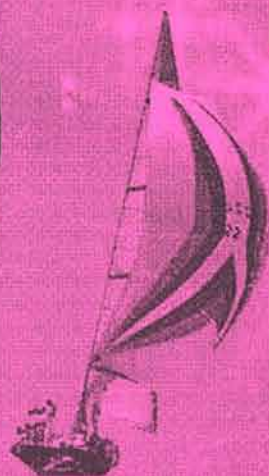




Science Extravaganzas! Librarian-Tested, Librarian-Approved

by Janice VanCleave



Texas State Library and Archives Commission, Library Development Division, 1998

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By: Janice VanCleave

Texas State Library and Archives Commission
Library Development Division
Austin, Texas

September 1998



**TEXAS STATE LIBRARY AND ARCHIVES
COMMISSION CATALOGING
IN PUBLICATION DATA**

VanCleave, Janice Pratt.

**Science extravaganzas! : librarian-tested,
librarian-approved / by Janice VanCleave. --
Austin, Tex. : Texas State Library and Archives
Commission, Library Development Division, [1998]**

118 p. : ill. ; 22 x 28 cm.

"September 1998."

Includes bibliographical references (p. 91-111).

- 1. Science—Experiments—Study and teaching—Juvenile literature. 2. Science projects—Juvenile literature. 3. Scientific recreations—Juvenile literature. 4. Library outreach programs—United States. 5. Libraries and education—United States. I. Texas State Library and Archives Commission. Library Development Division. II. Title.**

507.8

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INTRODUCTION

BY MARY STANTON

As you open this manual and begin to explore the world of science in the library, you must be wondering why on earth someone would want to do science in the library. Here's how it started: One summer, the local school system offered free summer school to all students. The schools made field trips to the public libraries, who were faced with groups of 200 or more children. One children's librarian's solution was to present scientific demonstrations. That "crazy" idea was the germ that started the successful science program at my branch library.

This past summer, a father brought his son to a preschool science experiment on his wife's orders. His initial reaction was puzzlement. As they were leaving, he exclaimed, "This is wonderful! We'll be back!" That's reason enough for this program to continue at my branch library.

WHO, ME? WHY THE LIBRARY?

Why science in the library of all places? First, the library is a storehouse of information, including scientific resources. Second, if you can follow the instructions for a craft or a recipe, you can follow the steps of an experiment. Also, science education has been lacking in the United States in past years, especially for girls. Science programs are a way to get children excited about science and introduce scientific concepts even to preschoolers. In addition, for large groups (including homeschoolers) scientific demonstrations

are dramatic and supplement the curriculum. Literature and science can be combined in the same way art and literature often are. For example, *The Very Hungry Caterpillar* by Eric Carle can be followed by a science experiment instead of a craft.

Finally, science programs are a way to use science materials at times when they normally sit on the shelves, such as during the summer.

HOW DO YOU OVERCOME YOUR "I CAN'T DO SCIENCE" FEARS?

First, practice the experiments and read the supplementary materials. That's how any new skill is learned. Realize that it's okay to read the explanation from this manual or from any book. Children need to know that you aren't making it up and that they can find the answer in a book too. Then, if a question is asked that you can't explain, either say you will find the answer later or challenge the older children in the group to find the answer themselves.

The very nature of an experiment assumes that you do not know the answer and that there is a possibility of failure as well as success. We don't like to admit to failure, but some of the hard and fast rules in this manual are the results of failures. The "most important rule" in the Basic How-To's section resulted from a major mistake. One hour before the program, we frantically tried to get the planned experiment to work to no avail. With the aid of staff

members we prepared Plan B: blowing bubbles. When show time arrived, the experiment was a failure, but the Plan B was enjoyed thoroughly by the 50 preschoolers. Later that day, a mother told us her children went home and worked until they got the experiment to succeed! this was an exciting result of a supposed failure.

WHO WILL DO THE EXPERIMENTS?

Some of the many possibilities include:

- A **librarian**, i.e. YOU. You don't need a Ph.D., just preparation and a desire to learn. Maybe a member of your library's staff would do the experiment for you or with you.
- A **parent**. Ask for parents who have scientific or education backgrounds to volunteer.
- A **teacher**. Ask your local schools or universities.
- A **docent** from a science museum or a volunteer from a science organization (see appendix).
- A **science editor** from the local newspaper.
- A **teen volunteer** who needs to do a volunteer project or is just interested in science and children.

With all volunteers, a trial is recommended. Find out if they can talk on the children's level without talking down to them or over their heads.

BASIC HOW-TO'S

Registration

In order to prepare the correct amount of materials, registration is highly recommended. Because of the

popularity of these programs, telephone registrations are not recommended. On the other hand, better turnouts occur if registrants are called the day before and reminded of the program.

Facilities

- You will need a meeting room or a large area to use. Otherwise, consider demonstrations and take-home projects, or taking your "show" on the road.
- You will need either large tables or butcher paper to act as paper "tables."
- If you have carpeting that shows stains readily, you will want to avoid performing experiments with liquids.

Staff

Extra staff or volunteers will be needed for set up, distribution of materials, and clean up. If you are on your own, caregivers are another source of help. All children (even preschoolers) can be taught to throw away trash.

Budget

If your library does not provide funds, you will need to choose experiments that use household items or things that are inexpensive to buy. You can also try seeking local sponsors. The experiments in this manual were designed to be produced inexpensively.

Tips for a Successful Presentation

- In the event of latecomers, print the experiment instructions on a large sheet of paper and tape it to the wall.
- Fold the bottom up so only step 1 shows and secure

it. As you do the experiment, you will unfold the paper to reveal each step. You may also print the instructions on a chalk or white board and tape a piece of paper over the steps not yet shown. Uncover each as you come to it.

Display

If your meeting room is not located next to the children's area, be sure to display books related to the experiment topic in the meeting room.

Publicity

Advertising is important for any new program, but especially for one as different as this. Our original title for the preschool science programs was "Discovery Time" and "Discover!" for the elementary grades. Because they have been so successful, we are presently able to label them as science programs.

Bulletin Boards

Science bulletin boards can be used in a variety of ways:

- To expand an experiment.
- To illustrate a scientific concept such as metamorphosis.
- For hands-on demonstrations.

The Most Important Rule

Don't advertise an experiment until you have tested it. It may look great on paper but not work for you. This one rule can save you many headaches.

EXPERIMENT FORMAT

Each subject section is divided into experiments with age designations. A list of supplies is provided for each experiment along, with suggestion for preparation. Step-by-step instructions are provided, as well as scientific explanations. Related books are listed for storytimes, display purposes, or curriculum enrichment.

Ages for experiments are suggested, but keep in mind that what works as a demonstration for preschoolers can be used as a hands-on experiment for elementary ages. Flexibility should be allowed as much as possible.

PRESCHOOL EXPERIMENT HOW-TO'S

- The age range is usually 18 months to five years. Parents or caregivers are required to stay in the room; therefore, registration is lower than for the other ages. Determine how many children and adults can fit in the designated area and set that number as your limit.
- Nap time must be considered when you schedule a preschool experiment.
- Any sharp or small objects should be handed to the caregiver rather than the child. The other materials are packaged and handed out as the children come in with statement to wait for instructions. If your library has lots of staff or volunteers materials can be distributed during the program.
- A roll of paper towels should be provided on each table.

- As a rule, avoid using liquids with preschoolers.
- Preschool experiments can be part of a storytime.
- Total program length is usually 30 minutes.
- How to do the actual experiment:

Introduce the subject of the experiment either with a simple oral explanation, a colorful chart or diagram, or a simple book. Do the experiment step by step. (Ringing a bell or clapping your hands is useful for regaining their attention for the next step.) Ask appropriate questions as the experiment progresses; wonderful discoveries can be made if the children and their caregivers know to report their findings. Conclude the experiment with a summary of the group's findings. Preschoolers love to show off their experiments to the presenter. Encourage parents to check out the display books and try experiments at home.

ELEMENTARY SCIENCE HOW-TO'S

- The age range is generally 5-12 years.
- The registration limit can be higher as caregivers do not have to accompany the children.
- All the materials can be placed on the tables ahead of time unless an item is sharp or very small. Don't forget paper towels.
- Instead of the library storing 50 jars, etc., consider asking the children to bring an item with them. (This works well if you phone the day before to remind them.)
- Session length is generally 45 minutes to one hour.
- If using vinegar or other liquids, you will want to give a "wait for instructions" warning.

- How to do the actual experiment:

The introduction can be more oral than visual. Once again, do the experiment step by step. Ask lots of questions and encourage the children to respond. A book can be incorporated before or after the experiment. Summarize the experiment results. Suggest other ways the same scientific principles could be done at home or encourage the children to check out a display book.

TEEN SCIENCE HOW-TO'S

- The age range is 13 years and higher.
- Publicity is necessary, especially if the teens will be asked to bring a prepared item.
- Experiments will have to have a lot of teen appeal unless you already have a captive audience.
- Program length can run longer than 1 hour.
- How to do the actual experiment:

The experiment will need an introduction, usually oral. The chosen experiment will determine how you proceed (e.g. if it is a contest, it will be conducted differently than an actual experiment).

FAMILY GROUPS

- If there is a wide range of ages, try to do demonstrations, use outside performers, or provide take-home sheets.
- If demonstrating an experiment, assign a task to each child.
- Program length will vary with ages.

CHILDREN WITH SPECIAL NEEDS

Try to find ways to accommodate children with special needs. Extra help will be needed. For the visually impaired, use experiments that involve the senses of smell, touch, taste, or hearing. For the hearing impaired, written instructions or one-on-one help should be provided.

THINGS PARENTS CAN DO AT HOME

- Perform the take-home projects included in this manual with your child.
- Continue the experiment at home (for example, grow the seeds).
- Check out experiment books and try other experiments.
- Read books on the experiment topic or other science topics. Related fiction is a good choice too.
- Point out science in everyday life:
 - ☞ Measurements in recipes
 - ☞ Chemical reactions in cooking
 - ☞ Distance measurements (walking or driving)
 - ☞ Gardening provides a lot of topics such as what earthworms do, how seeds grow into plants, etc.
 - ☞ Bath time can provide a time to experiment with bubbles, water, etc.
 - ☞ Almost any daily activity can be related to science!

GUERRILLA SCIENCE (OR, HOW TO ADD SCIENCE AT ODD TIMES)

Besides adding science to storytimes, you could:

- Point out the science in craft projects.
- Use a science demonstration as part of a school visit.
- Develop a science pathfinder
- Use science as part or all of a carnival.
- Present library skills lessons on how to prepare for a science fair project.
- Present after-school science programs.

HOW TO FIND THE MATERIALS

While most of the experiments in this manual use household items, you can also purchase actual scientific materials to present more elaborate programs. However, most children are impressed when everyday objects are transformed “magically” by science.

Sources of Purchased Materials

- Scientific Supply Companies (usually mail order)
- School Supply Stores
- Grocery Stores (for household items)

Sources of Household Items

- Parents or caregivers
- Staff

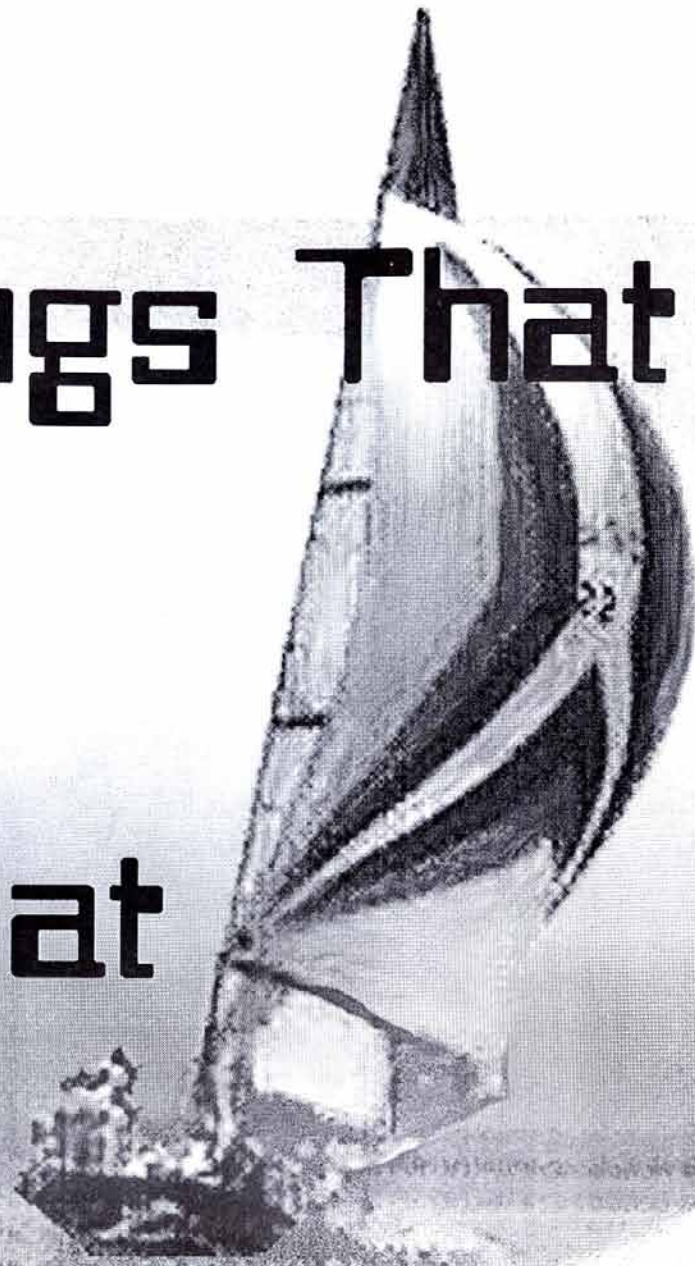
What to Save (a few examples)

- Empty, clean jars with lids
- Margarine tubs
- Empty film canisters

Things That Fly



and Float



THINGS THAT FLY AND FLOAT

BACKGROUND

Gravity is the force that pulls everything toward the center of the earth. Simply stated, gravity makes objects fall through the air or sink in liquids. Buoyancy is the upward push on an object in a fluid (liquid or gas) such as water or air. An object is said to be buoyant if it floats in a fluid. For example, boats are buoyant in water and airplane gliders are buoyant in air.

PRESCHOOL

FUN ACTIVITIES

THE GLIDER



Purpose:

Children will discover how some squirrels seem to fly.

Materials

- ▶ shoe boxes
- ▶ crayons
- ▶ scissors
- ▶ small paper clips

Caution: Take care with paper clips around very young children. They can choke on small objects.

Getting Ready!



Make 1 copy of **The Glider** for each person. (Figure 1.1 at the end of this chapter.) Using shoe boxes to distribute supplies, prepare one shoe box for each group of 4 to 6 kids. In each box, place 1 glider pattern per child, crayons, 1 or more pairs of scissors, and 2 small paper clips per child. Discuss the procedure steps, pointing out that each child is to help as much as possible.

What To Do!



1. Have each child color the two halves of the squirrel. The middle section doesn't have to be colored.
2. Cut around the outlines of the glider.
3. Fold the paper in half on fold line B, so that the two halves of the squirrel touch.
4. Fold along fold lines A and C so you can see the whole squirrel and attach the paper clips under the front end of the squirrel as shown.
5. As each child holds their squirrel from below, adjust the flaps so the squirrel's body is parallel to the floor.
6. Have each child throw the squirrel as they would a paper airplane.

So Now You Know



Flying squirrels do not really fly. They stretch skin out between their front and back legs and glide through the air when they leap from one branch to another.

TAKE HOME PROJECT

THE FLYING DRAGON

Make 1 copy of *The Flying Dragon* for each person.
(Figure 1.2 at the end of this chapter.)



Before handing out the copies of *The Flying Dragon*, tell the group that lizards in the rain forest of Asia, called flying dragons, also have extra flaps of skin along the sides of their bodies. The flying dragon, like the flying squirrel, is able to glide through the air for short distances.

FLYING AND FLOATING EXPERIMENTS IN JANICE VANCLEAVE'S SCIENCE BOOKS FROM JOHN WILEY AND SONS, NEW YORK.

VanCleave, Janice. *Play and Find Out about Science*
pp 70-73.



OTHER SCIENCE BOOKS ABOUT FLYING AND FLOATING

Coerr, Eleanor. *The Balloon Race*.

Harlan, Jean Durgin. *Science as It Happens*.

LITERATURE CONNECTIONS

Allen, Pamela. *Who Sank the Boat?*

Anderson, Joan. *Harry's Helicopter*.

Benjamin, Cynthia. *I Am a Pilot*.

Bunting, Eve. *Ducky*.

Calhoun, Mary. *Hot-Air Henry*.

Kroll, Steven. *The Magic Rocket*.

McPhail, David. *First Flight*.

Magee, Doug and Robert Newman. *Let's Fly from A to Z*.

Meyers, Bernice. *The Flying Shoes*.

Peet, Bill. *Merle the High Flying Squirrel*.

Ringgold, Faith. *Tar Beach*.

Siebert, Diane. *Plane Song*.

Wade, Allen. *I'm Flying*.

E L E M E N T A R Y

FUN ACTIVITIES

DANCERS



Purpose:

Children will learn that gases can make things float.

Materials

- ⇒ baby food jars or other small jars with lids
- ⇒ vinegar
- ⇒ egg shells from boiled eggs
- ⇒ paper towels

Caution: Do not use raw egg shells. They can contain harmful bacteria.

Getting Ready!



For each group of 4 to 6 children, fill 1 jar about three fourths full with vinegar. Secure the lids to prevent spills. Rinse the egg shells with water and allow them to dry. Break the shells into quarter size pieces. Each group will need two egg shell pieces. Ask one child from each group to place a paper towel on their work table. This child will then set the jar of vinegar on the paper towel and remove its lid. Ask a second child to place 2 egg shells on the table. Give the following instructions to the group.

What To Do!



1. Break each of the shell pieces into 4 to 6 smaller pieces.
2. One at a time, drop the shells into the jar.
3. Observe the egg shells in the vinegar.

So Now You Know



Bubbles immediately form on the shells. Within 2 to 3 minutes, the shells start to rise and sink in the liquid. These bubbles are carbon dioxide gas, which forms as a result of the combination of the chemicals calcium carbonate (egg shell) and acid (vinegar). The bubbles on the shells act like little life preservers and cause the shells to be buoyant. As the shells rise, some of the bubbles get knocked

away and the shells sink again. The shells continue to rise and sink in the liquid until they become so small that only a few bubbles will make them float. At this point, they float on the surface of the vinegar until all the calcium carbonate has changed. The thin membrane inside the shell will continue to float without the shell. It is buoyant even without bubbles.

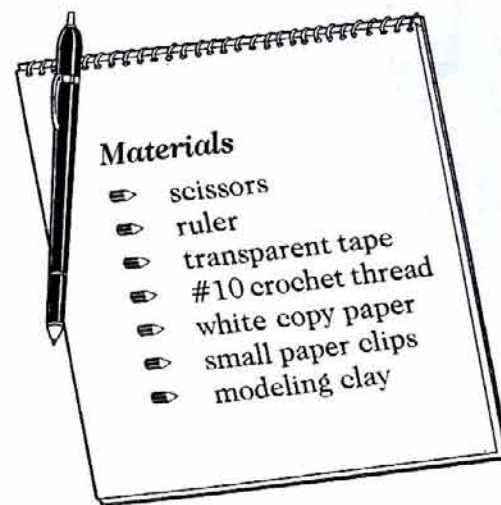
MORE FUN TO DO!

DRIFTER

Purpose:



Children will learn that air slows falling objects, especially those with a large surface, such as a parachute.



Getting Ready!



Prepare a supply table so that each group of 3 to 5 children will have 1 or more pairs of scissors, 1 ruler, 1 roll of transparent tape, and 1 ball of crochet thread. Each child will need 1 sheet of paper, 2 paper clips, and grape-sized ball of modeling clay. A list of supplies needed per group and a second list of supplies per child should be taped to the supply table. Ask each group to transport the needed supplies to their work table. Guide the groups so that each child perform the following steps to make a parachute. Note: Do not try to cut the string in advance, it usually gets tangled.

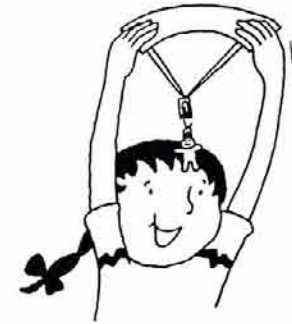
What To Do!



1. Cut four 12-inch pieces of crochet thread. Tape one end of each thread to each of the four corners of the paper.
2. Bring the four free ends of the threads together and tape them together.
3. Open one paper clip to make a hook. Tape the hook to the taped ends of the thread. You have made a parachute.
4. Shape a figure out of the clay and press it onto the other paper clip so that a small part of one end of the paper clip extends above the figure.

5. Attach the clip of the clay figure to the hook on the parachute.
6. Hold the short ends of the paper part of the parachute so that the clay figure hangs down. (See Figure 1.3 below.)

Figure 1.3



7. Raise the parachute in your hands as high as possible and drop it.

So Now You Know



Air fills and pushes up on the inside of a falling parachute. This makes the parachute fall slowly. Your clay figure floated down gently because it was attached to a parachute.

TAKE HOME PROJECTS

FLOATING BOAT



Make a copy of the Floating Boat for each person. (Figure 1.4 at the end of this chapter.)

*FLYING AND FLOATING EXPERIMENTS IN VANCLEAVE SCIENCE BOOKS
FROM JOHN WILEY PUBLISHER, NEW YORK.*



- VanCleave, Janice. *202 Oozing, Bubbling, Dripping, and Bouncing Experiments*, pp. 84, 87, 93.
- _____. *201 Awesome, Magical, Bizarre, and Incredible Experiments*, pp. 85, 111.
- _____. *200 Goopy, Slippery, Slimy, Weird, and Fun Experiments*, pp. 194-195.
- _____. *Oceans for Every Kid*, pp. 194-195.
- _____. *Physics for Every Kid*, pp. 148-151.

OTHER SCIENCE BOOKS ABOUT FLYING AND FLOATING

- Kenda, Margaret and Phyllis S., Williams. *Science Wizardry for Kids*, pp 94-103.
- Murphy, Pat, Ellen Klages, Linda Shore, and the Staff of the Exploratorium. *The Science Explorer*, pp. 51-64.
- Orii, Eiji. *Simple Science Experiments with Water*.
- Oxlade, Chris. *Helicopter*.
- Wiese, Jim. *Rocket Science: Flying, Floating, Flipping, Spinning Gadgets Kids Create Themselves*.

LITERATURE CONNECTION

- Allard, Harry. *The Stupids Take Off*.
- Allen, Pamela. *Mr. Archimedes' Bath*.
- Coerr, Eleanor. *The Big Balloon Race*.
- Kitamura, Satoshi. *UFO Diary*.
- Maris, Ron. *I Wish I Could Fly*.
- Provensen, Alice and Martin. *The Glorious Flight*.
- Wade, Alan. *I'm Flying!*
- Walter, Mildred Pitts. *Brother to the Wind*.
- Wolstein, Diane. *8000 Stones*.

T E E N S

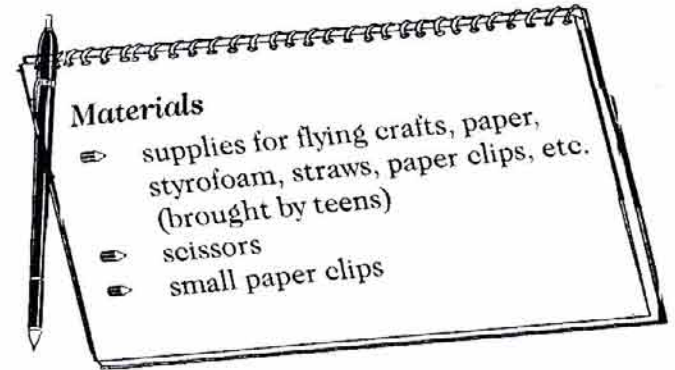
FUN ACTIVITIES

TWIRLER



Purpose:

To have a flying event in which the flying craft are made of simple supplies.



Getting Ready!



Prepare an announcement sheet for this event. The event title could be: Wings and Other Flying Things. Instruct teens to bring supplies and designs for their own special paper airplane or other flying craft made from household items, such as paper and styrofoam. Straws and paper clips can be added to this list. Invite teens to come with their own special paper airplane design. Encourage everyone to experiment ahead of time by reading books about paper airplanes and other flying things, such as the ones listed here. Start the event off by having everyone make the paper helicopter. Make 1 copy of the Twirler for each child. (Figure 1.5 at the end of this chapter.)

What To Do!



- * Pass out the copies of the Twirler and tell the group to follow the instructions on the paper.
- * After the group has dropped the Twirler several times and all have observed that it spins as it falls, ask them to find the answers to the following questions:
 1. What happens when more paper clips are added? (It falls faster and spins faster.)
 2. How can the Twirler be made to spin in the opposite direction? (Flip the wings in the opposite direction.)
- * Provide time for teens to make their own paper flying craft then allow them to test them. Depending on the crafts, flying contests can be held. Fastest? Longest in the air? Longest flying distance? Etc.

FLYING AND FLOATING EXPERIMENTS IN VANCLEAVE SCIENCE BOOKS FROM JOHN WILEY AND SONS, NEW YORK.



Janice VanCleave. *A+ Projects in Chemistry* pp. 123-128.

OTHER SCIENCE BOOKS ABOUT FLYING AND FLOATING

Hutchison, Michael. *The Book of Floating: Exploring the Private Sea.*

Simon, Seymour. *The Paper Airplane Book.*
The Visual Dictionary of Flight.

LITERATURE CONNECTIONS

Bellville, Cheryl Walsh. *Flying in a Hot Air Balloon.*

Bowler, Tim. *Midget.*

Byars, Betsy Cromer. *Coast to Coast.*

Carter, Alden. *Between a Rock and a Hard Place.*

Crouch, Tom D. *The Bishop's Boys: A Life of Wilbur and Orville Wright.*

Dubois, William Pene. *The 21 Balloons.*

Freedman, Russel. *The Wright Brothers.*

George, Jean. *There's An Owl in the Shower.*

George, Jean. *Who Really Killed Cock Robin?*

Hobbs, Will. *Downriver.*

Howard, Fred. *Wilbur and Orville: A Biography of the Wright Brothers.*

Jakab, Peter L. *Visions of a Flying Machine: The Wright Brothers and the Process of Invention.*

Jennings, Terry. *Flight: The Planes, Gliders, Helicopters and other Flying Machines.*

Kindl, Patrice. *Owl in Love.*

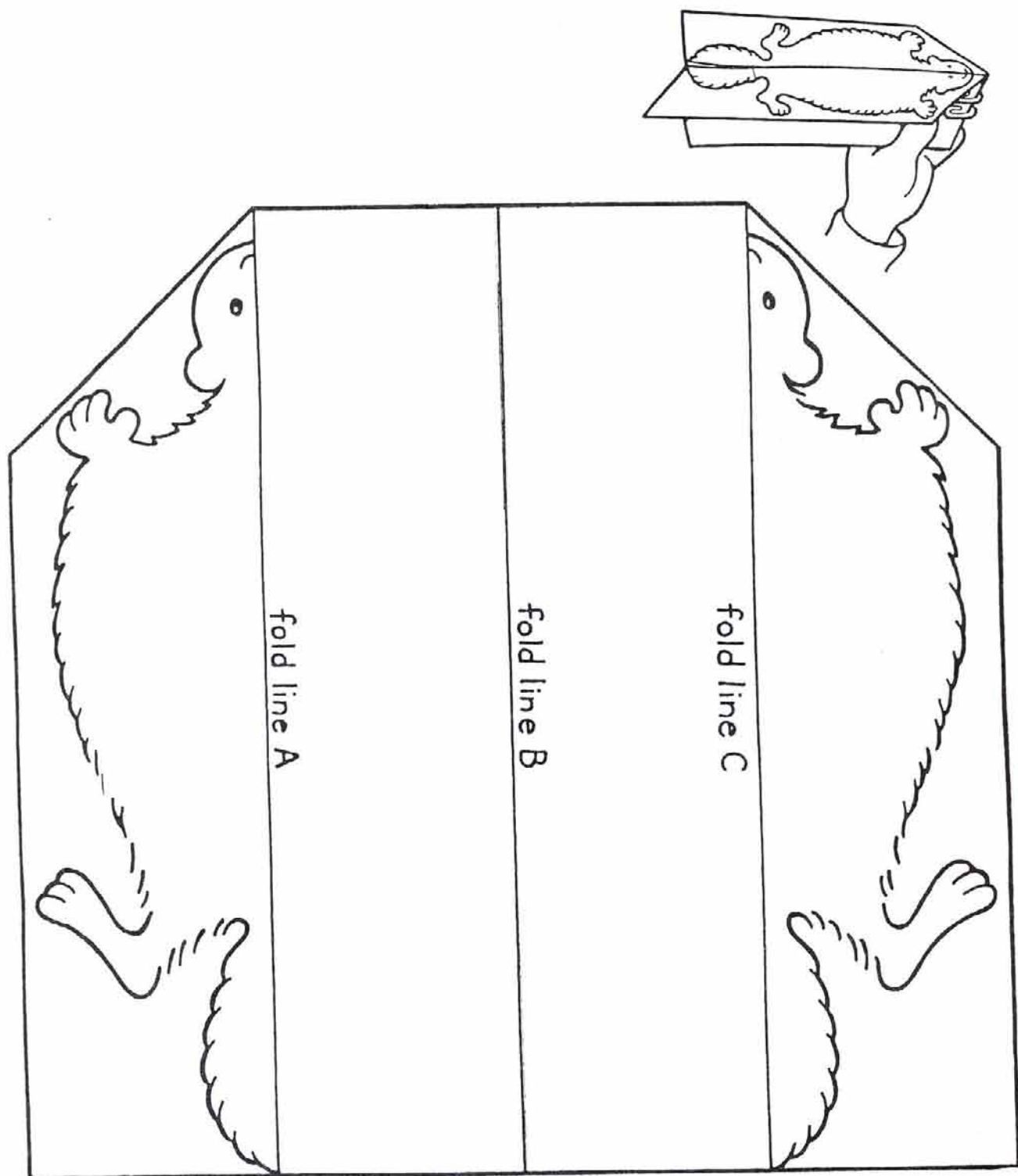
Paulsen, Gary. *Hatchet.*

Provensen, Alice and Martin. *The Glorious Flight: Across the Channel with Louis Bleriot.*

Schloss, Muriel. *Mary Cleve: Astronaut.*

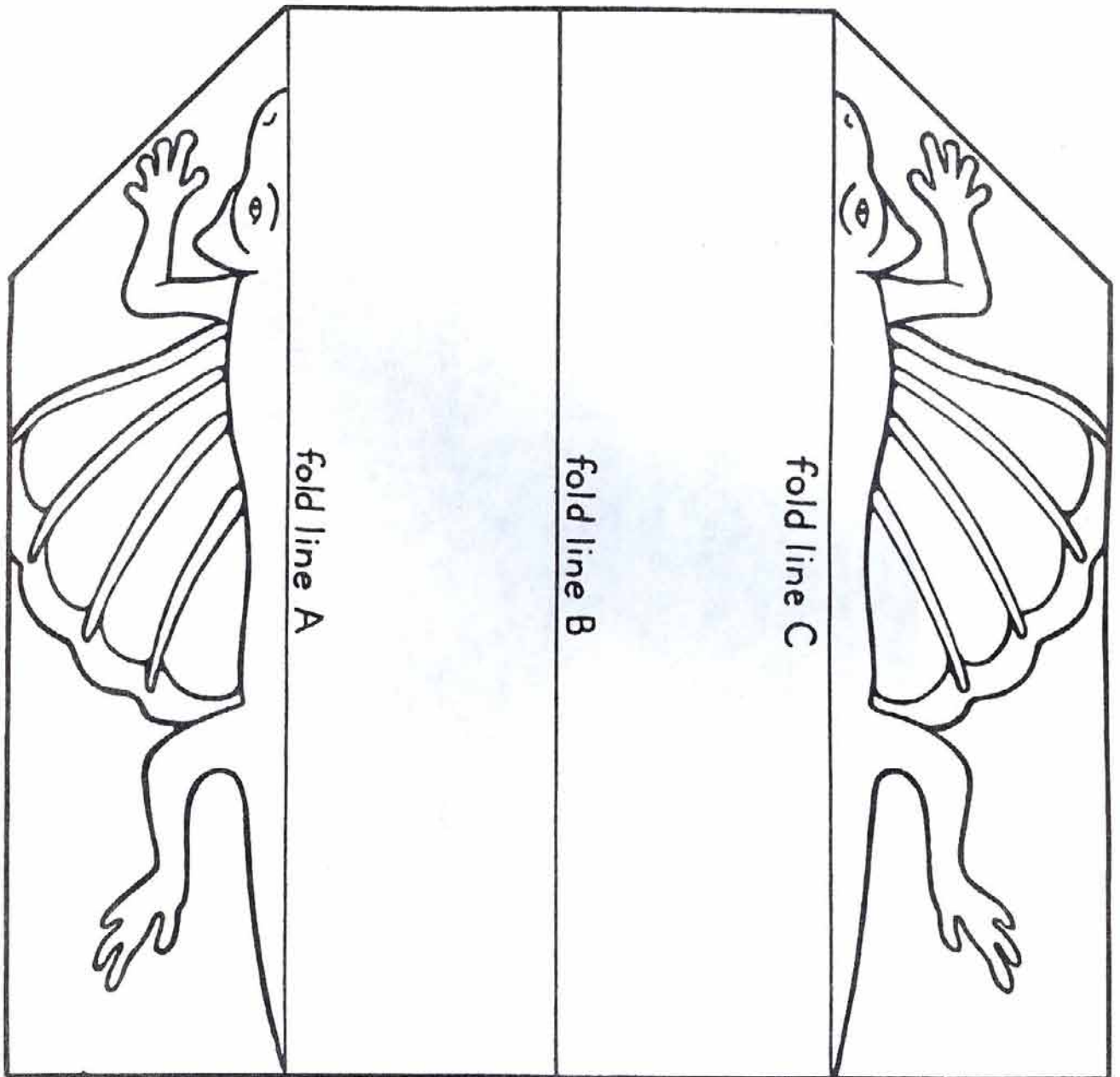
THE GLIDER

Figure 1.1



THE FLYING DRAGON

Figure 1.2



FLOATING BOAT

Figure 1.4

PURPOSE

To determine how a heavy ship floats.

Materials

scissors
ruler
aluminum foil
20 paper clips
small bucket
tap water

Procedure

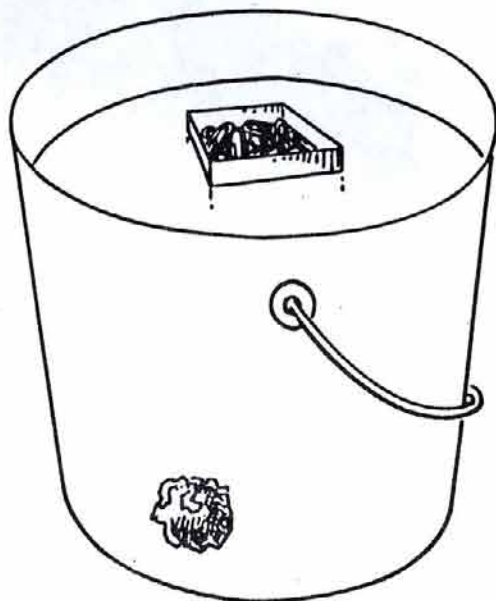
1. Cut two 12-inch (30-cm) squares from the aluminum foil.
2. Wrap one of the metal squares around 10 paper clips and squeeze the foil into a tight ball.
3. Fold the four edges of the second aluminum square up to make a small boat.
4. Place 10 paper clips in the boat.
5. Fill the bucket with water.
6. Set the boat on the water's surface in the bucket.
7. Place the metal ball on the water's surface.

Results

The boat floats and the ball sinks.

Why?

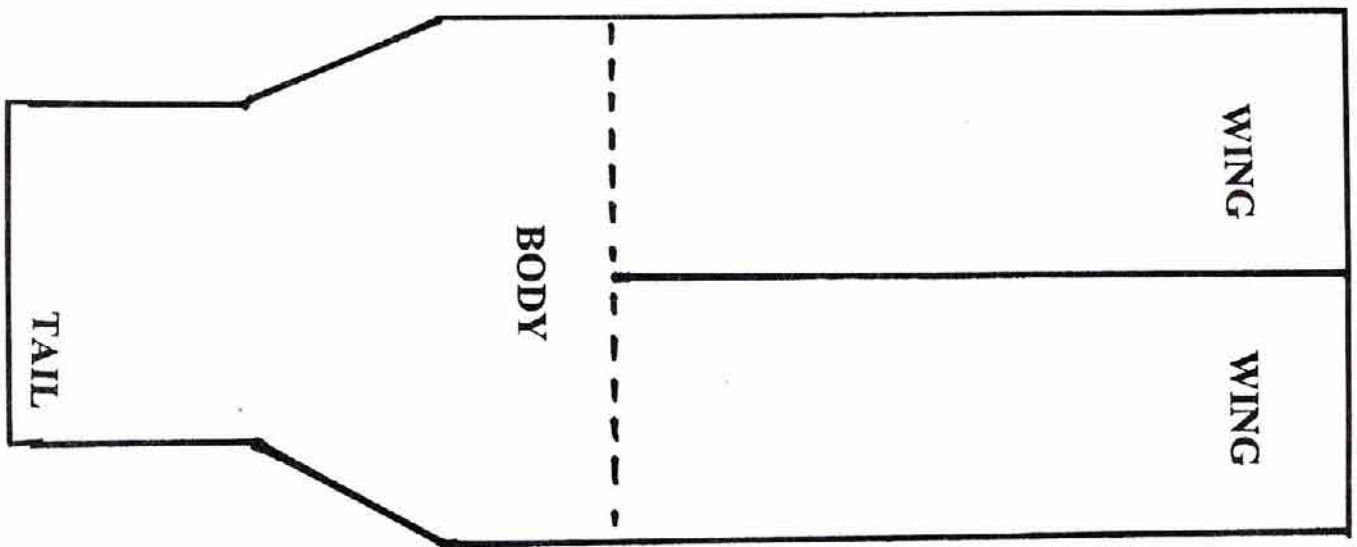
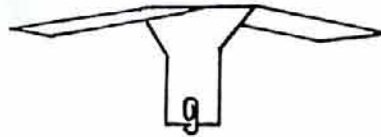
The ball and boat both have the same weight, but the ball takes up a smaller space than does the boat. The amount of water pushed aside by an object equals the force of water pushing upward on the object. The larger boat pushes more water out of its way than does the ball and thus there is enough upward force to cause it to float. Ships are very heavy, but they are large, which increases their buoyancy.



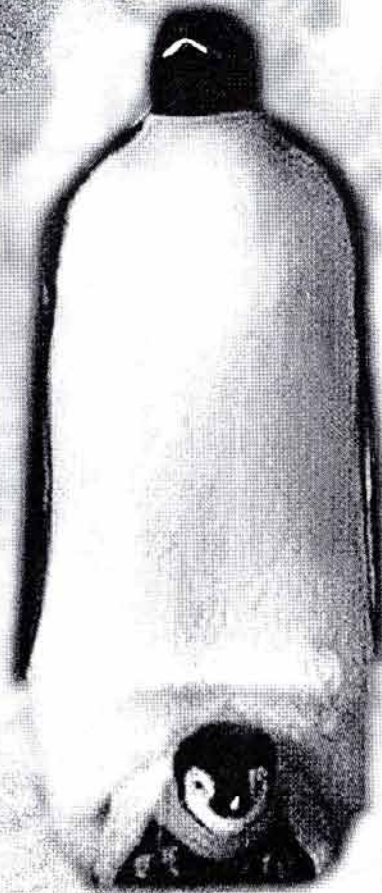
TWIRLER

Figure 1.5

1. Cut the twirler along the solid lines, including the line separating the wings.
2. Fold the wings along the dotted lines. Folding one wing forward, the other back.
3. After folding, lift both wings up to slightly unfold the paper.
4. Attach one paper clip to the bottom as shown on the twirler.
5. Hold the body of the paper and raise the twirler as high as possible. With the wings parallel with the floor and the tail pointing down, drop the paper.



Penguins



PENGUINS

BACKGROUND

The **Antarctic** is the coldest place on earth, but there are animals that live along its coastline. One of these animals that seems to be loved by many people is the penguin. These flightless birds stand upright on their legs like people and waddle around. They spend a great deal of time in the ocean and swim very fast. Not all penguins live in cold places, but all live in the Southern Hemisphere. There are 18 different species and no two species are exactly alike. The largest is the **emperor penguin** at about 42 inches tall and weighing more than 60 pounds. The smallest is the **fairy penguin** at about 16 inches tall and weighing less than 3 pounds. This unit provides activities to learn more about these “tuxedo-dressed” animals.

PRESCHOOL

FUN ACTIVITIES

SLOW SHUFFLE



Purpose:

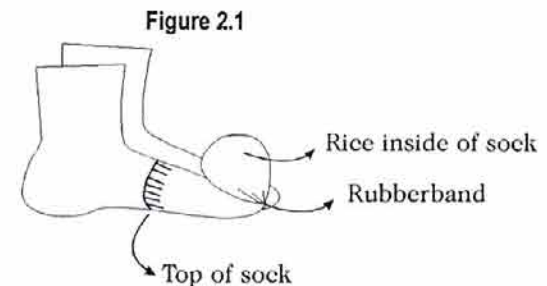
To model egg-carrying by male emperor penguins.



Getting Ready!



For each group of 3 to 5 children, prepare one sock by pouring a cup of rice into the toe of the sock. Then, secure the rice by wrapping the rubber band around the sock to make a pouch of rice in the toe. This pouch will be called the “egg.” Children will walk around with the egg on their feet. You can have them flap their arms slightly and waddle a bit as might a penguin when it walks. (See Figure 2.1 below.)



What To Do!



1. In each group, slip the sock over half of one of the children’s feet.
2. Flip the “egg” onto the top of the child’s foot.
3. Fold the top of the sock back over the “egg” to hold it in place.

4. Have the children stand with their feet together.
5. Have the children walk around by taking baby steps.
6. Repeat steps 1 through 5 with each child in the group.

So Now You Know



The top of the sock holds the “egg” on the foot as the child walks. Emperor females lay 1 egg, which the male rolls on top of its feet where it remains until it hatches. Like the pretend egg, the male penguin uses a skin flap to hold real eggs on top of their feet. This special flap on the bottom of their stomachs not only helps to keep the egg in place, but also helps to keep it warm. Staying warm is difficult since emperor penguin eggs hatch during the Antarctic winter, which can be the coldest weather on earth.

With winds at times blowing more than 100 miles per hour and the temperature dropping to more than 80 degrees below zero Fahrenheit, the males huddle together with the eggs on their feet in an effort to stay warm. The males rotate their position from the outside to the inside of the huddle, and then out again. This allows those on the outside to warm up. This vigil is kept up for 2 months until the eggs hatch. During this time, the females are feeding. They return in time to feed the hatched chicks regurgitated seafood. The males then leave

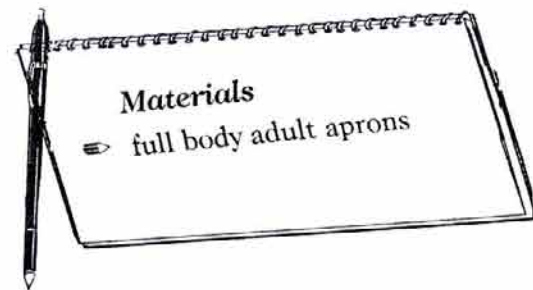
to eat and return with more food. The males and females take turns carrying the baby chicks around on their feet for about 2 months until their fat layer and protective feathers develop.

MORE FUN TO DO!

WADDLE WALKING

Purpose:

To model how emperor penguins carry their young chicks.



Getting Ready!



Tell the children about penguin chicks and how they keep warm by standing on their parents' feet. They are also kept warm by standing under their parents' skin flaps. Show pictures of chicks standing on their parent's feet in picture books. Adults can model the emperor's method of transporting their chicks by letting a child stand on their feet. Give the following instructions to the children's adult helpers.

What To Do!



Wear the apron, secured only at the neck. With the child in socks or bare footed, have him stand on your feet, facing your body and holding around your legs or body. Place the loose fitting apron over the child. Hold the child with your hands as you slowly walk around. Stop periodically, lifting the apron so the child can peek out. Explain that baby penguin chicks also peek out from beneath their parents' skin flaps.

TAKE HOME PROJECT

UNDERCOATS



Make 1 copy per person of Undercoats. (Figure 2.2 at the end of this chapter.) Before giving out copies of the home project, tell the group that penguins don't have overcoats to put on when it is cold. Instead, they have a permanent coat of feathers and an undercoat of thick fat to keep them warm.

PENGUIN EXPERIMENTS IN JANICE VANCLEAVE'S SCIENCE BOOKS FROM JOHN WILEY AND SONS, NEW YORK.

VanCleave, Janice. *Play and Find Out about Nature*, pp 42-43.



OTHER SCIENCE BOOKS ABOUT PENGUINS

Cowcher, Helen. *Antarctica*.
McMillan, Bruce. *Puffins Climb, Penguins Rhyme*.
Westerskov, Kim. *Emperors of the Ice*.

LITERATURE CONNECTIONS

Benson, Patrick. *Little Penguin*.
Lester, Helen. *Tacky the Penguin*.
Lester, Helen. *Three Cheers for Tacky*.
Wood, Audrey. *Little Penguin's Tale*.

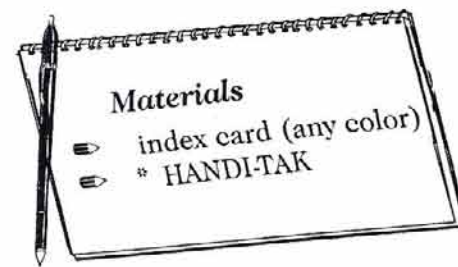
E L E M E N T A R Y

FUN ACTIVITIES

UPRIGHT

Purpose:

To demonstrate why penguins stand up straight like people.



Getting Ready!

For each group of 3 to 5 children, designate several places where 1 child in each group can stand against a wall (a door or bookshelf will work). Use HANDI-TAK to secure the index cards to the floor about 18 inches from the wall. If the floor is carpeted, place the cards on the carpet without securing them. (These unsecured cards may have to be repositioned periodically.)

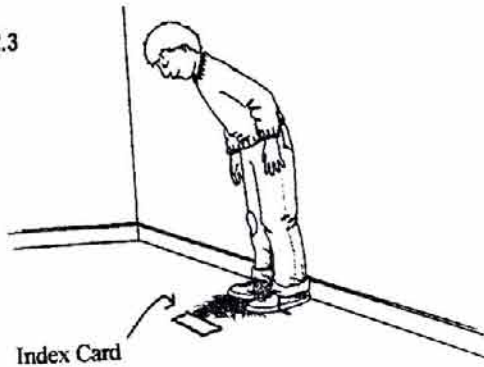


What To Do!



1. Have one child in each group stand with his or her heels against a wall facing the index card on the floor.
2. Keeping their feet in place, have them try leaning over to pick up the index card.
3. Have them observe how far they can lean away from the wall without falling over. (See Figure 2.3 below.)

Figure 2.3



So Now You Know



The distance the children can lean away from the wall will vary with each individual, but no one will be able to lean far enough to pick up the index card. Every object has a point called the **center of gravity** at which all of its weight seems to be concentrated. This point is also where an object will balance. When your body leans, it stays balanced as long as its center of gravity does not pass your foundation, the ends of your feet. When this happens, your body is out of balance and falls over. Penguins, like people, have their legs

attached so that an upright posture is the only way they can balance their bodies over their feet. Other birds have legs near the center of their bodies which allows them to lean over, but they cannot stand upright like penguins.

MORE FUN TO DO!

MEASURE UP



Purpose:

Children will compare their height to that of penguins.



Getting Ready!

Make 2 penguin growth charts:

1. Draw an Ade'lie penguin on one sheet of white bulletin board paper and an emperor penguin on another sheet. The penguin's feet must be at the bottom of the paper and the height of each penguin accurate. (Ade'lie at 24 inches and emperor at 42 inches) Note: If drawing is not your gift, ask a parent or other volunteer to do this — maybe an art teacher or a talented student. Another drawing technique



is to trace a penguin from a book onto a transparency and then put the transparency on an overhead projector. Move the projector until the penguin projected on the wall is the correct height. Hang a piece of paper on the wall and trace the penguin's image onto the paper. Laminate the paper so that it can be used again at a later time.

2. Starting at the bottom of one vertical edge, mark the inches from the bottom to the top of the paper.
3. Use pieces of HANDI-TAK to secure the papers to the wall so that the feet of the penguins are at floor level.

What To Do!



1. One at a time, have each child stand next to the penguin growth charts and compare their heights with that of the two penguins.
2. Parents can be encouraged to bring cameras and take photos of the children. For those who forget, a Polaroid could be handy.

TAKE HOME PROJECT

FATTY INSULATORS



Make 1 copy per person of **Fatty Insulators**. (Figure 2.4 at the end of this chapter.)

PENGUIN EXPERIMENTS IN JANICE VANCLEAVE'S SCIENCE BOOKS FROM JOHN WILEY AND SONS, NEW YORK.



VanCleave, Janice. *Guide to the Best Science Fair Projects*, pp. 68-69.

_____. *Ecology for Every Kid*, pp. 86-89.

_____. *Geography for Every Kid*, pp. 177-187.

_____. *Sourcebook*, p. 62.

OTHER SCIENCE BOOKS ABOUT PENGUINS

Arnold, Caroline. *Penguin*.

Butterfield, Moira. *1000 Facts about Wild Animals*. (see penguins).

Eyes on Nature—Penguins.

McMillan, Bruce. *Puffins Climb, Penguins Rhyme*.

Taylor, Barbara. *Arctic & Antarctic*.

Weller, Dave and Mick Hart. *Arctic & Antarctic*.

LITERATURE CONNECTIONS

Atwater, Richard and Florence. *Mr. Popper's Penguins*.

Monsell, Mary. *The Mysterious Cases of Mr. Pin*.

FUN ACTIVITIES

DEEP SEA DIVERS

*Purpose:*

To determine how the density of a penguin's body affects its diving and swimming ability.

*Getting Ready!*

Prepare one copy of the **Deep Sea Divers** instruction sheet for each person. (Figure 2.5 at the end of this chapter.) Select a table for supplies. Fill one soda bottle with water for each group. Ask one teen from each group to use the soda bottle to fill 1 jar with water to within about 1 inch of its top. Then have them place a paper towel on the work table and set the jar of water on it. Each teen at the table will use the same jar of water. Ask a second teen to pass out copies of **Deep Sea Divers**.

What To Do!

Each person is to follow the instructions on the **Deep Sea Divers** instruction sheet.

So Now You Know

Canister 2 sinks to a deeper depth and takes longer to rise than canister 1. The canisters are the same size but canister 2 is heavier. Canister 2 has a **greater density** (mass per volume) than canister 1. The greater the density of an object, the easier it is for it to sink in water.

Penguins do not fly and are heavier than most birds their size. This body weight is partly due to their solid, heavy bones. Flying birds often have hollow bones. The penguin's heavier weight, like that of the canister 2, makes it easier for it to dive deeper. Its heavier weight also allows the penguin to float lower in the water, using its powerful wings to propel itself. Lighter birds that float high in the water can only use their feet to push themselves along when they swim.

TAKE HOME PROJECT

JET PROPELLED



Make 1 copy per person of **Jet Propelled**. (Figure 2.6 at the end of this chapter.) Tell the group that they can use the power of water to move paper penguins. In the take home project **Jet Propelled**, dishwashing liquid is used to break the surface tension of water. This causes an unbalanced force

on the paper and the water molecules pull the paper across the water's surface. You may wish to have the penguin designs brought to the library for races. *Note that once soap has been added to the water in a container the soapy water must be thrown out and fresh water used for another race.*

PENGUINS EXPERIMENTS IN JANICE VANCLEAVE'S BOOKS FROM JOHN WILEY AND SONS, NEW YORK.



VanCleave, Janice. *A+ Projects in Chemistry*, pp 123-128.

Science Experiment Sourcebook, p 178.

OTHER SCIENCE BOOKS ABOUT PENGUINS

Asmimov, Isaac. *The Ends of the Earth*.

Bonnus, Susan. *A Penguin Year*.

Davis, Lloyd Spencer. *Penguin*.

Fletcher, Neil. *Penguin*.

Markle, Sandra. *Pioneering Frozen Worlds*.

LITERATURE CONNECTIONS

Arthur, Elizabeth. *Antarctic Navigation*.

Henry, Thomas Robert. *The White Continent*.

L'Engle, Madeleine. *Troubling a Star*.

UNDERCOATS

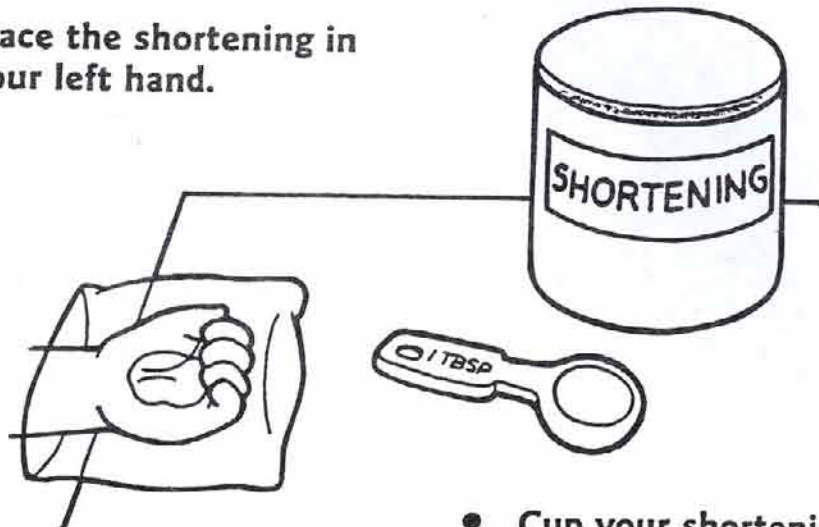
Figure 2.2

Some animals that live in very cold places, such as walruses, seals, and whales, have a thick layer of blubber (fat) under their skin. Let's see how this fatty layer helps to keep them warm.

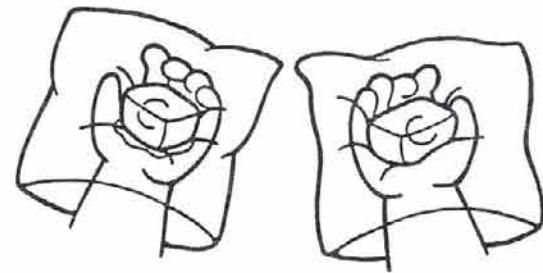
- Place the shortening in your left hand.

- Place your hand inside the bag. The plastic bag represents the skin on an animal, and the shortening represents the layer of fat beneath the skin.

- Place your other hand inside the other plastic bag. Cup your hand and place the other ice cube on top of this plastic bag.
- Hold the ice in your hands for about 5 seconds. Compare how cold each hand feels.



- Cup your shortening-covered hand and place the ice cube on top of the plastic bag.



FATTY INSULATORS

Figure 2.4

PURPOSE

To determine how the fat layer under the skin keeps an animal warm.

Materials

two 7-ounce (210-ml) paper cups
shortening
2 thermometers
freezer
timer

Procedure

1. Fill one paper cup with shortening.
2. Insert one thermometer into the cup of shortening so that the bulb of the thermometer is in the center of the shortening.
3. Stand the other thermometer in the other paper cup.

NOTE: Lay the cup on its side if the weight of the thermometer tends to topple the cup over.

4. Read and record the temperature shown on each thermometer. Then place the cups with their thermometers in the freezer and shut the door.
5. Read and record the temperature on each thermometer after 15 minutes.

Results

In 15 minutes, the readings on the thermometer placed in the shortening changed very little, but the temperature inside the empty cup decreased rapidly.

Why?

The shortening, like the fat layer under the skin of animals, acts as an insulator and, thus, restricts the heat flow away from the warm inner body to the frigid air outside the body. The heat inside the shortening, like that in an animal's body, is lost, but, because of the insulating fat, the loss is very slow. Food eaten by animals provides energy that continuously replaces the lost heat.

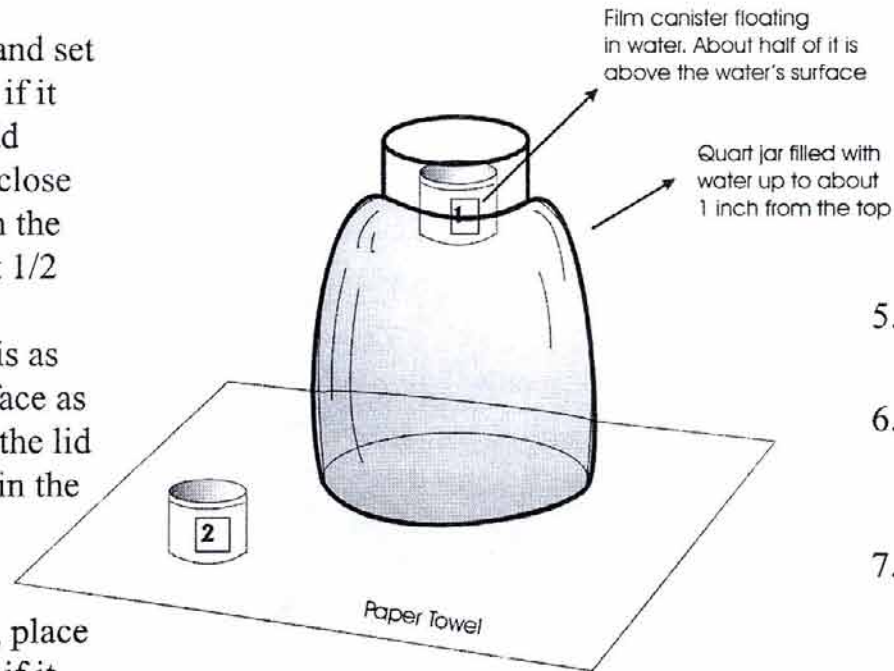


DEEP SEA DIVERS

Figure 2.5

Procedure

1. Use the tape and pen to label the canisters 1 and 2.
2. Place the lid on canister 1 and set it in the water to determine if it will float upright. If not, add about 1/2 teaspoon of salt, close the lid, and again place it in the water. Continue adding salt 1/2 teaspoon at a time until the canister floats upright, but is as high above the water's surface as possible. Be sure to secure the lid before placing the canister in the water. (It will take about 1 tablespoon of salt.)
3. Secure the lid on canister 2, place it in the water to determine if it will float upright.



4. If not, repeat the procedure in step 2, adding salt 1/2 teaspoon at a time. But add enough salt to make the canister float with its lid just above the surface of the water. (It will take about 2 tablespoons of salt.)
5. Remove the canisters from the water.
6. With its lid securely fastened, hold canister 1 about 2 inches above the water, then drop it.
7. Observe how far the canister sinks in the water. Remove the canister from the water.
8. Repeat steps 6 and 7 using canister 2.

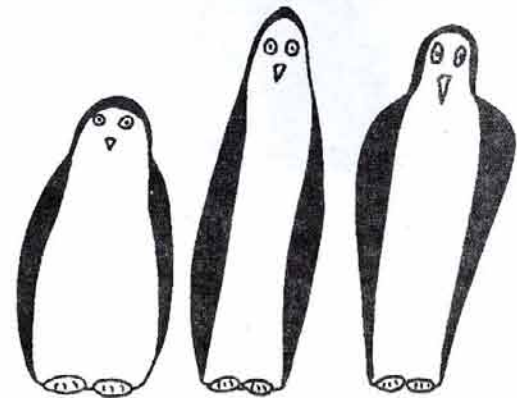
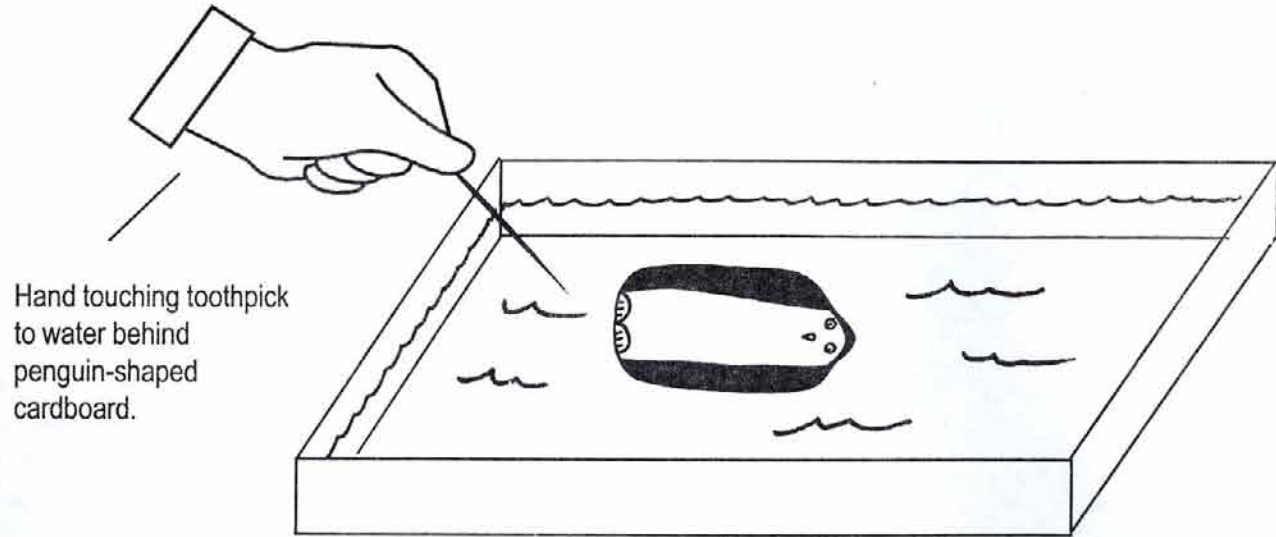
JET PROPELLED

Figure 2.6

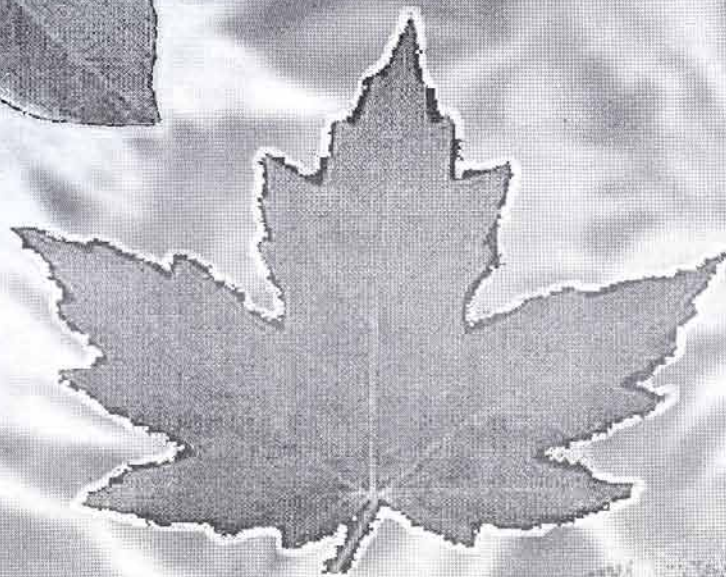
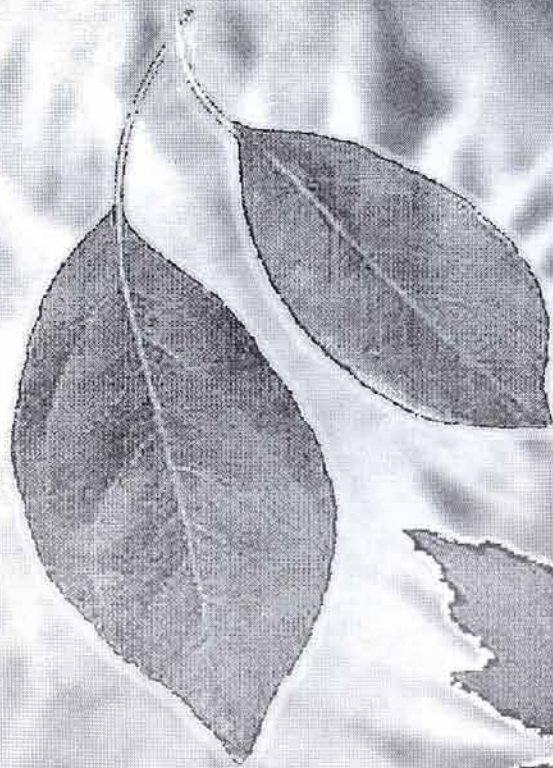
A penguin's body is shaped like a submarine. This allows the bird to cut through the water with ease because there is less friction between the penguin's body and the water than there would be if its body was broader in the front. Design a penguin that jets through the water from a 2 inch square of stiff paper (such as cardboard). To jet your paper penguin across the water use the following procedure:

1. Fill a long shallow baking dish with water.
2. Place the paper penguin in the water with bottom of the penguin near the end of the dish.
3. Place a drop of dishwashing liquid on the end of a toothpick.
4. Touch the water near the bottom of the penguin with the wet end of the toothpick. The penguin will jet across the water.
5. Repeat steps 1 through 4 using different penguin shapes.

Note: Fresh water must be used in the container for each testing.



Plants



PLANTS

BACKGROUND

Some trees have leaves that stay green and remain on the trees all year long. These trees are called **evergreens**. The leaves of another type of tree change colors and drop in the fall. These trees are called **deciduous**. The color of leaves and other plant parts, such as flowers, is due to coloring substances in the plant called **pigments**.

Some flowers, such as morning glories, four o'clocks, and mimosa, open due to the movement of water into their cells. The pressure of the water inside a plant cell is called **turgor pressure**. Plant movement due to turgor pressure is called **turgor movement**. It is believed that hormones are the chemical messengers that "tell" water to move into petals, causing them to move. The hormones respond to **stimuli** such as varying amounts of light and touch. The faster the water moves into the cells, the faster a plant moves. Turgor movements are relatively rapid. They may be instantaneous, as in mimosa leaves, but usually occur within thirty minutes.

Seeds contain what look like baby plants. If the seed is large enough, it can be opened and the baby plant, which is actually an **embryo**, can be observed. Seeds from different plants have similar physical

structures, but each seed can only grow into the kind of plant that it came from.

PRESCHOOL

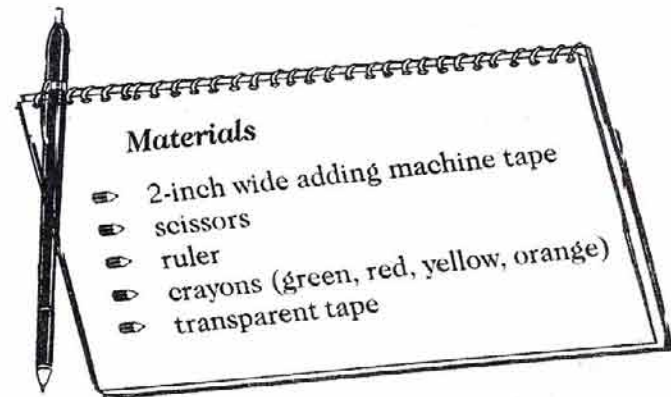
FUN ACTIVITIES

CHANGES



Purpose:

To learn about the colors of leaves.



Materials

- 2-inch wide adding machine tape
- scissors
- ruler
- crayons (green, red, yellow, orange)
- transparent tape

Getting Ready!

Make 1 copy of the Maple Leaf Crown page per child.

(Figure 3.3 at the end of this chapter.) Cut 30 inch strips of adding machine tape, one per child.



Note:

1. If adding machine tape is not available, use 2-by-30 inch pieces cut from bulletin board paper.
2. A stapler can be used in steps 5-7 below instead of tape, but staple from the back so the smooth part of the staple is against the child's head.

Give the following instructions to the adult helpers.

What To Do!

1. Wrap the paper strip around the child's head and across his/her forehead so that the ends of the paper overlap. (Figure 3.1 below)
2. Holding the overlapping ends together, remove the paper strip from the child's head and use a crayon to mark where the ends of the paper overlapped. (The ends should overlap only about 1 inch.) Cut off any excess paper. (Figure 3.2 below)



Figure 3.1

3. Have the child use crayons to color the leaves on the Maple Leaf Crown page.
4. Cut out the crown and the leaves.
5. Assist the child in taping the crown to the center of the paper strip.
6. Assist the child in taping the leaves onto the paper strip on either side of the crown.

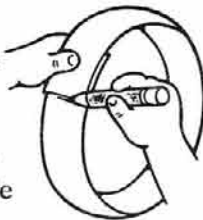


Figure 3.2

7. Tape the ends of the paper strip together at the crayon mark.
8. Place the band on the child's head.

So Now You Know



Leaves have different colors. Most are green in the spring and summer and some change to the bright colors of red, yellow, and orange in autumn.

TAKE HOME PROJECT

PLANT PAINTS

Make 1 copy of the take home project **Plant Paints** for each child. (Figure 3.4 at the end of this chapter.) Encourage the kids to wear their plant painted T-shirts to the next scheduled library science extravaganza event.



PLANT EXPERIMENTS IN JANICE VANCLEAVE'S BOOK FROM JOHN WILEY AND SONS, NEW YORK

VanCleave, Janice. *Play and Find Out about Nature*, pp. 64-112.



OTHER SCIENCE BOOKS ABOUT PLANTS

Ardley, Neil. *The Science Book of Things That Grow*.
Bowden, Marcia. *Nature for the Very Young*.
Fowler, Allan. *It Could Still Be a Tree*.
Jordan, Helen J. *How a Seed Grows*.
Marzollo, Jean. *I'm a Seed*.
Walker, Lois. *Get Growing! Exciting Indoor Plant Projects for Kids*.

LITERATURE CONNECTIONS

- Bunting, Eve. *Someday a Tree*.
Carle, Eric. *The Tiny Seed*.
Ehlert, Lois. *Planting a Rainbow*.
Ehlert, Lois. *Red Leaf, Yellow Leaf*.
Kandoian, Ellen. *Molly's Seasons*.
Krauss, Ruth. *The Carrot Seed*.
Mahy, Margaret. *The Pumpkin Man and the Crafty Creeper*.
Pearson, Susan. *My Favorite Time of Year*.
Scarry, Richard. *Richard Scarry's Best Times Ever*.

E L E M E N T A R Y

FUN ACTIVITIES

SEASONS



Purpose:

To demonstrate changes in a tree during the four seasons.



Getting Ready!



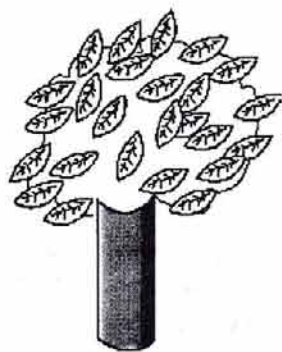
Make 1 copy of the Tree Shapes on the card stock paper for each child. (Figure 3.5 at the end of this chapter.) Copy the leaf patterns onto green, red, yellow, and orange paper (Figure 3.6 at the end of this chapter.) Each child will need 2 pages of green leaves and one page each of red, yellow, and orange leaves. Cut the tissue paper into strips of about 2 x 20 inches. Prepare one strip for each child. Give each group of 3 to 5 children, a paper plate with a dab of glue on it. Note: For procedure step 1, use course sandpaper if it is not possible to go outside to make a bark rubbing. Kids can lay their paper on top of the sandpaper to make the rubbing. Provide the following instructions for the entire group. At least one adult helper per group will be helpful.

What To Do!



1. Lay the sheet of white paper against the bark of a tree. Using the brown crayon, color the paper. This is called a bark rubbing.
2. Fold the bark rubbing paper in half with the short ends together.
3. Use the ruler and pencil to mark a line across the paper 1 inch from its folded side. Cut off this strip and discard it. Two pieces of bark rubbing will be left.
4. Wrap one piece of the bark rubbing around each of the paper tubes, color side out, and secure them with tape. These are the tree trunks.

5. Cut two slits, each about 1 inch in length, opposite each other on one end of each of the paper tubes. (4 slits in all.)
6. Cut out the spring/summer tree shape. (Green leaves for the fall tree are described below.)
7. Cut out the green leaves from the two printed sheets.
8. Glue these leaves onto both sides of the spring/summer tree shape. Note: Save 4 to 6 green leaves for the fall tree described below.
9. On one side of the tree shape from step 6, use the tissue paper to add pink flowers. Do this by cutting the pink tissue paper into 1-inch squares. Press the eraser end of a pencil in the center of 1 tissue square and carefully squeeze the paper around the pencil. Dip the end of the tissue-covered pencil into the dab of glue on the paper plate. Press the glue side of the paper onto the tree shape, then remove the pencil. The tissue paper should stick to the tree shape. Add about 10 pink tissue flowers to the tree.
10. After the glue has dried, insert the tree shape into the slits on one of the tree trunks.
11. For spring, turn the tree to display the flowers. For summer, turn it around to display only the green leaves.
12. Cut out the fall/winter tree shape and color the branches printed on one side brown for the winter tree.



13. For fall, cover the other side of the tree shape from step 11 with red, yellow, orange, and a few green leaves.
14. Repeat steps 10 and 11 to display the fall and winter trees.

So Now You Know



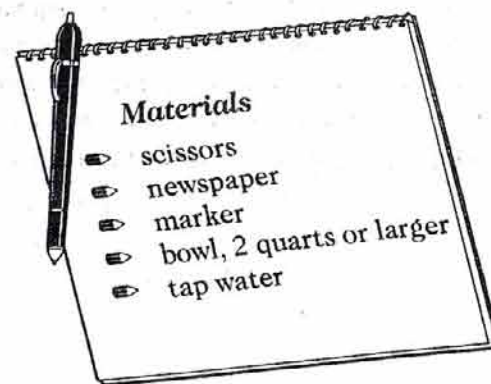
The leaves on deciduous trees, like maple trees, are green in the spring and summer. The leaves change colors in the fall and drop off, leaving the bare branches showing in winter.

MORE FUN TO DO!

MORNING GLORY

Purpose:

To model how some flowers open.



- Materials**
- ✎ scissors
 - ✎ newspaper
 - ✎ marker
 - ✎ bowl, 2 quarts or larger
 - ✎ tap water

Getting Ready!



1. Make newspaper flowers by following these steps:
 - * Copy and cut out the **Morning Glory** pattern. (Figure 3.7 at the end of this chapter.)
 - * Lay the pattern on a stack of 6 or 7 sheets of newspaper.
 - * Trace around the pattern with the marker.
 - * Cut out the tracing (be sure to cut through all the layers of newspaper.)
 - * Repeat the previous step making two newspaper flowers for each child.
2. For each group of 3 to 5 kids, fill 1 bowl about half full of water. (Note: Any large container that will hold about 2 inches of water will do.) Containers 4 to 6 inches deep are less likely to tip over.
3. Provide the following instructions for the kids.
Note: It is best if you demonstrate the procedure stopping short of dropping the paper into the water. You want the kids to discover for themselves what will happen.

What To Do!



1. Fold each petal toward the middle of the pattern as shown. (Figure 3.8 at the end of this chapter.)

2. Hold the folded paper, petal side up, about 4 inches above the water in the bowl. (Figure 3.9 at the end of this chapter.)
3. Drop the paper into the bowl and watch the petals open.

So Now You Know



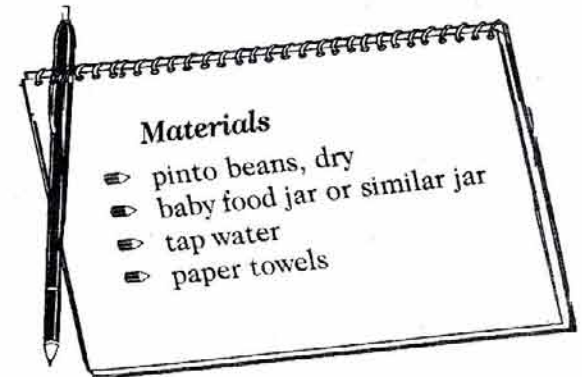
The paper flower petals open one at a time as the water fills the tiny canals between the fibers in the paper. The pressure pushes the paper petals open, just like sap pushes real flower petals open.

MORE FUN TO DO!

BABY BEAN

Purpose

To study the parts of a pinto bean.



- #### Materials
- ⇒ pinto beans, dry
 - ⇒ baby food jar or similar jar
 - ⇒ tap water
 - ⇒ paper towels

Getting Ready!

Make 1 copy of the Baby Bean experiment sheet for each child. (Figure 3.10 at the end of this chapter.) Follow procedure step 2 through 4 on the Baby Bean sheet to prepare the beans. (Note: You will need 5 or 6 beans per child for soaking plus 2 to 3 dry beans for inspection in procedure step 1.) Prepare the dry and soaked beans beforehand. Having a copy of the printed instructions allows the children to repeat the experiment at a later time at home or school. It also encourages them to read and follow instructions on their own.



What To Do!



1. Start with procedure step 1 on the Baby Bean experiment sheet.
2. Skip to procedure step 5.
3. Find all the indicated bean parts.

TAKE HOME PROJECTS

GROW A SEED

Make 1 copy of the Grow a Seed experiment sheet for each child. (Figure 3.11 at the end of this chapter.)



PLANT EXPERIMENTS IN JANICE VANCLEAVE'S BOOKS FROM JOHN WILEY AND SONS, NEW YORK

- VanCleave, Janice. *Janice VanCleave's Plants*.
_____. *Biology for Every Kid*.
_____. *200 Goopy, Slippery, Slimy, Weird, and Fun Experiments*.
_____. *201 Awesome, Magical, Bizarre, and Incredible Experiments*.
_____. *202 Oozing, Bubbling, Dripping, and Bouncing Experiments*.
_____. *Science Experiment Sourcebook*, pp 98 & 99.

OTHER SCIENCE BOOKS ABOUT PLANTS

- Baker, Wendy. *Plants: A Creative Hands-On Approach to Science*.
Cork, Barbara. *Mysteries and Marvels of Plant Life*.
King, Elizabeth. *The Pumpkin Patch*.
Kite, L. Patricia. *Gardening Wizardry for Kids*.
Potter, Jean. *Nature in a Nutshell*.
Roberts, Allene. *The Curiosity Club: Kid's Nature Activity Book*.
Silver, Donald M. *One Small Square Backyard*.
Suzuki, David. *Looking at Plants*.
Taylor, Barbara. *Green Thumbs Up!*
Walker, Lois. *Get Growing*.

LITERATURE CONNECTIONS

- Beard, Darleen Bailey. *The Pumpkin Man from Piney Creek*.
Borden, Louise. *Caps, Hats, Socks and Mittens*.
Bunting, Eve. *Flower Garden*.
Gibbons, Gail. *The Seasons of Arnold's Apple Tree*.
Gillis, Jennifer Storey. *In a Pumpkin Shell*.

Hawkes, Kevin. *His Royal Bucklines*.
 Lyon, George-Ella. *A B Cedar*.
 McCaughrean, Geraldine. *The Cherry Tree*.
 Oppenheim, Joanne. *Have You Seen Trees?*
 Primavera, Elise. *Plant Pet*.
 Pulver, Robin. *Nobody's Mother is in Second Grade*.
 Ryder, Joanne. *Hello, Tree!*
 Young, Ed. *Up a Tree*.

TEENS

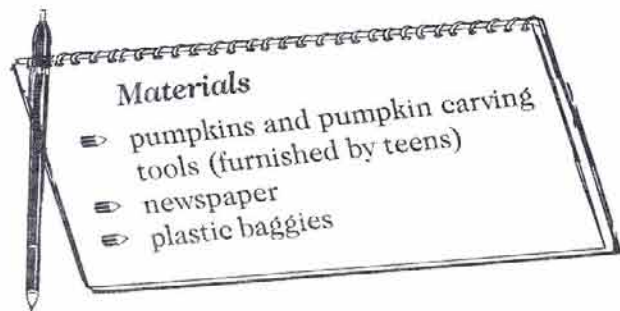
FUN ACTIVITIES

JACK-O-LANTERNS



Purpose:

To have a jack-o-lantern contest.



Getting Ready!



Prepare announcement sheets of the contest. Note: Add a caution that only tools designed for safe pumpkin carving are to be used. Cover the tables with newspaper and have trash cans available for cleaning up. The seeds are to be saved for the take home project. (The pumpkin carving could be done at home and the final products brought to the library for judging.)

What To Do!



1. Using pumpkin carving tools, carve a jack-o-lantern.
2. Save the seeds by placing them in a plastic baggie. Seeds can later be washed and dried for a take home project. Discard the pumpkin pulp.

TAKE HOME PROJECT

GROW A SEED

Make 1 copy of the Grow a Seed experiment sheet for each teen. (See Figure 3.11 at the end of this chapter.) Instruct teens to use the seeds from their pumpkins for this project.



PLANT EXPERIMENTS IN JANICE VANCLEAVE'S BOOKS FROM JOHN WILEY AND SONS, NEW YORK



VanCleave, Janice. *A+ Biology*, pp 139-144.

OTHER SCIENCE BOOKS ABOUT PLANTS

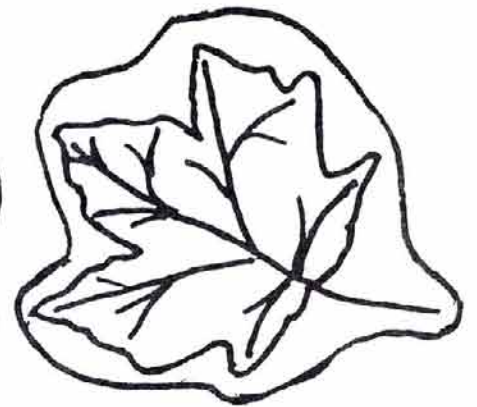
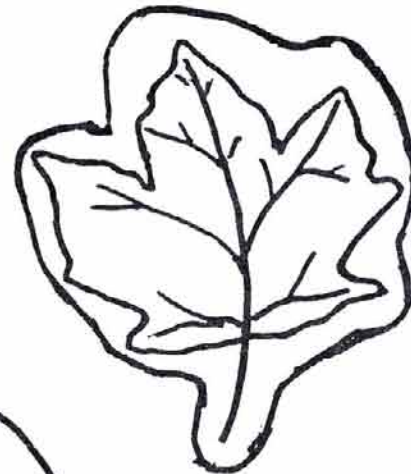
Gillis, Jennifer Storey. *In a Pumpkin Shell*.
 Johnson, Jerry Mack. *CountThings That Fly and try Scrapbook*.
 Roth, Charles E. *The Amateur Naturalist*.

LITERATURE CONNECTIONS

Byars, Betsy. *McMummy*.
 Fellowski, Anne. *Hidden Stories in Plants*.
 Quattlebaum, Mary. *Jackson Jones and the Puddle of Thorns*.

MAPLE LEAF CROWN

FIGURE 3.3



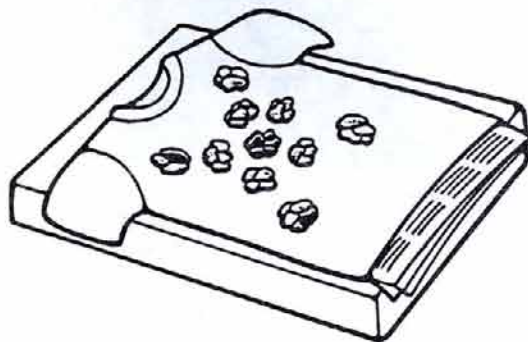
PLANT PAINTS

FIGURE 3.4

Plant parts, such as leaves and flowers, contain coloring substances. Leaves are usually green, but flowers vary greatly in color. If plant parts are crushed, their coloring substance, like that in grass, can get out and stain cloth. Use plant parts to create a flower design on the front of a T-shirt.

- Fold the newspaper and place it inside the shirt.
- Lay the shirt on the cutting board so that the front of the shirt is face-up.

- Arrange the flower petals and leaves in the center of the shirt front. Make small piles of petals and leaves to form a design.



- Cover the flower parts with the waxed paper.
- Crush the petals and leaves by tapping them

with the rock so that their coloring substance can get out.

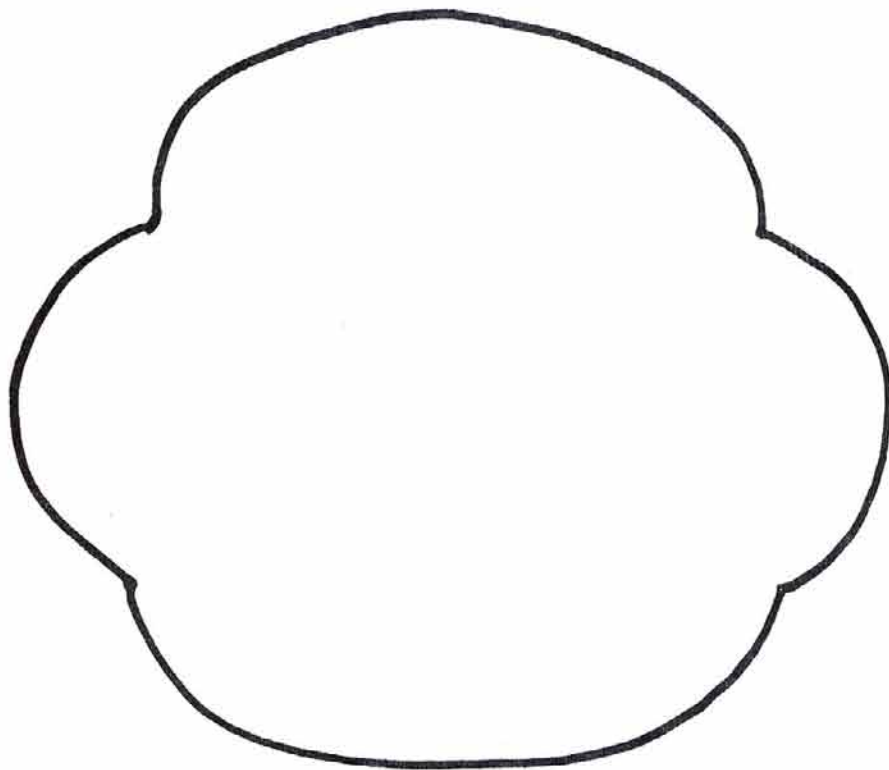
CAUTION: Hold the rock in one hand and keep the other hand away so you do not hit your fingers.



- Remove the waxed paper and crushed petals and leaves. **NOTE:** Washing the shirt by hand in cold water will help keep the colors bright.

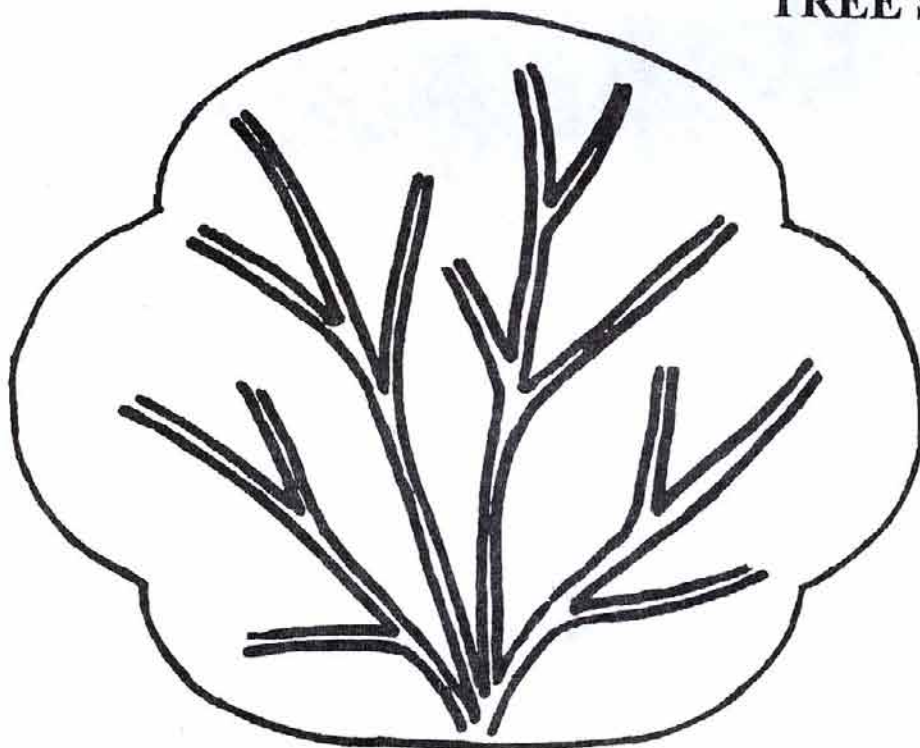
TREE SHAPES

FIGURE 3.5



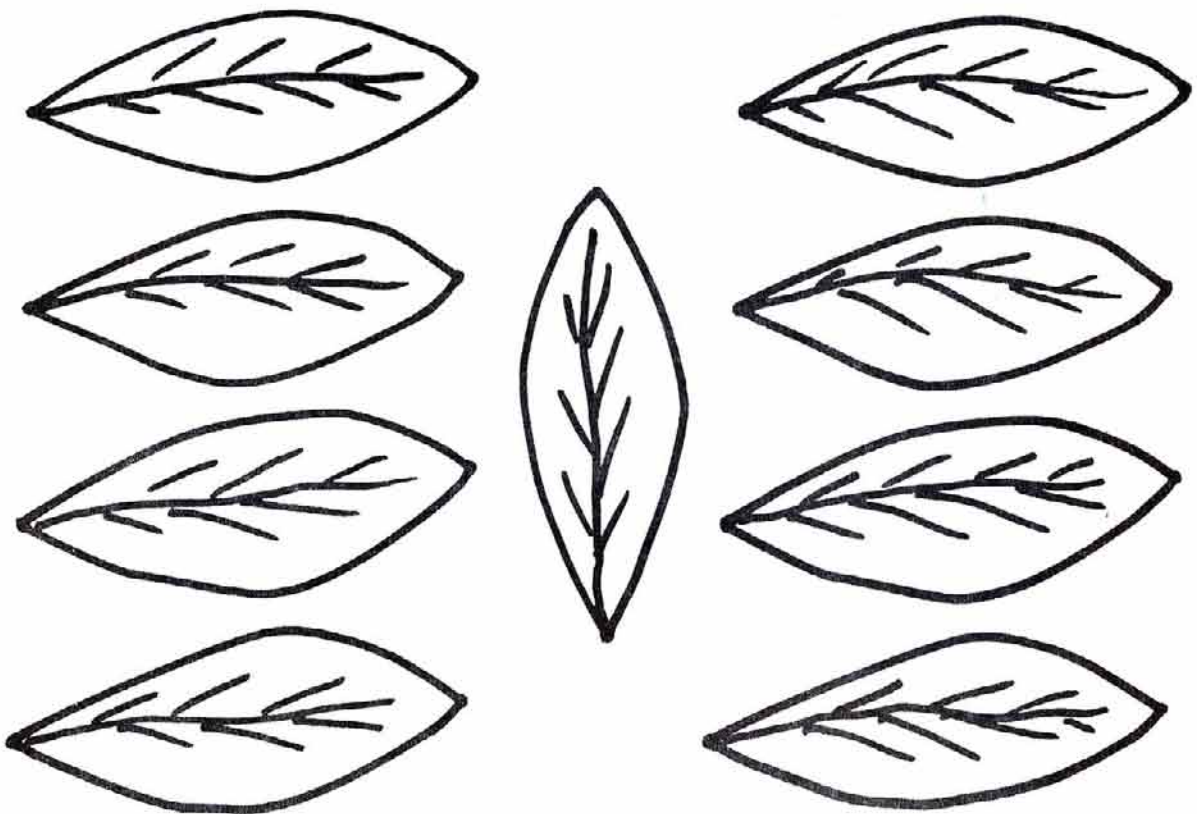
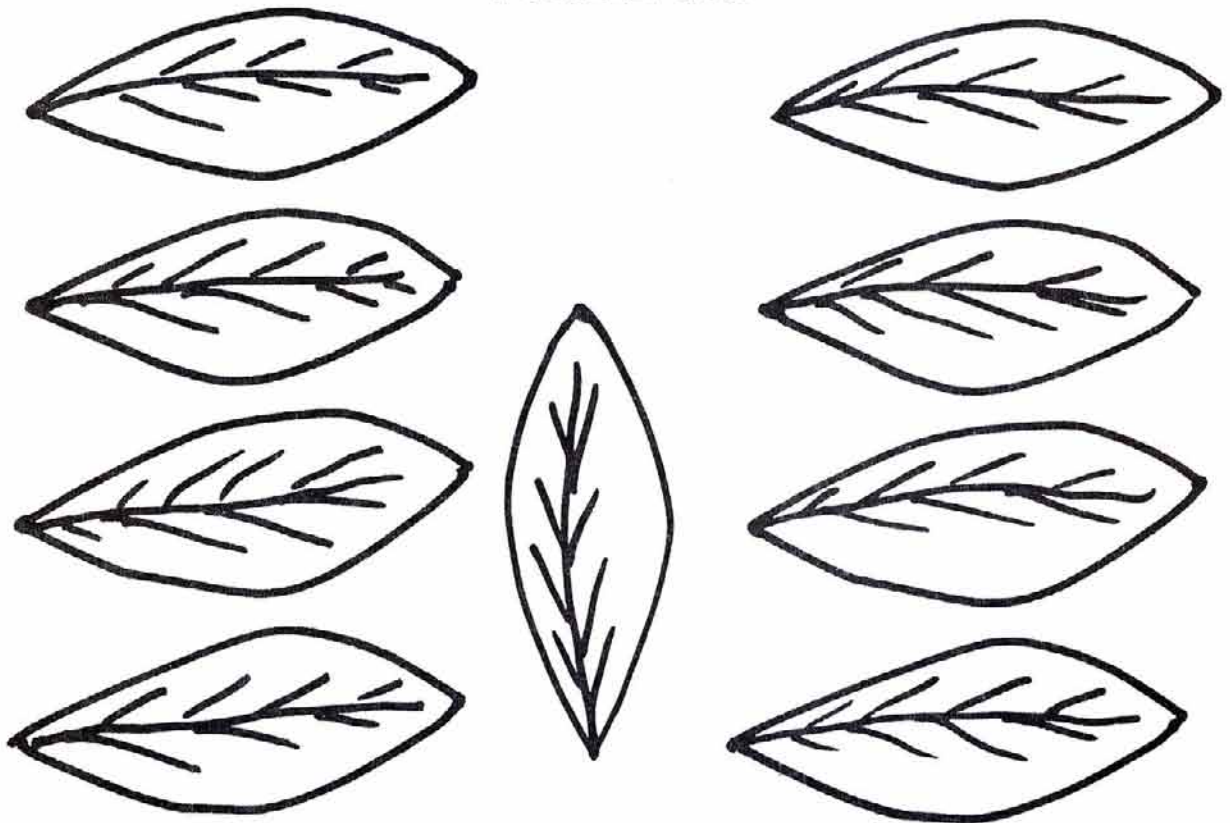
SPRING/SUMMER

TREE SHAPES



FALL/WINTER

LEAVES
FIGURE 3.6



MORNING GLORY

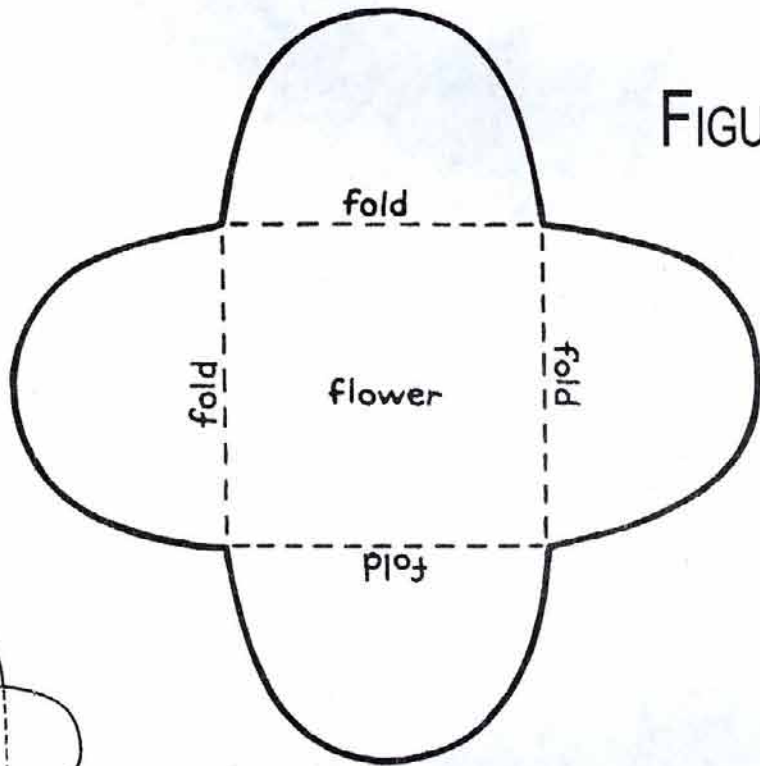


FIGURE 3.7

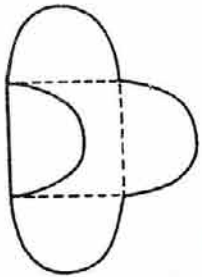


FIGURE 3.8

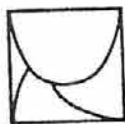
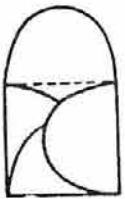
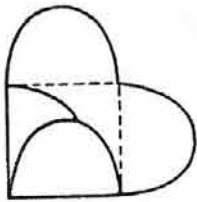
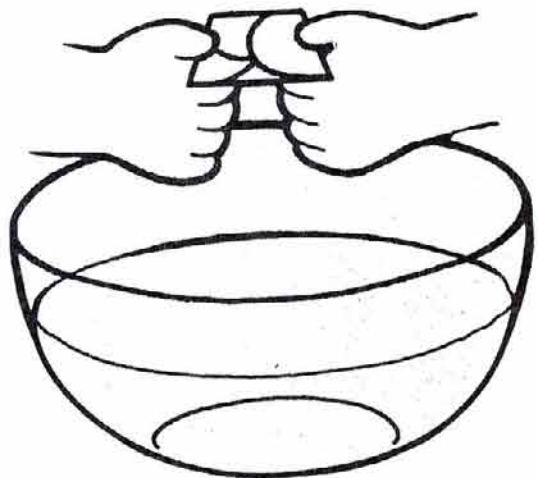


FIGURE 3.9



BABY BEAN

FIGURE 3.10

PURPOSE

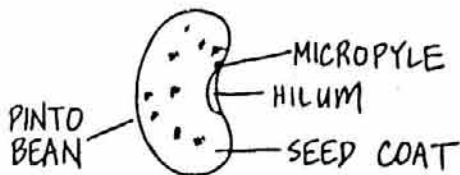
To dissect a bean, identify the parts, and learn the functions of each part.

Materials

10 to 12 pinto beans
baby-food jar
tap water
paper towels

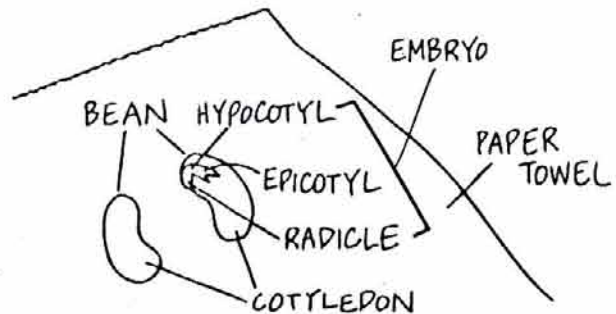
Procedure

1. Inspect a dry bean and find the parts identified in the drawing.
2. Place the beans in the jar and cover with water.
3. To prevent souring, refrigerate the jar overnight.
4. Remove the beans from the jar and place on a paper towel to absorb the excess water.
5. Carefully remove the outer layer from one of the beans.
6. On the rounded side, pry the bean open with your fingernail. Be very gentle as you open the bean.



Results

What appears to be a baby plant is found inside the bean. If you do not find the baby plant or if it was broken in the process of opening the bean, try again with another bean.



Why?

The function of each bean part:

1. **seed coat**—protective covering
2. **cotyledon**—food for the growing baby plant
3. **micropyle**—small opening through which a pollen grain enters
4. **hilum**—where the bean was attached to the pod wall
5. **embryo**—undeveloped plant
6. **epicotyl**—forms the leaves
7. **hypocotyl**—top forms the stem, lower part is radicle
8. **radicle**—forms the roots

GROW A SEED

FIGURE 3.11

PURPOSE

To determine if the way seeds are planted affects the direction of root growth.

Materials

paper towels
clear drinking glass
masking tape
marking pen
4-6 pinto beans or other large seeds,
such as pumpkins
tap water

Procedure

1. Fold one paper towel and line the inside of the glass with it. Wad several paper towels and stuff them into the glass to hold the paper lining tightly against the glass.
2. Place a strip of tape around the outside of the glass.
3. On four sides of the glass, mark the tape with an arrow to indicate up, down, left, and right.

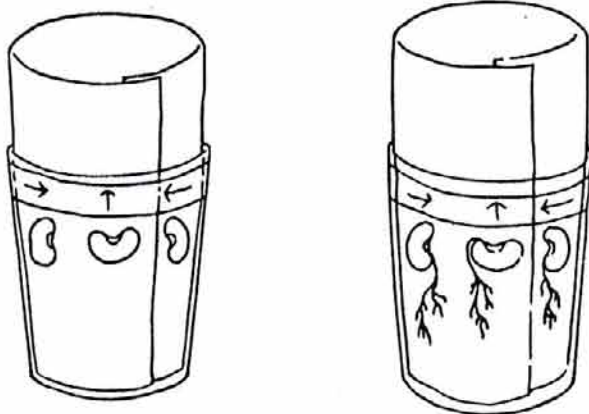
4. Place one bean between the glass and the paper towel lining under each arrow. Point the bean's concave side in the direction indicated by the arrow.
5. Moisten the paper towels in the glass with water. The paper should be moist, not dripping wet.
6. Keep the paper moist and observe for 5 to 7 days.

Results

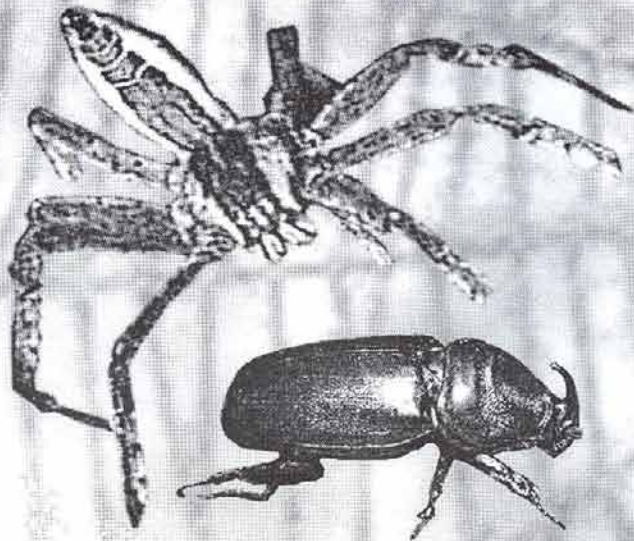
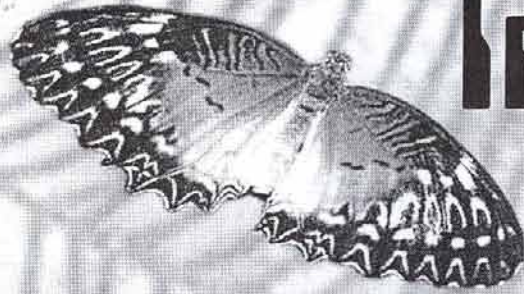
No matter in which direction the bean is planted, the roots grow downward.

Why?

Plants contain auxin, a chemical that changes the speed of plant growth. Gravity causes the auxin to collect in the lower part of the plant. Root cells grow faster on the side where there is a smaller amount of auxin, causing this section to bend downward. The result is that auxin causes roots to grow down.



Insects And Spiders



INSECTS AND SPIDERS

BACKGROUND

Insects have three body parts in this order: the **head**, the **thorax**, and the **abdomen**. Most adult insects have two large eyes on their heads called **compound eyes**. Also attached to the head are two **antennae**. Insects have six legs attached to the thorax, three on each side. Most insects have one or two pairs of wings, which are also attached to the thorax. The two main features that distinguish insects from spiders are the number of body parts and the number of legs. Insects have three body parts and three pairs of legs. This can be called the "3 + 3 rule." Spiders have two body parts and four pairs of legs. Most spiders have eight eyes but some have fewer. The two body parts of a spider are the **cephalothorax**, which is a combination of its head and thorax, and the **abdomen**. The legs are attached to the cephalothorax, four on each side.

Spiders make silk threads. These threads come from holes called **spinnerets**, located on the underside on the ends of their abdomens. Most spiders have a dragline of silk trailing behind them. With the dragline they can gently drop to the ground, turn around and climb back up.

Spiders use the silk they make in their bodies to spin webs. The most recognized web shape is the **orb web**, which looks like a wheel with spokes and silk threads spiraling around them.

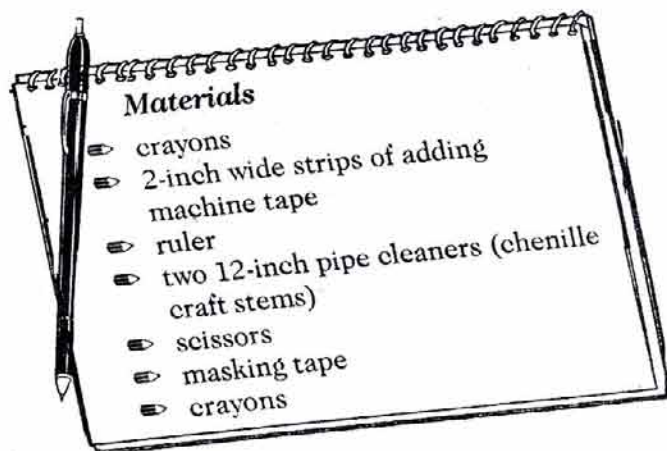
PRESCHOOL

FUN ACTIVITIES

ANTENNAE HEADBAND

Purpose:

To make a model of an insect's antennae.



Getting Ready!

Use shoe boxes to distribute supplies, preparing one shoe box for each group of 4 to 6 kids. In each box, place 1 roll of adding machine tape, 1 or more pairs of scissors, 1 roll of masking tape, crayons, and 2 small paper clips per child. Discuss the procedure steps, pointing out that each child is to help as much as possible. Books with pictures of insects can be displayed for step 4.



What To Do!



1. Cut one 30-inch long piece of adding machine tape for each child.
2. Wrap the paper strips around the child's head and across his/her forehead so that the ends of the paper overlap.

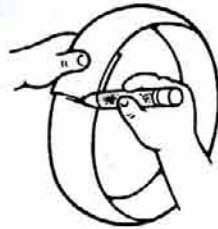
Figure 4.1

3. Holding the overlapping ends together, remove the paper strip from the child's head and use a crayon to mark where the ends of the paper overlap. (The ends should overlap only about 1 inch.) Cut off any excess paper. (Figure 4.2 below)



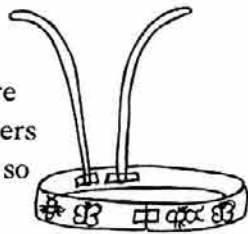
4. Have the children use crayons to draw insects, like simple butterflies or dragonflies, on one side of their paper strips. Remind the children that insects have three body parts with three pairs of legs on the second body part.

Figure 4.2



5. Tape one end of each pipe cleaner to the center of the unmarked side of the paper strip, about two inches apart. Note: Be sure the ends of the pipe cleaners are covered with the tape so they won't scratch the child's head.

Figure 4.3

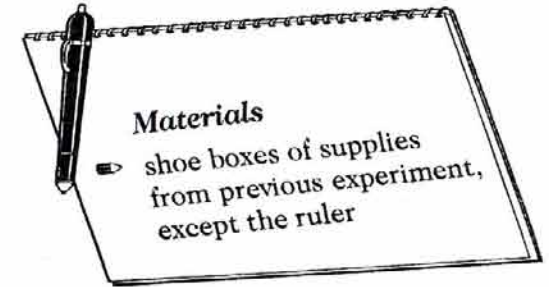


6. Tape the ends of the paper strips together at the crayon mark.
7. Place the bands on the child's head.
8. Some insects "talk" by touching each other with their antennae. For fun, tell the children to try this by touching their antennae together.

MORE FUN TO DO!

Purpose:

To model the number of legs a spider has.



Getting Ready!

In this activity, the child's legs and arms will be counted as spider legs. (Note: If any child attending the program does not have two arms, discuss the activity with the caretaker in advance if possible.) While spiders generally have 8 legs, some do lose their legs in accidents. The children can wear their spider legs made in this activity as a story about spiders is read. Show pictures of the spider in the story and let the children count its legs.



What To Do!



1. Have each child hold his/her arms out from their sides.
2. Cut two pieces of adding machine tape the length of the child's outstretched arms.
3. Tape the strips of paper to the back of the child's shirt so that they hang down on each side. Let them pretend to be spiders by walking on their hands and feet with paper legs dangling.

So Now We Know



Insects have 6 legs, but spiders have 8.

TAKE HOME PROJECT

MYSTERIOUS CRYSTALS

Make 1 copy of the Mysterious Crystals experiment sheet for each child. (Figure 4.4 at the end of this chapter.)



INSECTS AND SPIDERS EXPERIMENTS IN JANICE VANCLEAVE'S BOOKS FROM JOHN WILEY AND SONS, NEW YORK

VanCleave, Janice. *Play and Find Out about Nature* pp 100-103.



_____. *Play and Find Out about Insects and Spiders.*

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- Facklam, Margery. *The Big Bug Book.*
 French, Vivian. *Spider Watching.*
 Hariton, Anca. *Butterfly Story.*
 Markle, Sandra. *Outside and Inside Spiders.*
 Marzollo, Jean. *I'm a Caterpillar.*
 Parker, Nancy Winslow and Joan Richards Wright. *Bugs.*
 Parsons, Alexandra. *Amazing Spiders.*
 Podendorf, Illa. *Spiders.*
 Vansant, Rhonda and Barbara Dondiego. *Moths, Butterflies, Other Insects, and Spiders.*

LITERATURE CONNECTIONS

- Aardema, Verna. *Who's in Rabbit's House?*
 Carle, Eric. *The Very Busy Spider.*
 Carle, Eric. *The Very Hungry Caterpillar.*
 Graham, Margaret Bloy. *Be Nice to Spiders.*
 Kirk, David. *Miss Spider's Tea Party.*
 Philpot, Lorna & Graham. *Amazing Anthony Ant.*
 Van Allsburg, Chris. *Two Bad Ants.*

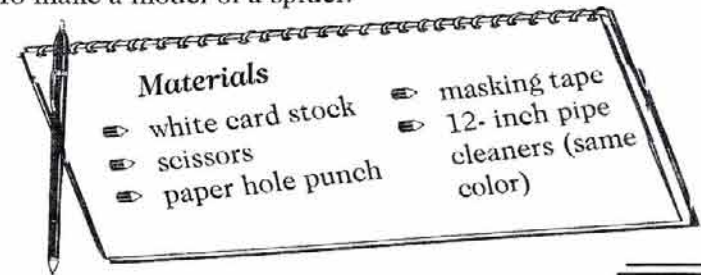
E L E M E N T A R Y

FUN ACTIVITIES

STELLA THE SPIDER

Purpose:

To make a model of a spider.



Materials

- ⇒ white card stock
- ⇒ scissors
- ⇒ paper hole punch
- ⇒ masking tape
- ⇒ 12-inch pipe cleaners (same color)

Getting Ready!



Make copies of the **Stella the Spider** pattern on card stock. (Figure 4.5 at the end of this chapter.) Cut the copies in half so that each child has one spider pattern. Prepare a supply table so that each group of 4 to 6 kids will have 1 pair of scissors, 1 paper hole punch, 1 roll of masking tape, and 4 pipe cleaners per child. Ask children from each group to transport the needed supplies to their work table. Before beginning, read the following instructions and make a sample spider. Show your spider to the group, pointing out how each pipe cleaner is threaded through the holes to form one leg on each side of the cephalothorax. Point out that the underside of the spider is the side without the eyes. Identify the spider's parts: cephalothorax, abdomen, 8 legs, and 8 eyes. Ask one child from each group to hand out spider patterns to each child in the group. Children are to do as many of the steps as possible, but at least one adult will be needed to assist each group. Display your spider as an example.

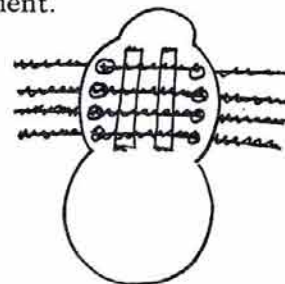
What To Do!



1. Cut out the spider pattern. If children are old enough, they may cut out their own spiders.
2. Use the paper hole punch to make 4 holes on each side of the cephalothorax.
3. Stick the pipe cleaners through the holes to form legs. Adjust them so the spider's eight legs are even.

4. On the underside, place several pieces of tape across the pipe cleaners where they cross the body to hold them in place. (Figure 4.6 below)
5. Bend the pipe cleaners to form eight legs. Have the kids keep their spiders handy for the next experiment.

Figure 4.6



So Now You Know



You can tell from the number of body parts and legs that spiders are not insects. Insects have three main body parts and six legs. Spiders have two main body parts and eight legs.

MORE FUN TO DO!

OVER THE EDGE

Purpose:

To show how a dragline protects a spider.



Materials

- ⇒ spider model from previous experiment
- ⇒ scissors
- ⇒ ruler
- ⇒ #10 crochet thread
- ⇒ transparent tape

Getting Ready!



Prepare a supply table so that each group of 3 to 5 kids will have 1 pair of scissors, 1 ball of crochet thread, and transparent tape. Each child in the group is to perform the following steps.

What To Do!



1. Cut one 12-inch piece of crochet thread.
2. Tape the thread underneath the spider from the previous experiment, at the end of the spider's abdomen.
3. Tape the free end of the thread to the edge of a table.
4. Move the spider around on the table, then push it off the edge.

So Now You Know



The spider falls over the edge, but the string allows it to fall only a short way.

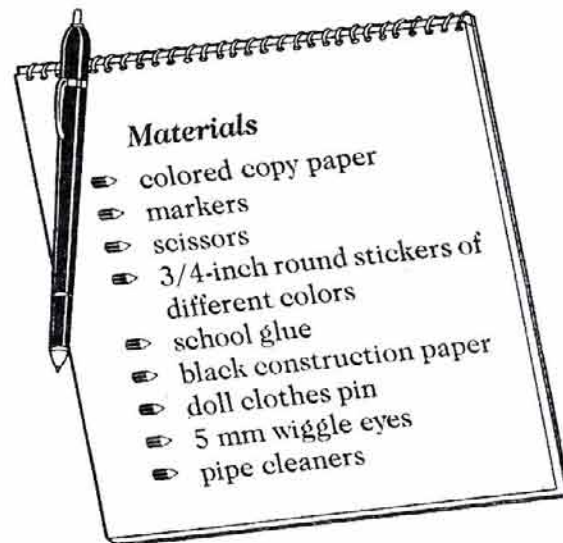
The string represents a spider's dragline, which is a silk strand that keeps the spider from falling and hurting itself. A real spider would climb back up its dragline, rolling the line into a ball as it climbs. Some spiders then eat the ball of silk.

MORE FUN TO DO!

BETTY THE BUTTERFLY

Purpose:

To make a model of the body parts of a butterfly.



Getting Ready!



Follow the instructions and make a sample butterfly in advance. Show your butterfly to the group and point out the different body parts of the insect. (Figure 4.8 on the following page.)

Copy the Betty the Butterfly pattern onto colored copy paper. (Figure 4.7 at the end of the chapter.) Cut the copies in half so that each child has one butterfly pattern. Prepare a supply table so that each group of 3 to 5 kids will have 1 or more pairs

of scissors, 1 bottle of glue, and a sheet of black construction paper for each child. Supply 1 doll clothes pin, 2 wiggle eyes, and a 6 inch piece of pipe cleaner for each child. Ask children from each group to transport the needed supplies to their work tables.

What To Do!



1. Cut around the outside of the wing pattern. Do not cut the wings apart.
2. Decorate the wings with the colored stickers. Remember that the designs on the wings are symmetrical, which means wings on opposite sides of the body are mirror images of each other. The front wings do not have to have the same design as the hind wings.
3. Fold the wings with the design sides together. Use the glue to secure the folded end of the wings in the opening of the doll pin. The wings should be as close to the head of the pin as possible. (Figure 4.8 below)

Figure 4.8

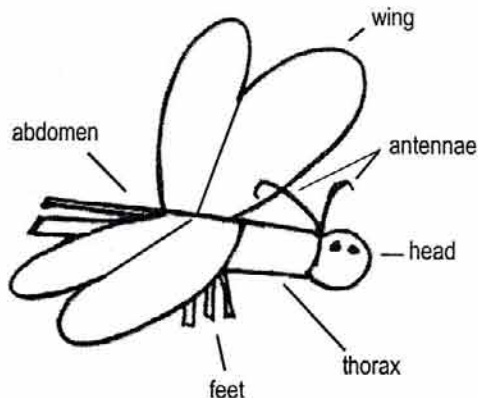


Figure 4.9



4. Fold the black piece of paper in half with the short sides together. Cut out two notches from the paper to form a shape that looks like the letter E. (See Figure 4.9 shown here.)
5. Unfold the black paper and glue the center of the paper onto the doll pin beneath the wings. Bend the six strips to form the 6 legs of the butterfly.
6. Twist the pipe cleaner around the neck of the doll pin to form two antennae.
7. Glue the eyes onto the head of the doll pin.

So Now You Know

Butterflies, like all insects, have three body parts, three pairs of legs, symmetrical wings, two large eyes, and two antennae.



TAKE HOME PROJECT

BUTTERFLY METAMORPHOSIS

Make 1 copy of the **Butterfly Metamorphosis** experiment sheet for each child. (Figures 4.10 and 4.11 at the end of this chapter.)



*INSECT AND SPIDER EXPERIMENTS IN JANICE VANCLEAVE'S BOOKS FROM
JOHN WILEY AND SONS, NEW YORK*



- VanCleave, Janice. *Biology for Every Kid*, pp. 94-109.
_____. *Play and Find Out about Insects and Spiders*.
_____. *Biology for Every Kid*.
_____. *Insects and Spiders*.
_____. *200 Goopy, Slippery, Slimy, Weird, and Fun
Experiments*, pp. 31-33.
_____. *201 Awesome, Magical, Bizarre, and Incredible
Experiments*, p. 30.
_____. *202 Oozing, Bubbling, Dripping, and Bouncing
Experiments*, p. 32.
_____. *Science Experiment Sourcebook*, pp. 81-83.

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Imes, Rick. *Incredible Bugs*.
Kneidel, Sally. *Pet Bugs*.
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Russo, Monica. *The Insect Almanac*.
Still, John. *Amazing Butterflies and Moths*.
Suzuki, David. *Looking at Insects*.
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Guide*.

LITERATURE CONNECTIONS

- Bloy, Margaret. *Be Nice to Spiders*.
Herole, Ann. *The Butterfly Birthday*.
Kimmel, Eric. *Anansi and the Moss-Covered Rock*.

- Kipling, Rudyard. *The Butterfly That Stamped*.
Kline, Suzy. *Horrible Harry and the Dungeon*.
Osborne, Mary P. *Spider Kane and the Mystery at Jumbo
Nightcrawlers*.
White, E.B. *Charlotte's Web*.
Williams, Karen Lynn. *Baseballs and Butterflies*.

T E E N S

FUN ACTIVITY

GEOMETRIC DESIGNS

Purpose:

To collect and display spider webs.



Getting Ready!

Fill in the date and location that the prized web collections will be displayed on the **Spider Web Art** handout. Make 1 copy of the handout for each teen. (Figure 4.12 at the end of this chapter.) Prepare a place to hang the web art pieces.



What To Do!

Teens will follow instructions on handout to collect spider webs.



*INSECT AND SPIDER EXPERIMENTS IN JANICE VANCLEAVE'S BOOKS FROM
JOHN WILEY AND SONS, NEW YORK*



VanCleave, Janice. A+ Biology, pp 139-144

_____. Insects and Spiders.

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Guide to the More Common American Species*.

Zakowski, Connie. *The Insect Book*.

LITERATURE CONNECTIONS

Klass, David. *California Blue*.

Stratton-Porter, Gene. *A Girl of the Limberlost*.

MYSTERIOUS CRYSTALS

FIGURE 4.4

LITERATURE CONNECTION

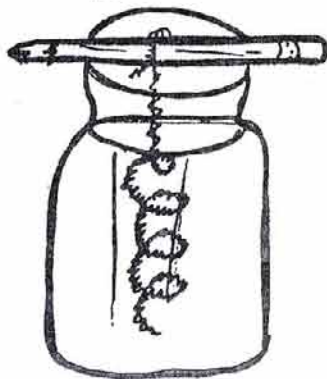
Van Allsburg, Chris. *Two Bad Ants*. The quest for a mysterious sweet-tasting crystal lead to near disaster for two curious ants.

PURPOSE:

To grow the mysterious crystals (sugar crystals) the ants searched for in the story, *Two Bad Ants*.

MATERIALS

- 2 1/2 cups sugar
- 1 cup tap water
- cooking pot
- stirring spoon
- 1 quart jar with lid
- 12-inch pipe cleaner
- 12-by-12 inch piece of wax paper



WHAT TO DO!

Note: The crystals grown are not to be eaten because the jar will be left open and the crystals may not be clean.

1. Combine the sugar and water in the pot. Stir until as much sugar as possible dissolves in the water.
2. Adult Step: Cook the sugar and water mixture until it comes to a boil. Stir as you cook. When the solution comes to a rolling boil, it will look clear. Remove the pot from the heat.
3. Allow the liquid to cool to room temperature in the pot, then pour it into the jar.
4. Coil the pipe cleaner so that it is about 1/2 inch shorter than the height of the jar.
5. Dip the coiled pipe cleaner in the sugar solution. When the pipe cleaner is soaked with the solution, remove it, and lay it on a piece of waxed paper. Close the jar. Allow the pipe cleaner to dry for 2 to 3 days on the wax paper. As the water evaporates from the pipe cleaner, small crystals of sugar will cover the surface of the pipe cleaner.
6. Wrap one end of the prepared pipe cleaner around the center of the pencil. Remove the lid from the jar and lower the coiled pipe cleaner in the sugar solution.
7. Place the uncovered jar where it will be undisturbed and at room temperature. Observe the surface of the pipe cleaner periodically for 2 to 4 weeks. The tiny crystals on the pipe cleaner provide a surface for more sugar to stick, thus growing into large crystals. If crystals form on the surface of the liquid, use a spoon to dip them out or break them so they fall to the bottom of the jar.

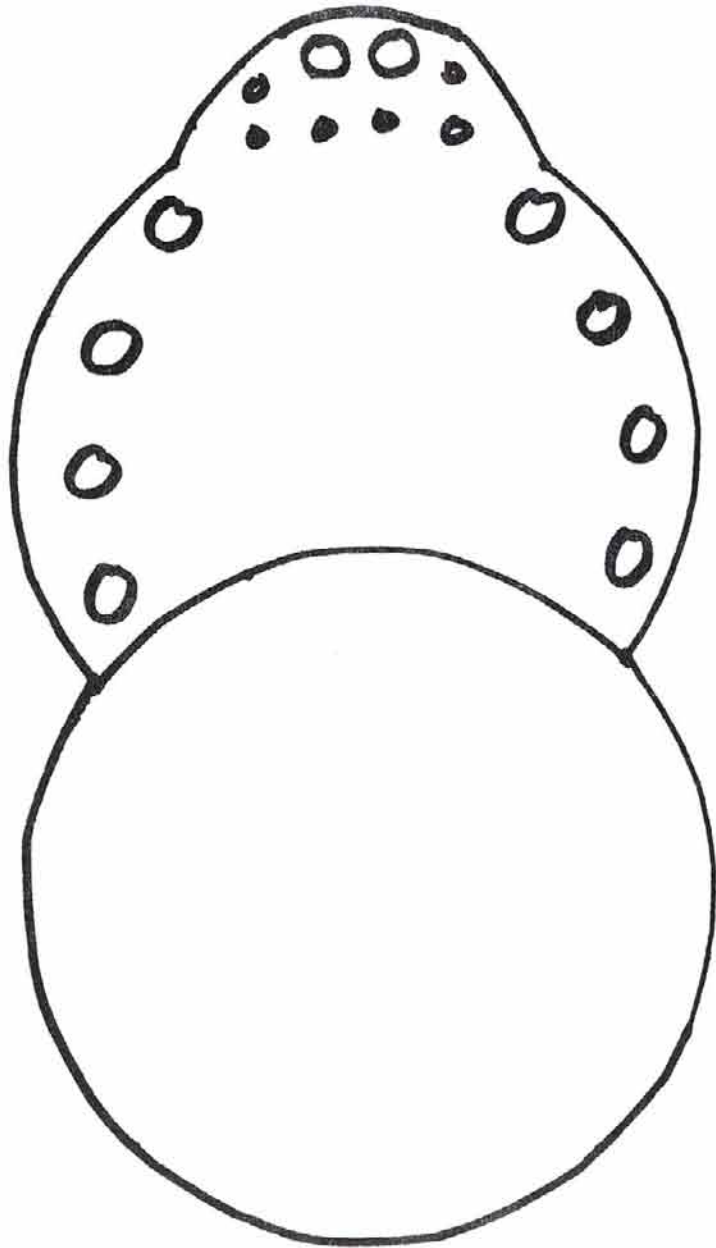
Crystal Experiments found in these science books by Janice VanCleave from John Wiley and Sons, New York.

VanCleave, Janice. *Chemistry for Every Kid*, pp 132-135, 138, 140-142, 148-149, 156-157.

_____. *Earth Science for Every Kid*, pp 24, 26, 30-31.

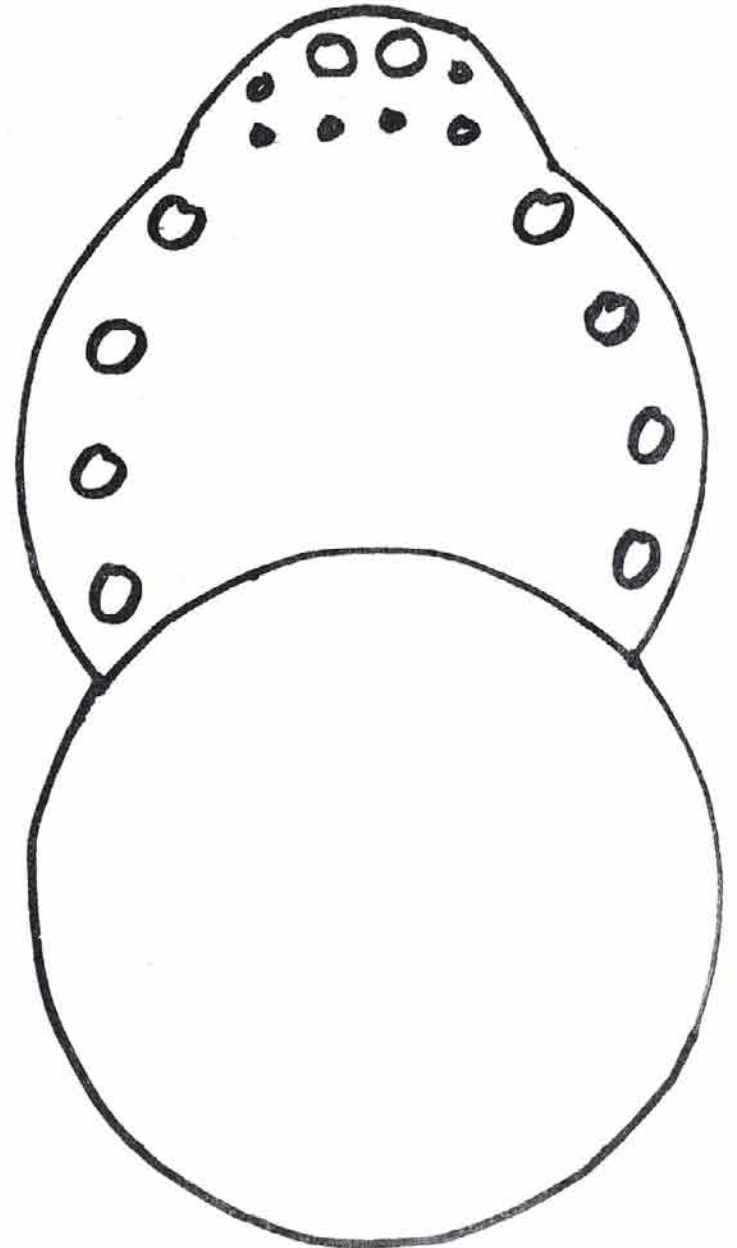
STELLA THE SPIDER

FIGURE 4.5



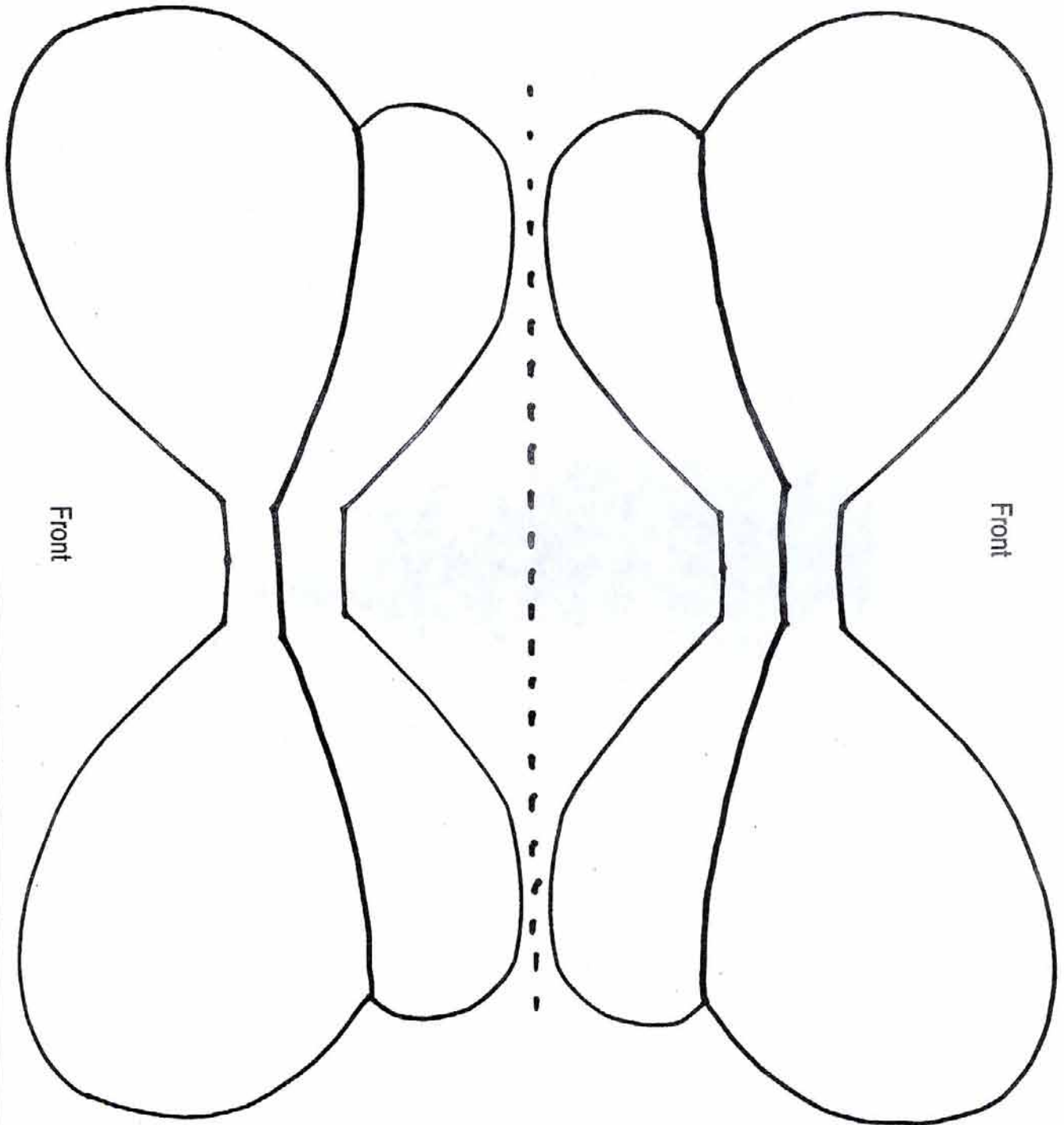
Cephalothorax

Abdomen



BETTY THE BUTTERFLY'S WINGS

FIGURE 4.7



BUTTERFLY METAMORPHOSIS

FIGURE 4.10

PURPOSE:

To make a fold book showing the stages of growth of a butterfly.

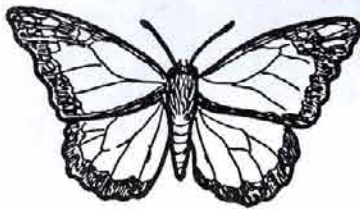
WHAT TO DO!

1. Cut along the solid lines of the square.
2. Turn the paper over and fold all four corners along the dashed lines into the center.
3. Fold the paper along the diagonal line to form a triangle.
4. Open the book, then cut out and tape the following pictures under the indicated flaps to represent the stages of the butterfly's growth.

So NOW YOU KNOW!

Some insects only have 3 steps of growth, which is called incomplete or gradual metamorphosis. The growth of a butterfly is called complete metamorphosis because it consists of 4 steps.

Step 1 Adult



Step 2 Egg



Step 3 Caterpillar

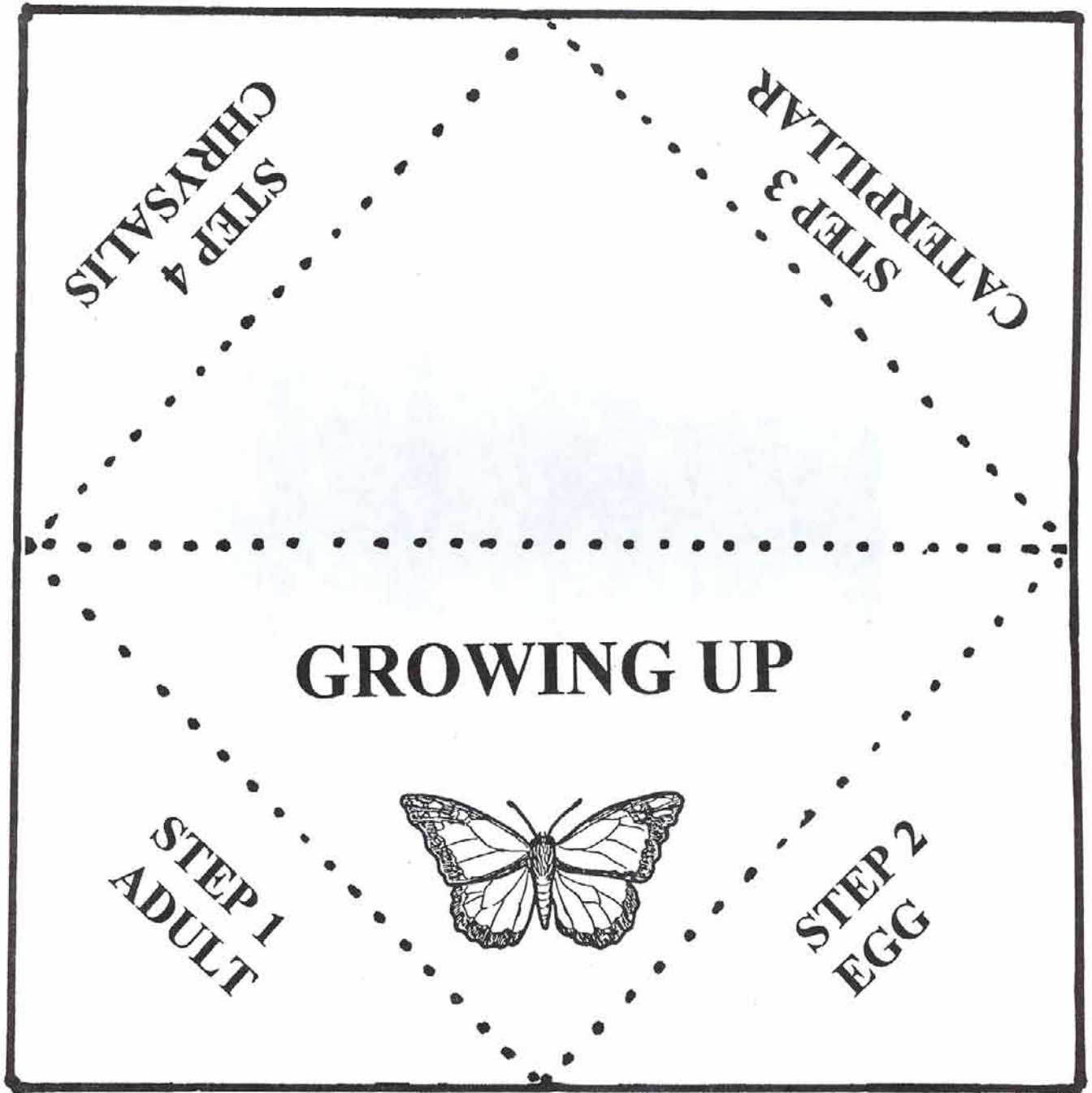


Step 4 Chrysalis



BUTTERFLY METAMORPHOSIS

FIGURE 4.11



SPIDER WEB ART

FIGURE 4.12

WHAT? Real spider webs will be collected and displayed.

WHEN? _____

WHERE? _____

How? Follow the instructions given here to catch real spider webs. Use your own creativity in mounting your collections. Choose your best web for display.

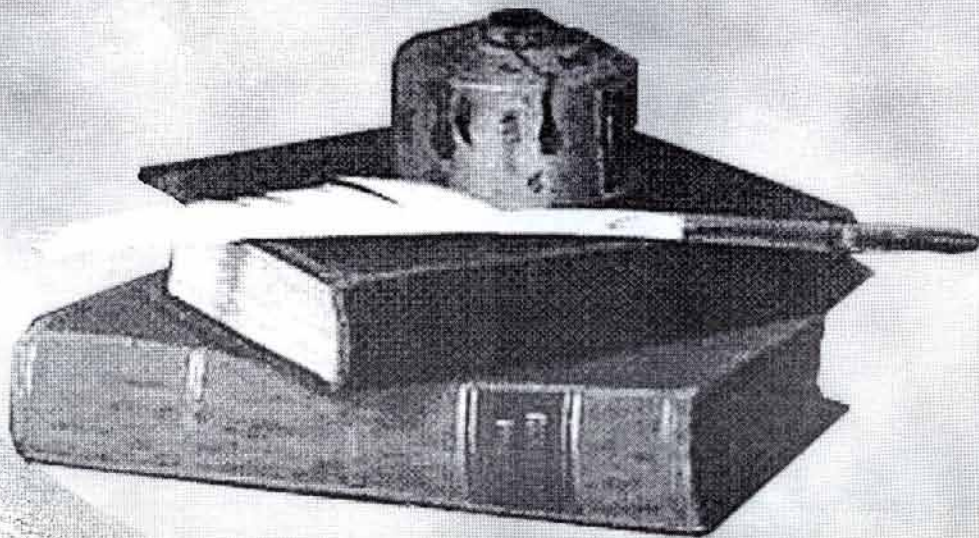
MATERIALS

hair spray
baby powder
scissors
construction paper (dark color)
helper

WHAT TO DO!

1. Find several webs suitable for framing. Caution: Be sure the spider is gone before continuing.
2. Spray the web with hair spray, then spray it with a fine mist of powder.
3. Spray the paper with hairspray, and push the sticky paper against the web.
4. Hold the paper in place while your helper cuts the webs support strands.
5. Repeat steps 1 through 4 to collect different webs.
6. Be creative in mounting and framing the collected webs.

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Preschool

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- Allen, Pamela. *Who Sank the Boat? Coward, 1983*. Various animals get in a boat until it sinks under their weight.
- Anderson, Joan. *Harry's Helicopter*. Morrow, 1990. One day Harry's bright red cardboard helicopter takes off, giving him a thrilling ride.

- Bare, Colleen. *Busy, Busy Squirrels*. Dutton, 1991. A photodocumentary about the various kinds of squirrels and their life cycles.
- Benjamin, Cynthia. *I Am A Pilot*. After flying on a plane, Anna and Josh wonder what it would be like to be a pilot.
- Benson, Patrick. *Little Penguin*. Philomel Books, 1991. Comparing herself to the larger emperor penguins, Pip the Adélie penguin feels unhappy with her size until an encounter with a huge sperm whale puts things in a different perspective for her.
- Bond, Ruskin. *Cherry Tree*. Boyd Mills Press, 1991. Story from India in which a young girl plants a cherry seed and cares for the tree.
- Branley, Franklyn. *Floating and Sinking*. Crowell, 1967. The science of floating is explained in simple terms.
- Bunting, Eve. *Ducky*. Clarion Books, 1998. A yellow plastic duck makes a long perilous journey when he is washed overboard with a crate of bathtub toys during a storm.
- Bunting, Eve. *Flower Garden*. Harcourt Brace, 1994. A young girl prepares a flower garden as a birthday surprise for her mother.
- Bunting, Eve. *Night Tree*. Harcourt Brace, 1991. A family decorates a tree in the forest for the animals at Christmas.
- Bunting, Eve. *Someday a Tree*. Clarion, 1993. Alice's big old oak tree is dying, but she thinks of a way to keep part of the tree alive—planting its acorns.
- Calhoun, Mary. *Hot-Air Henry*. Morrow, 1981. Sassy Siamese cat Henry stows away on a hot air balloon and ends up taking a fur-raising flight across the mountains.

- Carle, Eric. *The Hungry Caterpillar*. HaperCollins, 1969. A caterpillar hungrily nibbles its way through a medley of foods before metamorphosizing into a butterfly.
- Carle, Eric. *The Very Busy Spider*. Philomel Books, 1995. Farm animals try to divert a busy little spider from spinning her web, but she persists and produces a thing of both beauty and usefulness.
- Carle, Eric. *The Tiny Seed*. Alphabet Press, 1987. A simple description of a flowering plant's life cycle through the seasons.
- Collins, Pat. *Tomorrow, Up and Away!* Houghton Mifflin, 1990. When Turtle tells Squirrel he'd like to fly, Squirrel finds a way to help him—much to Turtle's dismay!
- Conklin, Gladys. *When Insects are Babies*. Holiday House, 1969. Describes briefly the short infancy of such common insects as the grasshopper, praying mantis, cicada, earwig, and twelve others.
- Delaney, E. *The Gunnywolf*. Harper, 1988. Flowers tempt a little girl to leave her yard, putting her at the mercy of the Gunnywolf.
- Ehlert, Lois. *Planting a Rainbow*. Harcourt Brace Jovanovich, 1988. A mother and child plant a rainbow of colors in the family garden.
- Ehlert, Lois. *Red Leaf, Yellow Leaf*. Harcourt Brace Javanovich, 1991. A colorful book illustrating the growth of a sugar maple tree.
- Gibbons, Gail. *The Seasons of Arnold's Apple Tree*. harcourt, 1988. As the seasons pass, Arnold enjoys a variety of activities as a result of his apple tree. Includes a recipe for apple pie and a description of how an apple cider press works.
- Graham, Margaret Bloy. *Be Nice to Spiders*. Harpercrest, 1967. A spider is a welcome guest at the zoo because her sticky web keeps pesky flies under control.
- Hayes, Sarah. *The Grumpalump*. Clarion, 1991. The animals can't get a reaction from the grumpalump until the gnu blows in on the wind.
- Howe, Caroline. *Counting Penguins*. Harper, 1983. A penguin 1-2-3 book.
- Hutchins, Pat. *Titch*. Macmillan, 1971. Titch is the littlest at everything until he learns to garden.
- Joose, Barbara. *Spiders in the Fruit Cellar*. Knopf, 1983. Elisabeth is old enough to go to the fruit cellar alone, but she is afraid of the spiders lurking there.
- Kandoian, Ellen. *Molly's Seasons*. Cobblehill, 1992. A young girl observes the seasons at her Maine home and wonders about seasons in other parts of the world.
- Kellog, Steven. *Much Bigger than Martin*. Dial Press, 1976. Explores the concepts of "bigger than" and "smaller than." A personal way to initiate exploration of volume.
- Kimmel, Eric. *Anansi and the Moss-Covered Rock*. Holiday House, 1990. Anansi the Spider uses a strange moss-covered rock in the forest to trick all the other animals, until Little Bush Deer decides he needs to learn a lesson.
- Kirk, David. *Miss Spider's Tea Party*. Scholastic, 1994. Lonely Miss Spider prepares a lovely tea party, but none of the other insects want to come.
- Krauss, Ruth. *The Carrot Seed*. Harpercrest, 1988. Despite everyone's dire predictions, a little boy has faith in the carrot seed he plants.

- Kroll, Steven. *The Magic Rocket*. Holiday House, 1991. Felix's dog, Atom, is abducted by a flying saucer and Felix must rescue him by following in a magic rocket.
- Lester, Helen. *Tacky the Penguin*. Houghton Mifflin Co., 1988. Tacky the penguin doesn't fit in with his sleek and graceful companions, but his odd behavior comes in handy when hunters come with maps and traps.
- Lester, Helen. *Three Cheers for Tacky*. Houghton Mifflin, 1994. Tacky the penguin adds his own unique touch to his team's routine at the penguin cheering contest, with surprising results.
- Lloyd, David. *Hello, Goodbye*. Lothrop, 1988. A bear, two bees, some birds, and other creatures meet at a tree and say hello until the rain begins and they say goodbye.
- Lobel, Anita. *Allison's Zinnia*. Greenwillow, 1990. Alison acquired an amaryllis for Beryl who bought a begonia for Crystal—and so on through the alphabet, as full-page illustrations are presented of each flower.
- Magee, Doug and Robert Newman. *Let's Fly from A to Z*. Cobblehill, 1992. An alphabet book that explores people, places, and things specific to airplanes.
- Mahy, Margaret. *The Pumpkin Man and the Crafty Creeper*. Lothrop, Lee & Shepard Books, 1991. A bossy and demanding plant insists on going home with Mr. Parkin, who usually only tends quiet pumpkins, and from that moment his peaceful existence is changed.
- Maris, Ron. *I Wish I Could Fly*. Greenwillow Books, 1986. Turtle wishes he could fly, dive, climb and run like the other animals.
- McDermott, Gerald. *Anansi the Spider: a Tale from the Ashanti*. Holt, 1972. In trying to determine which of his six sons to reward for saving his life, Anansi the Spider is responsible for placing the moon in the sky.
- McNulty, Faith. *The Lady and the Spider*. Harper & Row, 1986. A spider living in a head of lettuce is saved by the lady who finds her.
- McPhail, David. *First Flight*. Little, Brown and Company, 1987. A boy tells the story of his first trip in an airplane with his teddy bear.
- Myers, Bernice. *The Flying Shoes*. Lothrop, Lee & Shepard Books, 1992. Dogma Barker sets off to deliver her flying shoes to the queen, but Cattails, the sneak thief, tries to steal them from her.
- Oppenheim, Joanne. *Have You Seen Trees?* Addison-Wesley, 1967. A poem about the seasonal changes of trees.
- Pallotta, Jerry. *The Icky Bug Alphabet Book*. Children's Press, 1986. Introduces the characteristics and activities of insects and other crawly creatures from A to Z, beginning with the ant and concluding with the zebra butterfly.
- Pearson, Susan. *My Favorite Time of Year*. Harper & Row, 1988. A family enjoys the weather and activities of every season of the year.
- Peet, Bill. *Merle the High Flying Squirrel*. Houghton Mifflin, 1974. Merle, a shy Eastern city squirrel, decides to shed his fears and take a trip West. A kite he untangles carries him away.
- Philpot, Lorna & Graham. *Amazing Anthony Ant*. Random House, 1994. Sing-along with the story as Anthony Ant is followed by marching ants through his underground nest.
- Pluckrose, Henry. *Floating and Sinking*. Watts, 1987. The science of floating is explained in easy-to-understand terms.
- Pollock, Penny. *The Spit Bug Who Couldn't Spit*. Putnam, 1982. The story of a lonely spittlebug who can't make spit.

Ringgold, Faith. *Tar Beach*. Crown, 1991. A young girl dreams of flying above her Harlem home, claiming all she sees for herself and her family.

Ryder, Joanne. *Hello, Tree!* Dutton, 1991. Describes, in simple text and illustrations, some of the unique characteristics of trees.

Scarry, Richard. *Richard Scarry's Best Times Ever*. Western Publishing Co. 1988. A book about seasons and holidays.

Shannon, George. *The Surprise*. Greenwillow, 1983. Squirrel surprises his mother for her birthday.

Siebert, Diane. *Plane Song*. Harpercollins, 1993. Colorful, realistic painting by Vincent Nester show images of outer space. A good rhyming book for younger children.

Stevenson, James. *Winston, Newton, Elton and Ed*. Greenwillow, 1978. Two stories—the first featuring three pugnacious walruses, the second, a stranded penguin.

Van Allsburg. *Two Bad Ants*. Houghton Mifflin, 1988. The quest for a mysterious sweet-tasting crystal leads to near disaster for two curious ants.

Wade, Allen. *I'm Flying*. Knopf, 1990. A boy floats his balloon across mountains, plains, vistas, cities, and the sea to land on a desert island.

Watson, Mary. *The Butterfly Seeds*. A child is given "butterfly seeds" by his grandfather to bring to America.

Weis, Leatie. *Funny Feet!* Watts, 1978. A pigeon-toed penguin, cheating on the corrective treatment she is undergoing for her handicap, suddenly tries to make up for lost time.

Wood, Audrey. *Little Penguin's Tale*. Harcourt Brace Jovanovich, 1989. Searching for fun in his snowy world, Little Penguin dances with the gooney birds, cavorts at the walrus polar club, and narrowly escapes being eaten by a whale.

Young, Ed. *Up A Tree*. Harper, 1983. A wordless book in which a cat finds himself up a tree and won't come down until supper passes him by.

Elementary

Allard, Harry. *The Stupids Take Off*. Houghton Mifflin, 1989. In an attempt to avoid a visit from Uncle Carbuncle, the Stupids fly off in their airplane and visit several other relatives who are just as stupid as they are.

Allen, Pamela. *Mr. Archimedes' Bath*. Angus and Robertson, 1980. Mr. Archimedes explores displacement in his tub with his friends Kangaroo, Wombat, and Goat.

Anderson, Margaret. *Children of Summer: Henri Fabre's Insects*. Farrar, Straus & Giroux, 1997. Ten-year-old Paul describes how he and his sisters learned about insects from the observations and writings of their father, the nineteenth-century French entomologist Jean-Henri Fabre.

Atwater, Richard and Florence. *Mr. Popper's Penguins*. Little, Brown & Company, 1988. The unexpected delivery of a large crate containing an Antarctic penguin changes the life and fortunes of Mr Popper, a house painter obsessed by dreams of the polar region. Readable to young kids.

Beard, Darleen Bailey. *The Pumpkin Man from Piney Creek*. Simon & Schuster, 1995. After seeing a jack-o-lantern for the first time, Hattie tries to convince her father to spare one of the pumpkins he is selling.

- Borden, Louise. *Caps, Hats, Socks and Mittens*. Scholastic, 1989. Simple text and illustrations describe some of the pleasures of each season. (An Early Reader.)
- Bunting, Eve. *Flower Garden*. Harcourt Brace Jovanovich, 1994. Helped by her father, a young girl prepares a flower garden as a birthday surprise for her mother.
- Byars, Betsy. *McMummy*. Viking, 1993. Looking after an eccentric scientist's greenhouse doesn't seem any stranger than the other odd jobs taken by Mozie and his partner Battie—until Mozie discovers a large, mummy-shaped pod on one of the plants.
- Chapian, Marie. *Alula-Belle Blows Into Town*. Bethany House, 1995. When eight-year-old Alula-Belle Button-top Paintbrush Puccini Softshoe Magrew shows up in the middle of Main Street in the town of KneeBend-on-Limber surrounded by millions of butterflies she changes the lives of everyone she meets.
- Christian, Mary Blount. *Sebastian (Super Sleuth) and the Flying Elephant*. Macmillan, 1994. When Detective John Quincy Jones is told to find the circus's missing elephant by nightfall, his faithful canine companion must come to the rescue as usual.
- Coerr, Eleanor. *The Big Balloon Race*. Harper Collins, 1992. Ariel almost causes her famous mother to lose a balloon race and then helps her win it in this historical account of balloonist Carlotta. (An I-Can-Read book.)
- Collins, Pat. *Tomorrow, Up and Away!* Houghton Mifflin, 1990. When Turtle tells Squirrel he'd like to fly, Squirrel finds a way to help him—much to Turtle's dismay!
- Conklin, Gladys. *When Insects Are Babies*. Holiday House, 1969. Describes briefly the short infancy of such common insects as the grasshopper, praying mantis, cicada, earwig, and twelve others.
- Derby, Sally. *Jacob and the Stranger*. Ticknor & Fields, 1994. When the plant he is minding for a stranger grows unusual buds, Jacob soon finds himself the temporary owner of a houseful of magical cats.
- George, Jean Craighead. *The Fire Bug Connection: an Ecological Mystery*. HarperCollins, 1993. Twelve-year-old Maggie receives European fire bugs for her birthday, but when they fail to metamorphose and grow grossly large and explode instead, she uses scientific reasoning to determine the cause of their strange death.
- Gibbons, Gail. *The Seasons of Arnold's Apple Tree*. Harcourt Brace, 1984. As the seasons pass, Arnold enjoys a variety of activities as a result of his apple tree.
- Gillis, Jennifer Storey. *In a Pumpkin Shell*. Storey Communications, 1992. Instructions for a variety of projects involving pumpkins including growing them, using them in recipes and making things out of them.
- Graham, Margaret Bloy. *Be Nice to Spiders*. Harpercrest, 1967. A spider is a welcome guest at the zoo because her sticky web keeps pesky flies under control.
- Hawkes, Kevin. *His Royal Buckliness*. Lothrop, Lee & Shepard Books, 1992. Carried to a frozen land by giants to be their king, Lord Buckliness misses the delights of summer and spring.
- Herold, Ann. *The Butterfly Birthday*. Macmillan, 1991. Matt, a collector of caterpillars, expresses his fear of spiders and learns that everyone has fears, even his father.

- Kellog, Steven. *The Mysterious Tadpole*. Dial Press, 1977.
By following Louis's growing tadpole, Alphonse, this story looks at volume and measurement.
- King, Elizabeth. *The Pumpkin Patch*. Dutton Children's Books, 1990. Text and photographs show a pumpkin from seeds to fat pumpkins ready to be carved into Jack-o'-lanterns.
- Kimmel, Eric. *Anansi and the Moss-Covered Rock*. Holiday House, 1988. Anansi the Spider uses a strange moss-covered rock in the forest to trick all the other animals, until Little Bush Deer decides he needs to learn a lesson.
- Kipling, Rudyard. *The Butterfly that Stamped*. Bedrick, 1983. A butterfly and his wife help a mighty king control his quarreling wife.
- Kirk, David. *Miss Spider's Tea Party*. Scholastic, 1994. Lonely Miss Spider prepares a lovely tea party, but none of the other insects want to come.
- Kitamura, Satoshi. *UFO Diary*. Farrar, Straus & Giroux, 1989. A UFO is lost in space until it spots a strange blue planet. (An Early Reader.)
- Kline, Suzy. *Horrible Harry and the Dungeon*. Viking, 1996. Its almost summer vacation and the students in room 2B are having trouble concentrating on their butterfly project, until a frightening-looking new teacher comes to supervise the suspension room and Harry is sent there as punishment for unruly behavior.
- Krauss, Ruth. *The Carrot Seed*. Harpercrest, 1988.
Despite everyone's dire predictions, a little boy has faith in the carrot seed he plants.
- Langton, Jane. *The Fledgling*. Harper and Row, 1980.
Georgie experiences the magic and delight of flying to the dismay of her family who do everything to try to stop her.
- Lyon, George Ella. *A B Cedar: an Alphabet of Trees*. Orchard Books, 1989. An alphabet book introducing the leaves from a variety of trees.
- Maguire, Gregory. *Seven Spiders Spinning*. Clarion, 1994. Seven prehistoric spiders that had been trapped in ice for thousands of years bring excitement to rural Vermont and briefly unite two rival clubs at a local elementary school.
- Mahy, Margaret. *The Girl with the Green Ear: Stories about Magic in Nature*. Knopf, 1992. A collection of nine stories in which characters encounter talking plants, a pine-tree man, a merry-go-round with flying horses, mystical midnight birds, and a cake-eating tree.
- Maris, Ron. *I Wish I Could Fly*. Greenwillow Books, 1986. Turtle wishes he could fly, dive, climb and run like the other animals, but then he realizes something he can do that they can't.
- McCaughrean, Geraldine. *The Cherry Tree*. Knopf, 1992. After a war destroys their Japanese village and kills their father, Taichi and Yumiko find hope by nursing a cherry tree through a harsh winter and seeing it blossom into new life.
- Monsell, Mary E. *The Mysterious Case of Mr. Pin*. Antheneum, 1989. Follows the adventures of Mr. Pin, a rockhopper penguin, who leaves his home at the South Pole to be a detective in Chicago.
- Oppenheim, Joanne. *Have You Seen Trees?* Scholastic 1995. A lively introduction to trees and the seasons, just right for spring. Includes a glossary and four pages of child-friendly tree trivia.

- Osborne, Mary P. *Spider Kane and the Mystery at Jumbo Nightercrawlers*. Knopf, 1993. With the help of a spider, a moth, and two ladybugs, a young butterfly tries to uncover the mystery involving a gossamer-winged butterfly with whom he has fallen in love.
- Pellowski, Anne. *Hidden Stories in Plants*. Macmillan, 1990. Unusual and easy-to-tell stories and activities from around the world. Myths, legends, tales, and folklore about plants. Also describes how to use plants to make ornaments, toys, disguises, dolls, and musical instruments.
- Primavera, Elise. *Plant Pet*. Putnam, 1994. In his junkyard, Bertie discovers a life form found of gardening, but he nearly loses his new pet by not understanding its needs.
- Provinsen, Alice and Martin. *The Glorious Flight: Across the Channel with Louis Bleriot*. Viking, 1983. A witty biography of the man whose fascination with flying machines produced the Bleriot XI, which crossed the English Channel in thirty-seven minutes in the early 1900's.
- Pulver, Robin. *Nobody's Mother is in Second Grade*. Dial Books for Young Readers, 1992. Cassandra's mother, who wishes she could go to second grade again, visits her daughter's class disguised as a plant.
- Quattlebaum, Mary. *Jackson Jones and the Puddle of Thorns*. Delacorte, 1994. When his mother gives him a garden plot for his tenth birthday, Jackson Jones hopes to earn enough money to buy a basketball, but all he seems to get is trouble.
- Rockwell, Anne. *Up a Tall Tree*. Doubleday, 1981. A wood cutter's son explores the nearby forest when he makes a discovery that changes his life.
- Rogers, Paul. *Rain and Shine*. Orchard, 1987. Seven episodes in the life of a family are chronicled, one of which involves making spider pies.
- Ryder, Joanne. *Hello, Tree!* Lodestar Books, 1991. Describes some of the unique characteristics of trees in simple text and illustrations.
- Titherington, Jeanne. *Pumpkin, Pumpkin*. Greenwillow Books, 1986. Jamie plants a pumpkin seed, watches it grow, then carves a pumpkin and saves seeds to plant in spring.
- Wade, Alan. *I'm Flying!* Knopf, 1990. A little boy floats away on his balloon across mountains, plains, cities, and the sea, until he lands on a desert island.
- Walter, Mildred Pitts. *Brother to the Wind*. Lothrop, Lee and Shepard, 1985. With the help of Good Snake, and despite the ridicule of his friends and parents, a young African boy gets his dearest wish.
- Wayne, Jenifer. *Sprout and the Helicopter*. McGraw-Hill, 1977. The desire to own a rubber dinghy ignites Sprout's characteristically strong sense of purpose.
- Weiss, Leatie. *Funny Feet!* Fiwatts, 1978. A pigeon-toed penguin cheats on her foot treatments and tries to make up for lost time.
- Williams, Karen Lynn. *Baseballs & Butterflies*. Lanthrop, Lee & Shepard Books, 1990. Daniel finds his summer butterfly project threatened by his bratty little brother and his friend's obsession with baseball.
- White, E.B. *Charlotte's Web*. Harper Collins, 1952. Wilbur, a lovable pig, is rescued from a cruel fate by a beautiful and intelligent spider named Charlotte.
- Wolstein, Diane. *8000 Stones*. Doubleday, 1972. While playing with his toy sailboat and his friend's ivory elephant, P'ei finds a way to determine how much his father's new elephant weighs.

Teen

- Arthur, Elizabeth. *Antarctic Navigation: a Novel*. Knopf, 1994. Adventure stories about women explorers in the Antarctic regions.
- Bowler, Tim. *Midget*. Mcelderry Books, 1995. Fifteen year old Midget life seems out of control because of his abusive older brother, but he finds he is in control for the first time when he gets his own sailboat.
- Burleigh, Robert. *Journey of Charles Lindbergh*. Philomel, 1991. This story of courage, endurance, and pursuing a dream follows Charles Lindbergh's flight across the Atlantic in 1927. Lovely paintings.
- Bellville, Cheryl Walsh. *Flying in a Hot Air Balloon*. Carolrhoda Books, 1993. The author describes her experiences with hot air ballooning as passenger and ground-crew member and depicts the sport from flight preparation to dismantling.
- Byars, Betsy Cromer. *Coast to Coast*. Delacorte Press, 1992. A thirteen-year-old girl encourages her grandfather to fulfill his dream of flying his old piper cub plane from South Carolina to California and then informs him she is coming along.
- Carter, Alden. *Between a Rock and a Hard Place*. Scholastic, 1995. A fifteen-year-old boy and his cousin are not looking forward to a family canoe trip, but start to enjoy it when it becomes a fight for survival.
- Crouch, Tom D. *The Bishop's Boys: A Life of Wilbur and Orville Wright*. Norton, 1989. A recognized authority on early aeronautics and the Wright brothers, Crouch emphasizes their family background, their personality traits, and their attitudes toward life and work.
- Dowd, John. *Abalone Summer*. Alaska Northwest Books, 1993. Twelve-year-old Jim, depressed after his father's death, finds adventure and challenge when he spends the summer with a Department of Fisheries diver off the rugged coast of British Columbia's Queen Charlotte Islands.
- Dubois, William Pene. *The 21 Balloons*. Viking, 1947. Relates the incredible adventures of Professor William Waterman Sherman who in 1883 sets off in a balloon across the Pacific, survives the volcanic eruption of Krakatoa, and is eventually picked up in the Atlantic. (A Newbery Award winner.)
- Fletcher, Ralph. *Spider Boy*. Clarion, 1997. After moving to another state, seventh grader Bobby deals with the change by telling people at school made-up stories and then retreating into his world of pet spiders and books about spiders.
- Freedman, Russel. *The Wright Brothers*. Scholastic, 1991. The story of how the Wright brothers invented the airplane with original photographs by Wilbur and Orville.
- George, Jean Craighead. *Who Killed Cock Robin?: An Ecological Mystery*. Dutton, 1971. Eighth-grader Tony Isidoro follows a trail of environmental clues to try and figure out what ecological imbalances might have caused the death of the town's best-known robin.
- George, Jean Craighead. *There's An Owl in the Shower*. Harper Collins, 1995. Because of the protection of spotted owls, Borden's father lost his job. Borden plans to kill any spotted owl he sees until he and his father find themselves taking care of an owlet.

- Gillis, Jennifer Storey. *In a Pumpkin Shell*. Storey Communications, 1992. Instructions for a variety of projects involving pumpkins including growing them, using them in recipes and making things out of them.
- Henry, Thomas Robert. *The White Continent*. Sloane, 1951. The story of the Byrd Antarctic expedition.
- Hobbs, Will. *Downriver*. Macmillan, 1991. Fifteen-year-old Jessie and other rebellious teens from a wilderness survival school abandon their adult leader and try to run the dangerous white waters at the bottom of the canyon.
- Howard, Fred. *Wilbur and Orville: A Biography of the Wright Brothers*. Knopf, 1987. An informative and highly readable biography, based on solid research.
- Jakab, Peter L. *Visions of a Flying Machine: The Wright Brothers and the Process of Invention*. Smithsonian Institution Press, 1990. A unique book that focuses on the Wrights' research and experiments. Jakab offers a detailed technical account of exactly what they accomplished and how they did it.
- Jennings, Terry. *Flight: The Planes, Gliders, Helicopters and other Flying Machines*.
- Johnson, Jerry Mack. *Country Scrapbook*. Simon & Schuster, 1977. A collection of nature facts and rural lore on such topics as the weather, plants, animals, farm foods, cleaning methods and pest purges of the past, and country cures and pastimes. Kingfisher Books, 1993. This "How Things Work" book includes a short history of flight, concise explanations of how things fly and simple experiments kids can do to experience first-hand the principles being described.
- Karr, Kathleen. *Spy in the Sky*. Hyperion, 1997. When Northerner Thaddeus Lowe lands his huge balloon in South Carolina at the beginning of the Civil War, ten-year-old orphan Ridley Jones joins up with him and the two set out to find a way to use Lowe's balloon to help the North.
- Kindl, Patrice. *Owl In Love*. Houghton Mifflin, 1993. A fourteen-year-old girl, who can transform into an owl, has a crush on her science teacher, which leads her into interesting new relationships with both humans and owls.
- Kingman, Lee. *The Luck of the Miss L*. Houghton Mifflin, 1986. Eleven-year-old Alec's dream of winning an upcoming rowing race is endangered when a near-fatal boating accident shakes his confidence.
- Klass, David. *California Blue*. Scholastic, 1994. When a boy finds a new species of butterfly which may necessitate closing the mill where his dying father works, they find themselves at opposite ends of the environment conflict.
- L'Engle, Madeleine. *Troubling a Star*. Farrar, Straus & Giroux, 1994. As she tries to stay alive after being left on an Antarctic iceberg, sixteen-year-old Vicky recalls the series of events that brought her to the bottom of the world and involved her in a dangerous mystery.
- Pellowski, Anne. *Hidden Stories in Plants*. Macmillan, 1990. Unusual and easy-to-tell stories and activities from around the world. Myths, legends, tales, and folklore about plants. Also describes how to use plants to make ornaments, toys, disguises, dolls, and musical instruments.
- Provinsen, Alice and Martin. *The Glorious Flight: Across the Channel with Louis Bleriot*. Puffin books, 1983. A witty biography of the man whose fascination with flying machines produced the Bleriot XI, which crossed the English Channel in thirty-seven minutes in the early 1900's.

Stratton-Porter, Gene. *A Girl of the Limberlost*. Indiana University Press, 1984. Deeply wounded by her embittered mother's lack of sympathy for her aspirations, Elnora finds comfort in the nearby Limberlost Swamp, whose beauty and rich abundance provide her with the opportunity to pay for her education by collecting moths.

RESOURCES FOR PARENTS, TEACHERS AND LIBRARIANS.

An * means it is highly recommended for library programs by coauthor Mary Stanton.

Blakey, Nancy. *Lotions, Potions and Slime: Mudpies and More!* Tricycle Press, 1996. Second in series. Household materials used in science experiments.

*Blakey, Nancy. *The Mudpies Activity Book: Recipes for Invention*. Ten Speed Press, 1993. Simple activities.

Bowden, Marcia. *Nature for the Very Young: A Handbook of Indoor and Outdoor Activities*. Wiley, 1989. Preschool activities for teachers or parents.

Carin, Arthur. *Guided Discovery Activities for Elementary School Science*. Macmillan, 1993. For teachers.

**The Giant Encyclopedia of Theme Activities for Children 2 to 5*. Gryphon House, 1993. For teachers and librarians; a wealth of information.

*Harlan, Jean Durgin. *Science As It Happens! Family Activities with Children Ages 4 to 8*. Henry Holt, 1994. For parents and librarians.

Herman, Marina. *Teaching Kids to Love the Earth*. Pfeifer-Hamilton Publishers, 1991. Nature activities for teachers.

*Kohl, Mary Ann F. *Science Arts: Discovering Science Through Art Experiences*. Bright Ring Publishing, 1993. Creative activities.

*Lingelbach, Jenepher, editor. *Hands-On Nature: Information and Activities for Exploring the Environment with Children*. Vermont Institute of Natural Science, 1986.

Vansant, Rhonda; Claire Kalish; and Barbara Dondiego. *Moths, Butterflies, Other Insects, and Spiders: Science in Art, song, and Play*. Tab Books, 1995.

Great activities including games and short puppet shows. Ross, Michael E. *Sandbox Scientist: Real Science Activities for Little Kids*. Chicago Review Press, 1995. For children aged 2-8.

Victor, Edward. *Science for the Elementary School*. Macmillan, 1980. For teachers. Website for Parents:

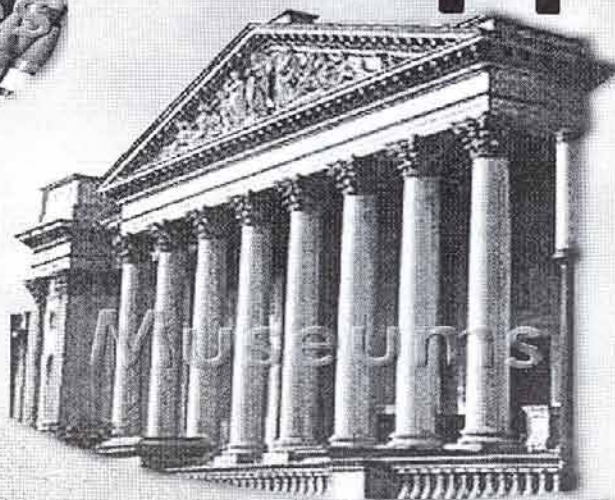
Helping Your Child Learn Science.

Includes experiments.

<http://www.ed.gov/pubs/parents/Science/>



Appendixes



APPENDIXES

SUPPLIES

Equipment

- adding machine tape, 2 inch wide
- baby food jars with lids
- bowls, 2 quart or larger
- crayons
- crochet thread, #10 (any color)
- doll pins (clothes pins found in craft stores)
- eyes, 5 mm wiggle
- film canisters with lids
- glue, school
- Handi-Tak
- index cards (any color)
- jars, 1 quart
- markers, black
- modeling clay
- newspaper
- paper, card stock, white
- paper, construction (different colors)
- paper, bulletin board (white)
- paper, pink tissue
- paper clips, small
- paper, 8 1/2 x 11 inch copy, white and colored

- paper cups, 9 ounce
- paper towels
- pencils
- pens
- pipe cleaners, 12 inch (chenille)
- plastic cola bottles
- poster board
- rulers
- sock, ladies white
- spoons, plastic
- stickers, 3/4 inch round -different colors
- tape, masking
- tape, transparent
- scissors
- toilet tissue tubes
- yardstick

Food items

- egg shells from boiled eggs
- pinto beans, dry
- rice, dry
- salt
- vinegar

TEXAS SCIENCE MUSEUM

ABILENE

Grace Cultural Center

102 Cypress Street
Abilene, TX 19601
(915)673-4587
www.abilene.com/moa/index.html

AMARILLO

Don Harrington Discovery Center

1200 Streit Drive
Amarillo, TX 79106
(806)355-9548
www.amarillo-cvb.org/don.html

AUSTIN

Austin Children's Museum

201 Colorado Street
Austin, TX 78701
(512)472-2499
www.austinkids.org/museum.html

CORPUS CHRISTI

Corpus Christi Museum of Science and History

1900 N. Chaparral Street
Corpus Christi, TX 78401
(512) 883-2862
[www.interconnect.net/connected/attractions/
pointfrm.htm](http://www.interconnect.net/connected/attractions/pointfrm.htm)

DALLAS

Science Place

1318 Second Avenue
Fair Park
Dallas, TX 75210

FORT WORTH

Fort Worth Museum of Science and History

1501 Montgomery Street
Ft. Worth, TX 76107
(817)732-1631
www.escii.net/fwms.html/

HOUSTON

Children's Museum of Houston

1500 Binz
Houston, TX 77004
(713)522-1138

Museum of Natural Science

One Hermann Circle Drive
Houston, TX 77004
(713)639-4600
www.hmns.mus.tx.us/

Museum of Health and Medical Science

1515 Hermann Drive
Houston, TX 77004
(713)521-1515
www.mhms.org

LUBBOCK

Science Spectrum

2579 S. Loop 289
Lubbock, TX 79412
(806) 745-2525

McKINNEY

Heard Natural Science Museum and Wildlife Sanctuary

One Nature Place
McKinney, TX 75069-8840
(972)562-5566
www.heardmuseum.org/

SAN ANTONIO

HEB Science Treehouse

(Outside of Witte Museum)
3801 Broadway
San Antonio, TX 78212
(210)357-1900

SCIENCE WEBSITES

With the explosion of the Internet, it is hard to keep up with all the latest websites available. Websites were chosen to be useful either as sources of information or sources of experiments. This is a very selective list mostly from *The Internet Kids and Family Yellow Page*, by Jean Armour Polly. Osborne/McGraw-Hill, 1997. Second edition.

Alexander Graham Bell's Kid's Page

Experiments.
bell.uccb.ns.ca/kids/kidspg_3.htm

Janice VanCleave's Page

Experiments and teaching tips.
members.aol.com/Janvanacle/index3.html

Let's Make Waves

Simple experiment.
www.hmco.com/school/rdg/gen_act/ocean/wave.html

New and Improved Little Shop of Physics Online

Demonstrations using everyday objects from Colorado State University.
129.82.166.181/Experiments.html

Nye Labs Online

Bill Nye the Science Guy. Requires computers with large file capacities. Lots of experiments and lessons.
nyelabs.kcts.org/

Professor Bubbles' Official Bubble Homepage

The ultimate soap solution for the best bubbles.
bubbles.org.

Rocket Principles

Experiments on the laws of motion.
www.lerc.nasa.gov/Other_Groups/K-12/TRC/Rockets/rocket_principles.html

Science Fair Ideas

Cyberspace Middle School's resource page has science fair ideas, projects, and tips.
www.scri.fsu.edu/~dennis1/CMS/sf/sf.html

Solving Dissolving Activity

An experiment on how caves are formed from the Science Museum of Minnesota
www.sci.mus.mn.us/sln/ma/sdact.html

Teeth, Tusks and Tarpits

Chicago's Field Museum of Natural History explains fossils. Recipe for making a fossil.
www.fnmh.org/exhibits/ttt/TTT1.htm

Theater of Electricity

Experiments using balloons, static electricity and more under the heading: "Teacher Resources."
www.mos.org/sln/toe/toe.html

Two-Potato Clock

How to make a clock powered by two potatoes.

[gopher://gopher.schoolnet.ca:419/00/K6.dir/
trycool.dir/clock](gopher://gopher.schoolnet.ca:419/00/K6.dir/trycool.dir/clock)

Volcano World

Lessons and activities on volcanoes as well as lots of information.

volcano.und.nodak.edu/vw.html

Wiley Children's Books

Information about science books and activities for kids.

www.Wiley.com/children

The World of Chemistry

15 experiments. Available in English and French.

www.schoolnet.ca/math_sci/chem/worldofchem/

You Can with Beakman and Jax

Lots of experiments from the television show.

pomo.nbn.com/youcan/