Seventh
Generation Club

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SEVENTH GENERATION CLUB

BOOK

8

SEVENTH GENERATION SCIENCE EXPERIMENTS

SEVENTH GENERATION CLUB

The Seventh Generation Club thanks Mad Science for their contribution of the fifteen experiments found in the Seventh Generation Club Science Experiments Book 8.

Mad Science has a mission to spark the imagination and curiosity of children everywhere by providing them with fun, interactive and educational activities that instill a clear understanding of what science is all about and how it affects the world around them.

Mad Science offers a variety of programs available in British Columbia including school assemblies with engaging science shows, age appropriate school workshops, and science camps. All Mad Science programs meet British Columbia Integrated Resource Package (IRP) requirements, include pre- and post-activities, reliable instructions, professional lesson plans, equipment, and the programs include language arts and math extension activities.

For more information on how to host a Mad Science program at your school or event, please contact:

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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:

Indian and Northern Affairs Canada
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Administration and coordination is provided by the
First Nations Schools Association

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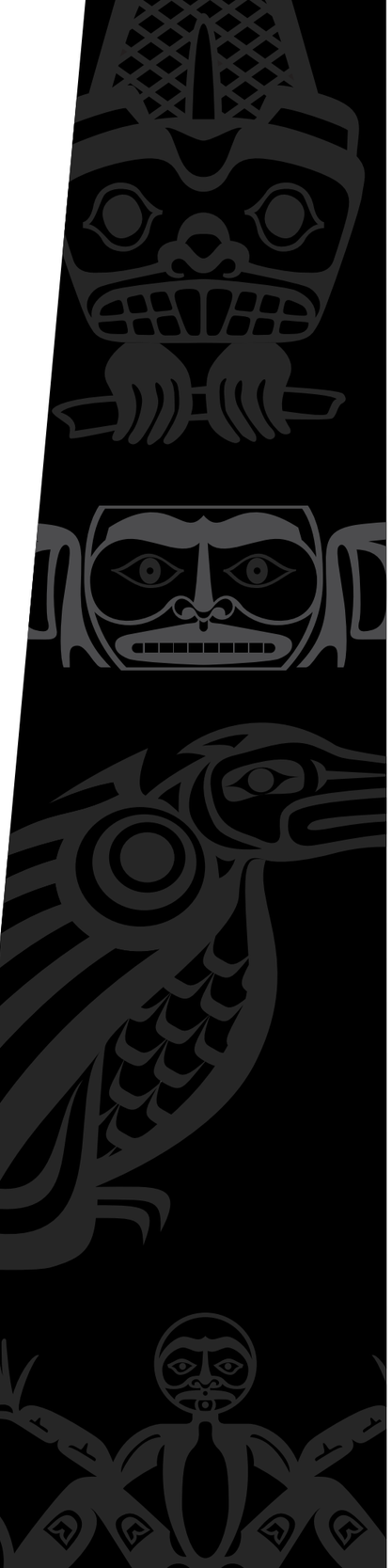

Insect Inspiration

What you need:

2 Fat flexible straws or tubes that are the length and width of straws
A nylon stocking or cheese cloth
A small, clear jar with lid
Hammer
Nail
Plasticine or blue-tack
Scissors
Tape

What you do:

Ask an adult to help use the nail and hammer to punch 2 holes in the lid. The holes should be large enough for the straws to fit through.

Cut 6cm (2 3/8 inches) off the long end of one straw.

Stick the short ends of the straws into the lid, and seal them with plasticine.

Cut a 2.5cm (1 inch) square piece of the nylon stocking and tape it onto the end of the shorter piece. This is your mouthpiece.

Screw the lid firmly onto the jar.

Find an insect that would fit inside the straw. Hold the long straw over it and suck gently through the other straw. The insect will be drawn into the jar.

When you have several insects, study them with a magnifying glass. Make detailed observations of them. How many legs do they have? How are their bodies divided? Can you see any hairs? Look at their antennae, mouthparts, and colour patterns.

When you are finished, return all of the insects to where you found them.

What's going on?

A pooter is a device scientists use to pick up small objects, like insects, without hurting them. It is a miniature vacuum cleaner that uses your lungs as the vacuum. When you suck through the short end of the straw, you are creating a vacuum inside the jar. The air around the opening of the long straw is drawn into this vacuum and any insect near the opening will be drawn in as well.

It's a Natural Fact

Scientists who study insects are called entomologists.

All insects must have the following 4 things: three body parts – a head, thorax, and abdomen, six jointed legs, antennae, and an exoskeleton (outside skeleton).

Melting Stone

What you need:

2 Pieces of regular chalk (not 'dustless' synthetic chalk)
2 Drinking glasses
Vinegar
Water
Watch

What you do:

Fill one glass with vinegar and the other glass with water.

Place one piece of chalk into each glass.

Watch for changes in the two glasses.

After 5 minutes, remove the chalk from the glasses and compare them.

How did each piece of chalk change?

What's going on?

You performed a chemical reaction! In a chemical reaction, two chemicals react together to form a new chemical. The new chemical can be a gas, a solid, or a liquid. You may also see a colour or temperature change. The chemicals you used in this reaction were acid and calcium carbonate. The vinegar is an acid and chalk is made from calcium carbonate. The chalk placed in water stayed the same. The chalk placed in vinegar formed bubbles of carbon dioxide gas. The chalk removed from the vinegar feels soft and gooey.

This chemical reaction also happens when acid rain reacts with limestone structures. Limestone is found in many building and statues. Limestone has calcium carbonate and melts quickly when acid rain falls on it. Acid rain is created when sulphur and nitrogen mix with water. Volcano eruptions and lightning can cause acid rain to form. Burning coal and crude oil can also create acid rain. Factories and power plants are the biggest producers of acid rain because they burn a lot of coal and crude oil as fuel. Acid rain can damage soil, water, building materials, plants, animals, and humans. Try this experiment with an eggshell and see what happens!

It's a Natural Fact

There are approximately 10 quintillion (10,000,000,000,000,000,000) insects alive.

There are 1,017,018 species of insects in the world! Some experts think that there might be as many as 10 million species out there. You could spend your whole life looking at different kinds of insects, but you'll never be able to see them all.

Keeping It Cool

What you need:

Large earthenware flower pot
Lid to cover large flower pot (a dinner plate will work)
Medium earthenware flower pot that will fit inside large one
Small bag of sand
2 Thermometers
Water
Cardboard

What you do:

If there is a hole in the bottom of the large flowerpot, cover it with the cardboard.

Cover the bottom of the large flowerpot with a layer of sand 1cm thick. Add water to the sand until it feels damp.

Place the medium flowerpot inside the larger pot. Fill in the space between the two pots with sand.

Add water to the sand until it feels damp.

Place one thermometer inside the medium pot and cover the pots with the lid.

After two minutes, remove the lid and record the temperature inside the pot.

Place the thermometer back in the pot, replace the lid and place the pots in a dry, sunny place. Place the second thermometer beside the pots and record the temperature outside the pot.

Record the temperature inside and outside the pots after 10, 20, and 30 minutes.

Record the temperature every day for several days, and make notes about the weather conditions and the dampness of the sand.

What's going on?

You just built a refrigerator! The pots are made of earthenware, which means they are made of porous clay. Air can move through the walls of the pots into the layer of sand between the pots. This allows the water in the sand to evaporate. Water uses the heat in its surroundings to evaporate. This removes heat from the inside of the pot which keeps it cool. This is also how you cool off when you sweat! The system of assembling pots and damp sand to keep things cool is also used by many desert dwellers in Africa who have no access to electricity.

It's a Natural Fact

Worms are one of nature's ultimate recyclers. Their castings, waste material, provide up to 10 times the amount of nutrients that is found in soil for plants!

Wormy Vermi Technology

What you need:

Water
A long stick for stirring
Hammer
Red worms and sow bugs
Nail
Garden soil
Paper, newspaper, shredded leaves, straw, peat moss or sawdust
A large 4L (1 gal) plastic or wooden bin with a lid, at least 20cm (8 ins) tall
Food scraps such as vegetable and fruit peelings, coffee grounds, and tea bags

What you do:

Ask an adult to use the nail and hammer to make some drain holes all around the side of the bin, near the bottom.

Create moist bedding by mixing garden soil, thin scraps of paper, newspaper, shredded leaves, grass clippings, peat moss or sawdust with water. The bedding should be very moist like a sponge.

Fill the bin with the bedding and add the red worms and sow bugs.

Place the bin in a convenient, sunny spot outside that is not too close to a wall.

Dig a hole in the bedding, place chopped up food scraps in the hole and cover it up with bedding. Pick a new spot each time you add food. Never add animal products such as meat, fish, bones, or dairy products as they attract rodents and raccoons.

After a month or so, spread a sheet of plastic under a bright light or in the sun. Dump the contents of the bin into several piles on the sheet. The worms will crawl away from the light into the center of each pile. Brush the worm compost (brown doughnut-shaped castings) to the outside of each pile.

Collect the worm castings and use them as fertilizer for your plants and garden.

Change the bedding every three to four months to keep the worms healthy.

Cover the bin with plastic or a tarp during freezing weather.

What's going on?

Vermi technology is the science of using worms to create compost. Worms are considered decomposers because they turn organic material including food waste, leaves and grass, shredded paper or cardboard waste, and chopped straw or hay into plant fertilizer in the form of worm castings. Red worms are extremely good at eating, digesting, and excreting almost any decaying organic matter as worm castings. Most of the castings are made in the warm core of the bin. The more worms you have in the bin, the more compost you will get out of it! Composting recycles tons of unnecessary garbage and helps gardens bloom. Worms are not the only decomposers around. Bacteria, fungi and sow bugs are examples of other decomposers in the soil that break down organic matter and turn it into food for new plants. The type of foods we eat—and where we buy them from—has a big effect on nature. Eat more vegetables and help our environment!

It's a Natural Fact

Raising and using worms is known as vermiCulture.

Worms can consume food in the amount of their own body weight every day, and they can double their numbers every 2-3 months.

Worms can live for a long time—15 years or more!

Plant Perspiration

What you need:

2 Healthy broad leaves with long stems
2 Wide mouth jars or glasses
2 Clear plastic cups, larger than the leaves
2 Pieces of cardboard to cover tops of jars
2 Small rocks
Food colouring
Petroleum jelly
Water
2 Cotton balls
Scissors

What you do:

Hold the stems underwater and trim the stems diagonally with the scissors.

Fill both jars with water, and add 10 drops of food colouring in each jar.

Poke a small hole in the middle of each piece of cardboard. The hole should be just large enough to insert the stem of one leaf.

Cover the underside of one leaf with petroleum jelly.

Insert the stems of the two leaves through each hole. Seal the hole with a small amount of petroleum jelly to prevent evaporation through the hole.

Place the cardboard on top of each jar so that the leaf stems are immersed in water.

Place plastic cups over each leaf. Both leaves must be completely contained inside each cup.

Put a small weight on top of each cup and place the jars on a sunny windowsill.

Wait one hour and look inside the plastic cups.

Which cup contains moisture? Use the cotton balls to wipe the moisture in the cup. What colour is the moisture?

What's Going On?

You were controlling plant transpiration! The moisture in the cup is from transpiration. Transpiration happens when plants give off water vapour through tiny pores in their leaves, called stomata. This is the plant's way of sweating! Plants take in water from soil through their roots. The sun's heat evaporates water from the leaves. As water evaporates from the leaves, more water is pulled from the roots up through the stems and into the leaves again. In our experiment, one leaf absorbed the coloured water and transpired the water from its stomata. The leaf that was coated in petroleum jelly could not transpire because its stomata were blocked. The sun evaporated the water into vapour. Water in a gas form is held in the air until it changes back to water. When it's sticky outside in the summer, you're feeling the water held in the air. This water vapour evaporates into the air and is stored in the atmosphere. The water can change into fine droplets by "condensing" in the air, which makes clouds. When the droplets get big enough, they are pulled to the earth by gravity through precipitation, which is rain, sleet, snow, hail, dew, or frost.

It's a Natural Fact

The plant Mimosa pudica is called the Sensitive Plant because its leaves fold up when touched! The sensitive plant uses turgor pressure to open and close its leaves.

Thermal Eagles

What you need:

1 White paper plate
Scissors
Glue
Thread
Paper
Coloured pencils
Heat source such as a light bulb

What you do:

Cut the ribbed edge off the paper plate.

Start from the middle of the plate and draw a spiral about 1cm (1/2 inch) wide. Cut along this line.

Copy the picture of the eagle four times onto a sheet of paper and colour them in.

Cut out these four pictures and glue the eagles onto the spiral so that they all face the same direction. Bend the middle of their wings slightly upward.

Poke a small hole in the center of the spiral. Tie a thread through this hole, and hang up your mobile over a heat source.

Caution: Do not allow your mobile to touch the heat source. It is made of paper and will burn easily.

What's Going On?

You're using a thermal! The paper spiral turns as the warm current of air from your heat source rises. The current of air is strong enough to push against the paper, making it move. In nature, the sun warms up parts of the surface of the earth faster than others creating rising, warm currents of air. The air above the warm part of the earth becomes warm, while the air above the cooler part of the earth remains cool. The warm air rises, and the cool air sinks. This rising warm air is called a thermal. Birds like eagles and vultures spread their wings and glide upward on thermals.

It's a Natural Fact

When an eagle comes across a thermal, it can use this rising hot air to soar in the air very quickly. By circling over the middle of a rising thermal, a bald eagle can just spread its wings and the warm air will lift it to heights up to 7 km (3 miles) above the surface of the earth!

Paper Beads

What you need:

Bright coloured paper from magazines, gift-wrap or catalogues
Button
White glue or glue stick
Scissors
String, yarn, or fishing line

What you do:

Cut strips of paper 2.5cm (1 inch) wide and 8cm (4 inches) long to make beads. Cut as many strips as you want beads.

Spread glue over half of the strip.

Roll up the strip at the unglued end so that a hole is left in the middle. This hole should be big enough to fit your string or fishing line. Continue rolling until the strip forms a bead

Once your beaded string is longer than 36cm (14 inches) cut 3 more strips of paper 2.5cm (1 inch) wide and 20cm (8 inches) long and roll them to make large beads.

Tie the end of the string to the button.

String the three large beads together at the other end and loop them to form a triangle shape. Tie the string to keep this shape.

Slip the button through this triangle to wear your beaded string as a necklace, or offer it to someone special!

What's going on?

You just performed an act of recycling! Old magazines and papers can get a second life when we are creative. The act of gluing strips of paper into rolled beads can produce a beautiful work of art instead of adding more waste to landfills. Use your creativity to recycle!

It's a Natural Fact

You can cut down on air pollution by using devices that do not require electricity or fuel. Cut the grass in your yard by using a push lawn mower.

Every tonne of paper that is recycled saves 17 trees.

Edible Aquifer

What you need:

Blue or red food colouring
Vanilla ice cream
Clear pop
Different size chocolate chips
Cake decoration sprinkles
Drinking straw
Spoon
Clear cup

What you do:

Fill one-third of a small, clear cup with chocolate chips.

Pour clear soda over the chocolate chips. See how the soda fills in the spaces around the chocolate chips.

Spread a layer of ice cream over the chips and soda. Note how the soda cannot move through the ice cream.

Add another layer of chocolate chips.

Add a layer of decorating sprinkles.

Make coloured soda by mixing it with food colouring. Pour the coloured soda on top of the layers and watch where it goes.

Put your straw into the bottom of the cup, into the chocolate chip layer.

Slowly suck on the straw and watch as the level of clear soda goes down. Watch the movement of the coloured soda.

Add more soda, and watch as the level of clear soda moves up again.

Eat your aquifer before it melts!

What's going on?

You created an aquifer! An aquifer is a natural source for groundwater. Aquifers are made up of layers of soil, sand, and rocks. Groundwater is stored in and moves slowly through these layers. A lot of communities rely on aquifers for their water supply. In your edible aquifer, the chocolate chips are like the gravel, sand, and rock layer that groundwater is stored in. The clear soda is like groundwater. In an aquifer, a layer of clay or dense rock confines the water in the gravel, sand, and rock layer. In your aquifer, this is the ice cream. Another layer of gravel and sand, like more chocolate chips, covers the confining layer. The top layer is soil and is very porous. This is like the cake decorations. Adding more clear soda to your aquifer is similar to what happens when it rains. The aquifer fills up. Adding the food colouring is similar to what happens when pollutants are added to the ground. The pollution eventually moves into the aquifer and the wells become polluted. The straw is like a well that is drilled into the aquifer. By sucking on the straw, you pump the well and the level of water in the aquifer goes down.

It's a Natural Fact

Aquifers act as a natural filter to help remove natural impurities from the water. This makes groundwater some of the cleanest water on the planet!

Water that enters an aquifer stays there for an average of 1400 years!

Heat Wave in a Jar

What you need:

2 Large glass jars that are the same size
1 Jar lid
2 Pieces of dark paper or cloth
2 Thermometers
Notebook
Pencil
Oven mitts

What you do:

Put a piece of dark paper inside each jar.

Place a thermometer in each jar, on top of the dark paper or cloth.

Lay the jars outdoors in the sun.

Put the lid on one of the jars. Turn the jars so that their tops face away from the sun.

Record the temperatures in both jars in your notebook.

Record the temperature every two minutes for twenty minutes or until one thermometer reaches the top of its scale.

Use the oven mitts to move the jars to the shade and remove the lid.

Compare the temperatures of the two jars. Was there a big difference between them?

What's going on?

You made a model of the greenhouse effect! Sunlight heats up objects that it shines on. The interior of the container heats up quickly if the object is inside a closed container because the heat cannot escape. The jar with the lid traps heat from the sun's rays. The temperature within this jar rose much more quickly than the jar without a lid. Greenhouses use this science to keep the air warm for their plants. There is a layer of gases building up around the earth called greenhouse gases. They create the greenhouse effect on the earth. When sunlight strikes the earth's surface, some of it is reflected back toward space as infrared radiation (heat). The greenhouse gases absorb this infrared radiation and trap the heat in earth's atmosphere. Scientists say the greenhouse effect is warming up the earth. This can lead to changes in the weather and the melting of the polar ice. Scientists are asking the world to reduce the production of greenhouse gases such as carbon dioxide. Some suggestions for this have been to plant more trees to filter the air and to modify cars so that they reduce their carbon dioxide emissions.

It's a Natural Fact

Earth Day started on April 22, 1970. This is the day to promote eCology, enCourage respect for life on earth, and highlight solutions for reduCing pollution of the soil, air, and water. Earth Day is now observed in 140 nations worldwide!

Fly Farming

What you need:

Slice of apple
Big glass jar or plastic container
Big plastic funnel
Paper towel
Piece of scrap paper
Handkerchief or other piece of cotton cloth
Rubber band
Magnifying glass (optional)

What you do:

Put your slice of apple in the jar and set the funnel in the opening of the jar.

Set your experiment outside and leave it alone for a few hours.

When you have about eight fruit flies in your jar, remove the funnel, drop in the scrap of paper, cover the top of the jar with the handkerchief, and secure it with the rubber band.

Look carefully at the flies with a magnifying glass.

Leave the jar on a sunny shelf for three weeks and watch for tiny worms. If you see worms, you've got baby flies! Look at the adult flies and see if you can tell the males from the females. Hint: Male fruit flies are smaller than females, and have black tips at the end of their bodies.

When you have finished, release the flies outside.

What's going on?

You just started a fruit fly colony! Fruit flies are attracted to the slice of apple and will enter your jar. If you have male and female fruit flies in your jar, you'll see tiny worms crawling around the apple in a few days. Baby fruit flies look like worms. These worms are called larvae. When the larvae have finished growing, they turn into pupa. The paper is in the jar for the larvae to crawl onto before they turn into pupa. Fruit flies hatch, grow, and are ready to reproduce within two and a half weeks!

It's a Natural Fact

A female fruit fly, onCe fertilized, may lay 30 to 50 eggs per day throughout her lifetime.

A mosquito's wings flap about 300 times per seCond; a honeybee's wings flap about 250 times per seCond; a housefly's wings flap about 190 times per seCond

Heart Song

What you need:

Plastic funnel
Plastic or rubber tubing
Tape

What you do:

Fit one end of the tube onto the funnel spout. Tape them together.

Put the funnel over your heart and hold the other end of the tube to your ear. Don't push the tube into your ear.

Listen for a heartbeat.

Run on the spot for a few minutes, and then listen for the sound again.

What's going on?

You created a stethoscope! Stethoscopes are used to hear the heartbeat. The funnel catches the sound, and the tube brings it to your ear. You will hear the sound of your heart better if you place your funnel a little to the left of the middle of your chest. This is where your heart is closest to the skin. The heart is about the size of your fist. It is made of muscle and it acts like a pump. It pumps blood 24 hours a day, everyday! There are valves in the heart that keep the blood moving in your body. The two sets of valves open and close when the heart squeezes, making a noise every time. This is your heartbeat. When your heart beats, it pumps blood to all the different parts of your body. The blood brings fresh oxygen to your muscles, which they need for energy. When your muscles are working hard, they need more oxygen for energy. Your heart speeds up so it can pump more blood. When your body is relaxing, your muscles need less oxygen for energy so your heart doesn't need to pump as quickly. Try different activities to speed up or slow down your heartbeat!

It's a Natural Fact

Your heart beats about 100,000 times in one day and about 35 million times in a year. The human heart will beat more than 2.5 billion times during an average lifetime.

Your heart takes less than 60 seconds to pump blood to every cell in your body.

Paper Spill

What you need:

3 Plastic Cups
Clear cooking oil
Food colouring
Water
Fork
Tablespoon
Teaspoon
White construction paper
Flat baking pan
Clothespins and clothesline

What you do:

Add one tablespoon of cooking oil and one teaspoon of food colouring into each cup.

Beat with the fork until the food colouring is well mixed. This will take about 3 minutes per cup.

Fill the baking pan with water until it is just a few millimetres deep.

Pour some of the mixture onto different areas of the water in the pan. What happens to the oil?

Lay a piece of the construction paper on top of the water. Wait thirty seconds, and then carefully lift it off.

Hang up the wet paper with a clothespin, and let it dry for a few hours.

What's going on?

You just created a productive oil spill! Oil floats on water and spreads quickly to cover a large area. This is why the colouring and oil mixture spreads over the water in your pan. The colouring sticks to the construction paper and leaves a swirl of colour. In nature, oil spills are bad for the environment. Petroleum from oil spills spread quickly. Birds, sea life, and seashore animals that contact the oil get coated with it. This removes their natural waterproof layer and can make them helpless to the sea and cold weather. It is very difficult to clean up an oil spill!

It's a Natural Fact

Approximately 4.5 million metric tonnes of oil produced in the world each year ends up in the ocean.

One litre of oil can contaminate up to 2 million litres of water.

Blooming Paper

What you need:

Newspaper
Pencil
Drawing compass
Ruler
Scissors
Bowl or pie plate
Water

What you do:

Ask an adult to help you use the drawing compass to draw a 15cm (6 inch) diameter circle on the newspaper.

Draw three lines to divide the circle into six equal parts.

Use the lines as a guide to draw a flower with petals inside the circle.

Cut out the paper flower.

Fold each petal in half, towards the center of the flower and crease it so that it lays flat. The petals will overlap.

Fill the bowl or pie plate with water.

Place the folded paper flower, petal side up, on top of the water in the bowl.

What happens to the flower after a few minutes?

What's going on?

You're experimenting with turgor pressure! Turgor pressure is the pressure of water inside a plant cell. Plant cells that are full of water have a high turgor pressure and are stiff. When a plant does not have enough water, the turgor pressure is low and the stem droops. Water moves through a plant cell by capillary action. Capillary action happens in very narrow tubes or tube-like structures that are found along the length of the plant. Newspaper is made of fibres of plant cells. The fibres soak up water by capillary action and straighten out by turgor pressure. In your paper flower, this straightens the petals and your flower blooms. Morning glories are a type of flower that open and close its petals because of changes in the turgor pressure inside their cells. Turgor movements of water can occur as quickly as 1 to 2 seconds or as slowly as 30 minutes.

It's a Natural Fact

Bunchberry uses quick changes in turgor pressure to launch pollen explosively from their flowers. The pollen is thrown more than ten times the height of the flower and is carried away by the wind. .

The World In Your Pocket

What you need:

Raw egg
Markers

What you do:

Decorate the egg with markers.

Carry the egg with you all day and make sure it doesn't break.

You can't put the egg in any sort of protective packaging. Do all the things you would normally do. Take the egg everywhere you go. You only get one egg. If the egg cracks, there are no second chances.

How do you feel at the end of the day? Did the egg survive? How did you change your activities to protect the egg? Is it a big responsibility to care for an egg? How difficult is it?

What's going on?

You're one step closer to taking care of your world! No other living creature is able to influence and change the environment like humans can. That means that humans have a big responsibility in the world. The world is like an egg. The world houses life, just as an egg can hold a chick. The world sustains life, just as we can get nourishment from an egg. The world is strong, just as an egg's shell is tough enough to protect a developing chick. But the world is also fragile, just as a forceful blow will crack an egg's shell and cause its contents to spill out. The world is a human responsibility, just as your caring for an egg for a day is a responsibility. What sorts of things can you do to take care of the earth?

It's a Natural Fact

It is 98% more energy efficient to recycle an aluminium can than to make a new one from scratch!

Each gallon of fuel releases 20 pounds of carbon dioxide into the air.