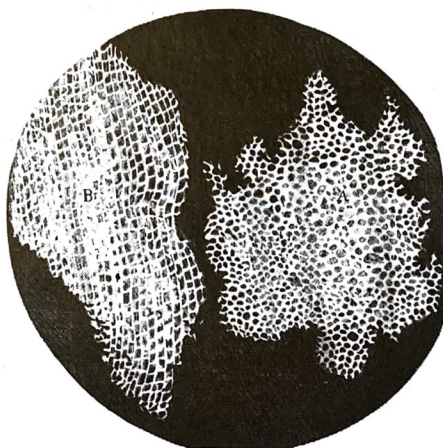


What are the differences between plant and animal cells?

The first person to use a microscope to look at part of a plant was Robert Hooke. In about 1665 he looked at some cork and noticed what he thought looked like small rooms. He called them **cells**. There are animal cells and plant cells. These cells are far too small to see, so we need to use microscopes. Our bodies contain over 1000 000 000 000 animal cells!



Robert Hooke
(1635–1703).



Hooke's drawing of cork cells.



Hooke's microscope.

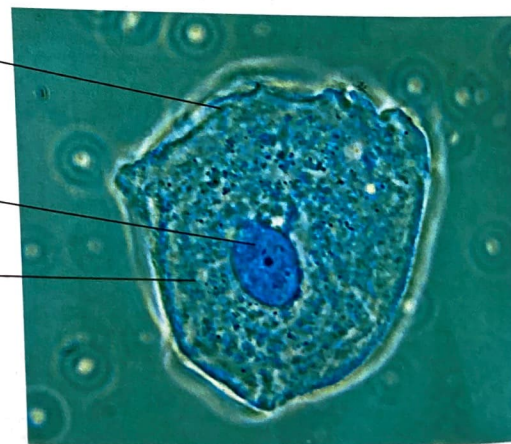
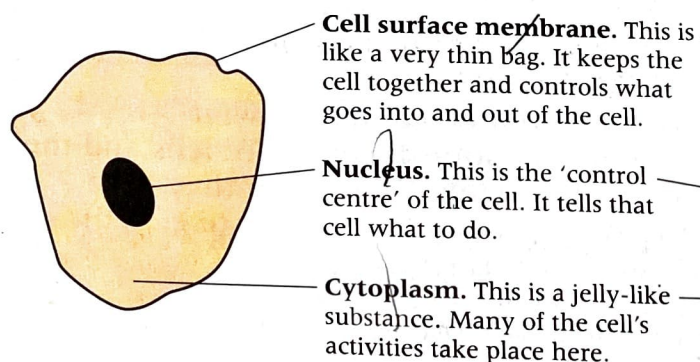


- 1 a) Who first discovered cells?
- b) What did he use to see them?



- 2 a) Name five living things that are made from animal cells.
- b) Name five living things that are made from plant cells.

The drawing below shows the parts of an animal cell. The photograph next to it shows a real animal cell. It is taken from the inside of somebody's cheek.

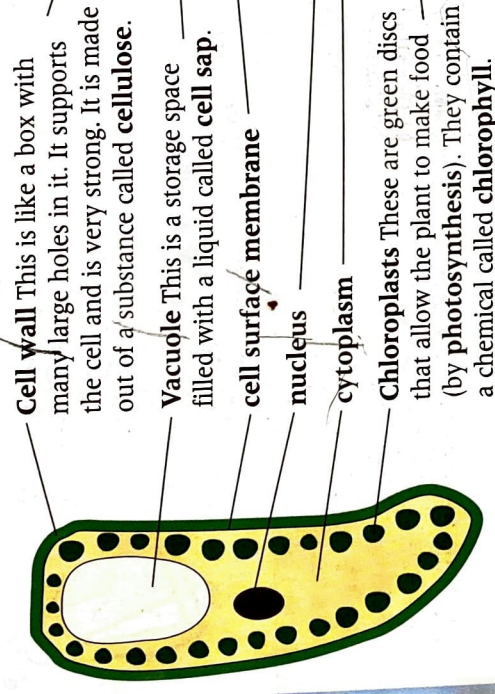


An animal cell (magnification $\times 2000$).



- 3 a) What does the nucleus do?
- b) Name two functions of the cell surface membrane.
- c) What happens in the cytoplasm?

Plant cells look a little different from animal cells, but they also have cytoplasm, a nucleus, and a cell surface membrane. Plant cells have straighter edges and are more box-shaped. These cells are from a moss leaf.



A plant cell (magnification $\times 1100$).

- 4 a) Write down the cell parts that both plant and animal cells have.
- b) Write down the cell parts that plant cells have but animal cells do not.
- 5 What makes plant cells green?
- 6 a) Draw a basic line diagram of a plant cell and label all of its parts.
- b) Make a table to explain what each part of the plant cell does.

The animal cell in the photograph on the opposite page is 2000 times bigger than in real life. It has been magnified 2000 times. We say it has a magnification of $\times 2000$.

- 7 Measure the widest part of the animal cell on the previous page. Now work out its width in real life.

! An average animal cell is about 0.02 mm across. An average plant cell is about 0.04 mm across.

Cell surface membranes are only 0.00001 mm thick.

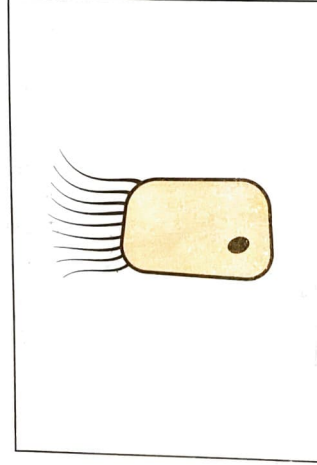
You should know...

- Animal cells have a nucleus, cytoplasm and a cell membrane.
- Plant cells also have a cell wall, a vacuole and chloroplasts.
- What all of these parts do.

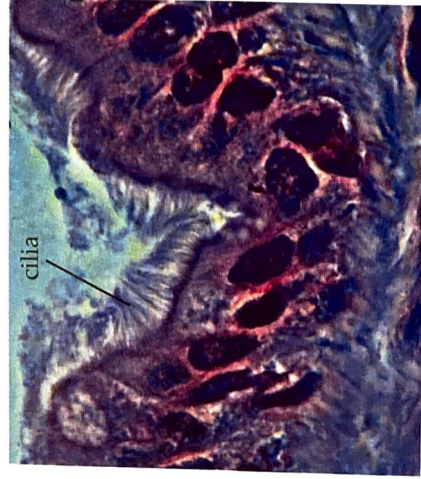
Why do cells have different shapes?

Not all cells look the same. Some cells have a special shape to help them do a certain job.

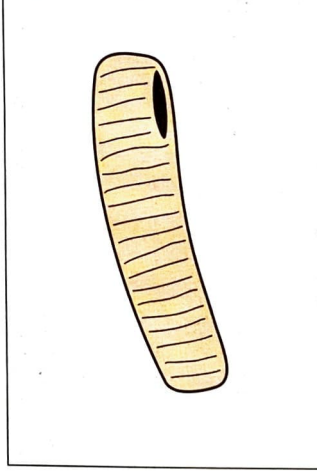
Cells of the same type that are grouped together form a **tissue**. A tissue is a group of the same sort of cells, all working together to do a job. The group of muscle cells in the picture below is called **muscle tissue**.



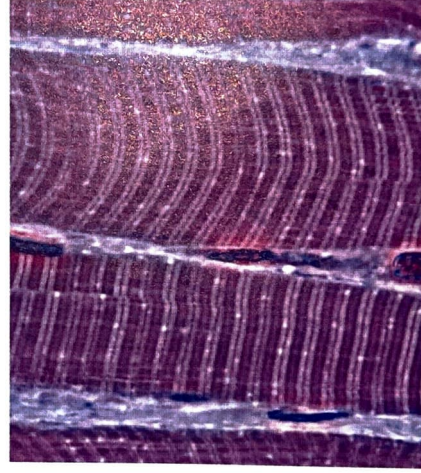
A **ciliated epithelial** cell. The strands at the top (cilia) wave about to move things.



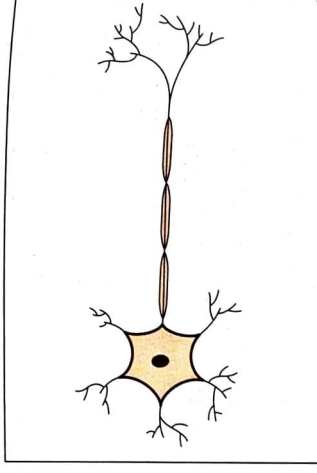
Ciliated epithelial tissue in a lung. The cilia wave together to move dirt out of the lungs. The cilia are killed off by cigarette smoke.



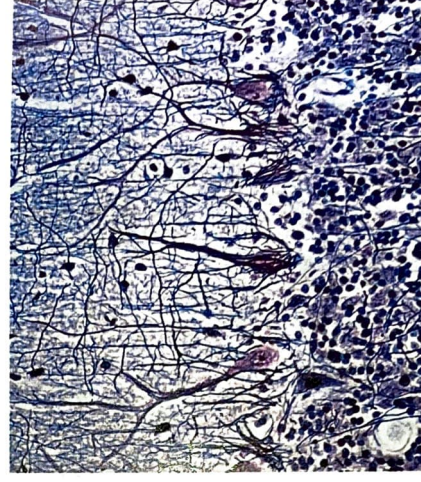
A **muscle cell** is able to change length.



Muscle tissue allows us to move.



A **nerve cell (neuron)** can be very long so that messages can be carried around the body quickly (at speeds up to 300 km/h).



Nerve tissue in the brain.

1 What is a tissue?

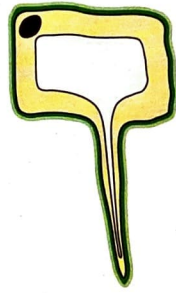
2 Why are nerve cells so long?

3 What does muscle tissue allow us to do?

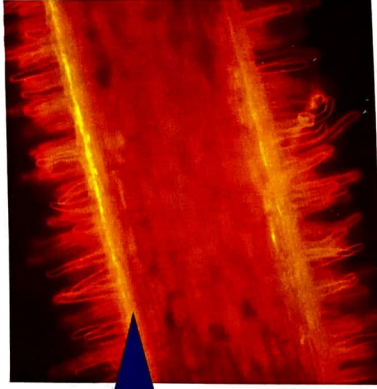
4 Where would you expect to find a lot of nerve tissue?

! An adult's body has over 200 types of cell. The longest are the nerve cells in the spine – these can be up to 1.3 m long. The smallest are another type of nerve cell found in the brain. These are only 0.005 mm long.

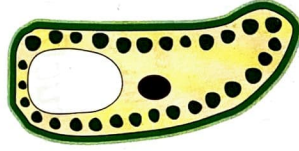
Not all the cells in a plant look the same.



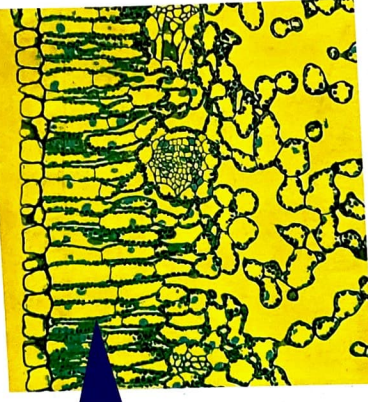
A **root hair cell** takes water out of the ground quickly. The root hair gives the water more surface area to get into the cell.



Root hair tissue (stained orange).



Palisade cells are packed with chloroplasts to help the plant make food.



Palisade tissue forms a layer near the top of leaves.

- 5 a) Which process, needing light, happens in palisade cells?
b) Which part of the palisade cell does this process happen in?
- 6 a) What does a root hair cell do?
b) How does the shape of a root hair cell help it to do this?
c) Why are there no chloroplasts in a root hair cell?

Cells that have special shapes are said to be **adapted** to do certain jobs. The jobs that cells do, help us to live.

- 7 a) Explain how ciliated epithelial cells are adapted to remove dirt.
b) What do you think happens to dirt in a smoker's lungs?
- 8 Make labelled drawings of a ciliated epithelial cell and a root hair cell.
- 9 Look at this picture of a xylem cell.
a) How are xylem cells adapted to carry water?
b) What do you think a group of these cells is called?



This is a xylem cell from a plant stem. Xylem cells join together to form hollow tubes, which carry water.

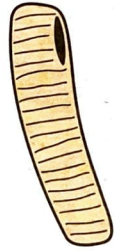
In 1839 Theodor Schwann (1810–1882) said that cells were the smallest living units from which all plants and animals were made. Before this time, people thought that tissues were the smallest parts. They also thought that tissues were not living.

You should know...

- Some cells are adapted to do special jobs.
- How ciliated epithelial cells, nerve cells and root hair cells are adapted.
- A group of the same sort of cells is called a tissue.

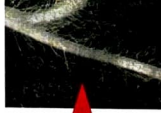
How do cells, tissues and organs work

Cells of the same type are grouped together to form **tissues**. Different types of tissues can be grouped together to form **organs**. Here are two examples.



Muscle cells are grouped to form muscle tissue.

The heart is made of muscle and other tissues.



Root hair cells are grouped to form root hair tissue.

The root cap is made of root hair and xylem tissue.

That's not the end of the story! Organs work together too. A set of organs working together is called an **organ system**. The heart is part of the **circulatory system**.

There are many other organ systems. Food is broken down in the **digestive system**. The brain is part of the **nervous system** which carries messages around our bodies. The lungs are part of the **breathing system**.

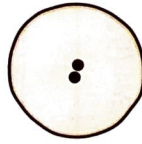


1 Name two types of cells found in roots.

How are new cells made?

For something to be alive it must move, reproduce, sense things, grow, respire, get rid of waste (excrete), and need nutrition. These are the seven 'life processes'. Cells do all of these things and so help us to carry out the seven life processes. For example, our nerve cells help us to sense things.

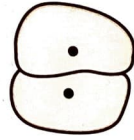
All living things grow. For whole plants and animals to get bigger, they need to make more cells. The cells need to reproduce. They do this by dividing. One cell divides to make two new cells. This is called **cell division**.



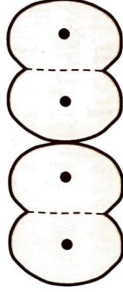
The nucleus of the cell splits into two.



A new cell membrane forms in the middle.



The new **daughter cells** get bigger.



Once the daughter cells are full size, they too can divide.

When a cell divides, the two new cells are called **daughter cells**. The daughter cells made by cell division are quite small. Before they can divide they must grow to full size. To do this they require nutrition. Our cells get nutrition from the food we eat. That is why people who do not get enough food may not grow as tall as they should.



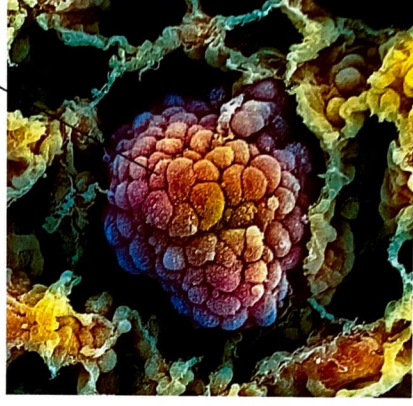
- 1 Which life processes do the following cells help us with?
a) nerve cells
b) muscle cells

- 2 a) What is cell division?
b) Which life process does cell division help with?

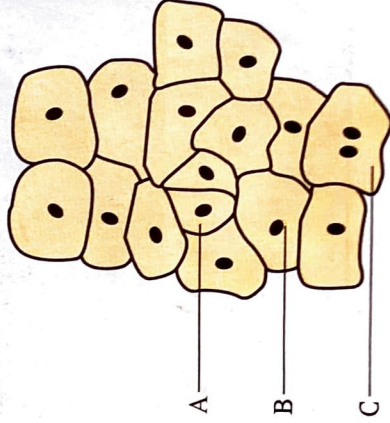


Sometimes cell division goes wrong and cells start to divide faster than they should. Cancer cells do this.

a cancer tumour



- 3 Look at this picture.
a) Which cell is dividing (A, B or C)?
b) How can you tell?
c) Make a drawing of the dividing cell and label the parts.
- 4 Draw a diagram to show how cells divide.



You should know...

- Cells reproduce by dividing.
- Cells need nutrition to grow.