

# Pre-contact Astronomy

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**Abstract:** This paper examines a representative selection of the Aboriginal bark paintings featuring astronomical themes or motives that were collected in 1948 during the American-Australian Scientific Expedition to Arnhem Land in north Australia. These paintings were studied in an effort to obtain an insight into the pre-contact social-cultural astronomy of the Aboriginal people of Australia who have lived on the Australian continent for over 40 000 years.

**Keywords:** American-Australian scientific expedition to Arnhem Land, Aboriginal astronomy, Aboriginal art, celestial objects.

## INTRODUCTION

About 60 years ago, in 1948 an epic journey was undertaken by members of the American-Australian Scientific Expedition (AAS Expedition) to Arnhem Land in north Australia to study Aboriginal society before it disappeared under the onslaught of modern technology and the culture of an invading European civilisation. It was believed at that time that the Aborigines were a dying race and it was important to save and record the tangible evidence of their culture and society. The leader of the scientific expedition referred to Arnhem Land as still being in the Stone Age (Mountford 1949). It was seen as the last frontier. The philosophy that guided the collections of the material culture of the Aboriginal people of Arnhem Land was based on Social Darwinist views which were prevalent in the 19th and early twentieth centuries thinking among intellectuals from the metropolitan centres of learning. They held the view that there was an evolutionary ladder in the progress of human beings and cultures (Griffiths 1996). The Aborigines were considered to be on the bottom rung of this ladder.

The official aims of the expedition were to observe the every day life of the Aborigines of Arnhem Land, to determine where they originally came from, to learn how they coped with their environment and to obtain specimens of their material culture (Mountford 1949). The expedition was funded by the National Geographic Society, the Smithsonian Institution and the Commonwealth Government of Aus-

tralia. One of the reasons for the Commonwealth Government supporting the expedition was that it was anxious to foster good relations between Australia and the US following World II and the other was to establish scientific cooperation between Australia and the US.

## The Collection

The expedition was organised and led by Charles Mountford, a film maker and lecturer who worked for the Commonwealth Government of Australia and an Honorary Assistant in Ethnology at the South Australian Museum. The bulk of the bark paintings and ethnographic material were collected from the three base camps at Groote Eylandt, Yirrkala in north-east Arnhem Land and Oenpelli in western Arnhem Land. They also visited Milingimbi Island, Chasm Island and Winchelsea Island but for shorter periods. The expedition lasted from May to early November 1948. Mountford's collection strategy was to set up a 'shop' in a big tent and ask the local people to bring goods which they wanted to trade. It is not known what he paid them but he obtained interpretations of the items the people brought to him.

In the case of the bark paintings, Mountford (1956) asked the Aboriginal people to make paintings for him. He says that he seldom suggested a subject. At the end of the day, the artists brought their work to his tent, related the associated myth, and explained the meanings of the designs. However, in the case of the astronomical paintings, Mountford suggested the subjects to be painted.

Thus, the astronomical folklore was collected within the perspective of the European astronomical knowledge system and his limited knowledge of astronomy. In fact, in his book "Brown Men and Red Sand" (Mountford 1949), wrote that although in the early days among the Aborigines he could recognise Orion, Scorpio and the Southern Cross, he found that the other constellations such as Argo, Delphinus, Hercules and others were beyond him. His knowledge of the sky was backed with little information. This is one of the reasons why the information collected on the astronomy of the Aborigines in Arnhem Land is rather limited and confined to those celestial objects and parts of the sky that Mountford was familiar with. Only three examples are provided by him of the actual Aboriginal constellations. However, the information on these is not complete and the stars are not identified by Mountford. Furthermore, the provenance of the paintings leaves much to be desired. Whilst the locations where the paintings were collected from is provided, however the information on the artists who painted the astronomical paintings is incomplete. Mountford notes that when the supply of prepared sheets of bark at Yirrkalala and Oenpelli became exhausted, he provided the artists with sheets of rough-surfaced grey and green paper (Mountford 1956). This explains why some of the paintings are on paper.

The interpretations that Mountford recorded were very basic. Since the artists had to explain their paintings in broken English it may be the case that the recorded interpretations may be incomplete. He does not tell us whether he checked the paintings with the positions of the celestial bodies in the night sky. He informs us that in the late afternoon, when the Aboriginal artists had finished their work, he would sit among them listening to stories they had illustrated on sheets of bark. Despite these shortcomings we have a valuable collection of pre-contact stories of the night sky which are illustrated by paintings. It is probably the single largest collection of astronomical paintings from an ancient culture.

The pigments used to paint the designs of the bark paintings were red, yellow, black and

white. On Groote Eylandt the black came from the carbon of dry batteries discarded by the Air Force after the war. The paintings have a mixture of the early style of cross-hatching, broken lines, parallel lines, circles and circles with radiating lines. The artists used three kinds of brushes, viz: a narrow strip of bark, chewed at one end for making broad lines, a thin cylindrical stick with the ends slightly burred for making dots and a brush made from a few fibres of palm leaf to make fine lines.

The expedition was a great success. In addition to collecting 13 500 plant specimens, 30 000 fish, 850 birds, 460 animals, the collection also included 2 144 ethnographic artefacts, including 484 bark paintings (Mountford 1956). For the purpose of this study it is rather unfortunate that at the end of the expedition the collection of bark paintings was dispersed to various institutions in Australia and the Smithsonian Institution in Washington in the US. Thirty six of the bark paintings in the collection were on the astronomy of the Aboriginal people. These were also dispersed and as a consequence of this it has been an extremely difficult task to locate them in the various institutions. The astronomical paintings have a collective story to tell. Unfortunately this was not considered important by the officials who sanctioned the distribution of these works of art and in particular those on the astronomy of the Aboriginal people. This may have been due to the fact that the officials lacked knowledge of astronomy. This paper is concerned only with the astronomical paintings.

## Aboriginal Astronomy

In the 19th and early twentieth centuries a number of writers (Stanbridge 1861, Smyth 1878, Ridley 1875, Matthews 1905 and Maegarith 1932) had collected information on the astronomical stories and beliefs of the Aboriginal people. One of the significant things that emerges from these accounts is that astronomical knowledge was one of the principal branches of education among Aboriginal people (Dawson 1881). Another remarkable aspect of their astronomy is that long before other civilisations had named the celestial objects the Aborigines had given them names. For example, in Groote

Eylandt, the Milky Way was known as Ataluma, the Coal Sack as Alakitja, Venus as Barnimbida, the Moon as Jumuria and the star Achenar as Anguoa. In other localities the celestial objects were known by different names. The astronomy of the Aboriginal people was based on oral accounts that had been passed down from one generation to another over the 40 000 years that they have lived on the Australian continent.

In the 1940s when the AAS Expedition took place the Aborigines in north Australia were still enjoying the last vestiges of pre-contact culture and society. Most of their cultural heritage was intact although there were already inroads in spoiling their culture by Christian missionaries. Thus, the bark paintings that were collected provide us with the only examples of the astronomical knowledge system of the Aboriginal people in visual form. Thus, this collection of 36 paintings is unique in that it not only provides us with a visual representation but is also supplemented with an oral testimony of their meaning.

The subject of the paintings can be classified into the following categories for ease of discussion:

- Sun and Moon
- Planets: Venus and Jupiter
- Constellations and clusters: Southern Cross, Scorpio, Orion and the Pleiades
- Galaxies: Magellanic Clouds and the Milky Way
- Aboriginal constellations: Scorpion, the Crab and the Crocodile, the Opposum and Ibis-men.

The above list is not exhaustive of what can be seen in the night sky at any one time with the naked eye. They represent what was of interest to the Aborigines in terms of their social cultural astronomy and the information that was collected by the collector. While there are some resemblances between the myths of Millingimbi and Yirrkala which are in relative close proximity, those from Oenpelli, Groote Eylandt and Yirrkala show differences. This may be the result of the larger distances between these places and a lack of sustained interaction between these communities.

The paintings are not just plain representations of the celestial objects that one sees in the night sky. They are much more complex and symbolic and thus they have to be interpreted by the artists since they have meanings encoded in them. Unfortunately, Mountford does not provide us with a full context for all the paintings and the social cultural aspects of the astronomy of the Aboriginal people.

## Sun and Moon

The Sun and Moon are the most conspicuous celestial objects and hence play an important role in Aboriginal society and culture. Unlike other cultures the Sun in Aboriginal social cultural astronomy is seen as a woman. Hence, it is given a lower status than the Moon which is considered a male.

On Groote Eylandt the Sun-woman (Mamoura) is associated with the female turtle, Imoraka which is seen to leave and enter the water again. This is illustrated by a song about the turtle. These acts of leaving and entering the water are used to explain the rising and setting of the Sun. At another level the bark painting does not just refer to the celestial objects and their movements but it represents ancestral celestial beings who are related to creation stories, such as the formation of the land or the islands and to places of significance. The Sun-woman and her husband are seen as ancestral people whose bodies when they died were transformed into two low rocks on the seashore. Thus, what is seen on the land is reflected in the sky and vice-versa - an important philosophical concept in Aboriginal society and culture. In Yirrkala, the Sun-woman, Walo rises from a far away place beyond the eastern horizon called Turinjina and disappears beneath the western horizon at a place called Biminura. She then changes herself into a wallaby and returns again in the east by hopping along an underground tunnel. This story explains the rising and setting of the Sun on a daily basis. In Milingimbi the Sun-woman transforms herself into a Warrukay fish in the evening and swims under the earth and reappears in the morning as the Sun (Isaacs 1980). Since they are fishing communities it is understandable that the imagery they use is associated with fishing activities.

The Moon is not only associated with death but also pregnancy. This belief is not only confined to the Aboriginal people of Arnhem Land but is also shared by other Aboriginal groups on the mainland. Young girls are told not to look at the Moon unless they want to become pregnant. In many stories in Aboriginal social-cultural astronomy the Moon is associated with death. While everything on earth is destined to die the Moon is reborn at the end of every month. In Yirrkalla the explanation for the resurrection of the Moon is explained thus. In a heated argument the parrot-fish (Dirima) and the Moon-man (Alinda) hit each other so badly with their clubs that they died. The spirit of the Moon-man told the spirit of the parrot-fish that he would go to the sky and become the Moon, while the parrot-fish and everything else on earth would die. The Moon-man, on the other hand would die for three days and be reborn. The pearly nautilus (*Nautilus pompilius*) is supposed to be the skeleton of the dead Moon. The Aborigines on Groote Eylandt and Yirrkalla have an explanation for the waxing and waning of the Moon. According to them we get a full Moon when the high tides run into the Moon and make it fat and round. When the tides are low, the water runs out of the Moon and we get a thin Moon.

In Milingimbi the Moon has a different origin. It is associated with the deceit and greed of two sons who having caught a whistling duck did not share it with their father. The angry father put them in a bag and took them out to sea and threw them overboard. In their anger his wives set fire to the hut he was sleeping in. He was carried away by the fire into the sky where he turned into the Moon. From his lofty position he decreed that every living thing would die except himself. He would die for three days a month and be born again. This explains the phases of the Moon according to the Aborigines at Milingimbi.

The status of these pre-scientific explanations of the phases of the Moon are not dissimilar to the pre-scientific explanations given by Aristotelian physics as to why objects fall to the ground or why projectiles are able to move through the air. According to Aristotelian

physics an object falls to the ground because its natural motion is towards the centre of the earth. Aristotelians explained the continued motion of a projectile or an arrow by saying that the air which was being pushed and compressed in front had to rush behind to prevent a vacuum from forming there. They reasoned that God hated a vacuum. It was criticisms of these pre-scientific ideas of the Aristotelians that eventually led to the rise of modern science (Butterfield 1957).

## The Planets

The stars and the planets that were observed by the Aborigines were associated with family and kinship relationships based on their philosophy that what is practiced on the land is reflected in the heavens. Thus, on Groote Eylandt Venus and Jupiter have two children who are the stars Lambda and Upsilon in the sting in the constellation of Scorpio. In other parts of Australia the Aboriginal people also used the celestial bodies to represent family relationships and kinship ties. Kinship ties formed the basis of social structure in Aboriginal societies that regulated marriage and other activities. The Aranda and Luritja people at Hermannsburg in Central Australia saw the night sky as two great camps that were separated by a large river, the Milky Way. The stars to the east of the celestial river were known as Aranda camps and the stars to the west of the river were considered to be Luritja camps. This division provided them with a class system which regulated acceptable marriages (Maegraith 1932).

Mars, Saturn, Jupiter and Venus were observed by the Aborigines. Of these four planets, Venus plays a significant role in Aboriginal life. Venus is very conspicuous in the sky and the Aborigines know it as the Morning and Evening Star. To the Aborigines in northeastern Arnhem Land, Venus is known as the Morning Star or Barnumbir and is associated with death. Barnumbir is held on a long string by two old women on the Island of the Dead (known as Purlko in Yirrkalla, Djiraia in Milingimbi or Bralgu) to ensure that Barnumbir does not escape. In the painting (Figure 1) the morning star is imprisoned in a bag shown at the bottom

of the painting by the two women. Just before dawn Barnumbir is let out of the bag so that the star can wake up the Aborigines and give them messages from the dead. Each of the blossoms represents a locality he visits with the messages. At dawn the star is pulled back to the shore and kept in a bag during the day. The process is repeated again next morning. Since Barnumbir is tied by a string the star never rises very high in the sky and can thus be seen most clearly at dawn or dusk. The Aboriginal people in northeastern Arnhem Land perform morning star ceremonies to ensure that the deceased travels safely to the Land of the Dead. The ancestral beings made feathered strings that they attached to the Morning Star to guide the dead person's spirit or soul to his/her final resting place. In the performance of the ceremony the Aborigines use a large pole decorated with feathered strings and a ball or bunches of sea gull feathers. The ball represents the Morning Star. (Berndt, Berndt and Stanton 1998, Mountford 1956).



Figure 1. Venus – the Morning Star or Barnumbir.

## Constellations

The Southern Cross is the most famous constellation in the southern hemisphere. It was first observed by Andreas Corsali in 1572 on a voyage to Goa in India (Bhathal and Bhathal 2007). But the Aboriginal people have been observing it for over 40 000 years. It is called by various names and has a number of different stories attached to it. There is a wide difference in the interpretation of the Southern Cross and the Pointers between Yirrkala and Groote Eylandt. In Yirrkala it is seen as a sting ray being chased by a shark (Figure 2). The Cross is the sting ray while the shark represents the Pointers. On the other hand at Groote Eylandt the Southern Cross is seen in association with the Coal Sack and the Pointers. Alpha and Beta Crucis represent two brothers who have speared a large fish (the Coal Sack) and are cooking it on two fires represented by the other two stars of the Southern Cross (Delta and Gamma Crucis).



Figure 2. The Southern Cross.

In contrast the Aborigines in central Australia look upon the Southern Cross as the footprints of the wedge-tailed eagle. While the pointers (Alpha and Beta Centauri) are his throwing stick and the nearby Coal Sack (the dark patch) is his nest (Mountford 1976). On Stradbroke Island the Southern Cross is seen as Mirabooka, a kindly man who has been put in the sky by the Great Spirit, Biambi to look after his people (Walker 1972).

It is rather interesting to note that in many cultures around the world the Pleiades are seen as the seven sisters or a group of girls (Andrews 2004). They are normally associated with the stars in the Orion which are seen as a group of men or a man. On Groote Eylandt, Yirrkala and Milingimbi, Orion and the Pleiades are represented as fishermen and their wives respectively who live in harmony. The representation of Orion and the Pleiades as fishermen and their wives is strongly linked to their style of living in a fishing community. The painting (Figure 3) shows a canoe which carries three fishermen (stars in Orion's belt) and their wives sitting at the other end (Pleiades). The paddles represent long lines of stars stretching to the north and south. The fish in the sea may be other stars

in the Milky Way. It may be the case that the association of the Pleiades with women was transferred to the Aborigines in north Australia by the Macassan fishermen who used to visit north Australia on their fishing expeditions in search of trepang (also known as sea-slug or beche-de-mer). Trepang was prized by the Chinese community in South East Asia for its culinary as well as supposed aphrodisiac properties (Mulvaney and Kamminga 1999). The harmonious relationship which existed between Orion and the Pleiades in north Australia is not repeated in the stories of these celestial objects as seen by the Aborigines in Central Australia. Here the stories are of violence where the men in Orion are constantly chasing the seven sisters. It also needs to be pointed out that the stories about the Pleiades are classified as secret women's business in some parts of Australia and are only known to those who need to know them. The secrecy of these stories has had dire consequences for some Aboriginal groups, such as in the case of the Hindmarsh Island Bridge Affair where a bridge was built between the mainland and the island with absolute disregard for the tradition and culture of the Aboriginal women (Simons 2003).

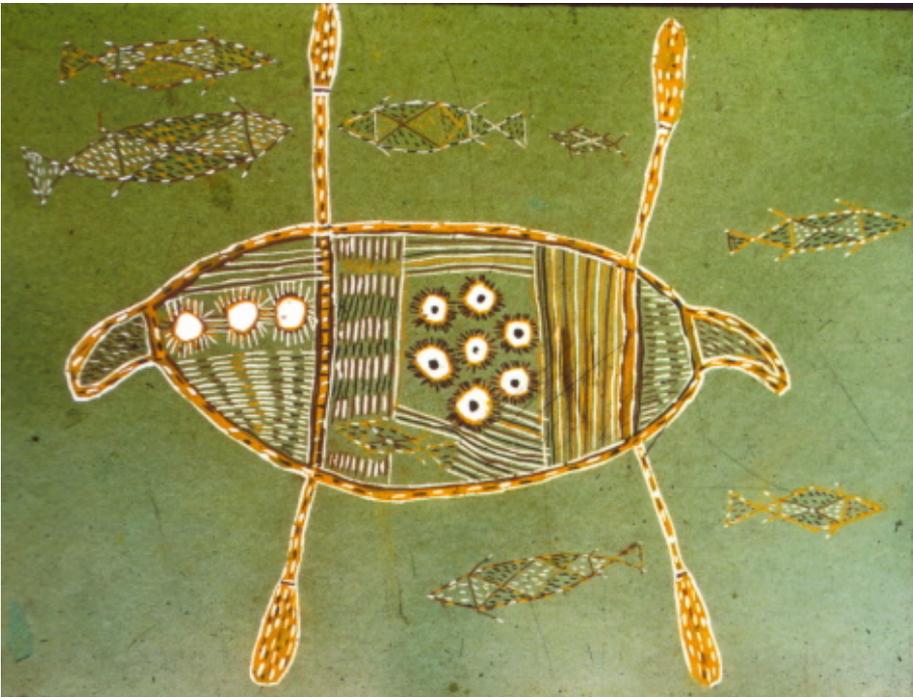


Figure 3. Orion (the three stars on the left) and the Pleiades (the seven stars on the right).

## Galaxies

There are two galaxies of interest to the Aborigines. These are the Milky Way galaxy and the Magellanic Clouds. Far away from city lights, the Magellanic Clouds can be seen with the naked eye as two fuzzy patches of light in the night sky. On Groote Eylandt they are interpreted as the camps of an old man (Large Magellanic Cloud) and an old woman (Small Magellanic Cloud) who cook their food over a fire which is represented according to Mountford by the bright star Achernar (magnitude 0.43). The star is more likely to be Gamma Hydri (magnitude 3.25) in keeping with the significance of fainter stars in Aboriginal astronomy. [Brighter stars have numerically smaller magnitudes than fainter stars. Thus,

a star of magnitude 0.43 is brighter than a star of magnitude 3.25. The magnitude is a measure of the brightness of a star.]. However, in Yirrkalla the Magellanic Clouds are given a different interpretation. They are interpreted as the homes of an older sister (lower figure), Nujai who lives with her dog in the Large Magellanic Cloud and a younger sister (upper figure), Narai who lives with her dog and children in the Small Magellanic Cloud (Figure 4). The interpretation of these celestial objects is quite different in other Aboriginal communities on the mainland. For example, in central Australia the Magellanic Clouds are looked upon as the homes of the Kungara brothers. The Aborigines believe that the Kungara brothers watch over them from the sky and punish or reward them according to their deeds (Mountford 1976).



Figure 4. The Magellanic Clouds.

The Milky Way which spreads like a broad white band from one horizon to the other is one of the most spectacular celestial objects to grace the night sky over Australia. It is seen by almost all Aboriginal groups as a river in the sky where the sky people live. In creation times the Milky Way was seen as a water course near Blue Mud Bay by the Aboriginal people in Yirrkala. This river is reflected in the sky as the Milky Way according to the Aborigines in Yirrkala. The story of two brothers who were caught in a storm after a fishing trip is depicted in the Milky Way. They did not survive the storm and drowned. Their bodies and their canoe are the dark patches in the Milky Way.

### Aboriginal Constellations

Mountford was informed of three Aboriginal constellations which bore their own Aboriginal names. Very little information of these constellations is recorded by him in the notes of the expedition. He mentions the Aboriginal constellation of Scorpion which it would appear is in the European constellation of Lupus. Unfortunately the names of the stars which make up this constellation are not provided. The Aboriginal constellation of the crab (Unwala) gives us an interesting insight into some aspects of the organisation of Aboriginal astronomy. They were more interested in the patterns made by the stars rather than their brightness and this led them to disregard the brighter more obvious nearby stars. Thus, at Groote Eylandt, the Aboriginal people gave the name Unwala to a group of rather inconspicuous stars (with an average magnitude of 4.4) at the head of the European constellation Hydra. They disregarded the two bright nearby stars, viz: Procyon and Regulus which have magnitudes of 0.36 and 1.35 respectively. They were also more interested in identifying a group of stars to support their stories.

The stars in the European constellation of Scorpio have been grouped by the Aborigines in Yirrkalla into two Aboriginal constellations, viz: the Crocodile and the Opossum and the Ibis-men. The Crocodile constellation is made up of the stars from the sting (i.e. Lambda and Upsilon Scorpio) to the star Sigma Scorpio

near the bright red star Antares. In the second group, Antares is the Opossum man. The two stars (Tau Scorpio and Rho Scorpio) on either side of Antares make up the Ibis-men.

### Stars and Seasons

From the rather patchy information we can glean from the paintings, it is clear that the Aboriginal people in north-east Australia had developed the beginnings of a correlation between the appearance of certain stars in the sky with the seasons and the beginning or end of certain activities. Thus, on Groote Eylandt when the stars Lambda and Upsilon Scorpi in the constellation Scorpio made their appearance in the sky towards the end of April the Aborigines knew that the wet season had ended and the dry south-easterly wind (Marimariga) would begin to blow. In Yirrkala the appearance of Scorpio informed them that the Macassan fishermen were coming to collect the trepang. When Arcturus could be seen in the eastern sky in the early morning, it was a sign to the Aborigines in Arnhem Land that it was time to make fish traps and baskets from the spike-rush. This correlation between the appearance of certain stars and the seasons was also used by the Aborigines for ordering their daily activities.

The association of the stars with the seasons was also used in other parts of Australia. Thus, when the Pleiades appeared in the dawn sky, the Pitjantjatjura in the Western Desert region knew that the annual dingo breeding season had begun. A few weeks later they would raid the lairs to feast on the young pups. In western Victoria, the appearance of Arcturus told the Aborigines where to find the pupa of the wood ant which served as a source of food.

### Conclusion

The collection of thirty-six bark and paper paintings collected by the American-Australian Expedition to Arnhem Land has provided us with some aspects of the pre-contact astronomy of the Aboriginal people living in this part of the world. The paintings are unique in that they not only provide us with a visual representation of Aboriginal social cultural astronomy but they

are supplemented with the oral testimony of their meaning. This group of bark paintings is the largest single visual collection of pre-contact astronomy in Australia. It is thus important that they should be brought together and placed in a single institution and called the Aboriginal Astronomical Heritage Collection.

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