

# BAIAMI AND THE EMU CHASE: AN ASTRONOMICAL INTERPRETATION OF A WIRADJURI DREAMING ASSOCIATED WITH THE BURBUNG

BAIAMI-BU DHINAWAN YANHAMANHA:  
GIBBIRGIRRBAANG WINHANGA-DURIN-YA WIRADJURI  
YARRUDHUMARRA-BU BURBUNG

**Trevor M. Leaman**

School of Humanities and Languages, University of New South Wales,  
Sydney, NSW, 2052, Australia  
Email: t.leaman@unsw.edu.au

and

**Duane W. Hamacher**

School of Physics, University of Melbourne, Parkville,  
Victoria 3010, Australia  
Email: duane.hamacher@unimelb.edu.au

**Abstract:** A Wiradjuri Dreaming connected to the Aboriginal creation ancestor *Baiami*, and enacted during a *Burbung* male initiation ceremony, was recorded by the Australian anthropologist R.H. Mathews in 1896. We investigate this further and conclude that the Dreaming most likely relates to the annual movements of the constellations in the Wiradjuri night sky, with *Baiami* represented by the stars in the Greek constellation of Orion, and the terrestrial emu featured in the Dreaming represented by the Wiradjuri 'dark' constellation of *Gugurmin* the Celestial Emu, formed from the dust bands of the Milky Way. The Celestial Emu may also represent *Daramulun*, another important ancestral figure associated with the *Burbung*, whose spirit descends from the Milky Way in emu form to take part in the male initiation ceremony. The Dreaming narrative has parallels with the Greek myth of Orion and the scorpion, represented by the constellation of Scorpius, in eternal pursuit of each other in the sky throughout the year. The Dreaming narrative recorded by Mathews also suggests a reference to the orientation of *Baiami* in Orion. He appears to be oriented the same way in the sky as Orion from Greek mythology, which is upside-down as seen from a Southern Hemisphere perspective. This is consistent with rock art depictions of *Baiami* from the Sydney Basin, and that of *Nyeeruna*, a creation ancestor of the Kokatha and Ngalea peoples from the Great Victoria Desert, South Australia, which shares similar characteristics and attributions with *Baiami*. The alternative 'right-side-up' orientation is also being investigated and will be the subject of a follow-up paper.

**Warning to Aboriginal and Torres Strait Islander People:** This paper contains references to Aboriginal cultural practices surrounding male initiations – but does not provide secret details about those ceremonies. It also contains historical archival photographs of people who are deceased.

**Keywords:** Aboriginal Australian Astronomy, ethnoastronomy, Wiradjuri, *Baiami*, Orion, Celestial Emu, R.H. Mathews

## 1 INTRODUCTION

The Milky Way is Warrambool ... There is one old man up there who was once a great rainmaker, and when you see that he has turned round as the position of the Milky Way is altered, you may expect rain; he never moves except to make it ... (Parker, 1905: 95).

By drawing upon the available literature, museum and library archives, artworks, ethnographic fieldwork and archaeological studies, we are now gaining a better understanding of the true extent and wealth of Aboriginal and Torres Strait Islander astronomical knowledge (e.g. Norris, 2016). What is becoming clearer is just how much this astronomical knowledge is integrated into every aspect of daily life, particularly its prominent role in ceremony. Although several early Australian ethnographers recorded such ceremonies in detail, the fact that they lacked

any formal qualifications or training in astronomy makes it likely that many subtle clues relating to astronomical content and connections to the sky-world were missed. One such case is explored in detail here.

Among the extensive list of publications by Robert Hamilton (R.H.) Mathews (1841–1918), is a detailed record of a Wiradjuri male initiation ceremony, or *Burbung*,<sup>1</sup> which was held at Bulgeraga Creek, New South Wales (NSW) (Mathews, 1896b; 1897a). The Wiradjuri (var: Wiradjuri) people of central NSW, Australia, represent the largest Aboriginal language group in the State, and second largest in Australia (Figure 1). Having cultural and linguistic similarities to their neighbours, such as the Kamilaroi (var: Gamilaroi/Gamilaraay) and Ngemba (var: Ngijampaa) (Fuler et al., 2014a; 2014b), astronomical knowledge is deeply embedded within Wiradjuri culture (Ham-



Figure 1: Language map of SE Australia showing the Wiradjuri (Wiradyuri) in relation to neighbouring Aboriginal language groups (Wikimedia Commons).

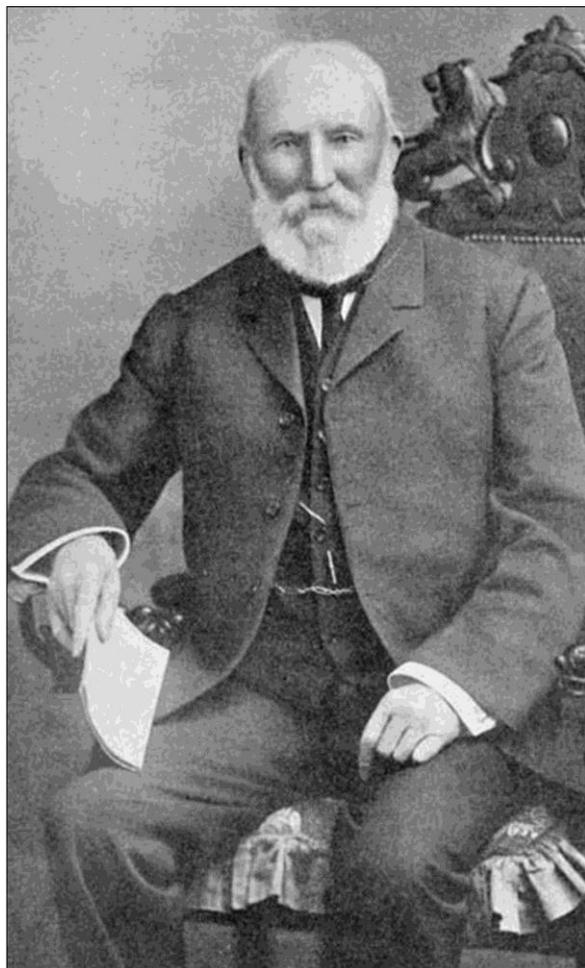


Figure 2: R.H. Mathews, in about 1909 (courtesy: National Library of Australia).

acher, 2014; Leaman and Hamacher, 2019). However, as is the case throughout Aboriginal Australia, invasion, colonisation and forced displacement caused a significant fragmentation of Wiradjuri traditional knowledge (e.g. see MacDonald, 1998; Read, 1983; 1984), hampering efforts to recover and determine the full extent of this knowledge.

In his observations, Mathews describes the physical layout of the *Burbung* initiation grounds, and outlines the proceedings of the ceremony. Of particular note was his detailed description of a Dreaming associated with the ceremony involving the important ancestral creator *Baiami*, and his pursuit of an emu. As both figures are represented in the Wiradjuri skyworld as constellations, we explore the possibility that this Dreaming narrative of a seemingly terrestrial event is in fact a reflection of events occurring in the skyworld. We analyse this story, along with evidence from rock art depictions of *Baiami* from the Sydney Basin, to determine the orientation of *Baiami* in Orion that best fits the narrative. His chasing of the emu in the narrative also appears to describe the movements of both constellations around the South Celestial Pole (SCP), similar to the later Greek story of Orion chasing Scorpius across the sky.

## 2 ROBERT HAMILTON MATHEWS: A BIOGRAPHICAL SKETCH

The Australian-born Government surveyor and anthropologist R.H. Mathews (Figure 2) observ-

ed and recorded the culture of many south-eastern Aboriginal language groups, including the Wiradjuri. Being self-taught in the field and lacking any formal qualifications, he was often derided privately and publicly by his British-born university-educated peers, Walter Baldwin Spencer (1860–1929) and Alfred William Howitt (1830–1908), who saw Mathews as something of a ‘colonial upstart’ (Thomas, 2012: 343–345). Other contemporaries from outside Australia, such as folklorists Edwin Sydney Hartland (1848–1927) and Andrew Lang (1844–1912), although caught up in their own personal disputes, were more supportive and appreciative of Mathews’ work, often comparing and exchanging field notes and ideas via frequent correspondences (Thomas, 2012: 270; 280–281).

Mathews’ extensive and detailed accounts of Aboriginal daily life and culture are indicative of the level of rapport he had developed with his Aboriginal peers, often being allowed to witness and record secret-sacred ceremonies normally off-limits to non-initiates. His ethnographic records have more recently been used in support of several Aboriginal native title claims (Thomas, 2012:196). Mathews’ interest in anthropology was initiated by first encountering the creation ancestor *Baiami* painted in a rock shelter at Milbrodale, in the Hunter Valley, NSW (Mathews, 1893; Thomas, 2012: Chapters 1 and 6). Mathews was to encounter this figure time and again during his years among south-eastern Aboriginal peoples, as *Baiami* is strongly associated with the land and skyscape of many of the neighbouring language groups, including Muruwari, Ngemba, Wailwan, Wongaibon, Euahlayi, and Kamilaroi (Berndt and Berndt, 1977; Eliade, 1966; 1967a; 1967b; Hartland, 1898; Lang, 1899; Mathews, 1994; Parker, 1905; Tindale, 1983). Another equally important ancestral figure associated with *Baiami* and the *Burbung*, and encountered by Mathews during his research, was the maleficent shapeshifter *Daramulun*.

### 3 THE BURBUNG AND THE MILKY WAY

*Baiami* (var: *Byamee*, *Baiame*, *Byama*, or *Baiamai*) and *Daramulun* (var: *Dharamulun* or *Dhuramulan*)<sup>2</sup> are two powerful ancestral creator beings, each playing an important role in the *Burbung* ceremony where boys are ‘made’ into men. According to Hartland (1898), *Baiami* made the Earth, water, sky, animals, and people. He made the rain come down and grass to grow, and welcomed good people to his ‘home’ in the Milky Way (a place of peace and plenty) upon their passing.

*Daramulun* is a gigantic and powerful being whose voice resembles the rumble of distant thunder. Some accounts suggest that *Daramulun* and *Baiami* are one and the same (e.g. see Berndt, 1974: 28; Eliade, 1966:112), whereas

others suggest *Daramulun* was the son of *Baiami* (e.g. see Howitt, 1904: 502). Mathews (1896b) and Hartland (1898) simply state that he was “... one of Baiami’s people.”

According to Wiradjuri lore (Mathews, 1896b), at a certain age young boys are handed over to *Daramulun* to be instructed in the law and customs of the community. When they returned to camp, the boys were missing a tooth. This was a sign that they were initiated by *Daramulun*, who told *Baiami* that he had killed the boys, cut them up, burnt them to ashes, then moulded the ashes into human form, and restored the boys to life, albeit with one tooth missing (Hartland, 1898; Mathews, 1896b). However, it was apparent that not all of the boys had returned from this ordeal. When questioned by *Baiami*, the surviving boys reluctantly admitted that *Daramulun* had not killed and reassembled them, but had extracted their teeth using his own lower incisors. During this process, he sometimes bit off the boy’s entire face and then devoured him (Mathews, 1896b). In his anger on hearing this, *Baiami* destroyed *Daramulun*, but put his voice into every tree in the forest. Thus, a bullroarer (*Mudthega*) fashioned from any tree will have the voice of *Daramulun*, and hence plays an important role in the *Burbung* ceremony (Hartland, 1898; Mathews, 1896b; 1897b). *Baiami* decided not to tell the women and uninitiated about *Daramulun*’s indiscretions, but rather continued to make them believe that boys were still being put to death and restored to life by *Daramulun*. By doing so, and showing men how to perform tooth evulsion and how the laws were to be passed on, he instituted the first *Burbung* ceremony, which has been followed by Wiradjuri men ever since (Hartland, 1898; Mathews, 1896b).

Most *Burbung* grounds consist of a larger circle of stones or mounded earth connected by an avenue to a smaller circle some distance away (Fuller et al., 2013; Hamacher et al., 2012). The larger circle is the open, public gathering site and the smaller circle is a restricted secret/sacred space (Figure 3, right). Working closely with elders, Fuller et al. (2013) showed a link between the orientation of *Burbung* sites with the *Emu in the Sky* and *Sky Burbung* in the Milky Way, and the calendrical timing of the *Burbung* ceremony. The *Emu in the Sky*, or *Celestial Emu*, is a ‘dark’ constellation in the Milky Way made up of the dust lanes running from the Coal Sack Nebula (the head of the Emu) to the galactic bulge in Scorpius-Sagittarius (the body of the Emu), and Ophiuchus-Scutum (the feet of the Emu) (Fuller et al., 2013; Norris and Norris, 2009). This motif is widespread throughout Australia (Cairns and Harney, 2004; Fuller et al., 2014a; 2014b; Norris and Hamacher, 2009:13; Stanbridge, 1861: 302; Wellard, 1983:51). Its significance to the *Burbung* ceremony, where sen-

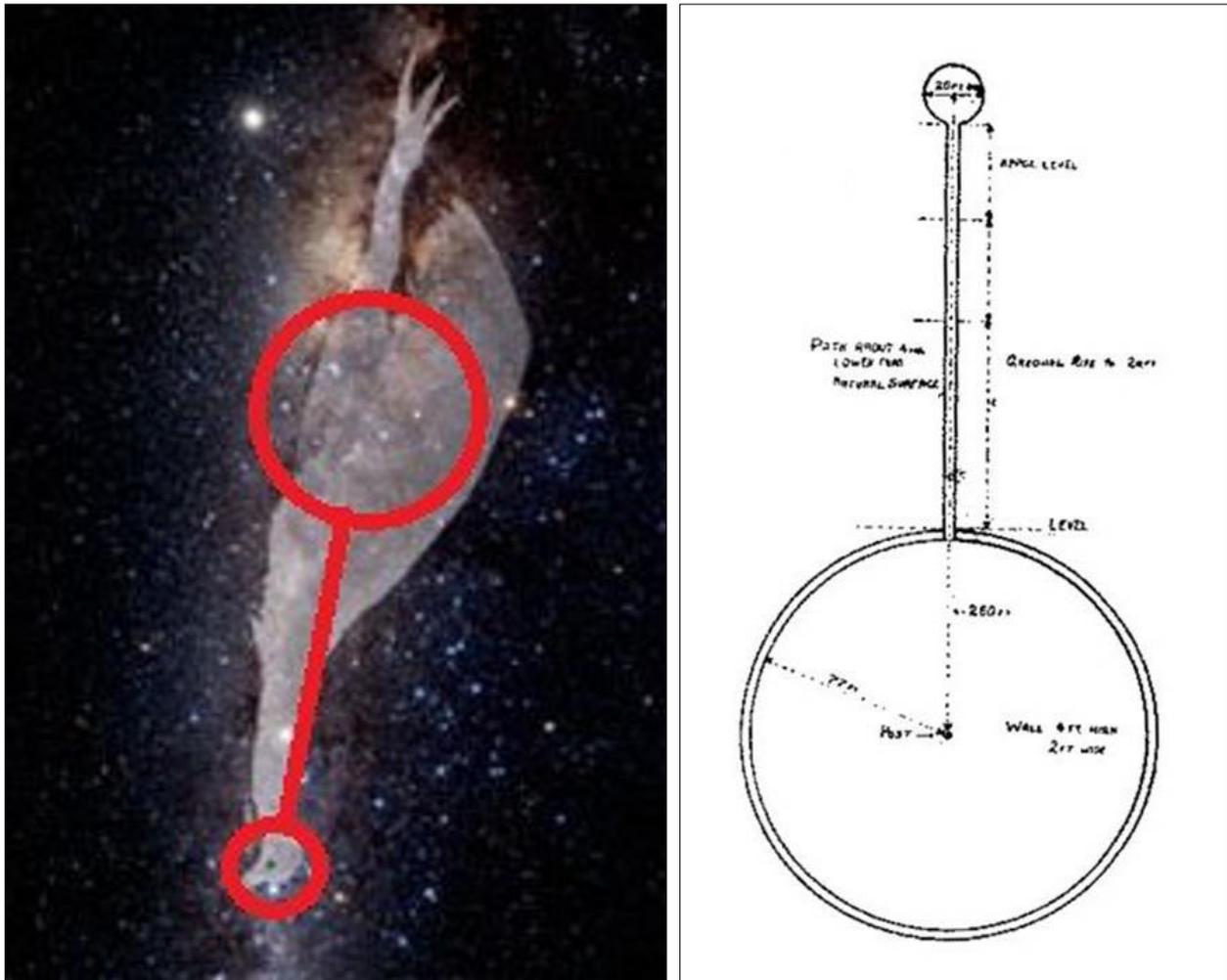


Figure 3 (Left): The *Celestial Emu*, with *Sky Burbung* superimposed, and oriented as seen in the Milky Way after sunset in August, the time that most *Burbung* ceremonies were performed. (Right): Typical layout of a *Ground Burbung* mirroring the *Sky Burbung* (photographs: R. Fuller (left) and S. Bowdler (right)).

ior male elders ‘make’ men from boys, may be reflected in the fact that it is the male emu that broods and hatches the emu chicks and rears the young (Coddington and Cockburn, 1995; Love, 1987).

These accounts describe the *Burbung* ceremony predominantly taking place after sunset in August, when the band of the Milky Way is perpendicular to the horizon. Hence, the ‘*Sky Burbung*’ contained within the body of *The Celestial Emu* is visually and spiritually ‘connected’ to the terrestrial *Burbung* (Fuller et al., 2014b; see Figure 3, left). This allows *Daramulun*, who is of the emu totem, to descend to Earth and take part in the ceremony (Fuller et al., 2014b). The earthen figure of an emu adjacent to imprints of emu tracks morphing into human footprints, as witnessed by Mathews (1896b: 229) during a *Burbung* ceremony, may be symbolic of *Daramulun*’s descent to Earth as an emu and his transformation into human form. Interestingly, Howitt (1904: 588) states that the newly initiated were not allowed to go to sleep at night until the Milky Way was again horizontal in the sky. Howitt does not offer a reason for this.

One possible interpretation is that once the connection between Milky Way and ground was ‘severed’, *Daramulun* was no longer able to come down from the sky to walk the Earth, and therefore unable to pose a threat to the boys.

In both the Wiradjuri and Kamilaroi languages, the name of the terrestrial emu is *Dinawan*. Elders explain that the name of the *Celestial Emu* (Kamilaroi: *Gawarrgay/Gawarghoo*, Wiradjuri: *Gugurmin*) differs from its terrestrial counterpart, and its role changes as the orientation of the Milky Way changes over the year. Each orientation is linked to a different aspect of an overall narrative cycle linked to the emu’s behaviour and the ceremonial calendar (Fuller et al., 2014b: 175–177).

#### 4 BAIAMI AND THE EMU CHASE

*Burbung* ceremonial grounds are often decorated with intricate motifs carved into surrounding trees (Etheridge, 1918; Mathews, 1896a; 1896b), accompanied by ground-based anthropomorphic, animal, or abstract figures made of mounded soil (Mathews 1896a; 1896b; 1901; Figure 4).

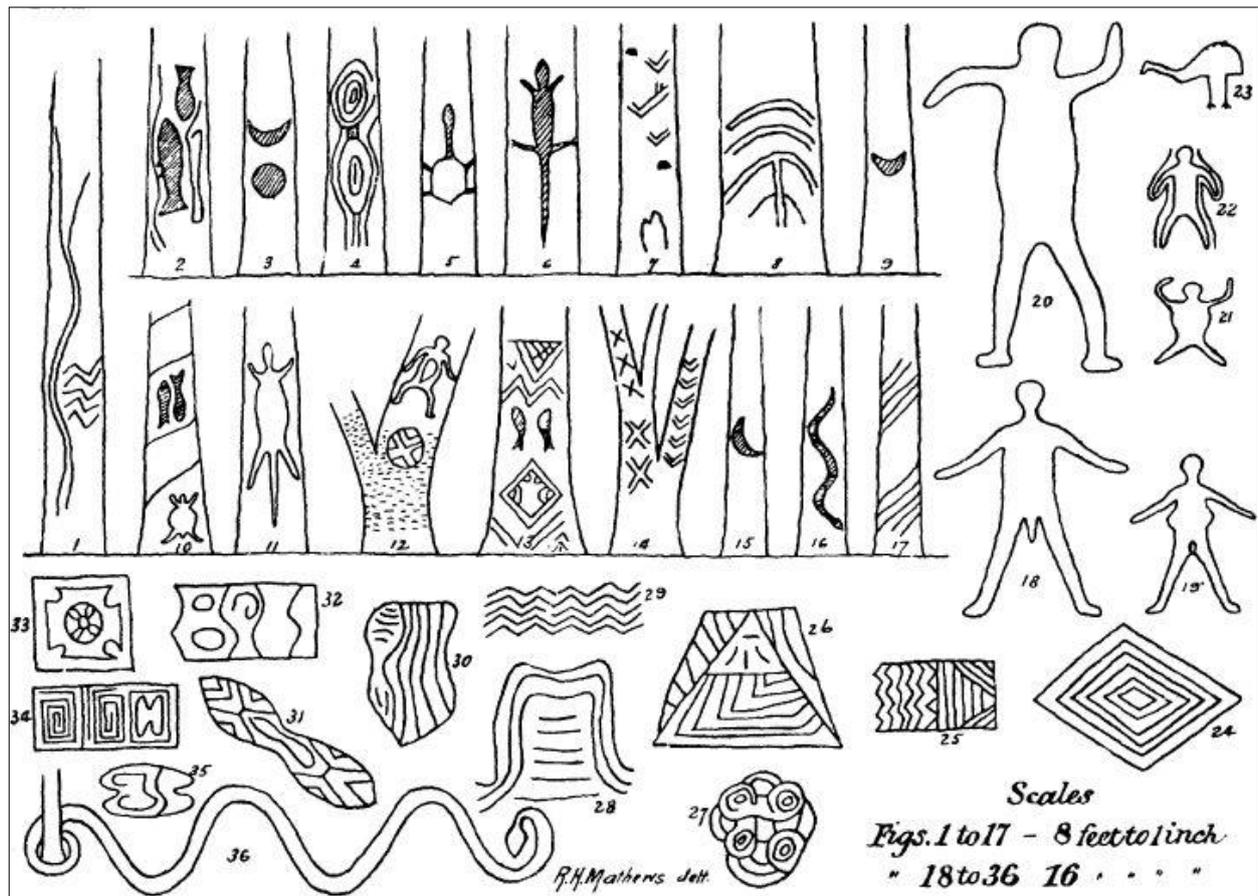


Figure 4: Some tree and ground motifs found in association with *Burbung* ceremonies (after Mathews, 1896a; numbers refer to his detailed descriptions).

Of the tree carvings (dendroglyphs), Mathews (1896a; 1896b) and Etheridge (1918) each offer a description of the manner of their construction. These designs include motifs that appear to depict the Sun and Moon, suggesting a connection to the skyworld.

One of the earthen figures is of special interest to our analysis. According to Mathews (1896b: 300), an earthen figure of a man measuring 6.60 m long by 1.68 m across the body, and 0.53 m in height is positioned opposite a large fire ('*Baiami's Fire*'). The figure, attributed to *Baiami*, was lying face-down with his arms spread out. Close to him were representations of two giant handprints, made by puddling and working the clay soil to shape. These were said to be the handprints of *Baiami* when he tripped and fell. A similar mounded figure was observed and photographed by Kerry in 1898 (Figure 5) during another *Burbung* ceremony, and thus contemporaneous with Mathews' observations.

According to the narrative recorded by Mathews (1896b), *Baiami* was hiding in a tree surrounded by bushes beside a waterhole, waiting for an emu to drink. When one did approach, *Baiami* speared it, but it ran some distance before it fell. On running after the emu, *Baiami* tripped over a log and fell hands-first to the ground, as



Figure 5: Earthmound representation of *Baiami* similar to and contemporaneous with the one witnessed and described by Mathews (1896b) during a *Burbung* ceremony (photograph: Charles Kerry (1898); courtesy: The Kerry & Co. Collection, Powerhouse Museum, Museum of Applied Arts and Sciences, Sydney).

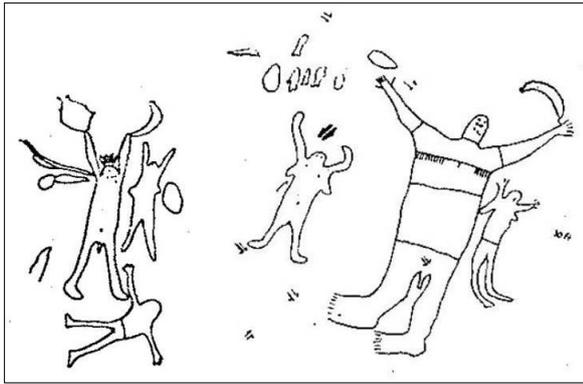


Figure 6: Line drawing sketches of rock art from the Sydney Basin depicting anthropomorphic figures attributed to *Baiami*. Note the Boomerangs (crescent Moons) held in the raised hands (images from McCarthy, 1983).

depicted in the earthen figure and handprints. At the same *Burbung* ceremony, near the earthen figure of the emu described previously, was a *Belar* tree (not identified by Mathews, but probably a *Bellaway* or River She-oak: *Casuarina cunninghamiana*) to which was tied a bunch of bushes. This was said to be '*Baiami*'s hiding place' (Mathews, 1896b: 300). Another *Belar* tree about 3.20 m from *Baiami*'s head was surmounted by 'a mock Eaglehawk's nest' (the Eaglehawk is an alternative name for the Wedge-tailed Eagle: *Aquila audax*), with the bole of the tree carved with representations of the Sun and crescent Moon (ibid.).

**5 AN ASTRONOMICAL CONNECTION?**

This narrative might seem unusual at first, describing and depicting *Baiami*—an important ancestral 'All-Father' creator—in a rather compromising and undignified manner. However, an

explanation may come from relating the story to the night sky. According to Eliade (1996: 41), *Baiami* "... dwells in the sky, beside a great stream of water." In Wiradjuri Lore, as with several other Aboriginal cultures from southeastern Australia, the Milky Way represents a great celestial river, going by the generic word *Bilabang*, 'river', from which we get the word *Billabong* meaning a series of waterholes (Dixon et al., 1992). More specifically the name of the nearest terrestrial river is also used for the Milky Way, such as *Calare* (var: *Galare*), the Wiradjuri name for the Lachlan River, which flows through central Wiradjuri country, *Warrambool*, the Wiradjuri, Kamilaroi and Euahlayi name for the Macquarie River, which flows through northern Wiradjuri and southern Kamilaroi country, or *Marrambidgeri*, the Murrumbidgee River, which flows through southern Wiradjuri country.

If *Baiami* "... dwells in the sky, beside a stream of water", where among the band of the Milky Way is he positioned? A clue may be found in how he is portrayed in tree carvings and earth mounds witnessed at *Burbung* ceremonies (Mathews, 1896a; 1896b; 1901; see Figures 4 and 5), and in rock art (e.g. see Mathews, 1895; 1897c; McCarthy, 1983; see Figure 6). These consistently depict *Baiami* standing with legs splayed and arms outstretched, which is very similar to the pose seen in the stars making up the Greek constellation Orion. This hypothesis has been confirmed on numerous occasions by several anonymous Wiradjuri custodians.<sup>3</sup> However, there are differing accounts as to how *Baiami* is positioned in relation to these stars. Due to the fairly symmetrical nature of this constellation (Figure 7) it is possible for *Baiami* to

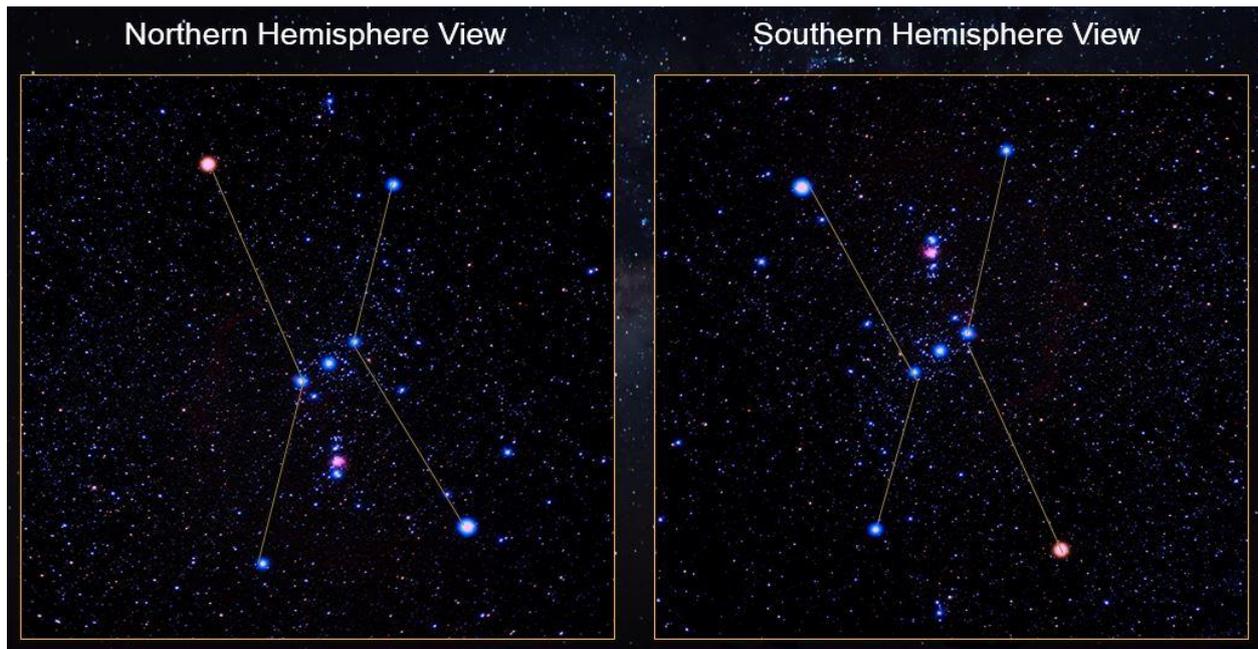


Figure 7: The north-south symmetry of the stars making up the constellation of Orion. Whether viewed from the Northern Hemisphere looking south (left), or from the Southern Hemisphere looking north (right), the constellation still appears similar (image: Wikimedia Commons, modified by T.Leaman).



Figure 8: Further strengthening the inverted orientation of *Baiami* in Orion is the fact that the ecliptic (tan line lower left) passes close by his outstretched hands, allowing for the occasional close passage of the crescent Moon, much as depicted in the Sydney Basin rock art (see Figure 6). Several Dreamings associate *Baiami* with boomerangs and crescent Moons, both being interchangeable motifs (image from Stellarium with the Moon scaled (X5) for better visualisation).

be oriented in either of two ways: head downwards ('upside-down') as is seen in the 'classical' depiction of Orion when viewed from the Southern Hemisphere, or head upwards ('right-side-up'), which would still fit the pattern of the stars equally well. Here, we discuss the evidence for an 'upside-down' orientation based on Mathews' account, and supported by other evidence outlined below. Evidence for the alternative 'right-side-up' orientation will be the subject of a future follow-up paper.

In Ngalea and Kokatha traditions from the Great Victoria Desert surrounding Ooldea, South Australia, Orion is identified with *Nyeeruna* (Bates, 1921; 1933), an ancestral being having many characteristics in common with *Baiami*, including an association with male initiations (Berndt and Berndt, 1943, 1945; Leaman and Hamacher, 2014). Bates' account of *Nyeeruna* clearly places him in Orion such that his right shoulder, which holds his club that directs 'sparks' (possibly referencing the Orionid meteor shower, as its radiant is located in this part of the sky) is

indicated by the variable red-giant star Betelgeuse (Leaman and Hamacher, 2014; Hamacher, 2018).

Are there any clues suggesting that *Baiami* is also oriented the same way? Rock art depictions of *Baiami* usually show him holding a boomerang in one of his outstretched hands (McCarthy, 1983; see Figure 6). Boomerangs and the crescent Moon are often interchangeable motifs, and both are associated with *Baiami*. One Dreaming in particular describes how, in order to settle a dispute between four ancestral animals, *Baiami* brought the first returning boomerang to Earth, which he threw towards the western horizon to become the first crescent Moon ever seen (Ellis, 2006: 114–117).<sup>4</sup> It is worth noting that the plane of the ecliptic, along which the Sun, Moon and planets move in the sky, passes close to the head and outstretched arms of Orion. Occasionally the crescent Moon will also be seen to pass close by (Figure 8). Is this *Baiame* holding his boomerang? If so, then this suggests that the orient-



Figure 9 (Left): The orientation of Orion as seen from a Southern Hemisphere perspective. (Right) The most likely orientation of *Baiami* in Orion based on a summary of the available evidence (images taken from Stellarium using the Western constellation artwork (left) and Wiradjuri constellations add-in for Stellarium developed by T. Leaman, and using the artworks of Scott 'Sauce' Townney (right)).

tation of *Baiami* in Orion is head-downwards, just as the Greek constellation of Orion is viewed from a Southern Hemisphere perspective (Figure 9).

This orientation fits very well with the overall narrative. Firstly, *Baiami's* chasing of the emu is a perfect allegory of the nightly (and/or yearly) movement of Orion and the *Celestial Emu* around the South Celestial Pole (SCP) (Figure 10). A similar story is told of Orion chasing Scorpius in Greek mythology. Secondly, *Baiami's* tripping and hands-first stumble to Earth describes the orientation of Orion as it sets in the western sky, with his hands (extending from his shoulders—the stars Betelgeuse and Bellatrix) being the first part of his body to touch the horizon (Figure 11). Lastly, in this orientation his right shoulder, being marked by Betelgeuse, fits well with another Dreaming narrative<sup>5</sup> in which this hand is capable of yielding immense power—just what is needed to hurl a boomerang at great distances.

Other elements of the narrative are also represented in the skyworld as Wiradjuri constellations. For instance, the log that causes *Baiami* to trip could be from *Yarran-Doo*, the Yarran Tree (either a River Red Gum, *Eucalyptus camaldulensis*, or Spearwood Tree, *Acacia homalophylla*), represented by the constellation Crux (Southern Cross) (McKeown, 1938: 18), which pivots around the SCP in the form of an 'Axis Mundi'. The mock Eagle's Nest constructed for the *Burbung* maybe a representation of the constellation of *Maliyan Wollai*, the nest of the Wedge-tailed Eagle, made up of the stars in Corona Borealis (Ridley, 1875: 141–142). *Mali-*

*yan* the Wedge-tailed Eagle can itself be seen in Altair and the stars of Aquila (Ridley, 1875: 142; see Figure 10, bottom). The *Wawi* (Rainbow Serpent) also features in the ground and tree drawings of the *Burbung* (Figure 4), and it too has a celestial counterpart in the dark bands of the Milky Way, stretching from Crux to Orion (anonymous Wiradjuri custodian, pers. comm.).

## 6 DISCUSSION AND SUMMARY

The sky is home for many ancestral creator beings that came down to make the world, the animals, and the people during a period referred to as the 'Dreaming' or 'Creation Time' (Clarke, 2007/2008). Unlike a modern Western worldview, Aboriginal peoples do not separate the realms of Earth, Sea, and Sky, but rather see them as aspects of a unified 'Cosmoscape' (Clarke, 1997). In this scheme, the skyworld is every bit as real as its counterpart on Earth, complete with rivers and forests inhabited with fish, birds, animals, and ancestral beings (Clarke, 1997; 2007/2008; 2014; 2015a; 2015b); just as these ancestral beings can come down to walk the land, it is possible for one to journey into the skyworld and interact with them (Clarke, 1997; 2007/2008; Eliade, 1967b: 161–163; Howitt, 1904: 406–408). In Wiradjuri, this place is called *Wantangganga* "... beyond the clouds in the sky." (Berndt 1974: 28) or *Murriyang* "... skyworld, where *Baiami* lives." (Grant and Rudder, 2010: 228).

Because little distinction was made between the land and skyworld, traditions that describe terrestrial events can just as easily describe events in the skyworld, and vice-versa (Clarke,



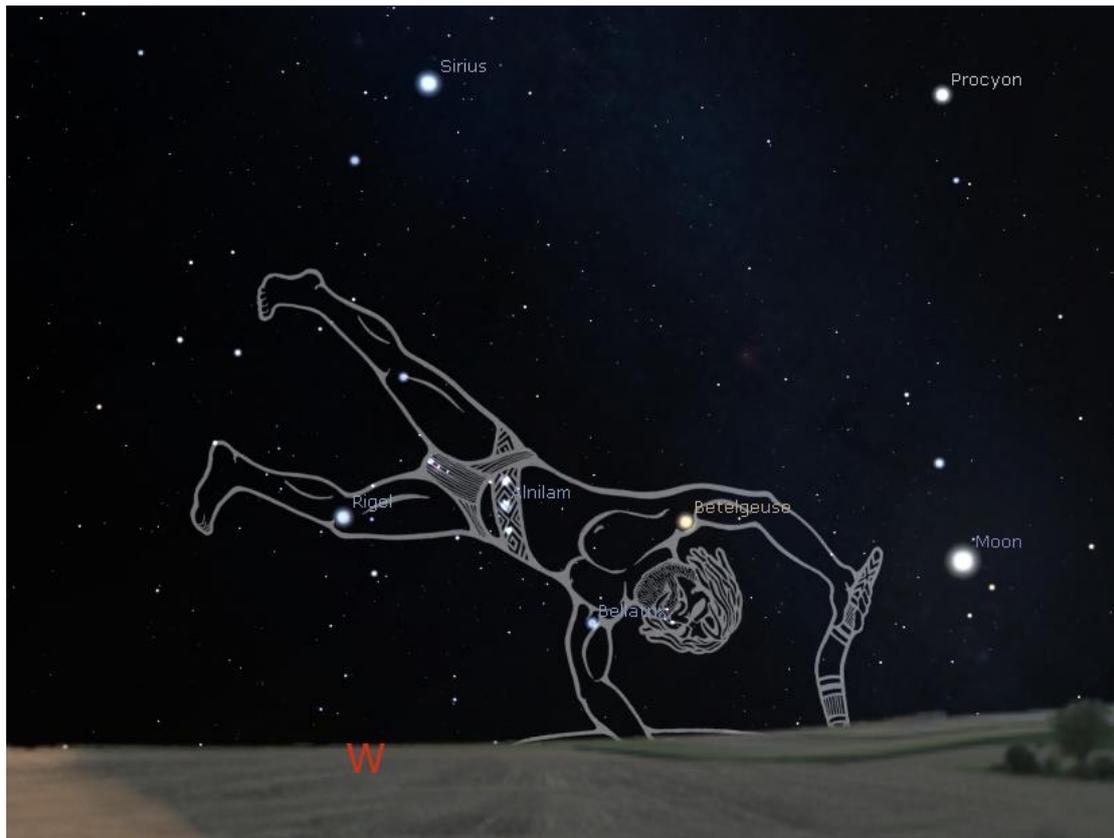


Figure 11: The orientation of *Baiami* (as Orion) as he sets in the west matches the description of his stumbling hands first to earth after chasing an Emu (image taken from Stellarium using the Wiradjuri constellation add-in for Stellarium developed by T. Leaman, and using the artworks of Scott 'Sauce' Towney).

dark bands in the Milky Way from Crux to Scorpius) as they move around the SCP (Figure 10). This is similar to the story of Orion's eternal pursuit of a scorpion (represented by the zodiac constellation Scorpius) from Greek mythology.

This narrative—supported by evidence from depictions of *Baiami* in rock art from the Sydney Basin—also indicates that his orientation in the stars of Orion appears to be the same as the Greek depiction of Orion itself, being upside-down as seen from a Southern Hemisphere perspective (Figure 9). This orientation is consistent with how *Nyeeruna*, a creator ancestor sharing similar attributes to *Baiami*, is also oriented in Orion (Bates, 1921; 1933; Leaman and Hamacher, 2014).

Further supporting this skyworld interpretation are the parallels that can be drawn between elements of the Wiradjuri *Burbung* described by Mathews (1896b) and the male initiation ceremony (*Minari* and *Baba Inma*) from Aboriginal traditions centred on Ooldea (Berndt and Berndt, 1943: 46; 1945; Leaman and Hamacher, 2014: 189). Both centre on a cultural ancestor represented by the stars in Orion, and both incorporate representations of the skyworld, either (a) through re-enactment of Dreamings associated with cultural ancestors represented by constellations, as is the case with the

*Minari* and *Baba Inma*, or (b) through representations of constellations in ground and tree drawings, and Dreaming narrative, as is the case with the *Burbung*. Such re-enactments through song, dance and ceremony are an effective way of memorising and transmitting cultural knowledge across the generations (Kelly, 2016). The '*Baiami* and Emu Chase' narrative is consistent with this mode of knowledge transmission.

This paper highlights the value of revisiting the ethnohistorical records to uncover knowledge of astronomical phenomena overlooked by previous researchers. It is hoped that further research of the archives will recover more examples that will assist communities in building a more complete corpus of knowledge for future generations.

## 7 NOTES

1. Aboriginal male initiation ceremonies are more widely known throughout Australia as *Bora*, which is a word borrowed from the neighbouring Kamilaroi language (Dixon et al., 1992: 150; Etheridge, 1918: 59). Here, as we are focussing on a Wiradjuri Dreaming and associated initiation ceremonies, we have adopted the Wiradjuri word *Burbung* when describing these ceremonies.

2. Early ethnohistorical researchers have adopted several spelling variations for these creation ancestors in an attempt to record the regional dialectic differences in pronunciation, both within Wiradjuri country and across neighbouring language groups (Thomas, 2015: 236). For clarity, we have standardised on *Baiami* and *Daramulun* in this paper. We have also adopted the spelling conventions listed in the Wiradjuri/English dictionary by Grant and Rudder (2010) for many of the Wiradjuri words used in this paper.
3. There is some debate as to whether Aboriginal people saw groups of stars as constellations, as in the modern western tradition (borrowing mostly from Greek mythology), or only a single significant star to represent important ancestors in their entirety. There is evidence, however, to suggest both view-points are equally valid depending on context of the Dreaming being told. In Wiradjuri sky-lore, the small curve of stars making up the constellation of Corona Australis is seen as the *Gugubarra*, the Kookaburra. Similarly, the curve of stars making up Corona Borealis is *Maliyan Wollai*, the Eagles Nest. *Guggaa* the goanna is represented by the star Antares, but the overall shape of the goanna is marked by the other stars in Scorpius, and its changing orientation in the sky forms part of an important seasonal resource calendar (Leaman, 2019).  
  
Similarly, while the whole of Orion may be seen as *Baiami* (this paper), individual stars in Orion can also represent separate ancestral beings e.g. the belt stars are the three brothers (*Gibirgang*) who lust after and chase the Seven Sisters or the Pleiades, *Malandyang* (alt: *Dindima*) (Grant and Rudder, 2010; Hamacher, 2014; Howitt, 1904), once again mirroring the Greek myth of Orion.
4. One Wiradjuri word for 'boomerang' is *bar-gan*, and the word for 'crescent Moon' is *bar-ganbargan*, literally translating as 'big boomerang'. In Wiradjuri, as for other Aboriginal languages, repeat words emphasise number or size. Another example is with the NSW town named Wagga Wagga. *Wagga* (or *Wagan*) is the Wiradjuri word for Crow. *Wagga Wagga* can literally mean 'Place of Many Crows' (it may also mean "... barbs on a spear like crow's beaks ..." or "... to dance in a frenzied manner.") (Grant and Rudder, 2010; Gunther, 1838).
5. The brightness variability of Betelgeuse was recognised by the Aboriginal people of the Great Victoria Desert, and was incorporated into a Dreaming narrative describing *Nyee-runa's* waxing and waning lust for the seven *Mingari* Sisters, represented by the stars of the Pleiades (Hamacher, 2018; Leaman and

Hamacher, 2014; Schaefer, 2018). It is possible the Wiradjuri may also have observed variability in Betelgeuse, but no tangible evidence has yet surfaced.

## 8 ACKNOWLEDGEMENTS

The authors wish to pay respect to all Wiradjuri (Wiradyuri) Elders, past, present and emerging, and fully recognise and honour their intellectual property and traditions.

Hamacher acknowledges support from Australian Research Council project DE140101600. Leaman was funded by the Australian Postgraduate Award, the Australian Government Research Training Program Scholarship, and project CT00156, a grant from the Central Tablelands Local Lands Services (CT-LLS) in Orange, NSW. Ethnographic fieldwork was supported by UNSW Human Research Ethics project HC15037. Elements of this paper were presented at the 17th Australian Space Research Council (ASRC) conference, which was held at the University of Sydney from 13–15 November 2017.

The authors would like to thank Larry Towney (CT-LLS, now retired) for sourcing the funding and assistance in the field. We also thank David Towney, David Acheson, Chris Heckenberg, and other members of the Wiradjuri Cultural Advisory Group for their advice, and members of the Australian Indigenous Astronomy Research team ([www.aboriginalastronomy.com.au](http://www.aboriginalastronomy.com.au)) and two anonymous reviewers for editorial comment and input. We would also like to thank Scott 'Sauce' Towney for permission to use his Wiradjuri constellation artworks featured in this paper, and Geoff Anderson and David Acheson for providing a Wiradjuri translation of the title of this paper, which honours the spirit of the 2019 International Year of Indigenous Languages. Mandaang guwu, mudyigaang.

## 9 REFERENCES

- Bates, D., 1921. Aborigines and Orion. *The Australasian*, 1 October, page 671.
- Bates, D., 1933. "Abo" astronomy, the constellation Orion. *The Sydney Morning Herald*, 9 September, page 9.
- Berndt, R.M., 1974. *Australian Aboriginal Religion*. Leiden, Brill.
- Berndt, R.M., and Berndt, C.H., 1943. A preliminary report of field work in the Ooldea region, western South Australia. *Oceania*, 14(1), 30–66.
- Berndt, R.M., and Berndt, C.H., 1945. A preliminary report of field work in the Ooldea region, western South Australia. *Oceania*, 15(3), 239–275.
- Berndt, R.M. and Berndt, C.H., 1977. *The World of the First Australians*. Sydney, Landsdowne Press.
- Clarke, P.A., 1997. The Aboriginal cosmic landscape of southern South Australia. *Records of the South Australian Museum*, 29, 125–145.
- Clarke, P.A., 2007/2008. An overview of Australian Aboriginal ethnoastronomy. *Archaeoastronomy*, 21,

- 39–58.
- Clarke, P.A., 2014. The Aboriginal Australian cosmic landscape. Part 1: The ethnobotany of the skyworld. *Journal of Astronomical History and Heritage*, 17 (3), 307–325.
- Clarke, P.A., 2015a. The Aboriginal Australian cosmic landscape. Part 2: plant connections with the skyworld. *Journal of Astronomical History and Heritage*, 18(1), 23–37.
- Clarke, P.A., 2015b. Australian Aboriginal astronomy and cosmology. In Ruggles, C.L.N. (ed.), *Handbook of Archaeoastronomy and Ethnoastronomy*. New York, Springer. Chapter 214.
- Coddington, C.L. and Cockburn, A., 1995. The mating system of free-living emus. *Australian Journal of Zoology*, 43(4), 365–372.
- Dixon, R.M.W., Ramson, W.S., and Mandy, T., 1992. *Australian Aboriginal Words in English: Their Origin and Meaning*. Melbourne, Oxford University Press Australia.
- Eliade, M., 1966. Australian religions: an introduction, Part I. *History of Religions*, 6(2), 108–134.
- Eliade, M., 1967a. Australian religions: an introduction, Part II. *History of Religions*, 6(3), 208–235.
- Eliade, M., 1967b. Australian religions: an introduction, Part IV: The medicine men and their supernatural models. *History of Religions*, 7(2), 159–183.
- Eliade, M., 1996. *Patterns in Comparative Religion*. Lincoln, University of Nebraska Press.
- Elkin, A.P., 1977. *Aboriginal Men of High Degree*. Brisbane, University of Queensland Press.
- Ellis, J.A., 2006. *The Dreaming of Aboriginal Australia*. Penrith, Kaliarna Productions.
- Etheridge, R. (Jr.), 1918. *The Dendroglyphs, or "Carved Trees" of New South Wales*. William Applegate Gullick, Government Printer, Department of Mines, NSW (Facsimile reprinted 2011 by Sydney University Press).
- Fuller, R.S., Hamacher, D.W. and Norris, R.P., 2013. Astronomical orientations of bora ceremonial grounds in Southeast Australia. *Australian Archaeology*, 77, 30–37.
- Fuller, R.S., Norris, R.P. and Trudgett, M., 2014a. The astronomy of the Kamilaroi people and their neighbours. *Australian Aboriginal Studies*, 2, 3–27.
- Fuller, R.S., Anderson, M.G., Norris, R.P. and Trudgett, M., 2014b. The emu sky knowledge of the Kamilaroi and Euahlayi peoples. *Journal of Astronomical History and Heritage*, 17(2), 171–179.
- Grant, S. and Rudder, J., 2010. *A New Wiradjuri Dictionary*. Canberra, Restoration House.
- Gunther, J., 1838. *The Native Dialect Wirradurri Spoken in the Wellington District, 1838*. Handwritten Manuscript, catalogue number C136 (Digitised), State Library of NSW, Sydney, Australia.
- Hamacher, D.W., 2014. *The Wiradjuri Astronomy Project: A Project Report and Strategic Plan*. Prepared for the Lachlan Catchment Management Authority. Unpublished report for the Central Tablelands Local Lands Services, Orange, NSW.
- Hamacher, D.W., 2018. Observations of red-giant variable stars by Aboriginal Australians. *The Australian Journal of Anthropology*, 29, 89–107.
- Hamacher, D.W., Fuller, R.S. and Norris, R.P., 2012. Orientations of linear stone arrangements in New South Wales. *Australian Archaeology*, 75, 46–54.
- Hartland, E.S., 1898. The "High Gods" of Australia. *Folklore*, 9(4), 290–329.
- Howitt, A.W., 1904. *The Native Tribes of South-East Australia*. London, MacMillan and Co.
- Kelly, L., 2016. *The Memory Code*. Sydney, Allan & Unwin.
- Lang, A., 1899. Australian gods, a reply. *Folklore*, 10(1), 1–57.
- Leaman, T.M., 2019. Reading the Indigenous night sky to interpret wildlife patterns. *Wildlife Australia Magazine*, Winter 2019, 18–20.
- Leaman, T.M. and Hamacher, D.W., 2014. Aboriginal astronomical traditions from Ooldea, South Australia. Part 1: Nyeeruna and 'The Orion Story'. *Journal of Astronomical History and Heritage*, 17, 180–194.
- Leaman, T.M. and Hamacher, D.W., 2019. An Overview of the Astronomical Knowledge of the Wiradjuri People of New South Wales, Australia (in preparation).
- Leaman, T.M., Hamacher, D.W. and Carter, M.T., 2016. Aboriginal astronomical traditions from Ooldea, South Australia. Part 2: animals in the Ooldean sky. *Journal of Astronomical History and Heritage*, 19(1), 61–78.
- Love, W.R.F., 1987. There is an emu on the bora ground. *Anthropological Society of Queensland Newsletter*, 177, 1–5.
- McCarthy, F.D., 1983. *Catalogue of Rock Engravings in the Sydney Hawkesbury District N.S.W., Volume 2*. Sydney, NSW National Parks and Wildlife Service.
- Macdonald, G., 1998. Master narratives and the dis-possession of the Wiradjuri. *Aboriginal History*, 22, 162–179.
- McKeown, K., 1938. *The Land of Baiame*. Sydney, Angus & Robertson.
- Mathews, J., 1994. *The Opal That Turned Into Fire*. Broome, Magabala Books.
- Mathews, R.H., 1893. Rock paintings by the Aborigines in caves on Bulgar Creek, near Singleton. *Journal and Proceedings of the Royal Society of New South Wales*, 27, 353–358.
- Mathews, R.H., 1895. Australian rock pictures. *American Anthropologist*, 8, 268–278.
- Mathews, R.H., 1896a. Australian ground and tree drawings. *American Anthropologist*, 9, 33–49.
- Mathews, R.H., 1896b. The Burbung of the Wiradtheri tribes. *Journal of the Anthropological Institute*, 25, 294–318.
- Mathews, R.H., 1897a. The Burbung of the Wiradtheri tribes, Part II. *Journal of the Anthropological Institute*, 26, 272–285.
- Mathews, R.H., 1897b. Bullroarers used by the Australian Aborigines. *Journal of the Anthropological Institute*, 27, 52–60.
- Mathews, R.H., 1897c. Australian rock carvings. *Proceedings of the American Philosophical Society*, 36(155), 195–208.
- Mathews, R.H., 1901. Initiation ceremonies of the Wiradjuri tribes. *American Anthropologist, New Series*, 3(2), 337–341.
- Mathews, R.H., 1904a. The Wiradyuri and other languages of New South Wales. *The Journal of the Anthropological Institute of Great Britain and Ireland*, 34, 284–305.
- Mathews, R.H., 1904b. Ethnological notes on the Aboriginal tribes of New South Wales and Victoria, Part 1. *Journal and Proceedings of the Royal Society of New South Wales*, 38, 203–381

- Norris, R.P., 2016. Dawes Review 5: Australian Aboriginal astronomy and navigation. *Publications of the Astronomical Society of Australia (PASA)*, 33, e039, 1–39.
- Norris, R.P. and Hamacher, D.W., 2009. The astronomy of Aboriginal Australia. In *The Role of Astronomy in Society and Culture, Proceedings of the International Astronomical Union, IAU Symposium 260*, 39–47.
- Norris, R. and Norris, P., 2009. *Emu Dreaming: An Introduction to Australian Aboriginal Astronomy*. Sydney, Emu Dreaming Press.
- Parker, K.L., 1905. *The Euahlayi Tribe, a Study of Aboriginal Life in Australia*. London, Archibald Constable & Co.
- Read, P., 1983. *A History of the Wiradjuri People of New South Wales, 1883–1969*. PhD thesis, Australian National University, Canberra, Australia.
- Read, P., 1984. 'Breaking up these camps entirely': The dispersal policy in Wiradjuri country. *Aboriginal History*, 8(1), 45–55.
- Ridley, W., 1875. *Kamilaroi, and Other Australian Languages*. Sydney, Thomas Richards.
- Schaefer, B.E., 2018. Yes, Aboriginal Australians can and did discover the variability of Betelgeuse. *Journal of Astronomical History and Heritage*, 21, 7–12.
- Stanbridge, W., 1861. Some particulars of the general characteristics, astronomy, and mythology of the tribes in the central part of Victoria, Southern Australia. *Transactions of the Ethnological Society of London*, 1, 286–304.
- Thomas, M., 2012. *The Many Worlds of R.H. Mathews*. Sydney, Allan & Unwin.
- Tindale, N.B., 1983. Celestial lore of some Australian tribes. *Archaeoastronomy*, 12/13, 358–379.
- Wellard, G.E.P., 1983. *Bushlore – Or This and That From Here and There*. Perth, Artlook Books.



**Trevor Leaman** is a Cultural Astronomy PhD researcher in the School of Humanities and Languages, University of New South Wales (UNSW). He is researching the astronomical traditions of the Wiradjuri people of central NSW under the supervision of

Associate Professor Duane Hamacher (UMelb) and Associate Professor Daniel Robinson (UNSW). He earned diplomas in civil and mechanical engineering, degrees in biology and forest ecology, and an MSc in astronomy. He has worked as an astronomy educator at Ayres Rock Resort, the Launceston Planetarium, and Sydney Observatory. He also tutors the unit PHYS1160 "Introduction to Astronomy and Search For Life Elsewhere" at UNSW.



**Dr Duane W. Hamacher** is an Associate Professor of Indigenous Astronomy & Science in the School of Physics at the University of Melbourne. His work focuses on astronomical heritage and Indigenous astronomical knowledge in Australia and Asia. He is Secretary of the International Society for Archaeoastronomy and Astronomy in Culture, Chairs the International Astronomical Union's Working Group on Intangible Heritage, serves on the IAU Working Group for Star Names, and is an Associate Editor of the *Journal of Astronomical History and Heritage*.

International Society for Archaeoastronomy and Astronomy in Culture, Chairs the International Astronomical Union's Working Group on Intangible Heritage, serves on the IAU Working Group for Star Names, and is an Associate Editor of the *Journal of Astronomical History and Heritage*.