

PLANT TISSUE

All plants, except for algae, mosses and liverworts, are known as **vascular plants**. This means that they contain a complex system of **vascular tissue**, which gives support and carries food and water through the plant.

TISSUE TYPES

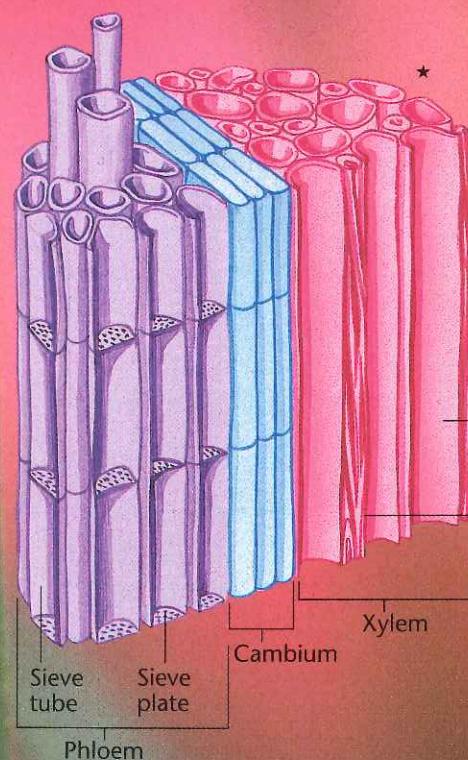
Vascular tissue is made up of two main kinds of tissue, called xylem and phloem.

Water is carried up from the roots by **xylem**. In flowering plants, this is made up of short tubes called **vessels** and long, narrow tubes called **tracheids**. Long, thin cells called **fibers** help to provide support between them. Vessels are made up of column-shaped cells that have lost their dividing walls. Non-flowering plants have only tracheids.

Food made in the leaves dissolves in water and is carried to all parts of the plant by **phloem**. This is made up of fluid-carrying cells called **sieve tubes**. These have other cells packed around them for support.

Sieve tubes are arranged in long columns. They have cell walls*, and though they do not have a nucleus*, they are living cells with a thin layer of cytoplasm*. The end walls between the cells, called **sieve plates**, have tiny holes which allow liquids to pass through.

The first tissue formed by a new plant is called **primary tissue**. The xylem is **primary xylem** and the phloem is **primary phloem**.



Section of vascular tissue in a flowering plant

Vessel
Fiber

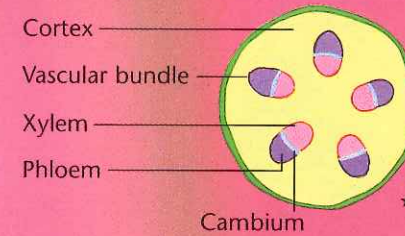
Between the xylem and phloem is a layer of thin, narrow-walled cells called **cambium**. The cells in this layer are able to divide, making more xylem and phloem.

There is vascular tissue inside these tulip stems. It supports the plant and takes food and water around it.

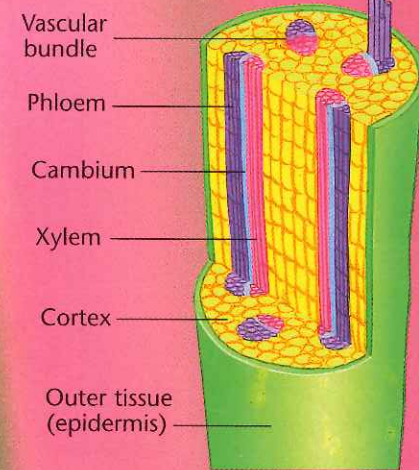
INSIDE A STEM

In young stems, vascular tissue is usually arranged in groups called **vascular bundles**. These are surrounded by tissue called cortex. In plants known as dicotyledons*, the bundles are arranged in a regular pattern, as shown below.

Cross section of a young dicotyledon stem



Cutaway of a young dicotyledon stem



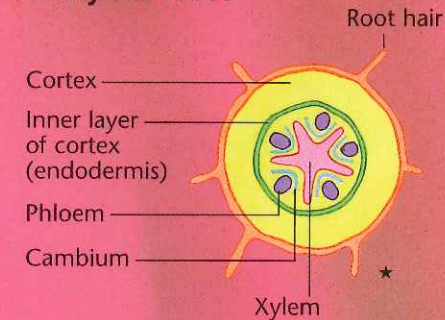
In older dicotyledon stems, the bundles join up to form a central core called the **vascular cylinder**. You can read more about vascular tissue in older plants on page 14.

In plants known as monocotyledons*, such as the tulip on the left, the vascular bundles are not arranged regularly in the stem.

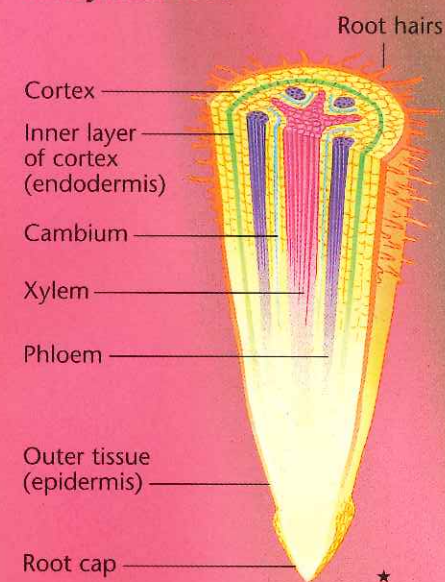
INSIDE A ROOT

In a young root, the tissue is arranged in a different way from a stem. A central core forms as the plant gets older.

Cross section of a young dicotyledon root



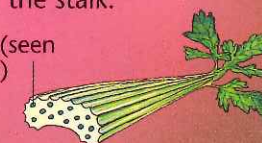
Cutaway of a young dicotyledon root



See for yourself

Try this experiment to see the xylem in a stick of celery. Fill a jar with about two inches of water, and add a few drops of ink or food coloring. Trim the end off a fresh celery stalk and stand it in the water. After a couple of hours, you can see the xylem as a pattern of colored dots in the end of the stalk.

Xylem (seen as dots)



OTHER TISSUES

All parts of a young plant are surrounded by a thin layer of tissue called the **epidermis**. In older stems, the epidermis is replaced by bark. In older roots, it is replaced by a layer of hardened cells called the **exodermis**, then by bark. An outer tissue which encloses a plant, such as the epidermis, is known as **dermal tissue**.

The epidermis of stems and roots surrounds an area of **cortex**. In roots, this has an area called **endodermis** as its innermost layer. Cortex is made up mainly of **parenchyma**, a type of tissue with large cells and many air spaces. In some plants there is also some **collenchyma**, a type of supporting tissue with long, thick-walled cells. These are both types of ground tissue*.

The top layer of the epidermis is known as the **cuticle**. It is made of a waxy substance called **cutin**. The cuticle prevents a plant from losing or absorbing too much water.

Waxy cuticle gives these leaves their shiny appearance.



Internet links

Go to www.usborne-quicklinks.com for links to the following Web sites:

Web site 1 A thorough overview of plant structure, with useful photographs and diagrams.

Web site 2 Go here for more information on plant structure.

Web site 3 A detailed look at tissue in a non-woody plant. There are also microscope images of cells in turgid and wilting plants (see page 21).

Web site 4 A lengthy but logical look at plant structure.