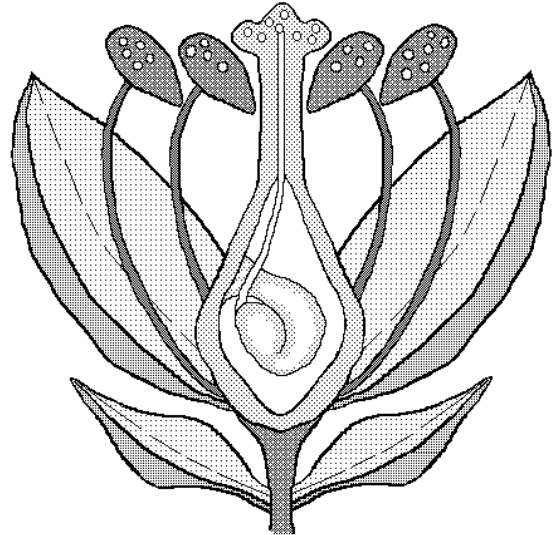


BASIC BOTANY

This lesson reviews basic concepts about plants (importance of plants, parts of plants, functions of plants). Students explore the concepts of photosynthesis and the oxygen/carbon dioxide cycle. They learn about the different leaf shapes and hunt for different examples. The anatomy of a flower is studied and students learn how flowers produce seeds by various methods of pollination.

ACTIVITIES:

- Review why plants are important.
- Review parts of a plant and their functions.
- Photosynthesis: how plants produce food.
- The Oxygen/Carbon Dioxide cycle: how plants give us oxygen.
- Flowers to seeds: parts of a flower and how a flower produces seeds.
- Leaves: simple and compound leaves



LOCATION:

CESC staff will inform you of the location of this activity.

EQUIPMENT AVAILABLE:

Photosynthesis posters
Oxygen/Carbon Dioxide posters
Anatomy of a Flower "electric" board
Continuity tester for "electric" board
Simple and Compound leaf posters
Puppets: 6 bees, 1 butterfly, 1 fly, 1 bat,
1 moth
8 hand lenses
Clipboards
Arizona Wildflowers

EQUIPMENT BROUGHT FROM SCHOOL:

Pencils
Paper for leaf sketches
Envelope to carry sketches back to school

ASSIGNMENT FOR GROUP LEADERS A FEW WEEKS PRIOR TO TRIP:

The leader reads all the material about the center. The leader may wish to do more research about the subjects presented in this lesson...functions of the various parts of plants, photosynthesis, carbon dioxide/oxygen cycle.

There may not be enough time to cover all activities in this lesson. Select those you wish to emphasize and work out a plan keeping time and sequence in mind.

DIRECTIONS FOR GROUP LEADERS ON TRIP DAY:

Check the contents of the "Basic Botany" activity box.
Look at the plants in the area adjacent to the activity site for examples to illustrate the lessons.

THE LESSON: (Choose from the following ideas.)

There probably will not be enough time to do all of the activities below, so you may wish to spend more time on one activity and eliminate another.

1. Why are plants important in our environment?

As a review and introduction to this lesson, ask the students why plants are important.

Possible responses are:

- Without plants there would be no life on earth.
- The oxygen in the air is produced by plants.
- The food we eat comes from plants or animals that eat plants.
- Plants give us clothing (cotton, linen).
- Plants give us shelter (wood).
- Plants give us medicines.
- Plants give us ingredients for lotions, shampoos, etc.
- Plants give us fuel (wood, coal, oil, and natural gas come from plants that lived long ago).

2. What are the main parts of a plant and what is the job of those parts?

As an additional review, ask the students to name the main parts of a plant and how those parts help a plant survive.

- ROOTS bring water and minerals (dissolved in the water) into the plant. They also anchor the plant.
- TRUNK OR STEM supports the plant and transports the fluids throughout the plant.
- LEAVES absorb sunlight and produce the plant's food.
- FLOWERS produce seeds.
- SEEDS produce new plants.

3. Plants are food factories. The story of Photosynthesis.

Background information for the students:

Plants make their own food. In fact, this is one of the characteristics of plants. They are food factories.

Ask: "What do plants need in order to produce food?"

Answers are:

sunlight
carbon dioxide
water
minerals from the soil
chlorophyll

Ask: "What foods do plants produce?"

There are many complicated answers to this question, but the basics are:

sugars
starch
vitamins

Explain: "The process by which plants produce food is called PHOTOSYNTHESIS. *Photo* means light and *synthesis* means putting parts together to make a whole."

Activity:

Use the **PHOTOSYNTHESIS CHARTS** in the kit (copy attached to this lesson) to illustrate photosynthesis to the group.

4. **Plants give us the oxygen we breath.**

As plants carry on food-producing photosynthesis they are also giving us breathable air.

We breathe out a gas, carbon dioxide. To us, it is waste air. But plants take in and use that carbon dioxide. It is necessary for their survival. In return, plants give off oxygen. It is their waste air. This cycle of oxygen from the plants to us and carbon dioxide from us to the plants is necessary for the survival of both plants and animals.

Most of earth's atmospheric oxygen comes from forests. What happens to the oxygen supply in our air when our forests are cut down?

Activity:

Use the **OXYGEN/CARBON DIOXIDE CHARTS** in the kit (copy attached to this lesson) to illustrate the cycle to the group.

5. **How are plants important to us?**

Ask: "Now that we have learned about photosynthesis and the oxygen/carbon dioxide cycle do you think there could be life on earth without plants?" Answer: "NO"

Ask: "Why not?"

Answers:

Without photosynthesis life could not exist. Plants provide food for animals. Even animals that are meat eaters eat animals who eat plants. All food chains begin with plants. Plants also provide all of the oxygen in our atmosphere.

Also: The roots of plants hold the soil so it does not wash away.

5. **The job of a flower.**

To the leader: The job of flowers is to produce seeds. You may wish to use the following narrative and the bee puppets to introduce this section:

Everyone likes flowers. Most have pretty colors, there are so many varieties, and they usually smell good. But the job of flowers is not to please people (though it is nice that they do). The sole purpose of a flower is to get pollinated which will result in the production of seeds which will produce new plants.

Pollination involves the union of a pollen grain from the male organ of a flower with an egg inside the female organ. Once united, they begin to form a seed.

Who are the plant pollinators? Bees are, of course, but many other insects also pollinate, as well as bats, birds, and even the wind.

How does this work? Imagine you are a hungry bee. You buzz along until you smell the sweet scent of a flower then see it with your large eyes. You land on a petal then maneuver past other flower parts as you seek food. You are covered with dusty, yellow pollen from the male flower parts, the stamens, from the last flower you visited. As you climb into the flower, your fuzzy back brushes against the female flower part, the pistil. More pollen from the stamens in this flower fall on your back. Finally deep into the flower you find the sweet liquid nectar. You take a big sip. Off you go to another flower where you spread more pollen as you search for nectar.

The pollen you carried and dropped onto the stigma (the top of the pistil) begins to grow a tube down the style. A pollen grain travels down this tube into the ovary where the eggs of the plant reside. Now that the pollen and egg have united a tiny seed begins to develop.

Remember, bees are important pollinators, but they are not the only agents of pollination. Many other insects, birds, and bats carry pollen. Many plants rely on the wind. Wind pollinated plants (grasses are a good example) do not have showy, fragrant flowers because they do not need to attract animals. The wind does the job of blowing the pollen around to eventually land on flowers of the same species. This is often the kind of pollen that causes us to sneeze because it is carried by the wind.

Activity:

Two flower diagrams are in the kit (copy attached to this lesson), one is an "electric" game. By matching the flower part to its name with the battery-operated light, the correct answer will be rewarded by the light going on.

Activity:

If there are flowers in bloom (in our area there are often blooms, no matter what time of year) allow the students time to examine the flowers with magnifying lenses. Ask them to look for the parts of a flower. Do all flowers have the same parts? Do they all look the same? How are they different?

Caution: Please ask students not to pick or otherwise destroy the flowers. You are welcome to bring your own flowers for the students to examine.

Allow time for discussion after the group reconvenes.

6. The many shapes and sizes of leaves. How many can we find?

This is an activity you may use if there is time remaining in the center.

There are so many species of plants and so many shapes and sizes. Leaves are especially interesting. They can be huge or very tiny. There are many shapes as well. One of the ways in which plants are identified is by their leaves.

There are many things to learn about leaves...their shapes, the way they are arranged on the plant, and more. The first thing to learn about leaves is if they are simple or compound.

Activity:

- Show the diagram illustrating the difference between a simple and compound leaf.
- Give each student a clipboard, paper and pencil. Give the group a few minutes to explore the area and sketch leaves. Can they find examples of both simple and compound leaves?

Allow time for discussion and sharing drawings after the group reconvenes.

7. **Summary**

If there is time, ask questions of the group to summarize the lesson. Here are examples of questions you might ask with answers in parentheses.

- Which part of the plant produces food? (leaves or any part that contains chlorophyll)
- What are the things a plant needs to produce food? (chlorophyll, sunlight, carbon dioxide, minerals, soil and water)
- What's the job of a flower? (to produce seeds)
- What gas do we breathe out that plants need? (carbon dioxide)
- What gas do plants give off that animals need in order to breathe? (oxygen)

CLEANUP:

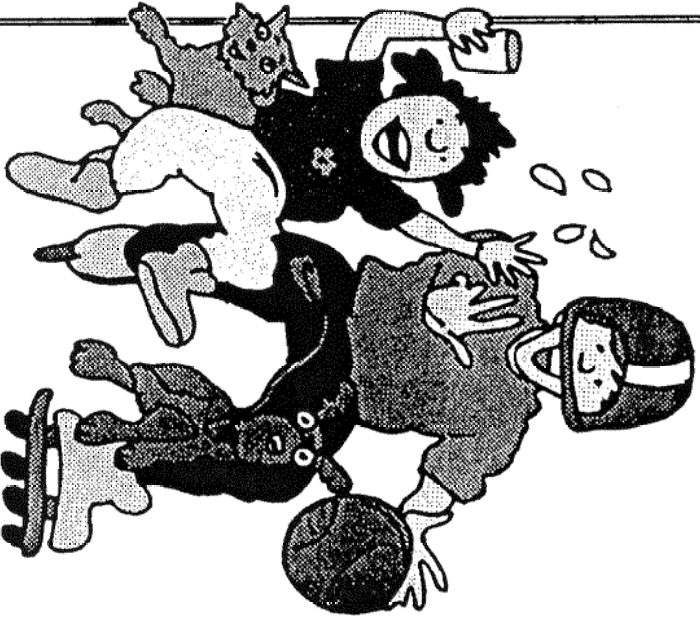
After each center collect all materials to have ready for the next group.

At the completion of the afternoon, reorganize all materials in the kit and return to the table in Biznaga cabin.

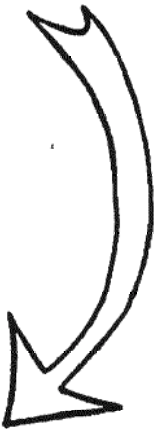
THE OXYGEN/CARBON DIOXIDE CYCLE

Animals breathe out carbon dioxide. Plants "breathe" in carbon dioxide.
Plants "breathe" out oxygen. Animals breathe in oxygen.

Animals breathe out carbon dioxide.
It is waste gas.



Animals must breathe in oxygen in order to live.



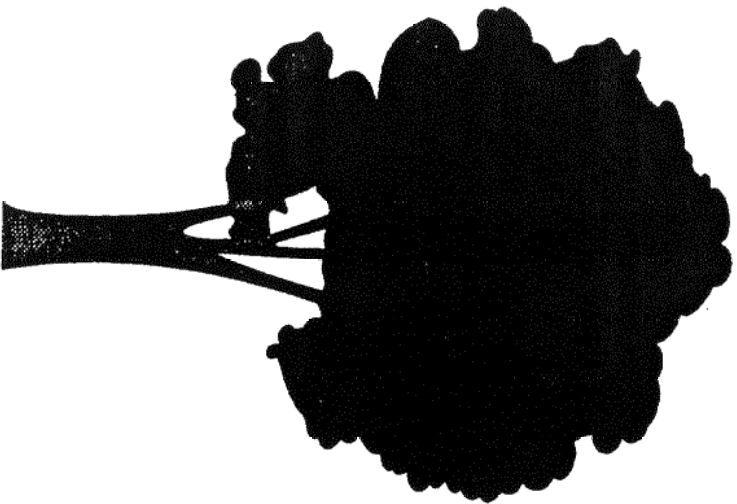
Animals breathe out carbon dioxide. It is waste gas.

All plants absorb carbon dioxide through openings in leaves or stems called stomata. They need carbon dioxide to live.

The plants, in turn, give off oxygen through their stomata. It is their waste gas.

Animals breathe in the oxygen, which is necessary for animal life.

Plants must take in carbon dioxide in order to live.



Plants "breathe" out oxygen. It is waste gas.

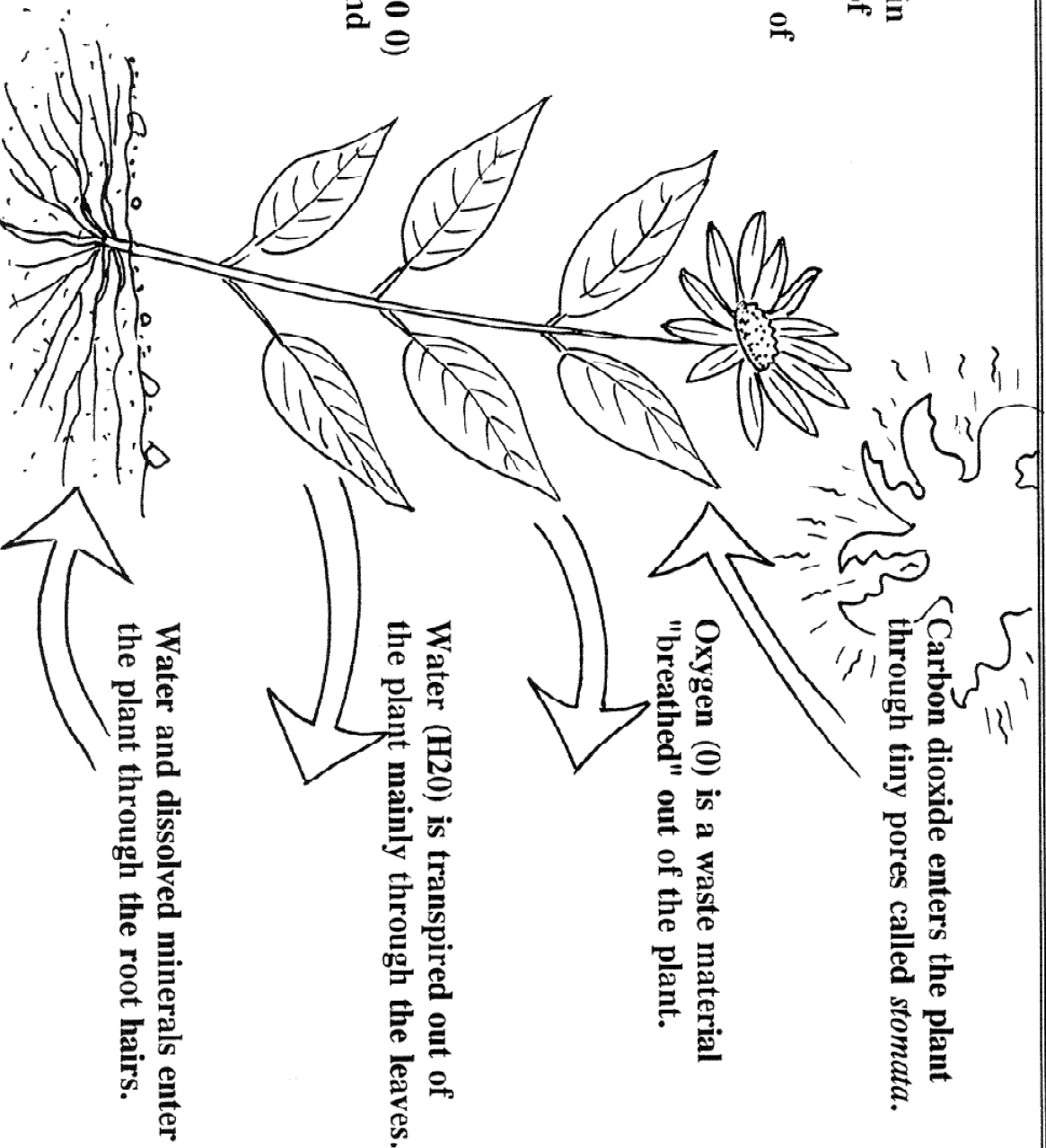


PHOTOSYNTHESIS:

The process by which plants produce food in the cells containing chlorophyll with the aid of the energy from sunlight.

The food making takes place in the leaves or any green part of the plant in cells containing chlorophyll — in the presence of sunlight.

The plant makes sugar ($C_6H_{12}O_6$) from carbon dioxide (CO_2) and water (H_2O).



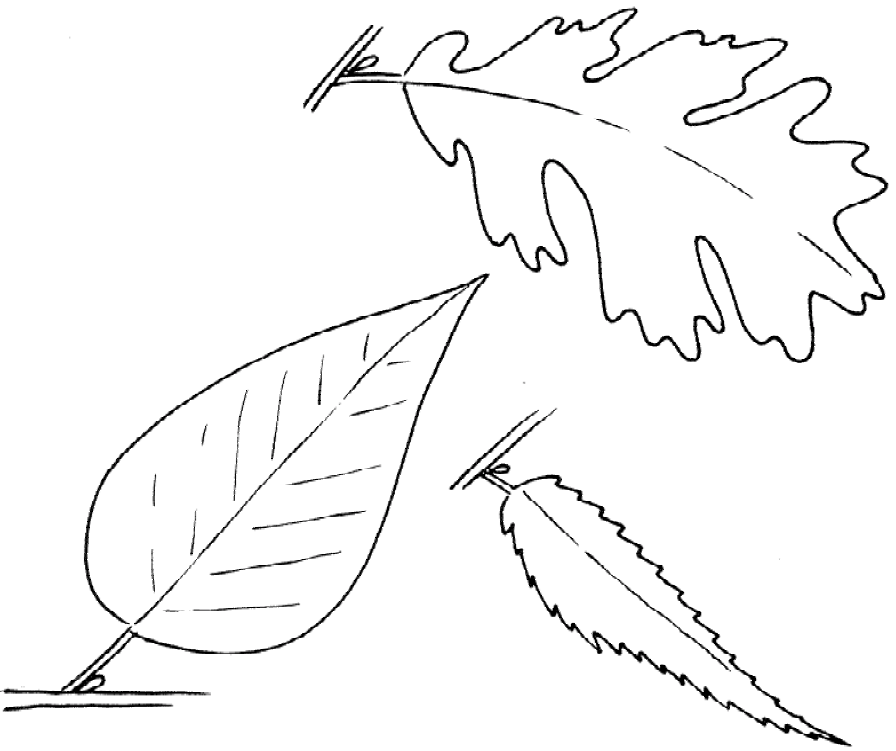
TWO TYPES OF LEAVES

There are many differences among the leaves of different plant species:
The way they grow from the stem, their shapes, edges, veins, etc.

Here are two basic leaf types: **SIMPLE AND COMPOUND.**

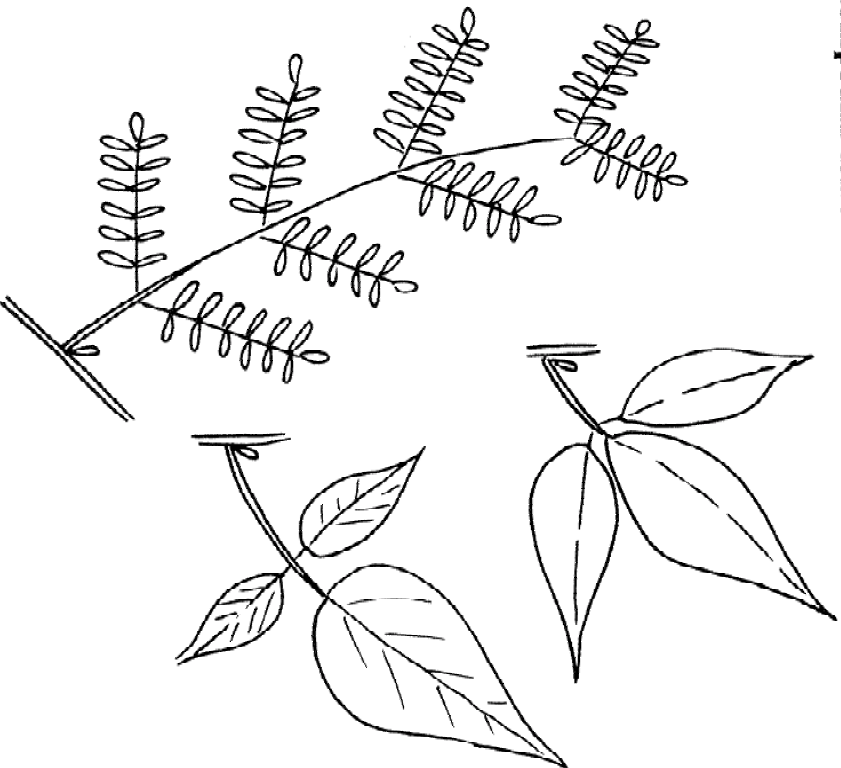
SIMPLE LEAF

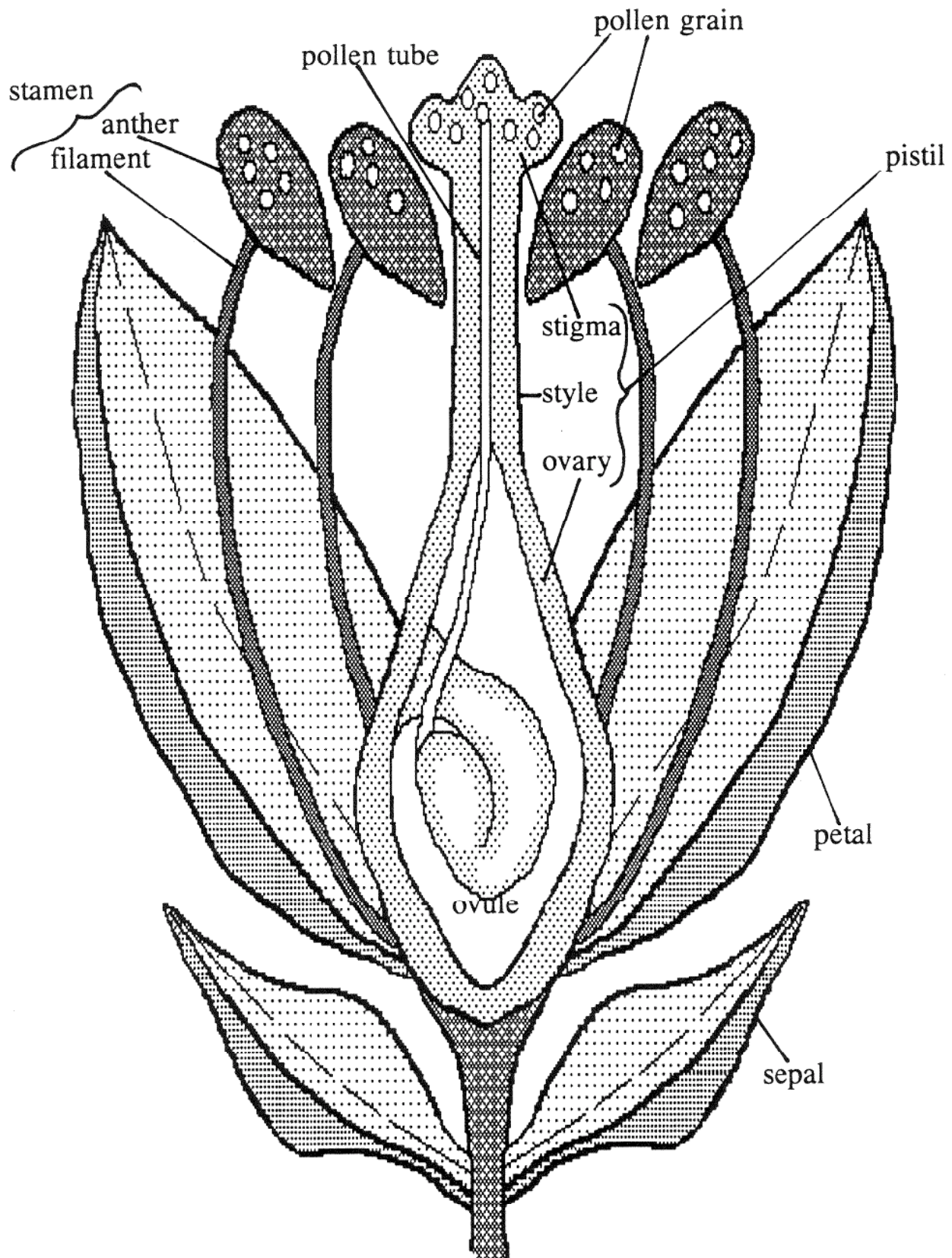
A leaf with the blade in a single segment is called a **simple leaf.**



COMPOUND LEAF

A leaf that is divided into several leaflets is called a **compound leaf.**





Cross-Section of a Simple Flower