



December 2009 – Winter

What does that word make you think of? Snow and ice? Cold weather? Even if you don't get to experience those things during winter where you live, you can do the experiments in this issue to find out more about them and why we have seasons.

Winter Science Projects

Make a Human Sundial

Are days really shorter during winter? Do this experiment to find out! Using sidewalk chalk you can draw a big circle on the ground and use your own shadow to mark different hours of the day.

What You Will Need:

- A large space outside, like a driveway or playground
- Sidewalk chalk (or spray bottle and food coloring)
- [Meter stick](#) or yardstick
- [Compass](#)
- An adult helper

What To Do:

1. Use the compass to find which direction is north (N). Have an adult help you line up the meter stick on the ground so that one end points the same way as the arrow on the compass.
2. While your helper holds the meter stick, trace a line with chalk from one end to the other. Write "N" at the top of the line that points north like the arrow on the compass. If there is snow on the ground, you may want to use a spray bottle to draw a line instead. Fill it up with water then add a few drops of food coloring. Squirt the colored water onto the snow to make a line.
3. Turn the meter stick the other way, so it crosses through the middle of the first line you made. While your helper holds it still, draw another line next to the meter stick.
4. Draw a circle around the giant "X" you just made.
5. When the sun is out during the middle of the day, stand in the middle of the circle, at the point where the two lines cross.
6. Notice how long (or short) your shadow is, and where it is at in the circle, when you are facing north.
7. Have a helper trace your shadow with chalk, and write the date, and time of day.

8. The next day, go out at the same time of the day. Stand in the middle, face north, and have your helper trace your shadow again.
9. Repeat step 8 as many times as you like, being sure to write the date for each shadow being traced.

What's Happening?

Did the length of your shadow change between days? December 21st is the shortest day of the year. The sun is the lowest in the sky that it will be all year long, so it doesn't take as long for it to rise from the east and set in the west, making the amount of light we get during the day shorter. If you stood in your sun dial and traced your shadow at noon each day, you probably noticed that your shadow was a little bit shorter each day. That's because after December 21st, the sun will be just a little bit higher in the sky each day, so it will be closer to straight over your head at noon.

Nature Walk - Animals in Winter

What do animals do differently during the winter than during warmer times? Take a walk and watch some animals to find out how they live during the winter.

With an older sibling or an adult, take a walk around your neighborhood. Start by walking around your house and yard. If there is snow on the ground, look around trees, flower beds, and fences for tracks that animals may have left. If there isn't any snow, look for areas with mud or soft ground and look for tracks there. Can you guess what animals might have made the tracks? Do you see any other signs of animals? Try to remember all the different animals that you see on your walk; you may even want to write about them or draw pictures of them in a notebook as you go. Think about where each of those animals might live and how their homes help them survive the winter.

Here are some things to look for on your walk:

- animal tracks in snow or mud
- tunnels or holes in the snow - sometimes animals dig holes in the snow to get to the ground to look for food like leaves or insects
- bark on trees that has been scratched or chewed
- holes in the ground where animals might live (called burrows)
- nests in trees, on telephone poles, or around houses and buildings (squirrels and birds both like to build nests in trees)
- holes in trees or caves in rocks where animals may live
- things that could be sources of food for animals (such as mice, squirrels, chipmunks, rabbits, birds, and any other animals you see)



Things to think about:

- If you were an animal, where would you make your home for the winter? Why did you choose that spot?
- Why do you think it is harder for animals to find food in the winter?
- What are some ways that animals can stay warm when it gets really cold?

Frosty Can

Have you ever seen a thin layer of ice on the ground on a cold morning? That is called frost! In this experiment, you can create your own frost and learn why it happens.

What You Will Need:

- an empty coffee can with a lid (see note* below)
- ice cubes
- salt

*Note: Instead of a coffee can, you can use a smaller can, some cardboard, and tape. Before you begin, trace around the bottom of the can on the cardboard and cut out the circle. Stir the ice and salt in step 2, then put the circle over the can and tape it all around the edge.

What To Do:

1. Fill the can up with ice cubes.
2. Pour about 1/2 a cup of salt over the ice (or about 2 tablespoons if you use a smaller can).
3. Put the lid on the can and shake the ice and salt really well while counting to ten.
4. Set the can down and watch what happens.

What's Happening?

In order for water to become ice, it needs to get below 32 degrees. That temperature is called the *freezing point* of water. When water gets to 32 degrees, it starts to freeze. When ice gets warmer than 32 degrees, it starts to melt. Salt makes the freezing point of water lower, so that it would have to be even colder to become ice, but ice doesn't have to get as warm to start melting into water! Adding salt to the ice in the can lowered the freezing point so that it would have to be MUCH colder than 32 degrees for the ice to stay frozen. When you covered the can and shook it up, the salt mixed with the ice and the air inside the can got really cold (but not cold enough to keep the ice from melting, because salt gave it a colder freezing point!). Then, because it was so cold inside the can compared to the temperature outside of the can, tiny ice crystals, called frost, formed on the outside of the can. Since ice comes from water, where did the water that formed the frost come from? It came from moisture in the air. Most air has some moisture, or tiny droplets of water, in it. The can got so cold that the tiny droplets of moisture in the air around the can got cold enough to freeze when they touched the can!

Frost happens a lot during the winter. You may wake up on a cold morning to find that everything outside is covered by a thin layer of pretty, white ice crystals. That is frost. If you have old windows on your house, you might see frost form on them on very cold days. The picture to the right is a close up view of frost on a window.



Expanding Bottle

What happens to water when it gets really cold? Do this simple experiment to see!

What You Will Need:

- empty plastic soda bottle and cap (any size)
- water
- a freezer

What To Do:

1. Fill the bottle up to the very top of the rim with water.
2. Screw the cap on tight.
3. Put the bottle in the freezer and leave it overnight. If it is below freezing (32 degrees) outside, you can put the bottle outside your door instead.

What's Happening?

By morning, you should find that all of the water has frozen solid and that the plastic bottle has been stretched and now has a funny shape to it. When water freezes, it expands, or takes up more space. Since you filled up the bottle to the very top, there was not really anywhere for the water to go when it froze and expanded, so it pushed out against the sides of the bottle and made the bottle bulge out. In fact, it's possible that your bottle even exploded as the water froze because it expanded so much! Have you ever seen cracks in a sidewalk and wondered what caused them? Water gets into tiny holes in concrete and when it freezes, it expands and pushes against the hole it's in and can sometimes crack the concrete!

Fun Facts

- There is a lot of water on the earth, but only 2% of it is fresh water (not salty). Imagine 100 cups full of water - 98 of them would be salty and only 2 of them would be fresh water!
- The most extreme temperature range in the world happens in Siberia (the northern part of the country Russia). In winter, the temperatures there can get as cold as -90 degrees and up to 98 degrees in the summertime!

Silly Science

- What do you get when you cross a snowman and a shark?
 - *Frost bite!*
- What kind of math do Snowy Owls like?
 - *Owlgebra.*
- What do you call a polar bear found in the desert?
 - *Really lost!*

Way Cool Websites

- Play this arctic animals [matching game](#) and find out about different animals as you go.
- Practice making pretty [snowflake designs](#) without even using any paper.
- Guess which animals these different sets of [footprints](#) belong to.

Teacher Tidbits

What Is Winter?

Winter is the season that comes after fall and before spring. Winter is usually the coldest time of year and in some places, it brings freezing temperatures, snow, and ice with it. Even places that don't get snow or freezing cold weather still have a winter season. Here are a few ways to tell that it's winter, other than snow and cold:

- The days are shorter and the nights are longer than during any other season. Today (December 21st) is the first official day of winter, because it is the shortest day of the whole year!
- The sun doesn't shine as warmly on the earth during the winter, even on the brightest days.
- Trees and plants usually go dormant (like they're sleeping) or else die so when you look outside, you'll see more brown than green.
- Winter is a wet season, with lots of rain or snow.

The changes that winter brings affect people, animals, plants, and trees alike. Trees and plants go dormant to live through the cold and some animals hibernate while other store up food in the fall to eat during the winter when it gets harder to find food. To learn more, check out our newsletter about [Hibernation](#). Some animals adapt to the change in weather by growing a white colored winter coat of fur to blend in with snow. Many animals eat different foods in the winter than during the rest of the year. Squirrels and mice gather food like nuts and seeds in the fall and save them in their nests to eat in the winter, and others like deer eat twigs and bark when it's hard to find other things to eat. These are ways that animals can adapt to stay alive and active during the coldest times of the year.

Why Do We Have Winter?

We have seasons because of the way that the earth moves around the sun. The earth orbits the sun along an egg-shaped path, just like all of the other planets do. It takes a whole year, or 365 days, for the earth to go all the way around the sun one time. The earth is also tilted. It is always tilted in the same direction, so only part of the earth can be facing the sun at a time. The part of the earth that is tilted farthest away from the sun gets winter (because it is farther away from the sun) while the part of the earth that is towards the sun has summer (it is facing the sun more directly). The earth also spins around (like a top) while it is moving around the sun! It spins around one full time in a day. You can learn more about the planets and their orbits [here](#).



Have you heard of the equator? It is an imaginary line around the middle of the earth that divides earth into two halves, a northern half and a southern half. While it is winter for the top half in places like North America and Europe, it is summer for the bottom half in places like Australia and South Africa! The sun shines directly on the equator all year, so how warm or cold your seasons are depends on how far away you live from the equator. If you live close to the equator, you probably don't experience very big changes in temperature when the seasons change. If you live a little farther away from the equator though, you probably experience warmer temperatures in the

summer and cooler ones in the winter (when the part of the earth you live in is tilted away from the sun). You can see how sunlight changes during the winter with a flashlight in a dark room. Shine the flashlight onto the wall and notice how it makes a bright circle of light. Without moving the flashlight any closer or farther away from the wall, turn it a little so that the light shines on the wall at an angle. Now the beam of light covers more of the wall, but it doesn't look as bright or strong as it did when you held it straight (look especially at the edge of the circle farthest away from the flashlight). During winter, the sunlight has to stretch over more of the earth to get to us, so when the light does get there, it isn't as strong as when it is shining directly, like during summer.

Birds In Winter

Many birds fly south to warmer places for the winter. This is called migration. When snow starts falling and lakes and rivers begin to freeze, it gets harder for many birds to find food, so they start traveling south to places where they can find food more easily. They will head back to their summer homes to build nests and lay eggs when spring comes. Other animals migrate, too. Did you know that even Monarch butterflies, sea turtles, and salmon (a type of fish) migrate?

Printable Worksheet

Use the following page to help kids recognize animal tracks. Talk about how different animals have different numbers of toes and different sizes and shapes of paws. Ask questions to get kids thinking about how different animals use their paws or feet to help them get food and move around. For example, a raccoon has five finger-link toes on each paw, which it uses to hold food while eating. A rabbit has long back feet for hopping and a moose has hooves with two "toes" to help it move quickly, even through snow.

Can you tell which animals made these tracks?
Draw a line to match each animal to its foot print.

