

The Astronomy of the Aboriginal Peoples of the Sydney Basin

Robert S. Fuller¹ and Duane W. Hamacher²

¹School of Science, Western Sydney University, Kingswood, NSW 2747 Australia

²School of Physics, University of Melbourne, Parkville, VIC 3010 Australia
and ARC Centre of Excellence in All Sky Astrophysics (ASTRO 3D)

Corresponding author: r.fuller@westernsydney.edu.au

Abstract

We present results of a preliminary study of the astronomical knowledge and traditions of the seven major Aboriginal language groups in the Sydney Basin. We establish a basic dataset of oral traditions (stories), vocabulary, and examples of cultural heritage relating to astronomical traditions laying the foundation for further study. Using a combination of primarily ethno-historical documents and material culture, with preliminary ethnographic work with two consultants, we explore the relationship between Aboriginal astronomical knowledge and cultural traditions, cosmology, natural resources, calendar development, law, ceremony, and material traditions. We conduct a thematic analysis of the collected information and place this within a larger framework of comparative analysis with other Aboriginal communities in south-eastern Australia in general.

Warning to Aboriginal Readers: This paper contains the names of Aboriginal people who have passed away and references to cultural subjects that may not be appropriate for the reader.

Keywords: Indigenous Australians; Aboriginal Australians; oral traditions; cultural astronomy; archaeoastronomy; Sydney Basin

1. INTRODUCTION

We conduct a large-scale project on the astronomical knowledge and traditions of Aboriginal Australians along the New South Wales coast of Australia. Our study of saltwater Aboriginal peoples and their astronomical knowledge aims to understand the various ways in which Aboriginal people utilised the Sun, Moon, and stars, and how this is incorporated into songlines and Dreaming tracks that extend from the Torres Strait to Victoria.

This paper, focusing on the Sydney Basin from Newcastle to Wollongong and out to the Blue Mountains, represents a starting point for the larger project, which was part of co-author Fuller's PhD thesis under Hamacher's supervision. It is in the Sydney basin that Aboriginal people interacted with the first European colonisers and the first written records of Aboriginal language and traditions are found in the ethno-historic literature. With the damaging effects of colonisation in the Sydney region extending

back to 1788, we can also get a sense of the astronomical knowledge that has survived since then with applications to cultural identity, education, public outreach, and reconstruction of fragmented traditions.

This study is focused primarily on ethno-history, material culture, and ethnographic work, which will be discussed in the Methods section. We utilise the methods and frameworks of cultural astronomy. Cultural astronomy is the study of the effect of astronomical knowledge or theories on ideologies or human behaviour (Campion 2003: xv). Sometimes called the 'Anthropology of Astronomy' (Platt 1991), it is a highly interdisciplinary field, drawing from the social sciences, humanities, and natural and physical sciences. The study of the cultural astronomy in Australia arguably began with the work of Stanbridge (1857) and continues through today (Norris, 2016).

For this study, the geological definition of the Sydney Basin as the area of the Hawkesbury sandstone formation is used to define the area of study (Fig. 1). This is extended to the coastal cities of Newcastle and Wollongong. This area (with the extensions) is also the natural modern definition of the Greater Sydney Basin. The Sydney Basin is an important part of East Coast saltwater Aboriginal history.

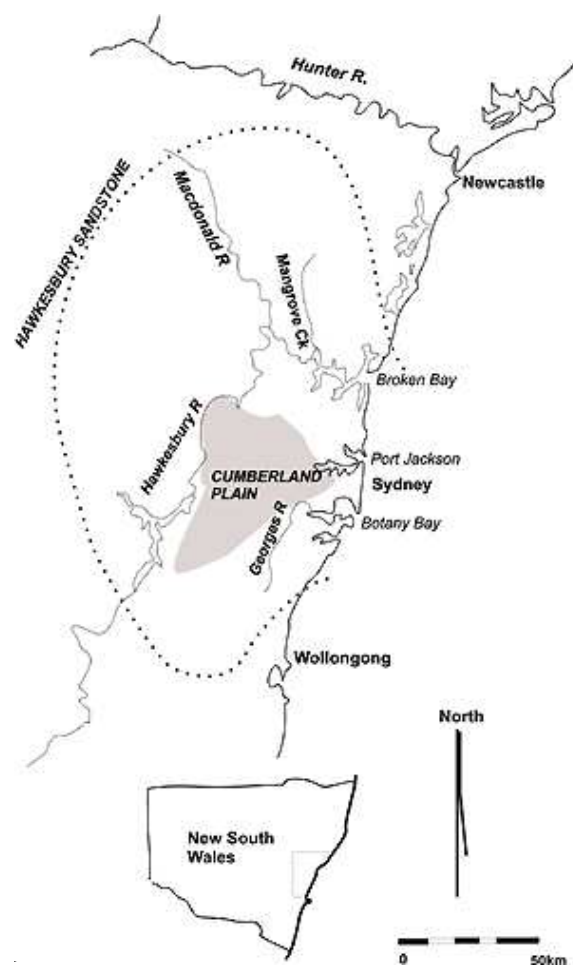


Fig 1: The Sydney Basin showing the extent of Hawkesbury sandstone, cities and major rivers (McDonald 2008, p. 2)

Aboriginal culture in Australia before 1788 possessed several universal features. Some of these include:

- a spiritual association with the land (Country) on which their kin group resided, so strong, in fact, that they believed that they belonged to the Country, not vice-versa,
- a system of Law, handed down by the creator heroes, that governed their relationship with each other, their Country, and everything contained in it. The Law, unlike European law, could not be changed or re-interpreted,
- a relationship with the resources upon which they lived that was controlled and sustainable,
- and a cosmology, or understanding of their universe, that was consistent with their belief system.

Aboriginal people in the Sydney Basin lived in their respective Countries, lived off the resources of their Country, and travelled outside their Country for trade, to share resources, and for ceremony. Strangers looked similar, had a shared Law and culture, and understood that other groups belonged to their own Countries. War for conquest of land as Europeans know it did not exist, conflict only serving as a cultural means of redressing wrongs.

The First Fleet arrived in 1788, first in Botany Bay, then in Sydney Cove, with over 1000 convicts, soldiers, and government personnel, all appearing, according to cultural belief, to be ancestors of Aboriginal people, who came back from the dead appearing white in colour. Europeans had visited Australia prior to 1788, such as the Dutch navigator Carstensz in 1623 (Willey 1979: 18), and Cook who visited Botany Bay briefly in 1770, and no doubt stories of these visits had spread around Aboriginal Australia via the excellent routes of communication. However, the large number of new arrivals and their aggressive flouting of Aboriginal customs would have sent shockwaves throughout the Sydney Basin.

Massola (1968: 105-106) told of a Victorian Aboriginal belief, which is purported to be universal across Australia, that the sky was held up by wooden props at the extreme edges of the Earth. The eastern prop was supposed to be in the charge of an old man of the Yarra tribe, and a message was passed around the Aboriginal people of eastern Australia that if presents were not sent to the old man, he would not repair the prop, and the sky would fall, killing everyone. Willey (1979: 55) says that the inference was that the danger was coming from the east, the direction from which the invaders came to Sydney, and because the eastern prop had fallen, the sky had fallen, and the ghosts or reincarnations of all the Aboriginal people who had lived had broken through from the spirit world to take over the land.

For the Aboriginal people of the Sydney Basin, a combination of smallpox, dispossession of land, and cultural destruction resulted in a vast silence about the rich culture of the peoples in this region. That silence is shown in the confusion and

argumentation about languages and boundaries of Aboriginal peoples of the Sydney Basin, and in the cultural gaps that are revealed in the lack of understanding of such aspects of culture as rock art. Similarly, there is a dearth of material for cultural astronomers, a situation which this study hopes to amend.

2. Language groups and uncertainties

Who are the Aboriginal peoples of the Sydney Basin? Archaeological evidence from sites in the Sydney Basin show occupation for at least 15,000 years BP (Attenbrow 2002: 3), so this region has a long history of settlement by Aboriginal peoples.

McDonald (2008: 20-22) surveyed the often chaotic and controversial scholarly writing on the languages encountered on the arrival of the First Fleet in 1788. From Dawes (1790), Hunter (1793), Tench (1793), and Collins (1798), we have some knowledge of languages and word lists, of the Sydney “language” (which we know was more than one). Threlkeld recorded details of a language “to the northward of Sydney” which Capell (1970: 23) suggests is the Kuringgai language, confirmed by Fraser (1892).

The ethnographer, R.H. Mathews, reported on the Dharawal language to the south of Sydney cove (Mathews 1901a), the Gundungurra language to the west and south of the Cumberland Plain area of Sydney (Mathews 1901b), and the Darkinjung language to the north of the Hawkesbury River and to the west of the Kuringgai and Awabakal language areas (Mathews 1897). Mathews originally defined the Dharug language as a dialect of Gundungurra (Mathews and Everitt 1900), but Capell (1970: 21) re-defined Dharruk (Dharug) as a separate language group between the coastal Kuringgai and Dharawal, and (presumably) the Gundungurra to the West.

Based on these sources, including McDonald (2008) and Capell (1970), we decided to include seven major language groups in this study: Awabakal, Darkinjung, Dharug, Gai-mariagal, Gundungurra, Kuringgai, and Dharawal. The boundaries of the Kuringgai, the Dharawal, and the Dharug are disputed (Capell 1970; Eades 1976; Kohen and Lampert 1987; Troy 1993; Smith 2004; and Steele 2005) and the spelling of each language group varies. There is even a suggestion by Darkinjung speakers that the Kuringgai (Guringai) people did not exist, but this has been disputed by persons who claim descent from the ‘Broken Bay peoples’ via the well-known Aboriginal person, Bungaree.

We assign knowledge from this study to the respective language groups to the best of our ability, but due to the complex and sometimes controversial issue of languages, dialects, and geographical boundaries, we acknowledge the uncertainties in this aspect of our study. Fig. 2 shows the language groups in the Sydney Basin as shown on the language map published by AIATSIS in 1994.



Fig 2: The Sydney Basin Language groups (image courtesy of AIATSIS)

3. METHODS AND THEORY

Much of the information published about Aboriginal astronomical knowledge and traditions from the Sydney basin are fragmented and scattered throughout the literature, in library and museum archives. We conduct a detailed survey to collect any and all records or accounts of astronomical objects and phenomena from the Sydney region and/or language groups mentioned above. We also draw from material culture sites and artefacts, such as rock art. Most of our survey draws upon literature of the early colonists and travellers from the period between 1850–1900, and from the 1880's by professionals who would later be considered ethnographers.

Interested individuals had various concerns, from folklore to linguistics (William Ridley being one of the latter), and the early ethnographers, such as R. H. Mathews, were in regular contact with Aboriginal people. Threlkeld, in establishing his church mission to Lake Macquarie in 1834, was the first colonist to thoroughly explore the culture and language of one language group (the Awabakal) and record it. But it wouldn't be until 1897 and 1901 that Mathews published articles on the cultures of some Sydney Basin Aboriginal peoples (Darkinjung, Dharawal, and Dharug). By this

time, he was presumably limited to the knowledge of elders from communities which had undergone much change since 1788.

Materials examined during this study included cultural stories, language and vocabulary, archaeological surveys of material sites, rock art, and anything with reference to the subject of astronomical knowledge. The sources of historical archival material for the Sydney Basin used for this study include the State Library of NSW (Mitchell Library), the on-line “Virtual Sourcebook for Aboriginal Studies in the Hunter Region” of the University of Newcastle, the Library of the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS), and the National Library of Australia (including the TROVE database), and other regional libraries.

We also present results of a preliminary ethnographic study, drawing on traditional information provided by Dharawal elder and academic Leslie Bursill, OAM, and (non-Aboriginal) rock art researcher Robert Pankhurst, who was given traditional knowledge by Darkinjung elders about their stories and rock art decades ago. Pankhurst has been given permission to supply information for this study. Both Bursill and Pankhurst participated in this study in accordance with UNSW Human Research Ethics Project HC16335.

We are aware of the Aboriginal practice of limiting access to levels of meaning in stories, where the meaning and detail in a cultural story are different depending on the level of initiation, gender, and age of the person learning the story. In the case of this study, we limit the level of the story recorded to that of a non-initiated person, and to the best of our ability, ensure that the story reported does not have gender restrictions.

We conduct a thematic analysis of the information collected to search for patterns and use them to create codes. We then combine the codes into themes, define each theme, and use the major themes to create a ‘thick description’ (Geertz 1973). This approach is used, but only in a gross manner, to create themes for comparative analysis.

4. RESULTS & ANALYSIS

The results of the literature study can be found in Table 1. Our survey identified 84 sources containing 22 stories and 101 vocabulary items. Stories are cultural stories. The 14 items of astronomical knowledge are information found related to astronomy, but not in story form. The actual stories and knowledge collected, a total of 34 items (including duplications), are far too lengthy for this article. A database of the stories is available at Appendix 1.

	<u>Awabakal</u>	Darkingung	Dharug	Gai-mariagal	Gundungurra	Kuringgai	Thurrawal
Stories	5	1		1	4	3	8
Astronomical knowledge	1	4		2		5	2
Astronomical objects described	<u>Sun</u>	<u>Moon</u>	<u>Meteors</u>	<u>Milky Way</u>	<u>Stars</u>	<u>Southern Cross</u>	
	6	11	4	2	4	1	
	<u>Pleiades</u>	<u>Orion</u>	<u>Planets</u>				
	9	1	1				

Table 1: Results of Literature Study; stories/knowledge by type and theme

Our thematic analysis of the stories resulted in 47 separate 'starting' codes, as follows:

1. Something falling out of the sky
2. Deity angry about roasting lice in the fire
3. Moon – male
4. Sun – female
5. Deity ascends back into sky
6. Killing large number of people
7. Moon jealous of Sun
8. Tears of Moon fall as rain
9. Ceremony to honour Moon-man
10. Eaglehawk / All-father
11. Eaglehawk – Altair
12. Crow subservient to eaglehawk
13. *Baiame* created man and woman
14. First man to die climbs tree to Heaven
15. Mundoes are *Baiame*'s footprints
16. *Baiame* stepped off flat-top mountain back to sky
17. Quartz crystal associated with *Baiame* in Bullima
18. Carvings in ground
19. Sun looking at buried dead
20. Young man desires wrong woman
21. Wrong use of resources
22. Moon origin is woman who wants wrong marriage
23. Young man desiring woman in (22) turns into brown snake
24. Moon who was wrong woman group, with child, water breaks, no water – brown snake
25. Sisters pursued by wrong person
26. Sisters climb, jump, thrown into sky
27. Moon man swells due to various reasons
28. Bad people eat human flesh
29. Burn out bad people
30. Venus was bad person
31. Milky Way is giant turtle

32. Holes/tunnels often lead to places like Bullima
33. Story explains marking/nature of animal
34. Spirit with red glow floats up and becomes Betelgeuse
35. Seven Sisters controlled cold, ice, and snow
36. Seven Sisters created creeks and rivers
37. Spirit (burned) becomes Aldebaran
38. Earth is flat plain with Sun, Moon, and stars revolving around
39. Sun produces light only (no heat)
40. Seven Sisters produce heat
41. Lightning Brothers and Alpha/Beta Centauri
42. Baiame created Country and Law
43. Sun is male
44. Moon is female
45. Moon was boomerang
46. Resource connection to object in the sky
47. Baiame travelled with a canoe

Combining the codes into themes resulted in the following 12 themes. The number of codes connected to a theme is only an indicator of the complexity of a theme, not of any relative importance.

4.1 Something falling from the sky (2 codes)

The first theme is that of something falling from the sky, usually described as a falling star (meteor) or rock. It is often ascribed to an omen and is consistent with Aboriginal perceptions of meteors across Australia (Hamacher and Norris 2011). Most Aboriginal descriptions of meteors have negative connotations and are perceived as bad omens. A Darkinjung tradition describes a meteor as a portent of something good happening. A similar view is held by the Lardil of Mornington Island, who see a white meteor as a good omen, but a coloured meteor as a bad omen.

Another thread within this theme is that of objects falling from the sky as punishment for breaking traditional laws and taboos. An example from this study is from Awabakal traditions regarding the formation of unusual rocks. In this tradition, people were roasting lice over an open fire, which was forbidden. As punishment, a sky goanna cast down a fiery stone which struck the land and killed the people. Remnants of the stone can be found at *Kurran Kurran* on Lake Macquarie, which has been identified as petrified wood.

A very similar tradition was found from near Toowoomba, Queensland in which a woman accidentally cast head lice into a fire. As punishment, a star fell to earth and killed the people, creating a spring called Woonarrajimmi (Hamacher, 2013). Aboriginal traditions from across Australia describe a fiery stone cast to earth as punishment (Hamacher and Norris, 2009). The Awabakal tradition links with the theme 'consequences for breaking traditional law', which will be described later.

4.2 Culture heroes (4 codes)

Stories about culture heroes, such as Baiame, were often connected to the sky, as he is believed to have come from the sky, and eventually returned there after creating Country on the Earth. Baiame was also known by other names, such as the Awabakal *Boyma*, and the Yuin *Dhurramoolun*. *Dhurramoolun* was variously described by other language groups as a son or associate of Baiame. Research with the Euahlayi and Kamilaroi has indicated that the constellation Orion can be Baiame for the purpose of ceremony (Fuller 2014: 110). Love (1988) has quoted Winterbotham's interviews with the Jinibara man, Gaiarbau, from south-east Queensland, that the *bora* initiation ceremony is done "for Baiame", with the direct intervention of his son/nephew, *Daramulan*. This was confirmed by the Euahlayi people (Fuller 2014: 19).

Early writers about Aboriginal culture in south-east Australia commented on the use of the word "Father" for a higher being (Manning, J. 1882: 160). Manning was reporting on a visit in 1844-5. Howitt (1904: 507), reported on the wide belief in an "all-Father" in south-east Australia, and Parker (1905: 4) confirmed that Baiame was "all-Father" for the Euahlayi people. The culture hero and creator, Baiame, was common to many language groups in south-east Australia (Fraser 1889: 10). Baiame's son, *Daramulan*, visits the people at the *bora* initiation ceremony and it is through *Daramulan* that Baiame "sees all" (Fraser 1882: 208; Howitt 1884: 458).

The *bora* is a ceremony common to south-east Australia (*bora* is a Kamilaroi/Euahlayi name, and other communities use different names for the ceremony). The *bora* ground commonly consists of two circles on the ground, either earth or stone. Baiame is celebrated at the *bora* ceremony (Ridley, 1873: 269) and *Daramulan* is believed to come back to the Earth by a pathway from the sky (Fraser 1882: 212). Eliade (1996: 41) reports that Baiame "dwells in the sky, beside a great stream of water (Milky Way)".

Fuller et al. (2013) tested the hypothesis that the orientation of *bora* ceremonial grounds, which are a large and a small circle connected by a pathway, was aligned with the Milky Way, which is vertical in the South-Southwest sky early evening in August and September. The results of testing the alignment of 68 *bora* sites using a Monte Carlo simulation confirmed that the alignment was not by chance. There is also speculation from Love (1987: 3), and evidence from Gaiarbau in Winterbotham (1957: 3-4) that the cultural Emu in the Milky Way may be the connection between the *bora* alignment and the sky at this time of the year.

Another connection between Baiame and the Sydney Basin occurs in Darkinjung Country at Mt Yengo, west of Wollombi, NSW. According to Aboriginal peoples from the Hunter River to Port Jackson (Sydney), Mt Yengo (Fig. 3) is where Baiame stepped off the sandstone country and into the sky when he had completed giving his Law (Jones 1993: 4).

4.3 The Moon (7 codes)

The Moon, being visible most nights, has many stories connected to it regarding gender, creation, behaviour, and connection to Law. He/she (the Moon has different genders according to different language groups) is often a common theme in more detailed stories. For the Awabakal people, the Moon was used to illustrate jealousy (of the Sun), and also to explain natural features, such as Belmont Lagoon.

The Gai-mariagal people used the Moon in a story illustrating the effects of breaking marriage Law. This is a story of a young woman who was ready to marry an important person and a young man who was to marry a widow. The young woman rejected the marriage plans and proclaimed her love of the young man, who then broke the Law by over-fishing. For causing this, the young woman was cast out of her Country and wandered until she found some clever people who caused her to go into the sky where she became the Moon. As the Moon she becomes pregnant to the brown snake, who is the young man who was similarly cast out, and she grows fat until her water breaks and there is rain on the Earth. The child comes to Earth as a shooting star.

The Gundungurra had a story that explained the phases of the Moon, and the Dharawal described the Moon as a person who chased the Seven Sisters into the sky. The Moon in other areas of south-east Australia is used variously in stories, such as the Euahlayi *Bahlloo*, who with *Wahn*, the crow, is responsible for girl babies, but is also used for weather forecasting (Fuller 2014: 63-65).

4.4 The Sun (4 codes)

The Sun, which is generally a female (except for the Yuin, to whom it is Grandfather Sun), has a less common connection to stories, and is often just a backdrop to a story. Interestingly, there is a Dharawal belief that only light, not heat, comes from the Sun, and that the Seven Sisters, who arrive with Spring, are the source of the summer heat. For the Darkinjung, the Sun was a symbol used in ceremonial ground sculptures, and burials were made in such a way that the Sun could look at them each day.

4.5 Ascent of a culture hero to the sky (3 codes)

There is a common belief that Baiame had ascended into the sky when he was done with creation and giving Law, and that he ascended/jumped off from a flat-topped mountain, which was made flat when he ascended. Mt. Yengo in the Hunter Valley is probably the most well-known jumping-off spot in the Sydney Basin.

The Darkinjung story of Mt. Yengo (which is on their Country) connects to the Southern Cross, and the story of the first man to die. Baiame created two men and a woman, and one man refused to eat his totem animal, so began to die. He travelled into the sky via a tree which is now used by the spirits of the dead. The footsteps he used to climb the tree are now the stars of the Southern Cross and are now called

mundoes. The mundoes of Baiame when he jumped back to the sky at Mt. Yengo can still be seen on the surrounding rocks.



Fig 3: Yengo is to the sandstone country what Uluru is to central Australia. (Jones 1993)

4.6 Ceremony (2 codes)

There are only a few references to ceremony connected to the sky, but previous research has shown a strong connection between the bora initiation ceremony, and certain objects in the sky, such as the celestial Emu (Fuller et al, 2013). In the Sydney Basin stories here, the Awabakal and the Darkinjung both have references to ceremony.

In the Awabakal story of the Moon and Belmont Lagoon, the Moon is jealous of Sun's beauty, and cried tears for days until they formed a large lagoon. He was pleased that the Aboriginal people would be able to see him reflected in the Lagoon when he was full and became happy. The Awabakal afterwards hold a corroboree at the Lagoon to celebrate the Moon man.

There are many other connections between the night sky and ceremony by language groups in the Sydney Basin, but most are of a sacred nature, and not for discussion in this study. Some examples which can be discussed are that of Orion, the human stick-figure, which can represent Baiame when it is setting on the western horizon (Fuller 2014: 109-110), and Venus and Mars, who are variously the eyes of

Baiame, and are related to the lighting and dousing of the Sacred Fire, and possibly to the Morning Star ceremony (ibid: 107). These latter examples may have also occurred during ceremony in the Sydney Basin, but this has not been confirmed.

4.7 Characteristics of Individual Stars (6 codes)

There are several stories that explain how a particular star came to be, such as through an important person or animal. Often, there is characteristic of the star, such as colour, which relates to the story of how the star came to be. There was rarely any specification of difference between stars and planets, except in their motion, so any stories, such as the Gundungurra one about Venus, are included in the category as 'star'.

The Kuringgai people had a story about a young warrior who was in love with one of seven sisters who lived in the forests of Ourimbah. He kidnapped her, and her sisters managed to rescue her by freezing the warrior. Due to his continued attempts to capture her, the sisters decided to go into the sky, where they became the Seven Sisters. The warrior, after he had thawed out, kidnapped another young woman, but she was married, and her husband tracked her down, and chased the warrior into a tall tree. The husband started a fire, and the warrior was burned, where he drifted into the sky, and came to rest as the red star, Aldebaran.

4.8 Creation stories (4 codes)

There are creation stories connected to the sky, as the creator heroes are universally believed to come from the sky and returned there. The Darkinjung and the Dharawal have stories about the creation of Man, and the creation of everything, including the Earth and Country. As Deb Lennis explains about Dharawal creation:

Long before there were any people, plants, or animals on their land, *Baiame*, the spirit of our Ancestral Being, lived in the sky. He came down to what was a formless void and formed and shaped this land. It is he who gave the laws of life. Baiame returned to the sky and is known as the Sky Hero. When he had returned, he had left some parts unformed. These parts were formed by the activities of other creation spirits such as *Yullangur/gul*, the creation serpent.

4.9 Breaking law has consequences (6 codes)

Many cultural stories have a 'moral' to them, and Aboriginal cultural stories are no different. The Law was not to be ignored, that of marriage, and these stories have a strong message that there will be negative consequences for ignoring Law. In the case of this study, every community has one or more stories of the consequences for breaking Law, in many cases the marriage Law. The Seven Sisters move to the sky is universally a result of a man breaking Law, and the Gai-mariagal story of the Moon and Brown Snake is a very detailed story of the consequences to both parties of ignoring marriage Law. The Kuringgai story of the warrior and the Seven Sisters where the warrior ends up dying and becoming the star, Aldebaran, is a strong

message of the consequences of breaking Law, and in this case, there is a star in the sky that can be used to illustrate the message.

4.10 Seven Sisters creation (1 code)

The Seven Sisters, or Pleiades, are a nearly universal meme around the world, and they have a particularly strong presence in Aboriginal cultural astronomy. The stories, which usually begin with a male breaking Law regarding marriage or relationship with unmarried women, result universally in the young women climbing or jumping into the sky, where they become the Seven Sisters, often still pursued by the wrong man/men.

The Gundungurra have several stories showing how the Seven Sisters came to be, an example being the story of *Karrugang* and the Seven Sisters, where a magpie, *Karrugang*, chases seven sisters until one is drowned. *Karrugang* saves her and makes her his wife, forcing her to do all the work. The woman and her sisters pulled bark from a stringy-bark tree and sung the tree into the sky. They then climbed the bark into the sky, becoming the Seven Sisters.

4.11 Description of physical features and environment (6 codes)

These stories generally describe the physical features of the night sky, such as the Milky Way, and the Sun, Moon, and stars in their relationship to the land. Environmentally, they describe such matters as the Seven Sisters being responsible for heat (not the Sun), and ice and snow. The Dharawal ascribed to Boyma (Baiaime) the creation of all the heavenly bodies, including the Earth, which was a flat plane, around which the Sun, Moon, and stars revolved.

4.12 Resources (1 code)

These stories, which are more in the nature of “rules” rather than stories, describe the relationship between resources in Country and related night sky objects which may act as indicators to availability of those resources. Outside of the Sydney Basin, the Euahlayi people used the position and appearance of the Emu in the sky to determine the availability of the emu bird resource (Fuller 2014: 85-86).

Wherever Aboriginal knowledge of the night sky has been studied, there are links between this and aspects of resources management. While the cultural Emu in the sky was reported by Ridley as early as 1872 (274), the importance of the cultural Emu in resource management wasn't commented upon until Norris (2007: 3) pointed out that the alignment of the engraved emu at the Elvina Track site in Ku-ring-gai National Park matched that of the cultural Emu in the sky in April-May, when emu birds were laying their eggs (Fig. 4).

This connection between the cultural Emu and the emu bird as an egg resource was confirmed by Fuller et al. (2014: 175) regarding the Euahlayi and Kamilaroi

communities of Northwestern NSW, where they see changes in the appearance of the cultural Emu in the sky to signal changes in the resource management of the emu bird. When the “legs” can be seen, the female emu is chasing the male for mating, and when the “neck” disappears, it is time to stop collecting the eggs. It is possible that the Kuringgai people of northern Sydney, who are presumed to have produced the emu engraving, also had further cues in the appearance of the cultural Emu in the sky to help with resource management.

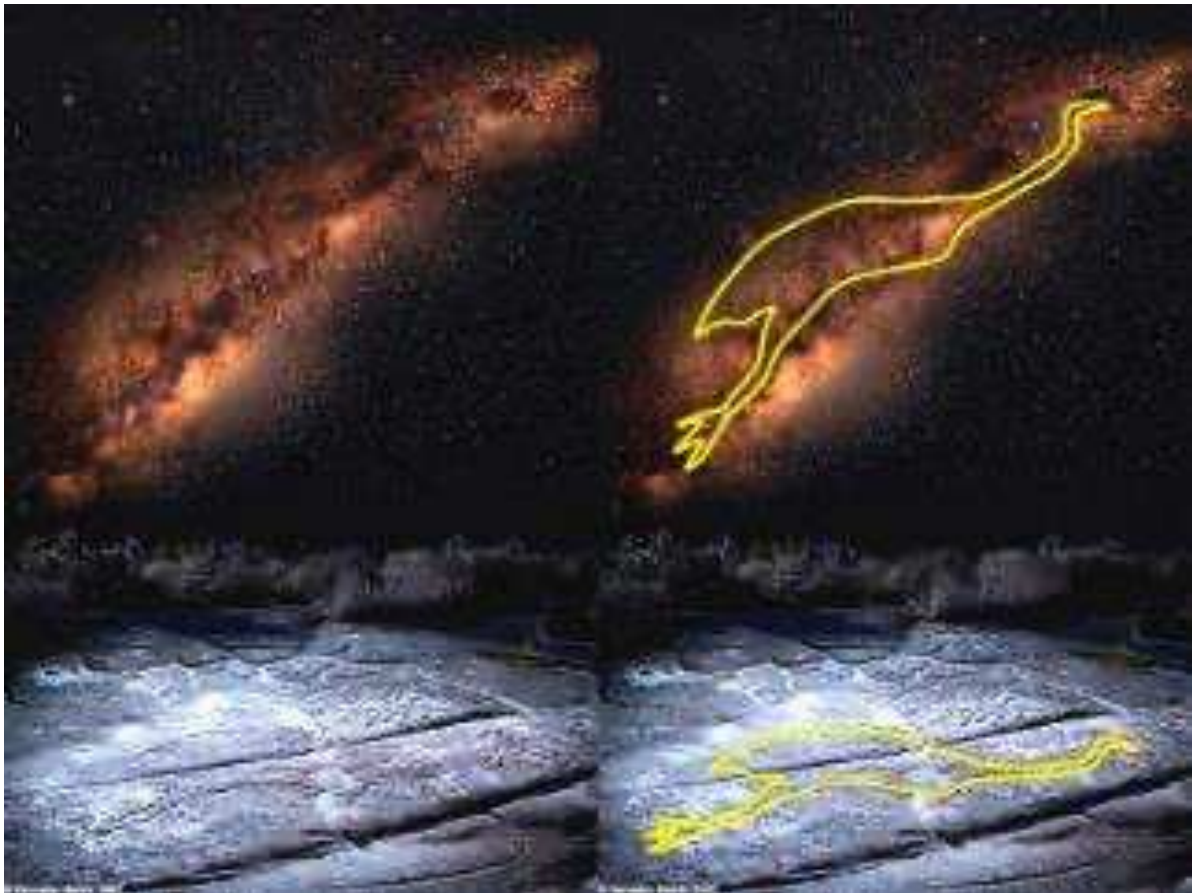


Fig 4: The cultural Emu in the Sky, and the matching engraving at Ku-ring-gai National Park (Norris & Norris 2007)

Turner reported (2014: 24) that Bursill has described how for the Dharawal people, the rising of some star groups such as the Pleiades, the Orion Cluster, and some larger stars such as Aldebaran directly coincide with the blooming of plant life and flowers, changes in temperature or season, and abundance of fruit growth. Bursill also said that the (evening) rising of the Pleiades heralds the Spring, and that the dreaming of the Wagilag Sisters (who dream the new season) is done. He also said that (the rising of) Orion’s Belt is the signal of Summer.

These examples of resource connections between astronomical objects and seasons are a sign that Aboriginal peoples in the Sydney Basin used the night sky as calendar to ensure their survival through knowledge of seasons and resources. Research in other

parts of Australia is revealing the close connections between resource management of animals and plants using knowledge of astronomy to provide indicators of when they are breeding, growing, and suitable for use as resources. Leaman et al (2016) show the close connections between animals represented in the sky by stars and other objects with the breeding cycles of their terrestrial counterparts.

5. THEMATIC CONNECTIONS BY LANGUAGE GROUP

An analysis of the themes and their relationship with individual language groups in the Sydney Basin does not show any real pattern, other than a strong interest in the Pleiades by the Dharawal and Gundungurra peoples, with most groups having a story about the Moon. Table 2 shows this graphically. Given the known similarity in cultures between these peoples, it would be expected that there would be a similarity in themes, and the lack of such is probably an indication that stories have not made it into the literature after the disruption of European colonisation took place.

The lack of any stories from the Dharug, who, depending on whose analysis is used, would be the most populous language group, or at least, the language group with the largest territory, indicates that knowledge was lost or not collected at the time. It is hopeful that the ethnographic phase of this project can fill in some of the gaps, and if so, more thematic connections can be made.

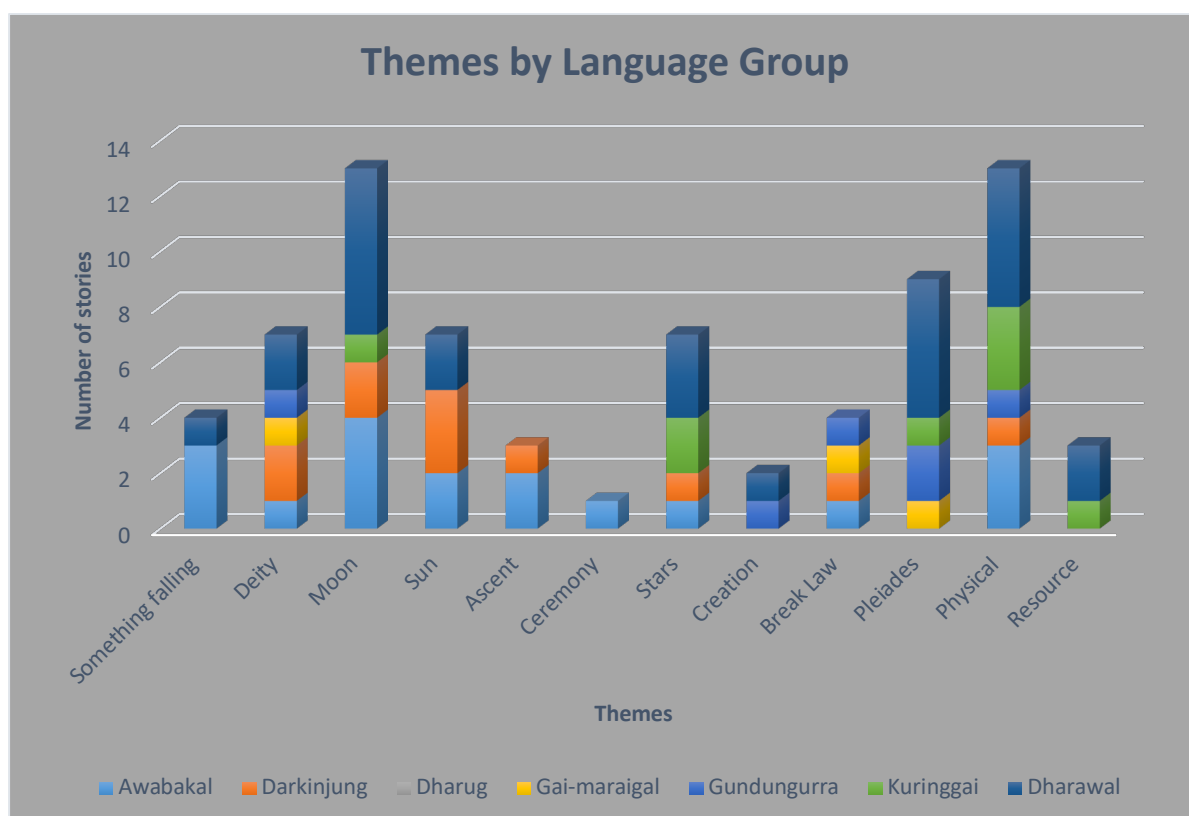


Table 2: Themes by Language Group

6 SYDNEY BASIN ROCK AND ASTRONOMY

The Sydney Basin is one of the largest rock art regions in the world. McDonald's (2008) survey of the Sydney Basin rock art examined over 14,000 motifs (individual artworks). Given the large sample, the only reference to a possible astronomical link in this report is that of some possible Darkinjung sun symbols in white ochre (Moore 1981: 396).

However, more recent analysis has led to some hypotheses about some specific examples of rock art in the Sydney Basin. There has been some speculation about star-like motifs which were described by Sim (1966: 2), as well as rock art previously identified as boomerangs, which may be the crescent Moon. As previously mentioned, in the same area there is the Elvina Track rock art depicting the cultural Emu in the sky. Branagan and Cairns (1993) have also suggested that cupules in the sandstone platforms in the Sydney area may represent star constellations, such as the Southern Cross.

An example of an astronomical linkage with Sydney rock art comes from the Kuringgai language area near Woy Woy on the Central Coast north of Sydney. This story was told to Pankhurst many years ago by a Kuringgai man and explains the meaning of this motif. Its use is approved by the Guringai Tribal Link Aboriginal Corporation.



Fig 5: Baiame figure with Sun and Moon and paddle (Pankhurst 2016)

This story explains that the figure is Baiame (Pankhurst, R., pers. comm. 16 and 19 February 2016). The object across his body is the paddle for his canoe, which is below him. His Mother was sending him to Earth, along with the Sun and the Moon (in his hands). While this story certainly makes a connection between rock art and the sky, the eminent Sydney rock art specialist, Fredrick McCarthy, in reviewing a lifetime of study of the rock art of the Sydney Basin (McCarthy 1985), was only willing to confirm that the rock art themes fell into two categories; one being persons and beings related to sacred and ceremonial matters, and the other being animals and objects related to resources and the increase of those resources.

7 DISCUSSION

Thick descriptions of thematic results are generally related to ethnographic studies, and while this is a mainly a literature study, there can be some value in doing one before going into other analyses of the data. “Thick descriptions” are a tool used in symbolic anthropology, which is a study of the way people understand their surroundings, including other peoples’ descriptions of such (Des Chene 1996: 1274).

It also studies symbols and processes, such as myth and ritual (Spencer 1996: 535). In the context of cultural astronomy, symbolic anthropology examines the cosmology created by each of these peoples, who are attempting to put meaning to their universe as they see it, in this case their universe being the night sky and their own Country, which reflects the night sky.

The description of the themes from our analysis can be broken down into the following:

- explanation for natural events, including meteors, the phases of the Moon, and where light and heat come from,
- the origin, behaviour, and eventual location of the creator hero(s), who seem to universally come from the night sky and return there after creation of the Earth’s features and providing Law,
- explanation for how individual night sky objects, such as stars and asterisms (such as the Pleiades) came to be in the sky, and what caused some of their properties (such as colour),
- moral messages relating to breaking of Law,
- connection between the night sky and resource management,
- and descriptions of the physical features of the night sky, and relationship with Country on Earth.

These themes comprise a cosmological framework to explain what is seen in the night sky and on Earth, and how they are related to the cultural life of Aboriginal peoples. However, based on the stories and items of astronomical knowledge found in this study, creating a thick description from them is problematic. Stories and knowledge sourced from the literature of mostly the 19th and early 20th centuries do

not lend themselves to a deep analysis of the symbolism behind the information contained. Most of the writers' intentions in recording knowledge was to record the stories as a means to understanding the culture of the people being studied, but rarely was there any deeper analysis of how the stories could be interpreted "to address fundamental questions about human social life", as Spencer suggested (ibid: 535).

We know from experience of ethnographic research with Aboriginal Australian people that they have both complex and complete cosmologies including their cultural astronomy, so attempting to recreate such cosmologies of the seven communities represented in this literature study from the limited data found would be unreasonable. Hopefully, further ethnographic research with these communities will lead to a more complete knowledge of their cosmologies. Accordingly, the thematic analysis results can only be described as a "thin description" (Ray, 2011).

The thematic analysis produced 12 themes, which are common to most Australian Aboriginal peoples who have had their cultural astronomy reported in the literature. The only theme that may be more local in the south-east Australia region is that of a culture hero jumping or stepping back into the sky from what becomes a flat-topped mountain, but it may be that this has just not been reported from other regions in Australia.

Attempting to take the results of the thematic analysis and creating a thick description were less successful, but a number of themes in the manner of symbolic anthropology were teased out of the analysis, and looking at other cultural astronomy projects, may fall into the category of 'universal themes'. A future analysis of a study of other Aboriginal peoples' cultural astronomy would be useful to see if these 'universal themes' extend elsewhere in Australia.

The analysis of the 12 themes by language group in the Sydney Basin from which they came was not particularly instructive, the reason being clearly that there is a large gap in the stories that have survived in the literature since 1788. It is hopeful to think that a future ethnographic phase to the overall East Coast cultural astronomy project might be successful in filling some of this gap, but in some of the language groups covered by this study, there may simply be no persons retaining the relevant cultural knowledge. Some common areas of knowledge in the Aboriginal cultures of south-east Australia related to astronomy should be examined with those 12 themes in mind.

8 CONCLUSIONS

Notwithstanding the current dearth of material for cultural astronomers, this literature study has resulted in a limited body of knowledge of the astronomy of the Aboriginal peoples of the Sydney Basin, in the form of collected stories and a basic vocabulary. In comparison to some Aboriginal language groups from isolated parts of Australia, the level of knowledge recoverable in the Sydney Basin is reasonable, and a strong basis for further ethnographic research amongst the descendants of those here in 1788. There remains much work to be done, as the literature study has not

resulted in anything close to a complete understanding of the cultural astronomy of any one language group, and given the limited number of sources, both historical archival, and ethnographic, it may never be possible to recreate such an understanding.

Out of this collected knowledge, it is possible to draw a few conclusions:

- as have been found in other cultural astronomy projects with Aboriginal Australians, there is a relatively universal cosmology within Sydney Basin Aboriginal language groups, in that they had creator heroes who formed the Country on which they lived, gave them their Law, and continued to play a part in their culture, particularly regarding initiation and maintaining the Law,
- there is a tradition regarding people acting within and without the Law, with consequences often relating to moving into the night sky and being identified with celestial objects, which is a common theme in stories,
- the night sky played a significant role in the knowledge of resource management,
- as one of the most intense areas of rock art in Australia (and the world), there may be some linkages between rock art and the cultural astronomy of the Sydney Basin,
- and these conclusions bring the cultural astronomy of the Sydney Basin into line with what is currently known in the rest of Australia.

As a starting point for further historical archival and ethnographic work, this study will hopefully provide a solid foundation for further research into the cultural astronomy of the Sydney Basin.

ACKNOWLEDGEMENTS

We acknowledge and pay our respects to the traditional owners and Elders, both past and present, of the Awabakal, Darkinjung, Dharug, Gai-mariagal, Gundungurra, Kuringgai, and Dharawal peoples. We thank the staff of the State Library of NSW, the AIATSIS Library, the Macquarie University Library, and the University of NSW Library for their assistance. We also thank Ian Colless, Carla Guedes, Tracy Howie, Marcus Hughes, David Pross, and William Stevens for their help and knowledge.

BIBLIOGRAPHY

Arposio, A. 2006, *A Grammar for the Awabakal Language*, Newcastle, Awabakal Cultural Association, Inc.

Attenbrow, V. 2002, *Sydney's Aboriginal Past*, Sydney, UNSW Press: 3.

- Branagan, D. and Cairns, H. 1993, Marks on Sandstone Surfaces – Sydney Region, Australia: Cultural Origins and Meanings? *Journal and Proceedings, Royal Society of New South Wales*, Vol. 126: 125-133.
- Brothers, R. 1897, Myth of Australia – Thowra and the seven myalls: South coast legend, *Australasian Anthropological Journal* v.1, No. 3: 10-11.
- Bursill, L. and Jacobs, M. 2007, *Dharawal, the story of the Dharawal speaking people of Southern Sydney*, Sydney, Kurranulla Aboriginal Corporation.
- Bursill, L. 2014, *A Collection of Dharawal Words Phrases, Tree fern and Tree Names*, Worrigeer, NSW, Dharawal Publishing Inc.
- Campion, N. 2004, Introduction: Cultural Astronomy, in N. Campion, P. Curry, and M. York (Eds), *Astrology and the Academy*. Bristol, Cinnabar Books: xv.
- Capell, A. 1970, Aboriginal languages in the south central coast, New South Wales: fresh discoveries, *Oceania*, 41: 21-22.
- Collins, D. 1798, *An account of the English colony in New South Wales, with remarks on the dispositions, customs, manners, etc., of the native inhabitants of that country*, 2 vols. New edition, Sydney: A.H. & A.W. Reed, 1975.
- Clarke, P. 2007, *Aboriginal People and their Plant*, Dural, NSW, Rosenberg Publishing
- Clarke, P. 2014, The Aboriginal Australian Cosmic Landscape. Part 1: The Ethnobotany of the Skyworld, *Journal of Astronomical History and Heritage* 17(3): 307-325.
- Dawes, W. c1790-1792, *Grammatical forms of the language of N.S. Wales, in the neighbourhood of Sydney, by William Dawes, in the year 1790*, Manuscript, Original in the Library of the School of Oriental and African Studies, London: Ms 41645.
- Des Chene, M. 1996, Symbolic Anthropology, In *Encyclopedia of Cultural Anthropology*, Levinson, D. and Ember, M. (Eds), New York, Henry Holt: 1274-1278.
- Eades, D. 1976, *The Dharawal and Dhurga languages of the New South Wales south coast*, Canberra, Australian Institute of Aboriginal Studies.
- Eliade, M. 1996, *Patterns in Comparative Religion*, Lincoln, USA, University of Nebraska Press: 41.
- Eseli, P., 1998, *Eseli's Notebook*, Aboriginal and Torres Strait Islander Studies Unit, University of Queensland, Brisbane: 49.

Foley, D. 2001, *Repossession of our Spirit, Traditional owners of northern Sydney*, Canberra, Aboriginal History: 44-46.

Foott, B. 2001, *Aboriginal Studies Teachers' Resource Book*, Asquith, NSW, Gibberagong Environmental Education Centre, Appendix 1, Dictionary of the Guringai Language.
Fraser. J. 1882, The Aborigines of New South Wales, *Proceedings of the Royal Society of New South Wales*, Vol 26: 193-233.

Fraser, J. 1889, *The Aborigines of Australia: their Ethnic Position and Relations*, London, The Victoria (Philosophical) Institute: 10.

Fraser, J. 1892, *An Australian Language as Spoken by the People of Awaba or Lake Macquarie (near Newcastle New South Wales)*, Sydney, Charles Potter, Govt. Printer.

Fuller, R., Hamacher, D. and Norris, R. 2013, Astronomical Orientations of Bora Ceremonial Grounds in Southeast Australia, *Australian Archaeology*, No 77: 30-37.

Fuller, R., Anderson, M., Norris, R. and Trudgett, M. 2014, The Emu Sky Knowledge of the Kamilaroi and Euahlayi Peoples, *Journal of Astronomical History and Heritage*, 17(2): 171-179.

Fuller, R. 2014, *The Astronomy of the Kamilaroi and Euahlayi Peoples and Their Neighbours*, MPhil Thesis, Macquarie University, Sydney.

Geertz, C. 1973, *The Interpretation of Cultures: Selected Essays*, New York, Basic Books: 2-30.

Greenway, C. et al 1878, Australian Languages and Traditions, *The Journal of the Anthropological Institute of Great Britain and Ireland*, Vol. 7: 232-274.

Gunson, N. 1974, Threlkeld, L.E. – Australian Reminiscences & Papers of L.E. Threlkeld, Missionary to the Aborigines, 1824-1859, *Australian Aboriginal Studies* 4, Ethnohistory Ser. 2, Australian Institute of Aboriginal Studies: 50.

Hamacher, D. 2012, *On the Astronomical Knowledge and Traditions of Aboriginal Australians*, PhD Thesis, Macquarie University, Sydney: 1-393

Howitt, A. 1884, On Some Australian Ceremonies of Initiation, *The Journal of the Anthropological Institute of Great Britain and Ireland*, Vol. 13: 432-459.

Howitt, A. 1904, *The Native Tribes of South-east Australia*, London, MacMillan: 507.

Hulley, C. 1996, *Dreamtime Moon*, Sydney, Reed Books: 44-46.

Hunter, J. 1793, *An historical journal of events at Sydney and at sea 1787-1792, by Captain John Hunter, Commander H.M.S Sirius; with further accounts by Governor Arthur Philip*,

Lieutenant P.G. King and Lieutenant H.L. Ball, New edition edited by John Bach, Sydney, Angus and Robertson, 1968.

Jones, G. 1993, *Yengo Country, a source of cultural and spiritual awakening*, Hawaii, Pacific Arts, on-line edition 2009: 4.

Kohen, J. 2006, *Daruganora, Darug Country: the place and the people*, Blacktown, N.S.W., Darug Tribal Aboriginal Corporation.

Kohen, J. and Lampert, R. 1987, Hunters and fishers in the Sydney region, in *Australians to 1788*, Mulvaney, D., and White, J. (Eds), Broadway, N.S.W.; Fairfax, Syme & Weldon Associates.

Leaman, T., Hamacher, D. and Carter, M. 2016, Aboriginal Astronomical Traditions from Ooldea, South Australia, Part 2: Animals in the Ooldean Sky, *Journal of Astronomical History and Heritage*, 19(1).

Larmer, J. 1832 *Larmer's Native Vocabulary: transmitted 24 November 1853*, Sydney, NSW Dept. of Lands.

Lissarrague, A. 2006, *A Salvage Grammar and Worklist of the Language from the Hunter River and Lake Macquarie*, Nambucca Heads, NSW, Muurrbay Aboriginal Language and Culture Cooperative.

Love, W. 1987, There is an Emu on the Bora Ground. *Anthropological Society of Queensland Newsletter* Vol. 177: 1-5.

Love, W. 1988, *Aboriginal Ceremonies of Southeast Australia*, M.A. Thesis, University of Queensland, Brisbane: 3.

Manning, J. 1882, Notes on the Aborigines of New Holland, *Proceedings of the Royal Society of New South Wales*, 16: 155-175

Massola, A, 1968, *Bunjil's Cave*, Melbourne, Lansdowne Press: 105-106.

Mathews, R. 1897, The Burbung of the Darkinung Tribes, *Proceedings of the Royal Society of Victoria*, Vol. 10(1): 1-12.

Mathews, R. 1901a, The Thurrawal Language, *Proceedings of the Royal Society of New South Wales*, Vol. 35: 127-160.

Mathews, R. 1901b, The Gundungurra language, *Proceedings of the American Philosophical Society*, Vol. 40(167): 140-148.

Mathews, R. 1908, *Some mythology and folklore of the Gundungurra tribe*, Wentworth Falls, NSW, Den Fenella Press.

- Mathews, R. 1908, Some Mythology of the Gundungurra Tribe, New South Wales, *Zeitschrift für Ethnologie*, Vol. 40: 203-206.
- Mathews, R. and Everitt, M. 1900, The organisation, language and initiation ceremonies of the Aborigines of the south-east coast of NSW. *Journal and Proceedings of the Royal Society of New South Wales*, 34: 262-281.
- Maynard, J. 2004, *Awabakal Word Finder: An Aboriginal dictionary and dreaming stories companion*, Southport, QLD, Keeaira Press: 49-50.
- Maynard, J. 2007, *Whose Traditional Land?* Newcastle, NSW, Research paper for the Department of Aboriginal Studies, University of Newcastle.
- McCarthy, F. 1985, *Artists of the Sandstone: a description of Aboriginal tribes inhabiting the Sydney-Hawkesbury district of New South Wales*, draft manuscript, AIATSIS.
- McDonald, J. 2008, Dreamtime Superhighway, Sydney Basin Rock Art and Prehistoric Information Exchange, *Terra Australis* 27, Canberra, ANU Press: 2: 20-22.
- Meredith, J. 1989, *The Last Kooradgie: Moyengully, Chief Man of the Gundungurra People*, Kenthurst, NSW, Kangaroo Press.
- Moore, D. 1981, Results of an archaeological survey of the Hunter River Valley, NSW. Part II: Problems with the lower Hunter and contacts with the Hawkesbury Valley, *Records of the Australian Museum* (9): 388-442.
- Needham, W. 1981, *Burrigurra-A Study of the Aboriginal Sites in the Cessnock-Wollombi Region of the Hunter Valley*, Adamstown, NSW, Dobson & McEwan Pty. Ltd: 11, 36, 38, 71.
- Norris, R. 2007, *The Emu in the Sky and other stories*, ATNF Newsletter (October): 1-3.
- Norris, R. 2016, Dawes Review 5: Australian Aboriginal Astronomy and Navigation, *Publication of the Astronomical Society of Australia (PASA)*, Vol 33: 1-39.
- Organ, M. 1993, *Illawarra and South Coast Aborigines 1770-1900*, Canberra, Report to the Australian Institute of Aboriginal and Torres Strait Islander Affairs.
- Paine, D 1983, *The journal of Daniel Paine 1794-1797, together with documents illustrating the beginnings of government boat-building and timber-gathering in New South Wales, 1795-1805*, Knight, R. and Frost, A. (Eds). Sydney, Library of Australian History.
- Parker, K. and Lang, A., 1905, *The Euahlayi tribe: a study of Aboriginal life in Australia*, A Constable Limited, London: 4, 96.

Peck, C. 1925, *Australian Legends: tales handed down from the remotest times by the autochthonous inhabitants of our land*, Sydney, Stafford & Co.: 79-86.

Peck, C. 1933, *Australian legends: tales handed down from the remotest times by the autochthonous inhabitants of our land*, Melbourne, Lothian.

Platt, T. 1991, The Anthropology of Astronomy. *Archaeoastronomy*, vol. 16: S76-S81.

Public Records Office, London, CO 201/1 ff 29-45v, <http://www.foundingdocs.gov.au/item-sdid-68.html>, accessed 13.7.16 14:00.

Ray, Keith. 2011, <http://cognitive-edge.com/blog/the-thick-and-thin-of-it/>, accessed 13.7.16 11:45.

Ridley, W. 1872, *Report on Australian languages and traditions*, Foreign and Commonwealth Office Collection: 258-291.

Ridley, W. 1873, *Report on Australian Languages and Traditions*, *The Journal of the Anthropological Institute of Great Britain and Ireland*, Vol. 2: 257-275.

Ridley, W. 1875, *Kamilaroi, and Other Australian Languages*, Sydney, Thomas Richards: 144-145.

Shepard, J. 2003, *Legends of the Blue Mountains Valleys*, Smith, J. (Ed), Wentworth Falls, NSW, Den Fenella Press: 105-108.

Sim, I. 1966, Rock engravings of the MacDonalld River district, NSW. *Occasional Papers in Aboriginal Studies* 7, Canberra, Australian Institute of Aboriginal Studies: 2.

Smith, J. 1992, *Aboriginal legends of the Blue Mountains*, Wentworth Falls, NSW, Jim Smith: 4, 84.

Smith, K. 2004, *Eora Clans: A history of Indigenous social organisation in coastal Sydney, 1770-1890*, MA Thesis, Indigenous Studies, Division of Society, Culture, Media and Philosophy, Macquarie University, Sydney.

Southwell, D. 1788, A list of such words used by the natives of New Holland in the district of Port Jackson, New South Wales, as could be gathered from them, and expressed as nearly as possible according to their mode of enunciation, to which are added the words in English that most closely correspond to them. *Historical Records of New South Wales*, Vol. 1, Part 2: 697-700.

Spencer, J. 1996, Symbolic Anthropology. In *Encyclopedia of Social and Cultural Anthropology*, Barnard, A. and Spencer, J. (Eds), London and New York, Routledge: 535-539.

Steele, J. 2005, *The Aboriginal Language of Sydney, A Partial Reconstruction of the Indigenous Language of Sydney Based on the Notebooks of William Dawes of 1790-91, Informed by other Records of the Sydney and Surrounding Languages to c. 1905*, M.A. (Research) Thesis, Warawara - Department of Indigenous Studies, Macquarie University, Sydney.

Tench, W. 1789, 1793, *Sydney's first four years: being a reprint of a narrative of the expedition to Botany Bay and a complete account of the settlement at Port Jackson*, Introduction and annotations by L.F. Fitzhardinge, New edition, Library of Australian History, Sydney, 1979.

Thieberger N. and McGregor W. (Eds), 1994, *Macquarie Aboriginal Words: a dictionary of words from Australian Aboriginal and Torres Strait Islander languages*, North Ryde, NSW, Macquarie University, Macquarie Library.

Threlkeld, L. 1834, *An Australian grammar: comprehending the principles and natural rules of the language as spoken by the aborigines in the vicinity of Hunter's River, Lake Macquarie, &c., New South Wales*, Sydney, Stephens and Stokes.

Threlkeld, L. in Fraser, J. 1892, *An Australian Language as Spoken by the People of Awaba or Lake Macquarie (near Newcastle New South Wales)*, Sydney, Charles Potter, Govt. Printer: vii.

Troy, J. 1993, *The Sydney Language*, Canberra, Panther Publishing and Printing: 126.

Turbet, P. 1989, *Aborigines of the Sydney district before 1788*, Kenthurst, NSW, Kangaroo Press: 123.

Turner, G. 2014, *Aboriginal Astronomy with the Sydney Region*, term paper submitted for ATSI3006: Indigenous Astronomy, Nura Gili Indigenous Programs Unit, University of New South Wales, Sydney: 20, 22, 24.

Winterbotham, L. 1957, *Gaiarbau's story of the Jinibara Tribe of south east Queensland (and its neighbours)*, manuscript, Canberra, AIATSIS: 3-4.

Willey, K. 1979, *When the sky fell down: the destruction of the tribes of the Sydney region 1788-1850*, Sydney, Collins: 18, 55.

APPENDIX 1: DATABASE OF STORIES IN TABLE FORMAT

SUBJECT	STORY or INFO	SOURCE	LANGUAGE GROUP
Meteor	At Kurran Kurran, a rock fell out of the sky and killed a lot of people, because a goanna was mad because people were killing lice by roasting in the fire	Turbet 1989, p. 126	Awabakal
Sun, Moon	Moon was jealous of Sun so he cried and created a lagoon so his face would shine at night	Threikeld in Maynard 2004, p. 49-50	Awabakal
Moon	Belmont lagoon was formed by moon weeping	Hully 1996, pp. 44-46	Awabakal
Meteor	Near Sugarloaf Mt, a meteor was an evil being named Putikan who will kill non-initiated men	Gunson 1974, p. 50	Awabakal
Meteor	Also at Sugarloaf Mt, a medicine man came down by meteor to initiate men	Gunson 1974, p. 50	Awabakal
Altair	Bibigā, the eaglehawk, is represented in the night sky by Altair	Needham 1981, p. 36	Awabakal/Darlingung
Southern Cross	The spirits of the dead climb to the Southern Cross using the notches (stars)	Needham 1981, p. 71	Darlingung
Sun, Moon	Represented with earth sculptures (presumably at the Bora ground)	Mathews 1897, pp. 2-3	Darlingung
Sun, Moon	Tree was ornamented with symbols of sun and moon (full and crescent)	Mathews 1897, p. 4	Darlingung
Meteor	Meteors were a portent of something good about to happen	Needham 1981, p. 11	Darlingung
Moon	Young woman who broke Law with young warrior who also broke Law eventually goes into sky and becomes Moon, with phases related to size of belly	Foley 2001, pp. 44-6	Gai-mariagal
Pleiades	Group of sisters were chased by magpie and had to climb the bark of a tree into the sky to escape	Mathews 1908, pp. 203-6	Gundungurra
Moon	Moon followed a family of young women who didn't want him. They gave him evil magic grubs and his stomach swelled up. The eaglehawk cured him, and he went up into the sky, where when he is full, it represents the time he was swelled up.	Mathews 1908, pp. 203-6	Gundungurra
Pleiades	Group of sisters (magpies) digging for yams, and common black or white magpie rescued one, but sisters had to escape his charms by climbing tree into sky.	Shepard 2003, pp. 105-8	Gundungurra
Venus	Magicians (clever men) found little boy and fed him their flesh, but he hid in hole. Clever men smoked him out and he went into the sky and became Venus	Mathews 1908, pp. 203-6	Gundungurra
Milky Way	The Milky Way is seen as a giant turtle	Smith 1992, p. 4	Gundungurra
Heaven	The place of the dead is seen as at the end of sky towards the sea, where there is a tunnel passing a fiery mountain	Feld in Smith 1992, p. 84	Gundungurra

APPENDIX 1: DATABASE OF STORIES IN TABLE FORMAT

SUBJECT	STORY or INFO	SOURCE	LANGUAGE GROUP
Milky Way	Baiamo was sent down from the Milky Way by his mother (Earth mother) in his canoe. While paddling around he created all the rivers, creeks, and valleys, and his head lit up the Sun. When he eventually left Earth he flattened Kariong Mt. Person had to kill a native cat (Quoll) who was eating them. When they did, his spirit floated up into the sky with a red glow to become the star Betelgeuse	Pankhurst 2016 Pankhurst 2016	Kuringgai Kuringgai
Pleiades/Aldebaran	Young warrior was in love with eldest sister of seven sisters, and kidnapped her. Other sisters got her back, and froze the country with ice and snow, then created springs which flowed to creeks and rivers, then lept into the sky to become Pleiades. Young warrior tried to follow by climbing tall tree, but people burned it and he drifted upwards to become red star Aldebaran	Pankhurst 2016	Kuringgai
Sun, Moon, Stars, Pleiades	Baiamo created all the heavenly bodies, with Earth an immense plane, around which circle the Sun, Moon, and stars. The Sun just provides light, while Pleiades provide warmth	Manning 1882, pp. 55-73 Bursill 2014	Thurawal Thurawal
Alpha and Beta Centauri	Seven Wagagal sisters correspond to the Pleiades	Bursill 2014	Thurawal
Pleiades	The Lightning Brothers correspond to Alpha and Beta Centauri Seven sisters were fishing and approached by Moon, who threatened them. They went into the ground and then up in the sky	Turner 2014	Thurawal
Sun, Moon	Sun and Moon are deities, Sun is male and father of the land, providing warmth, and Moon is female mimicking the 28 day women's cycle	Turner 2014	Thurawal
Pleiades	Mullymoola sisters (7) were fishing and roasting fish. The Moon was attracted, but could not see them. They went into ground and then into the sky. Seven sisters were pure and beautiful and lived apart from community, except for Thowra, who was in love with eldest and pursued her. He was burnt by fire and smelt like a dead whale. He tried to climb into sky after the sisters, but fell. When he recovered, he turned into a boomerang, which was thrown into the sky and became the Moon.	Turner 2014	Thurawal
Pleiades, Moon	Wumbula the bat and his two wives were hunting but women were impaled on spears when in the water and went up into sky to become part of Pleiades	Brother 1897, pp. 10-11	Thurawal
Pleiades	Ridley 1875, pp. 144-5	Ridley 1875, pp. 144-5	Thurawal

APPENDIX 1: DATABASE OF STORIES IN TABLE FORMAT

SUBJECT	STORY or INFO	SOURCE	LANGUAGE GROUP
Meteor	<p>Story of waratah and king from basalt country where waratah didn't grow. He came to waratah country with his people and there was a big fight with the local tribe. A great bright light, burning blue, came out of heaven and knocked everyone down, but the waratahs were unharmed by the fire.</p>	Peck 1925, pp. 79-86	Thurralwal
Moon	<p>Jannali (Sutherland Shire) is called the place of the Moon. Yennadi was a young woman who fell in love with a young man, even though she was given to another. She hid in the sky and became the Moon, with its 28 day cycle.</p>	Bursill 2014	Thurralwal

