

Leaves



Background Information

One of the main differences between plants and animals is that plants can make their own food, while animals cannot make their own food. For most plants, leaves are the parts where they make food. In other words, leaves are the food factories of most plants.

Making food is the primary function of green leaves, even though a number of other processes also occur here. Leaves make food using a process called photosynthesis.

During photosynthesis, plants use energy from the sun to produce food, a sugar called **glucose**, from water and carbon dioxide. Carbon dioxide, which was discussed earlier in this manual, is the gas in the air that living things breathe out.

Photosynthesis takes place in structures of the leaf called chloroplasts, which contain a green pigment called chlorophyll for absorbing the sun's energy. It is chlorophyll that gives most leaves their green color. Leaves that are not green contain other pigments that also absorb sunlight.

A second function of leaves is **transpiration**, the process where plants lose water through their leaves. Transpiration has two functions: it gets rid of excess water and helps cool the plant in the same way as perspiration helps cool people.

Why do plants need to get rid of water? Water passes from the soil, into the roots, up through the plant, and into the leaves. It transports nutrients from the soil to where they are needed in the leaves. Some of this water is used for photosynthesis, but generally more water enters the leaves than the leaves can use. This means that leaves must lose some water, and they do this through transpiration. Transpiration occurs through special leaf structures called **stomata**.

For botanists and **naturalists**, — people who are interested in, and study plants and animals — leaves are one of the most important tools for identifying plants. One of the first leaf questions people ask themselves when identifying a plant is, “Does the plant lose its leaves in winter?” Plants that lose their leaves in winter are deciduous, and those that keep their leaves year round are evergreen. Many evergreens are conifers with leaves called needles.

Leaves are very important for plant identification. The reason is, even though



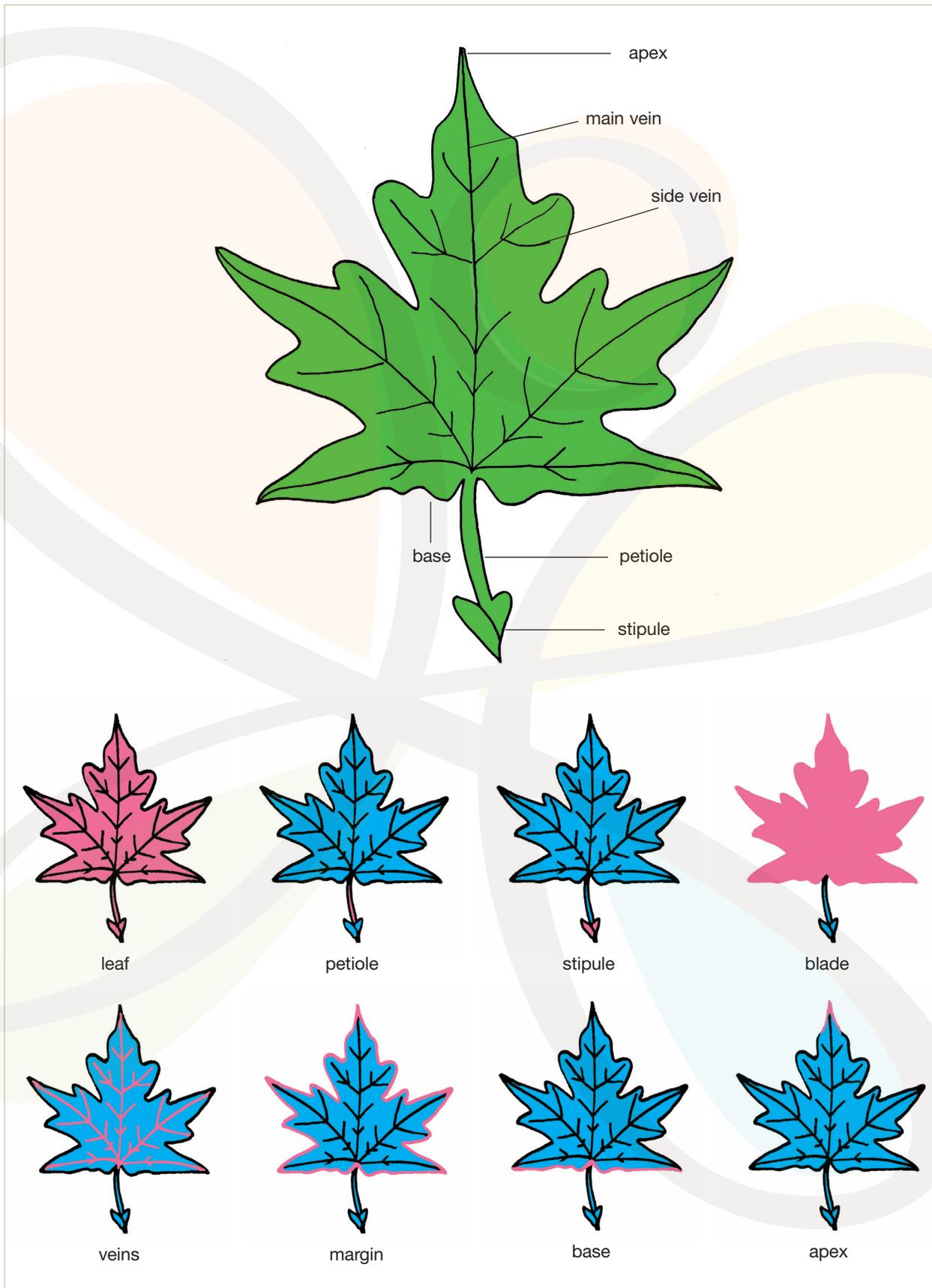
they are often green in color, they come in a wide variety of shapes, sizes, and textures, and many have distinctive smells when rubbed.

Parts of the Leaf

To understand leaves, it is important to first learn the different leaf parts. Here is a list of leaf parts that people describe when identifying plants:

- The **blade** is the flat part of a typical leaf such as a maple or oak leaf.
- The **margin** is the outside edge or rim of the leaf. Leaf margins are not always smooth, or entire. They can be serrated, or spiny, or one of several other shapes.
- The **veins** transport nutrients and support the leaf, giving it strength. They are usually visible as ridges on the underside of a leaf. When people describe veins, they describe the pattern of veins on the leaf. The large vein in the center is called the **main rib**, the side veins are called **lateral veins**, and the tiny veins are called **veinlets**.
- The **petiole**, or leaf stalk joins the leaf to the stem.
- The **stipules** are tiny leaflets at the base of the petiole in many plants.
- The **apex** is the tip or point of the leaf.
- The **base** is the lower edge of the leaf that connects to the petiole.

Parts of the Leaf



EXPERIMENT 1

Demonstrating That Leaves Transpire

Purpose

To learn that water circulates through plants and is lost to the air by transpiration.

Material

Small potted plant with leaves.

A clear jar large enough to cover the plant. If the plant is too big, a clear plastic bag will do.

Plastic wrap.

Science experiment templates (see NAMC's CSM).

Botany journals and pencils.

Control: This experiment does not require a control.

Presentation

- Most Montessori teachers present this concept in Years 2 and 3.
- Discuss transpiration with the students. Explain that water and dissolved nutrients are taken up by the roots and travel up through the plant to the leaves. Explain that while some of the water is used, some is lost to the environment through the stomata in the leaves. Announce that the students will observe this process in the classroom.
- Ensure the plant is well watered. Ask the students to place the plastic wrap on the soil surface around the base of the plant stem. This prevents evaporation of moisture from the soil.
- Ask a student to carefully place the jar upside down over the plant, so that the rim of the jar rests on the plastic over the soil.
- Place the plant in a warm spot in the classroom where there is good light.
- Ask the students to use their journals or science experiment templates to draw a labeled diagram of the experiment. Remind them to include the date and time.
- Leave the plant for two hours or overnight, if necessary.





- After the time has elapsed, ask the students to examine the jar without moving it. Water droplets should have formed on the jar. The plastic placed on the soil prevented evaporation from the soil, which means that the moisture on the jar must be the result of transpiration.
- Ask the students to use their journals or science experiment templates to record the results of the experiment.

Extension

- Older students can write a paragraph describing transpiration and its function.