SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Prize Winner

Science Writing

Year 9-10

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Mary MacKillop College

Oliphant Awards Submission: *First Nation's Science*

Thesis: Aboriginal People have a rich understanding of the sky and looked to it for guidance. Explore the observations made around creation and the influence astronomy had on everyday life.

Introduction:

"What Aboriginal and Torres Strait Islander peoples see in the sky are not only planets, stars and other physical bodies, but something much grander: a confirmation of what we already know about how the world operates – time, life, our place in the universe [Australian Government, n.d.]."

Australian Aboriginal People have inhabited Australia for an excess of 60,000 years, and were the first people to do so. Many communities of Aboriginal People existed pre colonisation *(Figure 1)*, and the reason they thrived was their environmentally focused lifestyle. Connection to land and spirituality was, and continues to be, important in Aboriginal culture, and this is reflected in the way they interacted with the world around them *[AIATSIS, 2022]*. One such example of this is Australian Aboriginal People's knowledge of astronomy – the scientific study '*of everything in the universe beyond Earth's atmosphere' [AMNH, n.d.]*. Australian First Nations People are known as *'the world's oldest astronomers' [Australian Geographic, 2017]*. Their intimate understanding of the skies dictated cultural practices, hunting, and shaped Aboriginal People's worldview.

The Kaurna People of the Adelaide Plains *(Figure 2)* were also Aboriginal astronomers, and while much of their heritage is sadly unrecorded, this report aims to include their perspective where possible.

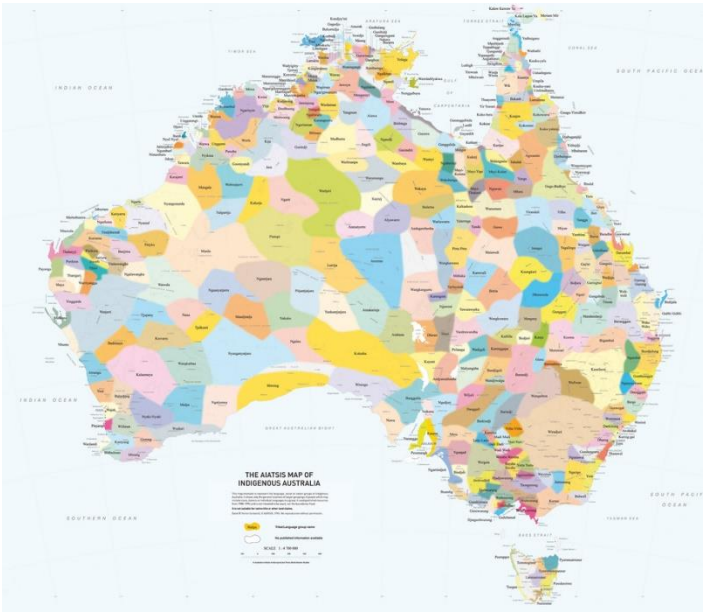


Figure 1: Map of Australian Aboriginal Groups

Source: AIATSIS

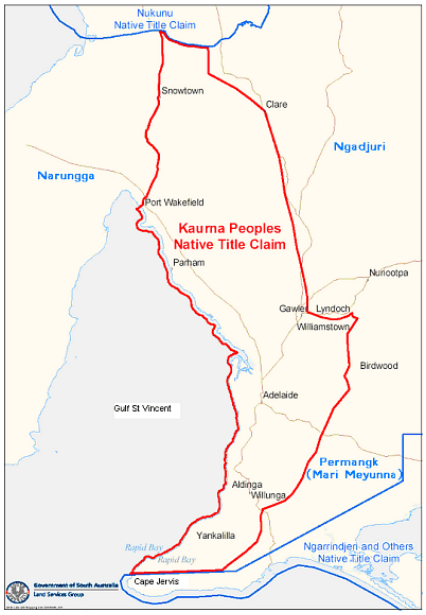


Figure 2: A map showing the position of Kaurna Land

Source: Native Land Digital

Cultural Practices and the Dreamtime

Since the beginning of time, humans have wondered about their purpose and the way the universe was created. Cultures across the centuries have created ways of explaining creation, often linking it to astronomy. Aboriginal communities were also seized with the desire to discover their origins, using primarily Dreamtime stories. Dreamtime stories are used to explain the origin of the world, and instruct future generations of the way to behave, as well as warning them about the consequences of disobeying. These stories lay the basis for Aboriginal society *[Common*

Ground, n.d.]. Stars are linked with stories and elders use them as vessels to share oral tradition and act as a constant reminder of their heritage.

Many communities believed that spirits walked the earth during the Dreamtime, before taking their place in the sky. For this reason, many Dreamtime stories are firmly rooted in astronomical beliefs. For example, the sun and the moon commonly represent creator spirits, including in Kaurna culture, while the planets are their children *[D. Hemacher, 2015].*

Studying Dreamtime stories demonstrates to modern astronomers the vast knowledge Aboriginal People acquired, well before Europeans. The *Dreaming Road* is common across many oral traditions, and corresponds with the path of the Zodiac, in which the planets move across the sky in a straight line (*Figure 3)*. What is particularly unique about the Dreaming Road is the way that the Wardaman people used it to observe conjunctions of the planets, and their retrograde motion. Put simply, this is the phenomenon where the planets can appear to stop, slow down and move backwards as they near one another in the sky *(Figure 4)*. While this concept is explained simply in Wardaman lore – as ancestral beings undertaking a journey and stopping to communicate – this masks the high level of scientific knowledge and observation undertaken to reach this conclusion *[University of Melbourne, n.d. - citing elder B.Y. Harney].*

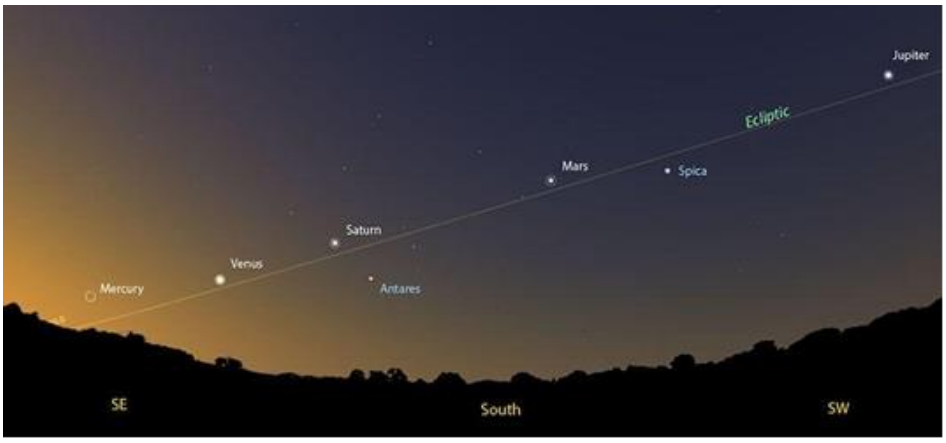


Figure 3: An image showing the Dreaming Road or path of the Zodiac.

Source: University of Melbourne

Figure 4: An image showing Mars undergoing retrograde motion near the constellation of Virgo

Source: University of Melbourne

Interpretations of the Milky Way Galaxy

In Australian skies, one of the most striking astronomical features is the Milky Way Galaxy. Unsurprisingly, its prominence means that there are many differing opinions about what is represents.

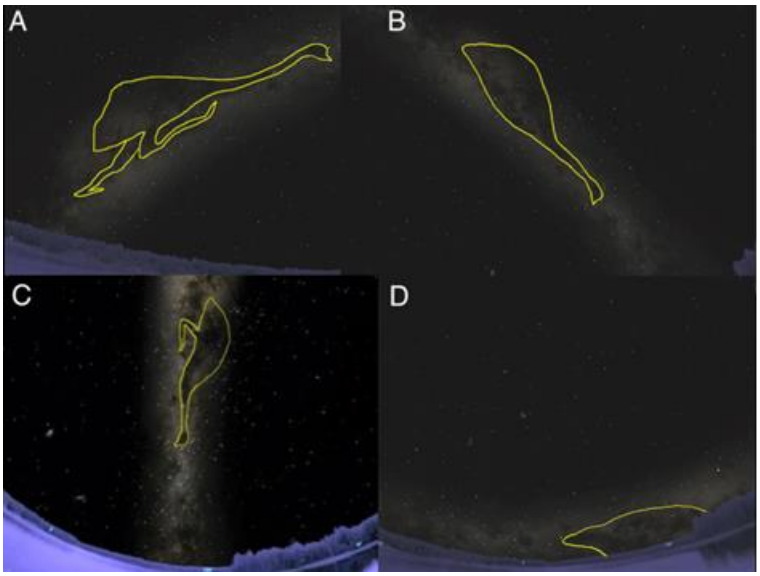


Figure 5: An image of the Emu seen in the Milky Way Galaxy – letters as corresponding in text.

Source: Ghillar Michael Anderson and Robert Fuller

Most commonly, the Milky Way is viewed as an emu (sometimes called *Gawarrgrgy*), whose head starts in the Coalsack Nebula and body follows behind *(Figure 5).* This is particularly seen throughout Central New South Wales, in Wiradjuri land *[K. Banks, 2019]*. This association between the Milky Way and an emu carries both stories and practical knowledge about the surrounding landscape. As the earth orbits, the Milky Way is at different points in the sky, and these coincided with the breeding cycle of emus. When the Gawarrgrgy is running through the sky *(A)* it is looking for a mate. Then, Gawarrgrgy is sitting on the nest, and emu eggs are ready to be collected *(B)* – a vital source of food for many communities. The emu then leaves the nest and chicks hatch *(C),* before heralding summer rains by 'sitting in the billabong' *(D) [University of Melbourne, n.d.].*

Interestingly, the Kaurna people have a very different perspective on the Milky Way, which more accurately reflects the Adelaide Plains area. They see the galaxy as a river connecting the land with the sky, called *Wodliparri* or 'hut river', surrounded by reeds and huts *[M. Steffans, 2009].* In their Dreamtime stories, the dark areas of the river are called *Yurakauwe,* and are a series of lagoons and billabongs. Here, an evil creature resides and kills anyone who comes too close *[P. Curnow, 2011].*

Interpretations of the Southern Cross

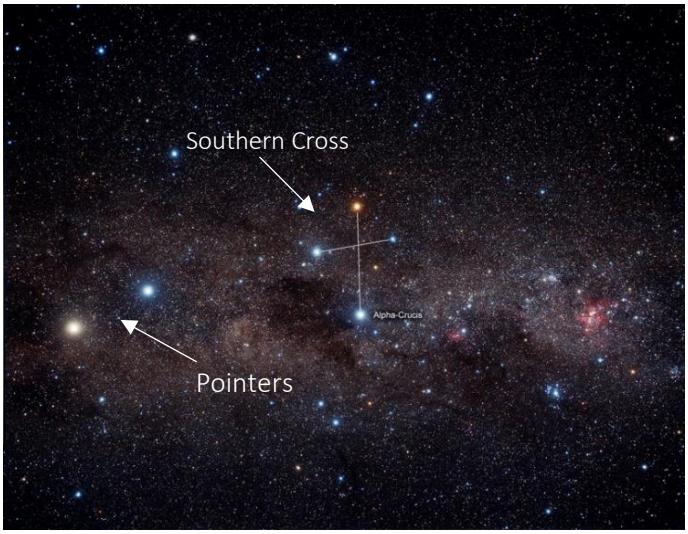


Figure 6: A diagram showing the Southern Cross Constellation

Source: ABC with additional labels by the author.

For many Australians today, the Southern Cross is important and easily recognisable, and this was the same in Australian Aboriginal Communities *(Figure 6)*. For example, in Coastal South Australia, the Southern Cross is a stingray chased by two sharks (the pointers) to the Ngarrindjeri People. The shark is an important totem to them, so they are particularly connected to this constellation. Commonly in the Eastern States, the Southern Cross is seen as an eagle, and a powerful entity. He shares a variety of names, such as *Bundiil* and *Wildu.* The Anindilyakwa People of the Gulf of Carpentaria saw the Southern Cross as two fisherman and their fires *[B Brennan, 2010 - citing astrophysicist Ray Norris].*

Traditions related to the Southern Cross demonstrate the advanced astronomical knowledge of Aboriginal People, especially considering that European scientists didn't observe the Southern Cross until 1515. While the traditions relating to this constellation had already been passed down through generations in Australia, they were only just being recorded on star charts in the Western world. Also, there is evidence that communities knew that the stars in the Southern Cross were circumpolar (don't rise or set), which are quite advanced concepts to be observed without telescopes or an understanding of the physics causing this *[R. Bathal, 2006].*

A Cosmic Calendar

Due to their nomadic lifestyle, it was imperative that Aboriginal communities understood the seasons. These dictated when to move campsite or harvest certain flora and fauna. The changing of seasons was reflected in the night sky. An amazing piece of ingenuity is at Wurdi Youang in Victoria *(Figure 7)*. This is known as 'Australia's Stonehenge' and is a stone arrangement to record the sun's position at the annual solstices and equinoxes *[R. Norris, 2007].* These were indicative of the longest and shortest days of the year. Wurdi Youang demonstrates the difference of time keeping in Aboriginal thinking. Instead of linear time, they have circular time. This means that they see events as repeating and going round. Instead of focusing on individual days and seasons, Aboriginal People record the events as being in the past, present and future *[R. Norris, 2021].*

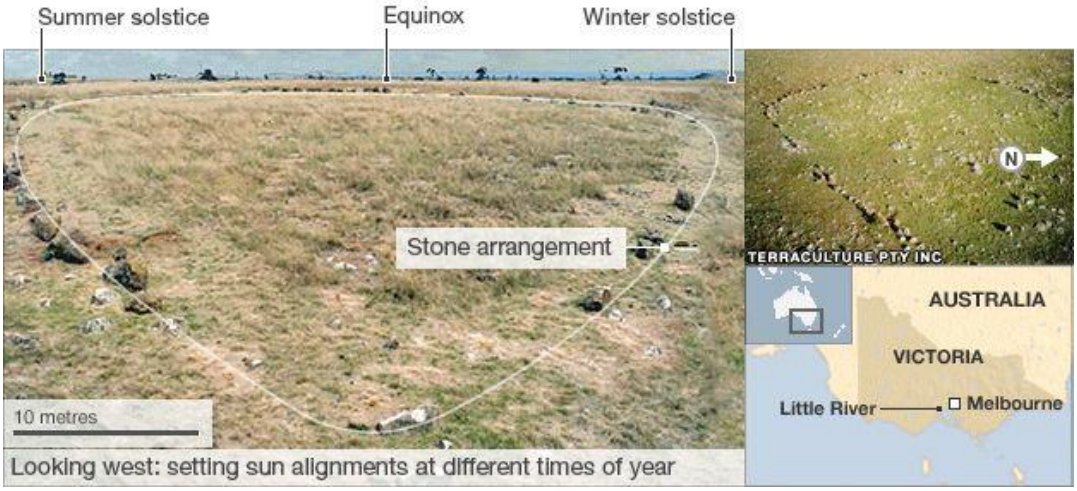


Figure 7: An image of the Wurdi Youang arrangement.

Source: S. Hegarty - BBC

The Kaurna people used certain stars to tell them when to prepare for the four seasons. These were *Wolta* (summer), *Kudilla* (winter), *Wilto* (spring) and *Parna* (autumn), and marked by the appearance of their associated stars at dusk *[University of Melbourne, n.d.]*. *Wilto* was likely under the influence of one of the stars in the Southern Cross. *Wolta* was influenced by the 'Wild Turkey' constellation, which is unknown. Unfortunately, many of the specifics have been lost, so it is unsure which stars the other seasons are assigned to *[D. Hamacher, 2015].*

Within a smaller timeframe, meteorological events could be predicted by looking at the stars, and the way their appearances changed. In northern Western Australia, Aboriginal communities look for differences in the colour and clarity of stars to predict rain. When the Pleiades (or Seven Sisters) look blue and fuzzy, rain is coming, and fisherman stay on land. The science behind this is that atmospheric conditions change, and light is refracted at a different rate. Using methods like this, Aboriginal communities could make informed choices about when to plant their crops or relocate *[D. Hamacher, 2018]*.

Figure 8: An image of a moon halo.

Source: Arabia Weather

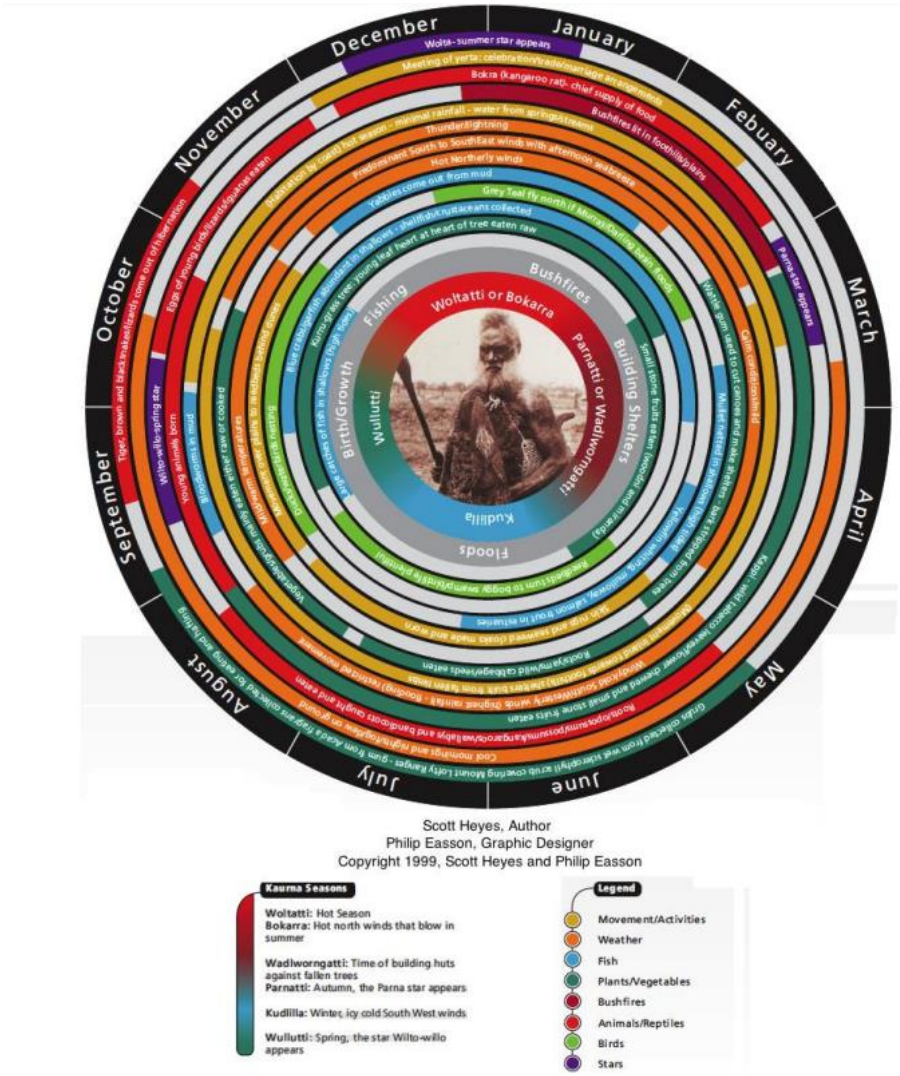
Similarly, the moon was used to make predictions about the weather. Moon halos are a meteorological phenomenon where light refracts off ice crystals in the atmosphere *(Figure 8)*. Moon halos were used to predict when storms were coming, particularly in alpine regions. Even more specifically, communities found ways of predicting how far away the approaching storm was. The number of stars you could see between the moon and the ring of light reflected the humidity. Lots of stars meant low humidity, and the storm was a few days away; few stars meant high humidity and the storm would hit within a day. Studies have found that these predictions are extremely accurate *[K. Noon, 2017]*.

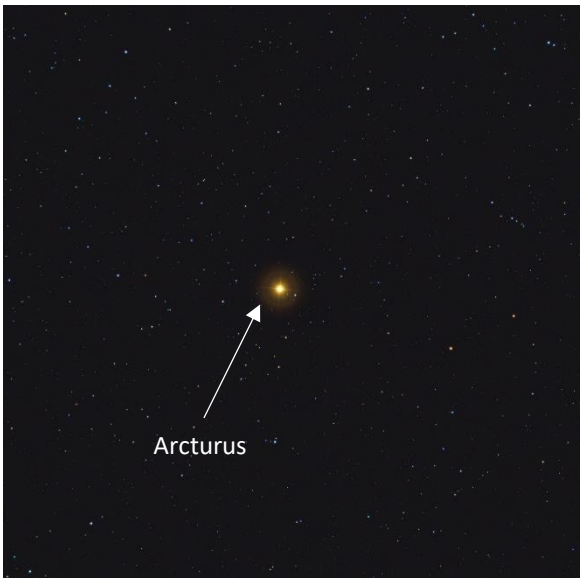
A Heavenly Menu

Historically, astronomy has been used to determine migration patterns. Aboriginal communities used careful observation to discover the intricate patterns of the stars and their correlation with the natural world. This was important knowledge, as many of the plants and animals they relied on for sustenance were seasonal *(Figure 9)* [University of Melbourne, n.d.].

In Victoria, the Boorong people called the constellation Lyra, Malleefowl. They noticed that during its annual helical rising, the Malleefowl were building their nests. When the constellation disappeared, their eggs were ready to be collected. The breeding cycle of the Malleefowl was carefully observed. These observations were then associated with something in the sky to allow for it to be easily passed down and remembered *[Australian Geographic, n.d. - quoting R. Norris].*

The Wergaia people have a similar story. They talk of a woman called Marpeankurric , who was sent to find food during the winter drought. She followed some bush ants to their nest and was curious about where they were going. When Marpeankurric dug into the nest, she found *bittur* (termite larvae), and was able to feed her community. According to the story, when Marpeankurric died, she was sent up as a star, so that when she rose in the evening, everyone would know to collect the *bittur.* The star is likely Arcturus, and its red colour is the same of the ants she followed *(Figure 10) [M. Quach, 2017].*





***Left* – Figure 9:** A Kaurna seasonal calendar, showing seasons, stars and produce.

Source: S. Heyes and P. Easson

***Right* – Figure 10:** An image of the star Arcturus.

Source: Cloudy Nights with labels by the author.

Conclusion

Australian First Nations People have an incredibly rich trove of astronomical knowledge. Through precise observation, they were able to notice cosmic occurrences with surprising accuracy and used this expertise to understand and categorise the world around them. Modern day astronomers have so much to learn from their Aboriginal counterparts. All they have to do is look up and simply observe, following in the footsteps of generations of First Nations scientists.

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