

Why do  
Birds fly  
South for the  
Winter?



What is  
Blood  
Pressure?

# Making Science Make Sense



How does  
Bubble gum  
make Bubbles?

How does a  
Fire Extinguisher  
Work?



Bayer

It's  
easy to be a scientist.  
Simply look around and ask,  
"why?" **A**s a science-based company,  
Bayer is committed to creating awareness  
of the *importance of science literacy* among  
parents and fostering the *curiosity, creativity*  
and *critical-thinking skills* of children. **S**o as  
you and your child use this booklet *together*,  
exploring even the simplest wonders  
around your home, we hope not  
just to create new scientists, but  
to reawaken the one that's  
alive inside every one  
of us.

## kids and science: pointers for parents

What can parents do to make sure their children are properly prepared for the science and technology-driven world ahead? In a recent Bayer Corporation/National Science Foundation survey, America's Ph.D. scientists give some advice:

- **Know that interest in science begins early.** The majority of scientists say their interest in science was first sparked before age 11.
- **Be aware that girls like science as much as boys.** Mounting evidence indicates that girls and boys start equally interested in science. Maintaining that interest is the key.
- **Understand your role.** Scientists say when it came to igniting their early interest in science, their parents were the single biggest influence.
- **Expose children to role models.** Contact science and technology-based companies in your community, like Bayer, that have employee-volunteer programs that allow scientists to spend time with students in local schools.
- **Check out school science programs.** Ask your children's teachers how they teach science. Is it hands-on and inquiry-based? If you have any questions, organizations like the National Science Resources Center, can help.
- **Nurture their interests outside of school.** Noodling around at home, setting up informal experiments after school and on weekends, is not only fun, but effective, report the scientists.
- **Utilize science resources.** Today, with the Internet, science museums, zoos and other nature parks, and the public library, resources abound.

## cool science web sites

- **Bayer's Making Science Make Sense** — <http://www.BayerUS.com/msms>
- **Bill Nye the Science Guy** — <http://www.nyelabs.com>
- **NPR Science Friday** — <http://www.sciencefriday.com>
- **Earth & Sky** — <http://www.earthsky.com>
- **NASA** — <http://www.nasa.gov>
- **PBS Kids** — <http://pbskids.org>
- **National Science Teachers Association** — <http://www.nsta.org>

# Plant Power

## YOU WILL NEED:

- WATERCRESS SEEDS
- POTTING COMPOST
- A SHALLOW TRAY FOR GROWING SEEDS
- CARDBOARD (BIG ENOUGH TO COVER THE TRAY)
- SCISSORS

## WHAT TO DO:

1. Fill the tray with the potting compost. Sprinkle watercress seeds on the surface and water them gently.
2. Leave the tray on a window sill, where it will get plenty of light. Check each day to see how the seeds are growing.
3. After a few days, when the leaves have formed, cut a piece of cardboard big enough to cover the tray. Cut out a circle in the middle of the cardboard and put it over the tray. Again, check each day. What happens to the shoots under the cardboard? How can you tell from this project that plants need light to grow?

## WHAT THIS MEANS:

A PLANT IS A LIVING THING THAT NEEDS FOOD IN ORDER TO GROW. WHEN A PLANT IS EXPOSED TO SUNLIGHT, IT TRAPS THE LIGHT ENERGY AND CONVERTS IT INTO FOOD THROUGH A PROCESS CALLED PHOTOSYNTHESIS. THUS, SUNLIGHT IS CRUCIAL FOR HEALTHY PLANT GROWTH.



# Strange Acting Goop

## YOU WILL NEED:

- CORNSTARCH
- LARGE BOWL
- WATER
- MIXING SPOON

## WHAT TO DO:

1. Put one cup of cornstarch into the bowl.
2. Add 1/2 cup of water.
3. Mix well.
4. Slowly dip your finger into the gooey mixture. Grab some in your hand and pour it back into the bowl. Now, try slapping it hard with your hand or a heavy spoon. What happens? Next, grab some in your hand again and squeeze. What happens now?

## WHAT THIS MEANS:

THE STRANGE ACTING GOOP ALLOWS US TO LEARN ABOUT MOLECULES. A MOLECULE IS ONE OF THE BASIC UNITS OF MATTER. IT IS THE SMALLEST PARTICLE INTO WHICH A SUBSTANCE CAN BE DIVIDED AND STILL HAVE THE CHEMICAL IDENTITY OF THE ORIGINAL SUBSTANCE. WHEN SLAPPED QUICKLY, THE STRANGE ACTING GOOP MOLECULES, BECAUSE THEY ARE ALL TANGLED UP, PREVENT ANY SPLATTERING. IN THIS WAY THE MIXTURE BEHAVES MORE LIKE A SOLID. WHEN YOU SLOWLY SQUEEZE THE MIXTURE IN YOUR HAND, THE GOOP FEELS LIKE A SOLID INSIDE YOUR HAND, YET IT SLIDES OUT THROUGH YOUR FINGERS BACK INTO THE BOWL. THAT'S BECAUSE THE MIXTURE NOW BEHAVES MORE LIKE A LIQUID.

# It's Chemical!

## YOU WILL NEED:

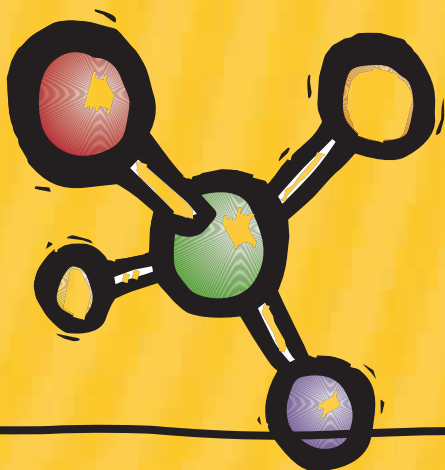
- A SMALL STRONG PLASTIC BOTTLE (20-OZ. SODA BOTTLE)
- A MEDIUM-SIZED ROUND BALLOON
- VINEGAR
- BAKING SODA
- A FUNNEL

## WHAT TO DO:

1. Pour vinegar into the small bottle until it is about half an inch deep.
2. Using a funnel, pour two teaspoons of baking soda into the neck of a balloon.
3. Stretch the neck of the balloon over the neck of the bottle, being careful not to let the baking soda out of the balloon.
4. Now lift up the balloon so that the baking soda runs into the vinegar. Shake the bottle. What happens?

## WHAT THIS MEANS:

WHEN TWO SUBSTANCES REACT TOGETHER, THEY CAN FORM NEW CHEMICALS OR PRODUCTS. IN THIS CHEMICAL REACTION, THE VINEGAR AND BAKING SODA REACT AND CREATE CARBON DIOXIDE. IT IS THESE BUBBLES OF GAS THAT INFLATE THE BALLOON.



# Dancing Raisins

## YOU WILL NEED:

- BAKING SODA
- VINEGAR
- RAISINS
- MEASURING CUP
- TEASPOON
- TWO-LITER PLASTIC BOTTLE
- SCISSORS

## WHAT TO DO:

1. Cut off the top of the two-liter plastic bottle.
2. Pour one-and-a-half cups of water into the plastic bottle.
3. Add one heaping teaspoon of baking soda and stir until it is dissolved in the water.
4. Add four to six raisins to the water/baking soda mix in the plastic bottle.
5. SLOWLY add one cup of vinegar into the plastic bottle.
6. After a couple of minutes, what happens to the raisins?

## WHAT THIS MEANS:

IN THE PLASTIC BOTTLE, A BASE (BAKING SODA) AND AN ACID (VINEGAR) REACT TO FORM A GAS (CARBON DIOXIDE). AS THE GAS FORMS, IT ADHERES TO THE RAISINS IN THE BOTTLE. ONCE ENOUGH GAS ADHERES TO A RAISIN, IT WILL BEGIN TO RISE TO THE SURFACE. WHEN IT REACHES THE SURFACE THE GAS ESCAPES INTO THE AIR AND THE RAISIN SINKS. THE RAISIN REPEATS THIS PROCESS FOR SEVERAL HOURS OR UNTIL THE RAISIN GETS SOGGY AND TOO HEAVY TO RISE TO THE SURFACE.

# Milk Magic

## **YOU WILL NEED:**

- ONE PINT OF HEAVY CREAM
- VINEGAR
- SMALL POT
- TEASPOON

## **WHAT TO DO:**

1. Pour the heavy cream into the pot. Heat the heavy cream until it simmers (do not boil).
2. Once it begins to simmer, slowly stir in a few teaspoons of vinegar.
3. Continue to stir until it becomes rubbery.
4. After the heavy cream turns rubbery, turn off the heat and let it cool.
5. Once cool, run the rubberized heavy cream under cool water. Now you have your own plastic.

## **WHAT THIS MEANS:**

MANY PLASTICS ARE MADE FROM PETROLEUM OIL OR CRUDE OIL, WHICH CONTAIN ORGANIC (CARBON-CONTAINING) SUBSTANCES. IN THIS PROJECT, THE VINEGAR (AN ACID) REACTS WITH THE CASEIN IN MILK (AN ORGANIC SUBSTANCE), CREATING THE PLASTIC. IN PRACTICE, THIS TYPE OF "MILK" PLASTIC IS MUCH TOO EXPENSIVE FOR HOUSEHOLD USE.

# Nails for Breakfast?

## YOU WILL NEED:

- "IRON-FORTIFIED" BREAKFAST CEREAL
- A BLENDER
- MEASURING CUP
- A CLEAR PLASTIC CUP
- WATER
- A STRONG MAGNET
- WHITE PLASTIC SPOON

## WHAT TO DO:

1. Mix two cups of iron-fortified cereal with two cups of water in the blender pitcher. Let it sit for a few minutes until the cereal is soft, then blend to make a smooth consistency.
2. Pour some of the cereal mix into a clear plastic cup.
3. While holding the magnet against the outside of the cup, stir the mix inside the cup gently with the plastic spoon. What happens when the magnet is taken away?

## WHAT THIS MEANS:

SOME OF THE IRON WITH WHICH OUR BREAKFAST CEREALS ARE FORTIFIED IS IN THE FORM OF "RAW" ELEMENTAL IRON, HENCE THE STRONG ATTRACTION TO THE MAGNET (IRON IN COMPOUNDS DOES NOT SHOW THIS SAME DEGREE OF ATTRACTION). THE SMALL PIECES OF ELEMENTAL IRON ARE ATTRACTED TO THE MAGNET AND GATHER TO FORM THE DARK SPOT YOU CAN SEE ON THE SIDE OF THE CUP. THE LONGER YOU STIR THE CEREAL MIX IN THE CUP, THE DARKER THE SPOT. WHEN THE MAGNET IS REMOVED, THE SPOT WILL GRADUALLY DISPERSE BACK INTO THE CEREAL.

# Soil vs. Cotton

## YOU WILL NEED:

- COTTON BALLS
- POTTING SOIL
- LIMA BEAN SEEDS
- WATER
- THREE CLEAR PLASTIC CUPS
- NOTEBOOK

## WHAT TO DO:

1. Fill one plastic cup half way with soil. Place a few seeds on top of the soil leaving a little space between them. Then fill the rest of the cup with soil, so you can bury the seeds.
2. Fill the other plastic cup half way with cotton balls. Randomly place one or more seeds between the cotton balls. Fill the rest of the cup with cotton balls, again burying the seeds.
3. Fill the third plastic cup with water.
4. Carefully pour a small amount of water over the cup containing the soil. Make sure the soil is not soupy, but moist to the touch (sticks to your fingers).
5. Carefully pour a small amount of water over the cup containing the cotton balls. Start with a VERY SMALL amount of water and add more water a little at a time. The cotton balls should just be moistened, not soaking.
6. Place the cups on a shelf or window ledge (make sure the ledge is not too cold). Plants do better if they are able to get some sun.
7. Water plants as needed when the soil/cotton balls are dry to the touch.
8. Watch everyday and write down what happens.

## WHAT THIS MEANS:

LIKE ANY LIVING THING IN A DEVELOPING STAGE, THE SEEDS' CELLS DIVIDE, CREATING A TINY STUB THAT WILL BE THE BEGINNING OF THE ROOT. THIS LITTLE FINGER, CALLED A "RADICLE," IS THE FIRST THING TO PUSH OUT OF THE SEED AND ANCHOR ITSELF IN THE SOIL. IN ORDER FOR THE TINY ROOTS (AND THE PLANT) TO GROW, IT NEEDS WATER AND NUTRIENTS. WHILE THE COTTON CAN HOLD WATER TO HELP GERMINATE THE SEEDS, IT DOES NOT CONTAIN THE KIND OF NUTRIENTS FOUND IN SOIL WHICH THE SEEDS NEED TO THRIVE AND GROW.

# It's all in the Taste Buds

## **YOU WILL NEED:**

- FLAVORED HARD CANDIES
- A PARTNER
- NOTEBOOK AND PEN

## **WHAT TO DO:**

1. Get a partner to do the experiment with you.
2. Have one person close their eyes and hold their nose, while the other person feeds them a flavored hard candy without telling them the flavor.
3. The person with the candy in their mouth should try to guess what flavor the candy is without letting go of their nose. Give them several minutes so the candy has a chance to dissolve in their mouth. This will give them enough time to detect the flavor.
4. Is there any change in the taste of the candy from the beginning to the end of the experiment? Describe the tastes.

## **WHAT THIS MEANS:**

MUCH OF WHAT WE PERCEIVE AS "TASTE" IS DUE TO OUR SENSE OF SMELL. AT FIRST, YOU MAY NOT BE ABLE TO TELL THE SPECIFIC FLAVOR OF THE CANDY, JUST PERHAPS A SENSATION OF SWEETNESS OR SOURNESS. IF PATIENT, AS THE CANDY DISSOLVES YOU CAN IDENTIFY THE SPECIFIC TASTE. THIS IS BECAUSE SOME SCENT MOLECULES VOLATILIZE AND TRAVEL UP THROUGH A "BACK DOOR" – A PASSAGE AT THE BACK OF THE THROAT TO THE NOSE. SINCE WE CAN ONLY TASTE FOUR DIFFERENT TRUE TASTES – SWEET, SOUR, SALT AND BITTER – IT IS ACTUALLY SMELL THAT LETS US EXPERIENCE THE COMPLEX, MOUTHWATERING FLAVORS WE ASSOCIATE WITH OUR FAVORITE FOODS.

## **Why do birds fly south for the winter?**

Many birds migrate or fly south for the winter because of temperature changes. Cold, snowy winters can create a real health hazard for them, as does the lack of food. So when the days grow shorter and colder, birds set off for their warmer winter home.

## **What is blood pressure?**

As blood accumulates in the heart's left ventricle, the walls contract, forcing the blood out and into an artery, putting a lot of pressure on the artery's wall. This is called systolic pressure. As the artery expands and the blood moves into veins and capillaries that pressure decreases. This is called diastolic pressure.

## **How does bubble gum make bubbles?**

Bubble gum contains more rubber than average chewing gum, giving it an elastic property.

When blowing a bubble, the gum is first stretched and flattened against the tongue. When the person starts to blow, the gum stretches further and further, making a bubble. Finally, the bubble pops and folds right back up, leaving a wad of gum again.

## **How does a fire extinguisher work?**

The common home fire extinguisher contains carbon dioxide or  $\text{CO}_2$  in a liquid form. Housed in the extinguisher, the  $\text{CO}_2$  is under tremendous pressure. During a fire when the extinguisher trigger is pulled, the  $\text{CO}_2$  is released as a blast of very cold, snowy-looking gas. As it hits the fire, the  $\text{CO}_2$  molecules smother the oxygen molecules, stopping the fire cold.



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Making Science Make Sense is Bayer's award-winning, companywide initiative that advances science literacy through hands-on, inquiry-based science learning, employee volunteerism and public education.

**For more information, please visit [www.BayerUS.com](http://www.BayerUS.com).**