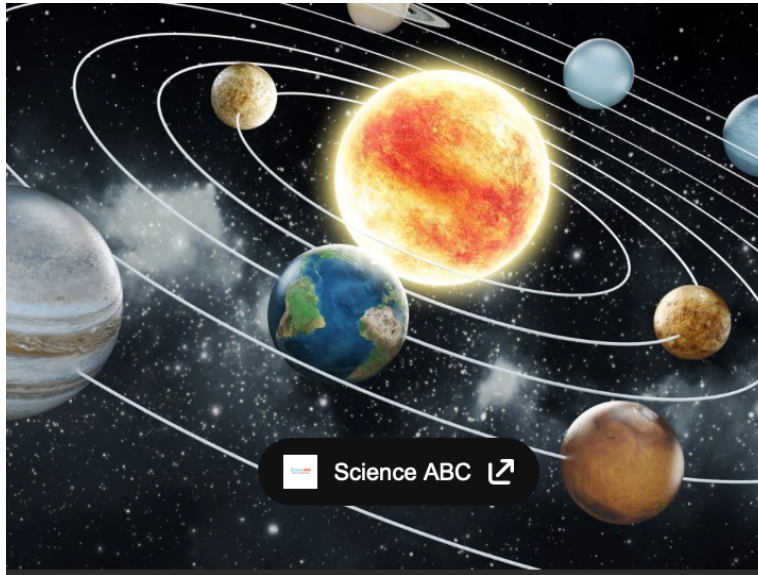


## Inquiry: Planets, stars, Sun, Earth, Moon.....outer space.

### What do we know?

A research project for Upper primary



### Tuning in:

Astronomy didn't start with the Greeks. Thousands of years earlier Aboriginal people scanned the night sky, using its secrets to survive the Australian landscape.

Article by [Maryke Steffens](#) from Australia's first astronomers:  
A beginner's guide to the night sky. ABC Science



An early morning alignment of the planets against the Dark Emu constellation on February 2nd, 2019. Photo by Alex Cherney.

The Emu in the Sky stretches across the Milky Way. (Barnaby Norris)

## Earth and Space Science Scope and sequence Year 5 curriculum: SCSA

Earth's rotation on its axis causes regular changes, including night and day	Earth's surface changes over time as a result of natural processes and human activity	The Earth is part of a system of planets orbiting around a star (the sun)	Sudden geological changes and extreme weather events can affect Earth's surface
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### **Related resources:**

- **Audio: Indigenous astronomy**
- **Aboriginal astronomers see emu in sky**, Science Online, 16 Aug 2005
- **Beyond Galileo - MessagStick ABC TV**, We examine the space between western astronomy and Aboriginal cosmology and the guiding spirits that occupy the dark nebulae in between.
- **Tnorala - MessageStick ABC TV**, Senior storyteller, Mavis Malbunka, tells the dreamtime story of Tnorala, a distinctive crater-shaped landmark that has sacred importance to the Western Arrente people.
- **Dust Echoes**, Watch twelve animated dreamtime stories from the Wugullar Community in Arnhem Land in the Northern Territory.
- NASA: <https://solarsystem.nasa.gov/solar-system/our-solar-system/overview/>
- CSIRO Two way science
- NASA Spaceplace <https://spaceplace.nasa.gov/all-about-earth/en/>

### **Dream time stories from Aboriginal astronomers**

*During the Dreaming, a blind man lived with his wife in the bush. Every day he told his wife to go out and hunt for emu eggs for him to eat. Even though his wife tried hard to please her husband, he was always angry with her, telling her that the eggs were too small.*

*One day while she was out hunting, she came across some very large emu tracks. She thought of her husband and how angry he got, and followed the tracks all the way to the nest. She found a huge emu there and threw stones at it to get at the eggs, but it stood up and ran towards her and killed her.*

*The blind man became hungry and worried about his wife. He felt around the camp until he came across a bush with some berries on it and ate some of them. Suddenly he could see. He made some spears and a woomera and set off to find his wife. He followed her tracks and finally saw the huge emu and the body of his wife. He speared the emu and banished its spirit to the Milky Way, where it can still be seen today.*

— a story from Papunya, Northern Territory

If you look up into the sky tonight, you can still spot the Emu in the Sky. You've almost certainly been looking at it all your life, but you've probably never seen it.

The Emu is stretched across one of the most familiar objects in the night sky, the Milky Way. Look closely at the the Southern Cross and you'll see its head as a dark smudge tucked near the bottom left hand corner of the constellation. Its neck passes between the two pointer stars, and its dark body stretches the length of our luminous galaxy.

The Emu in the Sky has featured in Aboriginal storytelling for thousands of years.

Many different language groups have their own interpretation of the Emu's heavenly fate, along with a rich and diverse range of stories about mallee fowl, parrots, fish, stingrays, hunters, men, women, girls and boys.

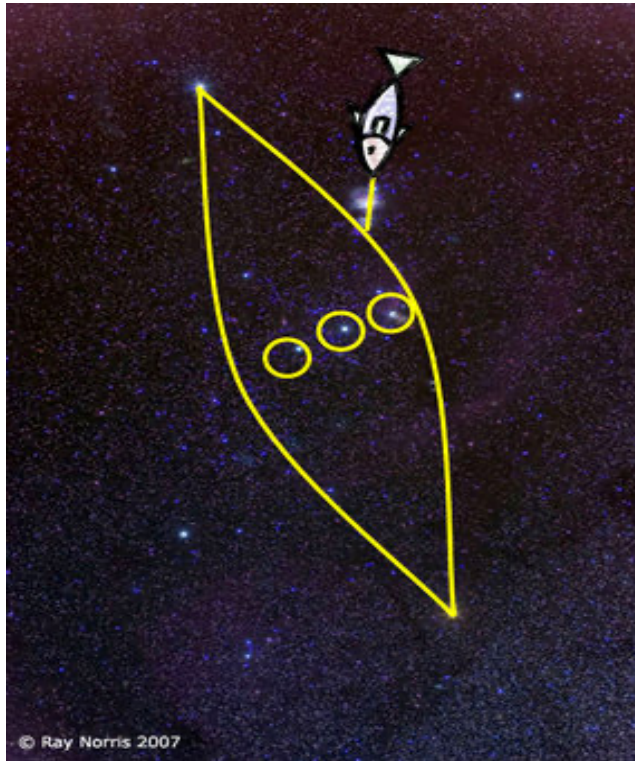
Once you hear these stories, the night sky will never look the same again. And it's not just stories you'll find — Aboriginal astronomy contains a map to understanding, surviving and living in harmony with this great southern land.

**Dark patches in the sky** Unlike Greek celestial tradition, which focuses almost exclusively on stars, Aboriginal astronomy focuses on the Milky Way and often incorporates the dark patches between stars.

The Emu in the Sky, a story common to many Aboriginal groups, is an example of this — its body is made up of the dark patches in the Milky Way. The Boorong people saw the same dark patches as the smoke from the fires of Nurrumbunguttias, the old spirits. The Kurna people saw the Milky Way — called Wodliparri or hut river — as a large river where a Yura (monster) lives in the dark patches.

To the Ngarrindjeri people, the dark shape formed by the Southern Cross is the stingray Nunganari and the pointers are Ngarakani, or sharks.

#### First astronomers



Orion the hunter appears as Djulpan to the Yolgnu people in the Northern Territory. (Source: Ray Norris)

Aboriginal people have been described as 'the world's first astronomers'.

The Yolgnu people in Arnhem Land, for example, have dreaming stories that explain tides, eclipses, the rising and setting sun and moon and the changing positions of rising stars and planets throughout the year.

In one of their stories, Walu the sun is a woman who lights her fire every morning and scatters red ochre across the clouds, creating dawn. She then carries her torch across the sky, creating daylight. At the end of the day, she descends, puts out her fire, and travels underground through the night back to her morning camp.

CSIRO astrophysicist Ray Norris has been gathering and listening to Aboriginal stories about the night sky across the country.

One of his favourites is the Yolgnu story of the three brothers in a canoe in the Djulpan constellation (known in Greek mythology as Orion the Hunter). The three stars in Orion's belt are the brothers sitting side by side, with the stars Betelgeuse and Rigel marking the front and back of the canoe. The stars in Orion's nebula represent a fish, and the stars of Orion's sword mark out a fishing line trailing behind the canoe.

"I love it because it actually looks like a canoe when you see it," says Norris.

There are many stories about the Orion constellation right across Australia, and they are nearly always about a group of men hunting or fishing, says Norris. Often they are following a group of young women, represented by the stars in the Pleiades cluster in the constellation Taurus.

Surprisingly, these stories are very similar to Greek mythology, in which Orion pursues the Pleiades sisters across the sky.

Orion's nemesis, Scorpius, is also depicted as a scorpion in some Aboriginal stories.

Leith Hogan 2023

For example, one Yolgnu story tells of Bundungu the scorpion, who is gathered with his people along the banks of the Milnguya (Milky Way) with their relatives the Baripari (quoll) and Wahk (crow).

"It's that sort of thing that fascinates me, the way that different cultures arrive at the same conclusions," says Norris.

**A celestial serpent** Aboriginal dreaming stories may help locate astronomical events — in time and in space — says Duane Hamacher, a PhD student from Macquarie University.

Hamacher is gathering Aboriginal stories of comets and meteors — often described as the glowing eye of a celestial serpent flying across the sky — and seeing whether he can use them in conjunction with Google maps to locate the site of previously undiscovered impact craters, like the one at Wolf Creek in Western Australia.

He has found a story about 'a star falling from the sky and causing fire, death and destruction' from a place about 100 kilometres outside of Alice Springs in the Northern Territory which seems to correspond with a large, circular structure he has found on Google maps.

"I've got my fingers crossed. When we look at it, it's heavily eroded, which suggests it's millions of years old, but still, if we were able to find an impact crater based on a dreaming story, then that's quite significant."

#### The sky as a calendar

Aboriginal people would have had a very practical reason for their interest in astronomy: the sky is a calendar that indicates when the seasons are shifting and when certain foods are available, says Roslynn Haynes, an associate professor at the University of New South Wales and author of *Explorers of the Southern Sky*, a history of Australian astronomy.

"Constellations appearing in the sky, usually at sunrise or sunset, were very important. They helped [Aboriginal people] predict what was happening in the world around them," says Haynes.

For example, at different times of the year the Emu in the Sky is oriented so it appears to be either running or sitting down. Depending upon its position people in the western desert knew it was time to hunt for emus or collect their eggs.

When Scorpius was visible in the evening sky towards the end of April people of Groote Eylandt in the Gulf of Carpentaria knew the wet season was over and the dry south-easterly wind marimariga would soon begin to blow.

The Boorong people in north western Victoria looked to the mallee fowl constellation, Neilloan (Lyra), to tell them when they should harvest the bird's eggs. When Neilloan appeared in the north-west sky around April, they knew the birds would be preparing their mound-like nests.

The disappearance of Neilloan in late September or early October meant it was time to start gathering.

"All of these things were very important as food sources," says Haynes.

While the night sky had a very practical use for Aboriginal people, it was also valuable spiritually, as a means of reinforcing culture and community, says Haynes.

"[Objects in the sky] had stories attached to them to do with the values and morality of the community. So when constellations appeared, the stories were told and those lessons would be ingrained in the younger people."

"They were interested in the holistic view that it gave them of the world, that the heavens were as close to them as the surrounding earthly environment."

## **Inquiry: Planets, stars, Sun, Earth, Moon.....outer space.**

### **What do we know?**





**Know. K** Collect all of the information that the students know about Planets, stars, sun, earth, the solar system, moon.....outer space.

Create a brainstorm or Mind map of all of their knowledge: Then with them begin to sort all the information into a table or a structured overview with all of their ideas sorted into categories. Everything that they know:



### Finding out:

#### What is a Planet?

This seemingly simple question doesn't have a simple answer. Everyone knows that [Earth](#), [Mars](#) and [Jupiter](#) are planets. But both [Pluto](#) and [Ceres](#) were once considered planets until new discoveries triggered scientific debate about how to best describe them—a vigorous debate that continues to this day. The most recent [definition of a planet](#) was adopted by the International Astronomical Union in 2006. It says a planet must do three things:

1. It must orbit a star (in our cosmic neighborhood, [the Sun](#)).
2. It must be big enough to have enough gravity to force it into a spherical shape.
3. It must be big enough that its gravity cleared away any other objects of a similar size near its orbit around the Sun. <https://spaceplace.nasa.gov/all-about-earth/en/>

**W:** What intrigues the students?

What do they want to know more about?

Encourage regular exploration of the NASA site either as a whole class or individually.

Use the NASA spaceplace site as the students can access all of the information that they need on that site.

<https://spaceplace.nasa.gov/all-about-earth/en/>

Let them take time exploring the site.

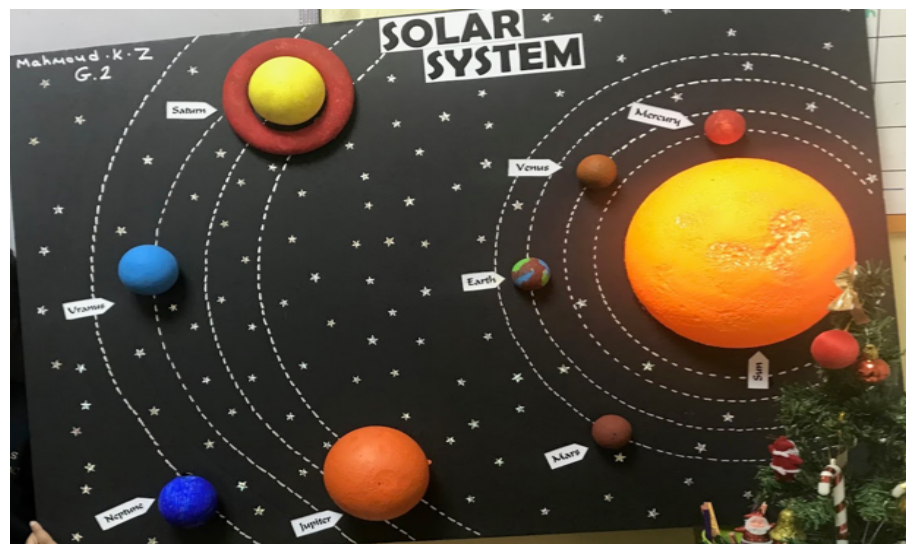
***There is a space image a day on the NASA site that will be an excellent stimulus for daily conversations.***

Allow them to choose something in the Solar system that they want to explore more fully.

Get the students to create an online folder or a scrapbook or a Book creator space as a final presentation or... .....where they can demonstrate all of the information that they collect.

### **Sorting out:**

Explore some of the key Solar system words that will be needed in this project so that the students can confidently spell them: Perhaps get the students to create a space wordle to add to their exhibition for the cover of their presentation?



Give the students a list of 8 generic questions that they must research about their chosen part of the solar system.

Encourage them to choose their Solar system topic widely so that at their class Exhibition or Showcase at the end of this inquiry most of the areas of the Solar system will be covered and all of the students will have heard everybody's research on PLANET DAY:

- The planets
- Sun
- Moon
- Earth
- Dwarf planets etc.,

Some suggestions for prompt questions to explore are below...

There are many on the NASA Spaceplace site: These are just some examples.

Wordle of space words as the cover of the PLANET booklet.
Page 1: Describe your chosen planet/moon, comet, asteroid etc., in the Solar system. Draw it or download an image of it. How big is it? What are its measurements?
Page 2: What makes up the surface of this planet? Create a drawing or a painting of the surface.
Page 3: What are its features? What makes it special? Can it sustain life? Is there water on this planet?
Page 4: What is so important about this planet?
Page 5: Where is this planet situated in the solar system? Show it in relation to the solar system.
Page 6: What are its closest neighbours. How important are these neighbours to the planet?
Page 7: How connected is this planet to us? Does it affect our weather or our environment?
Page 8: Make a list of all of the fun facts that you have discovered about this planet.

**Going further and exhibiting:**

**PLANET day.**

Celebrate the work that the student's have done.

Give each student 8 minutes or so to present their Solar system project or set up little displays around the class so that each child can visit each other or invite visitors in to hear the student's present their work or?

Revisit the K and W of the **KWL** and talk with students about what they have learnt as a reflection at the end of the PLANET day.

**L: Planets, stars, Sun, Earth, Moon.....outer space.**

**What have we learnt?**

