

Written by Kerry Everitt
Design and illustrations by Judie Shore



Sky in a jar

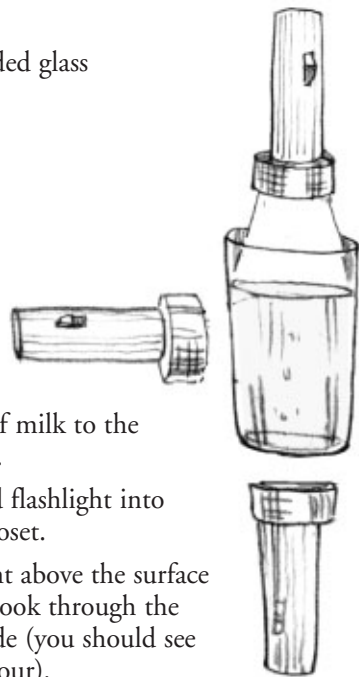
To learn more about how light scatters and causes the sky to appear blue, try this at home!

What you need:

- A clear straight sided glass
- Water
- Milk
- Spoon
- Flashlight

What you do:

1. Fill the glass about 2/3 full of water.
2. Add 1 teaspoon of milk to the glass and stir well.
3. Take the glass and flashlight into a dark room or closet.
4. Hold the flashlight above the surface of the water and look through the water from the side (you should see a slightly blue colour).



Now shine the flashlight through the side of the glass and look through the other side directly at the light (the light should be slightly red). In order to see an even darker and brighter red, hold the flashlight under the glass and look down through the top of the glass.

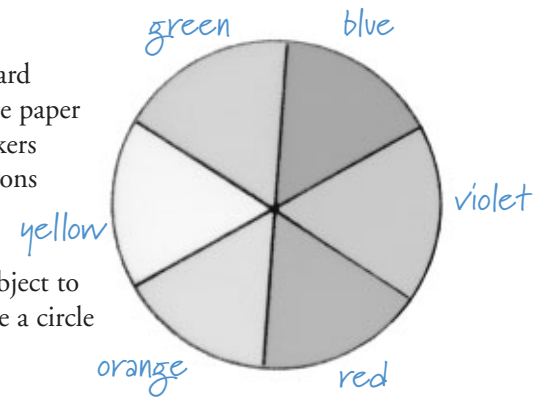
What happened?

The particles of milk acted just like particles of dust and water in the atmosphere and caused the light to scatter into different colours depending on the distance the light travelled from the source to your eye.

The colour wheel

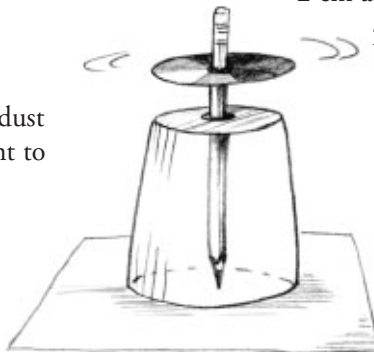
What you need:

- A pencil
- Scissors
- White cardboard or heavy white paper
- Crayons, markers or pencil crayons
- A ruler
- A bowl or other round object to trace and make a circle
- A paper cup



What you do:

1. Trace a circle onto the white cardboard and cut it out. Using the ruler, divide the circle into 6 equal sections.
2. Colour the six sections with the colours shown in the diagram. Colour as smoothly and evenly as possible.
3. Poke a hole through the middle of the circle with the pencil and push the pencil part way through.
4. Punch a hole in the bottom of the paper cut with the end of the pencil. Turn the cup over on top of a piece of paper. Put the pencil through the hole so the point just rests on the paper. Adjust the colour wheel so it is about 2 cm above the cup.
5. Spin the pencil quickly. What do you see?



What happened?

The colours on the wheel are the colours that make up white light. If the wheel spins fast enough, the colours all blend together and the wheel will look white.

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What is the sky?

It's where the birds and airplanes fly, where you find clouds, where our weather comes from and, if you go high enough...

Cirrus, meaning "curl of hair"

Cumulo-nimbus

Cumulus, meaning "heap"

Stratus, meaning "layer"

Nimbo-stratus (Nimbus means "rain")

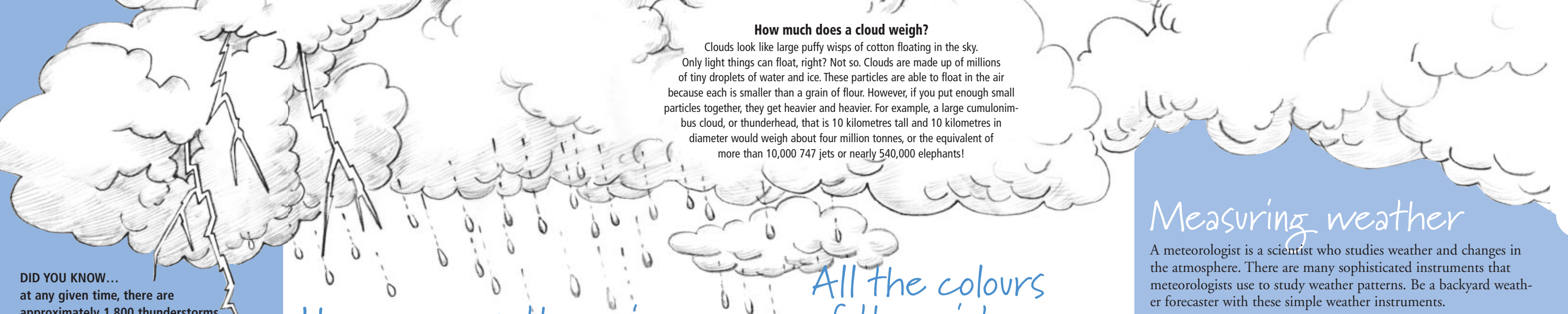
...it's where satellites orbit. The atmosphere, more commonly known as the sky, is simply a layer of gases that surrounds the earth.

Life on earth would not exist without the atmosphere. Not only does the atmosphere provide us with oxygen, it also moderates our temperature, is the source of weather and climate, and protects us from both space debris and the sun's harmful rays. Let's take a closer look at the lower part of the atmosphere, the part where weather is found.

The air that you breathe and that makes up the atmosphere is a combination of many different types of gases. Oxygen is the most important gas because without it we could not breathe. However, nitrogen is the most abundant gas in the atmosphere. The atmosphere is also full of invisible water vapour. Clouds form when moist air rises into the atmosphere to a height where the air begins to cool. At that level, the moist air condenses into tiny water droplets, which, together, form clouds. Clouds are named and classified according to their appearance.

Cumulo-nimbus

Small white cumulous clouds (the ones that look like cotton balls) are generally a sign of good weather. If they get larger, taller and dark grey on the bottom, they might become thunderheads. If you see one of these, you might want to take cover or grab an umbrella before the rain starts!



How much does a cloud weigh?

Clouds look like large puffy wisps of cotton floating in the sky. Only light things can float, right? Not so. Clouds are made up of millions of tiny droplets of water and ice. These particles are able to float in the air because each is smaller than a grain of flour. However, if you put enough small particles together, they get heavier and heavier. For example, a large cumulonimbus cloud, or thunderhead, that is 10 kilometres tall and 10 kilometres in diameter would weigh about four million tonnes, or the equivalent of more than 10,000 747 jets or nearly 540,000 elephants!

DID YOU KNOW...
at any given time, there are approximately 1,800 thunderstorms occurring around the world.

Thunderstorms occur when there is a lot of movement of electrically charged particles. When the energy build-up is too great, there is a spectacular release of energy in the form of lightning. Sometimes lightning reaches all the way from the clouds to the ground and forms lightning bolts. Other times lightning is shielded by thick clouds and appears as a bright flash in the sky known as sheet lightning.

DID YOU KNOW...a single fork of lightning lasts about 0.2 seconds and is about 30,000 degrees Celsius (water boils at 100 degrees!)

You can often see a white streak of cloud coming out of the back of an airplane. This isn't really a cloud at all but something called a contrail (short for condensation trail). These trails form when an airplane travels through very cold air and the water vapour

from the airplane's engine freezes into tiny ice crystals.

Here comes the rain

Every living creature needs water. Animals drink it, fish swim in it and frogs live in it. Water is continually cycled through the oceans, rivers, lakes, streams and atmosphere. This process is called the hydrologic cycle (also known as the **water cycle**). In the atmosphere, tiny cloud droplets get larger and larger until they are so heavy they can no longer remain suspended in air. At that point, the droplets fall to earth as rain, snow or hail, also known as precipitation.

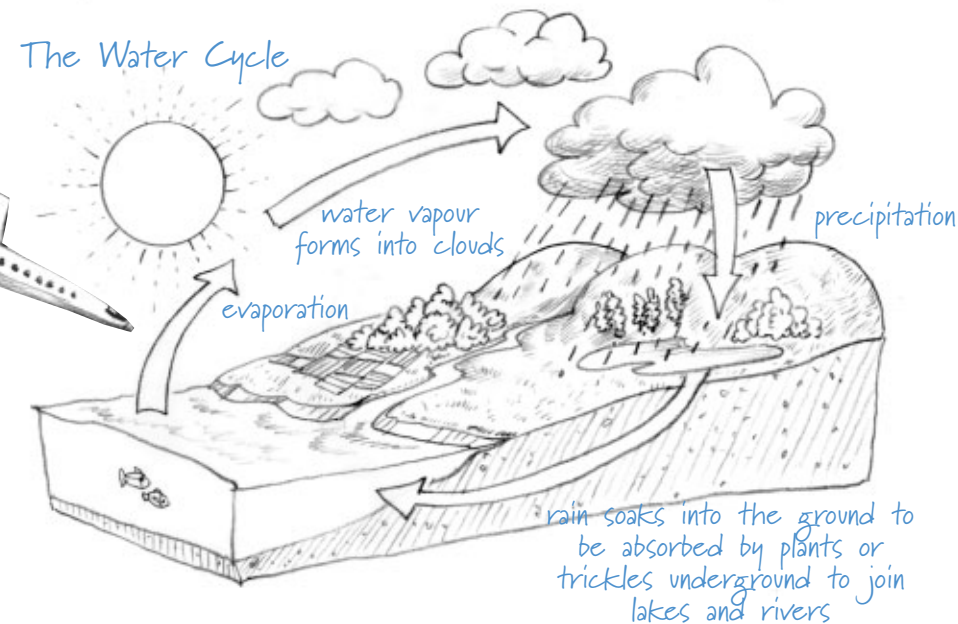
DID YOU KNOW...snow can form high in the atmosphere even during the warm summer months but due to the warm temperature close to the ground, it melts and falls as rain.

It is true that no two snowflakes have ever been found that are identical. There are even different types of snow. When it is very cold, the snow is "dry" and powdery and does not stick together. When it is warmer, the snow is "wet" and it's time for a snowball fight!

DID YOU KNOW...the average raindrop contains a million times more water than the average cloud droplet.

Water droplets that are suspended in the air just above the ground form fog. You can think of fog almost like a cloud that has sunk. Mist forms above bodies of water as a result of a small amount of condensed water vapour.

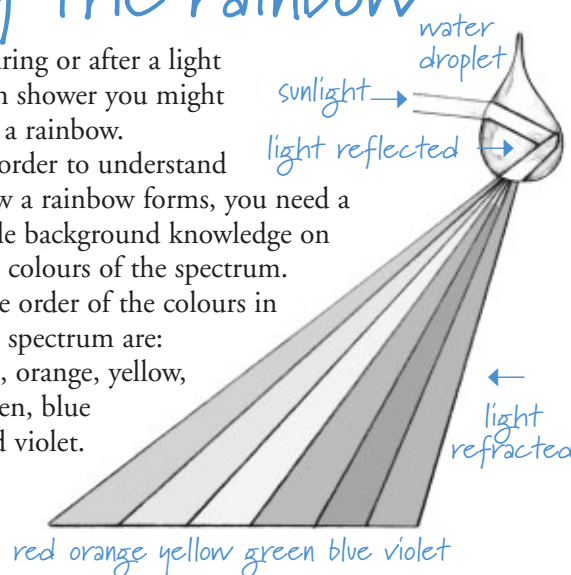
The Water Cycle



All the colours of the rainbow

During or after a light rain shower you might see a rainbow.

In order to understand how a rainbow forms, you need a little background knowledge on the colours of the spectrum. The order of the colours in the spectrum are: red, orange, yellow, green, blue and violet.



White light is made up of all the colours mixed together. In order to see individual colours, the light has to be reflected and scattered. A prism, which is a special piece of glass, does this. Water in the atmosphere can also act like a prism to scatter the light into different colours. A rainbow is formed when millions of tiny droplets of water break up (scatter) the sunlight into the different colours of the spectrum that is then reflected by your eye. The result is a brilliant, multicoloured arch reaching across the sky. The colours of a rainbow will always appear in the order of the spectrum.

On sunny days the sky is often a brilliant shade of blue. If light is made up of so many different colours, then why is the sky blue?

The air is made up of molecules of gases, water vapour and dust. The rays of the sun bounce off in different directions as they hit these molecules. Most of the colours in the light pass right through the air but the blue bounces off in all directions. It is this scattering in all directions that makes the sky appear blue.

Measuring weather

A meteorologist is a scientist who studies weather and changes in the atmosphere. There are many sophisticated instruments that meteorologists use to study weather patterns. Be a backyard weather forecaster with these simple weather instruments.

anemometer: A device with three cups that rotate to measure wind speed.

wind vane: A device with four directional vanes that point to show wind direction.

wind sock: A fabric sock that points into the wind to show direction and indicates relative wind speed by its inflation.

thermometer: A glass tube containing liquid that expands or contracts with temperature changes.

rain gauge: A clear plastic bottle with the top cut off and inverted to catch rain. The top is set upside down in the bottom. The gauge is marked with a ruler on the outside, and 0 is at the base. It is used to measure the amount of precipitation that falls.

An **anemometer** is used to measure the speed of the wind.

A **wind vane** or **wind sock** shows the direction from which the wind is blowing. You sometimes see these at the airport or on top of barns in the countryside.

A **thermometer** measures the air temperature. Check the temperature outside but be sure to place your thermometer out of direct sunlight or your reading will be too high.

Rain gauges are used to measure the amount of precipitation that falls. Make sure to let any snow that accumulates in the gauge melt before you take a reading or use the following conversion. Snow is approximately 10 times thicker in a rain gauge than rain. For example, 25 cm of snow would be equal to approximately 2.5 cm of rain.