Sense of Science

PLANTS

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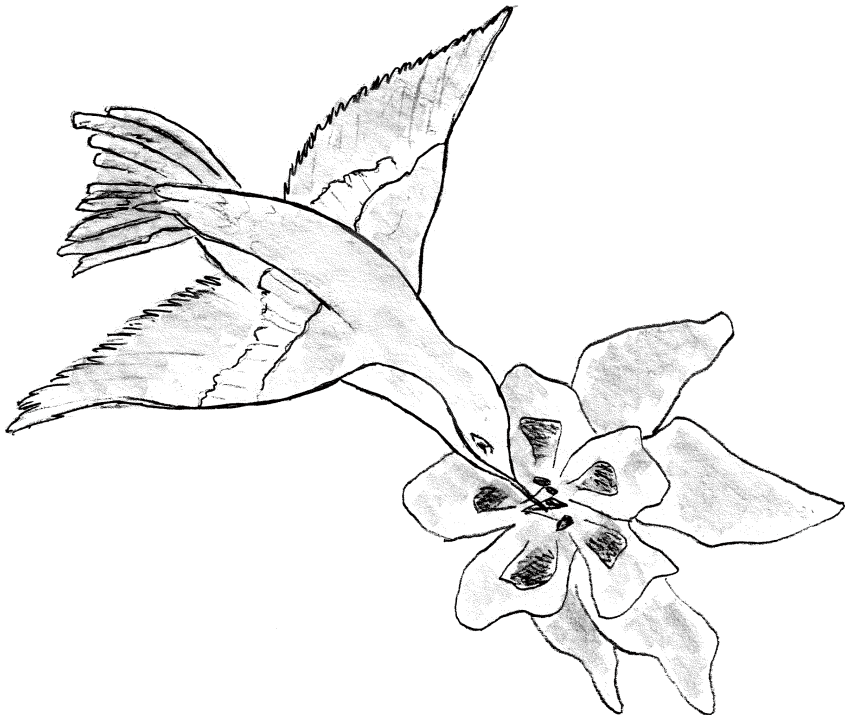

Dedication

To the memory of
Dr. Emerson Foulke
for his lifelong interest
in the education of blind and
visually impaired students.

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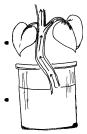

Trees

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Introduction

Sense of Science: PLANTS at a Glance

The purpose of Sense of Science: PLANTS is to enable teachers to make the "world of science" related to plant life accessible, understandable and enjoyable for young students who are visually impaired and for other students who may benefit from a multisensory approach to learning.

The guidebook presents easy-to-follow activities that use real objects to learn basic concepts: soil, seeds, roots, stems, flowers, trees and leaves. Students actively explore each concept. All learning activities comply with the 1996 National Science Education Standards, especially the three major areas of Life Science Standard C:

1. Understanding the characteristics of organisms
2. Understanding the life cycle of organisms
3. Understanding organisms and their environment.

Sense of Science: PLANTS includes Plant and Leaf Type Overlays and two custom-designed trays. Although the overlays and trays can be used as stand-alone materials, they are intended for use with the American Printing House for the Blind's Light Box and Mini-Lite Box.

The visual and tactile Plant and Leaf Type Overlays aid in reviewing and reinforcing

concepts taught through hands-on activities. This pairing of visual and tactile elements is especially useful for low vision students who need multisensory information. The tactile component helps students confirm what they perceive visually. Appendix B provides suggested activities for using the Plant Overlays to isolate parts of a bean seed, seedling, leaf, flower, tree, taproot system and cross-section of a log. Additional activities, including "Match It," "Leaf Shuffle," "The Real Deal," "A Pile of Leaves" and "Name that Leaf," can be performed using the smaller Leaf Type Overlays to review margins, veins and growth patterns of leaves.

Reasons to Study Plants

Nature provides a tapestry of shapes, colors, lines, smells and tastes that children can experience and enjoy.

Nature is . . .
within reach and accessible,
a common experience for all,
appealing because of its beauty,
filled with diversity, and
interesting because it is both unpredictable and changing.

Nature is a motivating attribute game through which children can recognize likenesses and differences and can witness both constants and variables.

Exploring nature through hands-on plant activities encourages:

Logical thinking
Making predictions, asking "What if . . ." questions, observing cause and effect, ...

Manipulative skills
Pouring, measuring, transferring, ...

Organizational skills
Matching, grouping, classifying, sorting, ...

Scientific literacy
Predicting, observing, recording, charting, measuring, ...

Vocabulary building
"Wilted," "alive," "bloom," "bark," ...

Communication skills
Asking questions, verbally describing likenesses and differences, ...

Enhanced curiosity
If planted, what will the seed grow into? What is the tallest tree? ...

Tactile discrimination
Detecting differences in the textures of objects (leaves, flower petals, tree bark, etc.), gleaning information from tactile models, ...

Social responsibility
Knowing not to litter, to recycle, to water plants, ...

Self-Esteem
Confidence in communicating intelligibly about plants, group work, individual projects, ...

Helpful Adaptations

As with any classroom activity, adaptations must continually be made to meet the needs of students. The following adaptations will help visually impaired students comprehend concepts presented through learning activities.

- Use *real* objects (real leaves and real flowers) that can be processed by different senses.

- Use realistic models if real objects are not available. Provide opportunities for students to create their own models using clay, paper, construction toys, etc.

- Use pictures or other visual representations that are clear and uncluttered and that have bright colors and good visual contrast.

- Provide well-lighted work areas for students with residual vision.

- Provide materials in braille and large print, such as readable labels placed next to flower pots, adapted measuring devices, etc.

- Allow extra time and verbal support as students explore real objects such as leaves, trees and soils.

- Acquaint students ahead of time with the setup of the work area and the materials that will be used during the activity.

- Demonstrate the activity for the student in a hand-over-hand fashion, if necessary. Then have the student repeat the procedure independently.

- Teach concepts otherwise thought obvious, such as that the inside and outside colors of a fruit are not always the same, that fruits change color as they ripen, and other concepts that are easily perceived visually.

- Use field trips to enhance experiences and connect them to real life and natural habitats. (See **Community Connections** on page 10)

How to Use the Plant Activities

The plant activities presented throughout the guidebook supplement traditional science curricula used to teach children in kindergarten through third grade. ***The teacher should not feel compelled to use every activity or to use activities in the order presented***. Begin with the familiar–with those concepts about which students have some knowledge or obvious interest. The time of year will also dictate the order of presentation. The "Adopt a Tree" activity, for example, should be initiated early in the school year to allow for seasonal changes.

Activities presented throughout the guidebook follow the same basic design and incorporate the following components:

Objective: The purpose of the activity and expected outcome

Vocabulary: New vocabulary words encountered throughout the activity

Materials: Supplies needed to carry out the main activity or procedure

Inquiry: A question posed at the onset of the activity to set an investigative tone

Procedure: A step-by-step outline of the suggested progression of the activity. Each step is preceded by a leaf icon

Extension: An activity that goes one step further for older or advanced students

Visual Adaptation: Suggested way(s) to accommodate a student with visual impairments, such as providing good visual contrast, tactile experiences and adapted educational materials. Appropriate APH Plant Overlays are recommended in this section as well. An "overlay" icon  appears next to this section when APH Plant Overlays are available to review or reinforce a concept encountered in the activity

Math Connection: A task that involves math skills such as measuring, counting, patterning, etc., as related to the activity

Language Connection: A task that involves reading and writing skills, such as journal writing and composition of stories or poems, related to the activity

Science Tidbit: An interesting or little known fact about plants as related to the activity

In general, the activities serve simply as a scaffold on which to build. The teacher's creativity will inspire extensions and modifications. The primary objective should be to instill in children with visual impairments a curiosity, wonderment and love of science related to plant life. Try incorporating some of the following suggestions to enhance students' learning and enjoyment of the activities:

- Set a tone of excitement at the onset of an activity by modeling your own enthusiasm for science.

- Introduce a concept by reading a book or story that in some way embodies that concept. This is an excellent way to fire the students' imaginations and peak their interests. A list of "Suggested Children's Literature" is located at the end of each plant unit.

- Try a fun opening activity. Place an object that pertains to the unit (such as a carrot, tomato or piece of bark) inside a box or bag. Let students pass the box or bag around so they can experience the weight and shape of the hidden object. Then have them ask yes-or-no questions in order to determine the identity of the object. This activity promotes verbal and analytical skills. Once the object has been identified, pass it around so the students can explore it more closely.

- Encourage students to be investigators by asking an inquiry question at the beginning of each activity. Help them discover their own answers. The **KWL** technique can be used: **K** stands for what the students already know about the subject, **W** stands for what the students wish to learn, and **L** stands for what the students have learned. After the activity is complete, ask students to write about what they have learned. Students' write-ups can be placed in their science portfolios or folders.

- Incorporate performance tasks such as reports, plays, games or journal keeping.

- Provide as many hands-on experiences as possible. For example, don't limit the student's experience of pumpkin seeds to the seeds alone. Visit a pumpkin patch, scoop seeds out of a pumpkin, eat pumpkin pie or measure pumpkins.

- Provide side-by-side presentations of objects that are thought to be the same but differ in some way. Exploring variations in the size, texture and color of leaves from the same tree is one way to encourage awareness that even like things are not identical.

- Help students differentiate between real objects and models of real objects (such as real flowers versus silk/plastic flowers versus illustrations of flowers).

- Encourage students to use as many senses as possible when they examine plants: smell flowers, taste vegetables, hear leaves rustle, feel wet soil, etc.

- Provide lots of opportunities for students to classify items by size, shape, texture and smell. This practice will help students make sense of the natural environment.

- Emphasize that parts make up a whole (leaves, branches, trunk and roots make up a tree) and that each part has a unique and important function.

- Compose letters to parents, to encourage parental support, and attach a list of supplies needed. **Appendix C: Simple Plant Activities for Home or School** may be copied and sent home to parents as well.

- Make a list of jobs related to the study of plants, such as a botanist, florist, landscape professional and farmer. Invite these professionals to the class to talk about their jobs.

Community Connections

This section contains suggestions for helping children make real-life and concrete connections in the community. These community connections are also ideal suggestions for parents to consider in extending the child's learning to natural settings. Teachers may wish to include some of these suggestions in communications with parents and family members. Several suggestions for community connections include:

- Visit a local flower shop. Examine real flowers and real plants. Talk about the growing medium used as well as growing conditions. Talk about the different jobs one might have in a flower shop. Consider purchasing a flower or a plant for the classroom or as a gift.

- Visit a plant nursery or garden center. Examine real plants, including shrubs and trees, and discuss the similarities and differences of each variety. Talk about how these plant materials are used for shade, for beauty, for decoration, etc. If possible, purchase a tree or shrub for your school. Learn about the optimal conditions for planting and growing, and about proper care (pruning, fertilizing, etc.). Discuss jobs one might have in a nursery or garden center.

- Visit public and private gardens. Discuss plants in the different types of gardens. Talk with the people who planned the gardens as well as the people who take care of the gardens. With assistance from an experienced gardener, plan a class flower garden, vegetable garden, or both. (Also refer to **Appendix A: Culminating Activities.**) Draw a diagram of the garden and write a story of the sequence needed to develop the garden. Compute the costs involved. Discuss tools you will need and arrange to borrow these or determine how much money will be needed to purchase them. (Include a visit to or information from a hardware store.)

- Visit a forest or woods. Explore firsthand the bark of trees, the various types of leaves and the seeds of the trees and plants. Observe any animal life that lives in the forest or woods habitat. Talk about how the plants provide homes for animals, protection, warmth in cold weather, etc. Dig up soil in the forest or woods and compare it to other soils. Discuss how leaves and other parts of trees eventually become enrichment for the soil.

- Have a landscaper or landscape architect visit the class, or go on a field trip to the professional's business or office. Talk about how they develop landscaping plans and the trees, plants and shrubs that are used. Together develop a plan for a school or home beautification project.

- Visit a seed company. Discuss the variety of seeds available. Talk about the process of growing seeds and the conditions necessary for seeds to grow. Purchase several different varieties of seeds and grow them in appropriate conditions. Keep a record, chart or journal of the growth of the seeds.

Soil

Activity 1
SOIL EXAMINATION

Objective: To explore various types of soil.

Vocabulary: Loam, topsoil, potting soil, peat moss, clay, sand

Materials: As many types of soil as possible (loam, topsoil, potting soil, clay, sand), large bowls or trays

Inquiry: How do soil types differ from each other?

Procedure:

- Put different types of soil into separate bowls or trays that are clearly labeled with the name of each soil (potting soil, clay, etc.).
- Allow the students time to explore the texture of each soil type.
- Ask the students to describe each soil type ("sandy soil feels rough and gritty," "clay soil feels hard and lumpy," etc.).

Extension: Experiment further by adding water to each soil type and experiencing how the texture of each changes when dampened. Soil that is mostly clay, for example, feels hard and cloddy when it is dry but becomes sticky when it is wet.

Remove a small sample of soil from the ground and examine its contents (sand pebbles, dead leaves, rocks, small roots).

Visual Adaptation: Examine the pieces of plant and animal matter that soil contains by placing a soil sample in a jar of water, shaking the jar and then after several hours feeling the floating organic matter.

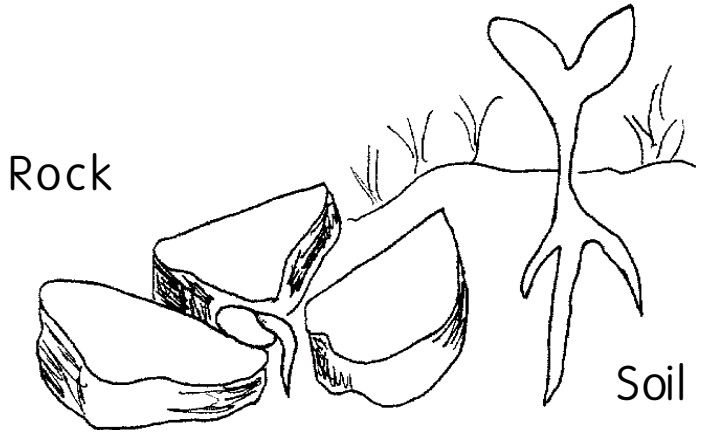
Math Connection: Use a balance scale to weigh the soil types to determine whether a cup of one soil type weighs more or less than a cup of another type.

Language Connection: Have students describe or write about the texture of various soil types.

Discuss various colors of soil (red clay, dark brown topsoil, etc.).

Science Tidbit: Topsoil is made up of decayed roots, plants and animal waste and is the best type of the soil for most growing plants.

Activity 2
SOIL FERTILITY



Objective: To understand that plants depend on nutrients in soil for healthy growth.

Vocabulary: Soil, bean seed, growth, compare, predict, nutrients, fertility

Materials: Small plastic cups or jars, potting mix or soil, bean seeds, small pieces of sponge

Inquiry: Will a seed grow better with or without soil?

Procedure:

- Have the students plant one bean seed in a cup of soil and then moisten the soil. Plant the other bean seed in a cup filled with small pieces of sponge and then moisten. Place both cups in a sunny location and maintain moisture.

- Have the students predict what will happen. Write predictions in large print and braille and place next to each plant.

- Observe for two weeks to see which plant grows more. [Continue to add an equal amount of water to each plant as needed.] Record the results and the plants' growth on a chart. Why was the use of soil more beneficial to plant growth? [Soil provides nutrients for the plant.]

Extension: Fill two cups with the same soil type. Plant a bean seed in each cup and add an equal amount of water to each cup. Place one cup in a warm location and one in a cold location. Have students predict what will happen to each plant.

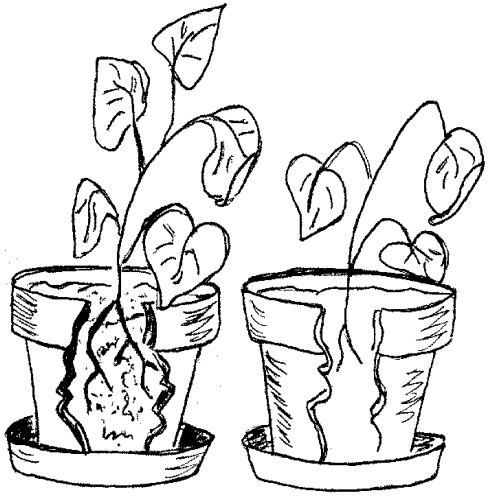
Visual Adaptation: Use a braille and print ruler or place a thin stick in the pot beside the plant to mark the height of the plant's growth. Mark the height with colored tape or rubberbands.

Math Connection: Chart the growth of both plants and keep them side-by-side to compare their growth.

Language Connection: Have the students as a group record the results of the experiment. Students can also write up a new experiment of their own and perform it.

Science Tidbit: Earthworms contribute to soil fertility. Worms make underground tunnels that improve the soil structure and make it easier for oxygen and nutrients to be absorbed by plants' roots.

Activity 3
CHOOSING THE BEST SOIL



Objective: To learn how soil type affects seed growth.

Vocabulary: Soil, sand, clay, garden soil, potting soil, seeds, growth

Materials: Two clear plastic cups, two saucers, two types of soil (sandy soil, clay, potting soil, garden soil), bean seeds, water

Inquiry: Does soil type affect seed growth?

Procedure:

- Fill the plastic cups three-fourths full with different types of soil and label each with the name of the soil it contains. Be sure to punch small holes in the bottom of each cup to allow for drainage. Place the cups on saucers to catch water drainage. [For faster germination, soak seeds overnight.]
- Plant three or four bean seeds in each cup.

- Add an equal amount of water to each cup and place the cups in a warm location. Continue to add equal amounts of water to both cups over the next few weeks.

- Predict which beans will grow faster and record the growth of the plants.

Extension: Punch drainage holes in the bottom of two paper cups. Then position the bottom of each cup inside the opening of a jar. Fill one cup with garden soil and another with sand. Pour a measured amount of water into each cup at the same time. After 10 minutes, measure how much water has drained into each jar. Which soil was better at preventing water drainage?

Visual Adaptation: Make braille and large print labels specifying the different types of soil used and place the labels next to the cups.

Math Connection: Measure water and chart the growth of the bean plants.

Language Connection: Discuss the purpose of composting. Composting is a natural process through which kitchen and yard wastes decompose into a dark, nutrient-rich soil conditioner. Composting is an easy and free way to recycle natural materials and reduce waste. Have students research and make a list of things that can be composted, such as dried leaves, grass clippings, fruit and vegetable peels, egg shells, coffee grounds and tea bags.

Science Tidbit: Fast moving water contributes to soil erosion. The roots of plants help prevent such erosion.

Suggested Children's Literature

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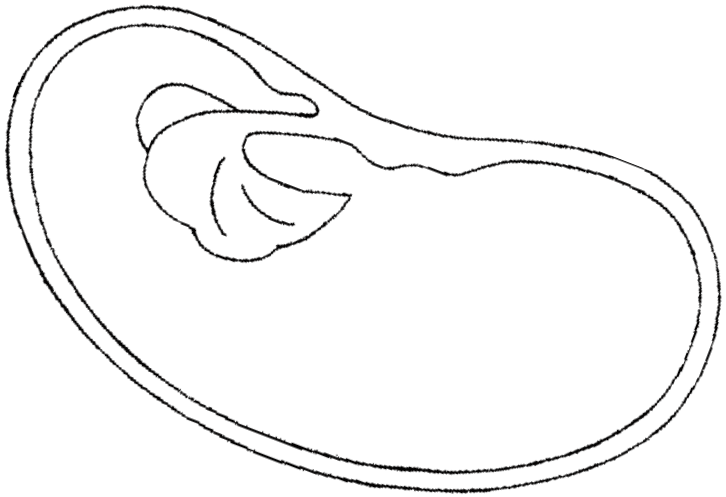
Seeds

Activity 4
LIMA BEAN EXAMINATION



Objective: To explore the inside of a bean seed.

Vocabulary: Lima bean, seed, plant, embryo, seed coat, food supply

Materials: Large lima beans or other broad beans (two for each student– one soaked and one dry)

Note: Soak some of the lima beans overnight before doing this activity.

Inquiry: What is inside a bean seed?

Procedure:

- Distribute one water-soaked bean and one dry bean to each student. Have students compare and contrast the wet seed to the dry seed. Use terms to describe each seed's firmness, texture, size and color.

- Students should then examine the seed coat of the wet seed and remove it. Explain that the *seed coat* is a tough covering that protects the seed from injury, insects and loss of water. It

also encloses the *embryo* (the tiny plant inside) and its food supply.

- Very gently split the seed into two parts. (This can be done by the teacher if students have difficulty.) The tiny plant growing in the seed is called the *embryo*; it consists of a tiny root, stem and leaf. The two fleshy halves of the seed make up the food storage area. As the tiny plant grows, it uses the stored food in the seed.

Extension: Arrange several beans between a moistened paper towel and place them inside a plastic bag. After a day or two, have students examine how the beans have changed.

Visual Adaptation: Soak the beans in colored water overnight so that the inside of the bean will be easier to see.

- Use the APH Bean Seed (Cross-Section) Overlays to review the seed coat, embryo and food supply of a bean seed.

Math Connection: Have each student take a handful of seeds and estimate the number picked up. Then have the students count the seeds and find out how accurate their estimates were.

Language Connection: Just as seeds need certain conditions in order to grow healthy, so do people. Discuss the things that people need in order to grow healthy (proper nourishment, clean air, sunlight, etc.).

Science Tidbit: Breakfast foods, like oatmeal and cornflakes, are made from seeds.

Activity 5
PLANTING SEEDS

Objective: To plant seeds and observe plant growth.

Vocabulary: Seeds, soil, germination, sprout, leaves, stem, roots, seedling

Materials: Seeds (bean, corn, poppy, marigold, sunflower, zinnia), soil, spoons, watering can, flower pots (made from milk cartons, plastic cups, or egg cartons), braille and print ruler

Inquiry: What do seeds produce?

Procedure:

- Have students fill their flower pots with soil, water the soil lightly, and plant seeds of their choice. The seeds should be covered with a thin layer of soil. [Encourage students to plant a variety of seeds.]

- Have students record when shoots first appear, and have them continue to

observe and record the plants' daily growth over the next few weeks.

Extension: Plant the same type of seed in two flower pots. After germination, expose one seed to a warm, sunny location and the other to a dark, cold environment. Does one plant fail to thrive? Have students record their observations of the plants' growth in their journals.

Visual Adaptations: Use the APH Seedling Overlays to review stages of germination.

Math Connection: If various types of seeds are planted, have students develop a chart that compares the plants' growth rates every five days.

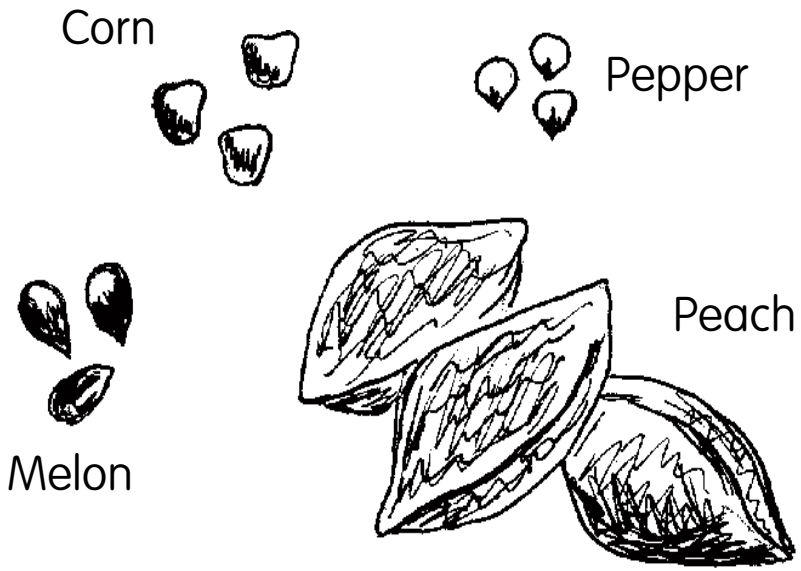
Language Connection:

Have students observe and record the following information in their journals:

Type of seed planted
When the seed was planted
Number and shape of the young plant's leaves
Height of the plant [record every five days]
Number of times watered
Other observations

Science Tidbit: Sunflowers may grow to 10 feet high and sunflowers always face directly into the sun.

Activity 6
SORTING SEEDS



Objective: To explore and sort various types of flower, fruit and vegetable seeds.

Vocabulary: Names of the various types of seeds used in the activity (sunflower, kidney, lemon, apple and lima), attributes of the examined seeds (shape, texture, size and color)

Materials: One small paper cup per student; assorted flower, fruit, and vegetable seeds; egg carton or paper cups; a sturdy tray

Inquiry: How do seeds differ from each other?

Procedure:

- Give each student an assortment of seeds in a paper cup, a tray and sorting containers. Begin by using seeds that differ greatly in size, shape and texture.

- Have the students shake their cups and pour their seeds onto a tray.

- The students should sort their seeds by type into separate containers, such as paper cups or an egg carton.

Extension: Match seeds with their source: peach seed with a real peach, a pumpkin seed with a real pumpkin, an apple seed with a real apple, etc.

Visual Adaptation: Sort seeds on top of an APH light box using the accompanying 2 x 3 overlay grid.

Math Connection: Count and group each set of seeds. Graph the number of each type of seed on a chart. Sequence seeds by size–smallest to largest.

Language Connection: Have students make a list of adjectives used as they describe various seeds (plump, sharp, tiny, ridged, round, flat, etc.).

Science Tidbit: The double coconut tree produces the largest seed. It weighs up to 50 pounds.

Activity 7
SEED TRAVEL

Objective: To become familiar with the various ways by which seeds travel or are dispersed.

Vocabulary: Travel, disperse, spread, seed coat

Materials: An assortment of seeds with various types of outer structures (maple seeds, acorns, seeds with prickly seed coats, etc.)

Inquiry: How do seeds travel or spread?

Procedure:

- Explain that some seeds travel with help from the wind. The wing-like structures of maple and ash seeds allow them to twist and twirl in the air. Other seeds have fluffy covers (dandelion seeds, cottonwood seeds, sycamore tree seeds, clematis seeds and willow seeds) that can be blown many miles away from the parent plant.

- Explain that some seeds, such as coconuts have waterproof coverings that allow them to float and travel with help from streams, rivers and oceans.

- Explain that some seeds, because of their sticky or prickly seed coats (cocklebur, beggar-ticks and tick trefoil) travel with help from people and animals. These seeds easily attach to people's clothing or to the fur of animals. Seeds are also carried by birds that eat blueberries, cherries, raspberries and blackberries.

- Explain that some seeds (pansy seeds, violet seeds, witch-hazel seeds, iris seeds, poppy seeds and geranium seeds) scatter when fruit dries and splits apart. As the pod bursts open, the seeds are scattered.

- Provide an assortment of seeds for students to explore. Based on the seeds' outer structures, can the students guess how the seeds travel?

Extension: Go on a nature walk and find seeds. Are some seeds found near the parent tree? Do any seeds attach to the students' clothing? [Students might like to drag a wool sock along the ground as they walk and see what types of seeds "hitch a ride."]

Math Connection: Find seeds, such as maple seeds, on the ground close to the parent tree and have students measure the distance between the spot where the seed was found and the parent tree. How far did it travel?

Language Connection: Students can tell or write a story about the "adventures of

a seed" as it travels from one place to another.

Science Tidbit: Tumbleweeds, which are plants that are found in deserts, break off at the ground and are blown by the wind. As they tumble, their seeds are scattered.

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Selsam, M. E., & Wexler, J. (1997). *The Amazing Dandelion*. New York, NY: William Morrow.

Simon, S. (1997). *Ride the Wind: Airborne Journeys of Animals and Plants*. San Diego, CA: Browndeer Press.

Waddell, H. J. (1962). *Seeds by Wind and Water*. New York, NY: Crowell.

Watts, B. (1990). *Bean and Plant*. Parsippany, NJ: Silver Burdett Press.

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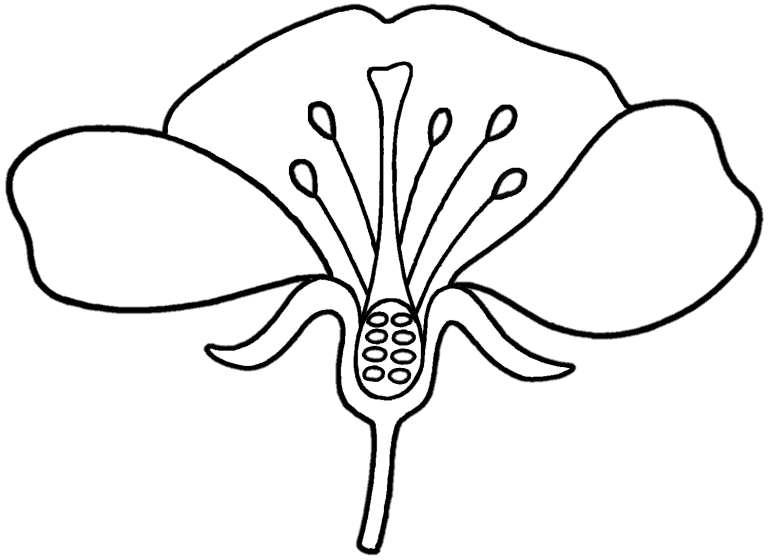
Flowers

Activity 8
FLOWERS
AND THEIR PARTS



Objective: To explore the different parts of a flower.

Vocabulary: Stamens, pollen, ovary, petals, pistil, sepals, stem, leaves, blossom, flower

Materials: A large, live flower (a lily, daffodil or tulip) for each student; a sheet of black paper, magnifying glass. [Note: Discarded flowers can be obtained from funeral homes and florists.]

Inquiry: What are the various parts of a flower? How are the parts connected to each other?

Procedure:

- Have students explore their flowers as whole units, discovering how the parts (stem, leaves, petals, etc.) are connected.

- Explore the shape, color and texture of the *petals*. Are the petals separate from each other (as with daffodils and morning glories) or joined together (like the poppy, rose and tulip)? Count and remove the petals. Explain that petals are the outer parts of the flower. Petals provide landing platforms for insects and protect the female and male parts of the flower.

- Locate the *sepals*, the tiny leaf-like or petal-like structures below the petals. Usually sepals are greenish in color. However, some sepals are the same color as the petals as noticed in a lily or a tulip.

- Locate the *stamens*. Explain that the stamens are the male part of the flower that produces pollen grain. Brush a stamen against some black paper. Some students might be able to examine the pollen on the black paper with a magnifying glass.

- Locate the *pistil* and let the students feel its sticky end. Explain the pistil is the female part of the flower.

Extension: Make a large model of a flower pistil: Stick a drinking straw (*style*) into a ball of clay *(ovary*) and place a piece of double-sided tape (*stigma)* on top of the straw. Stamens can be modeled with a cotton swab: The cotton tip is the *anther* and the attached stick is the *filament*.

Visual Adaptation: Select bright, full flowers like daylilies, tulips or hibiscus to examine.

- Use the APH Flower Overlays to further highlight and review the various parts of a flower.

Math Connection: Count the number of petals found on various types of flowers (daisies, roses, etc.). Is there an even or odd number of petals?

Measure the length of flower stems.

Language Connection:

Have each student create a "Parts of a Flower" book. Make several copies of the black outline card from the APH Flower Overlays for each student. Students can color a different flower part on each copy and label the part (see "Make a Book About Flowers" in **Appendix B: Suggested Activities for APH Plant Overlays**). Older students can also write a definition for each part (see **Glossary** for definitions).

Write a poem or story about a flower and share it with the class.

Science Tidbit: The stamens of the bottlebrush blossom form a spike that resembles a brush used to wash bottles. [Show the students an ordinary brush used to wash bottles to demonstrate the blossom's shape.]

Activity 9
FLOWER IDENTIFICATION

Objective: To identify various types of flowers (rose, lily, tulip, etc.).

Vocabulary: Flower type (tulip, lily, rose, etc.), real flowers, silk flowers, annuals, perennials, fragrance, living, non-living

Materials: An assortment of real flowers (daisies, roses, tulips and lilies); a vase for each type of flower, pitcher of water, silk or plastic flowers to correspond with the real flowers, paper

Inquiry: In what ways do flowers differ from each other?

Procedure:

- Let the students examine, handle and smell an assortment of real flowers.
- Identify the type of each flower (such as rose, tulip and lily) examined by

the students and have them place each flower type in a separate vase.

- Have the students prepare braille and print labels for each flower type (help with spelling if necessary) and place the labels next to the appropriate vases.

- Reinforce the concepts of "living" and "nonliving" by having students compare and recognize the differences between real and fake flowers. For example, silk flowers lack fragrance and real flowers need water.

Extension: Discuss the difference between *annual* flowers (those that flower and die within the space of a year) and *perennial* flowers (those that live for a number of years). Explore examples of each. Morning glories, pansies, petunias and sunflowers are annuals. Peonies, phlox and chrysanthemums are perennials.

Visual Adaptation: Use brightly colored flowers and flowers with distinctive aromas.

Math Connection: Make repeating patterns using flower petals of various sizes and shapes.

Measure the length or width of petals.

Language Connection:

Have students compile a list of ways in which flowers are used: as table decorations, as gifts for special occasions, as hair adornments, to add fragrance and beauty to yards, parks, and gardens, etc.

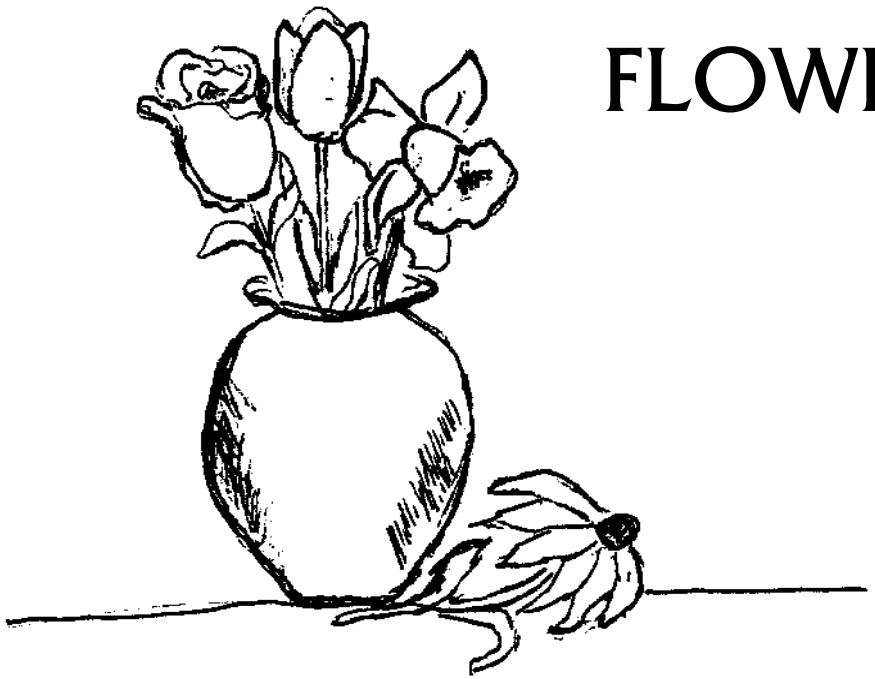
Have a professional florist visit the class. Talk about the reasons people give flowers as gifts, which flowers are most expensive, which types of flowers are most popular for certain occasions, etc.

Have students create a mini-dictionary of various types of flowers. Adhere an assortment of pressed flowers to blank pages and label with the names of the flowers.

Have the students write in their journals about their favorite types of flowers.

Science Tidbit: The largest flower is the *rafflesia*. It grows in jungle regions and is three to four feet wide.

Activity 10
FLOWER ARRANGING



Objective: To experience creative expression with cut flowers and also learn how to best care for them.

Vocabulary: Floral arrangement, centerpiece, bouquet

Materials: Cut flowers, greenery and baby's breath in three separate containers; small jars (baby food jars or medicine jars) or vases with a nice weight; funnel; small water pitcher; sponge; scissors; and garbage container near setup.

Note: Flower shops often have discarded flowers, ones with short stems or nearly spent blossoms. Funeral homes are also a good source, but these arrangements take more preparation. Cut and separate blooms to downsize for smaller vases.

Inquiry: How can we decorate with flowers?

Procedure:

- Provide a work area with all needed materials. Begin by introducing the visually impaired child to the entire

setup. Students may choose to work in pairs.

- Let students create their own flower arrangements. They should begin by filling their jars or vases with water. They can then select flowers and greenery to design their own flower arrangements. Emphasize that the flowers' stems need to reach the water to prolong their life.

- Students can place their flower arrangements around the classroom for decoration and enjoyment.

Note: Decide whether the process or the product is more important. If the flower supply is limited, clean up the room each afternoon placing the blooms back into separate containers and refrigerating them for use again the next day. If the students' arrangements are left out until spent, then instruct students to water flowers daily.

Extension: Explore other uses of flowers: gifts on special occasions, landscaping purposes, fragrance in perfumes, corsages and boutonnieres, etc. Students might like to give their flower arrangements as gifts to family members or friends.

Math Connection: How many days do the flower arrangements last before drying out or wilting? Keep a record of what physical changes occur in the flowers over time?

Language Connection: Ask the following questions:

What can prolong a flower's life once it has been cut from the plant?

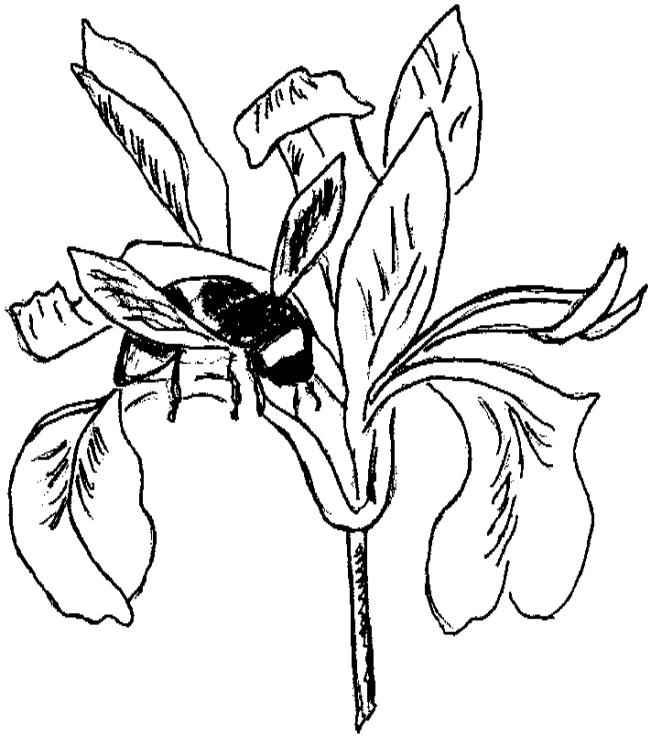
Where are flower arrangements found?

Are all flower arrangements created with real flowers?

Invite a florist to visit the classroom and to bring in many of the interesting devices used to create bridal bouquets and to keep stems in water.

Science Tidbit: Oils from some flowers, such as jasmine and roses, supply fragrances for some perfumes.

Activity 11
POLLINATION PALS



Objective: To learn about flower pollination through drama.

Vocabulary: Cross-pollination, self-pollination, fertilization, pistil, stamen, pollen

Materials: Something to represent pollen (such as cotton balls), enough students to create two "flowers" that are cross-pollinated by a "bee."

Inquiry: How are insects "friends" to flowers?

Procedure:

- Begin by explaining *pollination*: When pollen travels from the stamen to the pistil of the same flower or another flower. Once a flower is pollinated, *fertilization* takes place. Seeds then develop and these seeds grow into new plants.

- If possible, take a walk near a flower bed and have students notice what type of insects and animals are seen or heard nearby. Explain that many flowers rely on insects and animals for pollination. Insects and animals are attracted to a flower's nectar, fragrance or color.

- Act out cross-pollination: Have students create two "flowers." A "flower" consists of one student as the "pistil" who stands straight and chants, "I am sticky, I am sticky." Two to three other students sit around the pistil and pretend to be the stamens; these students hold cotton balls (pollen) and chant, "We make pollen, we make pollen." Four to five students hold hands and form a circle of "petals" around the stamens and pistil and chant, "We smell nice, we smell nice." Once both "flowers" are formed, a student acting as the bee, buzzes around and collects pollen from the stamen of one flower and carries it to the pistil of another flower. The "bee" can also chant, "I love nectar, I love nectar." If available, "The Flight of the Bumblebee" by Nicholas Rimsky-Korsakov can be played during this drama.

Extension: Act out self-pollination: Have the "bee" transfer the "pollen" from a stamen of one flower to the pistil of the same flower.

Math Connection: Petals act as landing pads for insects to rest on as they drink nectar from flowers. Count how many "landing pads" are found on various types of flowers.

Language Connection: Have pairs of students select a pollen-carrying "pal"

(bee, hummingbird, butterfly, beetle, fly, moth, etc.) and research the types of flowers it prefers. For example, bees like yellow and blue blossoms because they cannot see the color red. Moths like pale-colored or white flowers that give off their scent at night. Students can report their findings to the class.

Have students write in their journals about being a bee, butterfly, etc., and traveling from flower to flower.

Science Tidbit: Beetles prefer white or dull-colored flowers with spicy odors such as magnolias.

Activity 12
FLOWER POWER

Objective: To understand that the main function of a flower is to produce seeds for a new plant.

Vocabulary: Pollination, fertilization, seeds, pistil, ovary, ovule, stamens, fruit, pollen tube

Materials: Various types of fruits such as peaches, pears, apples, cherries, tomatoes and oranges; plastic knives.

Inquiry: How do flowers produce new plants?

Procedure:

- Explain what happens after a flower is pollinated: Pollen grains move from a stamen to a pistil and the pollen grain forms a tube called the *pollen tube*. The pollen tube grows down through the pistil to the ovary. When the pollen tube pierces the ovary, *fertilization* occurs.

- Explain what happens after fertilization: The fertilized egg cell inside the ovule grows into a young plant. The ovule develops into a seed that contains a young plant. The ovary grows larger and develops into a fruit that contains the seeds.

- Have students examine the inside of various fruits and locate the new seeds. Help students slice open apples and locate the seeds inside. Emphasize that each seed, if planted, would grow into a new apple tree.

Extension: Plant seeds from various types of fruits and see if any of them sprout into new plants.

Visual Adaptation: Count seeds from fruits on a contrasting background (such as brown seeds on a yellow background).

Use the 2 x 3 light box grid to sort similar types of seeds.

Math Connection: Count the number of seeds inside two apples. Do both apples have the same number of seeds? Experiment with different fruits.

Reinforce fraction concepts: half, whole, one-fourth, etc.

Language Connection: Make a "Fruit Book": Staple four or five clear sealable plastic bags together for each student. Have students collect and insert a different type of seed into each bag and label the outside of the bag with the type of seed enclosed. Adhesive print and braille labels can be attached to the outside of the bags.

Science Tidbit: Plants that do not produce flowers produce cones instead. Their seeds form inside cones.

Suggested Children's Literature

Bennett, P. (1994). *Pollinating a Flower*. New York, NY: Thomson Learning.

Bunting, E. (1994). *Flower Garden*. New York, NY: Harcourt Brace and Jovanovich.

Fowler, A. (1992). *What's Your Favorite Flower*. Chicago, IL: Children's Press.

Heller, R. (1983). *The Reason for a Flower*. New York, NY: Scholastic.

Henkes, K. (1991). *Chrysanthemum*. New York, NY: Greenwillow Books.

Lauber, P. (1987). *From Flower to Flower: Animals and Pollination.* New York, NY: Crown.

Lobel, A. (1984). *The Rose in My Garden*. New York, NY: Greenwillow Books.

Lucht, I. (1995). *The Red Poppy*. New York, NY: Hyperion Books for Children.

McMillan, B. (1986). *Counting Wildflowers*. New York, NY: Lothrop, Lee, and Shepard Books.

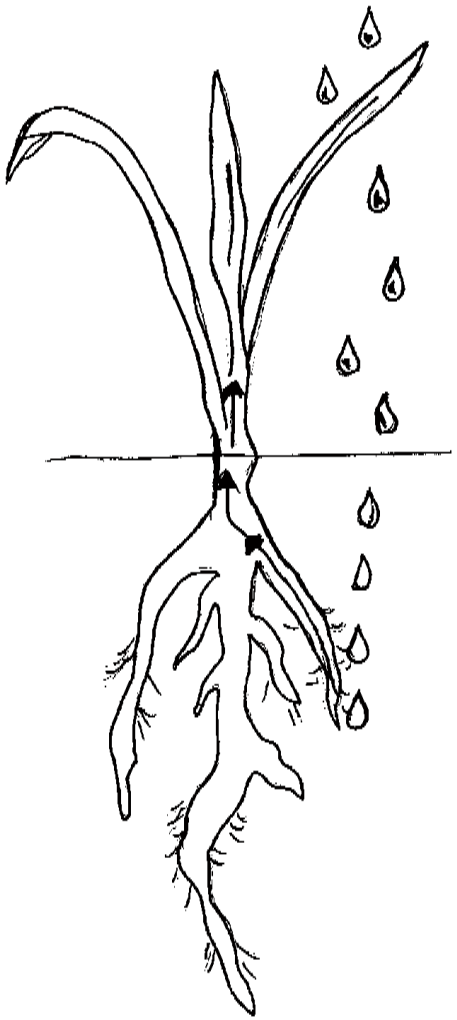
Micucci, C. (1992). *The Life and Times of the Apple*. New York, NY: Orchard Books.

Patent, D. H. (1990). *Flowers for Everyone*. New York, NY: E. P. Dutton.

Robbins, K. (1990). *A Flower Grows*. New York, NY: Dial Books.

Roots

Activity 13
PURPOSE OF ROOTS



Objective: To understand the purpose of roots and their various parts.

Vocabulary: Roots, edible, anchor, absorb, storage, root hairs

Materials: Examples of real root systems, such as a dandelion root or the root of another weed; edible roots (carrots, turnips, beets or rutabagas)

Inquiry: How do roots help plants?

Procedure:

- Have students tactually explore examples of real root systems. Discuss the purpose of roots: 1) roots act as anchors for a plant, holding it firmly in the ground; 2) roots have root hairs that absorb water and minerals from the soil to feed the plant; and 3) roots act as a storage area for the plant's food.

Extension: Have students become familiar with edible roots, such as carrots, turnips, beets and rutabagas.

Take a nature walk and observe tree roots along the surface of the ground.

Visual Adaptation: Shake as much dirt off of the root systems as possible and place the roots on a high-contrast background.

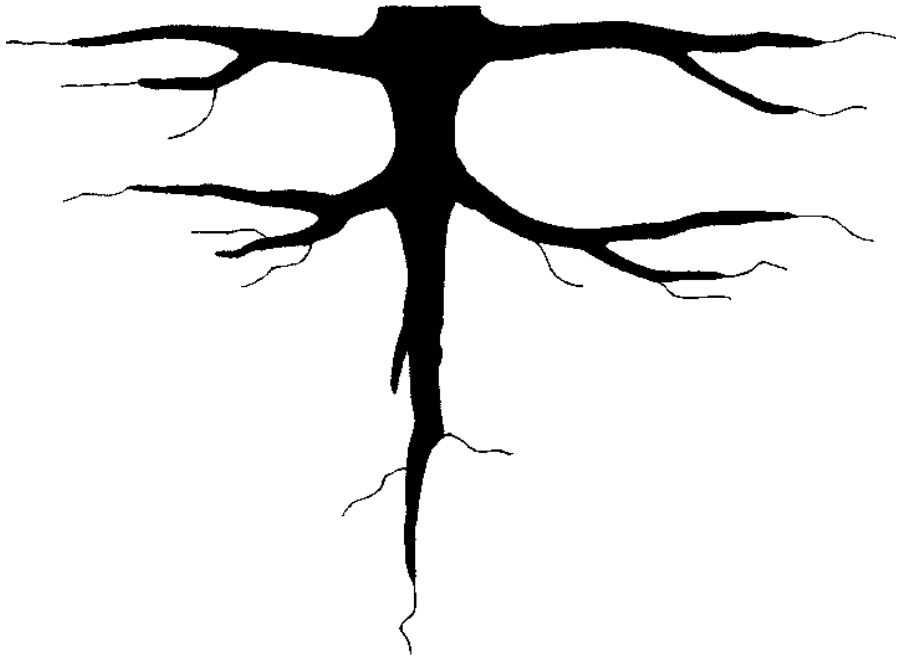
Math Connection: Measure the length and circumference of different carrots.

Compare the weight of a carrot root with that of another edible root such as radish, turnip or rutabaga.

Language Connection: Discuss the various ways in which the word *root* is used in our everyday language: family *roots*, *root* word, *root* of the problem, etc.

Science Tidbit: Roots of plants help prevent soil erosion.

Activity 14
TYPES OF ROOTS



Objective: To learn about different types of roots.

Vocabulary: Taproot system, fibrous root system, taproot, secondary roots, root hairs

Materials: Real examples of various types of roots (such as dandelion as an example of a taproot and grasses as examples of fibrous roots), contrasting colored paper

Inquiry: What are the two main types of root systems?

Procedure:

- Let students explore various samples of the two types of root systems.
- Encourage the students to recognize and describe the physical differences between the two types of roots. A *taproot system* has one long, main

root and smaller roots called *secondary roots* that branch out to the sides. A *fibrous root system* is made up of many thin branches. Explain that all roots have *root hairs* that absorb most of the water and minerals from the soil.

If possible, allow the students to search the schoolyard and pull weeds, grass, or dying annual flowers to observe roots still attached to plants.

Extension: Experiment pulling various plants (such as weeds, dandelions, faded annual flowers, tufts of grass, etc.) out of the ground and experiencing how some plants are harder to pull than others due to their root systems. Classify the plants by root system type.

Have students model a taproot system: Students should stand with their feet together and as still and upright as possible to model the taproot. Then they should stretch their arms (secondary roots) out from their sides and extend their fingers to represent root hairs.

Visual Adaptation: Use the APH Taproot System Overlays to review the parts of a taproot system.

Place real roots on a high-contrast background to make them more visible.

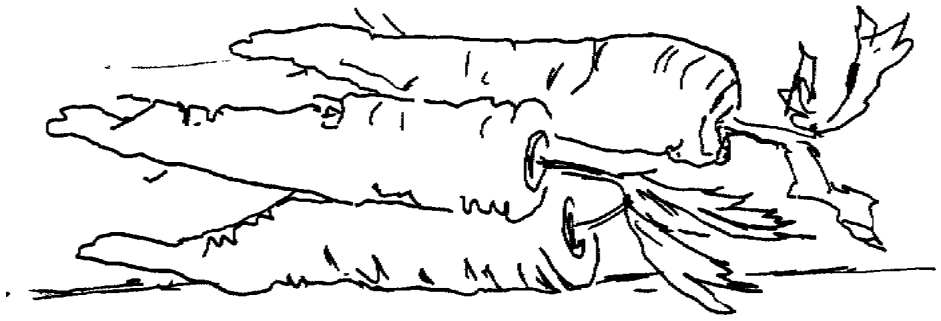
Math Connection: Measure the length of some of the roots examined.

Language Connection: Recite this poem when studying root parts.

Learning roots is not too complicated
This poem will get you educated
Lateral roots are root pairs
Tiny roots are root hairs
Secondary roots are thin and small
Taproots are fat and tall.

Science Tidbit: The banyan tree has roots that grow down from its branches. These are called *pillar roots*.

Activity 15
ROOTING OUT



Objective: To examine the growth of roots.

Vocabulary: Root system, plant names (e.g., bean, radish, carrot, iris, etc.)

Materials: A variety of seeds and bulbs; clear plastic cups, jars, or sealable bags (one for each seed type planted); dampened paper towels.

Inquiry: In what direction do most roots grow?

Procedure:

- Soak seeds overnight before planting in clear "root farms."
- Plant the seeds (such as lima beans, carrots, radishes, etc.) in clear plastic cups, jars or bags. Support the seed next to the wall of the cup, jar or bag with a dampened paper towel and place in a warm location. Keep the towel damp, not soaked.
- After the roots fully develop, have the students take the rooted plants out of the cup or bag and examine them.

Allow the students to manipulate and handle all of the plants and their root systems.

Extension: Go on a tree root hunt to discover how trees must stretch out their roots, no matter what may be in the way. Look for ways trees may have uprooted sidewalks and fences. Look to see what else roots might have grown up or around.

Visual Adaptation:
Sit a hyacinth or tulip bulb on top of a glass jar that is filled with water. The bottom of the bulb should just touch the water. In time roots and leaves will begin to appear and can be tactually explored.

Math Connection: How long is the root when the stem begins to appear?

Language Connection: Have students record the changes in the plant on a daily basis in their journals.

Science Tidbit: Orchids have *aerial roots* that cling to branches and absorb water minerals from the air.

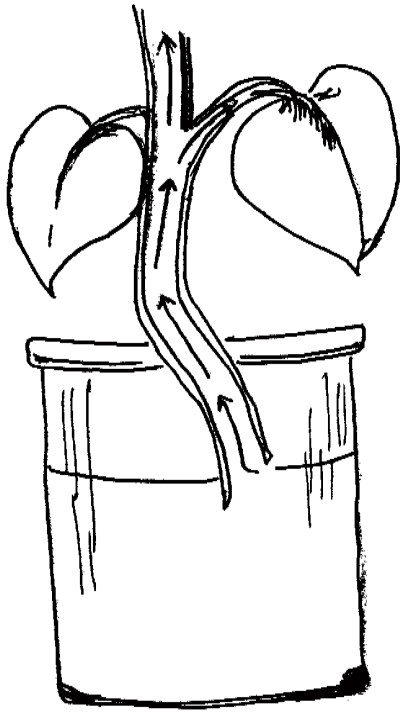
Bourgoing, P. (1989). *Vegetables in the Garden: A First Discovery Book*. New York, NY: Scholastic Inc.

Branley, F. M. (1975). *Roots are Food Finders*. Ann Arbor, MI: Crowell.

Hall, Z. (1994). *It's Pumpkin Time*. New York, NY: The Blue Sky Press.

Stems

Activity 16
FUNCTION OF STEMS



Objective: To learn how water and nutrients travel up plant stems.

Vocabulary: Stem, nutrients, water, travel

Materials: White carnations, water, red food coloring, tall drinking glasses

Inquiry: How do stems help plants?

Procedure:

- Have students explore the stems of several carnations and let them describe some characteristics of the stems (straight, slender, long, etc.).

- Discuss the function of the stems: 1) most stems hold other plant parts above the ground, and 2) they carry food down from leaves to the roots, and transport water up from the ground and to the leaves.

- Give each student a white carnation and a tall drinking glass. If there is a

limited number of carnations, students can also work in small groups.

- Fill the glasses with water and add lots of red food coloring. In a day or two, the flowers will turn red. Discuss why this change in color occurred. [Nutrients and water are transported by the stem to other parts of the plant.]

Extension: Split the stem of a white carnation in half lengthwise. Put one end in a glass with red food coloring and one end in a glass with blue food coloring. One half of the carnation will turn red and the other half will turn blue.

Visual Adaptation: Let students tactually explore the stem(s) of a limp potted plant. Then water the plant and within a day or two the limp stems will begin to perk up again.

Math Connection: Measure and compare the length of carnation stems.

Keep a record of how much water a plant absorbs over a period of time.

Measure the growth of a plant's stem over time. Chart its growth.

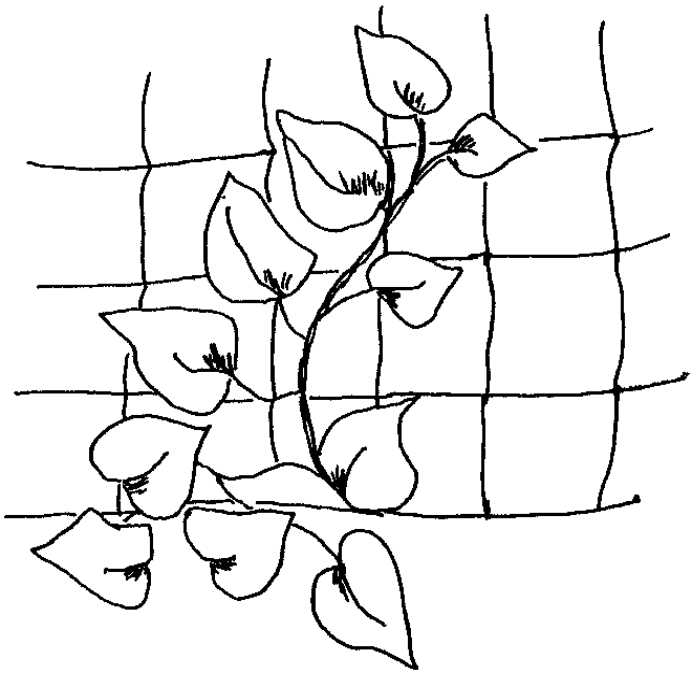
Language Connection: Read a *Magic School Bus* book. Then write a story pretending you are on the Magic School Bus inside of a stem.

Read or perform a version of *Jack and the Beanstalk*.

Science Tidbit: Tree trunks are stems. The redwood tree grows to be over 200 feet tall!

A cactus stores water in its stem.

Activity 17
STEMS ON THE MOVE



Objective: To tactually explore the direction of stem growth.

Vocabulary: Underground stems, climbing stems, upright stems, stems close to the ground

Materials: None (A nature hike is involved.)

Inquiry: In what direction do stems grow?

Procedure:

- Discuss the various growth patterns of stems. Some stems grow underground. White potatoes, for example, are actually swollen areas of underground stems. Some stems, such as ground ivy and strawberries, grow close to the ground. Some stems, such as grape vines and morning glory stems, climb trees and fences. However, stems of most flowers and trees grow upright.

- Have students explore various types of stems on live plants found in natural settings. What types of growth patterns of stems are encountered? Let students try to identify the type of growth pattern observed.

Extension: If possible, visit a pumpkin patch, a strawberry field or a grape orchard to examine the stem growth of a variety of plants.

Visual Adaptation: Encourage students to tactually explore the full length and texture of each stem examined. Notice where the stem begins and ends in relation to the rest of the plant.

Math Connection: Measure and compare stems found on foods we eat (cherries, pickles, apples, etc.).

Language Connection: Discuss how stems of plants are like our bodies' backbones. [Just as stems support and strengthen the plant, our backbones support and strengthen our bodies.]

Discuss and sample stems that are edible, such as asparagus, celery and rhubarb.

Science Tidbit: Some stems, such as those of roses, have thorns to protect the plant.

Suggested Children's Literature

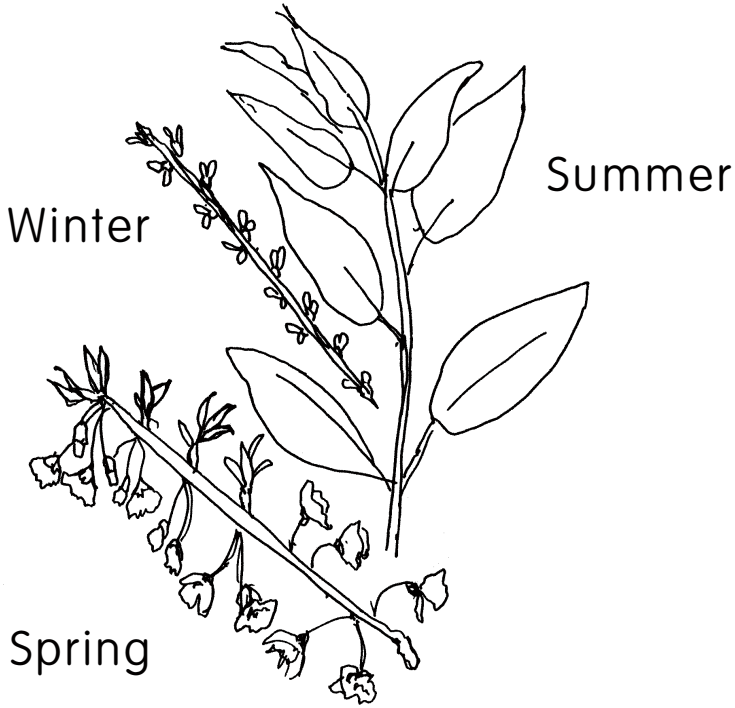
Fowler, A. (1995). *It's a Fruit, It's a Vegetable, It's a Pumpkin*. Chicago, IL: Children's Press, Inc.

Hall, Z. (1994). *It's Pumpkin Time!* New York, NY: The Blue Sky Press.

Kellogg, S. (1991). *Jack and the Beanstalk*. New York, NY: William Morrow.

Trees

Activity 18
ADOPT A TREE



Objective: To understand how seasons affect trees and to learn the parts of a tree.

Vocabulary: Tree, seasons, summer, fall, winter, spring, bark, leaves, branches, roots

Materials: Access to at least one tree, but preferably three or four that are on or near the schoolyard.

Inquiry: How does a tree change over time?

Procedure:

- Have students explore a tree that is on or near the schoolyard at the beginning of the school year. Begin by identifying the type of tree that it is. Discuss the parts and characteristics of the tree: the size of its branches, the shape of its leaves, the texture and color of its bark, any noticeable roots, the size

of its trunk, etc. Observe if animals use the tree to build nests or if insects are crawling near or on the tree. Describe and collect any seeds or fruits that the tree bears.

- Revisit the tree every month and have students record on a classroom chart or in a personal journal any changes that have occurred (buds began to open, new leaves appeared, leaves changed color, branches are bare, etc.).

Extension: Adopt several types of trees. Make a timeline of the seasons and the trees visited. If groups of students adopt different types of trees, have them compare the seasonal changes of those trees. If possible, encourage one group of students to adopt an evergreen tree and another group to adopt a deciduous tree.

Visual Adaptation: Provide the students with a hands-on experience by having them feel how far the base of a tree trunk extends before branching off into different directions.

- Use the APH Tree Overlays to review the parts of a tree.

Math Connection: Measure the circumference of the tree's trunk and some of its branches.

Have students count the number of branches they can reach on a tree.

Language Connection:

Discuss the purpose of trees: Trees give off oxygen, they provide a home for birds and animals, they provide shade, etc.

Discuss how we can be friends to trees: by not breaking tree branches, by not wasting paper and other products made from trees, by recycling, etc.

Read or write poems about trees.

Invite a botanist to the classroom to talk about tree identification or a conservationist to explain how we can save trees by recycling.

Read a story to the students underneath a shade tree.

Science Tidbit: Every state in the United States claims a specific tree as its "state tree." For example, the blue spruce is Colorado's state tree. Florida's state tree is the sabal palm, and New York's state tree is the sugar maple. [Have students research other state trees.]

Activity 19
TREE GROWTH

Objective: To find a seedling of a tree, dig it up, replant it, and watch it grow.

Vocabulary: Tree, root, stem, branches, leaves, soil, seedling, growth

Materials: A tree seedling in the ground, soil, water, trowel, large flower pot.

Note: Small trees can be received from the National Arbor Day Foundation for a small membership fee.

Inquiry: How quickly does a tree grow?

Procedure:

- In the spring, find a young tree seedling.
- Have the students look for leaves coming up out of the ground attached to small stems. The students should gently follow the stem down to the ground.

- Have students carefully dig up the small plant and replant it in a large flower pot. Keep the soil moist.

- Students should measure the height of the tree when planted and then measure weekly thereafter. [Emphasize that trees grow very slowly and that growth may not be much within the span of a few weeks or months.]

Extension: Have students research the type of tree planted and find out how tall such a tree usually grows.

Plant a new tree on the schoolyard.

Visit historic trees in your area which might be noted for their size or age.

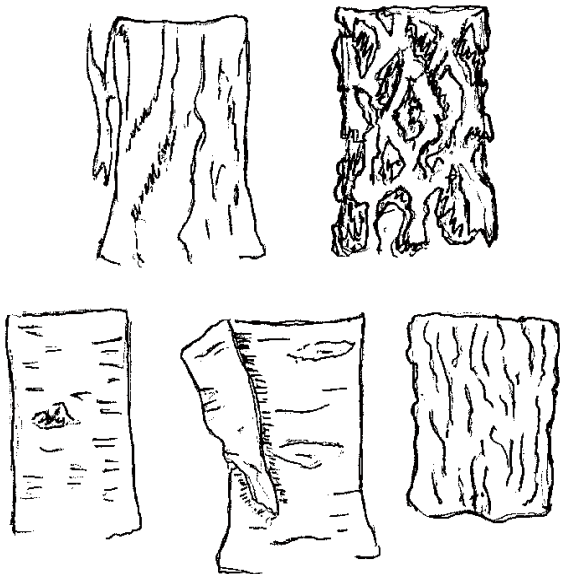
Visual Adaptation: Provide a braille and large print ruler for the visually impaired student to use to measure the growth of the small tree.

Math Connection: Grow more than one tree and compare the trees' growth rates.

Language Connection:
Ask students to complete the following sentence to describe their tree:
My tree is taller than _____, but shorter than _____.

Science Tidbit: Some giant sequoias grow to be nearly 300 feet tall.

Activity 20
EXPLORING TREE BARK



Objective: To experience the texture of various types of tree bark.

Vocabulary: Tree bark, rough, bumpy, ridged, smooth, flaky, papery

Materials: Pieces of bark from several different kinds of recently cutdown trees (the larger the pieces, the better) or take a nature walk through a wooded or treed area.

Inquiry: Do all tree barks feel the same?

Procedure:

- Have students explore the texture and color of various tree barks.
- Discuss how the tree barks are alike and different: Some barks are more grooved than others, some are flat with an occasional bump here and there, some are papery, etc.

- If bark samples similar to that of trees on your schoolyard are available, let the students go outside and match up the barks with the appropriate trees.

- Explain that the purpose of tree bark is to protect the tree from diseases, animals, insects and very hot or cold weather.

Extension: Discuss the uses of tree bark: It is used for boat building, tanning leather, making baskets, and producing cork products. Have students explore bottle corks or cork tile. Cork is the bark of the cork oak.

Have students compare the bark of the tree trunk with the bark of its branches. Are there any noticeable differences?

Visual Adaptation: Tag each piece of bark sample with a cardboard shape (e.g., triangle, square, etc.). Then tag the corresponding tree on the schoolyard with the same shape.

Math Connection: Weigh and measure the length and width of each bark piece.

Language Connection:

Have students list as many adjectives they can think of to describe tree bark (bumpy, spongy, grooved, flaky, smooth, etc.).

Discuss how tree bark is similar to the skin on our bodies. [Both tree bark and human skin are protective layers and they both show signs of aging.]

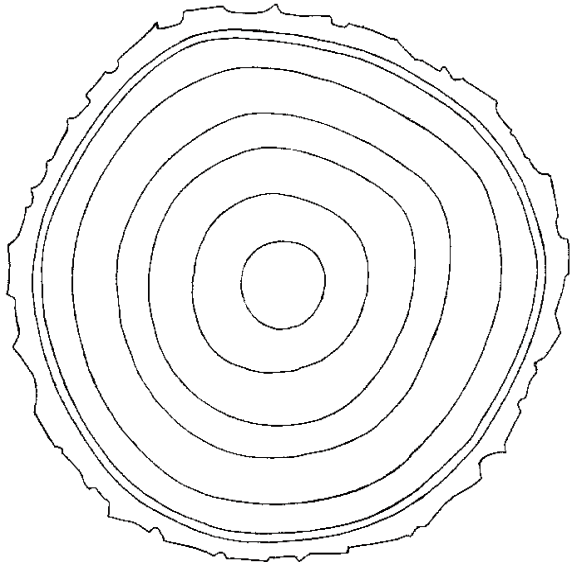
Science Tidbit: Tree bark cannot stretch as the tree trunk grows, so it cracks,

splits and peels making different textures.

North American Indians used birch bark to cover canoes and tepees.

Cinnamon, a very popular spice, is actually dried bark.

Activity 21
CROSS-SECTION OF A LOG



Objective: Become familiar with the layers of a cross-sectioned log through a craft activity.

Vocabulary: Heartwood, sapwood, cambium, outer bark, annual ring, growth ring, cross-section, log, tree trunk, layer

Materials: White paper plates; cardboard; sandpaper; string, yarn or cord; puff ink; glue; any other available material to build a tactile model of a cross-sectioned log; a real sample of a cross-sectioned log or access to a tree stump.

Inquiry: Is it possible to determine the age of a tree?

Procedure:

- Discuss the layers of a cross-sectioned log: *heartwood* is the tree's center which is no longer alive; *sapwood* carries water and minerals from the

roots to the leaves; *cambium* is a thin layer that makes new cells; and *bark* is the outermost layer.

- Begin by having students examine a tree stump or a cross-section of a real log. Explain that a tree's age when it was cut down can be determined by the number of visible growth rings.

- Give each student a white paper plate and have them build a tactile model of a cross-sectioned log. [Students can also work in small groups if craft materials are limited.] Assist the students as needed.

1) The ridged edge of the paper plate can represent the *bark* of the tree, the part that protects the tree from wind, animals and diseases.
2) Glue a circular piece of sandpaper in the center of the plate to illustrate the *heartwood*, the part that supports the tree and is dark in color.
3) Position and glue a doughnut-shaped cardboard piece around the "heartwood." This piece depicts the new wood, also called the *sapwood*, which carries water from the roots to the leaves.
4) Glue 3 or 4 growth rings made with yarn, cord or string on top of the sapwood and the heartwood. The *growth rings*, also called *annual rings*, are counted to determine the age of the tree.
5) Dab little dots of puff ink next to the bark. This is the *cambium*, a thin layer that produces new cells. This layer will become a new growth ring.

Extension: Find a tree stump or an unsplit firewood log and have groups of students work together to estimate the age of the tree when it was cut down.

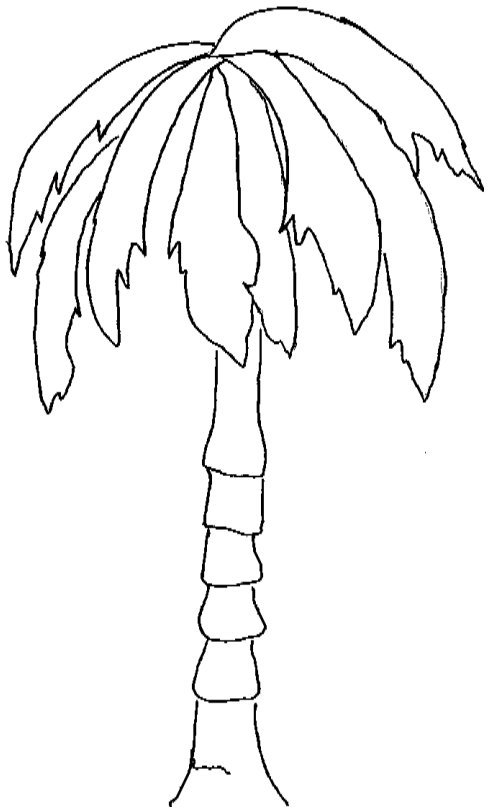
Visual Adaptation: Use the APH Log Cross-Section Overlays to review the parts of cross-sectioned log and how a person might count the growth rings if they were tactile as well.

Math Connection: Estimate and measure the circumference of a tree trunk with standard or nonstandard measures. Can the students reach their arms around the tree trunk? How many linked paperclips does it take to reach around the tree trunk?

Language Connection: Help students remember the layers of a cross-sectioned log by relating them to the ways in which we describe our own bodies. For example, we each have a heart in middle of our chests just as heartwood is located in the middle of the tree trunk; our outer skin sustains a lot of wear and tear like the outer bark of the tree; old skin is always being replaced with new skin just as the cambium layer is making new cells that make new wood for the tree, etc.

Science Tidbit: The width of growth rings in a tree depends upon the weather. Growth rings are wide in wet years and narrow in dry years. A dry year might even result in a missing growth ring.

Activity 22
TYPES OF TREES



Objective: To become familiar with types of trees and tree products.

Vocabulary: Conifer, evergreen, broad-leaved, deciduous, palm, needles, tree types

Materials: An assortment of natural or manufactured products from various types of trees. *Evergreens* and *conifers*: pine cones, pencils, wreaths. *Broadleaved trees:* maple syrup, baseball bats, furniture, cork, acorns. *Palms*: coconuts, fans, dates. Also have display tables or trays for sorting items.

Inquiry: What are the various tree types? What products (natural or manufactured) come from each tree type?

Procedure:

- Discuss the distinguishing characteristics of the various tree types: *Conifers* are common in cool temperate areas, they lack true flowers, their seeds develop inside cones, and they have needlelike leaves. Most keep their leaves all year and therefore are called *evergreens*. *Broadleaved trees* have flat, broad leaves which change color and drop in autumn. *Palms* have parallel-veined leaves and grow in warmer regions.

- Let students explore an array of products that come from or are made from the three tree types.

- Provide tables or trays labeled with the tree types. Have students sort the items by tree type.

Extension: Keep the sorted tree products displayed in the classroom for a week or two. Have students bring items from home to add to the tables or trays.

Visual Adaptation: Attach a large print and braille tag or label to each item before asking students to sort the materials.

Math Connection:

Chart how many items were displayed on each "tree type" table.

Make a graph indicating the number of each type of tree encountered on the schoolyard. Which type of tree was most common? Was there a tree type not present at all? If not, why? [The climate might not be tolerated by the tree type (for example, too cold for palms).]

Language Connection: Recite the names of various trees and see if the students can identify the correct grouping: *Palms*: palmetto, yucca and cabbage palms; *Evergreens*: blue spruce, Douglas fir and cedar; *Broadleaved trees:* oak, ash, maple, cherry and birch.

Science Tidbit: The Louisville Slugger baseball bat is made from the wood of an ash tree.

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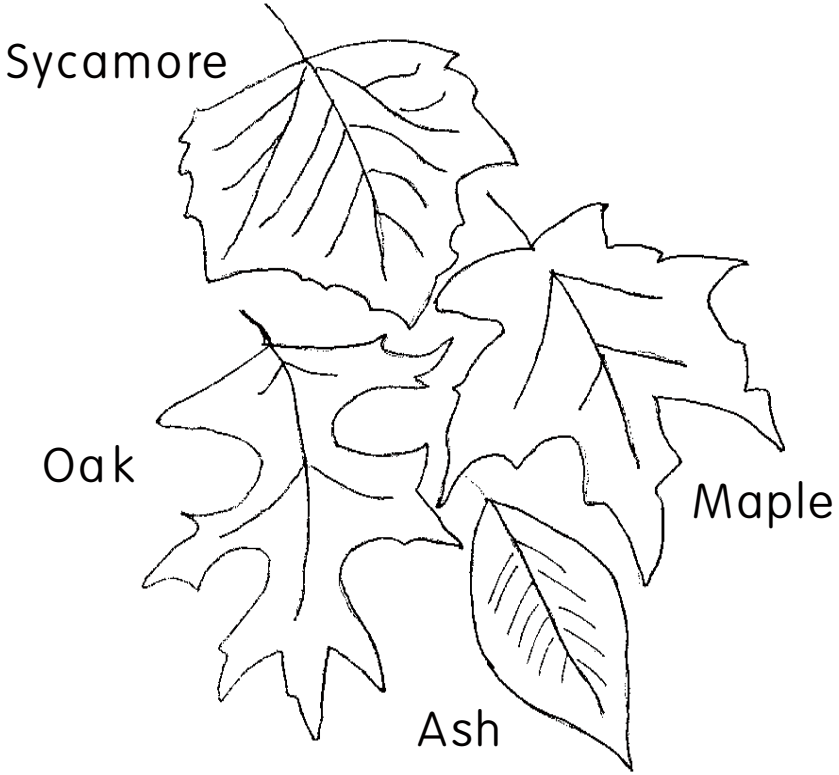
Leaves

Activity 23
LEAF NAMES



Objective: To become familiar with tree leaf names.

Vocabulary: Leaf names (maple, oak, sycamore, ash, birch, magnolia, redwood, etc.)

Materials: Use real leaves such as maple, oak, sycamore, birch or any four varieties in your area. Have three to six of each kind of leaf depending on the number of students.

Inquiry: Do leaves from various types of trees differ in shape?

Procedure:

- Allow students time to tactually explore the unique shape of each leaf type presented. Discuss differences between the leaves.

Distribute leaves to the students.

To the tune of "London Bridge" sing:

Maple leaves are falling down, falling down, falling down;

Maple leaves are falling down, it is autumn.

(The students with maple leaves let them flutter to the ground.)

Repeat with each type of leaf. Many different kinds of leaves can be added as time allows.

Extension: Have pairs of students select a leaf and determine from which type of tree it came using a tree guide or resource.

Discuss the colors of leaves. Although most leaves are some shade of green, they all differ. Using the leaves explored earlier, have students investigate what colors these leaves change to in autumn. For example, leaves of water oaks turn to yellow in fall, and sassafras leaves turn to rich orange and red hues.

Visual Adaptation: If real leaves are not available, use brightly colored cardboard to make leaf shapes.

Math Connection: Gather leaves from the schoolyard. Sort by type and determine which type of leaf was most commonly found in the area. Make a bar graph illustrating the class's findings.

Language Connection:

To the tune of "Twinkle, Twinkle Little Star" sing:

"Five little leaves ready to play [five children stand in mid-circle]

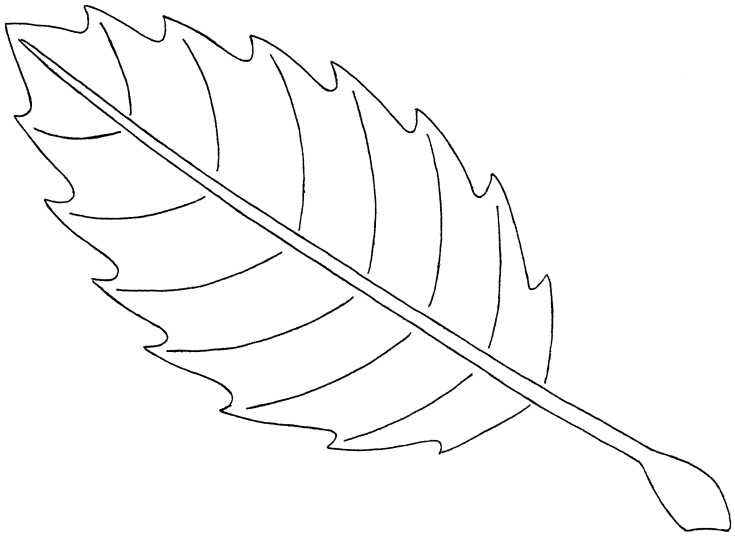
were dancing on the tree one day;

Along came the wind [circle of chil

dren make blowing sound]
and blew them around;
And little leaf _____ [insert child's name]
came tumbling down [child drops and returns to his seat].
(Continue singing the song, reducing the number stated in the first line, until all of the students are seated.)

Science Tidbit: Every kind of tree with leaves has its own uniquely shaped leaf. The leaf's shape helps us to identify the parent tree.

Activity 24
PARTS OF A LEAF



Objective: To become familiar with the various parts of a leaf.

Vocabulary: Veins, blade, petiole (leafstalk), apex, midrib, chlorophyll, photosynthesis, oxygen, carbon dioxide

Materials: Real leaves with distinctive shapes, veins and margins.

Inquiry: What are the parts of a leaf? How are leaves important to people?

Procedure:

- Let students tactually explore an assortment of real leaves with tactually distinctive shapes, veins and margins.

- Identify with students the various parts of each leaf examined. Begin by pointing out the two main parts of each leaf—the *petiole* (leafstalk) and the leaf *blade* (the flattened portion of the leaf). Then identify the *veins*, the *midrib*, and the *apex* (the upper tip of the leaf).

- Explore how the look and feel of the upper surface and underside of a leaf differ (the veins are more tactually distinctive on the underside of a leaf). Explore other characteristics of leaves: Are they easy to tear? Are they stiff or floppy? Pour water on a leaf. Does the water tend to be absorbed by the leaf or does the water run off the leaf?

Extension: Discuss the purpose of leaves: Leaves make the food for the tree through a process called *photosynthesis*. Leaves absorb carbon dioxide from the air and the *chlorophyll* in the leaves absorb sunlight. During this process, leaves produce oxygen and release it into the air. Veins also support the leaf and hold the leaf's surface up to the sun.

Have students act out the oxygen cycle. Have one student stand and be the "tree." Have another student stand about 10 feet away and be the "person." Using a cardboard arrow labeled with the word "oxygen" on one side and "carbon dioxide" on the other, have other students take turns "walking" the oxygen cycle, flipping the arrow appropriately to indicate what the person or tree is putting into the atmosphere and what the other is breathing in.

Visual Adaptation: Use the APH Leaf Overlays to review the parts of a leaf.

Math Connection: Measure the midribs of large leaves. Are there any patterns in length observed?

Measure the leafstalks of various types of leaves.

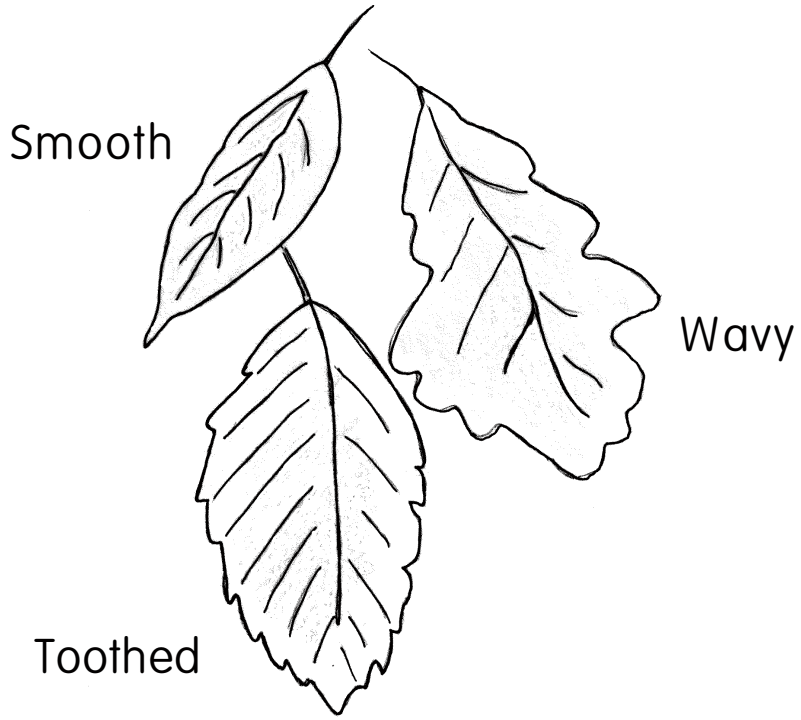
Compare the sizes of various types of leaves. Then sort or sequence the leaves according to size, from smallest to largest.

Language Connection:

Have students create their own "Parts of a Leaf" book. Make several copies of the black outline card from the APH Leaf Overlays for each student. Students can color a different leaf part on each copy and label the part. Older students can also write the definition for each part (see **Glossary** for definitions).

Science Tidbit: Leaves absorb or "breathe" carbon dioxide and give off oxygen, the opposite of what humans do. Without leafy plants there would be no animal life.

Activity 25
LEAF MARGINS



Objective: To explore three types of leaf margins.

Vocabulary: Leaf, leaf margins, smooth, wavy (lobed), toothed (serrated or jagged)

Materials: Real leaves representing the three types of leaf margins. (Encourage students to bring leaves from home.)

Examples of margin types:
Smooth margins (magnolia, redbud, persimmons, live oak and black gum).
Wavy margins (sassafras, water oak, English oak, tulip tree and California white oak)
Toothed margins (cottonwood, elm, holly, beech, chestnut, hawthorn and river birch)

Inquiry: How do the margins of leaves differ?

Procedure:

- Discuss the meaning of leaf margins or edges and the characteristics of their shapes (wavy, toothed or smooth).

- Use common objects to tactually reinforce the margin types: a serrated plastic knife (toothed); spoons (smooth); bulletin board borders (wavy). Can students think of any other objects that have smooth, wavy or jagged edges?

- Sort real leaves according to leaf margins (i.e., smooth, wavy or toothed).

Extension: Take a nature walk and identify trees and classify by leaf margins. Emphasize that leaves from the same tree have the same general shape, but differ from one another in some way. No two leaves are identical.

Gather real leaves and press them between newspaper and place under a heavy book for two or three weeks.

- **Visual Adaptation:** Use APH Leaf Margin Overlays to review the three types of leaf margins.

Math Connection: Have the students gather an assortment of leaves from their own yards or from the schoolyard. Then graph the number of each type of leaf margin found. Which margin type was the most common?

Count the number of lobes on a wavy-edged leaf.

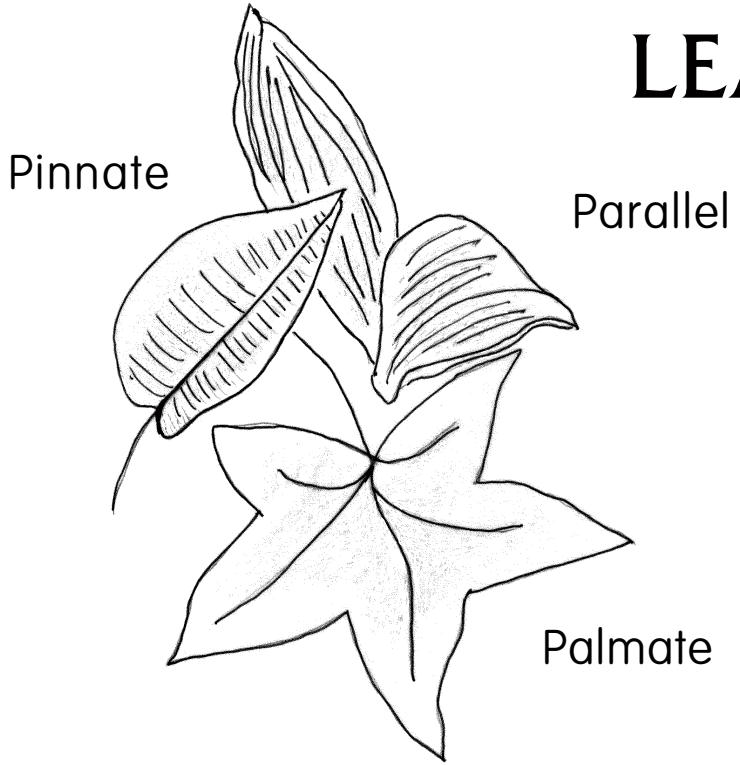
Introduce the concept of "symmetry" by folding leaves along their midribs. Do both sides of the leaves closely match?

Language Connection: Pretend you are a tiny insect and walking on the three different types of leaf margins. Write about your experiences. For example: "As I walked along this wavy sassafras leaf, I felt like I was on a roller coaster."

Science Tidbit: Leaves with smooth margins are most common in warm climates.

The sassafras tree has three distinctive leaf shapes all of which are lobed.

Activity 26
LEAF VEINS



Objective: To explore three types of leaf veins and to learn the purpose of leaf veins.

Vocabulary: Leaf veins, pinnate, palmate, parallel [Note: It is not important for younger students to master the names of vein types.]

Materials: Real leaves showing the three types of leaf veins. If real examples are not available, use the APH Leaf Vein Overlays to illustrate the various vein types.

<u>Examples of vein types:</u>
Palmate veins (sycamore, sweet gum, red maple and sassafras)
Pinnate veins (elm, blue beech and black birch)
Parallel veins (banana palm, grasses, leaves of orchids and lilies)

Inquiry: What is the purpose of leaf veins? What are the various types of leaf vein patterns?

Procedure:

- Distribute some leaves for students to observe and manipulate, so they can discover how the vein pattern of each leaf looks and feels. Explain that veins move food or energy from one part of the leaf to another.

- Have the students explore how the veins either spread out like fingers on a hand in separate directions (*palmate*), while others resemble a feather (*pinnate)*. Leaves with *parallel* veins are unique in that veins on a single leaf never contact or touch each other.

- Let the students collect leaves from the schoolyard and sort according to vein type.

Extension: Take a nature walk and identify trees and types of leaf veins.

Visual Adaptation: Use APH Leaf Vein Overlays to review the three types of leaf veins.

Use sycamore leaves, tulip poplar leaves or other large leaves with prominent veins.

Math Connection: After sorting the leaves by vein type, graph the number of each type.

Count the number of veins on various leaves. Students can work in pairs. One student can count the veins, and the other can record the number.

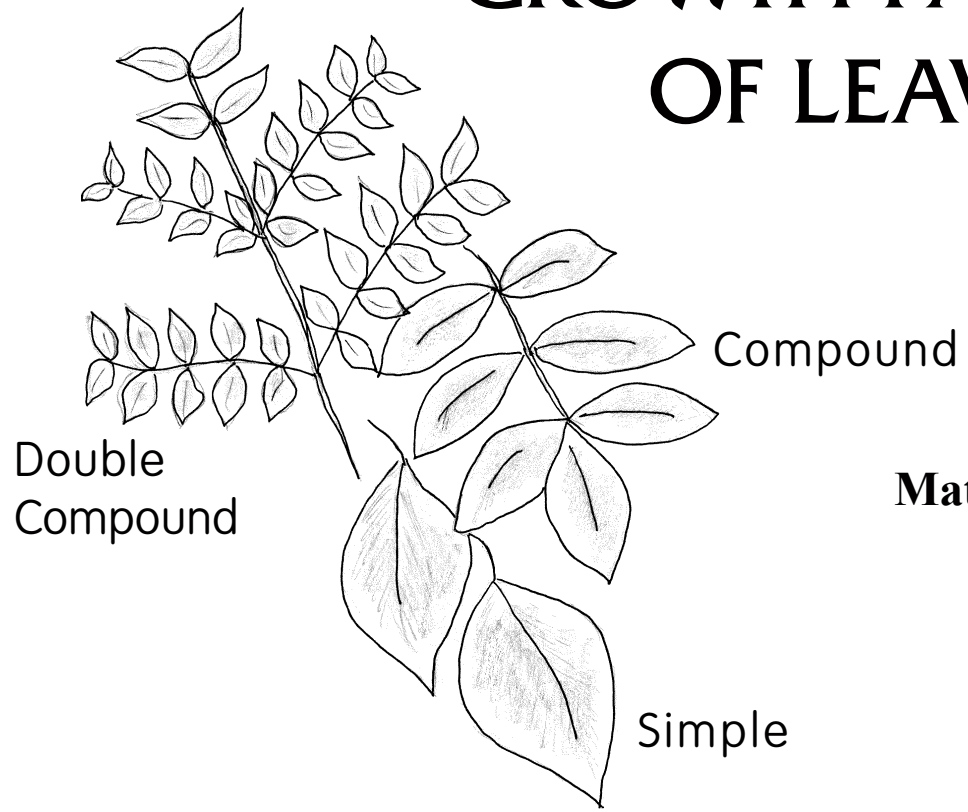
Language Connection:

Collect poems about leaves and share with the class. Students can also compose original poems about leaves.

Discuss how the veins of a leaf are like veins in our bodies. [Both carry liquids and nutrients from one place to another.] Based on this information, can students explain why leaves have many veins that branch out in all directions? [So that all parts of a leaf are properly nourished.]

Science Tidbit: Veins help the leaf keep its shape and also carry food and water to the leaf.

Activity 27
GROWTH PATTERNS OF LEAVES



Objective: To explore three growth patterns of leaves.

Vocabulary: Growth pattern, simple, compound, double compound [Note: It is not essential for younger students to master the names of the various growth patterns.]

Materials: Real leaves showing the three growth patterns. If real examples are not available, use the APH Leaf Growth Pattern Overlays or use cardboard shapes of leaves to illustrate the growth patterns.

<u>Examples of growth patterns</u>:
Simple (willow, beech, elm, hackberry, paper birth and hawthorn)
Compound (black walnut, hickory, pecan and butternut)

Double Compound (honey locust and Kentucky coffeetree)

Inquiry: Do all leaves have the same growth pattern?

Procedure:

- Review the definitions and characteristics of the three growth patterns of leaves. A *simple leaf* is a leaf with a single flattened blade; a *compound leaf* is a leaf divided into a number of leaflets; and a *double compound leaf* is a leaf with leaflets further divided into smaller leaflets.

- Distribute real leaves gathered from the schoolyard or other location for students to observe and manipulate. Discover how the three growth patterns are different from one another.

- Sort the gathered leaves by growth pattern.

Extension: Take a nature walk and identify tree leaves according to growth pattern (simple, compound or double compound).

Examine how leaves grow in relationship to each other on a twig. Do they grow directly opposite from each other or do they alternate?

Visual Adaptation: Use the APH Leaf Growth Pattern Overlays to review the various growth patterns of leaves.

Math Connection: Collect a group of leaves and separate by growth pattern. Graph the results and discover which type is more plentiful in a cer-

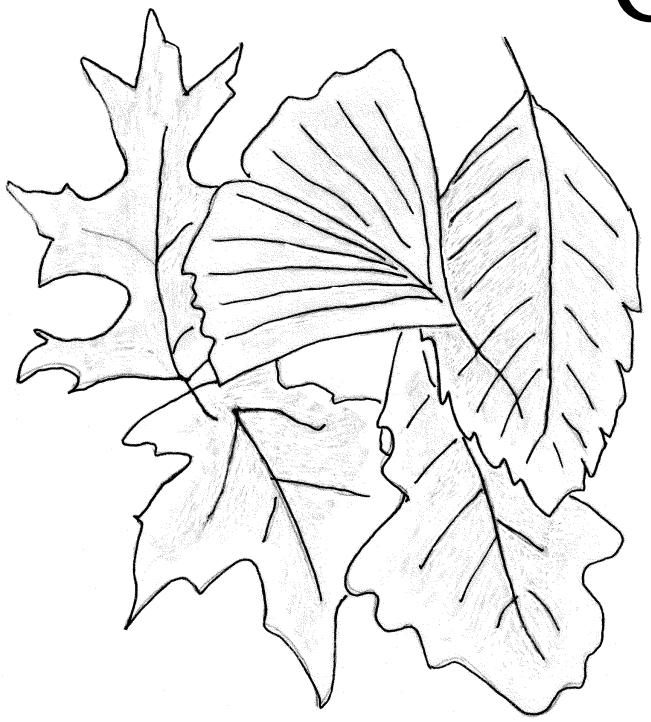
tain setting. Were any of the growth patterns not found at all?

Count the number of leaflets found on a compound leaf. Do the leaflets differ in size?

Language Connection: Gather several leaves from the same tree. Have students use descriptive language to describe how the leaves are similar and different from each other in regard to shape, size and texture.

Science Tidbit: In deciduous trees, chlorophyll dies in the fall, leaving the natural color of the leaf visible.

Activity 28
CLASSIFICATIONS OF LEAVES



Objective: To classify leaves by margin type, vein type and growth pattern.

Vocabulary: Leaf margins, leaf veins, growth patterns, classify, sort

Materials: Real leaves representing various margin types, vein types and growth patterns.

Inquiry: In what ways can you classify leaves?

Procedure:

- Gather an assortment of leaves from the schoolyard or other local site. Students can also bring leaves from home.

Have students describe each leaf according to growth pattern (simple, compound or double compound); margin type (smooth, toothed or wavy); and vein type (palmate, pinnate or parallel).

Extension: Challenge the students to give the name of the leaf being examined (maple leaf, oak leaf, etc.)

Visual Adaptation: Refer to "Suggested Activities for APH Plant Overlays" for an added activity using the Leaf Type Overlays.

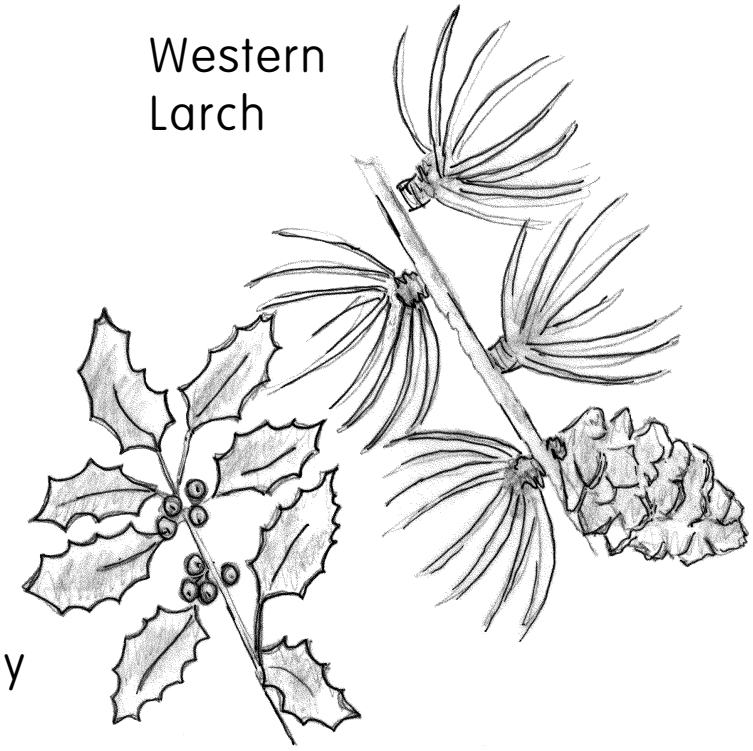
Math Connection: Have a contest: Which student can collect the most of the same type of leaf from the schoolyard.

Language Connection:

Discuss leaves of other plants by those that are edible and those that are poisonous. Edible: cabbage, lettuce, spinach and kale. Poisonous: poison ivy, poison sumac and poison oak. Discuss where poisonous plants often grow.

Science Tidbit: Leaves of poisonous plants like poison ivy can be identified by their growth patterns.

Activity 29
NEEDLELIKE LEAVES



Objective: To explore needlelike leaves of conifers and evergreen trees.

Vocabulary: Needles, conifers, evergreens, cones, pines

Materials: Evergreen needles still attached to twigs or small branches.

Inquiry: How are needlelike leaves different from broad leaves?

Procedure:

- Let students explore samples of needlelike leaves from a variety of evergreen trees such as spruces, firs, cedars, pines and junipers.

- Have students describe the needles--"long and prickly," "short and stubby," "narrow and pointed," etc.

Extension: Explore pine cones. Explain to students that conifers, such as pines, fires, larches, spruces, cedars, cypresses and redwoods, lack true flowers and that seeds develop in cones instead. Call attention to the stickiness of pine cones. Some pines produce a resin that is used to make turpentine, paint and soap.

Visual Adaptation: Emphasize the tactile differences between needlelike leaves and leaves from deciduous trees by having the students do a side-by-side comparison of both types using a light box.

Math Connection: Count the number of needles in a cluster of pine needles. Usually there will be two to five needles per cluster.

Measure the length of various types of needles.

Measure the length or circumference of pine cones.

Language Connection: Have students make a list of adjectives used as they describe needlelike leaves (prickly, narrow, pointed, etc.)

Science Tidbit: Needleleaf trees are also called “softwoods” because most of them have softer wood than deciduous trees. Wood from conifers is widely used in construction and papermaking.

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Appendices

APPENDIX A
Culminating Activities

The suggested culminating activities give students opportunities to apply their knowledge about plants in a holistic way with purpose. These activities can be completed by students individually or as a group.

Culminating Activity: PLANT SLEUTHS

Have the students select a plant to research. The chosen plant can be one found on the schoolyard, one located at home, one that interests the students or one that is unfamiliar. Students can gather information about the selected plant through a variety of sources, such as through interviews with persons knowledgeable about the chosen plant, local libraries, tree or flower guides, seed packets and nurseries. The type of information to sleuth can be determined by the teacher and students. Some suggestions are:

Name of the plant
Continents where the plant grows
Soil preference
Climate preference
Amount of sunlight needed

Type of stem (woody or hollow)
Type of root system
Seed size
Characteristics of its flowers
Type of fruit it produces
Leaf description
Evergreen or deciduous
Harmful or not
Common uses
Interesting fact(s) about the plant

After students have researched their plants and recorded what they found, each student or group can give a sleuth report to the class.

Culminating Activity: GROW A GARDEN

Have the students plan and grow a garden. The definition of "garden" can range from a few plants grown indoors by an individual student to an outside garden containing numerous types of plants cared for by a group of students. The size of the garden will depend on available space and student ambition.

Task: To plan, organize and create a garden.

Things to Consider:
What type of garden will be grown? (Vegetable, flower, herb, salad, root, etc.)
Where will the garden be grown? (Indoors or outdoors)
What size will the garden be?
How many types of plants will be grown? How many of each?
What type of soil will be needed to ensure healthy plant growth?
How much sunlight is needed?
How often should the plants be watered?
How far apart should the seeds be planted?

Write-Up: Students record in a journal observations made during this gardening activity. Did some plants grow healthier than others? Which plants grew fastest? Tallest? Did the outside temperature help or hinder the plants' growth (too much rain, an early frost, etc.)? Did any fruits, vegetables or flowers appear?

APPENDIX B
Suggested Activities for APH Plant Overlays

The APH Plant Overlays were designed to be used with either the APH Light Box or APH Mini-Lite. The overlays help reinforce many of the plant concepts explored throughout this guidebook. Visual contrast and tactile elements make the overlays ideal for use with students who have visual impairments, but all students can enjoy them.

This section includes activities for using the plant overlays to review parts of a bean seed, seedling, flower, leaf, taproot system, tree and log cross-section. There are also overlay activities for reviewing characteristics of leaves: vein type, margin type and growth pattern.

A complete list of the APH Plant and Leaf Type Overlays follows. Please note that two overlay trays are included.

I. 8.5"x 11" Plant Overlays

A. Bean Seed (Cross-Section) [5 cards]
B. Seedling [6 cards]
C. Flower [8 cards]
D. Leaf [6 cards]
E. Taproot System [5 cards]
F. Tree [6 cards]
G. Log Cross-Section [7 cards]

II. Leaf Type Overlays

A. Growth Patterns

1. Simple [4 cards]
2. Compound [4 cards]
3. Double Compound [4 cards]

B. Vein Types

1. Pinnate [4 cards]
2. Palmate [4 cards]
3. Parallel [4 cards]

C. Margin Types

1. Smooth [4 cards]
2. Wavy [4 cards]
3. Toothed [4 cards]

III. Trays

A. Tray to hold 8 1/2 x 11" overlay cards

B. Tray to hold 4 5/32 x 3 13/16" overlay cards

Plant Overlays: Suggested Activities

The following activities demonstrate how the APH Plant Overlays can be used to learn about parts of a flower. Similar types of overlay activities can be used to study parts of a bean seed (cross-section), leaf, seedling, tree, taproot system and cross-section of a log. The overlays are best used with the APH Light Box or the APH Mini-Lite. However, the enclosed trays, designed to slip snugly under a light box ledge, can also be used alone. Simply insert a white 8 1/2" x 11" sheet of paper into the tray before applying overlays. The 8 1/2"x 11" tray will provide a secure work area for manipulating the Plant Overlays.

Explore Parts of a Flower

Place the OUTLINE card in the 8 1/2" x 11" tray. Isolate various parts of the flower for the student by positioning various "part overlays" on top of the OUTLINE card. The name of the part and the part itself will be visible. Adding the TACTILE card on top of the "part overlay" helps to confirm what the student perceives visually.

Build a Flower

Initially place the OUTLINE card in the 8 1/2" x 11" tray. Then have the student add each "part overlay" until all overlays are added and a complete colored image of the flower emerges. Placing the TACTILE card on top will add the finishing "touch."

Name that Flower Part

Place the OUTLINE card in the 8 1/2" x 11" tray. Place one of the "part overlays" on top of the OUTLINE card. Conceal the name of the part with your hand or opaque paper. Ask the student to identify the highlighted part. The more advanced student may be able to describe the function of each part as well. The TACTILE card can be applied for additional sensory information.

Color a Flower

Make a paper copy of the OUTLINE card and outline the flower with puff ink. The student can enjoy coloring the raised image of the flower with crayons and markers.

Make a Book about Flowers

Use a photocopier to make paper copies of the OUTLINE card of the flower. Make as many copies as there are flower overlays. Have the student color a different flower part on each copy. The student may also like to print or braille the name of the colored part on the paper as well as what she knows about the highlighted part. Make a cover page for the book by creating a raised line and colored image of the whole flower, along with the student's name and date. The student may also like to write a story about a flower and then add their colored drawing or tactile design as the front cover.

Trace a Flower

If a light box is available, a student with some functional vision may enjoy tracing the OUTLINE image of the flower using a sheet of tracing paper. The creation could be used for the student's "Flower Book."

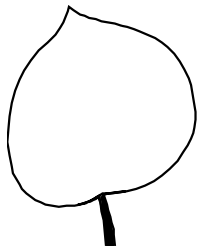
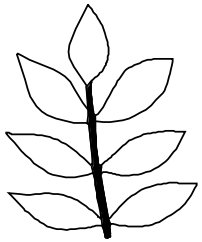
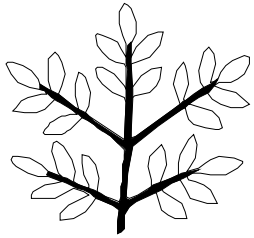
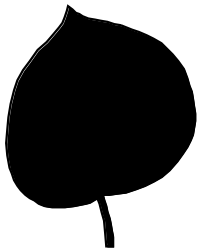
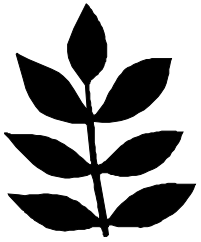
A Touchable Flower

If a student is a tactile learner, use both a real flower and the thermoformed image of the flower to review its main parts. Examine the real flower. Keep the flower handy while the student explores the tactile image. Encourage the student to explore the TACTILE card systematically and methodically, starting at the base of the flower's stem and tracking her finger upward to identify each part encountered along the way. Have the student examine a petal of the real flower and then trace with her finger the full shape of the tactile petal. Ask the student to describe how the real flower differs from or resembles the thermoformed image of the flower.

Leaf Type Overlays: Suggested Activities

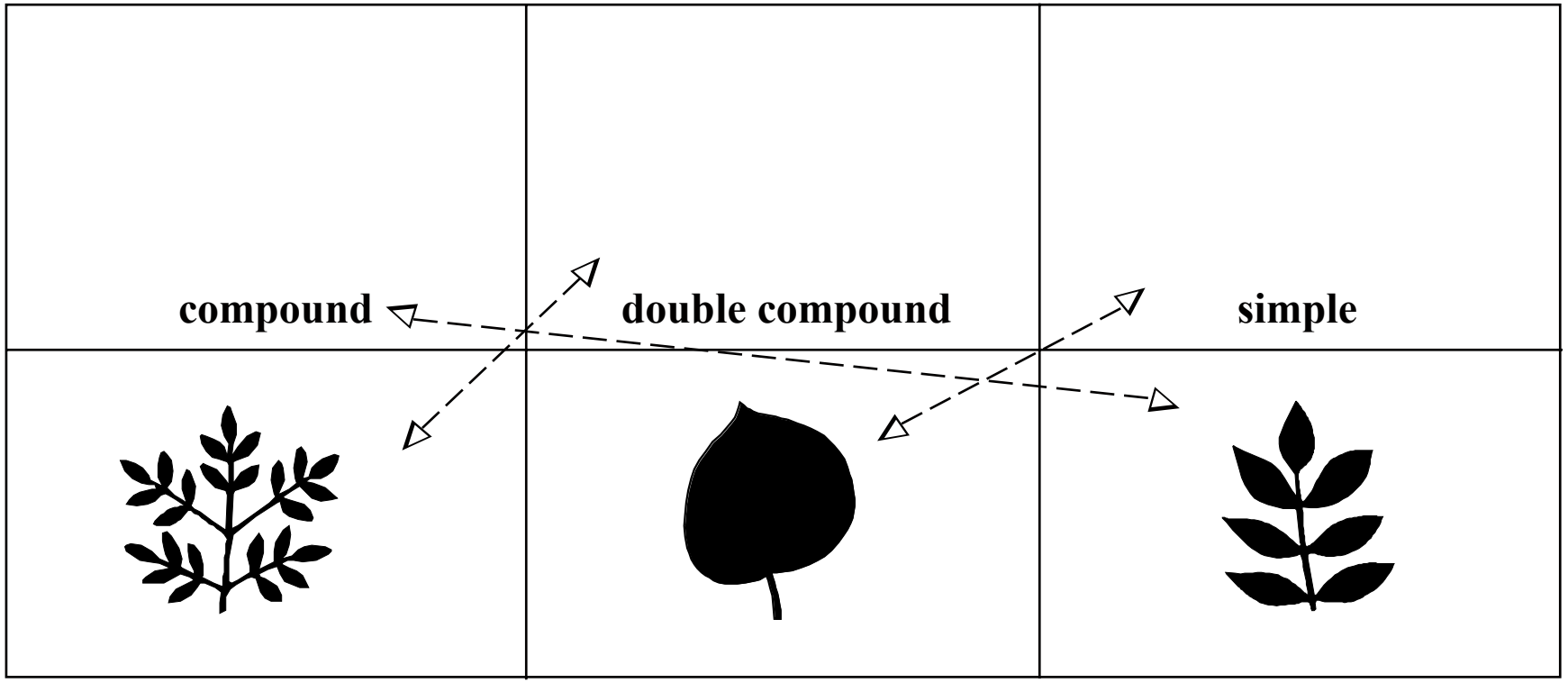
The next five pages include activities that use Leaf Type Overlays to learn about leaf concepts: growth patterns, leaf margins and leaf veins. These overlays are recommended for use with the APH Light Box or the APH Mini-Lite. However, the enclosed trays, designed to slip snugly under a light-box ledge, can also be used alone. The provided 2x3 tray will help keep Leaf Type Overlays stationary and aligned while students explore them.

MATCH IT!

 **simple**	 **compound**	 **double compound**
 **simple**	 **compound**	 **double compound**

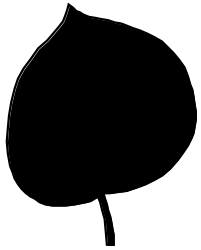
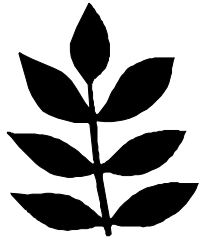
<u>ACTIVITY</u>: Place OUTLINE cards showing the three different growth patterns across the top row of the tray. Have the student locate the matching COLOR card and NAME card and place both in the tray below the appropriate OUTLINE card. [This activity can also be used to review vein types and margin types.]

LEAF SHUFFLE



ACTIVITY: Randomly put the NAME cards of the growth patterns across the top row of the tray. Then randomly place the COLOR cards of the three growth patterns across the bottom row of the tray. Have the student move the COLOR cards around until all match up correctly with the leaf NAME cards. Or, when the student finds the matching COLOR card, have him/her place it directly on top of the NAME card. The student can check her answers by placing the OUTLINE cards in the bottom row to see if the COLOR cards and NAME cards are paired correctly. [This activity can also be used to review vein types and margin types.]

THE REAL DEAL

(Real simple leaf)	(Real compound leaf)	(Real double compound leaf)
		
simple	**compound**	**double compound**

<u>ACTIVITY</u>: Place real leaves across the top row of the tray, one representing each of the three growth patterns. Leaves may vary in appearance from the pictured leaves, but must be either simple, compound or double compound. Have the student identify the real leaves by growth pattern and place the corresponding OUTLINE cards, COLOR cards, NAME cards, or TACTILE cards in the bottom trays. [This activity can also be used to review vein types and margin types.]

A PILE OF LEAVES

simple	compound	double compound
COLOR card **NAME card** **OUTLINE card** **TACTILE card**	**COLOR card** **NAME card** **OUTLINE card** **TACTILE card**	**COLOR card** **NAME card** **OUTLINE card** **TACTILE card**

ACTIVITY: Place the OUTLINE CARDS of the three growth patterns into the upper tray compartments. Have students sort the remaining growth pattern overlays according to type. The TACTILE card, ideally, should be the last applied to each "pile of leaves." [This activity can also be used to review vein types and margin types.]

NAME THAT LEAF

	(INSERT REAL LEAF)	
GROWTH PATTERN (OUTLINE card)	**VEIN TYPE (OUTLINE card)**	**MARGIN TYPE (OUTLINE card)**

ACTIVITY: Place a real leaf in one of the upper tray compartments. Then using the OUTLINE cards of the various growth patterns, vein types and margin types, have the student se lect the appropriate growth pattern card, vein type card and margin type card that correctly describes the real leaf. The three defining cards can be placed across the bottom row of the tray.

APPENDIX C
Simple Plant Activities for Home or School

Make a pine cone bird feeder with seeds and peanut butter. Roll a pine cone in peanut butter (or spread with a plastic knife) and roll in birdseed. Attach a string, ribbon or wire to the top of the pine cone and hang from a nearby tree to attract birds that stay for the winter.

Pull weeds from a flower or vegetable garden.

Explore the stems of cherries, apples, pickles, pumpkins, etc.

Cut open various fruits and vegetables and explore the seeds found inside. Remove the seeds and let them dry out. Once dry, use the different colored seeds to decorate a wreath made from heavy cardboard.

Take a hike through the woods and witness how many bumpy roots are encountered along the surface of the trail.

Plant bulbs (tulips, lilies, etc.) in the fall and await their blooming in springtime. Keep count of the number of days or months until their arrival.

Visit a rose show and smell the many fragrances and observe the beautiful colors.

Discuss the importance of recycling products made from trees (such as newspapers, cereal boxes, office paper and cardboard).

Discuss the many ways flowers are used: to create a bouquet for a bride; to send to friends and family on special occasions like

birthdays and anniversaries; to soften and brighten the outside landscape and appearance of a house; to add a sweet fragrance to a home; etc.

Rake and bag leaves in the fall.

Find a tree stump and estimate the age of the once-existing tree by counting the growth rings.

Interview friends and family members about their favorite kinds of flowers. Which flower is the favorite among those interviewed?

Volunteer to plant a new tree for a school, church, elderly person, etc.

Make clay or playdough models of flowers. Explore and discuss plants that grow wild (such as cattails, milkweeds, honeysuckle and dandelions).

Visit various places where flowers grow (gardens, pastures, fields, yards, greenhouses, etc.).

Cut some flowers and place them in a vase filled with water. How long do the flowers last before they start to wilt? What are some characteristics of wilting flowers (dry leaves, fallen petals and brown edges).

Collect an assortment of leaves and line them up in a row from smallest to largest.

Flatten and dry some leaves by pressing them between pages of a heavy book for about six weeks. Then paste the leaves to pages of a homemade "leaf" book.

Write a poem or story about a tree or flower. Create collages or pictures made from fall-colored leaves.

Create a tree with bare branches from corrugated cardboard and hang it on a wall. The child can enjoy attaching real leaves or cardboard leaf shapes to the branches.

Discuss different uses of trees: to hang swings from, to picnic or read a book under, to cool a house and protect it from direct sunlight or to provide a home for animals.

Select a seed packet from the nursery store and learn about how deep to plant the seeds, how close together the seeds should be planted, what time of year to plant the seeds and how high the plant will eventually grow.

Investigate what types of flowers grow best in shade, partial shade, or direct sunlight. Pull grass and weeds that have come up between brick or concrete sidewalks or driveways.

Paint a clay flower pot and then plant a favorite flower in it, water the flower, give it needed sunlight, and watch how it grows.

Create a bouquet of flowers using real or silk flowers. Use the colorful creation as a centerpiece for a table.

Decorate a grape wreath with silk flowers, adorn with a bow, and hang on an entry door.

With adult supervision, explore various types of garden tools (trowels, soaker hose, shovels, garden carts, rakes and wheelbarrows) and learn how to use them.

Draw eyes, nose and a mouth on a styrofoam cup and fill it with dirt. Plant rye grass, water as needed, and watch the grass grow into “hair.”

APPENDIX D
Resources

AIMS (Activities Integrating Math & Science)
1595 S. Chestnut Avenue
Fresno, CA 93702
(209) 255-4094

Burpee Seed Company
032763 Burpee Building
Warminster, PA 18974
1-800-888-1447

Delta Education, Inc.
P.O. Box 3000
Nashua, NH 03061-3000
1-800-442-5444

Carolina Biological Supply Company
2700 York Road
Burlington, NC 27215-3398
1-800-334-5551

In-Print for Children
2270 Mount Carmel
Glenside, PA 19038
(215) 885-2722

Johnny's Selected Seeds
Foss Hill Road
Albion, ME 04910
(207) 437-9294

Lawrence Hall of Science
Great Explorations in Math and Science (GEMS)
University of California, Berkeley
#5200
Berkley, CA 94720-5200
(510) 642-7771

Montessori Services
836 Cleveland Avenue
Santa Rosa, CA 95401
(707) 579-3003

NASCO (Fort Atkinson)
901 Janesville Avenue
P.O. Box 901
Fort Atkinson, WI 53538-0901
1-800-558-9595

National Arbor Day Foundation
100 Arbor Avenue
Nebraska City, NE 68410
(402) 474-5655

National Gardening Association
180 Flynn Avenue
Burlington, VT 05401
(802) 863-1308

National Park Service
Interior Building
P.O. Box 37127
Washington, DC 20013-7127
(202) 208-4747

National Science Teachers Association
Science Store
1840 Wilson Boulevard
Arlington, VA 22201-3000
1-800-722-NSTA

Pitsco Innovative Education
P.O. Box 1708
Pittsburg, KS 66762
1-800-835-0686

Stokes Seeds, Ltd.
Box 548
Buffalo, NY 14240-0548
(716) 695-6980

U.S. Department of Agriculture
412A Jamie Whitten Building
Washington, DC 20250
(202) 720-2798

USDA Forest Service
P.O. Box 96090
Washington, DC 20090-6090
(202) 205-1760

Washington Agriculture in the Classroom
P.O. Box 786
Ellensburg, WA 98926
(509) 962-4134

GLOSSARY

Annual
A plant that lives for a single year or season.

Apex
The pointed end of the leaf blade.

Bark
The protective outer covering of stems, branches and roots of a tree or other plant.

Blade
The broad, flat part of a leaf.

Branch
A woody extension growing from the main trunk of a tree or other large plant.

Broadleaf Tree
A tree that has broad, flat leaves as opposed to needlelike leaves.

Bulb
An underground bud that sends down roots and has a very short stem covered with leafy layers.

Cambium
A thin layer between the wood and bark that forms new wood and bark.

Compound Leaf
A leaf divided into a number of leaflets.

Conifer
A non-flowering tree that grow seeds in cones and is identified by needlelike leaves.

Deciduous Tree
A tree that sheds its leaves in autumn and stays dormant during the winter.

Double Compound Leaf
A leaf with leaflets further divided into smaller leaflets.

Embryo

The tiny plant inside a seed.

Evergreen Tree

A tree that does not lose its leaves all at once but gradually all year round.

Fibrous Root System

A root system that lacks a main root but consists of many tiny roots.

Flower

The reproductive part of any plant.

Fruit

The part of a plant that encloses and protects the seeds.

Germination

The development of the embryo of a seed into a young plant.

Growth Ring (or **Annual Ring)**

A circle of wood formed during new growth of a woody stem.

Heartwood

The center part of the tree that is no longer alive and supports the tree.

Leaf

A flat, thin and usually green part that grows out from the stem of a plant or tree.

Leaf Margin

The outer shape of a leaf; it can be smooth, wavy, or toothed.

Leaflet

One of the divisions of a compound or double compound leaf.

Loam

A rich soil composed of clay, sand and some organic matter.

Midrib

The main vein that appears as a line in the center of a leaf. Smaller veins are connected to the midrib.

Nectar

A sweet liquid inside many flowers. It attracts insects and is used by bees to make honey.

Ovary

The bottom part of the pistil that contains the ovules (eggs).

Palm

A tree with parallel-veined leaves that grows in warmer regions.

Palmate-Veined Leaf

A leaf with veins that spread apart like fingers on a hand.

Parallel-Veined Leaf

A leaf with veins that do not meet or connect.

Perennial

A plant that blooms year after year.

Petals

The outer part of the flower, usually brightly colored, that protects the female and the male parts of a flower.

Petiole

The leafstalk that attaches to the leaf blade and carries food and water to and from the blade.

Photosynthesis

The process by which the leaf turns sunlight into energy for the plant.

Pinnate-Veined Leaf

A leaf with veins that form a feather-like arrangement.

Pistil

The seed-bearing part of a flower that is composed of the stigma, style and ovary.

Pollen

A yellowish powder formed within the male part of the flower.

Pollination

The process by which pollen grains move from a stamen to a pistil.

Root

The underground portion of a plant that holds the plant in place, absorbs water and nutrients from the soil, and stores food.

Root Hairs

Hairlike projections that grow from the tip of the root and absorb almost all the water and nutrients taken in by the roots.

Sapwood

The newest part of the tree that carries water and minerals from the roots to the leaves.

Secondary Root

A root that branches off the main root as observed in a taproot system.

Seed

The part of a plant that contains the embryo from which a new plant grows.

Seed Coat

A tough, outer covering that protects the seed from injury, insects and loss of water.

Seedling

A very small or young tree or plant grown from seed.

Sepals

Tiny leaf-like or petal-like structures below the petals that cover and protect the flower bud before it opens.

Simple Leaf

A leaf with only one flattened blade.

Soil

The surface layer of the earth that supports plant growth.

Stamen

The male part of the flower that holds pollen grains.

Stem

The main stalk or trunk of a tree, shrub or plant from

which leaves, fruit and flowers grow.

Taproot System

A system of roots that consists of a main root growing straight down with other roots branching from it.

Tuber

A short, thickened portion of an underground stem, such as a potato.

Vegetable

A root, stem, leaf or flower that is grown to be eaten.

Vein

A thin tube in a leaf that carries water and food to and from leaf cells.

Weed

A plant that is considered undesirable or troublesome.

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Sense of Science: PLANTS invites active exploration of the "world of science" related to plant life. Using this set of materials, students with visual impairments and multisensory needs can learn about soil, seeds, stems, flowers, trees, and leaves. The materials include

- an easy-to-use guidebook with numerous hands-on activities,
- tactile and visual overlays designed for APH light boxes, and
- two accompanying trays to hold provided overlays.

Complete Kit: Catalog No. 1-08980-00
Large Type Guidebook only: Catalog No. 7-08980-00