Celebrating Chemistry

CHEMISTS CELEBRATE EARTH DAY APRIL 22, 2012
AMERICAN CHEMICAL SOCIETY

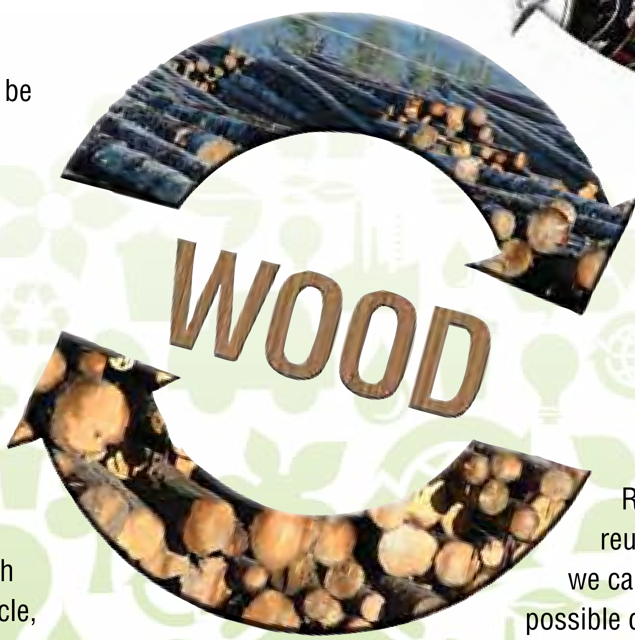
Rethinking the 3 R's: It's Easy to be Green

Rethinking the Stuff We Use

By Robert A. Yokley

Recycling is a process used to make new products from waste. This reduces the use of fresh, raw materials. It also reduces energy usage, air and water pollution, and waste disposal. You can recycle many types of products, including ones made from glass, paper, metal, plastic, textiles, electronics, etc.

For example, a used aluminum (Al) can may be recycled and back on the grocery shelf in as little as 60 days. The energy required to recycle one aluminum can is 1/20 of that required to make one aluminum can from bauxite ore, which is where aluminum is found in nature. That means that for each aluminum can you recycle, you save enough energy to run a TV for three hours, or the equivalent of half of gallon of gasoline. A lot of energy is needed to convert bauxite ore into aluminum metal (the ore must be heated to 1000°C).



Some resources are renewable, meaning that they are replaced by natural processes and replenished with the passage of time. Wood, also known as timber, is considered a renewable resource when it is harvested sustainably. A non-renewable natural resource often exists in a fixed amount and is consumed much faster than nature can create it. Examples include fossil fuels such as coal, petroleum, and natural gas, as well as uranium used for nuclear power.

Reusing aluminum over and over (recycling) is a sustainable process. Sustainability is the replacement or renewal of resources as fast as they are consumed. It is important to use the earth's natural resources thoughtfully to keep our land, air, and oceans free of trash and pollution. Reducing the amount of things we use, reusing stuff in old or new ways whenever we can, and recycling materials as often as possible can help our society and environment achieve these goals!

__Robert A. Yokley, Ph.D.__ retired in 2008 from Syngenta, where he managed a mass spectrometry and method development group. He still works for Syngenta on a part-time basis when he is not traveling, playing tennis, or exploring new countryside in his vintage Triumph sports car.

Where to Find More Information

http://kids.niehs.nih.gov/recycle.htm
www.epa.gov/osw/conserve/rrr/recycle.htm
www.recycling-revolution.com/recycling-facts.html
www.ecy.wa.gov/programs/swfa/kidspage/

REDUCE, REUSE, RECYCLE!

By Ronald P. D'Amelia

To deal with the environmentally unfriendly aspects of plastics, we have to Reduce, Reuse, and Recycle … also known as the three R's.

Reduce means using fewer resources in the first place. This is the most effective of the three R's. Reduce means cutting back from where we are now. When you buy something, look for things that will last, buy only the quantity that you will need and use, and think about how the item is packaged. Big fancy packages may attract your attention, but they end up in the landfill. Prevention of waste can help save money and reduce our impact on the environment.

Reuse before you recycle or dispose of a plastic item. Consider whether it has any life left in it. A plastic jar can be used to store other items. A plastic sandwich bag can be reused. Reusing keeps new plastic polymers from being used for a while and also prevents old plastic from going into our waste stream — that is, the journey that trash takes from the time we throw it away to the time it arrives at the landfill, and finally decomposes.

Recycle has been the best program at shrinking the non-friendly impact of plastic material. There are many recycling programs today that make recycling easy. Paper, metal, and glass are easy to recycle. Most plastic recycling programs use the 'chasing arrow' symbol in which a number in the middle of the arrows indicates the type of plastic.

Today, the vast majority of consumer products contain at least some plastic material. As the number and variety of human-made polymers grow, more and more industries are discovering how plastics can replace more expensive natural materials. Plastics, once considered cheap and shoddy, are now recognized as superior, rather than inferior, materials. Surely, more consumer products will contain plastics in the future.

Someday, we'll use more environmentally friendly materials called bioplastics, such as polylactic acid (PLA). But until then we must Reduce, Reuse, and Recycle … and use our current plastic materials wisely.

***Ronald P. D'Amelia** retired from Kraft/Nabisco as a Senior Principle Scientist after 32 years of service. He is currently an Adjunct Professor at Hofstra University, the Faculty Advisor to the Hofstra Chapter of the Student Members of ACS, and a Fellow of the ACS.*

See "Recycling by the Numbers" at **www.greenlivingtips.com/articles/187/1/Recycling-by-the-numbers.html** and **www.planetgreen.discovery.com/home-garden/recycle-by-number.html**.

Plastics

By Analice Sowell and Margaret S. Richards

Have you ever seen the recycle triangle and number on a bottle of water or plastic milk container? That number tells us which type of plastic it is made of and if it can be recycled. Try searching for these different types of plastics around your house and at school to see how many you can find! Can you also list some properties of each type of plastic? Is it rigid or bendable, clear or cloudy, soft or hard?

#1 PET or PETE: Polyethylene Terephthalate is used in many soft drink, water, and juice bottles. It is accepted by most plastic recycling centers.

Find 3 items made of #1 plastic.

____

____

____

#2 HDPE: High-density Polyethylene is used in milk jugs, detergent containers, and shampoo bottles. It is widely accepted and easily recycled.

Find 3 items made of #2 plastic.

____

____

____

#3 PVC: Vinyl or Polyvinyl Chloride is used in some cling wraps, many children's toys, fashion accessories, shower curtains, and spray bottles. PVC is not recyclable.

Find 1 item made of #3 plastic.

____

Safari!

#4 LDPE: Low-density Polyethylene is used in most plastic shopping bags, some cling wraps, some baby bottles, and reusable drink and food containers. It is recyclable at most recycling centers, but generally not in curbside recycling programs.

Find 2 items made of #4 plastic.

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____

#5 PP: Polypropylene can be found in some baby bottles, dairy and takeout containers, and many reusable containers. It is recyclable in some curbside programs and most recycling centers.

Find 2 items made of #5 plastic.

____

____

#6 PS: Polystyrene is used in takeout food containers, egg containers, and some plastic utensils. It is not often recyclable in curbside programs, though some recycling centers will take it.

Find 1 item made of #6 plastic.

____

#7 Everything else

Find 1 item made of #7 plastic.

____

Were you able to find containers made with each type of plastic? Compare your list with a buddy's. How many are the same, and how many are different?

To find out more about these plastics, go to **http://www.acs.org/CCED**.

Analice Sowell *is a chemistry teacher at Memphis University School and former chair of the American Chemical Society (ACS) Memphis Local Section. She has served on the ACS Committee on Community Activities since 2005.*

Margaret S. Richards *is a visiting chemistry professor at George Washington University in the Women's Leadership Program.*

A 300-Year-Old Juice Box?

Learn what's in your juice box ... besides juice, that is!

By Christine Jaworek-Lopes

How many juice boxes did you use in the last year? You probably enjoyed the juice — but have you ever thought about the boxes it came in?

A juice box is called a composite package because it is made of layers of paperboard, plastic, and aluminum foil. What does each layer do? The paperboard gives the box its shape. About 70% of a juice box is paperboard. The plastic, which is about 24% of a juice box, has two jobs. It keeps the juice in the box and it keeps the outside of the box dry. The type of plastic used to make juice boxes is polyethylene, a polymer made up of hydrogen and carbon. The aluminum foil found on the inside of the juice box, which is only 6% of the box's total weight, has a very important role. It protects the juice from light and oxygen, which could make unprotected juice spoil and become unsafe to drink.

Now that you know what juice boxes are made of, do you think you should put your empty boxes in the trash or the recycling bin? Scientists estimate that it takes at least 300 years for a juice box to decompose in a landfill. A better solution is have the juice boxes recycled through a process called hydro-pulping, where the boxes are mixed with water and mashed together using blades. You can think of a hydro-pulping machine as a giant blender. Many recycling centers in the US have hydro-pulping machines. To see if you can recycle juice boxes where you live, check **www.aseptic.org**.

With help from an adult, cut a used juice box in half and rinse it out with water. Can you separate the different parts that make up the composite packaging? How easy is it to separate the plastic from the paperboard? How about the aluminum foil?

Box or Pouch? Take the Sustainability Challenge!

In addition to boxes, another way that individual servings of juice may be packaged is in juice pouches. Currently, the only way to recycle juice pouches is by sending them to a company called TerraCycle (their website is: www.terracycle.net). Once a juice pouch is recycled, its material can be made into backpacks, pencil cases, or lunch boxes. Which packaging method is more sustainable? You like juice so let's find out which type of juice packaging is better for the environment. You can use math to help and decide for yourself by completing the tables below to compare juice boxes to pouches.

Juice Box

Juice boxes are sold in packages of eight. The 10-pack is wrapped in plastic and has a paper insert, which is recyclable. This packaging weighs 15.23 grams. An empty juice box weighs 218.57 grams. Each juice box contains 200 milliliters or mL (6.75 fluid ounces) of juice. Use your math skills to find the following:

Number of boxes in a package	Volume of a juice box (mL)	Total volume of juice in package

Number of boxes in a package	Mass of an empty juice box	Total mass of the boxes in package

Juice Pouch

Juice pouches are sold in a package of ten. The 10-pack is placed in a cardboard box; cardboard can be recycled. This packaging weighs 129.91 grams. Each juice pouch contains 177 mL (6 fl oz) of juice. The juice pouch has a mass of 190.64 g. You will have to do some more math so you can compare boxes and pouches.

Number of pouches in a package	Volume of a juice pouch (mL)	Total volume of juice in package

Number of pouches in a package	Mass of an empty juice pouch	Total mass of the pouches in package

Juice Box vs. Juice Pouch

Complete the following table using your math skills and the data from the other tables.

	10-pack of juice boxes	10-pack of juice pouches
Total volume of juice in a package		
Total mass of juice containers		
Mass of outer packaging		
Total mass of packaging		
$\frac{\text{Total volume of juice}}{\text{Total mass of packaging}}$		

Which product, juice boxes or pouches, contains the most juice with the smallest amount of packaging? Another thing to consider is whether the packaging is recyclable. Is it possible to recycle the individual juice containers in your town? Overall, which type of packaging for juice do you think is more eco-friendly? Why?

Christine Jaworek-Lopes *is an associate professor of chemistry at Emmanuel College. She is also a member of the ACS Committee on Community Activities.*

Word Search

Try to find the words listed below — they can be horizontal, vertical or diagonal, and read forward or backward!

ALUMINUM
CARDBOARD
COMPOST
DENSITY
ELECTRONICS
GLASS
PAPER
PLASTIC
RECYCLE
REDUCE
REUSE
SUSTAINABLE

H	T	F	D	M	H	Q	K	Z	F	G	E	C	G	V
M	B	D	F	L	J	S	S	A	L	G	R	H	L	R
G	A	C	E	L	C	Y	C	E	R	U	H	V	G	N
R	X	F	E	L	B	A	N	I	A	T	S	U	S	Y
L	F	D	I	R	A	L	U	M	I	N	U	M	K	E
I	V	S	Y	Q	P	D	C	O	M	P	O	S	T	C
M	H	G	N	A	X	G	L	R	R	I	P	L	P	U
U	V	F	F	D	R	A	O	B	D	R	A	C	D	D
P	L	N	R	G	R	E	P	A	P	I	B	D	P	E
S	C	I	N	O	R	T	C	E	L	E	E	L	K	R
J	S	V	R	C	B	X	N	W	A	N	A	T	L	E
P	S	U	I	R	E	U	S	E	S	S	C	E	H	T
O	E	K	P	R	B	I	D	I	T	Y	U	W	N	P
J	Z	L	S	G	E	P	T	I	G	J	A	X	F	G
L	M	T	Q	T	V	Y	C	Y	A	E	K	H	A	P

The Three R's

Using bar soap (and even bar shampoo) cuts down on packaging material. Don't forget to recycle empty bottles and toilet paper rolls.

Turning off the tap while brushing your teeth in the morning and at bedtime can save up to 8 gallons of water per day, which equals 240 gallons a month!

When you leave a game console on when you're not using it, it's like leaving as many as three 60-watt light bulbs on. Watt a waste!

Switch to Compact Fluorescent Lights (CFLs) — those twisty-looking bulbs. They are much more energy efficient than traditional incandescent bulbs.

Also, say NO to junk mail! Help your parents call toll-free numbers on unwanted catalogs and ask to be removed from mailing lists.

Start a compost to transform your household food waste, grass clippings, and leaves into a rich, earth-like material that can be added to a garden to help plants grow.

You can set up a rain barrel to collect the water that runs off your roof and use it to water the lawn or wash the car. During a one-inch rain, more than 700 gallons of water run off the average roof. That's enough water to take 17 baths or 58 showers!

Most laundry soap and bleach bottles (usually made of plastic #2) are easily recyclable.

Avoid single-serve containers whenever possible. Take your lunch to school in reusable bottles and plastic containers. Just remember to bring them home!

Also, use washable napkins and kitchen towels instead of paper products — cloth napkins are usually much larger and more absorbent than paper products.

By Anne K. Taylor

The idea of sustainability began to take shape about 25 years ago, when the United Nations defined sustainable development as the ability to meet "the needs of the present without compromising the ability of future generations to meet their own needs." Being sustainable is doing things over and over in a way that does not harm the environment.

For example, a farmer may find that he or she can use the same field many times without using much fertilizer or pesticides by changing its use every year or season. One year, the field may be a pasture for animals to graze and eat in. The waste from the animals will then fertilize the field so that a crop may grow there the next year. Then a different type of crop could be planted the third year. Each use of the land prepares the soil for the next year and a different crop or type of animal. This is how a farm can be sustainable.

What can you do to increase sustainability? Reduce, Reuse, Recycle!

Let's use a plastic grocery bag as an example. The bag is made of plastic, which is made from oil (petroleum). The oil in the earth is gradually being used up, so we need to make it last by using less. Here's where you come in:

- Reduce: If you take a cloth bag to the supermarket, you won't need a plastic bag. You will reduce the need for bags made from oil. The cloth bag can be used over and over — so it is sustainable.
- Reuse: When you do get plastic bags, you can reuse them for shopping or use them for collecting trash. You save money on garbage bags.
- Recycle: You can return your empty bags to the supermarket or another place that will recycle them. Old bags can be converted into new ones. Again, you are reducing the need for plastics made from oil.

Want to learn more? Check these out!

- Things you can do: **www.epa.gov/recyclecity/**
- "Sustainability a Window to the Future" — a website with information on sustainability for older kids (**http://Library.thinkquest.org/06aug/01346/environment.html**)

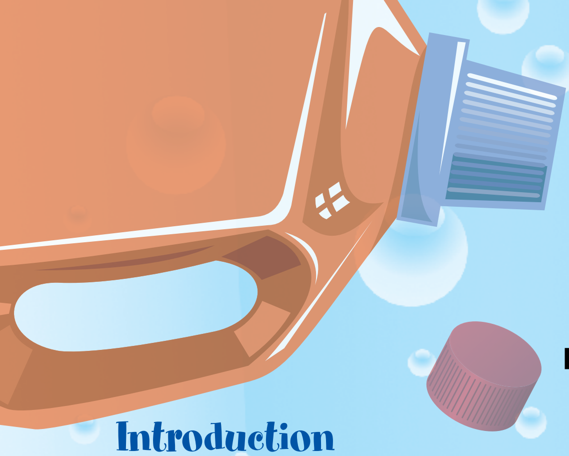
Recycling is a great example of sustainability!

Is there a way that you can increase sustainability with your lunch every day? Like reusing grocery bags, or you could take your lunch to school in reusable containers, take the containers home with you, wash them, and use them the same way the next day. If the container breaks or gets damaged, you can recycle it and get a new one. You could even decorate the reusable container so it doesn't get mixed up with other kids' containers.

***Anne K. Taylor** is a chemistry consultant who works with pharmaceutical companies. She is the Councilor from the Baton Rouge Section of the American Chemical Society and serves on the Committee on Community Activities.*

References

- Best: "A Pocket Guide to Sustainability" — a brochure about sustainability and how to live in a sustainable way (**www.ecy.wa.gov/biblio/0307017.html**)
- "Recycling for Sustainability" — a long article with details and background information on recycling (**http://web.missouri.edu/~ikerdj/papers/Nebraska-recycling.htm**)
- "Recycling Expert" — a website with many resources about recycling, created by an organization in the United Kingdom (**www.recyclingexpert.co.uk/**)
- "Green Living: Recycling & Sustainability" — part of a university's website that includes definitions and quotations about sustainability (**www.rwu.edu/campus-life/rwu-community/green-living**)



Density Intensity

By Melissa Golden, Gregory Harnden, and Ryan Dougherty

Introduction

Do you ever think about what happens to all the trash that you and your family throw away? Yes? Good! Most non-recyclable items are shipped to a landfill and buried. Objects in your trash that are made of glass, paper, and some metals and plastics are considered recyclable and are usually handled differently. They're shipped to recycling centers, where they are separated using lots of methods like sorting by hand, screening by size, and separating based on their properties. Properties? Sure, properties such as their density, or whether they are attracted to a magnet. Let's see how this can be done by trying this activity.

Be sure to follow Milli's Safety Tips and do this activity with an adult! Do not drink any of the liquid samples used in this activity!

Materials

Polyethylene Terephthalate (Resin ID code 1) —
 such as plastic water bottles, soda bottles
High-Density Polyethylene (Resin ID code 2) —
 such as milk jugs, detergent bottles
Low-Density Polyethylene (Resin ID code 4) —
 such as six-pack rings
Polypropylene (Resin ID code 5) —
 such as bottle caps, drinking straws, yogurt containers
Polystyrene (Resin ID code 6) —
 such as disposable coffee cups
Measuring spoons
One marble
One paper clip
Water
Sodium chloride (table salt)
Magnet
Isopropyl rubbing alcohol 70%
Light corn syrup
3 small clear bowls or containers
Two plates
Tongs
Tape
Marker

Procedures

1. With the help of an adult, cut a 3 cm x 3 cm piece of each type of plastic. Label each piece of plastic with its recycling code.
2. Label the three bowls or containers "1," "2," and "3" and the two plates "A" and "B" using tape and a marker.
3. Place 1 marble, 1 paper clip, and 1 piece of each type of plastic on plate A.
4. Take the magnet and slowly pass it over the items on plate A. What happens? If you are able to separate any of the items, then place them on plate B. Write the name(s) of the object(s) to the list at the end of the activity.
5. Add 3 tablespoons (45 mL) of 70% isopropyl alcohol (rubbing alcohol) to the container labeled 1.

CAUTION: ***Rubbing alcohol is flammable. Be sure to keep ignition sources away from your work area.***

6. Place the items from plate A in container 1. What happens? Are any of the plastic pieces floating? If so, remove them with tongs and put them on plate B. Record which type of plastic or object you placed on plate B in the list at the end of the activity.
7. To container 1, add 2 teaspoons (10 mL) of water and swirl to mix. Are any of the plastic pieces floating now? Remove any floating plastic with tongs and put them on plate B. Add the names of these objects to your list.
8. To container 1, add 1 teaspoon (5 mL) of water and swirl to mix. Have any of the plastic pieces started to float? Remove any floating plastic with tongs and put them on plate B. Add the names of these objects to your list.
9. To container 1, add 4 teaspoons (20 mL) of water and swirl to mix. Are any of the plastic pieces floating now? Remove any floating plastic with tongs and put them on plate B. Record your findings.
10. Now carefully remove any items that are left in container 1 with the tongs. Place them back on plate A.
11. In container 2, add 7 fluid ounces (200 mL) of water and 2 heaping tablespoons (30 grams) of sodium chloride. Stir so that all of the salt is dissolved.
12. Now carefully place the items from plate A in container 2. Are any of the pieces of plastic floating? If not, dissolve a little more salt in the water. Remove any floating plastic with tongs and put them on plate B. Record your findings.
13. Now carefully remove the marble and plastic pieces from container 2 with tongs and place them on plate A.
14. Into container 3, add 3½ tablespoons (50 mL) of light corn syrup.
15. Carefully place the items from plate A into container 3. Do any of them float? Remove any floating plastic pieces with tongs and put them on plate B. What is left in container 3? Add the names of these objects to your list.

Milli's Safety Tips Safety First!

ALWAYS:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Use all materials carefully, following the directions given.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

NEVER eat or drink while conducting an experiment, and be careful to keep all of the materials away from your mouth, nose, and eyes!

NEVER experiment on your own!

Where's the chemistry?

What determines whether the objects sink or float? Density! Density is the mass of the object per unit of volume. For example, you can fit one gram of water into a volume of 1 mL, so the density of water is 1 g/mL. When you compare the density of different substances, a lower density item will float in a higher density substance. So if you have a piece of plastic with a density of 1.05 g/ml and throw it in water, it will sink, because it has a higher mass per unit volume than water does. If you now add 30 g of table salt to the water, the density of this new solution will be different than water's. Table salt has a density of about 2 g/mL, so when added to water, the density of the solution changes to about 1.05-1.10 g/mL. After adding the salt, what happens? If a piece of plastic rises to the surface, its density is lower than the density of the salt water.

List the items in the order in which they were separated.

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________

More information about recycling plastics.

Recycling Symbol	Name	Density (g/mL)	Product Examples	Recycled Products
#1	PETE Polyethylene Terephthalate	1.39	Soft drink bottles Food containers Rope Fabrics	Fiberfill in coats Carpet Camera film Lumber
#2	HDPE High-Density Polyethylene	0.96	Milk jugs Grocery bags Toys Juice containers	Trash cans Floor tile Flower pots Garden furniture
#4	LDPE Low-Density Polyethylene	0.92	Bread bags Frozen food bags Grocery bags Container lids	Floor tile Furniture Garbage can liners
#5	PP Polypropylene	0.90	Food containers Medicine bottles Rope Wrapping films	Videocassette cases Lawn mower wheels Battery cables Landscape borders
#6	PS Polystyrene	1.05	CD cases Disposable utensils Foam cups Toys	Flower pots Trash cans Thermometers Rulers

__Melissa Golden__ is an inorganic chemistry professor at California State University, Fresno. Her research students, Gregory Harnden and Ryan Dougherty, are working on bioinorganic chemistry, investigating how a toxic metal such as nickel interacts with proteins. Greg aspires to be a high school chemistry teacher and Ryan plans to get his Ph.D. in chemistry.

SUPER SHRINKERS

The word *plastic* comes from the Greek word meaning "able to be molded." Plastics are popular materials because they can be molded or shaped in many different ways. It might surprise you, but plastic is all around us!

For instance, your pencil box and the desk you write on at school are most likely made out of plastic. At home, the handle of your toothbrush and the one gallon container of milk are almost certain to be made out of it. What about your games and toys? Their parts and pieces may contain plastic, too.

In this activity, you will turn a plain piece of plastic into your own work of art!

SAFETY FIRST! *Be sure to follow Milli's Safety Tips and do this activity with an adult! Do not eat or drink from any of the containers used in this activity.*

Materials

- Conventional or toaster oven
- One or two clear or white polystyrene containers (Resin ID code 6) – the container will be destroyed during this activity so make sure you ask your parents for permission.
- Blunt-ended scissors
- Oven mitts
- Colored permanent markers
- Metric ruler
- Cookie sheet or metal tray
- Aluminum foil

(Optional)
- Colored pencils
- Fine sandpaper

NOTE: Make sure your container is made of "6" recyclable plastic. If the edges of your final product are rough, your adult partner can help you to smooth them with sandpaper.

Procedures

1. Have your adult partner preheat the oven to 325˚ F.
2. Make sure the plastic container is clean, dry, and free of dust.
3. Carefully cut a piece from the plastic container. If possible, try to make it so that it's at least a few centimeters wide and tall. The shape of your piece (circle, triangle, etc.) is up to you!
4. Use permanent markers to draw or write something on your piece of plastic. The more color you use, the more intense the colors on your final piece will be. If you write something, make your letters big and thick!
5. Measure and record the length and width of the plastic with the ruler at its longest and widest parts. Write your measurements in the "What Did You Observe?" section.
6. Cover a cookie sheet or metal tray with aluminum foil and place the piece of plastic with your colored design on the foil.
7. Ask your adult partner to place the tray in the oven. If you have a glass oven door, you will see the plastic curl up and then flatten again. When this happens, the plastic has finished shrinking. This should take less than two minutes.
8. Have your adult partner take the tray out of the oven using the oven mitts. Be careful. It will be hot! Place the hot tray on a heat-resistant surface.
9. Do not touch your newly-created piece of art until it has completely cooled. Your adult partner will tell you when it is ready to be touched.
10. When it has cooled, take your design off the cookie sheet and measure its maximum length and width as you did in Step 5. Record your measurements in the "What Did You Observe?" section.
11. Thoroughly clean the work area and wash your hands.

Curious? Try These Ideas...

You can also create designs on the plastic using colored pencils. Use sandpaper to scratch the surface of plastic where you would like to draw. After you heat the plastic, does the surface still appear scratched?

Make a charm or necklace by punching a hole(s) in the plastic before you place it in the oven. After the plastic shrinks and cools, thread a string through the hole.

Where's the Chemistry?

When the polystyrene (PS) you used was made, it was first heated, then stretched into a film and quickly cooled. The molecules of PS were "frozen" in this stretched-out position. When the PS is heated again, the molecules relax and the PS returns to its original unstretched size. There are many kinds of plastic and they all have different properties. Different types of plastic may melt into liquid or stay just the way they are even after you heat it.

What Did You Observe?

Use this table to record what you discovered about the size of your piece of plastic.

	Length (cm)	Width (cm)
Before Shrinking		
After Shrinking		

The Adventures of Meg A. Mole, Future Chemist

Sara Risch, Food Chemist

In thinking "green," one of my first thoughts is cornfields, and they remind me of my favorite thing … popcorn! To learn what it takes to be a popcorn scientist, I traveled all the way to Debrecen, Hungary to visit a company called Popz Europe. There I met Dr. Sara Risch, a food chemist, and got to learn all about the chemistry behind popcorn!

Dr. Risch told me all about the work she does every day: testing popcorn! I asked her what kind of tests her company did on popcorn — after all, the only thing I know about it is popping it in the microwave! She explained, "We measure the volume of microwave popcorn after it's popped and count unpopped kernels. We also make sure the popcorn passes safety and quality tests, and that the machines we use to produce it are working properly."

She also gets to work on popcorn flavors! "I add different flavors to oil," she told me, "and mix it with the popcorn to develop new flavors. Right now I'm working on paprika and banana toffee flavors." She also gets to taste the products she makes, and travels around the world to talk with people about what kind of popcorn they want! Maybe being a food scientist would be a great career for me. I enjoy seeing new places and meeting people … and I love to eat!

Next Dr. Risch took me to her test kitchen, where her team was evaluating new "popcorn hybrids." She also showed me a grain analysis computer. She loaded the grain (that is, the popcorn) into the machine and in 15 seconds, it told us how much moisture was in the popcorn. The machine had one pan that separated out unpopped kernels, and another that figured out the size of the kernels. And of course, there was also a microwave for testing popping performance!

I asked Dr. Risch if she was interested in chemistry when she was growing up. "Absolutely! I did lots of experimenting in the kitchen," she said. "My mother would let me try to cook anything I wanted. Looking back, I can now see why some of my kitchen experiments worked, and others didn't." Her parents encouraged her to be inquisitive about everything — and so did her high school chemistry, biology, and physics teachers.

She also remembers that when she was quite young, she met a woman who was a pathologist (someone who studies diseases). "That made me start thinking I might want to become a doctor. But in my senior year in high school, I read about the field of food chemistry in a college catalog, and changed my mind." She stayed in science but ended up working in a very different area.

So what does Dr. Risch like most about her work? "It is fun to develop new foods that I can see when I walk through a grocery store. I'm always working on new and different projects, and that keeps my job interesting and challenging."

I asked her where a young person (or even a mole like me) might find some of the popcorn her company makes. She told me that products she has worked on are in grocery stores around the world. She gets to make great snacks that we all enjoy eating!

Personal Profile

FAVORITE FOOD?

"When I want something sweet, it's ice cream. For savory food, I love seared ahi tuna."

COOL PROJECT YOU WORKED ON?

"I helped develop a microwavable cheeseburger and fries."

ACCOMPLISHMENT YOU'RE PROUD OF?

"Being able to talk with non-scientists and help them understand science."

Vocabulary Words

Composite packaging — packaging made of at least two distinct layers

Hydro-pulping — a process that separates paperboard from polymer and aluminum layers

Polymer — a large molecule made up of repeating smaller units

Polyethylene — a polymer composed of hydrogen and carbon

Mass — the amount of matter in a substance, often measured in grams

Density — the mass per unit of volume

Physical properties — qualities of an element or compound that can be observed directly (that is, without using a chemical reaction such as burning) and that do not depend on the size or amount of matter being analyzed

Volume — the amount of space an object occupies, often measured in milliliters

What is the American Chemical Society?

The American Chemical Society (ACS) is is the largest scientific organization in the the world. ACS members are mostly chemists, chemical engineers, and other professionals who work in chemistry or chemistry-related jobs. The ACS has more than 164,000 members. Most ACS members live in the United States, but others live in different countries around the world. Members of the ACS share ideas with each other and learn about important discoveries in chemistry during meetings that the ACS holds around the United States several times a year, through the use of the ACS website, and through the journals the ACS publishes.

The members of the ACS carry out many programs that help the public learn about chemistry. One of these programs is Chemists Celebrate Earth Day, held annually on April 22. Another of these programs is National Chemistry Week, held annually the fourth week of October. ACS members celebrate by holding events in schools, shopping malls, science museums, libraries, and even train stations! Activities at these events include carrying out chemistry investigations and participating in contests and games. If you'd like more information about these programs, please contact us at outreach@acs.org!

Celebrating Chemistry

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The activities described in this publication are intended for elementary school children under the direct supervision of adults. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

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