

Water

GAC Pack

Here are some cool activities
for you and your partner to do
before the next
Girls at the Center Discovery Day.

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Una campaña nacional para alentar
la participación familiar en el aprendizaje
de la ciencia de las niñas.

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ARE YOU A WATER WHIZ?

Measure your knowledge of water and waste issues in the town in which you live. Work with your partner to answer the questions below. Bring this card, *even if you do not have all the answers*, to the next *Discovery Day* to receive your prize. Remember, answers will vary depending on where you live. **Be a water scientist — ask questions!**

1. Where does your non-recyclable trash ultimately go? _____
2. Which of the following items can be recycled in your community? Answer YES or NO:
_____ junk mail & magazines _____ telephone books
_____ corrugated pizza boxes _____ paint cans
_____ clean plastic containers labeled "5" _____ batteries
4. Waste water (water that drains or gets flushed from inside the house) goes to which treatment plant? _____
5. Storm water (water that drains off the streets) and treated sewage are discharged into which body of water? _____
6. From what body of water do you get your tap water?

You are now a local water and waste whiz!



Here are some suggestions for
putting your knowledge to work:

Check out these
activities to do with
your science partner.

- ◆ Volunteer for your local Nature Center.
- ◆ Share your knowledge with your neighbors and volunteer for local conservation activities.
- ◆ Walk through your community to find out how water is being used.
- ◆ Find out how to repair a leaky faucet or overflowing toilet.
- ◆ Reduce the amount of water you use when taking a shower. Find a way to measure this reduction.
- ◆ Suggest that your class adopt a local pond, stream, or beach.

DROP BY DROP

A Challenge for Partners

What you need:
water dropper (enclosed)
several pennies
water

We hope that you and your partner will work together on this challenge and as you explore the other GAC Pack activities.

All it Takes is Teamwork!

Signs of a good partnership —

- ◆ You both say “we” a lot, like “maybe we could try it this way.”
- ◆ You ask what your partner thinks and she asks what you think.
- ◆ You are both actively involved, with the girl taking the lead.
- ◆ You are talking to each other even if you disagree!
- ◆ Both of you are having fun.



How many drops of water can you fit on a penny?
How many drops can your partner fit on a penny?
Work together, taking turns.
What happens as you drop water onto the penny?
Can you each predict when the water bulge will collapse?
What do you think is holding the water drops together?
What happens if you touch the water bulge with a soapy finger?
What other questions do you have about this activity?
Where might you look for the answers?



Water is made up of tiny parts called molecules. These molecules cling together to form a “skin” on the surface of the drop. This is called **surface tension**. This “skin” gives the drop its round shape and stretches as the drop becomes bigger. At some point, the skin will stretch so much that the water molecules will lose their hold on each other. This makes the drop collapse.



WHAT IS HARD WATER?

Testing for Water Hardness

Find out how hard your tap water is by using the test strip provided. First read the instructions that come with the strip because you only have one try!

A chemical in the strip reacts with the minerals in hard water by turning orange. The more orange the color, the more minerals you have in your water.

A green color means you have soft water or water that doesn't have a lot of minerals. The greener the color, the softer the water.

Hard water is water that has a lot of dissolved minerals, especially magnesium and calcium. Where do these minerals come from? Water picks them up as it travels through rocks and soil. While magnesium and calcium are important for building strong bones, too much of these in your water can lead to annoying little problems such as:

- ◆ No more bubble baths—hard water doesn't make good suds.
- ◆ Using two bars of soap instead of one—it takes twice as much soap to wash in hard water as it does in soft water.
- ◆ Soap scum that leaves a dingy, gray film on clothes and your bathtub and spots on anything that you don't dry thoroughly, such as dishes and glasses.
- ◆ Skin and hair that look dull and lifeless, even after you take a bath—soap scum is hard to rinse off of your body.
- ◆ Itchy or irritated skin.

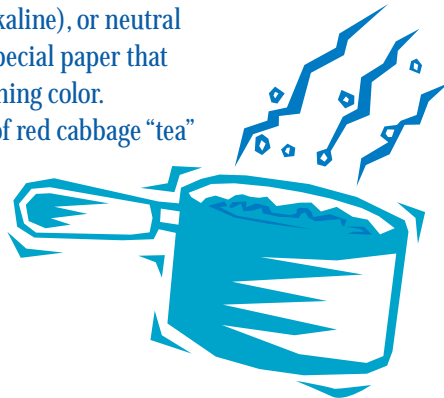
LET YOUR CABBAGE DO THE TALKING

Okay, so cabbages can't really talk, but they can *tell* you something about water and other liquids. More about the cabbage later . . .

Many plants and animals won't grow well or even become sick or die if the water they depend on has too much of a chemical called an **acid** or a **base**.

To find out if water is acidic, basic (also called alkaline), or neutral (in the middle) scientists use litmus paper—a special paper that indicates the presence of an acid or a base by turning color.

You can make your own acid-base indicator out of red cabbage “tea” (told you we would get back to the cabbage).



What You Need to Make a Red Cabbage Indicator

2 leaves of red cabbage
1 1/2 cups of water
Strainer
Jar with a lid
Saucepan (not aluminum)

Here's What to Do

Shred the cabbage into pieces with your hands.

Place the cabbage pieces and the water in the saucepan.

Bring the water to a boil, then reduce the heat and simmer for 10 minutes.

Let the liquid cool, then strain it into a jar. Cap the jar and refrigerate it until you are ready to use it.

Because you will be using a stove, it is especially important the girl and adult partners make the acid-base indicator together.

(turn over to continue)

How to Use the Indicator

You can test all kinds of liquids you find at home, such as lemon juice, vinegar, soda, tap water, and even water from a fish tank.

You also can make your own solutions to test by mixing different things in a little water, such as a pinch of baking soda, flour, a crushed aspirin tablet, or laundry detergent.

Pour one tablespoon of the liquid you want to test into a jar or cup and add one tablespoon of the cabbage indicator tea.

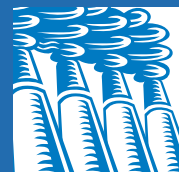
If the liquid is very acidic, the indicator will turn from violet to light pink. If the liquid is very alkaline, the indicator will turn from violet to green.

Ponder This

What can you add to make the indicator turn from pink or green back to violet?
What other vegetables or even fruits can you use to make indicators?



How can you use the red cabbage indicator to make pink or green patterns appear on a piece of paper?



ACID RAIN

When coal, oil, and gasoline are burned to produce energy, they release gases into the air. These gases combine with water vapor in the air to produce acids. These acids fall back to earth when it rains and can harm plants and animals, and damage buildings and artwork made of stone.

A Challenge for Partners

If you want to see how acid rain damages limestone or marble buildings or sculptures, use a nontoxic acid (such as vinegar) that you have in your kitchen on rocks, seashells, or chalk.

What do you notice?

Kitchen Science

What happens when you mix oil + water?

1. Dab a couple of drops of oil on your hand. Rinse with water. What do you notice about the water? What do you think might be happening?
2. Add equal amounts of water and oil to a small jar with a lid. Add a few drops of food coloring and shake. Do both the oil and the water change color to match the food coloring? Observe for a few minutes.

Why?

The oil breaks up into tiny droplets (balls) because oil molecules are different than water molecules and they cannot blend (mix) together. A mixture of liquids that do not blend is called an **emulsion**. Food coloring is made of water. So when food coloring mixes with water, their molecules blend together.

Can you think of other liquids that do or do not blend with water?

Riddle: Why do you dress a salad?

Answer: Because it feels naked without a coat.



Do oil and vinegar mix?

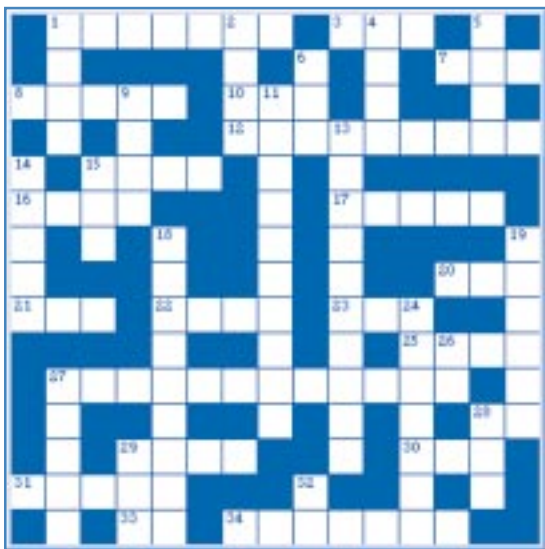
Make this salad dressing with your partner to find out.

You need:

- ◆ Salad oil
- ◆ Red or white vinegar
- ◆ Seasonings: salt, pepper, sugar, honey, mustard, ketchup, tarragon, garlic, etc.
- ◆ A container that you can shake
- ◆ A teaspoon

Here's your chance to be kitchen chemists. Start out with small amounts until you find your favorite combination. Depending on the seasonings you and your partner like best, add small amounts to your taste. Then mix the ingredients by shaking them in a closed container.

PUZZLED ABOUT WATER?



ACROSS: (1) DISEASE; (3) EPA; (7) DAM; (8) OCEAN; (10) ORE; (12) WATERSHED; (15) FISH; (16) LEAD; (17) ALGAE; (20) LEE; (21) DEW; (22) HOUR; (23) RED; (25) RIDE; (27) CONDENSATION; (28) AT; (29) LAKE; (30) GAS; (31) FLOAT; (33) WE; (34) POLLUTE.
DOWN: (1) DUCK; (2) SNOW; (4) PIER; (5) WAVE; (6) WET; (9) ACID; (11) RAINFALL; (13) EVAPORATES; (14) CLOUD; (15) FAD; (18) DEHYDRATE; (19) DESERT; (24) DROUGHT; (26) IN; (27) CYCLE; (28) ASK; (29) LAW; (32) EL.

ACROSS

- 1 Carried by polluted water and makes wildlife sick
- 3 The Environmental Protection Agency (Abbr.)
- 7 A wall to hold back water
- 8 A great body of salt water
- 10 A product from mines
- 12 Surface and groundwater system defined by mountains and valleys
- 15 A cold-blooded animal that lives in water
- 16 Harmful metal in old pipes
- 17 Fresh or saltwater plant
- 20 Protected side of a ship
- 21 Moisture that condenses
- 22 Measure of time
- 23 A type of algae tide
- 25 Surfer has one on a wave
- 27 The process of changing from a gas to liquid
- 28 On or by
- 29 A body of water
- 30 Evaporating water
- 31 Opposite of sink
- 33 Plural of l
- 34 To contaminate water

DOWN

- 1 Bird that lives near water
- 2 Frozen crystals of water
- 4 A dock
- 5 It's created when wind hits the water
- 6 Water makes you _____
- 9 Turns litmus paper red
- 11 Area lush from rainfall
- 13 Water _____ to gas
- 14 Collections of water drops floating in the air
- 15 A craze
- 18 To remove water
- 19 A place with little rain
- 24 It occurs when there is a lack of precipitation
- 26 Opposite of out
- 27 The water _____ (water's trip around the earth)
- 28 To form a question
- 29 A rule made by a government
- 32 _____ Niño

HOT LINKS

Got a water quality problem in your community? **Give Water a Hand** tells how to organize and carry out activities in your community. <http://www.uwex.edu/erc>

Visit **Kid's Stuff** at the Environmental Protection Agency (EPA) Office of Water. Build your own water cycle, follow a drop of water from its source through treatment, and check out water bloopers. <http://www.epa.gov/OGWDW/kids/>

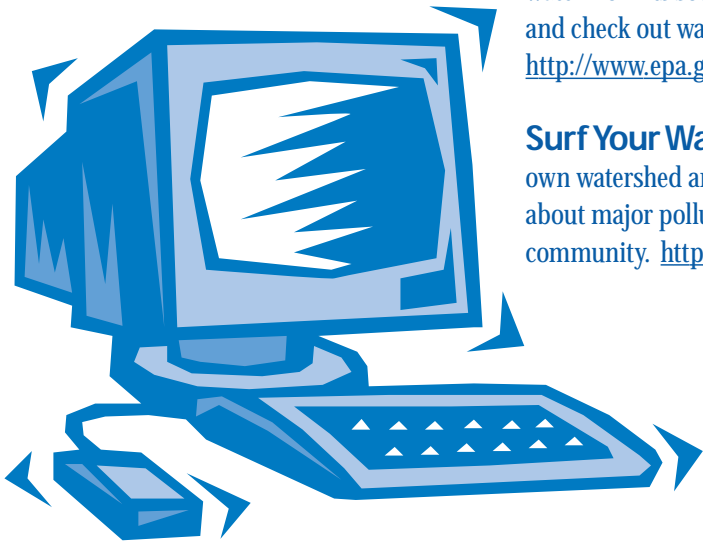
Surf Your Watershed. Locate your own watershed and find out from the EPA about major pollution sites near your community. <http://www.epa.gov/surf/>

Find out how the results of your water hardness test measure up to the results in the rest of the country. Visit the **National Chemistry Week's** Web site at <http://www.acs.org/ncw>

Learn about **Rachel Carson** by visiting her home at <http://www.rachelcarson.org>

Discover how to make marbelized paper, study "Bubbleology," make capillary cake, density dessert and rock candy—or leave us a message on the GAC bulletin board at **Just for Girls** <http://girlscouts/girls>

Note: To go to an address that we have given, type the underlined address that appears in the "Find Box" in Netscape or use the "find" function on your Internet service.



Where to Find an Internet Connection:

- ◆ A science museum
- ◆ A school
- ◆ A library
- ◆ Through your Girl Scout Council
- ◆ A workplace
- ◆ A friend's house

Top 5 Reasons to Surf the Net with Your Partner

1. You can learn lots together.
2. You can teach each other.
3. You can find out more about each other's interests.
4. It's always safer when you explore together!
5. It's really fun!

PARTNERS on the INTERNET

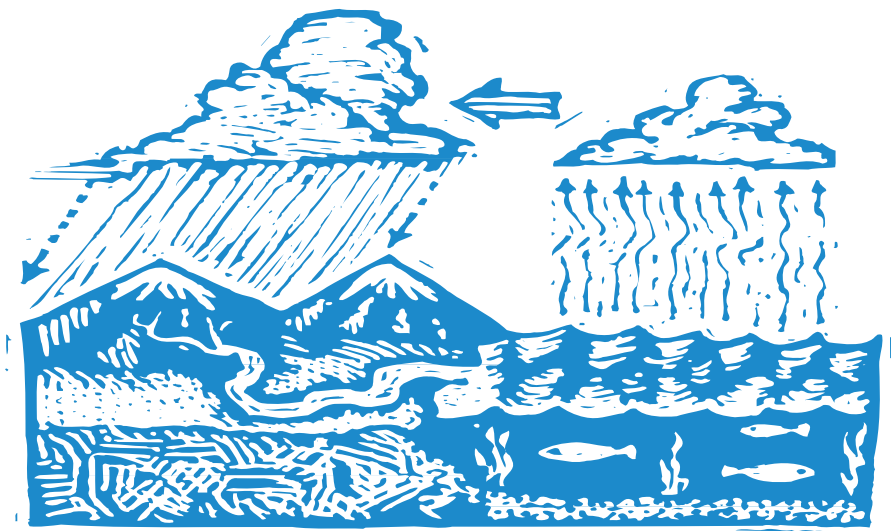
Go to

<http://www.girlscouts.org/girls>

The awesome Web site "Just for Girls" is a great place to visit. Look for the place just for G.A.C. girls and their partners that includes fun science activities. Whether you are contributing your thoughts and ideas, finding out about women in science, or following fascinating links, this is a great place to visit.

You can even find out more about Girl Scouting or send a question to "Dr. M" and her daughter. We hope you will visit often and check out the Girls At the Center Web pages after each Discovery Day.





Women in Science: Rachel Carson

Rachel Carson (1907-1964) worked for the U.S. Department of Fish and Wildlife Service as a marine biologist for most of her scientific career. She was a popular writer, making science easier to understand for all.

Rachel Carson was a pioneer in the environmental movement. Her investigation of the pesticide industry was described in *Silent Spring*, published in 1962. The book sounded an alarm about poisonous pesticides entering the food chain through water and soil.

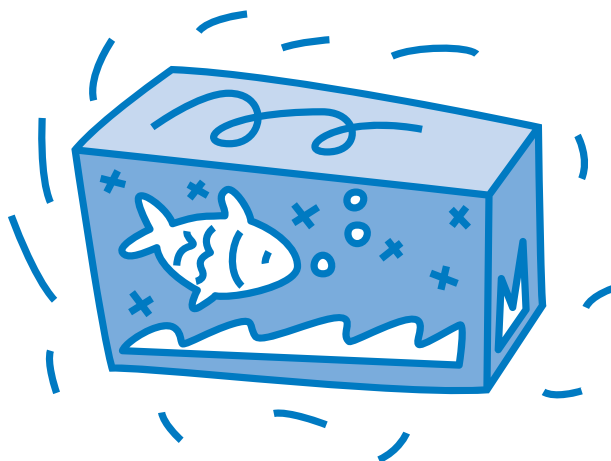
As a result of this one woman's writing, laws protecting the environment were passed in the U.S. and Canada. *Silent Spring* is considered by some to be the most influential book published in the past 50 years.

What's Hydrology?

Hydrology is the study of the water cycle —what happens to water as it travels on its journey from air to earth, through living and nonliving things, and back to air again. Hydrologists use science and math to solve water-related problems in our world. They ask questions like: How good is the water? How much water do we have? How do we get the water to where it is needed? How do we make sure there is water for everyone to drink? How do we control flooding and water pollution?

WATER QUALITY CAREERS

Fish Farmer
Science Writer
Lab Technician
Marine Biologist
Hydrologist (see back)
Aquarium Educator
Public Health Officer
Coral Reef Consultant
Computer Technologist
Swimming Pool Maintenance
Ichthyologist (one who studies fish)
Waste Management Consultant



Hobbies to get you started

Setting up a home aquarium
Growing plants in water (hydroponics)
Earning Girl Scout science recognitions
Fishing
Beachcombing
Adopting a stream
Using a microscope to study pond water

Can you find other jobs?

WATER & YOU

You're all wet! Here are some soggy facts to share with your partner.

Water makes up about two thirds of your body weight and 80% of your blood. It lubricates your muscles so that they can move and helps to control your body temperature so that you don't get overheated.

All food contains some water. The driest foods are seeds (between 5% and 10% water); the wettest are vegetables and fruit. (Can you guess what fruit is the best thirst quencher?) Solve the wet word scramble at right to find the answer.

Thirst occurs when your body's water supply gets too low. The thirst center in your brain sends out a message to the back of your throat.

Every day you need about 2 liters (3 pints) of water to replenish the water you lose in sweating, breathing, and expelling wastes.

Replenishing your water supply is extremely important, especially when you have a fever or when the weather is very hot. Drinks supply you with nearly half of the water you need; the rest of the supply comes from the food you eat.



Foods	Water Content
sliced tomato	94%
carrot & cucumber slices	90%
milk	87%
apple	80%
sandwich	35%
sunflower seeds	5%

WET WORD SCRAMBLE
EOWATRMELN

Girl Scout Program Links

For Brownie Girl Scouts:

The Water Everywhere Try-It patch is a great place to start. Earth and Sky and Outdoor Happenings also have good water-related activities.

For Junior Girl Scouts:

The Water Wonders badge has lots of indoor and outdoor activities. The Weather Watch badge explores the water cycle.

For Cadette and Senior Girl Scouts:

The From Shore to Sea interest project patch helps you explore waterways and oceans, while Eco-Action will lead to community action.

P.S. Don't forget *Fun and Easy Activities – Nature and Science*, available from Girl Scouts of the USA in English and Spanish for girls aged 6 – 11.

BOOKS ABOUT WATER

The Woman Who Outshone the Sun / La mujer que brillaba aun más que el sol, by Rosalma Zubizarreta, Harriet S. Rohmer, and David Schecter. Childrens Book Press, 1994. A Zapotec Indian legend about a woman who takes the river with her when she is driven from her village. (Early to middle reader.)

A River Ran Wild: An Environmental History, by Lynne Cherry. Harcourt Brace & Company, 1995. The history of a river from untouched wilderness to polluted mess and eventual cleanup. (All ages.)

Water Dance, by Thomas Locker. Harcourt Brace & Company, 1997. Beautifully illustrated book about the water cycle. (Early to middle reader.)

Come Back, Salmon: How a Group of Dedicated Kids Adopted a Stream & Brought It Back to Life, by Molly Cone. Sierra Club Books for Children, 1992. (Middle to advanced readers.)



WHAT'S UP?



Did you ever wonder how water can travel **up** a paper towel when just one corner of the towel is dipped in water, or how water gets from a plant's **roots** to its leaves?

What you need:

- ◆ 4 same-size stalks of fresh celery with leaves (use the pale-green inside stalks)
- ◆ 4 clear 8-oz. plastic cups half-full of water
- ◆ Red and blue food coloring
- ◆ A measuring cup
- ◆ A vegetable peeler
- ◆ A ruler
- ◆ Paper towels

Because you will be using sharp objects, it is especially important that the girl and adult partners do the celery climb together.

Here's how you can find out about climbing water:

1. Lay the 4 pieces of celery in a row on a cutting board or counter so that the place where the stalks and the leaves meet matches up.
2. Cut the ends of the celery so that the stalks are all 10 centimeters (4 inches) in length.
3. Make the cups of purple water by adding 10 drops of red **and** 10 drops of blue food coloring to each half cup of water.
4. Put the 4 stalks in 4 separate cups of purple water.
5. Label 4 paper towels in the following way: *2 hours, 4 hours, 6 hours, and 8 hours.*
6. Every 2 hours from the time that you put the celery into the cups, remove 1 of the stalks and put it onto the correct towel. For example, the stalk that you remove after 2 hours in the purple water will be placed on the *2 hours* towel. The next stalk that you remove 2 hours later will be placed on the *4 hours* towel, and so on.
7. After each stalk is removed from the water, carefully peel the rounded part with a vegetable peeler. This will allow you to see how far up the stalk the purple water has traveled.
8. Measure the distance it has traveled and record this amount on the very "top chart", depending on where it falls. What do you observe? Notice how fast the water climbs the celery. Does this change as time goes by? In what way?

Celery Chart

	0 Hours	2 Hours	4 Hours	6 Hours	8 Hours
Distance purple water traveled in centimeters					

Celery Grid

8										
7										
6										
5										
4										
3										
2										
1										
0	1	2	3	4	5	6	7	8	9	10

Distance water traveled up celery stalk (centimeters)

The upward traveling of water is known as **capillary action** or **capillarity**. Capillary action happens when water molecules are more attracted to (hold more to) the surface they travel along than to each other. In paper towels, the molecules move along tiny fibers that are woven together tightly. In plants, they move through narrow tubes that are actually called capillaries. Plants could not survive without capillaries because they use the water to make their food.

Partner Challenge

Graph the distance traveled by the purple water in each stalk against the time on the grid. Connect the dots. Is the result a straight line? Did the water travel the same distance each time?

WEIRD WATER

How many of these wet and wild water wonders did you know about? Send shock WAVES through your friends by telling them about some of these fascinating phenomena.

Waterspouts

You've seen photos of tornadoes. Now imagine a white twisting column of water rising from the surface of a lake or ocean. These "waterspouts" form over lakes in late summer and over oceans in tropical areas when thunderstorms are about to occur.

Tsunami (soo-nami)

Incredibly fast-moving and enormously high, these killer waves are set in motion by an underwater earthquake, volcano, or nuclear blast. Found in the Pacific regions and so named by the Japanese, tsunamis have lifted sailors and sharks into treetops, flung boats on mountains, and killed thousands of people in minutes.

Geysers

Jets of water and steam that gush out of the ground in volcanic areas are called geysers. Hot lava deep in the ground heats nearby water so hot that it erupts. A geyser might *(continued on back)*

(continued from front)

shoot up as high as a 20-story building. The world's most famous geyser, **Old Faithful** (so called because it erupts about once an hour), is in Yellowstone National Park. Other geysers can be found in New Zealand and Iceland.

Hot Spots in the Ocean

At one time scientists believed that the ocean bottom was inky black and freezing cold. Thanks to recent submarine explorations we now know about the existence of *hot spots*, cracks in the ocean bottom that split apart, spewing out lava. Six-foot-long bright red worms and dinner-plate-size clams actually live in the scalding water, thanks to chemicals which provide them with food.

The Bermuda Triangle

More than 150 ships and planes have mysteriously vanished in a triangle of water between Bermuda, Puerto Rico and the Florida Coast. The Bermuda or Devil's Triangle has claimed the lives of more than a thousand people over the years. No one knows for sure what causes the disappearances. One recent theory suggests that giant bubbles of methane gas rising from the ocean floor forms a froth that sinks ships and causes engine failure in planes.

Riddle: How do you know
the ocean is friendly?
Answer: Because it always waves.

