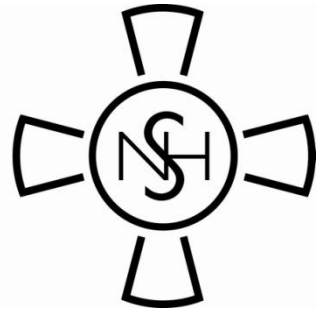


THE NEWCASTLE UPON TYNE  
CHURCH HIGH SCHOOL



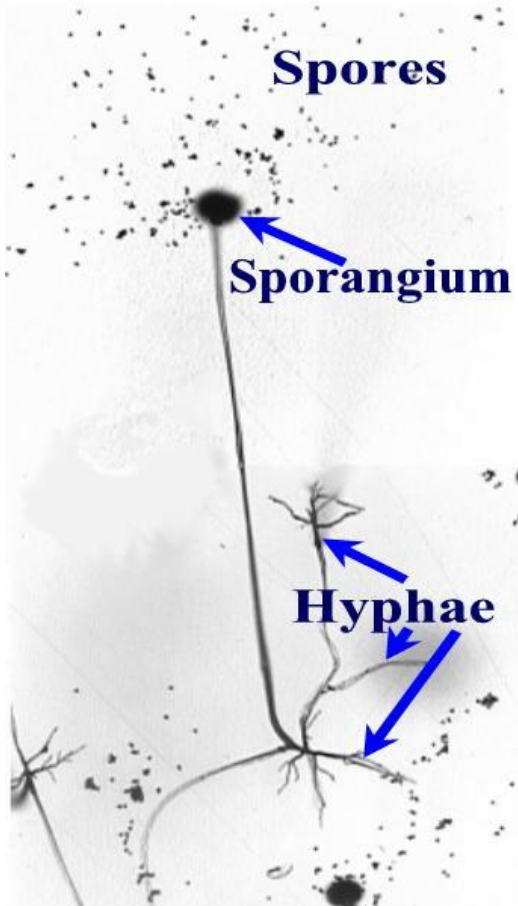
# Biology Department

## Year 8

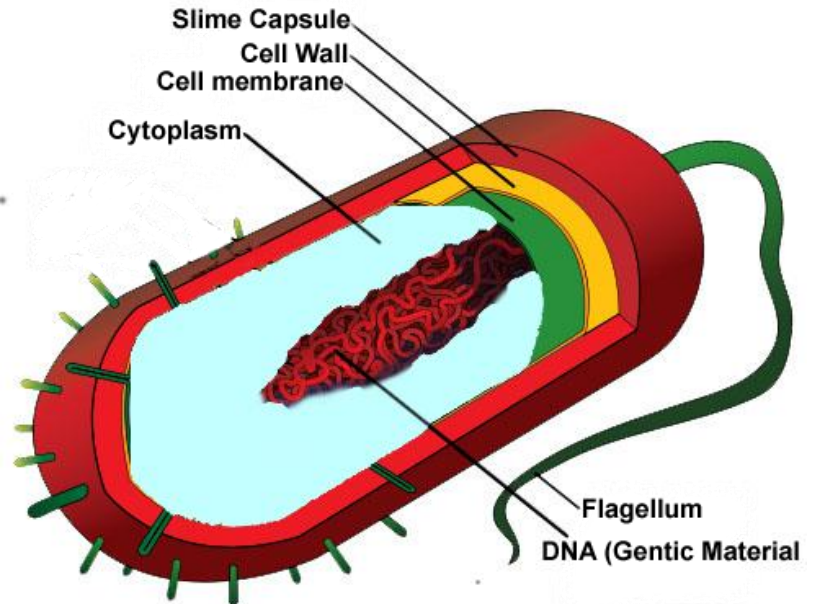
### Revision Notes

# Types of Microbe

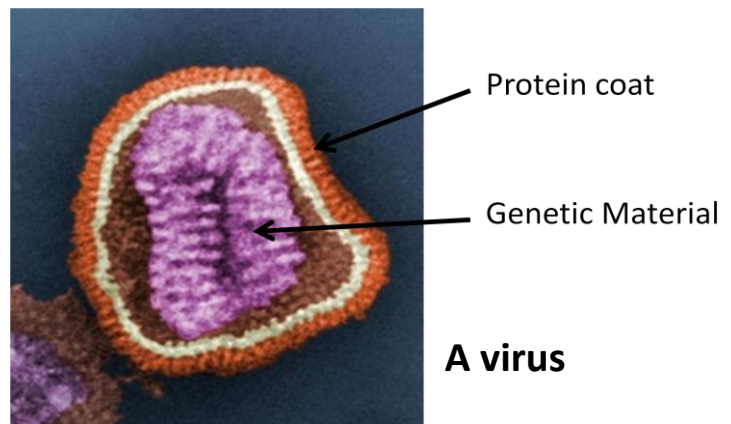
Microbes (short for micro-organisms) can only be seen using a microscope. There are three main types: **viruses**, **bacteria** and **fungi**. Viruses are not normally considered to be living because they do not carry out any of the seven life processes for themselves.



A fungus



A bacterium



A virus

Diagrams of a fungus, bacterium and a virus. In order of size from largest to smallest, they are: fungus > bacterium > virus.

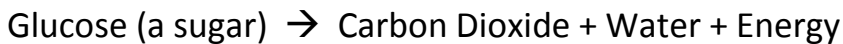
## Uses of Bacteria and Fungi

**Bacteria** are used to make yoghurt and cheese. The bacteria use a sugar in milk called lactose for **fermentation** in which lactose is converted to lactic acid. The lactic acid causes the milk to clot and solidify.

**Yeast** (a fungus) is used to brew beer and make wine by fermentation. When yeast breaks down sugars **anaerobically** (without oxygen) it produces alcohol.

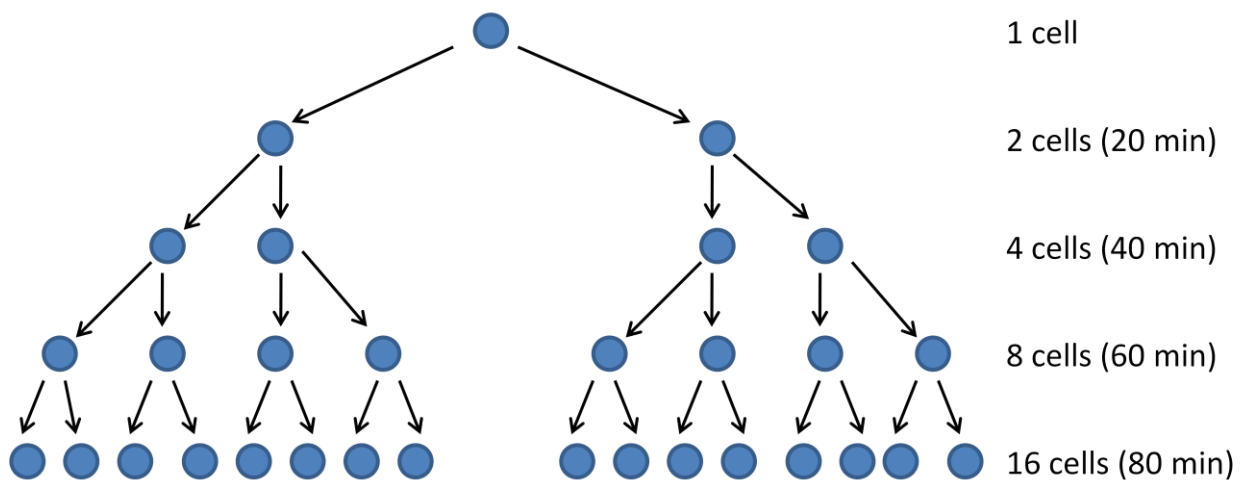
Glucose (a sugar) → Carbon Dioxide + Ethanol (alcohol) + Energy

Yeast is also to make bread dough rise. In this case oxygen is mixed into the dough when you kneed it. The yeast respire **aerobically** to produce carbon dioxide which makes the dough rise. The reaction is as follows:

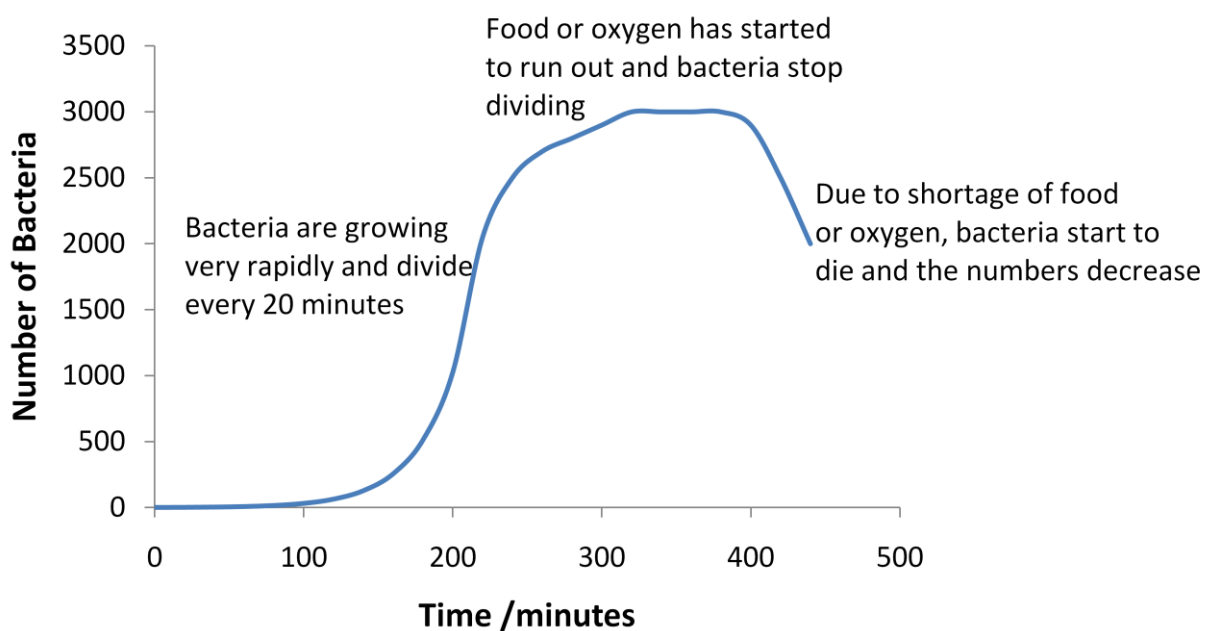


## Growth of Microbes

If bacteria have sufficient food, a plentiful supply of oxygen and a warm temperature they can divide as rapidly as every 20 minutes. The number of organisms in an area is called a **population**. In good conditions the population of microbes will grow rapidly, as shown in the diagrams below. The population will stop growing if something runs out, e.g. sugar. The thing that stops a population growing is called a **limiting factor**.



Most microbes grow by reproducing **asexually**. They divide (split) to produce identical copies of themselves. This form of reproduction is very efficient at producing lots of identical cells in a short period of time.



Microbes will continue growing until something runs out. This causes the graph to flatten. Eventually the microbes will start to die if there is insufficient food or oxygen.

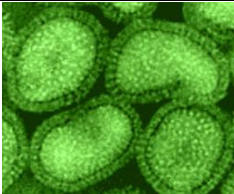
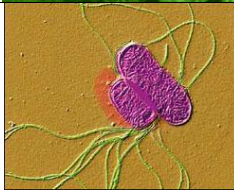


It is possible to grow microbes in the laboratory in a **petri dish**. The photograph shows



colonies of a fungus growing. The jelly-like substance, called **agar**, on which the microbes grow is contains nutrients (e.g. sugar and minerals). When growing microbes in the laboratory you should tape the lid on with two pieces of tape either side to allow air to enter the dish. The microbes are allowed to grow at room temperature (less than 25°C). It is unsafe to use higher temperatures as microbes that can infect us (called **pathogens**) are more likely to grow.

### Microbes and Disease

Some microbes cause **infectious diseases** (diseases that can be spread from person to person). The microbes are said to **infect** you. The effects the microbes have on your body are known as **symptoms**. Microbes can be spread by the air, water, touch, food, animals and sex. Some examples of Microbes that cause disease are shown in the table below.

Disease	Microbe that causes it		Symptoms	How it is spread
Colds and flu	Virus		Sore throat, running nose, fever	Air
Food poisoning	Bacteria		Vomiting, diarrhoea	Food
Cholera	Bacteria		Vomiting, diarrhoea	Water
Athlete's foot	Fungus		Sore cracked skin between the toes	Touch

Other examples of diseases caused by microbes include:

**Bacteria:** MRSA (often contracted in hospitals); Tuberculosis, Chlamydia, Bacterial Meningitis, Bubonic Plague, Syphilis, Lyme Disease (Spread by tick bites).

**Viruses:** HIV (AIDS), Hepatitis, Herpes, Smallpox, Foot and Mouth Disease, Warts and Verrucas, Polio, Rabies, Measles, Mumps, Rubella (MMR Vaccine protects against these).

**Fungi:** Thrush

### How do you prevent diseases from spreading?

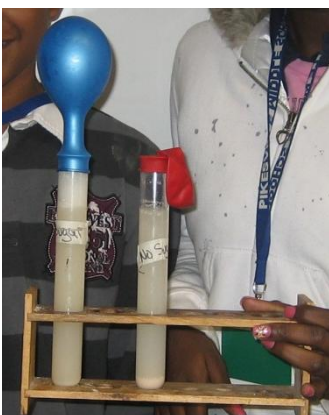
- Make sure sewage is treated and disposed of properly (Cholera is spread through sewage)
- Adding chlorine to water to kill bacteria
- Pasteurising milk
- Using disinfectants (on kitchen/bathroom surfaces), antiseptics (used to kill microbes in/on people) and soaps.

Your body has **natural defences** to stop microbes getting in. These include:

- A chemical in tears that kills bacteria
- Acid in the stomach that kills bacteria
- White blood cells that can engulf ('eat') microbes
- White blood cells that can make **antibodies** to help destroy microbes
- Mucus in the windpipe and nose
- Your skin forms a protective barrier.

Some diseases can be cured using **antibiotics** which are **medicines** which kill off bacteria. Some bacteria, however, are unaffected by antibiotics – they are **resistant** to them. For many diseases you can be **immunised (vaccinated)** against them. For example the MMR vaccine protects you from measles, mumps and rubella. Most people in the UK are also vaccinated against Tetanus, Polio and Diphtheria.





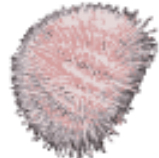

### Yeast Respiration



When yeast respire it produces carbon dioxide. The amount of respiration that takes place can be measured in a simple experiment in which yeast is dissolved in water with or without sugar. In the experiment shown, the tube on the left contains sugar and the carbon dioxide produced inflates the balloon. The tube on the right contains no sugar and no carbon dioxide is made.

# Invertebrate Classification


Invertebrates can be classified into the groups shown below:

Group	Examples		Key features
Coelenterates	<ul style="list-style-type: none"> <li>• Jellyfish</li> <li>• Sea anemone</li> </ul>		<ul style="list-style-type: none"> <li>• Hollow bodied</li> <li>• Mouth is the only body opening</li> <li>• Tentacles</li> </ul>
Flatworms	<ul style="list-style-type: none"> <li>• Liver fluke</li> <li>• Tapeworm</li> </ul>		<ul style="list-style-type: none"> <li>• Flat, thin bodies</li> <li>• Digestive system has one opening</li> </ul>
Annelids	<ul style="list-style-type: none"> <li>• Earthworm</li> <li>• Leech</li> </ul>		<ul style="list-style-type: none"> <li>• Rounded bodies</li> <li>• Bodies made of rings or segments</li> </ul>
Molluscs	<ul style="list-style-type: none"> <li>• Snail</li> <li>• Oyster</li> </ul>		<ul style="list-style-type: none"> <li>• Soft body in three continuous parts with head, foot and body mass</li> <li>• May have one or two shells</li> </ul>
Echinoderms	<ul style="list-style-type: none"> <li>• Sea urchin</li> <li>• Starfish</li> </ul>		<ul style="list-style-type: none"> <li>• Spiny body in five parts</li> <li>• Central mouth</li> </ul>
Arthropods	<ul style="list-style-type: none"> <li>• Crab</li> <li>• Spider</li> <li>• Fly</li> <li>• Centipede</li> </ul>		<ul style="list-style-type: none"> <li>• Hard body divided into segments</li> <li>• Jointed legs</li> </ul>

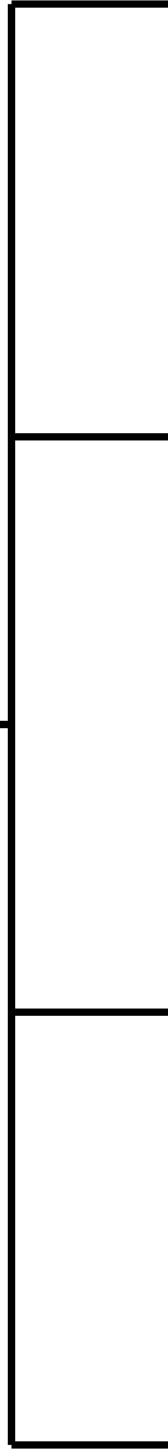
# The Arthropods

The largest group of invertebrates are the **Arthropods**. They all have an **exoskeleton** (skeleton on the outside of their bodies), segmented bodies and jointed legs. The word arthropod means 'jointed foot'. The main arthropod groups are shown below:

## Arthropod Groups



1. Bilateral (left/right) symmetry
2. Segmented body
3. Hard exoskeleton
4. Jointed legs
5. Many pairs of limbs



2 pairs of antennae  
5 or more pairs of legs

3 pairs of legs  
1 or two pairs of wings  
Body in 3 sections

No antennae  
4 pairs of legs  
Body in two sections

Many segments with legs on  
Centipedes = 1 pair per segment;  
millipedes = 2 pairs per segment



### Insects



### Spiders

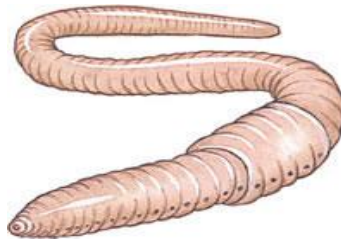


### Myriapods (Centipedes & Millipedes)



# Experiments with Invertebrates

## Earthworms



Earthworms move by lengthening and shortening their segments. The bristles that stick out of their sides are used to anchor the worm firmly in its burrow. The segments at the front of the body get longer and the bristles

'grip' the walls of the tunnel. The worm then retracts the bristles at the rear of the body and shortens the segments to

pull it forward. Earthworms feed on dead organic matter. They feed by passing soil and debris (e.g. leaves) through their gut from which nourishment is extracted. Waste

material is deposited on the surface of the ground as 'castings' (castings made by ragworms on a beach are shown in the photograph). The burrows made by worms help to aerate the soil. Worms also pull leaves and other matter underground.

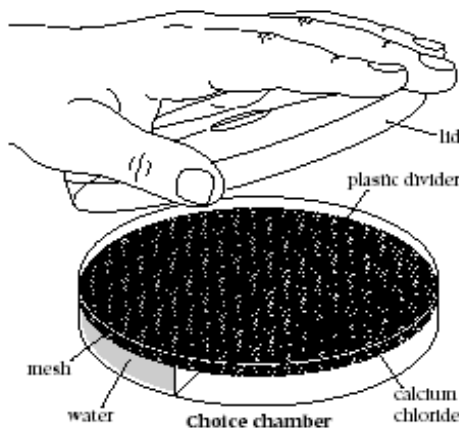


This and the addition of wastes from the worms help to introduce organic matter and nutrients to the soil. Bacteria and fungi also help to break down organic matter into minerals that are needed for plant growth. To do this they need oxygen to carry out aerobic respiration. The burrows made by

earthworms help to introduce oxygen into the soil. Bacteria and fungi that help to break down dead organic matter to release nutrients are called **decomposers**.

## Woodlice

Woodlice are crustaceans and breathe using **gills**. They are found in damp, dark places such as under rocks and logs. Like earthworms they feed of dead plant matter and help to return nutrients to the soil. A choice chamber is a piece of apparatus that can be



Dry Area used to find out what conditions woodlice prefer. In the example shown one half of the petri dish has a moist atmosphere, whereas the other has a dry atmosphere.

## Insects

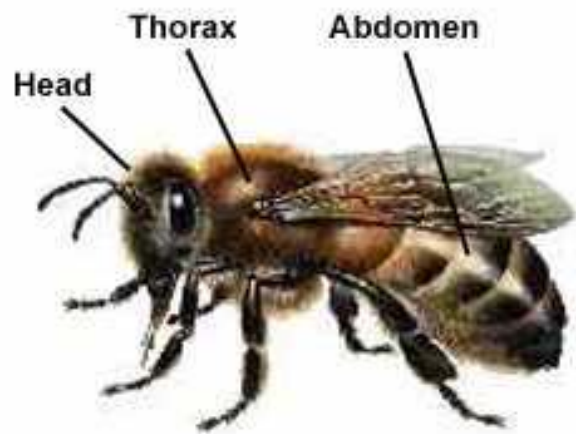
Insects are arthropods. They have a hard exoskeleton, a body that is divided into three parts (head, thorax, abdomen) and three pairs of jointed legs. Insects are the most diverse group of animals on the planet and there are probably around 10 million different species representing over 90% of all animal life. Insects can be useful to man, but many are **pests**.

Useful insects include:

- **Bees, wasps, butterflies & ants** – help to pollinate plants
- **Bees** – to produce honey
- **Maggots** – to treat gangrene
- **Silkworms (moth larvae)** – produce silk
- **Beetles** – many are scavengers helping to recycle biological materials
- **Ladybirds (a beetle)** – eat aphids which can damage plants.

Harmful insects include:

- **Mosquitos** – spread malaria
- **Lice** – parasites that feed on blood
- **Bed bugs** – feed on human blood
- **Termites** – damage buildings
- **Locusts** – destroy crops








## The Exoskeleton

Like all other arthropods, insects have an external skeleton (the **exoskeleton**). This provides a good surface to anchor muscles e.g. to move the wings. The exoskeleton is tough and a waterproof wax covers the plates and prevents the insect's internal tissues from drying out.

There are two major problems with the exoskeleton:

- they cannot grow once they have been formed and in order to grow arthropods have to moult and grow a larger one in its place.
- they become too heavy to move once they have reached a certain size. This is why most arthropods are relatively small.

# Vertebrates

Group	Examples	Image	Key features
Reptiles	<ul style="list-style-type: none"> <li>• Crocodile</li> <li>• Lizard</li> <li>• Snake</li> </ul>		<ul style="list-style-type: none"> <li>• Cold-blooded</li> <li>• Have lungs</li> <li>• Dry scaly skin</li> <li>• Lay leathery-shelled eggs</li> </ul>
Amphibians	<ul style="list-style-type: none"> <li>• Frog</li> <li>• Newt</li> <li>• Salamander</li> </ul>		<ul style="list-style-type: none"> <li>• Cold-blooded</li> <li>• Adults have lungs, larvae have gills</li> <li>• Moist skin</li> <li>• Lay jelly-coated eggs in water</li> </ul>
Fish	<ul style="list-style-type: none"> <li>• Goldfish</li> <li>• Shark</li> <li>• Cod</li> </ul>		<ul style="list-style-type: none"> <li>• Cold-blooded</li> <li>• Have gills</li> <li>• Wet scales</li> <li>• Lay eggs in water</li> </ul>
Birds	<ul style="list-style-type: none"> <li>• Budgerigar</li> <li>• Sparrow</li> <li>• Ostrich</li> </ul>		<ul style="list-style-type: none"> <li>• Warm-blooded</li> <li>• Have lungs</li> <li>• Feathers on body</li> <li>• Lay eggs with hard shells</li> <li>• Have wings</li> </ul>
Mammals	<ul style="list-style-type: none"> <li>• Rabbit</li> <li>• Kangaroo</li> <li>• Human</li> <li>• Dolphin</li> </ul>		<ul style="list-style-type: none"> <li>• Warm-blooded</li> <li>• Have lungs</li> <li>• Have body hair or fur</li> <li>• Give birth to live young</li> <li>• Produce milk</li> </ul>

# The Plant Kingdom

The plant kingdom contains the following main groups:

## The Algae

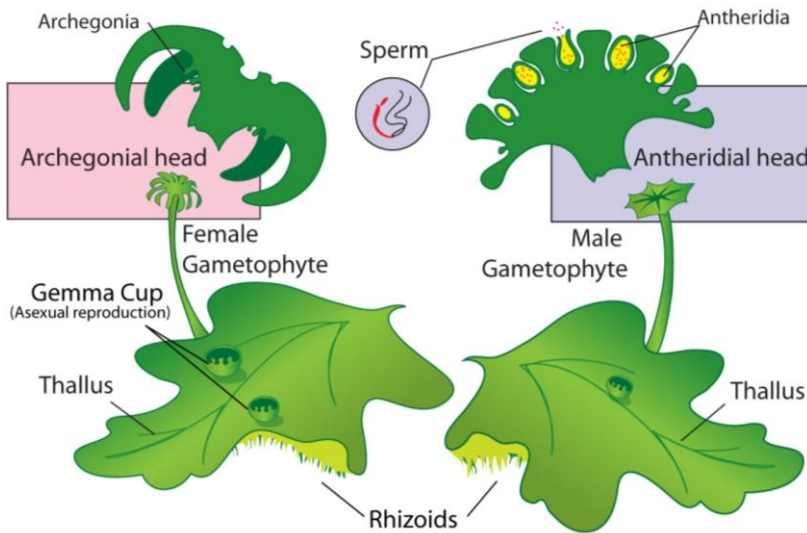
The algae are simple plants that contain unicellular (one cell) and multicellular forms. The largest of the algae are the **seaweeds**. Like all plants they make their own food by **photosynthesis**. Algae are simple because they do not have complex organs like flowering plants.



A single celled alga (left). The right-hand picture shows bladderwrack seaweed at Whitley Bay.

## Liverworts

Liverworts are small plants. They consist of a flattened structure called a **thallus**. They lack roots and may have single celled rhizoids that help to gain nutrients from the soil.



Female reproductive structures      Male reproductive structures

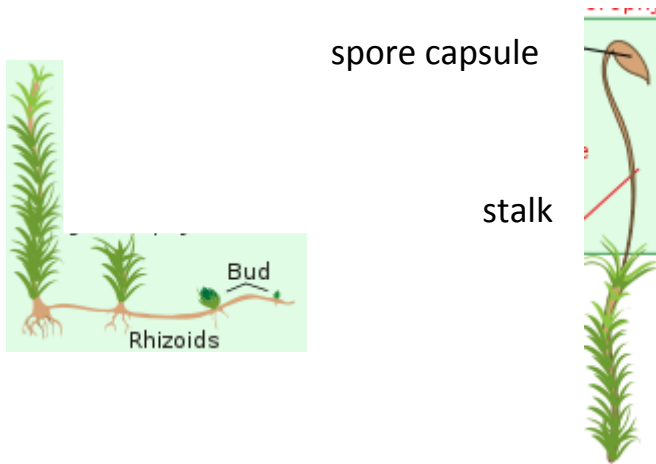


Liverwort

Liverworts can reproduce sexually. The male plants (on the right) produce sperm which must swim to the female reproductive structures on the left-hand plant. As sperm need water to swim, liverworts are found in moist or damp places. Like fungi, liverworts can also reproduce by means of spores that are released from a capsule.

## Mosses

Mosses are small, soft, plants that usually grow close together in damp or shady places. They do not have flowers or seeds and have simple leaves that cover the stems. They reproduce by producing spores in capsules on the top of a thin stalk. Mosses have multicellular rhizoids.



Both mosses and liverworts can carry out photosynthesis. However, they lack vascular tissues (xylem and phloem vessels) that carry materials around the plant. They have very simple leaves with no cuticle (which helps to prevent water loss) and can only live in moist, humid environments. Both mosses and liverworts are dependent on water for reproduction – the male organs produce mobile sex cells which need water to move.

## Ferns

Ferns are more complex than algae, mosses and liverworts. They have a vascular system. Like mosses and liverworts they reproduce by spores. Ferns contain the following parts:

- Stems - this is often underground (called a rhizome)
- Leaves – often called a **frond**. New fronds uncurl as they grow
- Roots – Take up water and nutrients from the soil



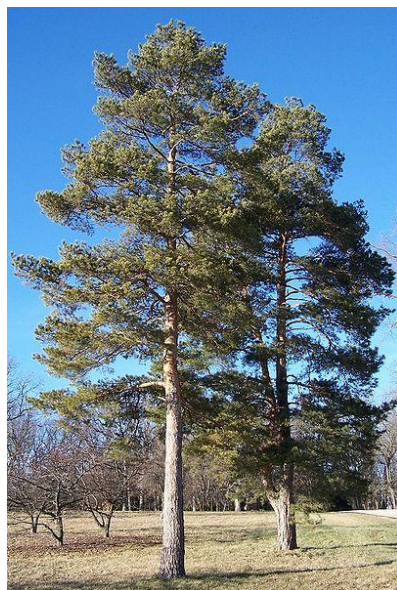
The underside of a frond (left photo) showing spores. Fronds grow by uncurling (right photo).



Diagram of a fern. Spores can be seen growing on the underside of the leaves (fronds).

## Conifers

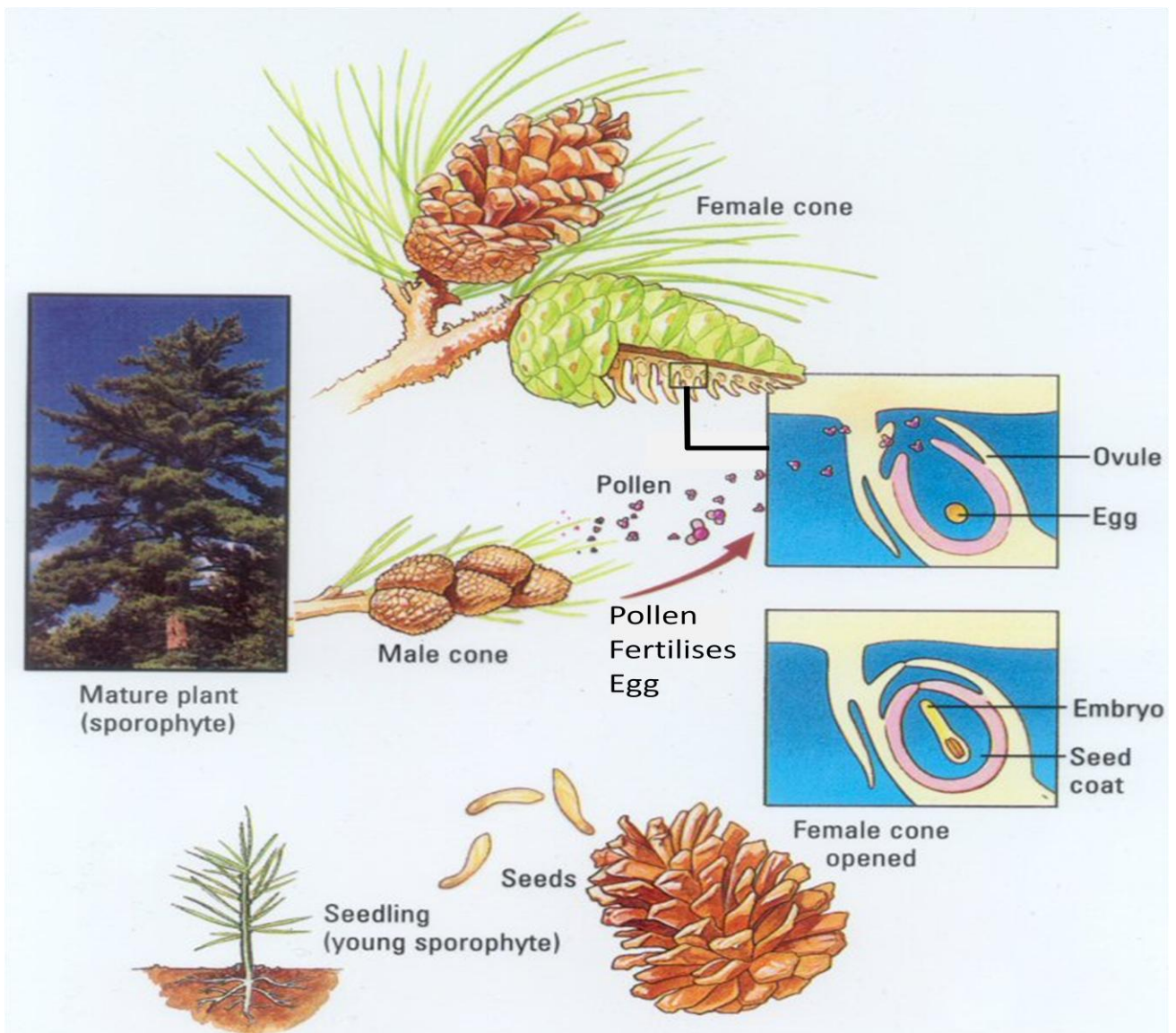
Conifers are woody plants and reproduce by cones that contain **seeds**. They have vascular tissue (veins). Some examples of conifer species are: Norway Spruce, Larch, Yew, Scots Pine.



Photographs showing the Norway Spruce (Left – often grown as Christmas trees) and Scots Pine (Right).

Conifers have needle-shaped leaves and are often evergreen. Conifers grow very rapidly and are often used to provide us with soft wood which is useful for making paper, furniture, telegraph poles and Christmas trees. Conifers can grow very tall and the tallest conifer is the Giant Sequoia with a height of 275 feet (84 metres). The oldest conifer, a Norway Spruce, is almost 10 000 years old and is found in Sweden.

## The Life Cycle of a Conifer

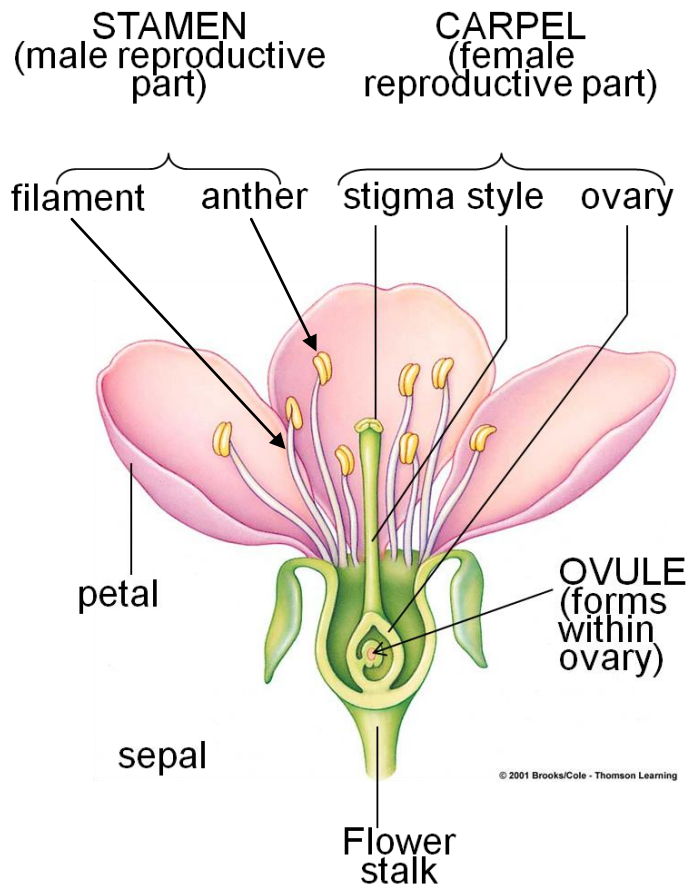


Conifers reproduce by cones. There are male cones which produce pollen and female cones which produce eggs. The female cone which contains ovules (female sex cells) is green. After fertilisation the female cone turns brown – it takes around one year – and releases seeds which have ‘wings’ to help dispersal.

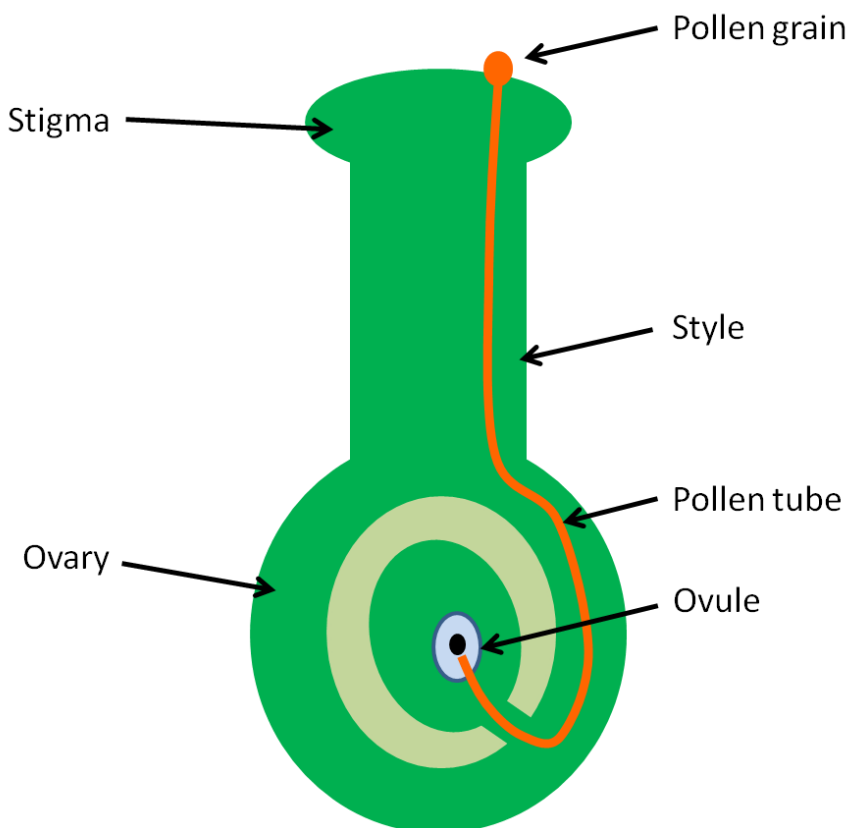
## Flowering Plants

The flowering plants are the most widespread group of land plants and reproduce by seeds. The reproductive organ is the **flower**. The male sex cell is **pollen** and this can be carried to the **stigma** (on the female part of the flower) by insects or wind. When the pollen grain lands on the stigma, it grows a long tube down the **style** and into the **ovary**. The pollen then fuses with the female cell (the **ovule**). The fertilised ovule will develop into a **seed**. There may be many seeds in each ovary. The ovary becomes a fruit which is adapted to help disperse the seeds.

## The Flower

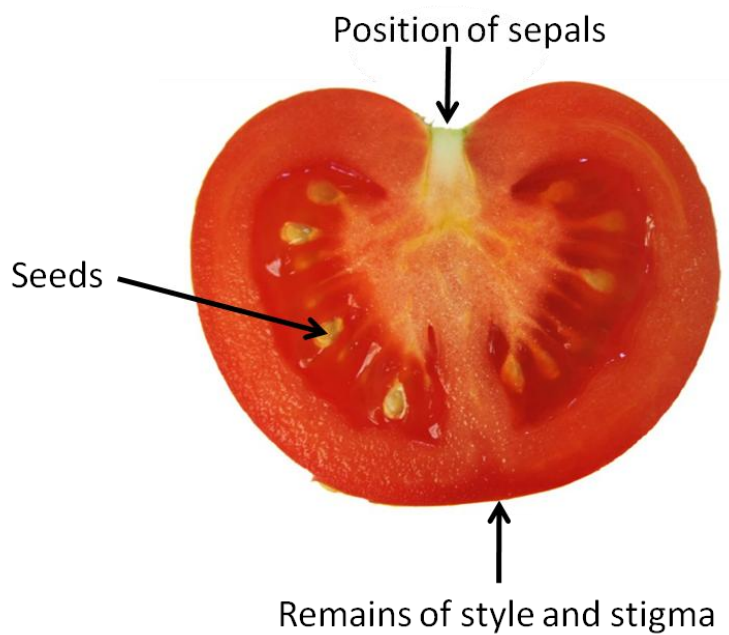


## Fertilisation of flowering plants



A pollen grain lands on the stigma. This is **pollination**. The pollen grain grows a pollen tube towards the ovule. The male nucleus from the pollen joins the female nucleus in the ovule. This is **fertilisation**. An embryo forms. It is found inside a seed inside a fruit.

## Seed dispersal



Seeds have to be spread to new areas so they do not compete with each other and the parent plant for light, water and space. The tomato is brightly coloured and animals want to eat it as it tastes good. The animal helps to disperse the seeds in its faeces (poo). Apples, pears, cucumbers, etc. disperse seeds in this way. Other methods of seed dispersal include:

### Hooks



Burrs hook on to animals by attaching to their fur. They fall off when the animal has moved elsewhere.

### Parachutes



Dandelion seeds have an umbrella of white hairs to catch the wind. They are propelled through the air and drop to the ground when there is less wind.

### Exploding Seed Pods



Lupin seeds are propelled into the air when the pod pops open.

### Helicopters



The wings help to catch the wind. It slowly 'helicopters' towards the ground.