

# Celebrating Science

## G.A.C. Pack

This year we've explored the science of communication, water and sports. Here are some exciting ways to Celebrate what we've learned and to learn new things to Celebrate!

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A national collaboration to encourage family involvement in girls' science learning

Developed for Girls at the Center, funded in part by the National Science Foundation.  
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# Celebrating Science with a Scavenger Hunt

**Go exploring with your partner.**  
**How many of these things can you find?**

Access to the Internet



Something Healthy to Eat

A Question You Both Wonder About

A Message   

A Place to Hear a Different Language

An Example of Erosion

A Problem That You Can Solve Together



Something That Moves

Animals Talking

A Place Where People Race



Someone Who Is Practicing Good Health

A Place to Experiment

A Place to Hear an Echo

Evidence of Pollution

A Quiet Place

Bubbles

Something That Is Like You

Nature Power

Bouncing Balls

A Body of Water



# WHAT SCIENTISTS DO



Here are some tools scientists use when they do their work.  
Keep these in mind as you and your partner **celebrate** science together.

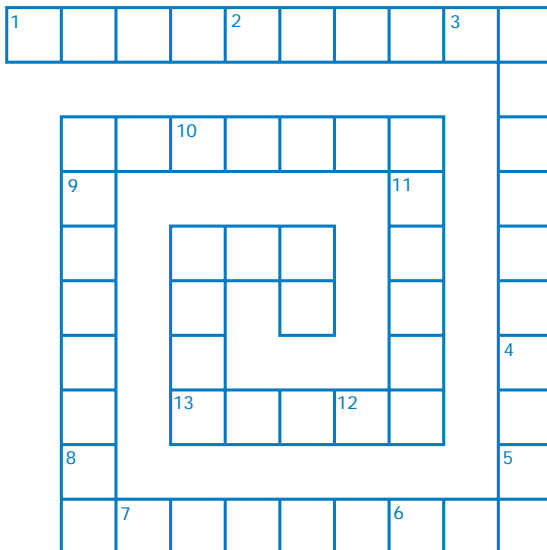
**Scientists...**

- communicate** Ask questions
- observe** Explore and examine the world
- collect data** Collect and organize information
- compare** Look for similarities and differences
- classify** Identify patterns and relationships
- create** Recognize that there is often more than one way to look at things (be creative)
- invent** Use their imagination to discover new ideas and techniques
- hypothesize** Make educated guesses about why things happen
- try** Try a number of different strategies before finding one that works (trial and error)
- interpret** Explain the meaning of what they observe
- decide** Make choices and examine the results of those choices



## CELEBRATING PUZZLES

Here is a twist on the traditional puzzle. Start each new word with the **last** letter of the previous word. For example, if the answer to clue #1 is “telephone,” then the answer to clue #2 should start with “e”, the **last** letter of the word “telephone.” Continue filling in the words in a spiral fashion until all of the empty squares are filled. **Have fun!**



### Clues

1. What a computer uses to “talk” to another computer over a telephone line.
2. The part of your body you talk with.
3. The name given to the parts of a computer, such as a keyboard.
4. This organ of communication is found on either side of your head.
5. Do again.
6. Water is made up of hydrogen and \_\_\_\_\_.
7. Tennis is played with a ball, racquet, and \_\_\_\_\_.
8. A net game you play on a court.
9. Another name for oceans.
10. A sport in which you kick a ball.
11. A runner on a track team who sets a fast pace for her team.
12. What the pull of the moon on the ocean causes.
13. The wearing away of land or rocks caused by flowing water.

Answers: 1. Modem, 2. Mouth, 3. Hardware, 4. Ear, 5. Redo, 6. Oxygen, 7. Net, 8. Tennis, 9. Seas, 10. Soccer, 11. Rabbit, 12. Tide, 13. Erosion

# CELEBRATING BUBBLES

There is always something new to learn about bubbles, even if you have done it before! Experiment with your partner. Can you

- ◆ Put a bubble inside a bubble?
- ◆ Make a bubble chain?
- ◆ Change the shape of a bubble?
- ◆ Make two bubbles of the same size meet?
- ◆ Make a small bubble merge with a larger bubble?
- ◆ Increase the life of a bubble?
- ◆ Measure a bubble?
- ◆ Explore how weather affects a bubble?



## You Will Need:

A 2-liter plastic bottle  
1/2 cup liquid dish soap (Joy or Dawn works best)  
1 quart water  
(Optional) 20 drops of glycerin (available in drugstores)  
A bubble frame (can be made with straws and string)  
Shallow pans

## What To Do:

Mix together the dish soap, glycerin and water in the plastic bottle. Let the bubble solution sit before using (overnight works best). Pour it into a shallow pan. Dip the frame into the pan and pull it out slowly so the soap film doesn't break. Bubble away!

Did you know that:

A bubble is a round, thin film of liquid filled with air?

The biggest bubble ever made was 50 feet long and two feet wide?

The longest a bubble ever lasted was 341 days?

Girls in Arizona have a harder time blowing bubbles than girls in Miami (except during the rainy season)?  
Can you figure out why?

You can see colors in a bubble?

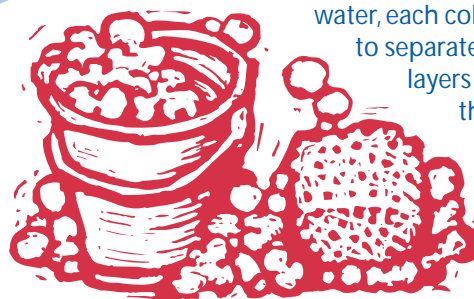
## Bubble Science

Water molecules like to stick together (surface tension). Soap "breaks" the surface tension so that the molecules become more **elastic** and less clingy. Soap also helps reduce evaporation. When water evaporates, a bubble's skin is broken and the bubble bursts. Glycerin helps a bubble to last longer, keeping it moist by slowing evaporation.

Colors in bubbles give a clue to the thickness of bubble walls. Light is made up of many colors. As light passes through the water, each color is bent slightly differently, causing the colors to separate and be seen. (Red is reflected from the thickest layers of water molecules, while violet is reflected from the thinnest layer.) The combination of colors in

between results from the unevenness of the layers. A bubble can contain over 150 layers of water molecules at one time. Watch your bubble closely. What color does it turn before popping?

# BURSTING BUBBLES!



# Jumping Rope – From Sidewalk Sport to Fitness Fad

**Did you know** that jumping rope is considered one of the healthiest ways of staying fit? It exercises the calves, thighs, abdomen, chest, shoulders, back, and arms. You don't need lots of equipment, you can do it almost anywhere, and it's fun to do with music.

## Jumping for Fitness

- ◆ Use a rope that fits you. (Step on the middle of your rope; the ends should reach the middle of your chest, and fit well in your hand.)
- ◆ Slowly build up to a 20-minute workout three to five times a week.
- ◆ Start out jumping five minutes a day the first week.
- ◆ Thereafter add five minutes each week.
- ◆ Start out jumping with both feet or alternating your feet (left, right, left...).
- ◆ Check your Target Heart Rate (see Sports G.A.C. Pack).



## Partner Challenge

For more of a workout, try running while jumping, making cross steps, moving side to side, or Double Dutch rope jumping.



## HOT LINKS

### Girl Scout Program Links

Celebrate science with the Girl Scouts. Try-Its for Brownie Girl Scouts, Badges and Awards for Junior Girl Scouts and Interest Project Awards for Cadette and Senior Girl Scouts provide many wonderful opportunities for exploring science.

Check with your local Girl Scout council or leader if you need help finding Girl Scout resources.

The joint is jumping at the **U.S. Amateur Jump Rope Federation.**

Log on to <http://www.usajrf.org> to find out about jump rope skills, competitions, camps, and more.

Experience creative genius at its funniest. Check out ideas from aspiring inventors at **Wacky Patent of the Month** at <http://www.colitz.com/site/wacky.htm>

Lights, camera, action! Learn the science of **movie animation** at [stopmotionanimation.com/stopmotionhandbook.htm](http://stopmotionanimation.com/stopmotionhandbook.htm)

Celebrate science at the Girl Scouts' **Just for Girls** Web site at <http://www.girlscouts.org/girls>. Click on to *Girls Ask Why*, *Girls Ask How* and *Girls on the Go* for some exciting water, communication, and sports activities and information.

# CELEBRATING CREATIVITY

Here are some steps used by inventors in the creative process. Put on your inventor's cap and exercise your creativity with the "It's about Time" and "On the Move" Challenges.

## 1. Identify the problem, what you want, or what you need.

Make a list of problems or needs and then focus on one.

## 2. Brainstorm.

Make a list of all the things that you might do, improve upon, or invent to solve your problem. Anything goes when you brainstorm.

## 3. Research.

Find out which of your ideas is practical. An invention is something new, so look for another way if someone has already done it. What are the best materials to use? How expensive is your solution? How easy is it to make? Is it safe? Do other people have suggestions for improvements? Will it do what you want it to do?

## 4. Make a drawing or chart.

Put your idea on paper. You can sketch and label the parts and pieces, and show how they work. Make a chart that shows the steps involved in the action.

## 5. Put it together.

Make a model so that you can test out whether your invention works. Refine it as you see things that need changing.

## "IT'S ABOUT TIME" CHALLENGE



Can you invent something that helps save time? Improve on a game or toy that involves time? Turn a job into something that's fun? Streamline a family routine?

Work together with your partner to make a list of situations in which you would like to save time.

### Guidelines

- ◆ It must save time.
- ◆ Consider safety issues when making and using it.
- ◆ Spend no more than \$3 for parts. Recycle!
- ◆ Make a diagram or poster describing your solution.

### Inventor's Supplies

- ◆ Recycled stuff from around the house—like plastic soda bottles, juice or milk boxes, bells, clocks, coat hangers, hinges, straws, hose, foil, marbles, wheels, baskets, clothespins, paper clips, etc.
- ◆ Tools, glue, wire, string, tape
- ◆ Gloves, goggles, first-aid kit



# “ON THE MOVE” CHALLENGE



Things that go whir, bump, clack, whiz, or bang all move in some way. Can you invent something that moves? Work with your partner. Put your creativity to the test!



## Guidelines

- ◆ It must be able to move. The activity can be just for fun or part of a useful device.
- ◆ Consider safety issues when making and using it.
- ◆ Spend no more than \$3.
- ◆ Make a diagram or poster describing your solution.

## Inventor's Supplies

- ◆ Recycled stuff from around the house — old toys, kitchen stuff, nuts and bolts, cardboard, food containers, foil, string, weights — the sky's the limit!
- ◆ Gravity, sun, wind, temperature change, electric or water power.
- ◆ Tools, glue, wire, tape.
- ◆ Gloves, goggles, first-aid kit.

## Moving Right Along...

Can you put science and technology to work moving things? Here are some hints to help you create movement.

### Gravity

What goes up, must come down! Can you use the force of gravity to make something move?

### Friction

When one surface rubs against another, you have **friction**. Can you control the speed of something (like a toy car) by using different surfaces to create more or less friction?

### Nature Power

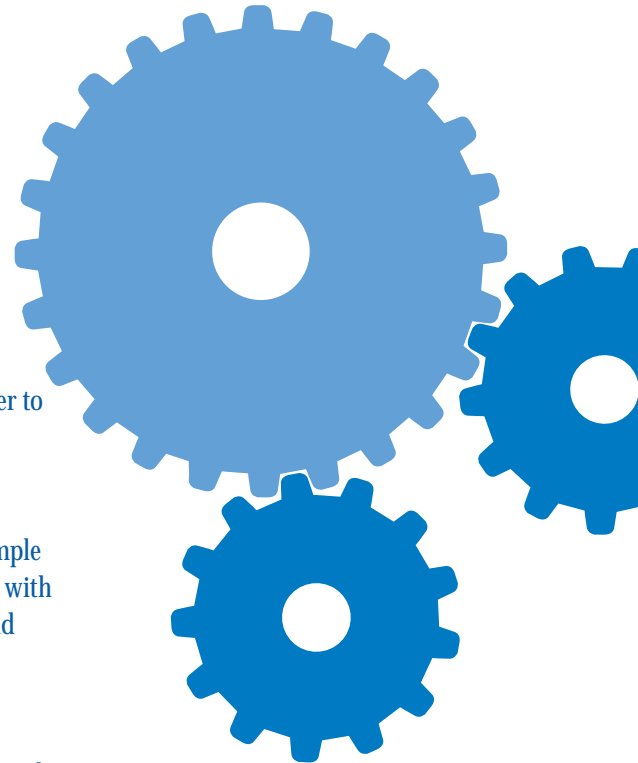
Can you make something that captures energy from moving air or moving water to create movement?

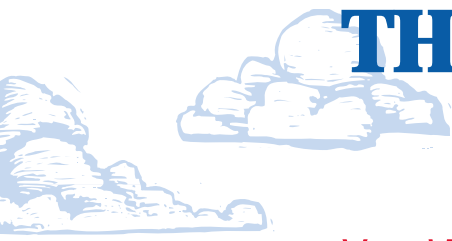
### Pulleys

Need some help lifting things? Try a simple pulley (a wheel with grooves combined with a rope) to make your task easier. Thread spools make great pulleys!

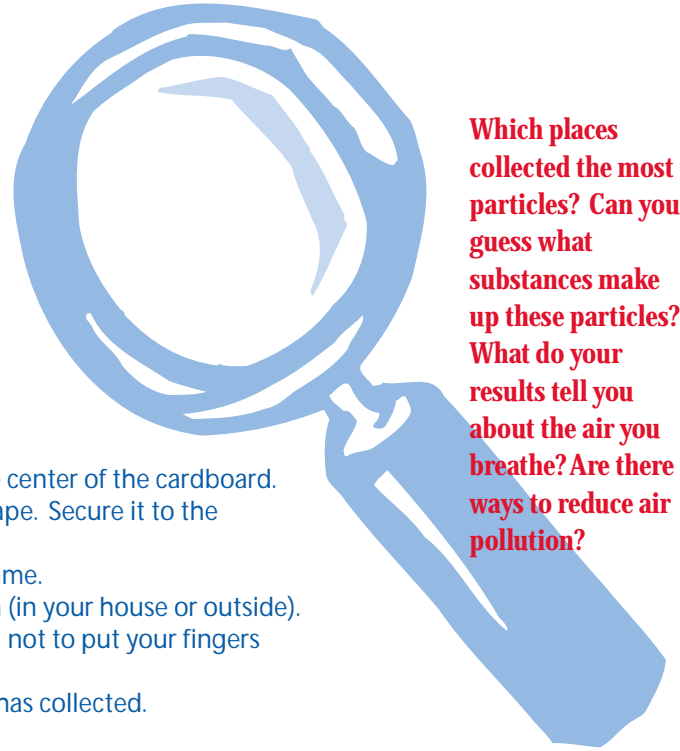
### Gears

Maybe you have observed these wheels with teeth in a toy or watch. The teeth fit together, and when one turns, it turns the other. When you use different sized wheels, they turn at different speeds.





# THE AIR YOU BREATHE



**How clean is the air around you? Build an air tester to see what particles are found in air. You may want to build more than one tester to study different locations.**

## You Will Need:

- Cardboard (6" x 6")
- Scissors
- Clear "sticky" contact paper (like shelf paper) or really wide (3") clear plastic tape
- A magnifying glass
- String
- A stapler

## What To Do:

1. Make a frame by cutting a large hole in the center of the cardboard.
2. Cover the hole with the contact paper or tape. Secure it to the cardboard with staples.
3. Staple a piece of string to the top of the frame.
4. Hang the tester in a place you have chosen (in your house or outside).
5. Check the tester after three days. Be careful not to put your fingers on the sticky part!
6. Use your magnifying glass to study what it has collected.

**Which places collected the most particles? Can you guess what substances make up these particles? What do your results tell you about the air you breathe? Are there ways to reduce air pollution?**

## EVERY BREATH YOU TAKE...

**Asthma** is an inflammation of the lungs that causes the airways to swell and narrow, making it hard to breathe. Particles in the air, such as pollen, dust, mold, wood smoke, and animal dander (flakes from skin and hair), can trigger an asthma attack. Between 12 and 15 million Americans suffer from asthma (including 5 million children).

**Plants** can act as indoor air filters, "breathing in" poor air and releasing oxygen. Spider plants are particularly good at this. Remember to rinse their leaves every so often so they can stay healthy.



**City trees** help filter air too. One of the hardier city trees is the **ginkgo**. Ginkgoes are at least 150 million years old. The fruit of the female tree smells terrible, adding to air pollution in the fall. Why is scent important to a plant? Why are all trees important to the air we breathe?

Some of the most beautiful **sunsets** come after a fire, dust storm, or volcanic eruption. These are caused by light bouncing off **particles in the air**.

Many buildings we spend time in have bad air quality caused by **poor ventilation or air**

**pollution** from carpeting treated with formaldehyde, molds, lead paint filings, or asbestos particles from walls and ceilings. Such places are often called **sick buildings**.

Cut down on **home pollution** and save energy by cleaning vents, air filters, and refrigerator coils.

**Cigarette smoke** is one of the worst forms of home air pollution. Even if you don't smoke, smoke in the air around you, called **secondhand smoke**, is bad for your health.

# WHY IS THE SKY BLUE?

Did you ever wonder why the sky is blue?

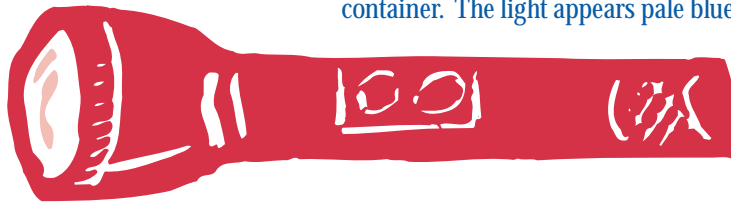
Try this activity with your partner to find out!

## You Will Need:

Water  
Powdered milk  
A flashlight  
A spoon  
A clear plastic or glass container

## What To Do:

1. Fill the container with water.
2. In a darkened room, turn on the flashlight and place it at one end of the container so that it shines through the water.
3. Add powdered milk, a sprinkle at a time, to the water.
4. Mix with the spoon until you can clearly see the beam of light in the water.
5. Look at the light from the side of the container. The light appears pale blue.



## Sky Science

The light of a flashlight, like sunlight, looks white to us, but it really is made up of the colors of the rainbow: red, orange, yellow, green, blue, indigo, and violet. You can see those colors only if they are scattered toward you by something, like dust, smoke, water droplets, or molecules of air.

The powdered milk in the water scattered the blue part of the light. The rest of the colors made it through the water without being scattered. In the same way, air scatters blue light and violet light, but not the other colors of the sun's rays. The sky looks blue and not violet because a lot more blue light is scattered in your direction.

# Celebrating Summer with Science

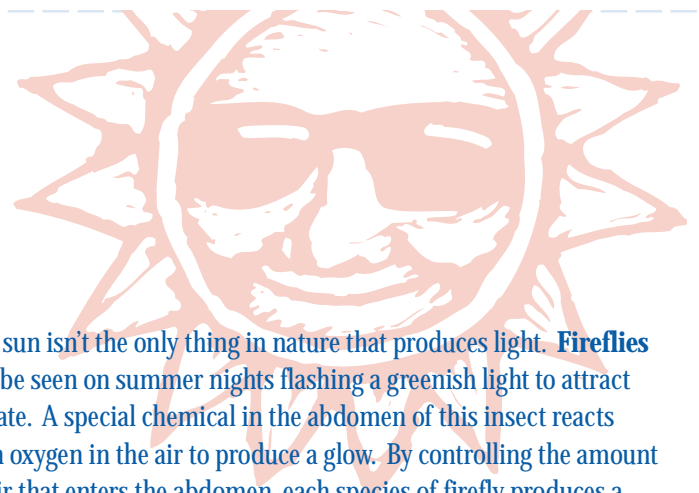
As you enjoy the blue sky on sunny summer days, think about the following:

A **tan** is a sign that your skin is trying to protect itself from the harmful **ultraviolet (UV) radiation** it's receiving from the sun. Too much time in the sun will permanently damage your skin and may lead to skin cancer. Limit the time you spend in the sun and use a sunscreen with a Sun Protection Factor (SPF) of at least 15, and reapply often.



Not everything about UV light is bad. Your skin makes **vitamin D** when it is exposed to sunlight.

Vitamin D helps your bones stay strong by controlling the level of calcium and phosphorous in your bloodstream. For healthy bones and teeth, eat your spinach, drink your milk, and...play outdoors.



The sun isn't the only thing in nature that produces light. **Fireflies** can be seen on summer nights flashing a greenish light to attract a mate. A special chemical in the abdomen of this insect reacts with oxygen in the air to produce a glow. By controlling the amount of air that enters the abdomen, each species of firefly produces a different pattern of flashes to **communicate** with other fireflies.

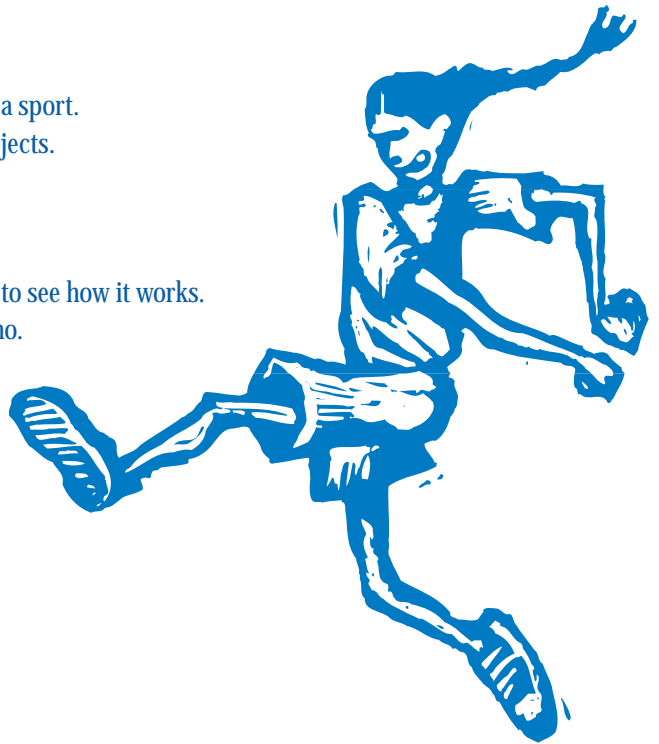
The warm weather causes some animals to migrate, end hibernation, or hatch out. **Listen** carefully for the songs of birds, the hoot of owls, the chirp of crickets, the hiss of cicadas, the trill of toads, or the call of tree frogs. Do the **sounds of summer** change as the day turns to night?



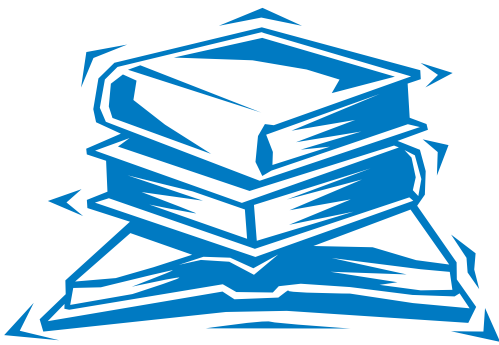
# ABC'S OF CELEBRATING SCIENCE

**A**sk questions about everyday things.  
**B**alance a book on your head.  
**C**ommunicate without words.  
**D**evelop a personal exercise routine.  
**E**xperiment with bubbles.  
**F**ind out how faucets work.  
**G**o to a science museum.  
**H**ave a high-energy snack.  
**I**vent something that moves.  
**J**ump rope to increase your heart rate.  
**K**ick a ball as far as you can.  
**L**isten to animals talk.  
**M**ove your body to a beat.  
**N**otice the sounds made by different objects.  
**O**bserve how water travels up.  
**P**redict what happens if....  
**Q**uestion someone who uses science in her job.

**R**ecord your target heart rate.  
**S**trategize ways to improve in a sport.  
**T**est the density of different objects.  
**U**se code to send a message.  
**V**olunteer at a nature center.  
**W**atch the Olympic games.  
**X**-ray an object—look inside to see how it works.  
**Y**ell where you can hear an echo.  
**Z**ero in on a cool career.



## Celebrating Science with Books



*Girls and Young Women Inventing: Twenty True Stories about Inventors, Plus How You Can Be One Yourself*, by Frances A. Karnes and Suzanne M. Bean. Free Spirit, 1995. Great stories about the creative process and steps to becoming an inventor. (Ages 10 and up.)

*In the Year of the Boar and Jackie Robinson*, by Bette Bao Lord. HarperCollins, 1986. A newcomer to the U.S. in 1947 learns a special lesson from Jackie Robinson. (Ages 8 and up.)

*A Drop of Water: A Book of Science and Wonder*, by Walter Wick. Scholastic, 1997. Marvel at the photos as you explore the science of water. (All ages.)

*Becoming Myself: True Stories about Learning from Life*, by Cassandra Walker. Free Spirit, 1994. True stories of learning how to “grow up without going crazy.” (Ages 11 and up.)

*Cool Careers for Girls in Sports*, by Ceel Pasternak and Linda Thornburg. Impact, 1999. Find out what it takes to succeed in careers that involve sports. Explore the backgrounds and real lives of the women in these fields. (Ages 10 and up.)

*We Can Get Along: A Child's Book of Choices*, by Lauren Murphy Payne. Free Spirit, 1997. Learn how to communicate feelings and resolve conflicts peacefully. (Ages 6-8.)

# SHE SAYS — HE SAYS



Do girls and boys have different ways of speaking and hearing? According to Dr. Deborah Tannen, a sociolinguist who studies the social aspects of language, the answer is yes. In her book, *You Just Don't Understand* (Ballantine Books, 1990), she talks about the differences in how girls and boys communicate and how these differences can lead to misunderstandings.

Measure your knowledge of gender differences in language and communication. Work with your partner to answer the questions below.

### True or False

1. Girls talk more than boys.
2. Boys are less likely to ask for help or directions.
3. Girls are better listeners than boys.
4. Boys' talk is more about telling you what to do or what he knows.
5. Girls are more likely to talk about feelings.
6. Boys don't talk about the details.

Answers: 1. False - boys talk more in public; girls privately; 2. True; 3. True (although boys have different ways of showing that they are listening); 4. True; 5. True; 6. False - boys are interested in the details of politics, news, and sports; girls in the details of personal lives.

## WOMEN IN SCIENCE

Meet Dr. Lyda Ruyter Ahearn, linguist, educator, researcher, and director of **The Language Exchange**, a school that teaches foreign languages to people of all ages. Dr. Ahearn believes that learning a foreign language provides exciting opportunities to explore different cultures as well as exercise the brain. In fact, her teaching methods are based on research about how the brain works as language develops.

Dr. Ahearn emphasizes the similarities or rules that are common to languages. She believes that by teaching the rules you can train the brain to learn any language. Students in her program learn by speaking and hearing the language. Activities focus



on real-life situations that encourage communication and fun.

One of 11 children, Lyda grew up on a farm in Holland. Her family was very poor and “there were no books in the house,” yet she went on to excel in school. Lyda learned English expecting to teach it to Dutch students. She came to the U.S. to perfect her English language skills and to study education. Instead, she fell in love with the science of language and earned a doctorate in linguistics.

For Lyda, the formula for success is to “love what you are doing and follow your heart.”

## What Is a Linguist?

Did you ever wonder why we say, “Chris hit the ball” instead of “Chris the ball hit?” or how bilingual people decide to switch from one language to another? Ask a linguist! A linguist studies the science of language, how people use language and what they must know in order to communicate.

There are many different components of language: the sounds (**phonology**); how words are formed (**morphology**); the way words are combined to form acceptable phrases and sentences (**syntax**); and what words and sentences mean (**semantics**). How we learn language, the connection between language and the brain, endangered languages (those that may disappear), and bilingualism or multilingualism are also of interest to a linguist. Did you ever think that language involved such an amazing combination of abilities?