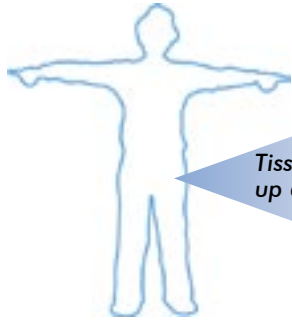
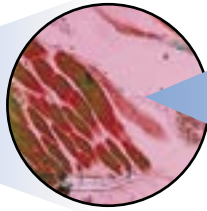


Nearly all living things – plants and animals (including us humans) – are built up from tiny pockets, called cells. Cells are so small that they can only be seen under a microscope.

# CELLS



Tissue make up a body.



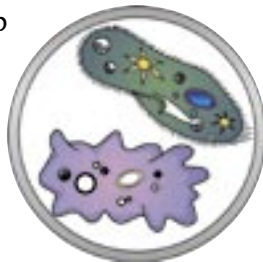
Many cells make tissue.

Each cell is a dynamic, living little factory. It is the smallest living unit that can carry out the basic functions of life: growth, metabolism and reproduction.

Some simple organisms are made up of only one cell, while most plants and animals are made up of huge numbers of cells. Each cell has its own role to play in the life of the plant or animal and is adapted to perform those particular functions. Your skin, your bones, your muscles and your brain are all made of cells.



Many bricks make walls. Many cells make tissue



One-celled organisms

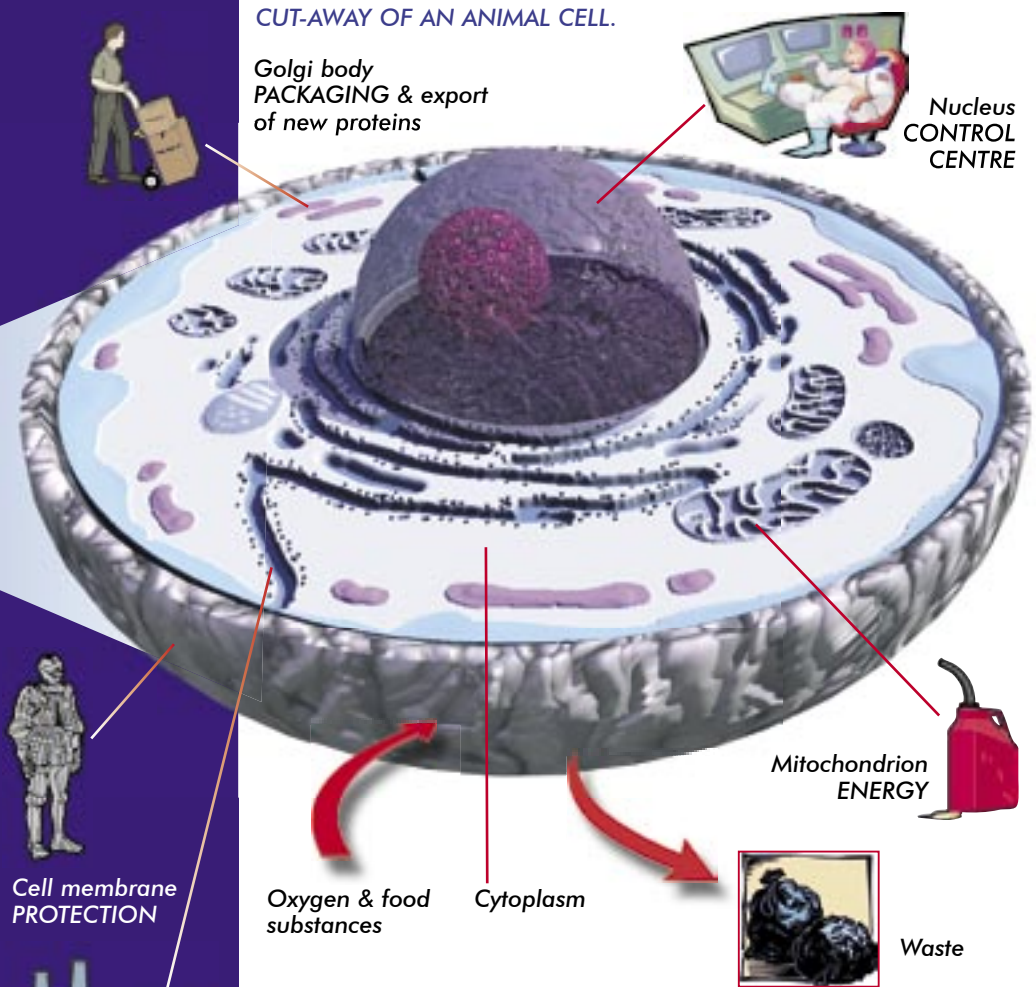
There are over 200 different types of cells in your body.

## Inside a cell

A living cell is a squidgy pocket containing cytoplasm (sai-tow-plazim), which is a watery, jelly-like mixture of chemicals.

A thin skin, called a membrane, holds the cytoplasm together. Animal cells have soft membranes made of fat and proteins.

The membrane gives the cell shape, and also lets certain chemicals like oxygen and food substances pass through to feed the cell,



CUT-AWAY OF AN ANIMAL CELL.

Golgi body  
PACKAGING & export  
of new proteins

Nucleus  
CONTROL  
CENTRE

Cell membrane  
PROTECTION



Endoplasmic  
reticulum  
PRODUCTION  
of new proteins

Mitochondrion  
ENERGY

Waste

Oxygen & food  
substances

Cytoplasm

but it stops others. It lets waste material out again. (See for yourself how this works in the experiment on page 6)

Plant cells have a tough membrane made of material called cellulose. The cellulose can sometimes be very thick and so gives the plant its shape.

The cytoplasm acts as

a storeroom of molecules for growing and repairing the structures inside the cell. Small structures called organelles are present in the cytoplasm. They produce hormones, enzymes and other substances which are released for use inside the cell and also elsewhere in the body.

Most plant and animal

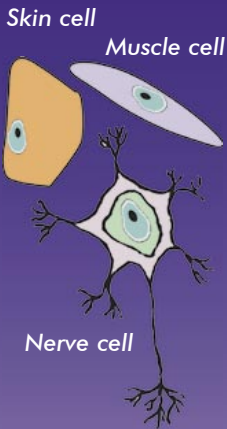
Illustration: Cobus Prinsloo

## How many?

There are about a hundred million cells in your body, with many different types with specific functions.

## How small?

At least 1000 cells would fit side by side across a full-stop.



cells contain an inner part, called the nucleus. It controls what the cell does and how it develops. The nucleus can be seen under a microscope.

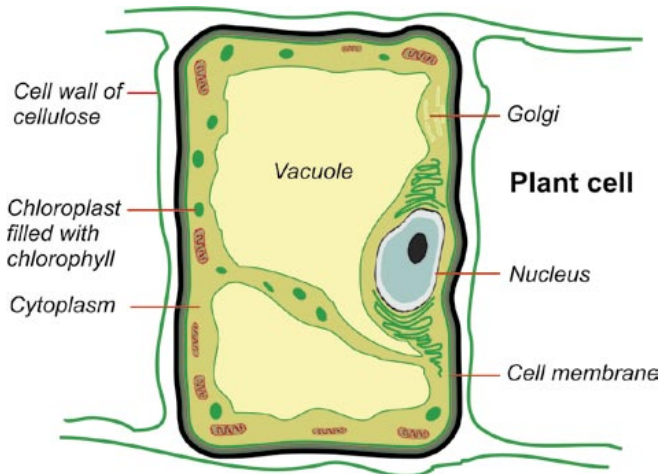
The vacuole is a space in the cell containing air, liquids or food particles. Animal cells usually have small vacuoles. All plant cells have vacuoles and the liquid inside them is called cell sap. Plant cell vacuoles are quite large. Water collects in the vacuoles when the plant is watered and this makes the plant rigid (or stiff). Without enough water, there is less pressure in the vacuoles and the plant wilts.

Plant cells also contain chloroplasts, which are tiny disks full of a green substance called chlorophyll. They trap the light energy that plants need for making food by photosynthesis.

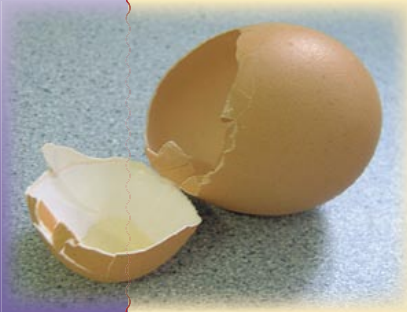
## The cells in your body

Just like a house is built of bricks, your body is made up of cells. The type of brick determines what the building will look like. In the same way, the type of cell determines what type of organ it will form. There are skin and blood cells that look like plates, liver cells that look like little boxes, fat cells that are round, and many others. They still all have the same basic structure.

All these cells grew from a single cell made when a sperm cell from your father met an egg cell from your mother and fertilised it. This one cell contained all the instructions necessary to make you. You grew because that single cell divided to make two cells, those two



# The egg - an amazing cell



There is a type of single cell that you can see without the aid of a microscope - an egg. Even an enormous ostrich egg is only a single cell! These cells are marvelously adapted to produce new creatures.

Every kind of animal produces eggs, but they do not all lay eggs. Female mammals, including people, produce very small eggs which they keep inside their bodies.

Take a look at a chicken egg. It is a fascinating thing which we take for granted. To us, a

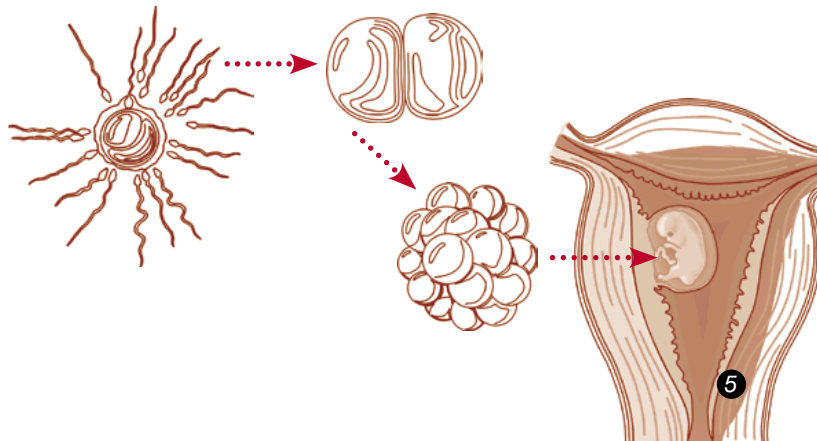
chicken egg is something you boil or fry, or make into an omelette. But an egg contains some of the clues to the whole mystery of life. The egg contains a supply of food, known as the yolk. Most eggs are surrounded by one or more membranes to protect it. The outer membrane often forms a hard shell.

Each egg contains a very small germinal disc. In unfertilised eggs, the germinal disc remains so small and does not divide. These are the eggs that reach our tables. In fertilised eggs, which are produced for hatching chickens, the germinal disc will divide and a young bird will grow.

divided to make four, and so on. We call this cell division and that is how all living things grow.

Cells are always wearing

out. They are then replaced by new ones. Some cells last months, and some less than a day. Nerve cells last for a very long time.



# Egg-experiment

You will need:

- A 400 ml glass jug
- Three glass cups
- Plastic wrap
- Vinegar
- Salt
- Distilled water (from the pharmacy or filling station)
- Eggs
- Syrup or honey

Place two eggs in a jug of vinegar. Watch the eggs for several minutes.

You will see how the egg shells seem to bubble. That is the vinegar, an acid, eating away at the calcium of the egg shell. There is a chemical reaction between the vinegar and the shells. The bubbles are carbon dioxide gas, the result of the reaction. Let the eggs stay in the vinegar, completely covered, for 1 - 3 days until the vinegar has 'eaten' away the shell on the eggs.

Remove the eggs from the vinegar and carefully rinse them off, getting rid of any shell that did not come off.

If the shell does not come off completely, put the eggs back in the jug of vinegar, and try to rinse them the next day.

Have a good look at these eggs. Even though they no longer have shells, they still don't fall apart.

This is because membranes hold them together. Can you see the membranes? And the yolk? Look carefully to see if you can see the germinal disk.

Measure equal amounts of distilled

water and syrup (or honey) in each transparent glass cup. Place one egg in each cup and cover the cup with plastic wrap. Make a mark on the cup to show the height of the liquid inside. Keep the eggs in these solutions for three days, then see and feel what they look like. You will see that the egg in the water did not change much. The egg in the syrup will have shrunk and will feel all wrinkly. Now place this egg in a new cup, containing water. The egg will swell up again, maybe even bigger than its original size.

## What happened?

At first all the water molecules inside the cell (egg) wanted to move out to the syrup or honey where there is less water - or a lower concentration. Then, when the egg had shrunk, all the water molecules outside the egg wanted to move inside to the lower concentration.

The reason only water moves across the membrane while the sugar particles in syrup do not, is that sugar particles are too big to cross the membrane.

