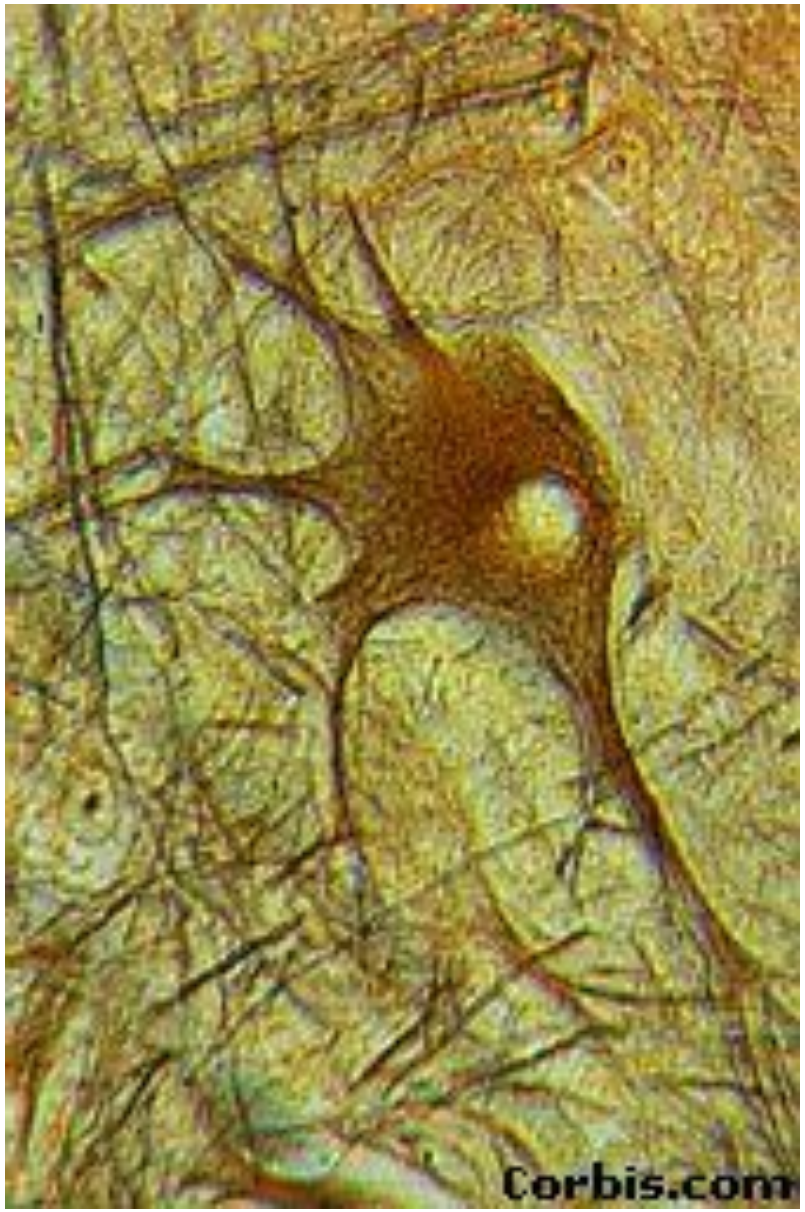
The job of the membrane is linked to its position.
Anything getting into the cell has to go through the membrane. So does anything getting out.
The job of the **membrane** is to control what gets into and out of the cell.

# Animal cell



# Plant cell

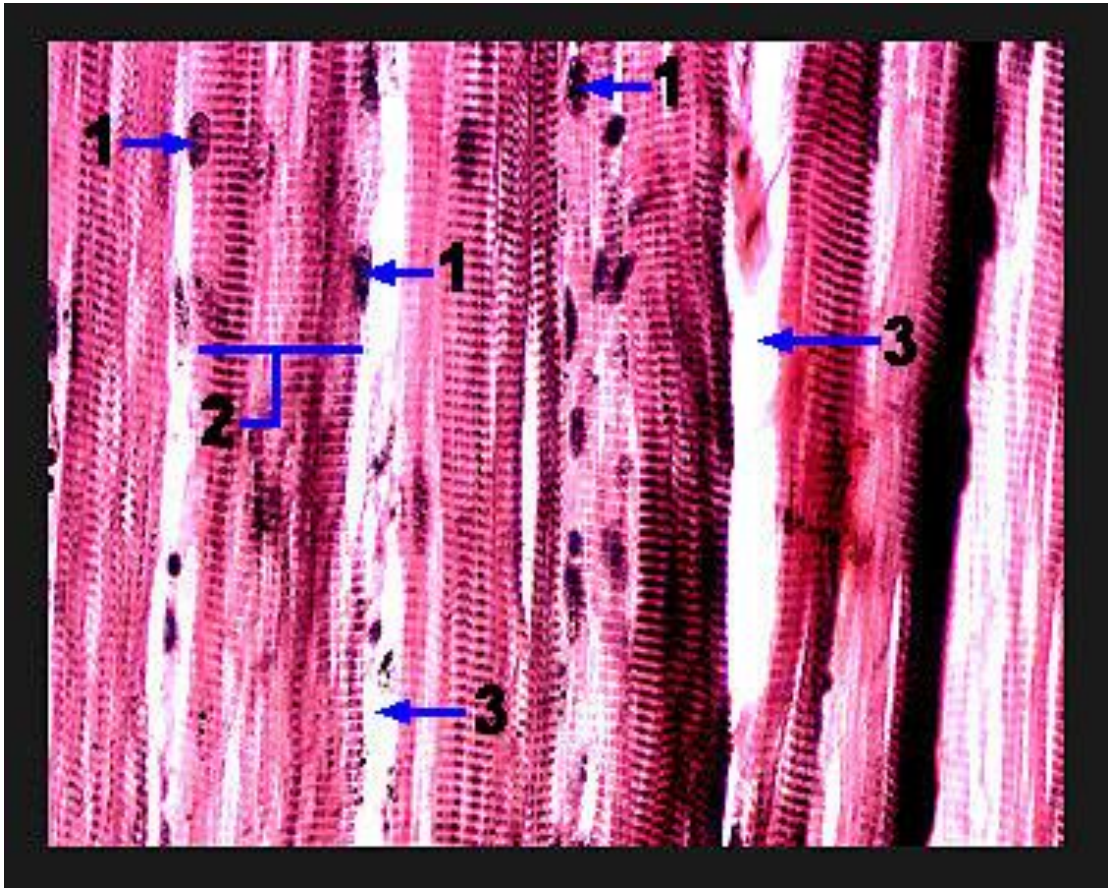

Nucleus
Chloroplast
Cell Wall
Membrane
Vacuole
Cytoplasm



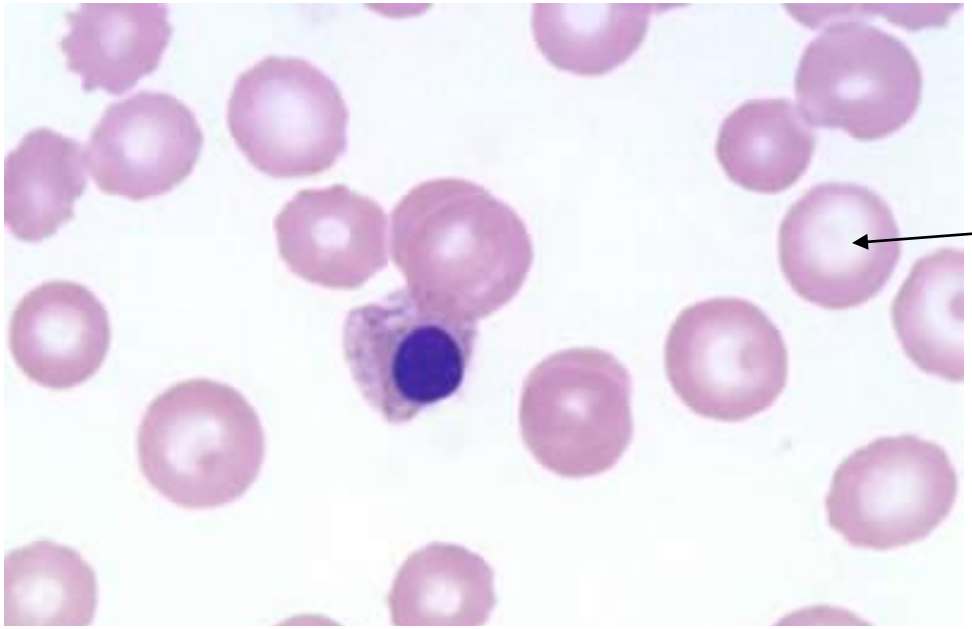

**All cells have a structure which is suited to its function**.

These are **nerve cells**.

They have **many side branches** to connect to other cells, and so pass on information in the form of tiny electrical signals.




These are **muscle cells**. In order to carry out their function, muscle cells are able to **contract**. This is how muscles pull on bones to make you move. The individual cells are organised together into **fibres**.



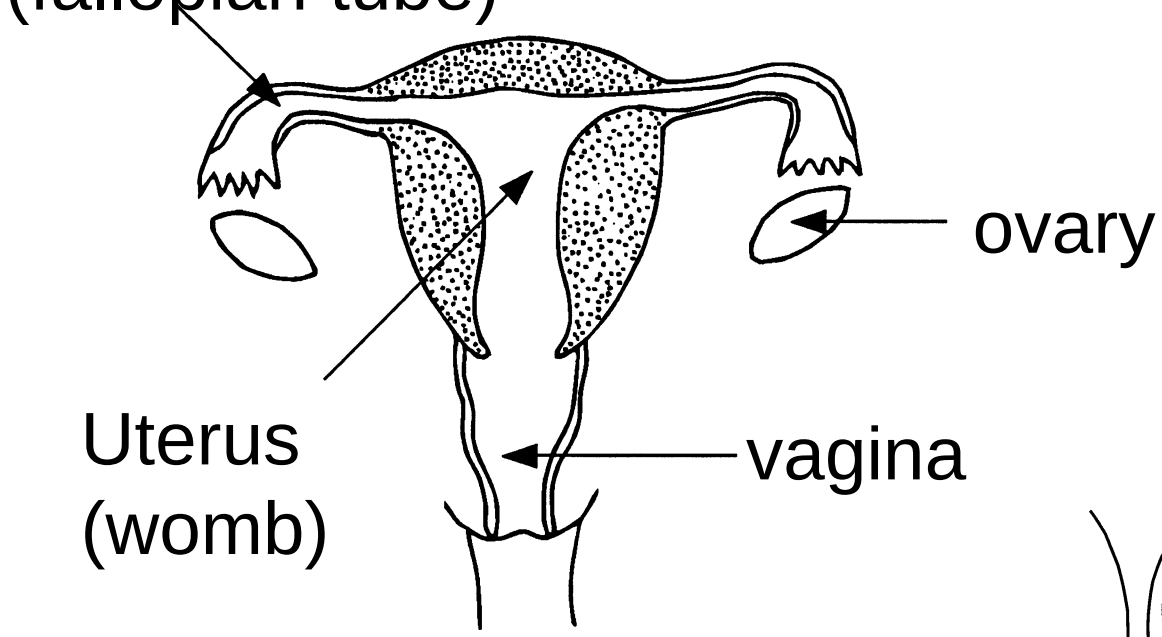
**Red cell**

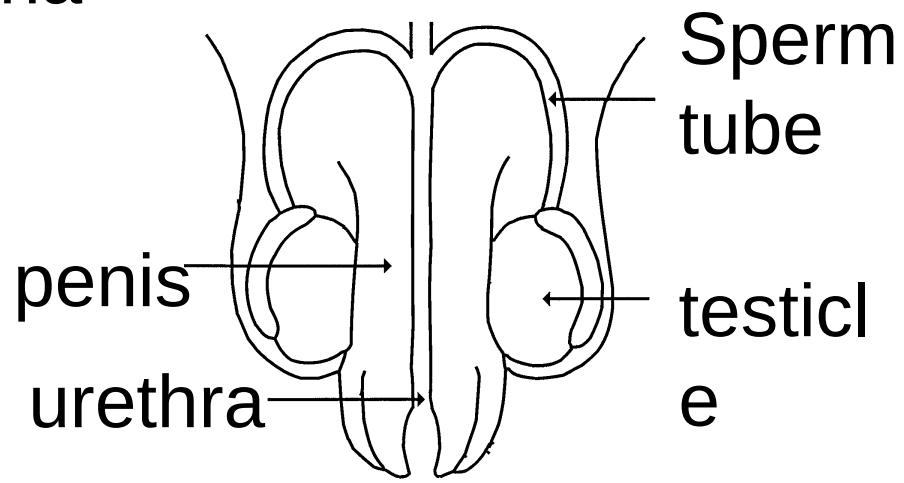
There are two types of blood cells – **red cells** are filled with a special chemical to let them carry oxygen. Red blood cells are the only cells which have no nucleus – it disintegrates as soon as the cells are formed.

White cells are actually see through. Their job is to defend the body against invading germs.

Puberty is the change from a child to a sexually mature adult. There a physical changes to your body and it may also affect your mood. Puberty happens at different times and at different rates in different people. No matter when it starts or how long it takes, you *will* become an adult!

## Girl bits -




## Boy bits -

Both male and female reproductive organs have the same two jobs –
To make sex cells
To get the sex cells together

If the sex cells meet and join, then the female's body also has to help the fertilised egg develop into a baby.

**Male** –
The two testes make the sex cells, called sperm.
The penis can become erect, so that when it is placed inside the female's vagina, it can release the sperm as close to the egg as possible.

The **vagina** is a tube which allows the penis into the female's body. It is also the **birth canal** through which the baby will be born.

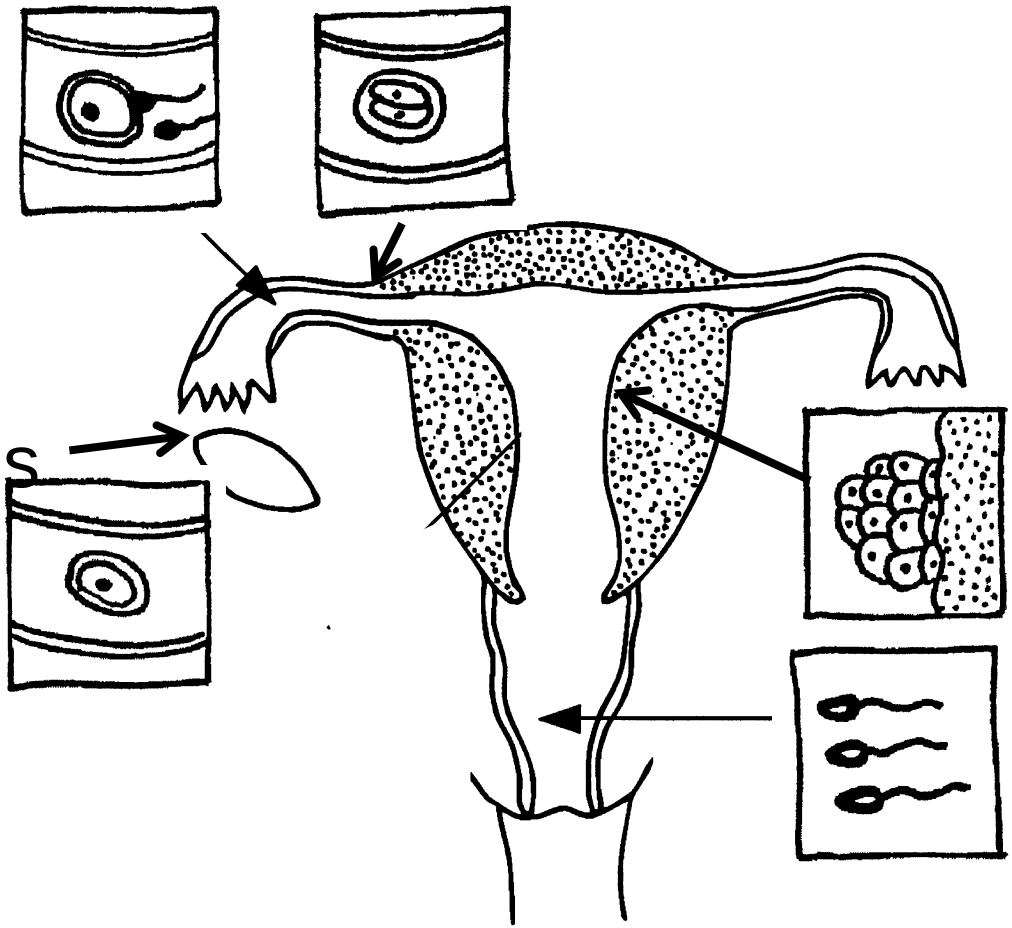
The female sex cells are **eggs**. These are made in the **ovary** and released around once every 28 days. Once the egg leaves the ovary, it is moved down the **egg tube**. If **fertilisation** is going to lead to a pregnancy, the sperm must meet the egg in the egg tube to give the fertilised egg enough time to divide before it reaches the **uterus**.

If the egg has been fertilised, it sticks onto the wall of the **uterus** and will grow and develop here for the next 9 months.

If the egg has not been fertilised, it passes out of the uterus along with some of the lining. This is a **period**.

3. Sperm swim through the uterus and fertilise the egg

4. The fertilised egg starts to divide



5. The ball of cells from the fertilised egg implant in the uterus wall

1. An egg is released from an ovary

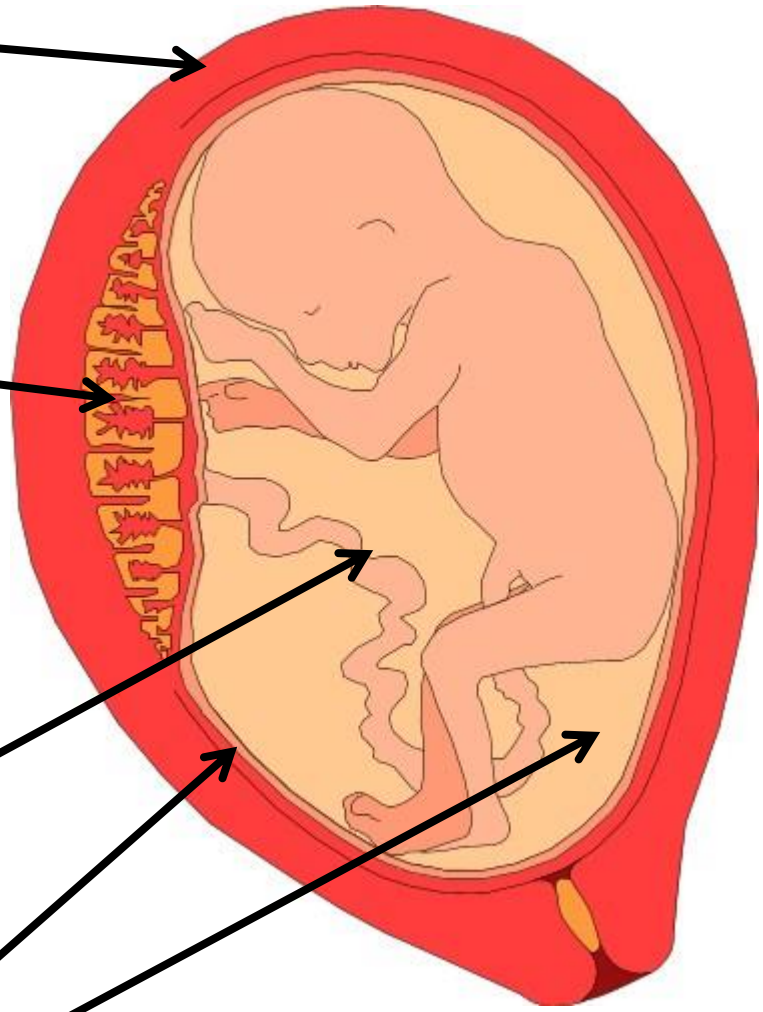
2. Sperm are released in the vagina

The growing baby develops in the **uterus**.

The mother's blood and baby's blood come close in the **placenta**, so food and oxygen can pass to the baby, and wastes to the mother.

The blood from the pacenta goes along the **umbilical cord**.

The baby is protected by being in the **amniotic sac**, filled with **amniotic fluid**.



The mother's blood and baby's blood come close in the **placenta**, so food and oxygen can pass to the baby, and wastes to the mother.
The problem with this system is that other harmful substances can also be passed to the baby –

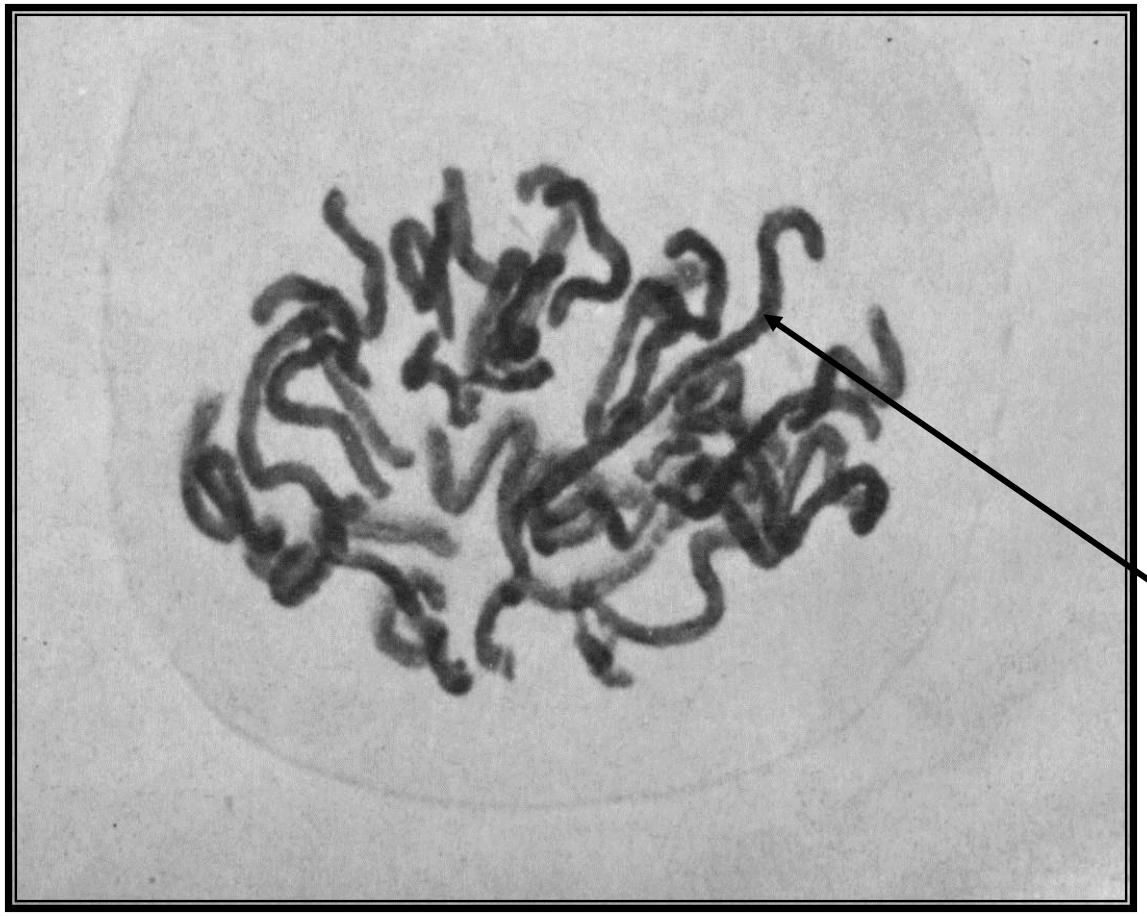
**Nicotine** (from cigarette smoke)
**Alcohol**
**Drugs**, including prescribed drugs
**Viruses**, such as rubella (german measles)

All of these can harm the baby, so mothers are avised not to smoke or drink through pregnancy and to always let doctors know in case there is an issue with prescribed drugs.

Members of the same family look different because they **inherit** different **characteristics** from both their parents. The **mix** is slightly different for each member of the family.

I'm feeling a bit mixed up about all this!

- The fertilised egg gets information from both the sperm (father) and egg (mother)
- The fertilised egg then divides to make every cell in the body
- Every cell in the body has a complete set of all the body information stored in its nucleus



When you look inside the nucleus of a cell which is dividing, there are many objects which look like threads.

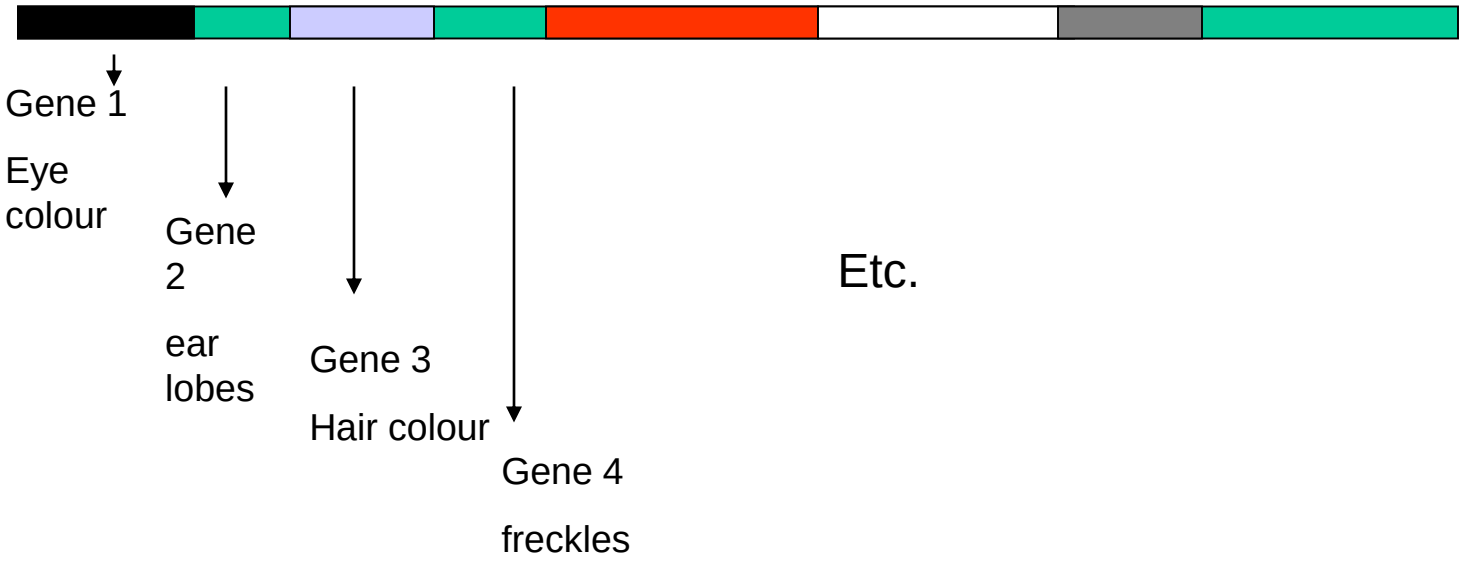
These are **chromosomes**.

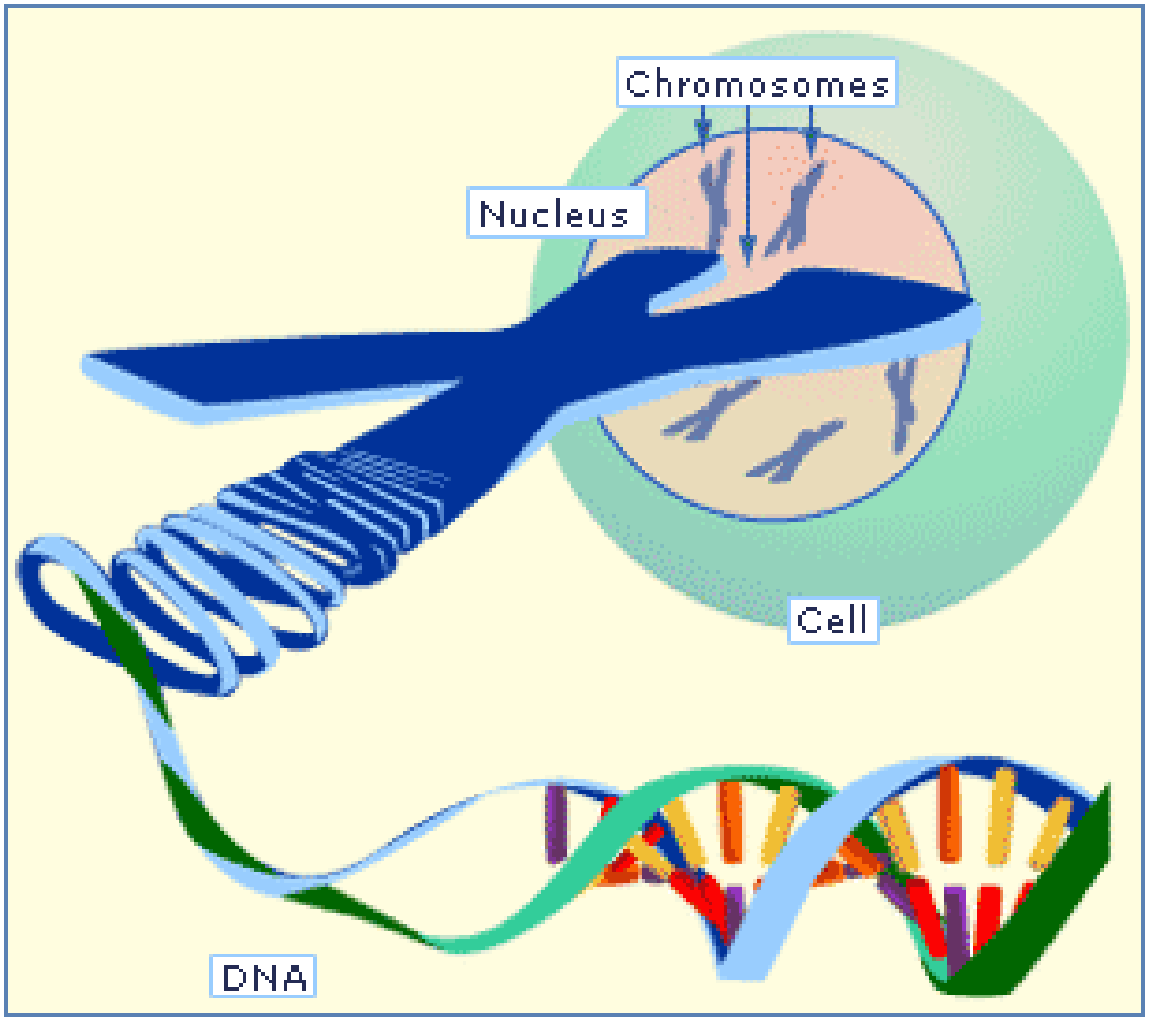
These **chromosomes** carry the genetic information.

Each chromosome carries a string of **genes**.

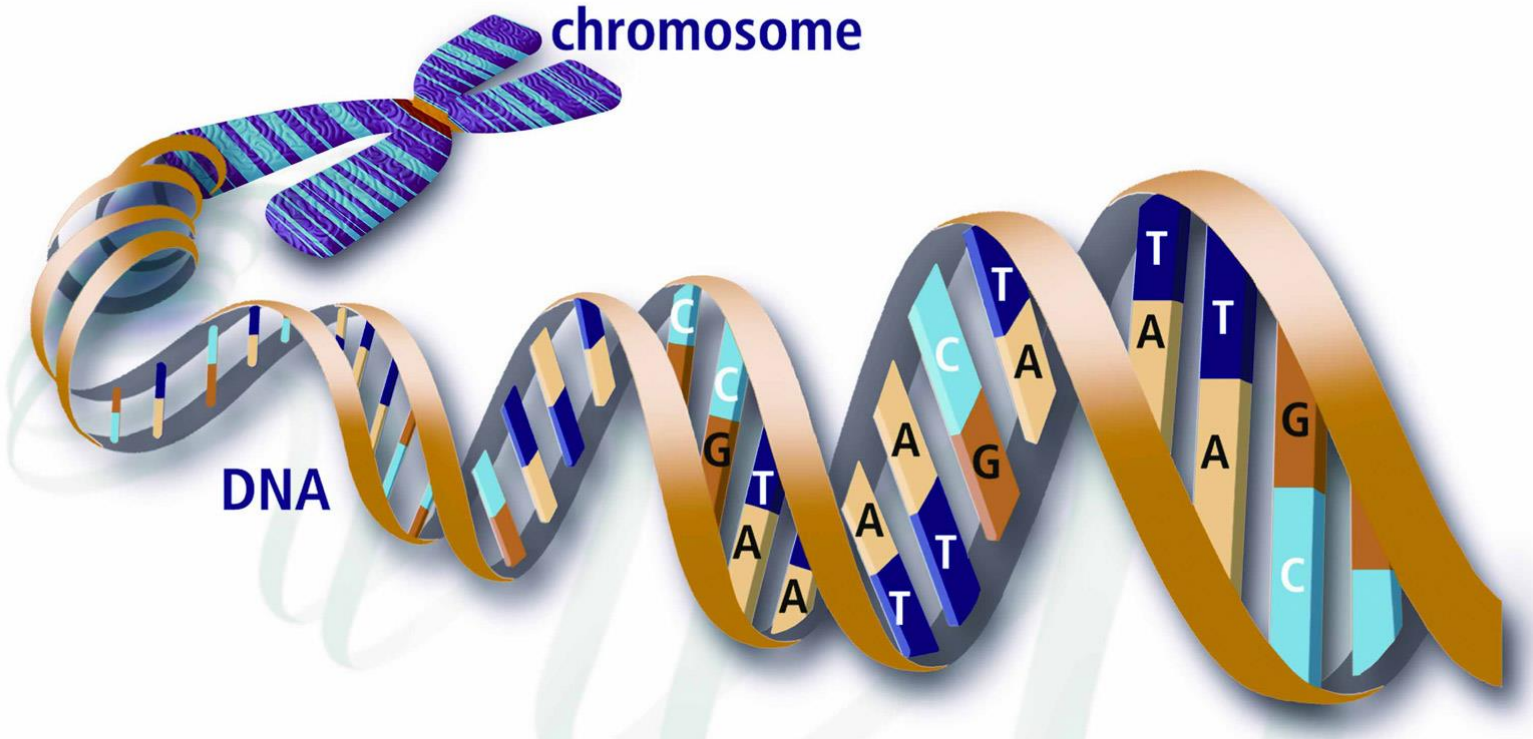
Each gene is one block of the cell's information.

Each gene carries the information for one characteristic






The **chromosomes** in the nucleus carry the genetic information.
The chromosomes are made of a **chemical** called **DNA**.
DNA forms long strands, which coil up on themselves to make the

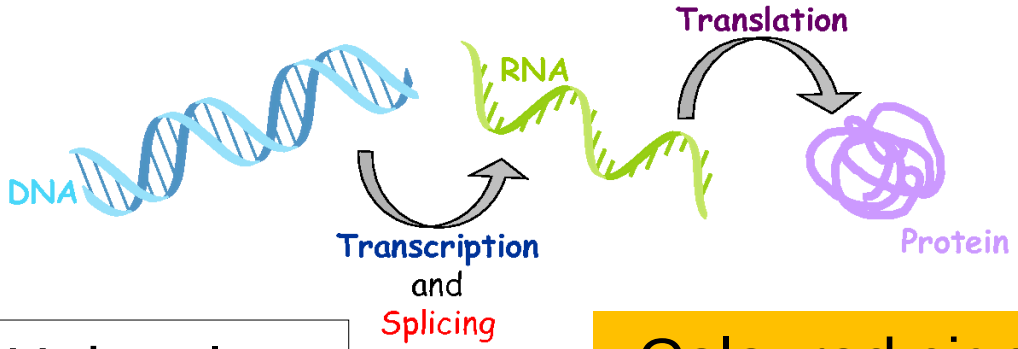



The coil of DNA is actually a double strand. Between these strands are pairs of molecules called **bases**. There are only four types – C, G, A, T. It is the **order of these bases** that carry the secret genetic code.

# An example – the 'ginger gene'

## Gene expression

### From Gene to Protein




Hair colour

red

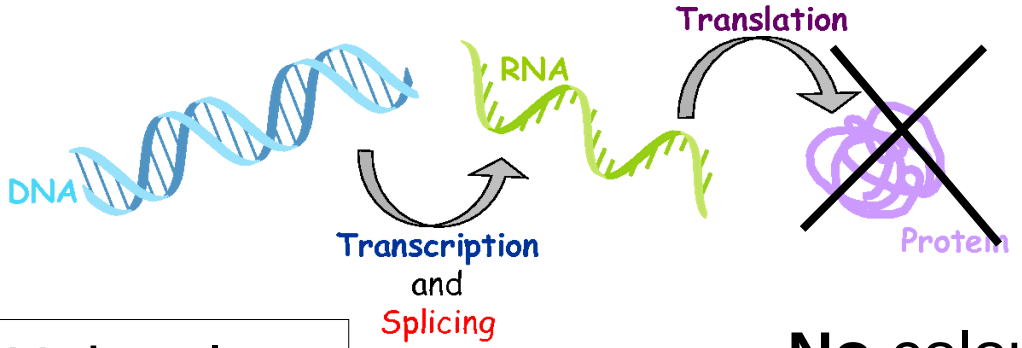
-ATTCCG-

Coloured pigment

I am a ginger (and proud!). My genes contain the **information** to tell my cells how to make the red pigment.

# Gene expression

## From Gene to Protein




Hair colour

Not red

-ATTGCG-

**No** coloured pigment

I don't have red hair because I don't have the **information** in my genes to know how to make the red pigment

# DNA profiling

No two people have the same DNA. This means that a DNA sample can be used to identify someone, if there is another sample to match it against –

- ***Crime*** – DNA from crime scenes can be used to identify criminals
- ***Paternity*** – if there is disagreement as to who the father of a child is, DNA samples can be compared to find the father.
- ***Genetic conditions*** – unborn children can be tested to see if they carry inherited diseases before any symptoms

# DNA profiling - pros and cons

DNA profiling is ***useful*** because it –

- Is quick
- Is very accurate
- Requires tiny amounts of sample

Some people, though, are worried that information from DNA profiling might be ***misused*** –

- Children may be aborted it genetic conditions are found
- Health insurance may be refused if genetic conditions are found
- Some people consider it an invasion of privacy