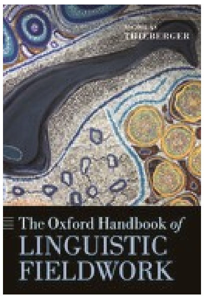

The Oxford Handbook of Linguistic Fieldwork
Nicholas Thieberger (ed.)

https://doi.org/10.1093/oxfordhb/9780199571888.001.0001

Published: 2011 **Online ISBN:** 9780191744112 **Print ISBN:** 9780199571888

CHAPTER

15 Cultural Astronomy for Linguists

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https://doi.org/10.1093/oxfordhb/9780199571888.013.0016 Pages 345–367
Published: 18 September 2012

Abstract

Humans have a long history of watching the sky and incorporating the sky into their culture in the form of art and stories. This article tries to explore the importance of cultural astronomy for linguists. They developed uses for the sky such as for timekeeping and night navigation. As with other parts of their natural environment, humans continued to watch and learn about the sky to better their lives throughout their history, resulting in an aspect of environmental adaptation that is often overlooked by scholars today. This article begins with definitions presented as a first step towards thinking about the many ways that people relate to the sky. This crash course in cultural astronomy should enable the reader to collect relevant information with some rigor and confidence. The interdisciplinary field of cultural astronomy is currently dominated by astronomers, and the goal here is to increase linguists' awareness of astronomy as a topic in field research, leading to them attending cultural astronomy meetings and publishing in cultural astronomy journals. Cultural astronomy is broadly defined as the study of the relationship between humans and the sky. There are a couple of working definitions that provide details of this relationship such as that of Campion 'the use of astronomical knowledge, beliefs or theories to inspire, inform or influence social forms and ideologies, or any aspect of human behaviour'.

Keywords: cultural astronomy, linguistic awareness of astronomy, sky, timekeeping, night navigation

Subject: Linguistic Anthropology, Semantics, Linguistics

Series: Oxford Handbooks

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15.1 Introduction

Humans have a long history of watching the sky and incorporating the sky into their culture in the form of art and stories. They developed uses for the sky such as for timekeeping and night navigation. As with other parts of their natural environment, humans continued to watch and learn about the sky to better their lives throughout their history, resulting in an aspect of environmental adaptation that is often overlooked by scholars today. This chapter begins with definitions presented as a first step towards thinking about the many ways that people relate to the sky. This crash course in cultural astronomy should enable the reader to collect relevant information with some rigor and confidence. The interdisciplinary field of cultural astronomy is currently dominated by astronomers, and my personal goal here is to increase linguists' awareness of astronomy as a topic in field research, leading to them attending cultural astronomy meetings and publishing in cultural astronomy journals.

p. 346

15.2 Definitions of Cultural Astronomy

Cultural astronomy is broadly defined as the study of the relationship between humans and the sky. There are a couple of working definitions that provide details of this relationship such as that of Campion (1997: 1): 'the use of astronomical knowledge, beliefs or theories to inspire, inform or influence social forms and ideologies, or any aspect of human behaviour.' There are also the very functional concerns of archaeoastronomers set out by Ruggles (1993), rephrased in Bates and Bostwick (2000), and modified here for a linguistic audience:

1. Observation. What do people look at in the sky? Is there a celestial body that they look for repeatedly? Do they make predictions about the next appearance of a celestial body? There is a question as to whether non-academic sky watchers understand the physical forces underlying the celestial motions —the expectation is that they do not. Nonetheless, predictions can be made from long-term repeated observations without physical forces or formulae, and many cultures have done this, for example, predicting when the Pleiades star cluster will appear in the night sky.

2. Perception. What meaning do people attach to that which is observed—what is the cultural significance of the observations? This overlaps with cultural/ethno- classification systems.

3. Use. How do people use the sky? Use of the sky can be entwined with religion, agricultural timings, environmental adaptation, sociopolitical structures, or survival such as navigation by the stars.

Archeoastronomers study the physical remains of earlier societies to understand their observations, perceptions, and use of the sky (simply put, archeoastronomers tend to study dead cultures). Cultural astronomy encompasses these efforts, but cultural astronomers studying contemporary cultures have additional concerns, including:

1. Cosmology. 'In so-called primitive societies, cosmologies help explain the relationship of human beings to the rest of the universe and are therefore closely tied to religious beliefs and practices' (Anon. 2004b). Cosmology is how people tie together their cultural origin story as well as explaining why things are the way they are today. Often the celestial realm is included as part of creation: how the stars got in the sky (which is informative about cultural aspects of knowledge of stars), why the stars are not visible during the day, why the Moon has dark spots, and so on. Similarly, how did the Moon, Milky Way, planets, and meteors (shooting stars) get into the sky? How are the things in the sky related to things on Earth?

2. Stellification. People create asterisms (groups of stars) which they identify with people, animals, and

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p. 347
environmental features such as rivers and oceans. How are ↳ these associations chosen—who gets their place in the sky and why? It has been theorized that storytelling plays a major role in what names are created and passed down, especially those reflecting events in local history such as migration stories. The idea is that the groups of stars are mnemonic devices that aid in telling the associated stories. The story of Perseus (below) is an example.

3. Static or evolving sky knowledge. Is their cosmology and resulting sky knowledge static, or are changes and 'evolution' built in? A way to probe this is to ask about transient phenomena such as eclipses, comets, and meteor showers. A related theme is the loss of sky knowledge: do people see their sky knowledge as changing, and what do they see as the future of their sky knowledge? They may hold to the myth of the Golden Age in which people today believe that the generations before them had more knowledge, were more skilled, lived better lives, etc. This is where checking the ethnographic record and other historical documents can be informative.

4. Acquisition and transmission of knowledge. The origins, evolution, and projected future of knowledge concerning the sky. How do people learn about the sky? Who holds what kind of sky knowledge? What is common knowledge and what is specialized knowledge?

5. Cross-cultural sky and formal education. How do people negotiate or reconcile sky knowledge that they learn in school with that of their culture? For example, four planets are easily visible in the night sky (Venus, Mars, Jupiter, and Saturn), yet students are taught there are eight or nine planets in our solar system—two or three cannot be seen with the naked eye. How is this 'correct' yet invisible knowledge handled?

6. Historical remnants. In another twist on the cross-cultural sky, there is the opportunity to investigate if celestial terms are borrowed from neighbours, trade partners, or European languages. For example, the names of the outer planets should all be from European languages, since they were only discovered in the last two centuries and are not visible without the aid of a telescope. Scholars have a detailed understanding of western, Egyptian, Islamic, Babylonian, and Chinese astronomy and astrology and it is possible to tease out elements of these in local cultures, thus revealing the possibility of historical contact. Calendar elements such as the days of the week are common cultural borrowings.

These are the broader issues explored by cultural astronomy researchers. In order to address these issues, data collection methods amount to learning as much as possible about the sky within a culture. In order to identify celestial bodies correctly in the field, researchers first need to learn the sky in their local culture. Learning the sky at home can be a phenomenological experience that aids in both learning the sky in the field and asking better questions about the sky during data collection.

p. 348
15.3 Learning the Night Sky

Holbrook and Baleisis (2008), a primer aimed at undergraduate students who have no stargazing experience and little astronomy knowledge, includes some simple exercises for learning how to measure distances across the sky. This chapter is aimed at academics who are not used to stargazing yet are very good at learning and processing information and are familiar with astronomy and the names of celestial bodies. In the 1920s, astronomers successfully worked together to standardize the names of celestial bodies and the constellation boundaries, which resulted in the International Astronomical Union (IAU) names used today by astronomers all over the world (cf. Delporte 1930). I will use these IAU names throughout this chapter unless otherwise indicated.

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15.3.1 Star charts

A map of the sky at home and at the field site is essential; these maps are called star charts and they can be generated for a particular latitude and longitude, day, hour, and direction. Star charts as well as planispheres (which are round star charts with the North or South Celestial Pole in the centre) can be purchased, or it is possible to create simple charts of black stars on white backgrounds online.[1] The charts can be scaled up or down in angular size and include as much or little detail as desired.

In the Northern Hemisphere the North Celestial Pole is marked by Polaris[2]—the Pole Star. It is part of the constellation Ursa Minor—the Little Dipper. The motion of the stars over the duration of a night is due to the Earth's rotation about its axis: the stars appear to rotate around Polaris and Polaris appears not to move. When learning the night sky in the Northern Hemisphere, Polaris/Ursa Minor and the surrounding constellations are an easy place to start. While there is no convenient star that marks the South Celestial Pole, the Magellanic Clouds and the Southern Cross are often used as starting points for finding constellations in the Southern Hemisphere. Note that the Milky Way (our galaxy) is very bright in the Southern Hemisphere. The Southern Cross lies along the Milky Way with its long axis pointing towards the South Celestial Pole (see Figs 15.5 and 15.6).

Star charts with black stars on white backgrounds are easiest to use at night. A free software program that p. 349 can be used to study the night sky before going outside is ↳ Stellarium.[3] Though there are several other free and commercial night sky software tools (McCool 2009), I find that Stellarium produces the most accurate night sky images. The latitude, longitude, date, and hour can be changed within the program to replicate what can be seen in the sky. In addition, it is possible to pan right/left and up/down. The representation is realistic in that there is daytime, sunset, twilight, and night with progressively fading light over time. Atmospheric effects such as a marine layer haze near the horizon can be added. However, the white stars on black background are very hard to see when working outside at night in the dark, and the night mode, which converts the white to red, is not much better.

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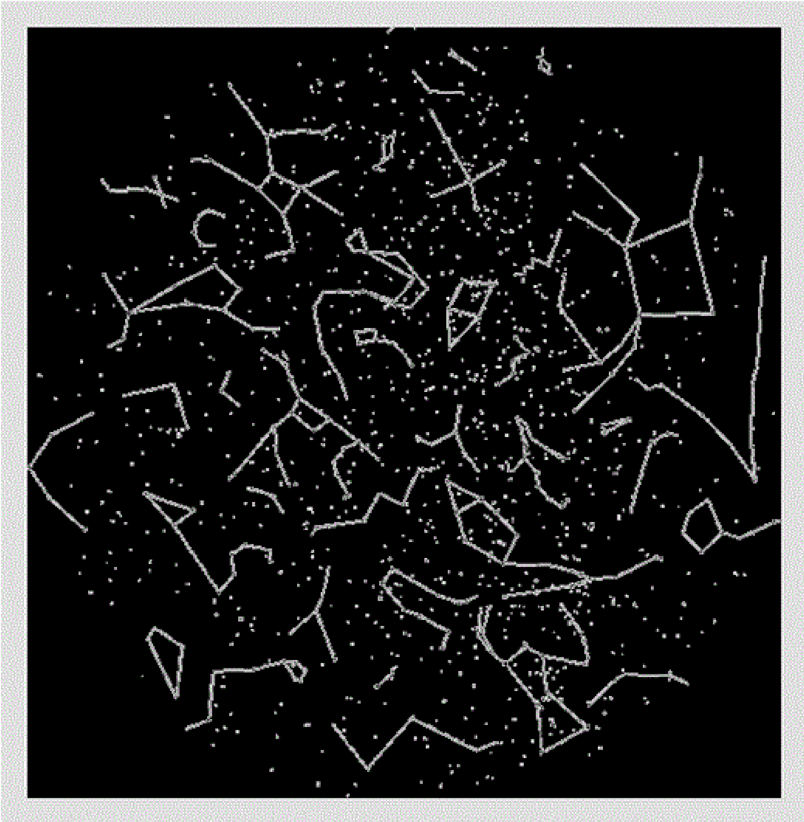
Figure 15.1.



Northern Hemisphere star chart with the North Celestial Pole at the centre.

p. 350 Stellarium can generate realistic images of the sky at a particular field site on a particular date, which makes it great for practising learning what constellations are on the eastern or western horizon at sunset or sunrise, which constellations should be visible to the north, etc. It is simple to click the constellation names and boundaries off and on during practice. When actually gathering night sky information with informants, I find that using printouts of individual sections of the sky with black stars on a white background works best.

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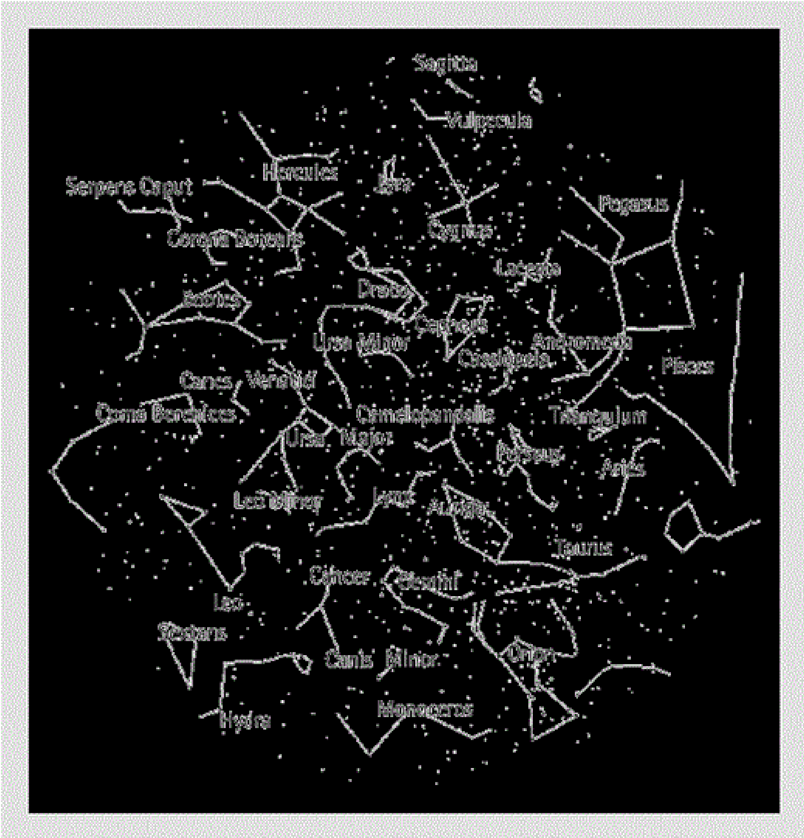
Figure 15.2.



Northern Hemisphere star chart as in Fig. 15.1, with constellation names added.

15.3.2 The legend of Perseus

Learning the legends associated with constellations can be a useful way to learn which constellations are near each other. For example, the classical Greek story of p. 351 ↳ Perseus recounts that Perseus was flying south when he spotted Andromeda chained to a rock. After talking to her, he flew to her parents, the queen and king, Cassiopeia and Cepheus, to learn how to win her freedom. The story goes on, but the point is that Perseus is next to Andromeda which is south of Cassiopeia and Cepheus (as shown in Figure 15.7).

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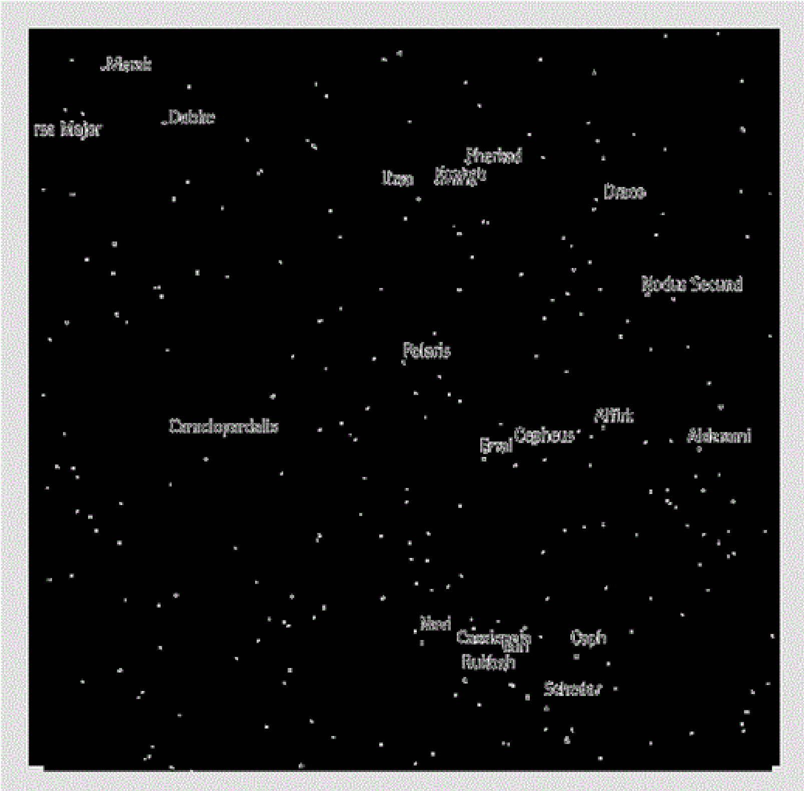
Figure 15.3.



The North Celestial Pole with both constellation names and the names of bright stars.

Similarly in the Egyptian story of Osiris and Isis, the Nile River is represented by the Milky Way. Osiris is the constellation Orion and Isis is the star Sirius. The story involves death, life, dismemberment, marriage, and jealousy. Osiris is put back together except for his penis, which is lost in the Nile River—the Milky Way—but Isis, who is his wife, causes the Nile to rise and flood with her appearance. The Egyptian calendar relied upon the appearance of Sirius to mark the year and the beginning of the floods. Again, as with the story of Perseus, Sirius and Orion are next to each other in the sky, with part of the Milky Way nearby.

p. 352

p. 353
p. 354

Many of the southern hemisphere constellations were not visible to the Greeks and Egyptians and as a result, the modern names do not reflect legends that weave sections of the sky together. This is where indigenous stories from Southern Hemisphere cultures can be helpful (e.g. Johnson 1998).

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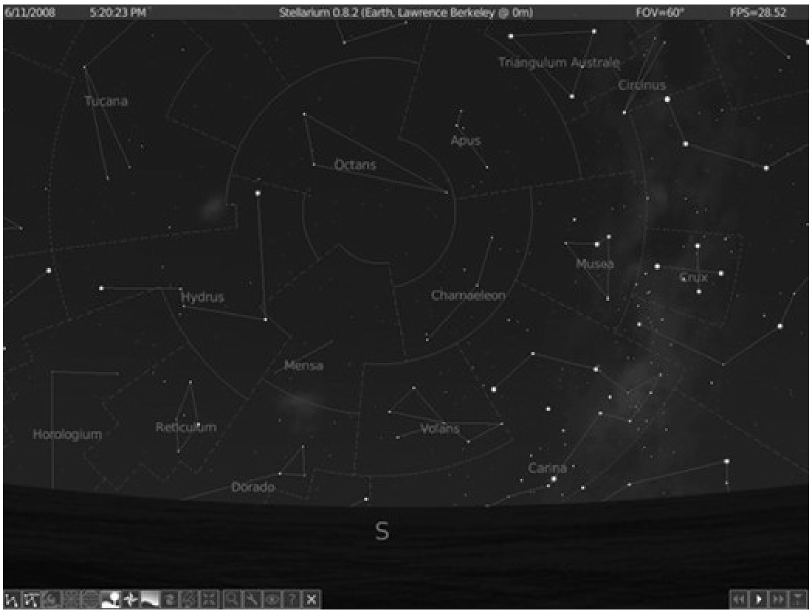
Figure 15.4.

Star Trails showing Polaris at the centre. This picture is taken by leaving the shutter open capturing the Earth's rotation (photo courtesy of Jerry Schad).

Figure 15.5.



Stellarium image of the Magellanic Clouds and the Southern Cross.

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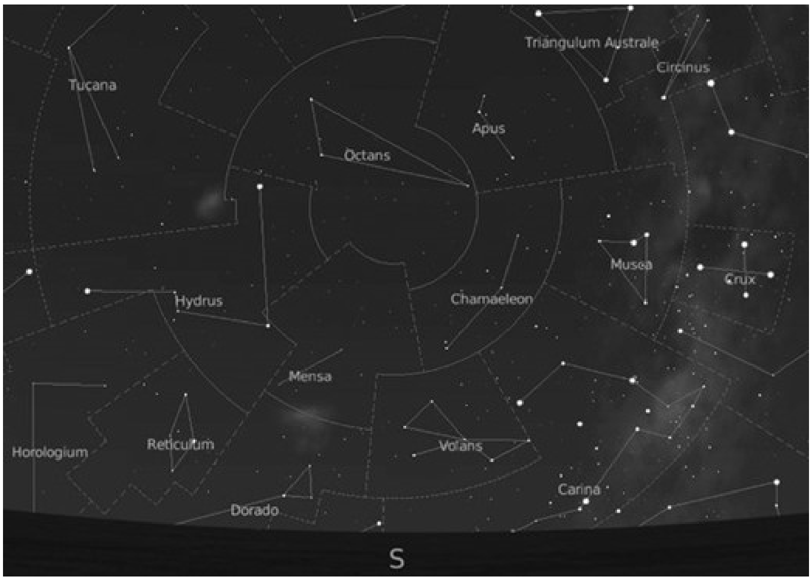
Figure 15.6.



Stellarium image as in Fig. 15.5 with constellation names and boundaries.

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Table 15.1. Constellations surrounding Polaris/Ursa Minor, the Magellanic Clouds, and the Southern Cross

Celestial object	Formal name	Constellation name	Nearby constellations
The Pole Star	Polaris	Ursa Minor	Ursa Major
			Draco
			Cepheus
			Camelopardalis
Large Magellanic Cloud	LMC	Dorado/Mensa	Volans
			Pictor
			Caelum
			Horologium
			Reticulum
			Hydrus
			Octans
			Chamaeleon
Small Magellanic Cloud	SMC, NGC 292	Tucana	Octans
			Hydrus
			Eridanus
			Phoenix
			Grus
			Indus
The Southern Cross	Crux	Crux	Musca
			Centaurus

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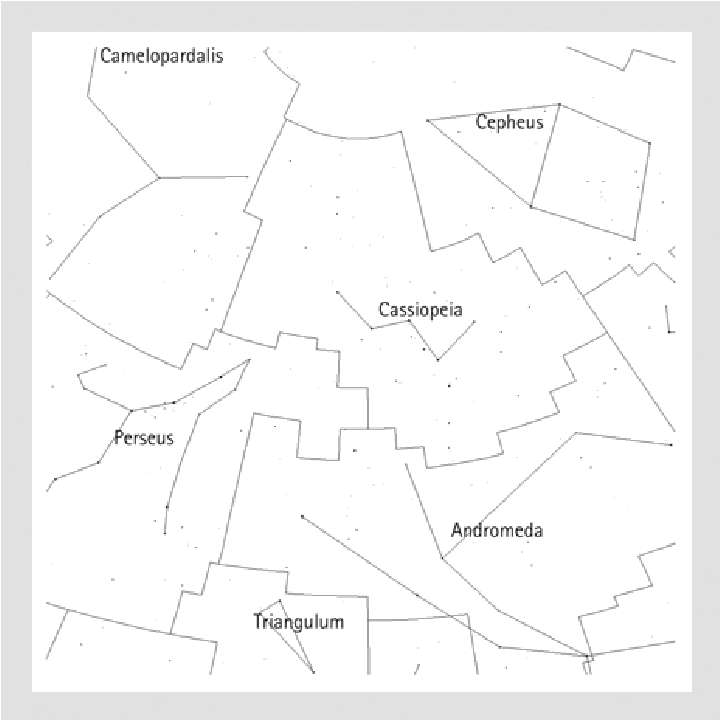
Figure 15.7.



Perseus, Andromeda, Cassiopeia, and Cepheus.

15.3.3 Practice

Spend as much time as possible studying the night sky before doing fieldwork. Twenty-minute intervals every two to three hours on clear nights is good practice for seeing how the sky changes over the night and learning constellations. The hours spent at home will make it easier to become oriented in the field. Learning how a chart in Stellarium compares to how things really look in the sky is invaluable. Learn the sky in the field in the same manner—before collecting astronomy data. In my experience, as I spent time outside at night learning the sky I attracted informants who were curious as to what I was doing and were extremely helpful later both with providing sky information and with introducing the project to others in their community. Ideally, researchers should be able to orient themselves to the night sky without having any star chart or computer before they start collecting sky information from informants.

p. 355

15.3.4 Ask an amateur

With star charts, Stellarium, and practice, it still can be difficult to learn the night sky. Amateur astronomers are the best human resource. Local amateur astronomy clubs often have ‘star parties’ and public viewing nights where they set up their telescopes to show the public the wonders of the night sky. They are experts on naked-eye astronomy—astronomy without telescopes—as well, and are used to interacting with non-experts. In addition, planetariums and university observatories may also host star parties for the public. Star parties are usually advertised on the internet as well as in community-focused weekly newspapers.

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15.3.5 Strong laser pointer

One piece of equipment that makes data collection much easier is a laser pointer, a high-powered one with a green beam that is visible for long distances. It makes pointing and identifying stars and asterism with informants very easy because both researcher and informant can see the target as opposed to trying to point with a finger or hand. The laser beam is visible from a great distance, and will attract a crowd that may contain future informants.

15.4 Collecting Simple Terms

Three ways to collect celestial terms are (1) working with informants with a list of terms to be translated, (2) going out at night with informants, and (3) analysing and interpreting terms found in recorded conversations. The problem with working with a list is that it can be like an examination and the answers may be ‘school’ terms, i.e. standard western terms, rather than local terms. The researcher has to be careful to assess the common usage of each term, and whether informants have heard other people in their community use these terms. The third approach is similar to participant observation in that conversations could be about anything and contain celestial terms about the calendar, time, and duration among other concepts. These three approaches are meant to be suggestive but not exhaustive in relation to the ways of collecting terms.

15.4.1 Daytime

Terms that are associated with the daytime sky should be collected along with associated myths and legends such as for the Sun, Moon, clouds, and rainbows. With weather and climate there is often a predictive aspect associated with terms, such as a ring around the Moon meaning rain is coming, rainbows associated with p. 356 the end of rain, and cloud colour indicating rain. Cardinal directions (North, ↳ South, East, West), island directions (East, West, towards the ocean, towards the mountains or away from the ocean), and wind directions usually emerge from discussing weather patterns. All these contribute to gaining a broader understanding of people's relationship to both the daytime and nighttime sky.

15.4.2 Bright stars and asterisms

Bright stars are the easiest to identify, and can be collected first. Asterisms are groups of stars that are not official western constellations. For example, the Big Dipper is an asterism of seven bright stars within the constellation Ursa Major. Asterisms tend to represent animals, fish, plants in the local environment, and important historical figures. Asking which stars belong together can begin the dialogue on local asterisms.

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15.4.3 Planets

The planets that are visible to the naked eye are Venus, Mars, Jupiter, and Saturn. Mercury is also visible, but p. 357 because it is very close to the Sun it can only be seen a few ↳ days a year. The best times to see planets are at sunrise and sunset when they are the first and last ‘stars’ to fade, and they lie along the same path that the Sun and Moon follow in the sky. Stellarium and other night sky software provide the position of planets visible for any date against the background of stars. Venus appears as a very bright star, Mars is red, Jupiter and Saturn are similar in that they are bright and yellowish. One trick for determining planets is that planets appear to twinkle less; another is to learn the bright stars in constellations well enough to recognize the presence of an extra ‘star’. It is easiest to create charts before commencing field research that have the planets indicated. Very few researchers have collected detailed information on Mars, Jupiter, Saturn, and Mercury, perhaps due to their own inability to distinguish these from bright stars or the invisibility of Mercury. A pair of binoculars is helpful in positively identifying Mars, Jupiter, and Saturn and for initiating conversations about planets which appear as disks rather than points in binoculars. The moons of Mars and Jupiter lie along a straight line looking like tiny stars near the planet. A good pair of binoculars will show the rings of Saturn.

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Table 15.2. Twenty brightest stars (note that the larger negative magnitude, the brighter it is, and, conversely, the larger the positive magnitude, the fainter the star)

Star name	Magnitude	Constellation	Visible in which hemisphere
Sirius	–1.46	Canis Major	Both
Canopus	–.72	Carina	Southern
Arcturus	–.04	Bootes	Both
Rigil Kentaurus	–.01	Centarus	Southern
Vega	.03	Lyra	Northern
Capella	.08	Auriga	Both
Rigel	.12	Orion	Both
Procyon	.38	Canis Minor	Both
Achernar	.46	Eridanus	Southern
Betelgeuse	0.3-1.2	Orion	Both
Hadar	.61	Centarus	Southern
Altair	.77	Aquila	Northern
Aldebaran	.85	Taurus	Both
Antares	.96	Scorpio	Both
Spica	.98	Vega	Both
Pollux	1.14	Gemini	Both
Formalhaut	1.16	Piscis Austrinus	Both
Mimosa	1.25	Crux	Southern
Deneb	1.25	Cygnus	Northern

Venus is the easiest planet to identify and is only visible near sunrise or sunset. Many cultures including Europeans refer to it by two names: the morning star and the evening star. It is very difficult to assess whether people think it is one object or two different objects. In Fiji, for my Moce Island site, I could only conclude that planets were generally referred to by the name for Venus in its evening star mode rather than having individual names, and that Venus was two objects. However, the population I sampled about Venus was small—about five of the thirty interviewees.

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15.5 More Complex Terms

15.5.1 Time, duration, past, present, future

Time, duration, past, present, and future may be found as part of grammatical structure rather than existing as independent terms. Equivalents terms for *minutes, seconds, hours, moment, instant, awhile*, and *infinity* are harder to collect while parts of the day connected to the position of the Sun tend to be easier, for example, *sunrise, sunset, morning, midday, afternoon, evening, night, midnight, twilight*. It is possible that some of these do not have indigenous equivalents.

Calendars tend to always have days measured from sunrise to sunset or from midday to midday, whereas the number of days in a week or month may vary. For example, some people have a four day rather than a seven day week (see Chemillier, Chapter 14 above). Months are usually based on observations of the Moon. p. 358 However, a lunar cycle is 29.5 days rather than an even 30. Many cultures have a ↳ lunar calendar, especially those near bodies of water that experience tides. Lunar calendars consist of twelve or thirteen months, neither of which fits the true 365.25 day year, thus, they usually go out of sync with the true year and a correction factor may be built into the calendar. The European tradition of the twelve days of Christmas is an example of the addition of festival days to the lunar calendar to have the days add up to 365 days closer to the true year.

Solar calendars are tied to the annual north–south motion of the Sun on the horizon. They are usually started on spring equinox or sometimes on one of the solstices. This calendar measures what astronomers call the tropical year, which is 20 minutes shorter than the true year; thus solar years make very good calendars.

Stellar calendars measure the true year. Observations are of a particular star or asterism that appears in a certain position at a certain time of night; when that happens again, it is a year later. The Egyptian calendar, which relied on sighting the star Sirius rising in the east just before sunrise, is a classic example of a stellar calendar.

There are also calendars which are mathematically based rather than depending on observations of celestial bodies, but even these seem to have roots in sky observations (Bartle 1978). Many local calendars are a mixture of lunar, solar, and stellar rather than entirely one or another (Turton and Ruggles 1978).

15.5.2 Legends and myths

Collecting stories about celestial bodies is one of the enjoyable aspects of cultural astronomy research. The rescue of Andromeda by Perseus and the story of Osiris and Isis given above are just two of many examples. On a warm night, there is something special about listening to long winding stories about the constellations, stars, and planets overhead. Within a community there may be several variations of the same story, each flavored by the storyteller. Audio recording works well for capturing both the complexity and the variations of each story (see Margetts and Margetts, Chapter 1 above).

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15.5.3 Transient phenomena: comets and meteor showers, satellites, eclipses

Comets are transient celestial phenomena in that they are not seen in the night sky every year. As comets get closer to the Sun, their tails get longer, and as they move away from the Sun, their tails get shorter. Whether approaching or retreating, comets tails always point away from the Sun. A comet can be visible in the night sky for several months, but usually only a few comets appear during one lifetime. We are fortunate to have seen three amazing comets in the Northern Hemisphere in the recent past: Halley in 1986, Hayakutake in 1996, and Hale–Bopp in 1997. People ↳ should remember these comets along with Comet
p. 359 McNaught in 2007 in the Southern Hemisphere, and perhaps know the local terms and stories about comets.

Table 15.3. Dates of annual meteor showers

Shower name	Dates	Shower name	Dates
Quadrantids	Jan 01-Jan 05	Draconids	Oct 06-Oct 10
Alpha Centaurids	Jan 28-Feb 21	Epsilon Geminids	Oct 14-Oct 27
Delta Leonids	Feb 15-Mar 10	Orionids	Oct 02-Nov 07
Gamma Normids	Feb 25-Mar 22	Leo Minorids	Oct 23-Oct 25
Lyrids	Apr 16-Apr 25	Southern Taurids	Oct 01-Nov 25
Pi Puppids	Apr 15-Apr 28	Northern Taurids	Oct 01-Nov 25
Eta Aquarids	Apr 19-May 28	Leonids	Nov 10-Nov 23
Eta Lyrids	May 03-May 12	Alpha Monocerotids	Nov 15-Nov 25
June Bootids	Jun 22-Jul 02	Dec Phoenicids	Nov 28-Dec 09
Piscis Austrinids	Jul 15-Aug 10	Puppid/Velids	Dec 01-Dec 15
Delta Aquarids	Jul 12-Aug 19	Monocerotids	Nov 27-Dec 17
Alpha Capricornids	Jul 03-Aug 15	Sigma Hydrids	Dec 03-Dec 15
Perseids	Jul 17-Aug 24	Geminids	Dec 07-Dec 17
Kappa Cygnids	Aug 03-Aug 25	Coma Berenicids	Dec 12-Jan 23
Alpha Aurigids	Aug 25-Sep 08	Ursids	Dec 17-Dec 26
September Perseids	Sep 05-Sep 16		
Delta Aurigids	Sep 18-Oct 10		

The normal rate for shooting stars is around one every ten minutes; this rate increases during meteor showers. Meteor showers occur when the Earth passes through the debris left by a comet. Meteor showers occur several times a year, but they vary in the rate of ‘shooting stars’. The Orionids which occur in October (see Table 15.3) have a rate of up to twenty-three meteors per hour.

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15.5.4 Artificial satellites

Strangely enough, most sky watchers recognize satellites. Satellites appear in the night sky as small points of light that travel in a line crossing the sky in about 10 minutes. Airplanes are easier to spot because of their blinking lights. In contrast, satellites may brighten and dim as they cross the sky but they will not blink.

15.5.5 Eclipses

Solar eclipses occur when the Moon passes between the Earth and the Sun, casting a shadow on the surface of the Earth. Lunar eclipses occur when the Earth passes between a full Moon and the Sun, placing the Moon in the Earth's shadow. Lunar eclipses, when they occur, can be seen by everyone who can see the Moon.
p. 360 Therefore they are location- ↳ dependent in that the Moon has to be visible. In contrast, total solar eclipses are common worldwide but rarely recur in a particular location. For example, Ghana experienced total solar eclipses in 2006 and 1947, but the path of totality through the country was different for each. The best internet source for finding the dates of solar and lunar eclipses is the NASA website[4] and Mr. Eclipse site,[5] both calculated by ‘Mr Eclipse’, Fred Espanek.

15.6 Complicated Terms

15.6.1 Faint stars

Bright stars are easy to find, as are their home constellations. However, many cultures have constellations and legends surrounding faint stars as well. Most faint stars do not have ‘names’ but are simply designated with a Greek letter and the name of the constellation, and a Greek letter is assigned to each star in order of brightness for each constellation (these are known as the Bayer names). There are only twenty-four Greek letters and far more faint stars; once the letters are exhausted the remaining stars are numbered from west to east—these are the Flamsteed names (really numbers!). Fig. 15.8 shows the constellation Sagittarius with star names, while Fig. 15.9 shows Sagittarius with both the Bayer and Flamsteed star names.

Identifying faint stars is often really the researcher's best guess made by first identifying the closest bright stars, then estimating the angular distance and direction from two or three bright stars, and finally sitting down with a star chart and field notes to do a final identification.

15.6.2 Navigation stars

The most common star used for navigation in the Northern Hemisphere is Polaris which is near the North Celestial Pole. It appears to not move and marks North. Many cultures use the Big Dipper to find Polaris, since Polaris is not a bright star. The two stars that make up the leading edge of the Dipper are often called the pointing stars because they point to Polaris. Thus, Ursa Major and Ursa Minor are common constellations used for navigation in the Northern Hemisphere. When Ursa Major is not visible, Cassiopeia is
p. 361 sometimes used to aid in finding Polaris ↳ (see Figure 15.1). As mentioned earlier, the Southern Hemisphere does not have a star that marks the South Celestial Pole. The Magellanic Clouds and the Southern Cross are often used to locate South (see Figure 15.6).

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Figure 15.8.

Sirius and Orion setting in the west. These are the Egyptian Isis and Osiris.

In the Tropics, the Celestial Poles will be low on the horizon and difficult to use for navigation. People tend to use rising and setting stars and both bright and faint stars. They may use a formal 360-degree ‘compass’ of stars (Ammarell 1999; Goodenough 1953), or, as I found in Fiji, they just use a convenient star that happens to be in the direction that they are going (Holbrook 2002). Some of these navigation stars may have names, or asterism names, but it is also possible that they have not been named.

Navigation practices are rapidly changing due to a variety of factors, and many traditional techniques have not been recorded. Researchers have used navigation practices to probe human cognitive processes, mental maps, and memorization across cultures. The details of which stars are used when, and the acquisition and transmission of knowledge, are of interest to cultural astronomers.

15.6.3 Calendar markers

In addition to determining if the local calendar is based on observations of the Sun, Moon, stars, or some combination, there may be physical markers on the horizon that are meant to align with certain celestial p. 362 bodies indicating a special day. The ↳ Ngas of Nigeria have an observing platform, and notches have been noted in the opposite hillside. Their ‘priest’ watches for the Moon to rise in line with certain notches to mark the calendar. The film *Cosmic Africa* shows a Dogon ‘priest’ watching for the Pleiades which would indicate the onset of seasonal rains (Rogers and Rubin 2002). Cultural astronomers are interested in the material remains indicating long-term observations of the sky such as fixed observing locations perhaps marked by a stone or a building and notches on the horizon, or perhaps a second marker building built on the horizon. Such observation sites have to be shifted over time as the heavens shift, which allows cultural astronomers to use old and new alignments to fit astronomical dates.

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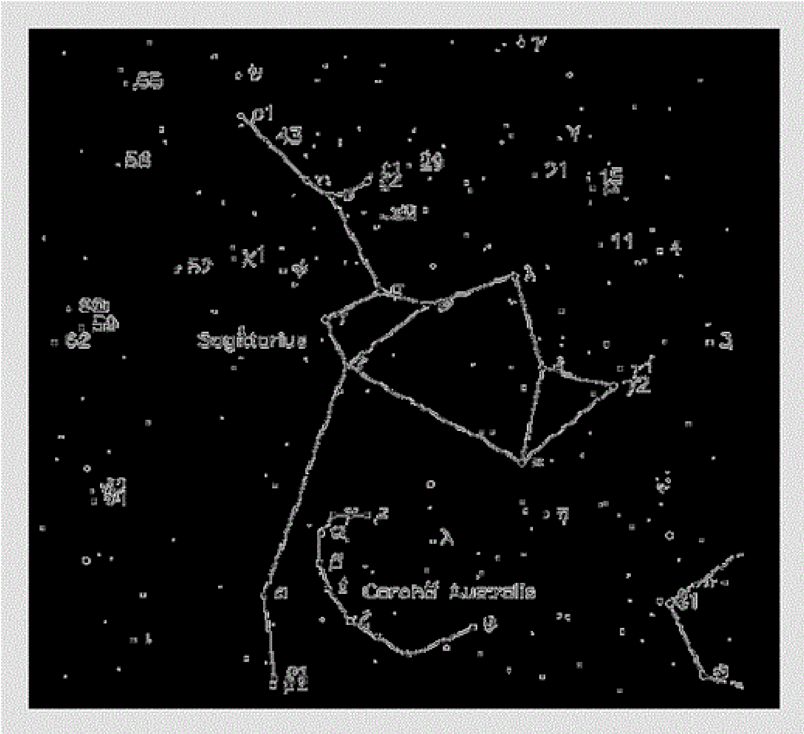
Figure 15.9.



Sagittarius with Bayer and Flamsteed names.

p. 363

15.6.4 Weather prediction

Many cultures study the sky to make weather predictions. This touches on cloud watching and knowing from which direction seasonal rains come, but includes observations of the atmosphere by focusing on celestial bodies. For example, in the rhyme ‘red skies at night, sailor's delight, red skies at morning, sailor's warning’, red skies at sunset or sunrise are marked by clouds but clouds to the west don't indicate a storm, whereas clouds to the east do, perhaps indicating a pattern of storms coming from the east. By observing the Sun at sunrise or sunset, people study its colour, looking for dust and clouds, the turbulence in the atmosphere, and haziness indicating a lot of moisture and/or dust. Each of these can indicate a change in weather. Rings around the Moon or Sun tend to be due to ice particles in the atmosphere or high clouds, and either can indicate freezing weather. If stars twinkle more, this indicates upper-atmosphere turbulence which may mark a storm front moving in. Dust in the atmosphere can change the colour of stars but also cool the atmosphere, indicating cooler weather. Weather is local, so rhymes and sayings about the weather are usually not transferable. It is important to document not only what people are observing about the sky, but what they use to predict weather changes.

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15.6.5 Cosmology

Cosmology is concerned with how everything is connected together into a grand narrative. Not all cosmologies begin with the sky, but they usually include accounts of what the sky is and how parts of the sky got up there. As mentioned earlier, typically there are local stories that explain how the stars or the Sun and the Moon got into the sky. Griaule's works with the Dogon of Mali (Griaule 1965; Griaule and Dieterlen 1965) are now classics of African cosmology, and include an examination of the relationships between sounds, numbers, metals, foods, animals, and buildings. The sky is part of the narrative but is of equal importance with many other earthly things like grains. The narrative is explicit about origins and how everything including humans and human relations are part of a cosmological pattern. Cultural astronomers are interested in where the sky fits in, whether the resulting universe is static or evolving, geocentric or heliocentric, the origins of humans are, and the impact of colonization and globalization on these cosmological narratives.

'Origin stories' are used here to focus on both the origin of humans (which may be different from their cosmology) and the origins of those local things that are considered to be from the sky. It is interesting to cultural astronomers if people believe that their ancestors came from the sky and/or return to the sky after they die. Details of where in the sky they came from and how they got to that location before coming to Earth have not typically been recorded. In West Africa, thunder stones were said to have fallen from the sky, p. 364 though anthropologists identify many ↳ as tools used by our ancient ancestors (Balfour 1903). Sky metal or meteorites are also candidates for local objects that truly come from the sky, but other objects may have a magical or functional relationship to the sky that has been solidified by a legend about coming from the sky.

Ocean-going people may have origin stories and cosmologies that revolve around the ocean and deep water rather than the sky, such as mermaid and selkie myths. Comparing the mysteries of the ocean to the mysteries of the sky is of interest to cultural astronomers, as is determining if such marine cosmologies are restricted to proximity to large bodies of water.

15.6.6 Faint asterisms

The term 'faint asterisms' is to some extent a misnomer, since in places where light pollution is minimized the stars appear much brighter, and faint asterisms are easier to see as a result. In Fiji, a young girl identified a constellation that was entirely made up of faint stars which she said was in the shape of a fan. There were no nearby bright stars that I could identify; however, the asterism was made up of a series of pairs of faint stars that made a 'V' in the sky. I memorized that pattern but really had no hope of ever identifying the asterism again, until I saw it one night while I was stargazing back in the United States. I was able to identify the bright star as Fomalhaut in Pisces Austrinis (Fig. 15.10), and the asterism is part of Pisces Austrinus and Grus. Unfortunately, she was the only person to identify this asterism, so it is not publishable.

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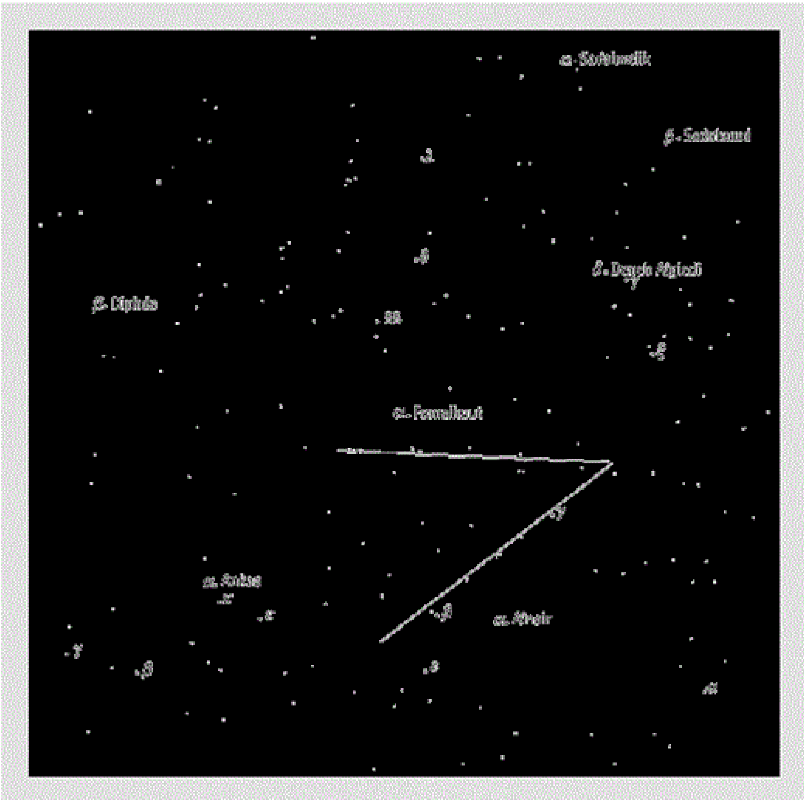
15.6.7 Path of the planets: Zodiac asterisms

The Sun travels across the sky along a path of stars in the sky called the ecliptic. The Moon and the visible planets which all lie in the plane of the solar system travel close to the ecliptic. The maximum distance of the Moon away from the ecliptic is 5 degrees; Mercury is the planet that travels furthest away, 7 degrees from the ecliptic, and Venus is at a distance of a little over 3 degrees. Venus and Mercury are always close to the Sun, so their distance from the ecliptic is not so important for naked-eye observing. Mars, Jupiter, and Saturn all stay within 2.5 degrees of the ecliptic; thus, knowing the constellations of the ecliptic aids in identifying planets in the night sky. The twelve Zodiac constellations are the constellations along the ecliptic plus an extra constellation named Ophiuchus. The Zodiac asterisms are: Aries, Taurus, Gemini, Leo, Cancer, Libra, Virgo, Sagittarius, Scorpio, Capricorn, Aquarius, and Pisces. The constellation names are the same except for Scorpius and Capricornus. There has not been very much research on local Zodiacs outside
p. 365 of European folk traditions, the Middle East ↳ and Muslim trade partners, and Asia, so any new information about people having a local Zodiac would be groundbreaking.

Figure 15.10.



The Fan constellation from Fiji, unverified, consisting of very faint lines of stars.

15.7 Divination

Mentioning the Zodiac brings to mind astrology, defined as '[t]he study of the positions and aspects of celestial bodies in the belief that they have an influence on the course of natural earthly occurrences and human affairs' (Anon. 2004a).

p. 366 Astrologers rely on complicated mathematical calculations related to the positions along the Zodiac of the Sun, Moon, and the visible planets to predict personality, give opinions on decisions, predict the future, etc. Using the sky to predict futures on Earth is not unique, and variations can be found among many cultures

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around the world. For example, the Chagga of Tanzania have an elaborate system of predicting personality traits based on both the day of the month and the hour of the day in which one is born (Dundas 1926). In the Chagga case, they have a lunar calendar, thus the day of the month is tied to observing the phase of the Moon. Then the hour of the day is marked by the progression of the Sun across the sky as well as routine activities that take place around the same time everyday. In contrast, astrology includes these and adds the position of the planets and the position of the sun and their astrological relationships to each other. In some cases, numerology or the magical properties of numbers may also be evoked. Here the numbers that make up the birth date are combined in some manner to come up with a representative number that can then be used to predict personality, life choices, romance, health, etc.

In Islamic countries, there appears to be a link between astrology and diagnosing illnesses and prescribing medicine that is not common in other present-day astrological traditions, though during the Middle Ages there was such a link among European astrologers with the Zodiac constellations ruling various parts of the body (see Curth 2005 and references therein).

Because of the complexity of observations, the mathematical calculations, and the extensive ways these are said to influence humans, studying divination systems takes a huge time commitment and careful study. Sometimes becoming an apprentice requiring a commitment of several years may be the only way to have access to the divination information and to get permission to publish it.

European astrology in the form of horoscopes has become a standard feature in most daily newspapers, and may now be influencing local divination systems. How people negotiate these two sources of divine influence is of interest to cultural astronomy researchers as part of their study of the globalization of astronomy knowledge.

15.8 Religions

The connection between the sky, celestial events, and religions has many levels of complexity. Religious calendars are a way to identify important days that correspond with full Moons, solstices, equinoxes, etc. Once these are identified, a researcher can try to make the connection explicit through interviews and
p. 367
archival ↳ research. Celestial themes that are found woven into religions include ‘twelve’ reflecting the classical twelve signs of the Zodiac, ‘seven’ reflecting the seven visible celestial bodies that move (Sun, Moon, Mercury, Venus, Mars, Jupiter, and Saturn), ‘three’ days of death with rebirth reflecting the time it takes the Sun to ‘turn around’ from reaching the solstice to obviously moving again on the horizon. Temples and houses of worship may be aligned such that the Sun's rays enter on religiously significant days. However, the significance may not obviously correspond to solstices and equinoxes; instead it can be when the Sun passes directly overhead (if it is in the tropics), or if dedicated to a particular saint it might be aligned to the Sun's position on the horizon on that saint's day. How to find alignments is beyond the scope of this chapter; instead I recommend that on the day of a proposed alignment the researcher simply take a picture recording the event and thus proving the alignment.

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15.9 Conclusions

Collecting names of celestial bodies requires preparation and uncommon knowledge of the sky, and moving on to collect information on functional relationships and more complex ideas is just as difficult. However, the night sky has enchanted humans throughout time and has served as a source of inspiration as well as being the root of a major branch of science: astronomy. It has been definitively stated again and again that all human cultures have sky knowledge and a relationship to the sky, but as of this millennium, information has not been collected from all human cultures in order to prove or disprove this point.

Linguists can help gather astronomy information and bring new insight that cultural astronomers do not have access to: the linguistic roots of the names of celestial bodies and celestially related objects. Linguists can also show connections between ethnic groups through analysis of astronomy terms that would be missed by cultural astronomers. Finally, cultural astronomers are amenable to collaborations with linguists to mutually benefit both disciplines.

For further reading on cultural astronomy, see Holbrook and Baleisis (2008). On data collection see Fabian (2001), and for more case studies see Chamberlain, Carlson, and Young (2005).

Notes

1 http://www.fourmilab.ch/cgi-bin/Yourhorizon

2 The names of stars and constellations used here are those adopted by the International Astronomical Union (cf. Delporte 1930), recognizing that, of course, they are entrenched in the western scientific view of the sky.

3 http://stellarium.sourceforge.net

4 http://eclipse.gsfc.nasa.gov

5 http://www.mreclipse.com

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