TEACHER RESOURCE

STARDOME OBSERVATORY & PLANETARIUM
FACTS, RESOURCES AND ACTIVITIES ON...

FINDING NORTH AT NIGHT

Star trails taken from Conical Peak in the Dome Valley region of New Zealand. Four hours and four minutes of rotation. Image Credit: Jonathan Green.

For thousands of years, the positions of stars have been used to help with navigation. At night, if a GPS or a magnetic compass are unavailable, the stars, Moon and planets can be used to find north.

South Celestial Pole

The easiest and most practical methods involve finding the South Celestial Pole (SCP). This is the point in the sky all the stars appear to rotate around.

Imagine being at the South Pole in Antarctica in the middle of winter. Looking up, all the stars will circle around a point directly above your head (90°) – because you are standing at the bottom of a very large spinning ball.

If you travel north away from the Pole, this point will gradually drop down until at the Equator it will be on the southern horizon (0°). The SCP is always directly south, and its altitude above the horizon is always equal to your latitude.

Finding South and Your Latitude

In the Northern Hemisphere the Pole Star (Polaris) is very close to the North Celestial Pole, and is a very bright star. In the southern hemisphere the area near the SCP is devoid of bright stars, so stars further away have to be used to find south.

The three main methods (see Activity) suitable for school usage (e.g. school camp) utilise the Southern Cross (Crux), the Pointers, and the bright star Achernar to locate the SCP. South is on the horizon vertically below the SCP.

Measuring the altitude of the SCP will tell you your latitude (degrees south of the equator). In Auckland, the SCP is about 37° above the southern horizon. All the stars circling within 37° of the SCP are termed 'circumpolar', because they never set below the horizon. The Southern Cross, the Pointers and Achernar are all circumpolar, so they can be used all year round for navigation.

Spacecraft use star positions to find their way around the Solar System.

Some migrating birds use the stars to navigate across the equator.

SCIENCE CONTENT/ CURRICULUM LINK

STAR PATTERNS AND TIME AT NIGHT. SHARING IDEAS AND OBSERVATIONS ABOUT TIME AND THE STARS.

Check out these other resources...

- Wikipedia: https://en.wikipedia.org/wiki/Celestial_pole#Finding_the_south_celestial_pole
- Encyclopedia of New Zealand (Te Ara) – three methods: http://www.teara.govt.nz/en/diagram/7486/navigating-by-the-southern-cross

DISCUSSION POINTS

Why should you use only dim red lights when observing at night?

The star Mintaka rises due east and sets due west. Which star is this in Orion's Belt?

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ACTIVITY

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USING STARS TO FIND YOUR DIRECTION

The stars used in these three methods are bright, and become visible on a clear night within half an hour or so after sunset, before the surrounding constellations appear.

Because the Southern Cross (Crux) makes a full circle around the South Celestial Pole (SCP), it is seen in different orientations after sunset during the year.

Crux is upside down, pointing upwards during the summer months, but in winter it is at the top of its arc, standing proud, pointing down towards the horizon. In autumn it is to the left of the SCP pointing to the right, and in spring it is on the other side pointing leftwards.

Inexperienced observers need to ensure they've found Crux, and not the 'False Cross' or the 'Diamond Cross' (which are asterisms and not actual constellations in their own right). The two brightest stars of the constellation of the centaur (Alpha Centauri and Beta Centauri) are nicknamed the 'Pointers' because they point to the top star of the Southern Cross. In Maori star lore these are sometimes called the anchor (Crux) and anchor rope (the line to Crux).

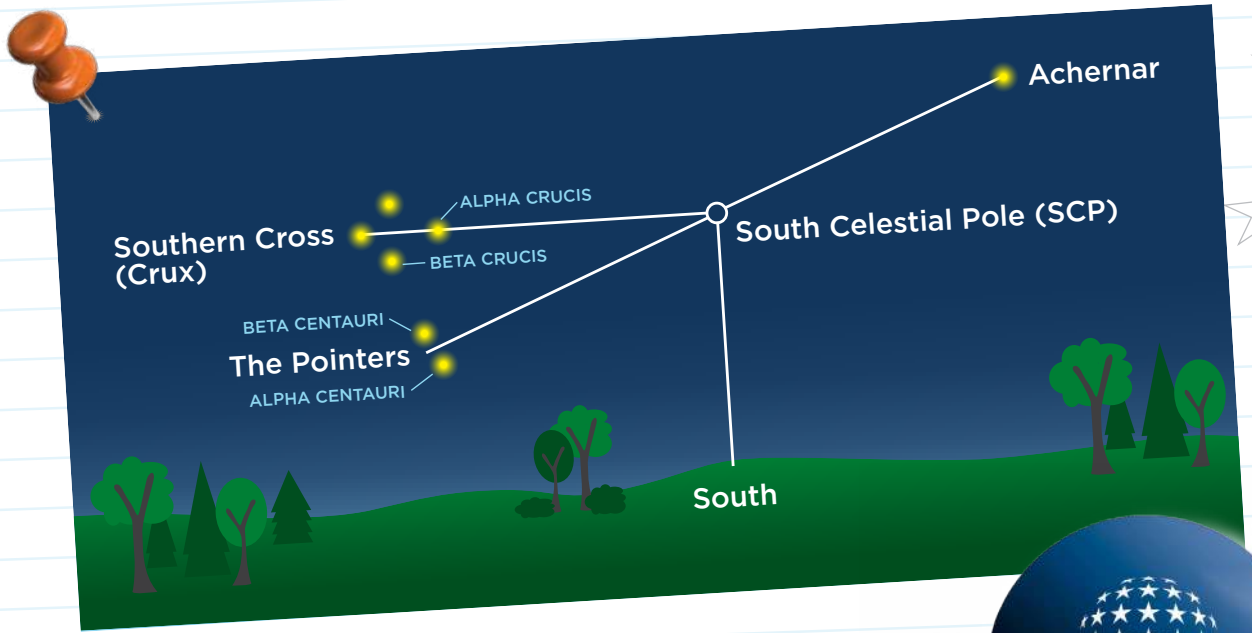
Step 1: The easiest method is to make a line from the top star to the bottom star through the long side of the cross and extend this length four and a half times. This will bring you within a few degrees of the SCP. Drop a line vertically down to the horizon to find due south. North is directly behind you!

This is also the most practical in New Zealand's cloudy skies, as only Crux (the smallest of all 88 constellations in the sky) needs to be in view.

Step 2: A slightly more accurate method is to extend the line through the cross as before, but then extend another line starting half way between the two Pointers at right angles. Where these two meet is close to the SCP. Due south is directly below that point.

Both the cross and the two pointers need to be visible for this to work.

Step 3: If Crux is not visible, another method is to point to Beta Centauri with one arm and the bright star Achernar with the other. Bring them together in the middle and you should be pointing near the SCP. Vertically below at the horizon is due south.



Take a photo of your activity and send it to us. We'd love to see it! education@stardome.org.nz

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