Skyscapes across the Mesolithic to Neolithic transition. The possible relationship pre-historic peoples of Western England had with the Sun, Moon and Stars

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Abstract. This survey looked for evidence of astronomic activity amongst the early Neolithic structures commonly known as Cotswold-Severn earthen tombs. Three sites were surveyed and it is suggested the monuments involved show evidence of intended alignment to specific celestial horizon events. The period under investigation is one of transition. It marks the shift from the Mesolithic to the Neolithic, but also at question in this research is whether there was a shift from lunar to solar allegiance across these eras.

1. Introduction
The stone tomb monuments surveyed for this research have been defined by John North as mounds ‘deliberately erected out of earth and other material […] and having a conscious architectural structure. Usually, but not always, built for burial purposes’ [1, p. xxiii]. Timothy Darvill estimates there are currently about 500 such mounds in Britain [2, p. 71]. Those of the Cotswold-Severn variety began to appear on the southern English landscape in the earliest Neolithic and there are about 200 still extant [2, p. 83].

The decision to survey these tombs for archaeoastronomic intent was based on Lionel Sims’ ‘solarization’ theory [3, p. 1]. Sims argues there was an abrogation from a predominantly lunar to a solar astronomy in prehistoric southern England [3, p. 3]. He suggests there was a greater cultural engagement with lunar cycles before the onset of pastoralism at the beginning of the Neolithic, when ‘an ancient cosmology which in its astronomical aspects had focused on the Moon’ [3, p. 3]. Sims claims pre-Neolithic communities organised themselves by ‘phase-locking their economic and ritual routines to the rhythms of the Moon’ [3, p. 3]. His solarization theory focuses on Stonehenge which he suggests is just one of a number of Neolithic monuments, designed to ‘juxtapose, replicate and reverse’ key horizon properties displayed by the Sun and Moon in order to invest the Sun with the Moon’s former religious significance [3, p. 1]. It was constructed he claims to ‘modify and transcend an earlier engagement with the Moon’ [3, p. 3]. The suggestion is that Stonehenge’s double lintel feature was specifically built to frame the Sun and a dark, hence invisible Moon during a critical syzygy at the winter solstice during a southern minor lunar standstill [3, p. 3]. It is the juxtaposition of the Sun and Moon within Stonehenge’s double horizon feature which facilitated ‘a religious substitution to mimic and estrange Palaeolithic hunters’ lunar motifs into an emerging Mesolithic and Neolithic solar cosmology.’ [3, p. 14]. This meant, according to Sims that, ‘strictly lunar scheduling to...
ritual could be reduced and estranged into solar cycles’ [3, p. 14]. If this was the case, it is possible that Stonehenge was built to engineer social change. Sims suggests his hypothesis be tested by an investigation of the material record in the region surrounding Stonehenge for versions of the same archaeoastronomic intent, which is what this research endeavoured to do. Most specifically this study was looking for astronomical intent amongst the early Neolithic Cotswold-Severn tombs. Rosamund Cleal gives mid-Neolithic sarsen Stonehenge an ‘average calibrated date of 2413 BC’ [4, p. 231]. So if Sims is correct an allegiance to a lunar astronomy would have been predominant before then, in which case the early Neolithic Cotswold Severn tombs may have displayed it.

Turning to the literature on these ancient burial mounds it becomes clear they were a radical introduction to the landscape. Julian Thomas describes them as ‘perhaps the most archaeologically conspicuous element of the British Neolithic’ [5, p. 72]. Indeed they mark the onset of this period, Darvill pointing out the new megalithic structures indicated ‘a step-change’ in construction and design [2, p. 71]. Chris Scarre argues that by building such monuments, the earliest Neolithic communities ‘established a pattern of behaviour that set them apart from their Mesolithic antecedents’ [6, p. 243]. Elizabeth DeMarrais most specifically pinpoints their cultural function when she writes, ‘Monuments can be impressive, even overwhelming constructions (...) often expressing relatively unambiguous messages of power’ [7, p. 18].

Thus, the earthen tombs were freighted with symbolic meaning, but just as there is debate about what constitutes the Neolithic there is debate about who built these burial mounds. Thomas for instance writes of the social complexity of the Neolithic transition as being ‘protean’ [8, p. 1]. He considers it a period when economic, technological, chronological, cultural, ethnic and social aspects of life changed [8, p. 1]. The tombs emerged at this time of change, which was when a predominantly forager way of life gave way to an agrarian one. Peter Rowley-Conwy contends that the appearance of agriculture was ‘not a demic “wave of advance” but rather a rapid and massive socioeconomic “wave of disruption”’ [9, p. 97]. If he is correct, then monument building and its associated belief systems may have been in response to the tensions caused by that ‘disruption’. One can only speculate about whether the ideologies associated with these burial mounds reflected or indeed shaped the inherent societal shifts of those times, but if the mounds had astronomical intent then that was either new to the landscape or it was being embedded in the material culture in a new way. Clive Ruggles also notes the social tension that cultural change can generate, claiming:

Discontinuities of ritual tradition, as manifested by clear changes in the patterns of astronomical symbolism incorporated in public monuments, may indicate significant social upheaval. [10, p. 152]

Thus the Cotswold-Severn earthen tombs may have performed a complex function designed to mitigate cultural upheaval in what was possibly a contested environment.

On the other hand it is possible there were regions where the transition to the Neolithic did not precipitate social tension, in which case monuments may have fulfilled altogether different functions. Fabio Silva and Roslyn Frank point out that when divergent populations interact, such as may have occurred between foraging Mesolithic and agrarian Neolithic peoples, it is possible for there to be transformation rather than conflict. In terms of belief systems, they suggest that different communities each could act on each other, creating ‘syncretic cosmologies with elements from both the colonised and colonizer’s world-views’ [11, p. 232].

Thus, the emergent tombs of western England may have fulfilled a suite of needs. What is known is that they were usually places of burial and thus memorial. A monument was a public statement, imbued with social meaning. They may have been intended not just as markers establishing territorial boundaries, but may have been used to enshrine shared cosmologies. Ruggles agrees that they manifested a social and political complexity, but he returns to their astronomic features claiming their ‘orientation was certainly important’ [10, p. 125]. He also writes:
Perhaps, in small communities, astronomical alignments simply helped to affirm a monument as being at ‘the centre of the world,’ but in other cases they may have had more to do with making its power impossible to challenge thereby affirming ideological structures and political control. [10, p. 154]

Whatever the function of the barrows, whether they were built by indigenous Mesolithic foragers, incoming Neolithic farmers or by selective appropriation between the two, this new architecture heralded the end of the Mesolithic in western England and it may have contained astronomic intent. When a culture embeds the astronomy it practices within the fabric of a new structure it is a declarative act inferring that continuity will apply. For those who are establishing territorial or ideological boundaries, an intended alignment from a power base - such as a barrow - to a celestial event links past, present and, critically, the future.

2. Methodology

Turning to the methodology used in this research, an adaptable approach was needed given the constraints of the material record available. The mounds were surveyed for orientation to the horizon. Two poles were placed along the length of each barrow and the orientation they created was then measured. The interior design of the barrows was as important as the exterior. However it is impossible to judge a barrow’s interior if it has never been taken apart. Tombs are generally closed. Certainly the Cotswold-Severn earthen mounds were. Thus the record from this time is limited. As Alasdair Whittle points out, ‘only three Cotswold long barrows or cairns have been more or less fully excavated’ [12, p. 327]. Because of this it was decided to focus on the three barrows Whittle specifically nominates. These were Burn Ground, Ascott-under-Wychwood and Hazleton North found in central western England [12, p. 327].

The reason the three barrows referred to above are mentioned in the past tense is because the very process of excavation completely destroyed them. This total lack of material record led to a reconsideration of what, in relation to this study, constituted primary and secondary sources. Because Don Benson appeared so confident in the quality of the archaeological reports for each barrow mentioned, those documents were made the primary material [12, p. 327]. Thus the primary sources became not the barrows themselves, but the reports associated with them.

Another reason for this choice was that the reports contained dependable dates which allowed me to establish a time frame within which to compare and contrast each barrow. Burn Ground was built possibly at the end of the fifth millennium, around 4230-3970 cal BC [13, p.339]. Ascott-under-Wychwood was built just after the beginning of the fourth millennium, around 3760-3700 cal BC [14, p. 226]. Hazleton North followed immediately, around 3710-3655 cal BC [15, p54]. Thus these tombs predate Sarsen Stonehenge and, if it occurred, the ‘solarization’ period, by anything up to 1,500 years [3, p. 2]. These dates are the ones used to judge possible stellar alignment.

Thus the methodology became a hybrid one which included the combined use of archaeological reports, maps and, illustrations. Fieldwork calculations, phenomenological notes and a discussion of the horizon issues local to each site were also included. Modern features such as roads, were used as key structures. The methodological process involved locating the road nearest to a barrow and going into the field and measuring its azimuth. Maps and archaeological plans were then to draw the angle between the road and the barrow. A protractor was used to calculate the difference. This hybrid, deductive approach was more dependable, the more precise the maps and illustrations. It was a methodology which had clear limitations, being less reliable when a badly, or roughly drawn diagram was used.

Fieldwork tools included a Garmin GPS 12 XL position finder, a Suunto compass and a Suunto clinometer to measure horizon altitude. Magnetic anomalies were checked for at all sites. True North was recalculated from Magnetic North by accessing the National Geophysical Data Centre’s website now the National Centre for Environmental Information [16]. As this research used secondary sources to impute primary source measurements, all calculations would benefit from some leeway thus an
error margin of up to 2° has been used throughout and this also includes results taken from the astronomy programme Stellarium [17].

Though the research focused on the Sun and the Moon, stellar orientation was routinely checked for, taking into account Schaefer’s discussion on the ‘uncertainty’ of a star’s extinction angle, that is, the closest point to the horizon at which it is visible [18, p. 41]. Two astronomy programmes were used. The first was as already mentioned, Stellarium [17]. The second was Starlight [19]. Starlight is compiled from the Yale Bright Star Catalogue and Ptolemy’s Almagest. Stars with a visual magnitude of 3 or less were assessed for possible alignment. All horizons East, West, North and South were checked for celestial horizon events in the form of Sun, Moon and Stellar rise and set.

To recapitulate, the research was designed to look for orientations from the monuments to celestial horizon events and then to judge whether they indicated a shift from a lunar to solar allegiance over time. The hybrid methodology described above allowed me to establish a diachronic profile of one small part of the material record of the Mesolithic to Neolithic transition on the landscape just north of Stonehenge.

3. Burn Ground

Burn Ground was the first burial mound studied and it immediately presented a methodological difficulty. Though its excavation was well documented there were no photographs or maps setting the barrow in its wider landscape. This was one incidence where the hybrid nature of the methodology came into play. It was only after a 1947 RAF aerial map had been sourced that the barrow’s relationship to the nearby A40 road could be calculated (figure 1) [20].

W. F. Grimes wrote of Burn Ground that its ‘true axis was almost exactly East-West’ and as can be seen, the hybrid methodology employed in this research arrives at the same measurement [21, p. 43]. Burn Ground may have aligned to a single celestial event, or possibly two, since zero degrees of declination aligns to both the equinox and to what Silva has discovered is one of the probable rising points for eclipsing Autumn Full Moons on a minor lunar standstill [22]. Candido Marciano da Silva

![Figure 1. The azimuth of the A40 was measured in a 1947 RAF aerial map [20], coming in at 117°. Then a line was drawn through Burn Ground until it made an angle with the road. At that point it was possible to calculate and angle between barrow and road. As that was 24°, it gave the barrow an azimuth of 91°.](image)
describes Equinoctial Full Moons as those which occur ‘one way or the other’, once the Moon has passed the Sun at the equinoctial point [23, p.476]. Silva adds these are the Full Moons which happen when ‘in essence, the Sun and Full Moon change their place, relative to the celestial equator’ [22, p. 1].

Thus Burn Ground’s declination of -0.6⁰/+0.6⁰ may have aligned to a rising Equinoctial Full Moon. More precisely, it may have been a rising Autumn Full Moon, on a minor standstill year because Silva calculates this particular moonrise occurs at three probable peaks around 0⁰, 4⁰ or 8⁰ of declination [22, figure 3 p. 5]. Burn Ground’s -0.6⁰ of declination is just half a degree from the 0⁰ peak. Minor lunar standstills occur only once every 18.6 years, but the significance of this period is that, as Silva points out, ‘the lunar nodes are close to the equinoxes’ [22, p. 4]. This means the specific quality of the Autumn Full Moon at a minor lunar standstill is that it will herald a night when the Moon will be eclipsed.’ The fixed stars that the barrow oriented to possibly included Alhena (HIP 31681, γ Gem), Procyon (HIP 37279, α CMi), Alphard (HIP 46390, α Hya), and Deneb (HIP 102098, α Cyg).

4. Ascott-under-Wychwood
Ascott-under-Wychwood barrow’s declination was +9.2/-8.4⁰. Nine degrees of declination has been identified by Silva as the rise point for the Autumn Full Moon, or the eclipsing Autumn Full Moon at minor lunar standstill [22]. There were also two sets of Mesolithic post holes on the surface below the barrow, one set running East/West and the second North/South, which may have had stellar orientations, possibly to Alcyone (HIP 17702, η Tau), Deneb, Aldebaran (HIP 21421, α Tau), and Vindemiatrix (HIP 63608, ε Vir).

5. The Hazletons
The third site actually included two monuments, Hazleton North and Hazleton South. Hazleton North has a declination of +10⁰, which again widely oriented to within a degree or two to the last of Silva’s probable rise points for eclipsing Autumn Full Moons on a minor lunar standstill [22, figure 3 p. 5]. Hazelton South’s declination of -21.5⁰/+23⁰ possibly oriented to the rising southern minor lunar standstill which Ruggles suggests stood at -20⁰ at this time [10, p. 57]. In terms of fixed stars, both the two barrows and the two sets of Mesolithic post holes found under Hazleton North may also have stellar orientations to Aldebaran, Denebola (HIP 57632, β Leo), Vindemiatrix, Deneb and Sirius (HIP 32349, α CMa).

6. Barrow Findings
Burn Ground’s possible orientation to the equinox may indicate a solar astronomy applied at this time, though opinion is divided on equinoctial measurements in general. Ruggles argues that the word equinox should be ‘eliminated’ from the archaeoastronomer’s vocabulary, claiming its use displays a ‘highly questionable’ tacit assumption that it was meaningful in prehistoric times [24, p.45]. Another contentious issue is that, given the speed the Sun travels along this part of the horizon, locating the exact equinoctial point can prove difficult.

There are other issues to do with observation as well, particularly with the Moon. Viewing and recording lunar eclipses and minor lunar standstills will have required an understanding of and an ability to measure long cycles. There is argument that this may not have been possible. But, the annual rise and set of stars may on the other hand be more dependable observable. Given the strictures mentioned above, what can be said is that the tombs do orient to the Sun, Moon and Stars, though this does not prove deliberate alignment existed.

This brought the survey’s primary line of enquiry to a close. However, the archaeological evidence indicated that deepening the time profile may prove of interest. The earthen tombs are Neolithic. But as Darvill explains, many such monuments in the Cotswolds ‘seal’ earlier structures’ [2, p.47]. This was the case at Ascott-under-Wychwood, where Mesolithic holes were found in the pre-barrow context (figure 2).
Lesley McFadyen, who was an archaeologist at Ascott, noticed there was a similarity in the orientation of the later Neolithic barrow, which she writes, ‘oriented rather uncannily, in the same direction as the Mesolithic post-holes in Timber structure 1’ [12, p. 81]. Timber structure 1 is the lowest, single row of post-holes (figure 3).

Unlike Timber structure 2, the post-holes in Timber structure 1, had no adjacent fire pit so they might not have been domesticate, possibly fulfilling a different function such as establishing an orientation to the horizon.
The uncanny replication of orientation noticed by McFadyen occurred between the Mesolithic post-holes and the later row of stake holes which were used to create the Neolithic barrow’s axial divide (figure 3).

This axial divide was the first thing constructed. The line it inscribed on the land established the barrow’s fundamental axis. North explains how the establishment of fundamental orientation was typical of the time:

The much flimsier lines of stakes found in so many earthen barrows, clearly mark the stages of construction. The conjecture [being] that the stakes were deliberately set in the directions of lines of sight. [1, p. 121]

At Ascott-under-Wychwood, the later Neolithic orientation paralleled the earlier Mesolithic one, though anything up to six hundred years divided them. As mentioned, the Neolithic barrow oriented to the rising Autumn Full Moon, as well as the rising eclipsing Autumn Full Moon at minor lunar standstill, and so did the Mesolithic post-holes below (figure 4).

7. Mesolithic Landscape at Stonehenge
Once this possible astronomic continuity across the Mesolithic/Neolithic transition had been identified, it led to a second line of enquiry. Though the original research focused on the Neolithic Cotswolds, given barrows may ‘seal’ earlier Mesolithic sites such continuities as applied at Ascott-under-Wychwood may have similarly occurred at Stonehenge [2, p. 47]. Thus the research now turned to the pre-sarsen stone circle material record which includes three Mesolithic post-holes under the old Stonehenge car park (figure 5).

As two of these post-holes have been dated, it is possible to establish a similar diachronic profile to the one established for the Cotswold-Severn tombs.

A site survey revealed that the orientation created by posts A and B had an azimuth of 91°, a measurement already established by Roy Loveday [26, p. 345]. This gives a declination of -0°/+1° which as mentioned may indicate an alignment to both lunar and solar equinoctial horizon events [22, p. 1]. In terms of the fixed stars, Pollux (HIP 37826, β Gem) rose at zero degrees of declination at this time [17]. When considering the posts and the order in which they were installed, it is possible post A to B is actually the second orientation created at this location. Cleal dates Post B sometime between 7480-6590 cal BC, but she dates Post A as earlier, sometime between 8820-7730 cal BC [4, p. 43].

![Figure 5. Mesolithic post-holes A/B/C. Stonehenge [4, p. 42].](image-url)
Thus it is possible that Post A, if joined with the tree (visible as ‘tree hole’ in the diagrams), created the first orientation (figure 6).

As the fieldwork measurement had established an azimuth between posts A and B, it was possible to then gauge the orientation of the tree and post A which gave a declination of +5°/-4°. If intended, this was an alignment to the rising Autumn Full Moon and the rising eclipsing Autumn Full Moon at minor lunar standstill [11]. Should this be a deliberate alignment, it suggests that the first orientation established on the Mesolithic hillside at Stonehenge was a lunar one, which again supports Sims’ theory [11, p. 1]. However the arrival of a possible equinoctial orientation shown by the second orientation from Post A to B may indicate that a solar astronomy joined the original lunar one. Given the different dates that apply to the post-holes these two possible alignments may have occurred concurrently, or over a period of up to two thousand years, but whichever it was, both orientations were established in the Mesolithic (figure 6).

8. Methodological Issues
The aim of the survey was to explore the material record of Neolithic southern England for evidence of shift from lunar to solar allegiance. The originating research for this study was Sims’ ‘solarization’ theory [3, p. 3]. Sims suggests the aim of the monument builders was to reverse key horizon properties of the Sun and Moon, ‘apparently with the intention of investing the Sun with the Moon’s former religious significance’ [3, p. 1]. He writes: ‘strictly lunar scheduling to ritual could be reduced and estranged into solar cycles’ [3, p. 14]. Hence the hypothesis informing this research which asks if there appears to be an abrogation from a predominantly lunar to a solar astronomy at this time. It is possible that Sarsen Stonehenge was designed to engineer this transition. The Stonehenge building process is dated to the mid-third millennium, around 2413 BC, so it is possible that is when the social aspects of ‘solarization’ occurred [4, p. 231]. When arguing for this calendrical shift, Sims recommends investigation further afield than Stonehenge ‘for earlier versions of the same complex’ [3, p. 14]. The research attempted that reinvestigation.

The methodology used to explore these burial chambers was qualitative and hybrid, including fieldwork and in depth analysis of archaeological reports. One of the fundamental aims was to establish a dating sequence for comparative purposes. The barrows surveyed ranged from possibly the very end of the fifth millennium to mid-fourth millennium. However, the emergence of possible
Mesolithic post-hole orientations discovered in pre-barrow contexts prompted a deepening of the time frame in the research overall. The material record of Mesolithic Stonehenge was then explored, the first Mesolithic date now standing at 8820-7730 BC [4, p. 43]. The latest Neolithic date was 3710-3655 cal BC [15, p. 54]. Thus a diachronic profile of one small part of the material record across the Mesolithic to Neolithic transition in central southern England was created. This profile allowed exploration of the possible astronomies of those who inhabited this region at this time. A number of issues arose during this survey, some to do with the research process itself and others to do with the findings.

Turning now a consideration of the hybrid methodology used in this study, it may be timely to question its feasibility. The combined use of fieldwork and archaeological report was in direct response to the limited material record under investigation. However, even though best endeavours were used, it is possible that some calculations are more dependable than others. For instance, the measurement for Ascott-under-Wychwood eventuated in an azimuth that at 5°, differed two degrees from that given in the archaeological report. As Benson, who wrote the report was still alive it was possible to both email and telephone him [27]. When questioned about his compass measurement he verbally confirmed and also wrote ‘I am confident about the 7 degrees North of East’ [28]. It was possible to only source one rough illustration of the Ascott barrow in relation to its nearby road and that was perhaps too blunt a tool to rely on, so Benson’s judgement was accepted as final (figure 7).

At Hazleton North on the other hand, the diagrams were finely illustrated and were used with confidence. Combining Alan Saville’s maps with this author’s own compass measurement of the nearby road an azimuth from magnetic north of 79° was concluded (figure 8).

Magnetic North stood at -1.9° on 29th April 2013, the day of the fieldwork, so Hazleton North’s azimuth, when recalculated, stood at 77°. This was subsequently discovered to correspond with Saville’s measurement. He too estimated that the barrow stood at 77° [29, p.34]. However, he did not specify which North he was referring to so he was contacted in order to check, and his reply ended the matter:

\[\text{Figure 7. Roughly drawn map, showing barrow in relation to nearby road [14, p. 3].} \]

\[\text{Figure 8. Hazleton North’s azimuth of 79° from magnetic north, in relation to adjacent road [29, p. 5].} \]
I’m afraid my memory is not up to helping…. [One] thing I would add is that the text does say East of North rather than East of magnetic north, but that is perhaps clutching at straws. [30]

So Hazleton North and Ascott-under-Wychwood’s measurements were arrived at using the best information a hybrid methodology could source, but it is clear that that methodology’s limit has been reached.

Measurements for the other two sites may perhaps be viewed more confidently. Grimes noted that Burn Ground’s ‘true axis was almost exactly East-West’ and indeed the hybrid methodology employed which included fieldwork and map usage suggested the barrow had a declination of -0.6°/+0.6° [21, p. 43]. The same hybrid methodology allowed for an assessment of the azimuths for the post-holes at Stonehenge. This author’s calculation of 91° corresponded to Loveday’s exactly which then lead to a confident use of the diagram to subsequently estimate the second orientation at that site [26, p. 345]. It may be best to assume this level of congruency will not always occur but considering the process overall, hybrid methodologies may find a use when sensitively applied to appropriate projects.

9. Research Findings

Returning to the question at the heart of this survey, which asked whether a solar astronomy superseded a lunar one in this region, the findings seem to suggest an attachment to lunar astronomy did apply during the Mesolithic and this continued into the early Neolithic. As mentioned, Sims claims there existed ‘an ancient cosmology which in its astronomical aspects had focused on the Moon’, and indeed, the earliest orientation found in this study was the lunar one on the Mesolithic Stonehenge hillside created by the Tree to Post A [3, p. 3]. The last lunar orientation was found at the ‘youngest’ site, Neolithic Hazleton North. This supports Sims theory that a lunar astronomy possibly applied in this region pre-sarsen Stonehenge. However, the emergence of a second Mesolithic post-hole orientation at Stonehenge, this time to zero degrees of declination, raises the possibility of solar equinoctial orientations joining lunar ones as early as the eighth millennium BCE. This ‘solar’ measurement joins with Neolithic Burn Ground, and Hazleton South’s equinoctial and solstitial orientations respectively. Sims argues it was ‘the Neolithic and Early Bronze Age introduction of solar symbolism [that] was to modify and transcend earlier engagement with the Moon’ [3, p. 3]. But as the Mesolithic car park post-holes clearly predate the ‘solarizing’ Neolithic stone circle at Stonehenge, it is possible there was an earlier appreciation of solar horizon events than Sims suggests [4, p. 43].

It is however, necessary to exercise caution when assessing the equinoctial point. As Silva points out, zero degrees of declination can have lunar as well as solar qualities [22, p. 3]. Given this possible bimodality, it is not possible to assume either luminary was preferred at this declination. Also, as mentioned previously, the Sun’s journey at this horizon point is difficult to measure, thus zero degrees remains a declination resistant to definitive interpretation. It is interesting to note that one of the burial mounds in this survey may have been specifically sited to address this horizon problem. Burn Ground was an anomaly in that not only was it the only barrow surveyed which had zero degrees of declination, it was also the only one located on a completely flat landscape (figure 9).

Figure 9. A 360° panorama of the field where the Burn Ground was built.
This choice of site was atypical given the generally rolling Cotswold landscape but the zero degree horizon altitude it afforded may have been deliberately chosen in order to facilitate the most precise solar measurement possible.

Another aspect of the research which should perhaps be more closely scrutinised is the use of the word lunar. The ‘lunar’ orientations which possibly emerge in these findings are to rising Autumn Full Moon eclipses at Minor Standstill, or a rising Autumn Full Moon. But this phraseology appears to infer a preferential emphasis on the Moon, when in fact the Sun is just as integral to these celestial events. Full Moons and lunar eclipses are simply the culmination of a complex and continuous soli/lunar syzygy.

Taking the rising Autumn Full Moon first, Silva argues that combined with the Spring Full Moon, it is one of only two annual celestial horizon events that sees both Sun and Moon visibly oppose each other across the horizon [31]. As the Moon rises at +4° of declination it directly opposes the setting Sun at -4° of declination and an ‘equinoctial axis’ is formed [31]. It is possible that this rare celestial event may have been meaningful in and of itself, but whatever its symbolic function, it involved both luminaries.

Turning now to the second ‘lunar’ orientation which emerged from the study, this was to the rising Autumn Full Moon eclipse at minor lunar standstill. This particular Full Moon is in the sky at night for longer than at other times, so this may have been a significant Full Moon which marked times of social gathering and hunting. The reason for what is one of the longest moonlit nights is because the angle the Moon makes with the horizon at moonrise at this time of year is at its narrowest, which means that the period between sunset and moonrise is at its shortest. So on these specific Full Moons, the night sky can be illuminated for one of its longest periods. In turn, given the commanding nature of this Moon, it would have been striking when it was totally eclipsed. An eclipsed Full Moon turns red at totality. When light passes into and then out of our atmosphere, the red part of the colour spectrum is the least affected by scattering processes, unlike the green to violet section which is nearly entirely scattered away [32]. During an eclipse, it is this red light which can be seen glowing across the Moon’s surface. Silva describes these particular eclipses as being, ‘more varied in the sense that an eclipsed Full Moon can exhibit very distinct colours, ranging from near invisibility to brownish red or bright orange’ [22, p. 4]. Silva describes the darkening into red of this bright Autumn Full Moon at minor standstill as visually arresting [22, p. 4]. Eclipses unfold over a number of hours, the actual totality when the Moon is at its most red, lasting anything up to 106.6 minutes [33]. It may not have required a complex astronomy to track and record lunar eclipses. As Silva points out: ‘For a given place, lunar eclipses are much more common than solar eclipses. This is because when one occurs it is visible during the night across the whole hemisphere’ [22, p. 4].

It is also of note that an Autumn Full Moon is an Equinoctial Full Moon; these occur just after the Sun and the Moon are seen to cross over the equinoctial point as they travel in opposite directions along the horizon. Marciano Da Silva explains the horizon relationship between the luminaries at this time. ‘One way or the other,’ he writes of this Full Moon, ‘(it) would be the first Full Moon past the Sun’ [23, p. 476]. Thus as with the non standstill Autumn Full Moon, both luminaries figure.

So for the viewer, the Sun is as implicated in these ‘lunar’ events as the Moon. In both instances the lunar and solar components are indivisible. Certainly there is no way of establishing which luminary was linguistically prioritised in prehistory. The ‘lunar’ horizon events possibly revealed in the research happen within days of the autumn equinox, a term currently used to define what is considered a solar calendar moment. But when describing Equinoctial Full Moons, Silva points out, this is ‘the time the Sun and Moon actually change positions in the sky,’ and then he adds: ‘In fact, it is possible that EFMs (Equinoctial Full Moons) are the ethnographic definition of equinox’ [22, p. 5].

This suggests an equivalence between Sun and Moon.

Turning to another aspect of the findings and separate to the luni/solar discussion above, though Sims makes no mention of the stars, unexpected but repeated stellar orientation emerged throughout the survey. These were to the very brightest stars and suggest that if astronomy was practised at this time, it contained a stellar component. If this was the case there may have been created what
Bernadette Brady terms a ‘cosmic and cultural knot’ [34, p. 4]. This supposes a complex mix of Sun, Moon and Stellar sky lore, combined and applied for navigational, calendrical and ritual purposes.  

Lastly, there may be an ethnographic aspect to these findings, given their seasonal emphasis. There was a predominance of orientations to celestial events which occur around the equinoxes. Setting aside observational and record keeping problems, this may indicate that during the Mesolithic to Neolithic transition, trade and ritual gatherings occurred at these times of year. The specific events include a single orientation to an Autumn Full Moon, which was the earliest one found at ninth millennium Stonehenge and subsequent to that all further orientations were to Autumn Full Moon eclipses at minor standstill. This may possibly indicate an astronomy which evolved over time into one that appreciated both eclipses and longer cycles.

In conclusion, this survey considered Sims’ argument that there was an abrogation from a lunar to a solar form of astronomy in southern England during the Neolithic [3, p. 3]. Sims’ ‘solarization’ theory suggests there was a greater cultural engagement with lunar cycles before the onset of pastoralism, during which earliest of times there existed ‘an ancient cosmology which in its astronomical aspects had focused on the Moon’ [3, p. 3]. Sims suggests that Stonehenge’s double lintels were designed to ‘juxtapose, replicate and reverse’ key horizon properties displayed by the Sun and Moon in order to invest the Sun with the Moon’s former religious significance [3, p. 1]. Stonehenge may be just one of a number of monuments, Sims points out, constructed to ‘modify and transcend [this] earlier engagement with the Moon’ [3, p. 3]. He suggests other monuments across the region be examined for evidence of similar archaeoastronomic intent which this limited survey attempted to do. Of particular interest was whether there appeared to have been a transition from a predominantly lunar to a solar astronomy during the mid Neolithic when Stonehenge was built. However, given the range of possible orientations which emerged, including solar ones from the earliest Mesolithic, it may be the case that not just a lunar astronomy, but a solar astronomy also could have been in place prior to the Stonehenge era. There appeared to be a significant number of stellar orientations too, so it may be that the astronomy practiced in prehistoric Western England paid allegiance to not just the Moon but also the Sun and stars.

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