This document represents a basic summary guide of the practice and methods of archaeoastronomy, aimed particularly at archaeologists to increase their understanding of prehistoric astronomy and the tools of the discipline. It covers the theoretical principles behind the subject, as well as the onsite methods of recording.

This guide draws on a number of currently available resources relating to the subject, which provide a concise and detailed account of the current methodology and approaches to the discipline of archaeoastronomy. The reader is advised to refer to the full list of resources at the end of this text for further study.

Special thanks to Douglas Scott for advice, training and patience in addition to useful comments on this short guide.

The following archaeoastronomy specialists can be contacted for a fuller analysis, if required:

- **Prof Clive Ruggles (University of Leicester)**
- **Dr Fabio Silva (University of Wales Trinity Saint David)**
- **Liz Henty (University of Wales Trinity Saint David)**
- **Dr Daniel Brown (Nottingham Trent University)**
- **Prof Lionel Sims (University of East London)**
- **Prof Euan MacKie (University of Glasgow)**
- **Dr Efrosyni Boutsikas (University of Kent)**

For further training, the University of Wales, Trinity Saint David, is the only university in the United Kingdom (and one of the few in the world) that runs a postgraduate degree in Cultural Astronomy. This includes a module on archaeoastronomy titled ‘Skyscapes, Cosmology and Archaeology’, which can also be taken as a one-off, that provides theoretical, methodological, analytical and field training. Interested parties should contact **Dr Nicholas Campion** and **Dr Fabio Silva**.

Further independent archaeoastronomers can be also found (though you may need to ask around).

Finally, you can keep up with developments in this field via a new academic publication: *Journal of Skyscape Archaeology (JSA)*.
1 Introduction

Recently a serious effort to broaden the horizons of the discipline of archaeoastronomy beyond the narrow boundaries assigned to it by mainstream archaeology (which has often viewed it as a mistrusted pseudo-science) has provided archaeology with the opportunity to examine the idea of celestial alignments and sky-related phenomena. Considering that half the experienced environment around us consists of the sky, to ignore its importance to past societies is to ignore a large area of crucial evidence.

The sun, moon, planets and stars would all form part of the daily life of prehistoric peoples, just as they do in indigenous cultures today. The rising of the sun, the changing of seasons are still associated with ritual activities— as evidenced from ethnographic studies across the world— and there is no reason to suggest they were not similarly ritualised in the past. Indeed, items such as the Nebra sky disc (Figure 1) hint at the importance of the sky to prehistoric/past societies.

We will probably never be able to fully comprehend the reasons behind these rituals or their full meaning to the prehistoric peoples, however, careful collection of field data, using simple methods described below, will enable us to piece together patterns and alignments of the celestial bodies at a particular time in the past and link these with the erection of particular prehistoric monuments surviving today.

This new approach to archaeoastronomy is based on scientific survey and data collection, including statistical analysis and digital reconstructions of past events, providing scientifically based evidence, which can be used alongside other archaeological techniques in the interpretation of prehistoric monuments.

Moving out from the ‘fringes’ to the mainstream, archaeoastronomy is now a vital tool for a more holistic understanding of the past— namely how various prehistoric societies interacted with the sky through a construction of particular monuments and/or through symbolism expressed through rock art and how these interactions related to their beliefs and everyday lives.

The following section/pages examine the basics of archaeoastronomy, and its practical application in the field.

Figure 1: Nebra sky disk [Dbachmann, Theway, licensed under the Creative Commons Attribution-Share Alike 4.0 International]
1.1 Background and basic principles

Although much of the meaning behind celestial alignments will be tied to specific beliefs and cosmologies of past societies, this does not mean that we should examine and record these features/events in less detail than for instance the depth of a posthole or the number of mollusc shells in a midden. In principle, more data recovered in the field equals a more nuanced picture of past societies. Using archaeoastronomy, particular material/physical evidence on the ground can be linked to the sky and in turn reveal how a wider landscape can be integrated into a belief system. The meanings of the sky and associated celestial bodies will vary between cultures and time periods, nevertheless there are scientific methods that can be applied to the collection of data to aid examination of ancient beliefs and the daily life of past societies.

In Europe, in general, there is little supplementary evidence about the sites themselves, other than folklore, which, although potentially useful, is not a reliable way to chart the meaning, function or belief structure originally associated with the site. In contrast, in the Americas (for example), site information is supplemented by richer ethnographic and historical data.

In Europe, the lack of further useful data to aid the understanding of celestially linked monuments should not form an issue, provided enough unbiased information is recovered in the field. Following the recovery, the generated data can be examined with at least the basic scientific methods, as first developed by Alexander Thom during his extensive surveys of British megalithic sites and further enhanced by subsequent research (Thom 1967, Ruggles 1999, Higginbottom & Clay 2016 etc.).

Collecting good, scientifically sound evidence is important in any discipline, archaeoastronomy included, and the potential research benefits of good data recovery practice are tenfold. The archaeology discipline already has a set methodology to maximise the potential of qualitative and quantitative data recovery and archaeoastronomy is no different. Although archaeoastronomy uses varied methods for data recovery, its application by archaeologists, without the direct input of archaeoastronomers, can be narrowed down to the following simple methodology, which does not require prior specialised astronomical knowledge (see also Section 2 for more detail):

- Create a plan of your site with the North clearly marked, including the type of North (True, Magnetic, or Grid; if the latter two apply, then provide a date for the north reading)
- Take an accurate series of elevations for the site
- Ensure you have accurate coordinates for the site
- Take a horizon panoramic photograph from the site
- Look for any potential sight-lines (such as passages, doorways, alignments etc.)
- Take photographs in both directions from these locations and True North azimuths
- If passages or doors are present, try to estimate heights

1.2 Assuming correlation

It is perhaps worth noting that one should never assume alignments were intentional or meaningful. There are two schools of thought in archaeoastronomy that relate to how intentionality can be argued. One school advocates a probabilistic reasoning, which is to say that intentionality can be demonstrated if a repeated pattern of common alignments occurs over a number of related sites. Another school advocates the creation of an argument with recourse to independent evidence, for instance stemming from other forms of material culture, writings and/or ethnography. To achieve
this requires a careful collection of sufficient data to ensure that the results are not inadvertently skewed. In addition, one must also accept the probability of a dual meaning behind alignments/orientations. For example, the recorded preferred orientation of prehistoric roundhouse entrances in Britain towards east and southeast can be either explained by practical reasons, where there is logical sense in orientating the only opening into a dark space to the direction where it will gain the optimum amount of light over the most number of days during the year or equally, by ritual meaning associated with the rising or setting of the sun.

In the late 1990s, Alistair Oswald noted that doorways of later prehistoric roundhouses in Britain tended to face east or southeast towards the rising sun (Oswald 1997). While some archaeologists argued this repeated alignment is proof of a cosmological importance, with meaning imbued in the architecture itself, others suggested that the orientations of openings are governed by more practical principles, particularly light intensity/condition, with the local prevailing wind and topography playing a an important part in the overall pattern (Pope 2007; see Figure 2).

![Figure 2](image.jpg)

**Figure 2.** **Left:** Roundhouse entrance orientation (after Oswald 1997); **Right:** Orientation of 161 circular structures in north-west Wales (after Oswald 1991).

In Figure 2, the 1997 image shows a distinct correlation between door directions and solar events, but has been skewed by the removal of data that did not fit the model. In contrast, the 1991 dataset of 161 circular structures in northwest Wales clearly shows little in the way of deliberate orientation. As Pope noted (2007: 211):

“this issue was brought to the fore at the Scottish Archaeological Forum’s Circular Arguments conference in Glasgow in 1999, when Mike Parker Pearson stated that 90% of structures across Britain faced east and south-east in the first millennium BC”.

As Pope’s research has demonstrated, this cannot be supported from the reviewed available literature—with a maximum of 52% of structures exhibiting orientation to the east and southeast during the Late Bronze Age and Early Iron Age, the percentage decreasing in other time periods (Pope 2007).

These issues clearly highlight the importance of accurate data collection in the field, as well as unbiased interpretation of the generated evidence.
2 Collecting reliable field data

Despite its complex name, the collection of useable archaeoastronomical evidence in the field is not hard at all— with much of the data routinely recorded during standard archaeological site investigations. The following section reviews these methods in more detail.

2.1 Locate your data

Every site should have a plan with **accurate locational data** and **absolute elevation data**. For the purposes of archaeoastronomy, this is often best recorded as the Latitude and Longitude coordinates for where the observations were taken from and elevation data in metres above sea level. Of course other coordinate systems can be used and converted later, but using the first system will save some time— disposing of the need to convert the values.

Carefully choosing where to take the readings from is equally crucial – as demonstrated in Figure 3 – therefore it is important to collect as much data as possible so that the off-site specialist can fully interpret the evidence, just like any other dataset.

![Figure 3: Moving only a few metres to the left and right can change celestial event locations, so careful thought should go into where the observer/recorder stands. This site at Barnhouse, Orkney is actually aligned on a northern moonset, based on a survey by D. Scott, so care should always be taken in not creating the desired alignment, rather than the reality.](image)

2.2 Understanding Angles: Azimuths, Altitudes and Elevations

*Azimuth* is the horizontal angle between True North and the point one is sighting on the horizon. *Altitude* is the vertical angle between the horizontal plane and the point being sighted, usually at or above the visible horizon line. *Elevation* means the height of a location above sea level. Elevation, then, is not an angle, but a distance (usually measured in metres above sea level).

Archaeoastronomers require that the record of north direction should be **precisely** described as either True North (preferred), Grid North or Magnetic North (with a **date recorded** for later calibration) on any archaeological plans used for recording the site. In reality, any suspected or potential alignment should have an exact True North bearing taken with a record of date and Magnetic declination. Magnetic poles move constantly and therefore knowing where and when the recording has been taken becomes crucially important in order to accurately record in which direction the compass is pointing. A number of excellent mathematical models are readily available to aid in this – such as that available on the [National Oceanic and Atmospheric Administration website](https://www.noaa.gov).
Correspondingly, because the horizon will often be of variable altitude, a magnetic compass reading alone will not show precisely where the sun or moon would rise on a given day – unless the entire site is surrounded by the sea, whereupon the horizon altitude is an even 0 degrees altitude (Figure 4).

For example, the sun at Equinox will rise in the east (90 degrees of azimuth from True North) – therefore a compass can indicate the area of the horizon where this celestial event should occur. However, as the sun rises at ‘sea level’ (0 degrees of altitude), it will not be observable from a given site until it has ascended high enough in the sky to clear the hills on the actual horizon. As such, more information will be required to indicate exactly where it will appear on any given day.

Thus in the illustration above (Figure 4), the equinox, although it takes place at 90 degrees (which is East), is not visible from the site until it has risen above the horizon by 1 degree of altitude – making the observed azimuth to the event between 91.2 and 91.5 degrees (from True North), depending where in the UK one is. In practice this shift in azimuth changes from location to location.

Remember that the intended sighting may not actually be to a feature on the horizon but to a closer point such as a standing stone, cairn or a now missing timber pole (there is much debate on long versus short alignments). Equally, constrained views (such as those created by the entrance of a passage tomb or the length of a cursus) are by necessity pointing in a particular direction, which might or might not be meaningful. Rather than aligning with a specific point, these provide a broader view of the horizon – a ‘window of visibility’ (Silva 2014b) – which might frame particular topographic features as well as specific celestial events.
2.3 Declinations

Declination of a celestial body is its angular distance North or South of the Celestial Equator. For example, the Sun ranges from 23.5° North to 23.5° South and back again during the course of a solar year. Declination can be summarized as the celestial equivalent of Latitude — as a degree of declination is a line across the sky, the rise and set of the sun, moon, planet or star on a particular day will have the same declination.

Put simply; “Given that a particular declination path always intersects a given horizon profile at the same point, and that every horizon point is intersected by one and only one declination path, and always the same one, it follows that there is a unique, one-to-one mapping between points on a given horizon and an astronomical declination. This mapping will vary according to site latitude and horizon profile. So, given an alignment direction (azimuth), the elevation of the local horizon in the direction of the alignment and the geographical latitude of the site, we can calculate the astronomical declination of a (hypothetical) celestial body that would cross the visible horizon in the direction of the alignment”. (Higginbottom & Clay 2016: 250)

Although basic declination values can be easily obtained using the Basic Declination Calculator (see below), more in-depth work is best carried out by a specialist. The calculations consist of spherical trigonometry combined with other factors that constrain visibility (such as atmospheric refraction). However, simple spherical trigonometry provides a simplified version (see below), which allows for a quick check of any potential alignments worthy of further, more precise examination by specialists.

List of declination calculators and programs:

**Basic Declination Calculator, version 1.0 (3.6.2013)** — This calculator uses the same formulae as “GETDEC”, the program referred to in Astronomy in Prehistoric Britain and Ireland (Ruggles 1999: 169). You must enter (for each observation) the Latitude of observation, the Azimuth direction (from true north) and the Altitude angle.

**Horizon, version 0.11b (1.1.2014)** — Andrew Smith has also created a more advanced program that allows this to be explored further and remotely (in Windows only and free to use). It creates DEM panoramas with which to examine events on the horizon line.

**Stellarium, version 0.15.0 (31.7.2016)** — Using this sky simulation program (Figure 5), it is possible to turn on the celestial grid and quickly visualize the declination of a particular azimuth and altitude angle (make sure you go to settings and change the Equatorial Grid setting to decimal degrees), as well as search for any celestial objects that would match that declination. You can also turn on ArchaeoLines in the plugins section, which is a free tool for archaeoastronomical alignment studies, created by Georg Zotti. This shows graphically the orbits of all the major celestial events as they traverse the sky and cross the horizon. It is also possible to load your own horizons into the Stellarium, although you have to ensure you know where the true north and the 0 degrees horizon are, as well as a few other pernickety adjustments.

(See also Section 6 for links to both Horizon and Stellarium)
2.3.1 Gathering declination information onsite

If you have a Theodolite or Total Station to hand, you can use this method, here outlined by Dougie Scott but also covered by Ruggles (1999: 164-171), as a method for onsite survey to record declinations.

At each site – set up and level a theodolite with the upper and lower Plates A and B locked at 0°. Sight the sun (ON WHITE CARD – DO NOT LOOK DIRECTLY AT THE SUN THROUGH THE TELESCOPE!) and adjust so that a focused image is projected onto a white card held in front of the eyepiece.

Crosshairs can then be timed by a digital timepiece set to GMT as they cross the sun’s disc. Once the sun is sighted, Plate A is released and the azimuths of the indicated sightlines of the lower Plate B is recorded.

The horizon altitudes of the indicated sightlines are also recorded. The 0 degrees azimuth of Plate A and B is later converted to the sun’s true azimuth for that time and day using calculations in “The Star Almanac for Land Surveyors” (HMNAO 2016). Once calculated, the recorded azimuths can be adjusted to angles from the True North.

The sightlines’ declinations can be calculated from the measured values of the site’s latitude and longitude, plus the sightline true azimuths and horizon altitudes using a calculator or the simple formula of:

\[
\text{Declination} = \arcsin \left[ \cos(\text{Latitude}) \times \cos(\text{Azimuth}) \times \cos(\text{Altitude}) + \sin(\text{Latitude}) \times \sin(\text{Altitude}) \right],
\]

where \(\cos(\ldots)\) is the cosine function, \(\sin(\ldots)\) is the sine function and \(\arcsin \ldots\) is the arcsine, asin or \(\sin^{-1}\), function. All these are present in most scientific calculators, as well as on Excel. Make sure that your calculator or computer is working in Degrees and not Radians.

These results can then be compared with the declinations of the sun, moon or stars.
For this to work you will need: an accurate plan of the site with a 360 degrees panorama; and a number of horizon points accurately surveyed for azimuth and altitude in order to allow the later recreation of skyscape horizons.

2.4 Photographic and digital panoramas – aiding interpretation

In previous sections, you will find that panoramas and accurate horizon profiles are important aspects of the record. To work with these there are often two options: either you can take a panoramic photograph of the horizon, which, together with accurate measurements of both azimuth and altitude, can be later stitched into a continuous image file or spherical projection (Figure 6); or you can use Andrew Smith’ Horizon, or a free online tool called Heywhatsthat (which is quick and easy to use), to input where you are and create a horizon profile (Figure 6).
3 Concepts of Analysis

One of the major perceived issues/problems with archaeoastronomy is the notion that non-constrained views (constrained views being the passages in passage graves for example) can be made to align to anything one wishes, and that this selection is therefore highly subjective. To avoid this, one must attempt to gather information that can be subjected to further investigation/scrutiny, rather than focusing on the desired outcome.

![Figure 7: The constrained view from Barnhouse through the doorway using the hearth as the central point of view. Note that construction of the house in front of this structure at a later date then obscures the earlier visual alignment. Environmental factors, such as haze, cloud and vegetation also have to be considered.](image)

A further issue, which has to be taken into consideration, is the change to the environment since the time the monuments were erected (Figure 7). Although the views towards the celestial bodies may be clear today, this may have been very different in the past (or vice versa). Additional elements, such as smoke, fire and sound, would have also played a part in the celestial ceremonies. To gain better understanding of the elements involved in such events, supplementary archaeological, anthropological and/or ethnographic evidence should be utilised. Complementary, palaeoenvironmental data can also be used to recreate past environments.

What has to be understood is that belief, ritual and the cosmologies they are based on are recognisable and follow strict internal rules, but, concurrently, they can be seemingly nonsensical and fantastical to an external or modern viewer. Religion is by definition an attempt to explain the patterns of life and death using the available knowledge and belief, no matter how improbable. This does not remove the potential for the belief to exist and be transformed into a physical expression, such as a stone alignment or a chambered tomb (Figure 8). An example of such a belief taking material form may be the phenomena of ‘light hierophany’: the celestial sunlight being cast within the darkness of the tomb, bringing life back to the tomb (and perhaps the ancestors buried within it) at certain times of the year.
Figure 8: Stones of Stenness, Orkney – a prime example of certain cosmologies and beliefs of a past society, expressed in physical form. Hearths, standing stones, alignments and associated monuments, all come together with excavated evidence to hint at the ritual significances of such remains for past societies. Knowing how such societies associated with the sky – in essence a fragment of the past we can see today expressed in the surviving monuments etc. – we can come closer to understanding the society itself.

Although most archaeologists are probably familiar with the main celestial alignments, the following section summarises these events in more detail.

### 3.1 Sun

**Solstices.** The periods when the Sun reaches the limits of its path of declination are known as the solstices, when the Sun seems to stand still before it changes direction. This is quite visible when tracking the position of sunrise (or sunset) on the horizon, as this pendular motion slows down as the date approaches the solstice and, eventually, it stands still for about five to seven days.

**The June Solstice** (mid-summer in the northern hemisphere) occurs around the 21st of June, when the Sun reaches the tropic of Cancer (declination 23.5° North in present epoch)

**The December Solstice** (mid-winter in the northern hemisphere) occurs around the 21st of December, when the Sun is in the tropic of Capricorn (declination 23.5° South in present epoch).
Archaeoastronomy for Archaeologists – A Basic Guide

Equinoxes. The Sun crosses the celestial equator on two occasions during the course of a year and these occasions are known as the equinoxes. During the equinoxes the nights and days are roughly of equal duration (i.e. 12 hours) – hence the term equinoxes (equal nights). Because the Sun is on the celestial equator at the equinoxes, its **declination** is of course 0°. The azimuth would be either 90° (rising) or 270° (setting). However, the rising and setting positions of the sun, at these times in the year, move considerably from day to day. It is therefore very difficult to pinpoint the dates of the equinox by solar observation alone, often requiring more conceptual tools (such as dividing the year in four, or splitting the angular separation between solstitial sunrise positions). These make the equinoxes rather unlikely targets for many past societies, as argued by Ruggles (1997) and González-García and Belmonte (2006).

The **September Equinox** (autumnal in the northern hemisphere) occurs on or around the 22nd of September, when the Sun crosses the celestial equator as it moves southwards.

The **March Equinox** (vernal, or spring, in the northern hemisphere) occurs around the 21st of March, when the Sun crosses the celestial equator as it moves northwards.

Cross-Quarter days. These are moments in time that are equally separate from a solstice and an equinox. Much like the equinoxes, they are fleeting moments, requiring some conceptual frameworks in order to first recognise them and, secondly, actually observe and mark them. They have been heavily featured in, for instance, any claims of Celtic calendars in the past. They are: **Samhain** and **Imbolc** on 1st November and 1st February, respectively; and **Beltane** and **Lughnasadh** on 1st May and 1st August, respectively.

A table for the values of declination the Sun has on any given day of the year, valid for the present epoch, can be [found online by clicking here](https://example.com). Figure 9 below represents the major celestial events relating to the Sun:

![Figure 9: Compass rose of both rising and setting major Sun orientated events for a particular location. For different locations (and horizons) the actual compass bearings (azimuths) will vary.](https://example.com/figure9.png)
3.2 Moon

Because of the rapid orbit of the Moon around the earth, in a plane which is close to the plane orbited by the Sun, the moon does in a month what the sun does in a year – in terms of the rising and setting that seems to change direction along the horizon and back again. The Sun’s swing continues at a much slower pace –the Sun completes one full swing each half year from summer solstice to winter solstice.

Because of the tilt of the Moon’s orbital plane, in relation to our orbit around the Sun, the outer extremes of the Moon’s monthly range of rising and setting are NOT THE SAME as the outer extremes of the Sun’s yearly range of rising and setting. The extreme occurrences are usually referred to in the literature as the Lunar Standstills, but should more accurately be described as Lunar Extremes (since the Moon, unlike the Sun, does not actually stand still).

However, these extremes of the Moon’s monthly range of rising and setting are not fixed, but change slightly from year to year, with an 18.6 year cycle. There is a minimum and maximum value between which they fluctuate, known respectively as the minor and major standstill or extreme (Figure 10). For the present epoch, they occur at the following declination values, according to Ruggles (1999: 57):

- southern major Lunar extreme: -29.5°
- southern minor Lunar extreme: -19.1°
- northern minor Lunar extreme: +17.45°
- northern major Lunar extreme: +27.7°
Figure 10: The pendulum swing of Standstill Moons at both extremes of minor (smallest) and major (largest range) standstills.

On a major lunar extreme year the Moon’s declination will range between +27.7 degrees and -29.5 degrees, rising and setting at horizon positions that the sun never reaches (Figure 10). On the other hand, on a minor lunar extreme year, the Moon’s extreme north and south declinations are +17.45 degrees and -19.1 degrees, respectively. To move from this short swing to the longer traverse along the horizon at the major extreme takes 9.3 years. Therefore a full progression from major lunar extreme to major lunar extreme takes 18.6 years (Figure 10).

Alexander Thom theorised that many ancient stone circles were designed to keep track of these changing positions of the Moon, as well as the Sun (Thom 1967).

Many prehistoric sites seem to align with these two lunar events, both rising and setting. For instance, the substantially studied recumbent stone circles of Scotland (see Bradley 2005 and Welfare 2011 for example) have been suggested to have a close connection with lunar events—the constrained window formed by the two uprights and a recumbent stone, serving as a good indicator of the intended view (e.g. Thom 1971, Ruggles and Burl 1985, Ruggles 1999).

In contrast, Tomnaverie stone Circle in Aberdeenshire, represents a more complex situation—seemingly designed to accommodate several celestial events (Henty 2014). The three stars which make up Orion’s Belt, among others, seem to appear at the southerly edge of the recumbent window and set over the recumbent stone— all this presumably taking place on the night of the winter solstice around 2580 BCE. At certain points in time, Orion’s Belt would have been seen setting...
almost horizontally on top of the recumbent stone. Henty’s research found nothing to add weight to a lunar explanation for this site, other than the sight of the winter full moon over the recumbent stone. Of course, there is nothing to stop several events being represented in a single monument or alignment.

You can read more about lunar events here:
http://www.umass.edu/sunwheel/pages/moonteaching.html
http://star-www.st-and.ac.uk/~fv/sky/standstill.html

3.2.1 Other celestial bodies

There can be a plethora of other potential celestial events, including planets and stars, which would have been celebrated by prehistoric peoples, as the historical and ethnographic records of several past societies attest to. However, these have received less attention by past archaeoastronomers. Recent work, particularly on European prehistoric sites, such as the Thornborough Neolithic complex (Harding et al 2006), the Tomnaverie Recumbent Stone Circle (Henty 2014) and Iberian passage graves (Silva 205), among others, has highlighted the role played by particularly bright stars, in relation to these monuments and the landscapes that surrounded them—therefore potentially enlightening what little we know of the societies that built them. Furthermore, the roles of planets, especially Venus, which features heavily in Mayan cosmology, have also been suggested as targets for future celestial alignment research, particularly in Mesoamerica (e.g. Sprajc and González-García 2016).

To be able to fully examine the entire range of potential alignments to celestial objects and events, collaboration with a specialist is recommended. One should, however, always be aware that there are many possible lines of celestial orientation, if none of the major ones are initially apparent. We can be certain that many celestial events were noted by the prehistoric societies, given the rich ethnographic evidence of astronomical observations known from around the world.

4 Conclusion

As this brief guide hopes to demonstrate, archaeoastronomy represents a scientifically valid discipline, which if rigorously undertaken, has a lot to contribute to the research of the past. The major premise of the discipline being that by connecting the relevant data sources, skyscapes become a quantifiable source of information for understanding deeper aspects of past cultures. As such, scientific survey undertaken as part of archaeoastronomy opens up new avenues of research, extending the limits of our knowledge of the past. Although some of the finer details and calculations should only be undertaken by trained specialists, field archaeologists are in a prime position to make their contribution to the research. This should involve undertaking a specific level of on-site recording – most of which is/or should be already part of standard procedures. The bare minimum requirements for an archaeologist should be a plan of the site with a true north reading; exact coordinates and elevation; a photographic panorama of the landscape surrounding the site; and/or views into and away from any potential alignments. Not much to ask, for such a great return.

Get in contact and work with specialists in the field of archaeoastronomy who may be able to enhance your research exponentially.
5 Recommended Reading


6 Further References


7 Software

**Horizon** ([http://www.agksmith.net/horizon/](http://www.agksmith.net/horizon/)) is a GIS tool designed by Andrew Smith for archaeoastronomers investigating alignments of prehistoric monuments with astronomical phenomena (e.g. rising and setting of the Sun, Moon and stars). It gets its name from its primary function, which is calculating accurate horizon profiles using DTM/DEM mapping data. More generally, it is a landscape visualisation tool which can generate full 360-degree panoramic scenes using 3D rendering techniques, which may have some applications in the field of landscape archaeology. Possible applications include:

- Analysis of field measurements using calculated horizons, which are not subject to being obscured by atmospheric conditions, vegetation or modern structures.
- Allows an archaeologist working in the field to visualise astronomical phenomena in relation to the observed landscape. The software has been deliberately designed with minimal computing resource requirements so that it can be run on small portable computers (e.g. netbooks or tablets).
- Creating realistic horizons for use with **Stellarium**.

The unusually named **Heywhatsthat** ([http://www.heywhatsthat.com/faq.html](http://www.heywhatsthat.com/faq.html)) is good for creating panoramic horizon profiles which can aid in working out altitude calculations to various horizon features to +/- 5 degrees.

**Stellarium** ([http://www.stellarium.org/](http://www.stellarium.org/)) is a free open source planetarium for your computer. It shows a realistic sky in 3D, and allows you to view specific dates and celestial locations to check potential alignments.

![Figure 11](image.png)

Figure 11: Sample excel spreadsheet for data collection and alignment correlations.