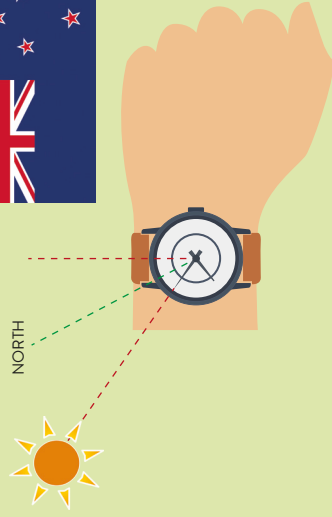
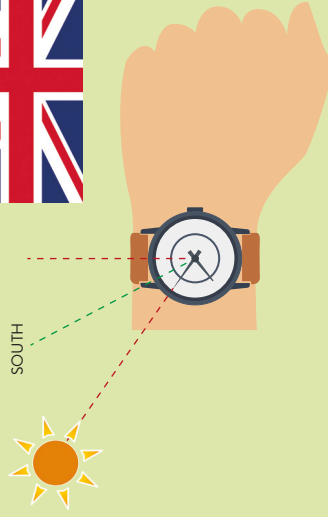


USING THE SUN AND A WATCH TO FIND SOUTH DURING THE DAY

(For this activity, you need a watch with hands. If yours has only a number display, you'll need to imagine the hands!) Hold the watch face in front of you, with the hour hand pointing at the Sun. Look where the 12 is pointing, and imagine a line half way between the 12 and the hour hand.

This line is pointing South. (This is true for anywhere in the Northern Temperate Region; if you were in the Southern Temperate Region (e.g. New Zealand), the line would point North).



Astronomy expert and educator Mike Willmott is working with Mayes Creative on the Dark Skies: Bright Stars project, which explores and celebrates our ancient and modern links to the stars and planets, working with a host of partners and schools.
www.mayescreative.com

This special leaflet aims to enable you to try out some simple but pleasing experiments linked to stars, comets, meteorites, gravity and rockets!

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EVERYDAY ASTRONOMY

SOME SIMPLE PROJECTS

by Mike Willmott FRAS

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MAKING MOON CRATERS

You need a tray or shallow box, flour, cocoa, and a variety of marbles and/or small balls.

This activity is fun, but has the potential to be messy, so take care! Spread a 3-5cm layer of flour on a tray or in a shallow box. Drop the marble or small ball initially from a height of about 30cm into the flour. Vary the height of the drop, and also the size of the ball. You might want to try to get the marble/ball to hit the surface at an angle. After each drop, look at the size and shape of the crater that formed.



BETTER CRATERS

Once you have got the best marble/ball size, height dropped, and angle, sprinkle a layer of cocoa onto the surface of the flour.

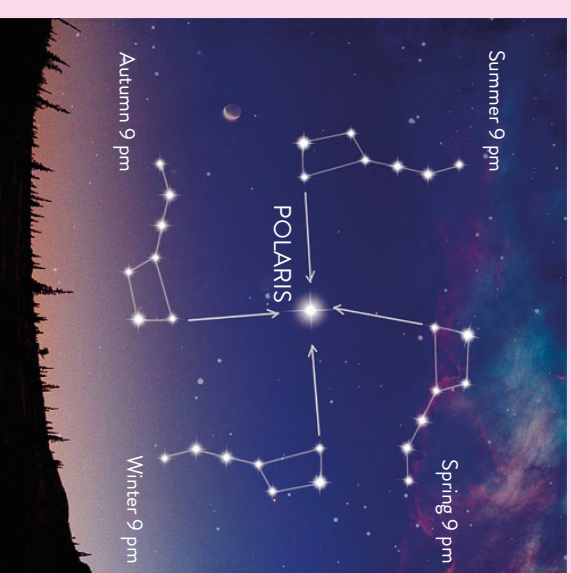
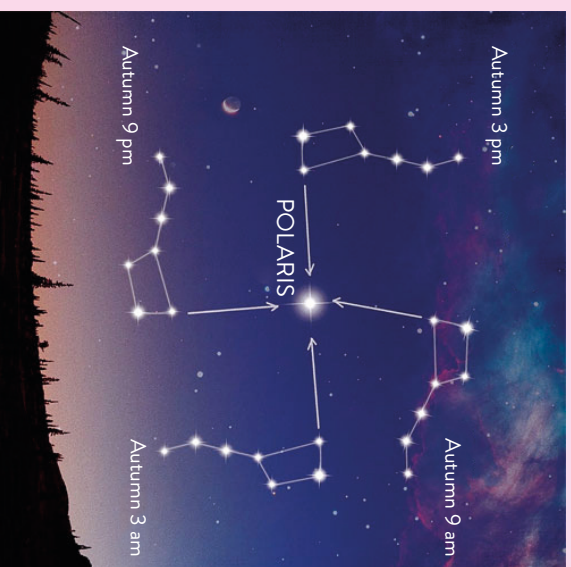
Now when you drop the marble/ball, in addition to seeing the size and shape of the crater, you can see how much sub-surface material (flour) is brought up onto the surface by the impact.

USING THE STARS TO FIND NORTH AT NIGHT

Many people know that Polaris, the Pole star, allows you to find North, but don't know how to find Polaris. Some assume Polaris is the brightest star in the sky, but it isn't, so they find the wrong 'Polaris'! Others know that Polaris can be found by using the seven stars of the Plough, which they assume is always low on the northern night horizon, whereas this is only true sometimes. So, here's what you need to know to be sure of finding Polaris to find North.

The Earth's axis points at the North Celestial Pole. All northern constellations and stars, including the Plough, move around this point in an anti-clockwise direction. The Plough is easy to recognise if you can find it, but its position changes, over the period of a night (due to the Earth's rotation), and over the year (due to Earth's orbit). The diagrams below should help.

As the Plough is just above the northern horizon at 9pm, where is it two months later at 11pm?



Over a period of two months, the Plough moves through 60 degrees, and the extra two hours later will have moved it another 30 degrees, i.e. expect the Plough to have moved 90 degrees and be 'standing on its handle' in the north-eastern sky.

Irrespective of the Plough's orientation in the sky, if you imagine that the Plough is a saucepan, find the four stars of the handle, then find the two stars on the opposite side of the saucepan. These two stars are called The Pointers, and if you go from the lower one, through the upper one and continue across the sky, you will find Polaris (easy to find because, although it's not particularly bright, it's brighter than any of the other nearby stars). Having found Polaris, move immediately down to the horizon – this direction is North i.e. in the direction of the North Pole. (Note: Many people believe that a compass points towards the North Pole, but this is wrong: a compass points towards the North Magnetic Pole, which is actually in Northern Canada.)

ROCKET LAUNCH

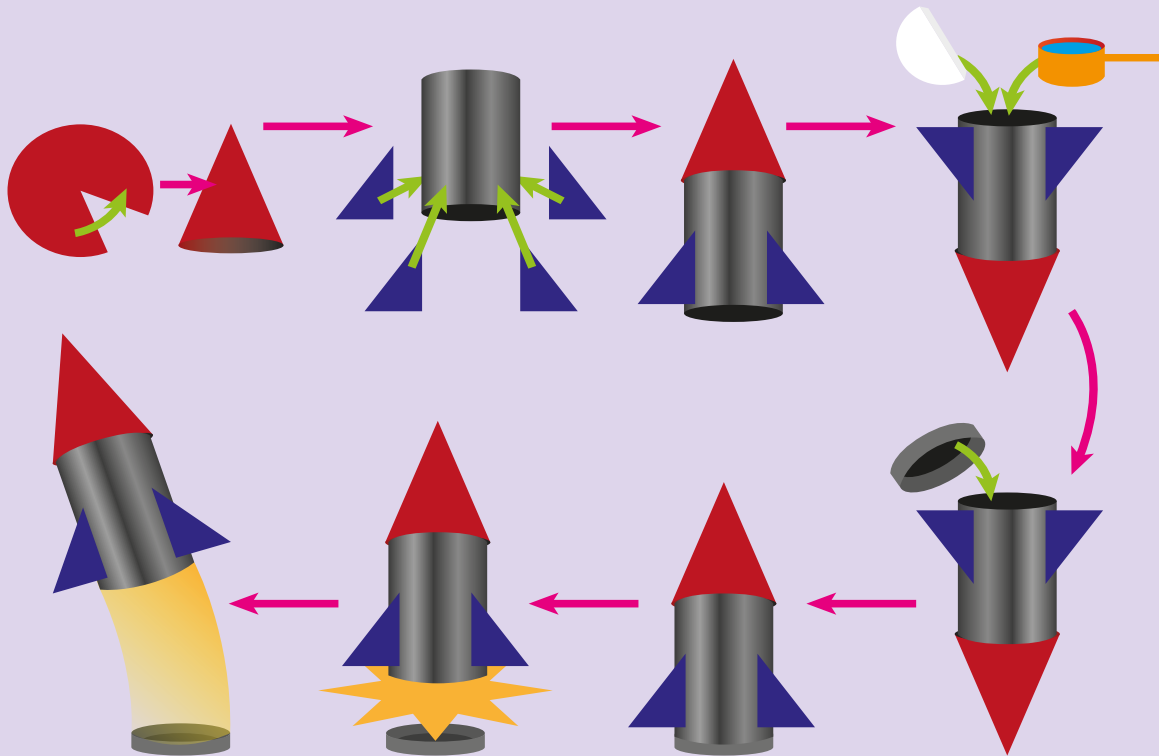
It's always advisable to wear eye protection and work outside when doing activities like these.

PLEASE NOTE: THIS ACTIVITY MUST NEVER BE TRIED WITHOUT ADULT SUPERVISION

You will need a film cannister and lid (white cannisters tend to work better than black ones), card, scissors and glue. The fuel can be either antacid tablets (like Alka-Seltzer) and water, or baking soda, vinegar and tissue. If done properly, the rocket can be launched to a height of a couple of metres.

ANTACID-FUELLED ROCKET

1. Remove the lid from the film cannister and glue the four cardboard triangles around the open end. These are the rocket fins.
2. Cut out a circle of card, cut a line to the centre, fold it round to make a cone and glue it to the base of the film cannister. This is the rocket nose cone.
3. Put an antacid tablet into the cannister (Alka-Seltzer generally works better than generic brands).
4. Add a teaspoon or so of water, snap on the lid and put the rocket (lid down) on the ground, stand back and wait.



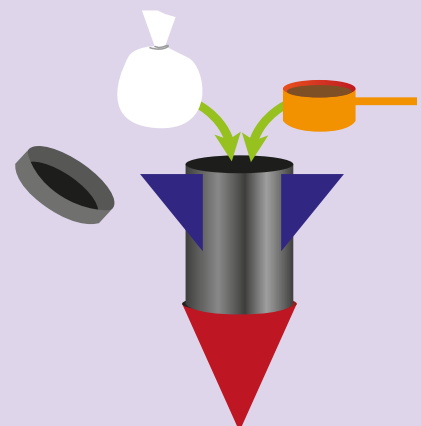
VINEGAR AND BAKING SODA-FUELLED ROCKET

As an alternative fuel, you can use vinegar and baking soda:

Wrap a tea-spoon of baking soda in a small piece of tissue.

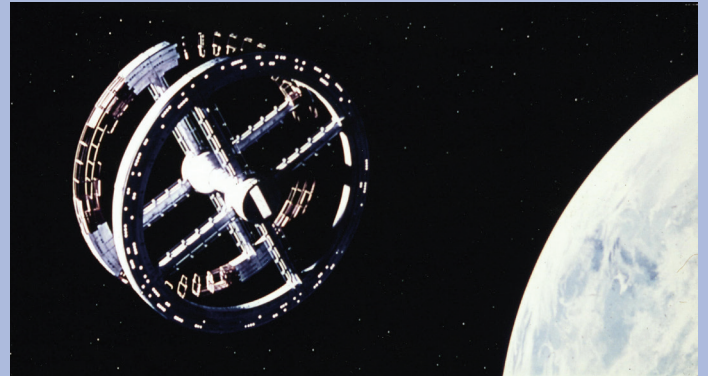
Quarter fill the cannister with vinegar and add the baking soda (in tissue) to it.

As before, snap on the lid, put the rocket (lid down) on the ground, stand back and wait.



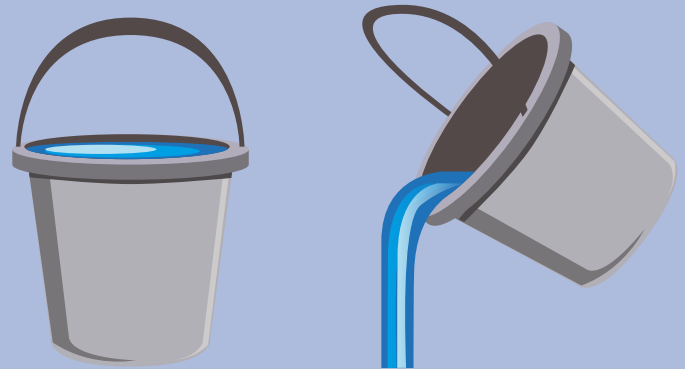
ARTIFICIAL GRAVITY

In 2001 A Space Odyssey, there is the spinning space station, with artificial gravity and people walking on a curved floor. On the Discovery spacecraft, the astronauts jog around a more pronounced curved surface.

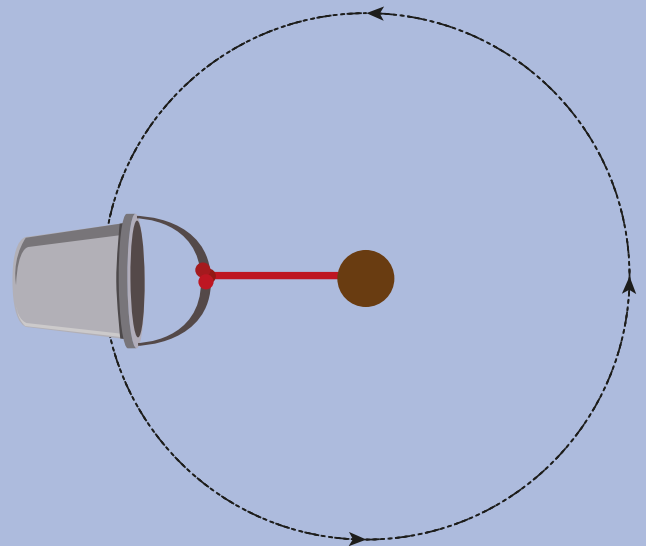


So how does spinning cause artificial gravity?
Even better, can we create artificial gravity ourselves?

Gravity acts downwards, which is why the bucket on the left holds water, but water pours from the one on the right.



But with a rope attached securely to the handle, you can spin round and can create an 'artificial gravity' which holds the water in the bucket. Start slowly with the rope straight and the bucket on the ground. Lift the bucket a little and start to turn. As you spin more, the bucket will rise until, at a fast spin rate, it will be almost horizontal, with all its water contained. Don't get dizzy and let go of the bucket; once the bucket is not being made to move in a circle, the 'artificial gravity' disappears, and the water will pour out. To stop, slow down turning, but keep the bucket high enough to keep it off the ground. Be prepared for some water loss, until you become proficient! Try filling the bucket to just halfway to begin with.



Incidentally, to further prove the 'artificial gravity' is acting horizontally, you could have a plastic duck float on the water in the bucket, and when you spin the bucket around, the duck will happily float sideways on the water!

