Chapter 4: Indigenous Uses of Astronomy

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In one sense, all cultural uses of astronomy are indigenous, whether past or present. In practice, though, the term 'indigenous' is commonly taken to apply only to people outside the 'Western' framework of thought, given the global nature of modern science. This introduces a dichotomy that parallels the differences of approach between historians of astronomy—who tend to focus upon places, discoveries and people significant in the development of modern scientific astronomy—and those such as archaeoastronomers who generally take a more anthropological perspective, striving to recognise human achievements in their own terms and to emphasize cultural diversity.

There is no hard-and-fast boundary between practices among indigenous communities in the present or recent past and those in the more distant past. It might seem that the obvious dividing line is the existence, or not, of ethnographic evidence: evidence from 'live informants'. However, ethnographic data does not remain current: it itself ages, and then becomes historical. The 'ethnohistoric' evidence of the European chroniclers who recorded the vestiges of Native American traditions shortly after the conquest is a key factor in interpreting many pre-Columbian sites in the Americas (see Chapter 3).

The existence of ethnographic data does not remove the need to consider other forms of evidence in interpreting cultural sites. Ethnographic evidence in the form of a reliable informant giving direct information about the meaning and use of a place is a virtually unattainable ideal, for a variety of reasons: some of the more obvious ones are the ethnographer's bias in selecting what questions to ask, or not understanding the answer in their own terms because of not sharing the world-view of the informant, or not having the privilege to be given sacred information. As ethnography ages into ethnohistory, all this is compounded with additional problems of historical interpretation. Finally, if one is interested in the cultural significance and meaning of a site at some time in the past, then it is questionable how relevant the 'living tradition' is to the practices that defined the place at a (possibly considerably) earlier time.

In this chapter we focus on places where some element of 'modern' ethnography (not more than, say, two centuries old) is considered relevant to the interpretation of sites. As we shall see, this does not eliminate the sort of methodological issues inherent in the interpretation of archaeoastronomical evidence—such as the possibility of fortuitous occurrences of impressive alignments and hierophanies—encountered in the preceding chapters. Forming the most sustainable interpretation involves a suitable balance between these different types of evidence—ethnographic, historical, archaeological and statistical.

In such an interdisciplinary field of enquiry, terminology is a significant issue, since the term used can carry unfortunate and unintentional overtones. For example, if 'observatory' is taken to mean a place constructed for the exclusive, or main, purpose of astronomical observations then it is likely to be inappropriate in almost any indigenous context; however, the term 'observatory' is generally acceptable if it is taken to mean any place where astronomical observations were actually carried out (for whatever purpose). We adopt the latter meaning here. Likewise, 'astronomy' makes more sense in the indigenous context if it is taken in a

broad sense to encompass activities, artwork, and measurements related to the sky carried out by people who would not be considered 'astronomers' in any modern sense (i.e. specialists). In this case, the term 'indigenous astronomy', or even 'indigenous astronomies', is to be preferred to 'indigenous uses of astronomy'. In what follows, we refer to 'indigenous astronomy' in this latter sense.

Examples of indigenous astronomy can be found on every continent. Mindful of the four categories of cultural property associated with astronomical heritage that were identified by the Astronomy and World Heritage Initiative at its outset (see Page 1), it is helpful to distinguish (i) physical sites that are connected to indigenous astronomy; (ii) practices and activities such as navigation that are connected to indigenous astronomy; and (iii) indigenous astronomy concepts found in oral forms and other intangible forms such as origin stories, songs, dances, and rituals, and calendars. Only the first represents fixed tangible heritage, the other two categories being intangible.

Physical sites connected to indigenous astronomy

In contrast to the observatories used for scientific astronomy, the places where people made regular observations of the night sky in an indigenous context reflect the cultural applications of those observations, such as timekeeping, setting the local calendar, or the needs of religion.

For example, the Ngas people of Nigeria follow a calendar based on regular observations of the moon. The moon is important to the Ngas and their monthly activities and agricultural activities are based on this lunar calendar. They look for the first crescent moon to appear on the western horizon every month, and their biggest festival is based on observing the first crescent moon of their New Year. The week-long festival activities include ritually cleaning their homes and their village, gift giving, and drinking 'the moon's beer'. A ceremony with the 'sons of the moon'— young boys whose faces are decorated with the full moon—involves the boys shooting arrows into the sky to kill the old moon in order for the new crescent moon to be born. The timing of their shooting the moon is precise: the first crescent moon must be sighted the next evening. If the timing is wrong, the villagers will fall ill. The priest who determines the calendar has an exact location where he stands to make the moon observations, and so there is a physical site connected to his moon-watching.

It is more challenging to interpret the evidence where traditional practices have been substantially modified, forgotten or lost, and conclusions must be derived from historical or archaeological evidence alone. For example, there is a group of Native North American sites that seem to combine petroglyphs or rock art and physical obstructions that together create light-and-shadow events marking certain days of the year. An example is the 'sun dagger' of Fajada Butte, New Mexico, USA, where a dagger of sunlight cast by a gap between two slabs of rock bisects a large spiral carving around noon on the summer solstice. Unfortunately, while there has been a lot of research on these sites, there is still debate and controversy as to whether these light and shadow events were intentionally designed by the people who constructed each site, or simply coincidence.

This sort of methodological issue has already been encountered in the preceding chapters. Similar remarks apply to the other well studied way in which places may directly reflect indigenous practices relating to astronomy: the alignment of buildings and structures upon the rising and setting positions of celestial bodies. It is generally accepted, for example, that some of the great cities of pre-Columbian America contained astronomical alignments serving purposes connected both to religious practices and political control; in many cases, observations of celestial events reinforced the divine right of the kings to rule.

Unlike the well-known and richly documented astronomical traditions of Mesoamerica, the astronomical traditions of the indigenous peoples of North America left no written historical record, a comparatively scant physical record, and only few 'astronomical' monuments. Thus archaeological records, combined with early ethnographic accounts, provide the principal

evidence of these astronomies. The accounts tell us that the native peoples saw the land as sacred, and in some cases an element of this sacred landscape was the way in which it joined the Earth and the Sky. Holy places that joined the Earth and Sky sometimes memorialized celestial beings; sometimes marked the times of the planting and ceremonial calendar. Sun-watching sites were numerous: some Sun shrines, although well attested historically, are associated with living pueblo peoples and therefore, because of their current ritual uses, not available for public inspection. However, one group of sites, the star ceilings created by the Navajo (see Case Study 4.1), are not known to be subject to current ritual uses and memorialize the astronomical concerns of the Navajo.

Practices and activities that are connected to indigenous astronomy

Navigation is perhaps the most obvious example of a practice with strong connections to indigenous astronomy. Navigation by the stars, especially mid-ocean, required a good knowledge of the night sky and its daily and seasonal motions. Elements of the navigational knowledge and skills of several ethnic groups in the Pacific have been recorded in the mid- to late 20th century, including peoples in Micronesia, Melanesia, and Polynesia. In some cases navigation practices are directly linked to physical sites, such as navigation temples and voyaging stones with directional markers. They are also linked to indigenous concepts such as the 'star compass' of the Caroline Islands—a mental construct whereby the navigator memorises the relative rising and setting positions of about 15 stars and, at any time or place, observes those few that are actually close to the horizon and 'imagines' the rest.

Fig. 4.0.1. Navigation temple (*heiau*) at Holo Moana, Island of Hawai'i, Hawaiian Islands. Photograph © Clive Ruggles.

Many other practices and activities are connected to indigenous astronomy through local calendars. Observations of celestial bodies help to regulate calendars that are also connected to the timing of planting, irrigation, harvesting and other agricultural activities on the one hand, or tied to determining the religious or ceremonial calendar on the other.

Indigenous astronomy concepts found in intangible forms

Calendars themselves are intangible concepts related to indigenous astronomy. Some have particular significance because of their unique characteristics. One such example is the calendar of the Mursi, a community of transhumant herders and cultivators from the lower Omo valley region of south-west Ethiopia. The Mursi reckoned time using lunar cycles (but also some observations of the sun and stars) in a way that, to Western sensibilities, appears haphazard but in practice 'self-adjusted' so that it was wholly fit for purpose. From a perspective that is keen to explore the diversity of indigenous astronomy the Mursi calendar is significant because it counters virtually every assumption that those who extrapolate the 'path of progress' approach too incautiously tend to make about the way in which calendars inevitably developed. Another example is the extraordinary 'luni-stellar' calendar of the Borana of southern Ethiopia and northern Kenya, which makes extensive use of the faint constellation Triangulum.

The fragility of this type of heritage is emphasized by the changes that have occurred since the Mursi calendar was recorded in the late 1960s and early 1970s, before it came into contact with external calendars.

Indigenous astronomy concepts include a range of ideas, beliefs, and understandings connected to the sky that may not be attached to a physical site. These include weather prediction; celestial deities such as solar, lunar, and stellar gods and goddesses; and 'sun kings' as an example of rulers who attribute the right to rule to a direct connection to a celestial body. Cosmological concepts may also be made real in physical structures such as the planning of cities and tombs.

Returning to the example of the Ngas of Nigeria, in addition to focusing on the moon to establish their calendar, they look at the tilt of the first crescent moon each month to determine the strength of the seasonal rains. Although there is no underlying physics to explain it (in other words, it doesn't make sense in 'our' western rationality) it is as much a part of 'their' rationality as the calendrical observations mentioned earlier. The importance of the moon to the Ngas is also expressed in the form of drawn and painted images of the moon that are found throughout their society. This includes those painted annually on the face of young boys during their new-year ceremony—another level of intangible heritage.

The 'value' of indigenous astronomy

Indigenous astronomy is a challenge for the Astronomy and World Heritage Initiative because there are often no material remains or tangible heritage associated with it, and where there is tangible heritage it is often several steps removed from the actual act of observing the sky. This makes it all the more important to try to comprehend the nature of these indirect links where they do exist.

Members of the IAU's Astronomy and World Heritage Working Group have examined the World Heritage List for sites that are connected to astronomy, including those connected to indigenous astronomy. The resulting list is shown in Table 4.0.1.[1] What perhaps stands out most is that the great majority of the sites listed do not have a connection with modern scientific astronomy or its history. In other words, most are connected to indigenous astronomy in its broadest sense (i.e. stretching back into the remote past).

[1] It is not exhaustive: among the other sites that might be added is Strasbourg Grande Île (Case Study 11.3).

Table 4.0.1. Sites on the World Heritage List identified by the IAU Astronomy and World Heritage Working Group as having a connection to astronomy or indigenous astronomy.

Country	**Established World Heritage Site With Possible Connections to Astronomy**	
	No.	**Name**
Argentina	936	Cueva de las Manos, Río Pinturas
Australia	447	Uluru-Kata Tjuta National Park
Bolivia	567	Tiwanaku: Spiritual and Political Centre of the Tiwanaku Culture
Bolivia	883	Fuerte de Samaipata
Botswana	1021	Tsodilo
Cambodia	668	Angkor
Chile	715	Rapa Nui National Park
China	881	Temple of Heaven: An Imperial Sacrificial Altar in Beijing
China	441	Mausoleum of the First Qin Emperor
China	1003	Longmen Grottoes
China	439bis	Imperial Palaces of the Ming and Qing Dynasties in Beijing and Shenyang
China	707ter	Historic Ensemble of the Potala Palace, Lhasa
Columbia	744	San Agustín Archeological Park
Columbia	743	National Archeological Park of Tierradentro
Egypt	88	Nubian Monuments from Abu Simbel to Philae
Egypt	86	Memphis and its Necropolis - The Pyramid Fields from Giza to Dahshur
Egypt	87	Ancient Thebes with its Necropolis
Ethiopia	12	Tiya
Ethiopia	15	Aksum
France	83bis	Palace and Park of Versailles
France	85	Prehistoric Sites and Decorated Caves of the Vézère Valley
Greece	392	Temple of Apollo Epicurius at Bassae
Greece	595	Pythagoreion and Heraion of Samos
Greece	530	Delos
Greece	941	Archaeological Sites of Mycenae and Tiryns
Greece	517	Archaeological Site of Olympia
Greece	491	Sanctuary of Asklepios at Epidaurus
Greece	393	Archaeological Site of Delphi
Greece	404	Acropolis, Athens
Guatemala	64	Tikal National Park
Guatemala	149	Archaeological Park and Ruins of Quirigua
Honduras	129	Maya Site of Copan
India	246	Sun Temple, Konârak
India	243	Ellora Caves
India	244	Elephanta Caves
Indonesia	592	Borobudur Temple Compounds
Ireland	659	Archaeological Ensemble of the Bend of the Boyne
Iran	114	Persepolis
Italy	787	The *Trulli* of Alberobello
Italy	94	Rock Drawings in Valcamonica
Italy	829	Archaeological Areas of Pompei, Herculaneum and Torre Annunziata
Italy	831	Archaeological Area of Agrigento
Kenya	801bis	Lake Turkana National Parks

Korea	977	Gochang, Hwasun and Ganghwa Dolmen Sites
Lebanon	294	Baalbek
Mali	119	Timbuktu
Mali	516	Cliff of Bandiagara (Land of the Dogons)
Malta	132bis	Megalithic Temples of Malta
Mexico	714	Rock Paintings of the Sierra de San Francisco
Mexico	415	Historic Centre of Oaxaca and Archaeological Site of Monte Albán
Mexico	791	Pre-Hispanic Town of Uxmal
Mexico	414	Pre-Hispanic City of Teotihuacan
Mexico	483	Pre-Hispanic City of Chichen-Itza
Mexico	411	Pre-Hispanic City and National Park of Palenque
Mexico	412	Historic Centre of Mexico City and Xochimilco
Mexico	631	El Tajin, Pre-Hispanic City
Mexico	939	Archaeological Monuments Zone of Xochicalco
Mexico	1061	Ancient Maya City of Calakmul, Campeche
Norway	352	Rock Art of Alta
Peru	548	Río Abiseo National Park
Peru	700	Lines and Geoglyphs of Nasca and Pampas de Jumana
Peru	274	Historic Sanctuary of Machu Picchu
Peru	273	City of Cuzco
Peru	330	Chavin (Archaeological Site)
South Africa	985	uKhahlamba / Drakensberg Park
Sudan	1073	Gebel Barkal and the Sites of the Napatan Region
Sweden	557	Rock Carvings in Tanum
Syria	23	Site of Palmyra
Togo	1140	Koutammakou, the Land of the Batammariba
Turkey	448	Nemrut Dağ
United Kingdom	373bis	Stonehenge, Avebury and Associated Sites
United Kingdom	795	Maritime Greenwich
United Kingdom	514	Heart of Neolithic Orkney
USA	27	Mesa Verde National Park
USA	353	Chaco Culture
USA	198	Cahokia Mounds State Historic Site
Uzbekistan	603	Samarkand – Crossroads of Cultures
Zimbabwe	306	Matobo Hills
Zimbabwe	364	Great Zimbabwe National Monument

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Case Study 4.1: Navajo Star Ceilings, USA

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Presentation and analysis of the sites

Geographical position: 'Four corners' region, States of New Mexico, Arizona, Colorado and Utah, USA.

Location: Latitude 35º 5´ to 37º 17´ N, longitude 109º 36´ to 105º 56´ W. Elevation c. 1500m to 2500m above mean sea level.

General description: Star ceilings are scattered throughout the Navajo region. They consist of clusters of stars painted or stamped on the overhanging ceilings of natural rock shelters. Each star in the pattern is depicted as an equal-armed cross, in black, red, or white or occasionally in orange, yellow or green. These characteristics distinguish star ceilings from depictions of stars on vertical rock faces and from star images incised or drilled into the rock. The star ceilings vary in detail from a single star to a cave ceiling filled with the imprints of several hundred stars.

Inventory of the remains: Eighty sites have been identified so far: about 66 percent of these are concentrated in the Canyon de Chelly National Monument, 15 percent in the original *Dinétah* heartland, and the remainder widely scattered throughout the four-corners region.

History of the sites: The Navajo (or *Diné*) were originally a Southern Athapaskan—or Apachean—people and are relative newcomers to their current homeland in the four corners region, where the states of New Mexico, Arizona, Utah, and Colorado meet. The exact date of their arrival in this region is uncertain, with scholarly estimates ranging between 1000 and 1525 AD. During this period of settlement the Navajo interacted with their puebloan neighbours and came to exchange many traditions with them. By the 16th century, Spanish explorers had already described them as a semi-sedentary people who hunted and raised maize and other crops in the *Dinétah* region south of the San Juan River in what is now Northern New Mexico. In addition to maize-based agriculture, they acquired from the pueblos a cosmology based on the association of colours with the four directions, and particularly with sacred mountains at the cardinal points, while the Navajo are said to have contributed their characteristic depiction of four-pointed stars to their puebloan neighbours.