

BOOK

1

SEVENTH GENERATION SCIENCE EXPERIMENTS

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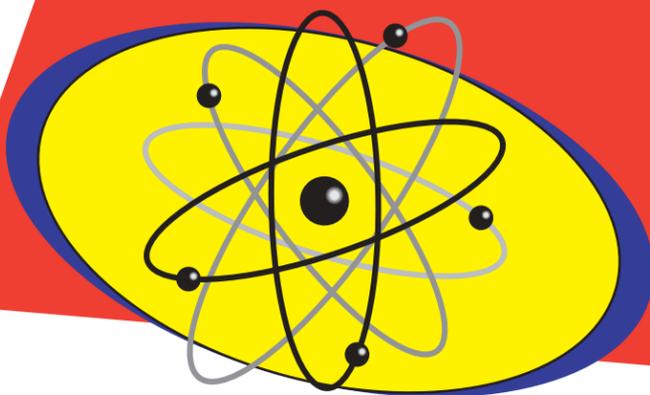
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SEVENTH GENERATION CLUB



The Seventh Generation Club thanks Science World for its contribution of the twelve experiments found in the Seventh Generation Club Science Experiments Book 1.

Science World, which opened its doors in 1989, is a non-profit, self-supporting organization dedicated to inspiring a greater appreciation of science and technology. The centre features hundreds of hands-on exhibits, dazzling demonstrations, and spectacular science and nature films on one of the world's largest dome screens.

Its exhibits encourage people to become familiar with scientific concepts and themes such as natural history, music and sound physics, illusions and sustainable development. It also hosts traveling exhibits on a variety of subjects ranging from bats to bugs to brains. Science World is a vital community resource that celebrates curiosity, creativity, and the thrill of learning.



SCIENCE WORLD British Columbia  
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Website: [www.scienceworld.bc.ca](http://www.scienceworld.bc.ca)

# Volcanic Eruption

Grades K to 6

## What you need:

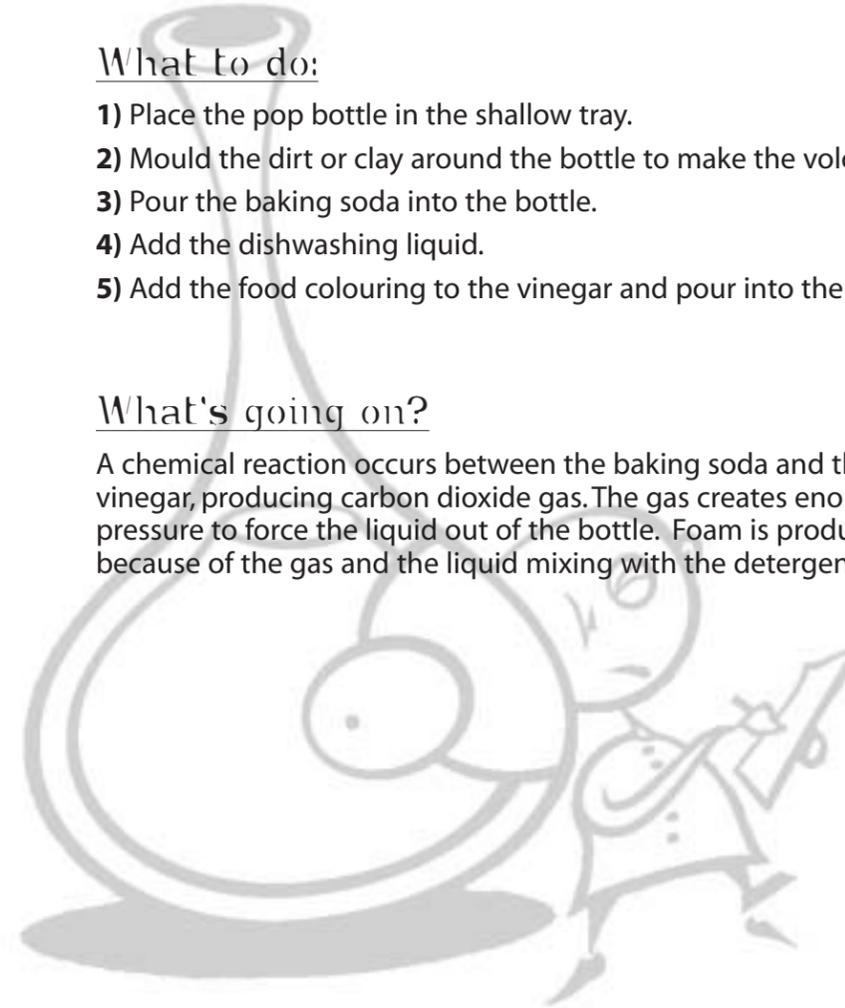
- Empty pop bottle
- 250ml of vinegar
- 15ml baking soda
- Dirt or clay or paper mache
- Shallow tray
- 5ml dishwashing liquid
- Food colouring (optional)

## What to do:

- 1) Place the pop bottle in the shallow tray.
- 2) Mould the dirt or clay around the bottle to make the volcano.
- 3) Pour the baking soda into the bottle.
- 4) Add the dishwashing liquid.
- 5) Add the food colouring to the vinegar and pour into the bottle.

## What's going on?

A chemical reaction occurs between the baking soda and the vinegar, producing carbon dioxide gas. The gas creates enough pressure to force the liquid out of the bottle. Foam is produced because of the gas and the liquid mixing with the detergent.



## This day in Science History

### **January 11, 1922**

At the Toronto General Hospital, Leonard Thompson, 14 years old, became the first diabetic to be successfully treated with insulin. Insulin had been discovered five months earlier by Canadians Frederick Banting and Charles Best.

### **February 13, 1895**

Louis and August Lumiere patented the cinematographe, the first moving picture camera. The cinematographe recorded 15 images per second compared to 24 frames per second for today's film cameras.

### **March 9, 1879**

Canadian inventor, Alexander Graham Bell patented the telephone.

### **May 26, 1969**

Humans clocked their fastest speed ever traveled when the command module of the Apollo 10 spacecraft reached a speed of 39,666 kilometers per hour.

### **June 9, 1884**

Joseph Tyrell found the first Canadian dinosaur in Drumheller, Alberta. It was an *Albertosaurus*, a relative of the *Tyrannosaurus*. Since then, over 475 dinosaurs have been discovered in the area making it the world's richest paleontological site.

# Building Your Own Bog

Grades 1 to 6

## What you need:

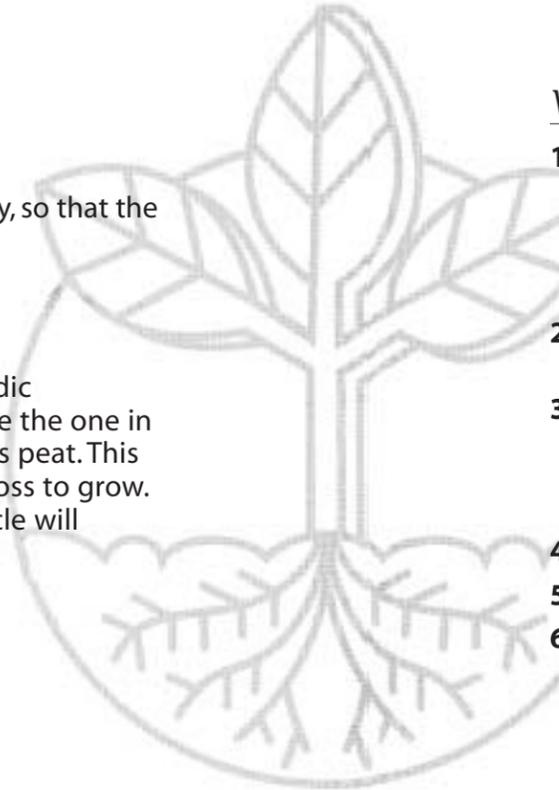
- Fish tank
- A layer of peat – 3 to 5 cm thick to cover the base of the tank
- Some bog moss
- Distilled water

## What to do:

- 1) Cover the base of the tank with a layer of peat.
- 2) Saturate the peat with water.
- 3) Place the bog moss in the tank, on top of the peat.
- 4) Using distilled water, water the tank daily, if necessary, so that the water level remains just below the moss.

## What's going on?

The peat makes the water acidic. Moss prefers an acidic environment to grow well. In a bog environment, like the one in the tank, the cycle is set up. Old moss dies and forms peat. This new peat makes the water acidic and helps more moss to grow. As long as the moss receives water regularly, the cycle will continue forever! This is how a bog is formed.



# Making A Simple Plant Press

Grades 1 to 9

## What you need:

- Two pieces of thick, corrugated cardboard 23cm x 30cm (heavy packing boxes are good sources of thick cardboard).
- Six to ten sheets of newspaper, folded in half, or cut to the same dimensions as the cardboard.
- Four heavy duty rubber bands.
- Heavy objects to weight the press down (bricks or heavy books).

## What to do:

- 1) Collect a plant specimen from your yard or school grounds. Try to collect only common or weedy types of plants. Do not collect rare or endangered plants, such as wild orchids. Be careful not to disturb or injure other plants when you are collecting your specimen.
- 2) Create a sandwich with the newspaper sheets between the cardboard pieces.
- 3) Carefully place the plant specimen between the newspaper sheets, making sure that there are several sheets on top and underneath the plant. Also, make sure that the plant is spread out and its leaves are flat.
- 4) Tightly secure the plant press with the rubber bands.
- 5) Place the bricks or heavy books on the plant press.
- 6) Wait for a few days until your plant specimen has dried. Remove it carefully from the press and tape it to a piece of heavy paper, or a page in a scrapbook.

## What else you can do:

Collect different kinds of plants at different times of the year. When you tape them to your scrapbook pages, record where and when you found them. Look at pictures of plants in books from the library and see if you can identify the plants. Write the names of plants in your scrapbook.

## This day in Science History

### June 27, 1929

Colour television was publicly demonstrated for the first time, at the Bell Laboratories in New York. The first colour TVs were sold in 1954.

### August 17, 1896

George Carmack discovered gold in Bonanza Creek, Yukon and the Klondike Gold Rush was on. Dawson became a city overnight with the arrival of 30,000 people.

### September 29, 1962

Canada's first satellite was launched by NASA. Alouette 1 was used for television broadcasting and communications.

### October 26, 1898

Eugene Ducretet and Ernest Roger, made the first wireless telegraph connection. The transmission traveled a distance of four kilometres. The wireless telegraph was the grandparent of the radio.

### November 30, 1974

Anthropologist Donald Johanson discovered the most complete skeleton of a hominid – a prehistoric human-like species – in Ethiopia. The 40 year old female was nicknamed Lucy and had been buried for 3 million years.

## This day in Science History

### December 24, 1906

Canadian inventor Reginald Fessenden made the first radio broadcast, to ships at sea. He read, played his violin, and played a record on a phonograph.

### January 22, 1992

Canada's first female astronaut, Roberta Bondar, flew into space aboard the space Shuttle Discovery, to conduct experiments.

### February 6, 1996

Crayola Crayons – the company that invented crayons in 1903 – produced its 100 billionth crayon.

### March 6, 1876

Canadian, Alexander Graham Bell successfully transmitted the first words to another person using the telephone. What did Bell say?...“Come here Watson, I want you.”

### May 11, 1949

The first Polaroid Camera went on sale in New York City. Built to take and develop pictures all-in-one, it produced a “finished” picture in 60 seconds.

# Spellbound Spaghetti

Grades 2 to 6

## What you need:

- Water
- Large clear glass jar or vase
- Baking soda
- Vinegar
- Food colouring
- Large spoon
- Three strands of dried, uncooked spaghetti

## What to do:

- 1) Put 750ml of water in the glass jar or vase. Add a few drops of food colouring, if you wish.
- 2) Add 30ml of baking soda.
- 3) Break three strands of spaghetti into small pieces of various lengths and add them to the jar.
- 4) Stir in 80ml of vinegar and watch what happens. Does the spaghetti float or sink? When the spaghetti starts to slow down, add more vinegar.

## What's going on?

A chemical reaction between the baking soda and the vinegar produces carbon dioxide gas that forms bubbles on the spaghetti. The bubbles float the spaghetti to the top. At the top, the bubbles burst, the spaghetti sinks, and the process starts all over again.

## What else you can do:

Cook some pasta and observe if it expands when it is cooked. Pasta is a high-carbohydrate (starch) food. As it cooks, the molecules that make up the starch relax and unfold, forming new bonds and creating a network that traps water molecules. The result? The pasta doubles in size.

# Tiny Plants – Big Pop

Grades 4 to 6

## What you need:

- One package of yeast
- 250ml warm water
- Cork
- 30ml of sugar
- 2 litre plastic pop bottle
- Vaseline

## What to do:

- 1) Put some Vaseline on a cork that fits the opening of the pop bottle.
- 2) Measure some warm water from the tap and pour it into the pop bottle.
- 3) Add the yeast and sugar.
- 4) Stir gently.
- 5) Watch and listen.

## What's going on?

Yeast are tiny plants. They convert sugar and water into alcohol and carbon dioxide gas. It is the carbon dioxide that builds up inside the pop bottle until the pressure is enough to push out the cork with a pop. Be careful – keep the bottle pointed in a safe direction, away from living and breakable objects.

## This day in Science History

### May 31, 1859

Big Ben, the most famous clock in the world, began keeping time in London, England. Actually, Big Ben is the name of the bell inside the clock tower, not the clock.

### June 15, 1956

The Vancouver Aquarium opened its doors on this date. The largest aquarium in Canada, it has over 7,000 fish, 30,000 invertebrates, 125 snakes, frogs, turtles and newts, and 45 birds and mammals.

### April 30, 1932

John Cockcroft and Ernest Walton announced that they had split the atom.

### August 10, 1954

Work began on the St. Lawrence Seaway, a joint Canada – United States project to provide passage for ships between the Great Lakes and the Atlantic Ocean, avoiding the long, dangerous voyage around South America.

### November 16, 1966

The Leonid meteor shower – the greatest meteor shower on record – occurred at night. Up to 2,300 meteors per minute streaked across the Arizona sky.

## This day in Science History

### December 15, 1654

Three hundred years of weather reports. The oldest known weather station was established in Tuscany, Italy to record daily temperatures.

### October 3, 1922

Half a century before fax machines became widely used C.F. Jenkins sent a facsimile picture over telephone lines between government buildings in Washington, D.C.

### September 3, 1962

The Trans-Canada Highway – at 7,790 kilometres, the longest national highway in the world – was completed. It begins in St. John's, Newfoundland and ends in Victoria, British Columbia.

### April 5, 1815

The greatest volcanic eruption in modern history began. Tambora on the Indonesian Island of Sumbawa spewed out 148 - 176 cubic kilometres of rock and the volcano lost 1,250 metres off its top.

### May 3, 1836

John Whiting patented baking powder. When the powder gets moist, it releases carbon dioxide gas, causing baked goods to rise.

# Creating Your Own Paper

Grades 4 to 6

## What you need:

- Two fine nylon screens (20cm x 30cm) in wooden frames
- Plastic tub approximately 60cm x 50cm
- Good sponge
- Construction paper (any colour) and white paper
- Blender
- Cornstarch (60ml per tub)

## What to do:

- 1) Rip the paper into small pieces for the blender.
- 2) Add water to the blender (3/4 full), then add the paper.
- 3) Turn the blender on for approximately 40 seconds to make pulp.
- 4) Fill the tub with water (3/4 full).
- 5) Put the pulp from the blender in the tub.
- 6) Using the pulpy water in the tub, continue to make more pulp in the blender until the pulp solution is thick (approximately six to seven mixes).
- 7) Use one of the screens and slowly screen out the pulp.
- 8) Place the second screen over the pulp in the first screen, and sponge or towel it dry. The pulp will now be like paper.
- 9) Remove the paper and let it dry.

# H2O on the Go

Grades 4 to 8

## What you need:

- Aluminum foil pie plate
- Scissors
- Nut from a bolt (or another small weight)
- Water source (e.g. faucet or hose)
- Piece of string about 45cm long
- Eraser
- Tape
- Ruler
- Pencil

## What to do:

- 1) Cut the circular bottom of an aluminum foil pie plate. Make eight equally spaced cuts toward the centre of the foil circle. End each cut about 2cm from the centre.
- 2) Use a ruler to fold one edge of each section of the plate to make small ledges.
- 3) Punch a hole in the centre of the plate and push the pencil through it. The pencil should fit snugly in the hole; secure the pencil in place with tape.
- 4) Hold the wheel under a slow stream of water (e.g. garden hose or kitchen faucet) so that the water hits the blades. Let the ends of the pencil rest lightly between your thumbs and index fingers. The wheel should turn smoothly.
- 5) Increase and reduce the flow of water. What happens to the wheel?
- 6) Tie one end of a piece of string to the pencil and attach a weight to the other end. The water wheel should wind the string onto the pencil, lifting the weight.

## What's going on?

Water power is based on water at a higher level having more potential energy (stored energy) than at a lower level. When flowing from a high to a low level, water gives up some potential energy. This changes to kinetic energy (energy of motion) as the water falls. Moving water can turn a bladed wheel, transforming the kinetic into mechanical energy. In the past, mechanical energy from water wheels was used to grind grains and saw timber. Today, moving water is used primarily in generating electricity. Power plants are built at the foot of high dams. Powerful jets of water shoot through pipes from a reservoir. The water hits the blades of dozens of water wheels, which turn the electric generators.

## This day in Science History

### September 25, 1956

The first transatlantic telephone cable started operation. It carried 48 phone lines and connected Britain, Canada, and the United States.

### January 30, 1947

A blizzard raged in Regina, Saskatchewan for 10 days – the worst storm in Canadian history. A train was found buried in a snowdrift one kilometre long and eight metres deep.

### February 29, 1968

Discovery of the first pulsar was made by Dr. Jocelyn Bell of Cambridge, England. Pulsars are spinning space articles that emit rapidly pulsating radio signals.

### April 20, 1988

The world's largest termite mound was found at Hayes Creek in the Australian outback. The mound measured 6.4 metres high – that's taller than a giraffe!

### July 6, 1885

French doctor Louis Pasteur made the first vaccination for rabies. His vaccine saved the life of a nine year old boy, and many more people since.

## This day in Science History

### July 30, 1921

Canadian researchers Frederick Banting and Charles Best discovered insulin, the chemical that controls blood-sugar levels. In 1923, Banting and J. McLeod won the Nobel Prize for the insulin discovery.

### September 6, 1952

The Canadian Broadcasting Corporation aired its first television broadcast. The program originated from CBFT in Montreal, Quebec.

### November 16, 1896

Was the official opening of the Suez Canal through Egypt. For the first time, ships could sail between Europe and the Far East without having to make the long, dangerous trip around Africa.

### December 18, 1869

William F. Semple patented chewing gum. It was a mixture of rubber, sugar and flavouring.

### October 25, 1960

The first electric wristwatch was introduced. Before this, watches had to be wound up to keep them running.

# A Huff and a Puff

Grades 4 to 8

## What you need:

- One large plastic bag
- A 2-litre measuring jug full of water
- A marker pen to write on the bag
- A plastic funnel

## What to do:

- 1) Grasp the top of the bag, as if you were going to blow it up and burst it.
- 2) Make the mouth opening wide enough to breathe into it with your mouth open.
- 3) Squeeze all of the air out of the bag.
- 4) Breathe twice normally.
- 5) On the third breath, breathe in as much air as you can.
- 6) Put the plastic bag to your open mouth.
- 7) Pinch your nose and breathe out hard all at once into the bag.
- 8) Bend forward and squeeze every last drop of air out of your lungs.
- 9) Close the bag tightly at the top.
- 10) Slide your hand down the neck of the bag, pushing the air to the foot, until the bag has completely expanded.
- 11) Draw a line on your bag where you're holding it, in case you lose your grip.
- 12) Hold the bag firmly and put the funnel in the neck of the bag (you can let the air escape).
- 13) Carefully pour the water from the measuring jug into the bag until it's as full of water as it was air.
- 14) Make a note of how much water you poured into the bag. This will tell you how much air your lungs can hold – your lung capacity.

## What else you can do:

Have your friends try this, and then compare your lung capacity with theirs.

# Water Mix Up

Grades 7 to 9

## What you need:

- Six or more glasses
- Hot water
- Salt
- Corn syrup
- Cooking oil
- Spoon
- Cold water
- Four different colours of food colouring (blue, yellow, red, green)

## What to do:

- 1) Take four glasses. Put cold salt water in one, cold fresh water in one, hot salt water in one and hot fresh water in one.
- 2) Add drops of different food colouring to each glass and stir. The food colouring makes it easier to tell the liquids apart; it does not affect their density.
- 3) Take a clean glass and carefully pour in a layer of each liquid. Try cold salt water on the bottom; cold fresh water next; hot salt water next; and finally hot fresh water. Be careful not to mix the layers as you pour. Add a new layer by tilting the glass slightly and running a new liquid along the side of the glass.
- 4) Take another clean glass and try pouring the layers in a different order. What happens this time?
- 5) Experiment with different temperatures of water and different amounts of salt. Then try layers of corn syrup and oil and water.

## What's going on?

The heavier the liquid, the greater its density. A liquid less dense than water will float on water; a liquid that is more dense will sink. If you compare hot and cold fresh water to hot and cold saltwater, the order of the density is: cold salt water (most dense) – cold fresh water – hot salt water – hot fresh water (least dense).

## What else you can do:

Put different food colours (avoid yellow) in a glass of water and a glass of corn syrup. Make a liquid layer creation with oil on the top, water in the middle and corn syrup on the bottom. Try adding the three liquids in different orders. Does changing the order, change the final positions of the liquids in the glass? Did you discover that oil is less dense than water but corn syrup is more dense?

## This day in Science History

### November 19, 1936

A tape recorder was used publicly for the first time. A concert by the London Philharmonic Orchestra was taped at the BASG factory in Ludwigshafen, Germany.

### March 13, 1781

English astronomer William Herschel discovered Uranus, the seventh planet in our solar system. Other astronomers thought the planet was a star but Herschel noticed it did not twinkle like a star.

### May 29, 1919

Charles Strite of Stillwater, Minnesota, was fed up with burned toast, so he invented the pop-up toaster. The first pop-up toaster went on sale in 1926 and was called the Toastmaster.

### July 8, 1892

Fingerprints were first used successfully in a criminal prosecution in Brazil. The fingerprints at the scene of the crime matched those of the main suspect and she confessed to the crime.

### August 21, 1993

The people of Kwajalein of the Marshall Islands in the South Pacific missed this day. They went to bed on August 20 but woke up on August 22, when the International Date Line was moved from west to east of their island.

## This day in Science History

### August 16, 1858

The first overseas telegraphic message was sent from North America to Europe. The message was relayed from Trinity Bay, Newfoundland to Valentia, Ireland and was sent along the first underwater telegraph cable.

### October 5, 1880

The first ball-point pen was patented by Alonzo Cross. The pen had its own ink supply and a retractable tip. The first commercial ball-point was not for sale until 1948.

### December 12, 1900

Guglielmo Marconi and J.A. Fleming made the first wireless telegraph connection across the Atlantic Ocean, from England to Newfoundland. They used a kite to lift the antenna as high as possible.

### January 26, 1905

Captain Wells discovered the world's largest diamond at the Premier Mines in Pretoria, South Africa. It weighed over 568 grams.

### April 21, 1994

Astronomer Alexander Wolzscan discovered two planets outside of our solar system. These two planets orbit around a pulsar located 1,200 light years from Earth.

# Composting Apples and Oranges

Any Age

## What you need:

- Four slices of apple or pieces of orange peel
- A clear bag
- Transparent tape
- Two pickle jars
- Soil
- A large spoon

## What to do:

- 1) Place two identical slices of apple or orange peel in a clear plastic bag. Tape the bag shut to ensure it remains sealed.
- 2) Fill the jars with soil and label them 1 and 2. Use the spoon to dig a hole in jar 1, and bury the wrapped fruit.
- 3) Dig a hole in jar 2 and bury two identical unwrapped pieces of fruit or peel.
- 4) Moisten the soil in both jars with water.
- 5) Water the jars every other day and loosen the soil gently with the spoon. Try not to break the unwrapped fruit or puncture the bag of wrapped fruit.
- 6) Write down what you think will happen to the fruit in the two jars after one week and after two weeks.
- 7) At the end of the first week, look in the jars and write down what you see.
- 8) Carefully scoop out the fruit, leaving the wrapped fruit in the plastic. What changes do you see? Write them down.
- 9) After you've noted the changes, bury the fruit again.
- 10) Leave the jars for another week, bury the fruit again.
- 11) Leave the jars for another week, then write down what you see at the end of two weeks.

## What's going on?

Compost forms when organic matter decays or rots. The decay or decomposition of organic matter is brought naturally by decomposers like bacteria, fungi, earthworms and snails, which require oxygen to live. The fruit in the plastic bag simulates the way in which much of our garbage is disposed of – in plastic bags taken to landfill. Plastic bags slow or stop the breakdown process because they prevent oxygen and some decomposers from reaching the organic matter.

# Marshmallow House Challenge

Any Age

Your challenge is to design and build a structure which is strong enough to support a book using only the materials provided.

## What you need:

- Toothpicks
- Two books
- Mini-marshmallows

## What to do:

- 1) Build as big a free-standing structure as you can with 20 toothpicks and 10 marshmallows.
- 2) Try to have your structure support one book. Then try two books.
- 3) Try to build another structure with 30 toothpicks and 10 marshmallows (re-use the materials from your first structure). How many books will your second structure support?

## What's going on?

This challenge will give you a chance to try out different base shapes for a structure, as well as use some rather unique building materials. Think about which shapes are strong and how these shapes can be combined to make a strong structure. Think about the shapes of bridges, furniture, houses and other buildings, and think up some new shapes to try too!

## This day in Science History

**May 9, 1873**

English archeologist Howard Carter was born. In 1924, Carter found the magnificent underground tomb of Egyptian Pharaoh Tutankhamun in the Valley of the Kings, hidden for thousands of years.

**June 30, 1908**

A meteorite exploded in the Tugunaska forest in Siberia and leveled trees for 1,925 square kilometres. Dust from the explosion caused nights to be abnormally bright for two months.

**July 26, 1971**

The Lunar Rover, a collapsible electric car, became the first to be driven on the moon. Powered by a 36-volt battery, its top speed was 14 kilometres per hour.

**August 3, 1876**

The first telephone call was made from one building to another. From Mount Pleasant, Ontario, Alexander Graham Bell called his uncle, David Bell in Brantford, Ontario.

**September 28, 1869**

French paper manufacturer, Aristide Berges became the first person to use the mechanical energy of a waterfall to generate electricity. This became known as hydroelectric power.

## This day in Science History

**September 27, 1905**

German scientist Albert Einstein published a paper that introduced the relationship between energy and mass, expressed in his formula  $E = mc^2$ . This stands for energy = mass x speed of light squared.

**October 8, 1937**

Ruth Wakerfield invented the chocolate chip cookie. She put chunks of chocolate into cookie dough, thinking that heat would melt the chips. It didn't – and a new cookie was born.

**November 1, 1940**

Boys exploring a cave in Lascaux, France found beautiful prehistoric paintings of bison and other animals. The paintings dated from 17,000 years ago. The cave was closed in 1962 because moisture from people's breath was ruining the paintings.

**January 8, 1610**

Italian Astronomer Galileo discovered that Jupiter had moons. Before this, people thought that only the earth could have a moon. Galileo helped prove that the sun, not the Earth, was the centre of the solar system.

**March 30, 1858**

American inventor Henry Lipton patented a pencil with an eraser attached to one end.

# Making a Sound Map

Grades 6 to 12

## What you need:

- A large piece of paper or card
- A pencil crayon

## What to do:

- 1) Choose a comfortable place to sit in your schoolyard. (This activity requires that you sit quietly for a while and listen to all the sounds around you).
- 2) Take a piece of paper and draw an X in the middle of it. This shows where you are sitting.
- 3) Close your eyes and listen.
- 4) When you hear a sound, open your eyes and make a mark on the paper that represents the sound. For example, wavy lines might mean the wind; a jagged series of lines might mean a bird's call.
- 5) Make sure the position of the mark on the paper gives a true idea of the direction and distance of the sound.

## What's going on?

When scientists study noise levels, they might make sound maps. You have just made a sound map of your schoolyard.

## What else can you do:

Make a sound map at different times of the day. Compare the maps. What differences can you hear? How many different sounds did you hear? Were there any sounds you had never heard before? Were there any sounds you could not identify?

## This day in Science History

### March 31, 1896

American inventor, Whitcomb Judson patented the first zipper. Unfortunately it did not work very well and seventeen years later – April 29, 1913 – the first zipper that worked was introduced.

### May 24, 1988

Snow fell on the Syrian Desert in Northern Africa for the first time in 50 years.

### July 21, 1983

The coldest temperature on Earth was recorded at Vostock, Antarctica when the mercury dropped to – 89.2 degrees Celsius, close to the temperature of dry ice.

### August 21, 1981

IBM released its first home computer, the IBM PC. It came equipped with 64 kilobytes of RAM memory and was powered by an Intel 8080. By contrast, today's computers usually have at least 128 times more memory (8 megabytes) and are at least a hundred times faster.

### May 6, 1989

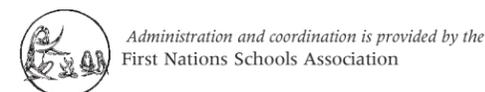
Science World officially opened in Vancouver and every year over 500,000 kids visit to learn about science and technology.



## Seventh Generation Club Mission Statement

To create a club where First Nations youth can envision their future by recognizing their own energy, the culture of their people, and the teamwork needed to succeed by giving them opportunities to make healthy life choices, participate in their community, and to meet the challenges of life.

The Seventh Generation Club would like to thank the following partners:



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SEVENTH GENERATION CLUB