

LINES OF ENQUIRY: LINEAR ORGANISATION OF THE  
HIGH LEA FARM BRONZE AGE BARROW CEMETERY

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# Lines of enquiry: Linear organisation of the High Lea Farm Bronze Age barrow cemetery

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## Abstract

Previous published fieldwork at High Lea Farm, Hinton Martell, Dorset, found an unusual spatial arrangement of a Bronze Age cemetery in which seventeen ring ditches lay in three lines, converging on a large, elaborated barrow, which lay on the near horizon, as seen upwards from the others. This arrangement was investigated since it may indicate an astronomical alignment to the Winter Solstice sunset, a possibility that has rarely been considered in British Bronze Age barrow cemeteries.

Two possible explanations were explored. First, a suggestion that the large barrow 'pointed' towards a prominent hill, because that hill was an especially significant place to the constructors of the cemetery, was tested by collecting data about the locations of monuments and find spots in the 400km<sup>2</sup> around the cemetery, and then examining these in a GIS to see whether they clustered by the hill. The second explanation, that the arrangement was aligned to the Winter Solstice sunset, was tested using computation and a theodolite horizon survey.

Support was found for both explanations, leading to consideration of the potential for astronomical factors to contribute to understanding the organisation of such cemeteries and, more generally to landscape archaeology.

## Introduction

The purpose of this study is to explore the meaning of an enigmatic arrangement of round barrows discovered by the intensive investigation of a barrow cemetery. It is concerned with the remains of a barrow cemetery in a field at High Lea Farm, situated on the eastern side of the valley of the River Allen between Hinton Martell and Witchampton. The remnants of a round barrow in the field (known as 'Kings Close') had long been recognised (e.g. Grinsell 1959, 115) and afforded scheduled protection. Crop marks visible in aerial photographs had suggested the presence of ring ditches indicating at least 9 more round barrows (Grinsell 1982 42). Gale and colleagues surveyed Kings Close using multiple geophysical methods, and found, in addition to the scheduled barrow, the presence of sixteen ring ditches, implying the presence of the remains of round barrows (Fig. 1) (Gale et al. 2004, Gale, Laver, and Russell 2007, and Gale, Hewitt, and Russell 2008). Excavations of two barrows (HLF4 and HLF3, using the nomenclature of Gale et al. 2007) found that their remnants had been almost destroyed by ploughing. Only the two largest barrows, HLF1 and HLF9, had escaped such very severe damage, presumably because of their size and bulk, with diameters of 39m, double that of the 19 m median of the others. HLF1 and HLF9 were also both positioned at opposing headlands of the field, where they would

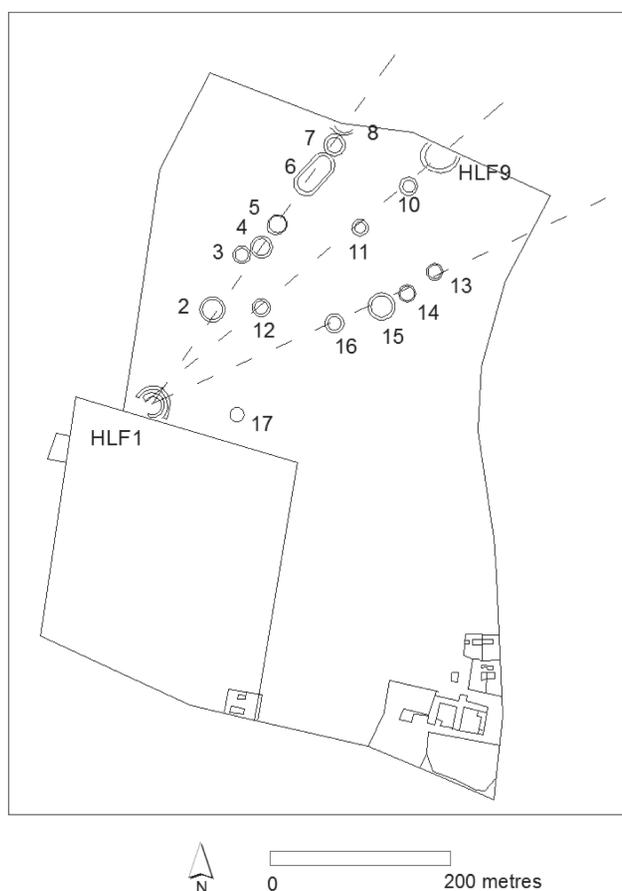
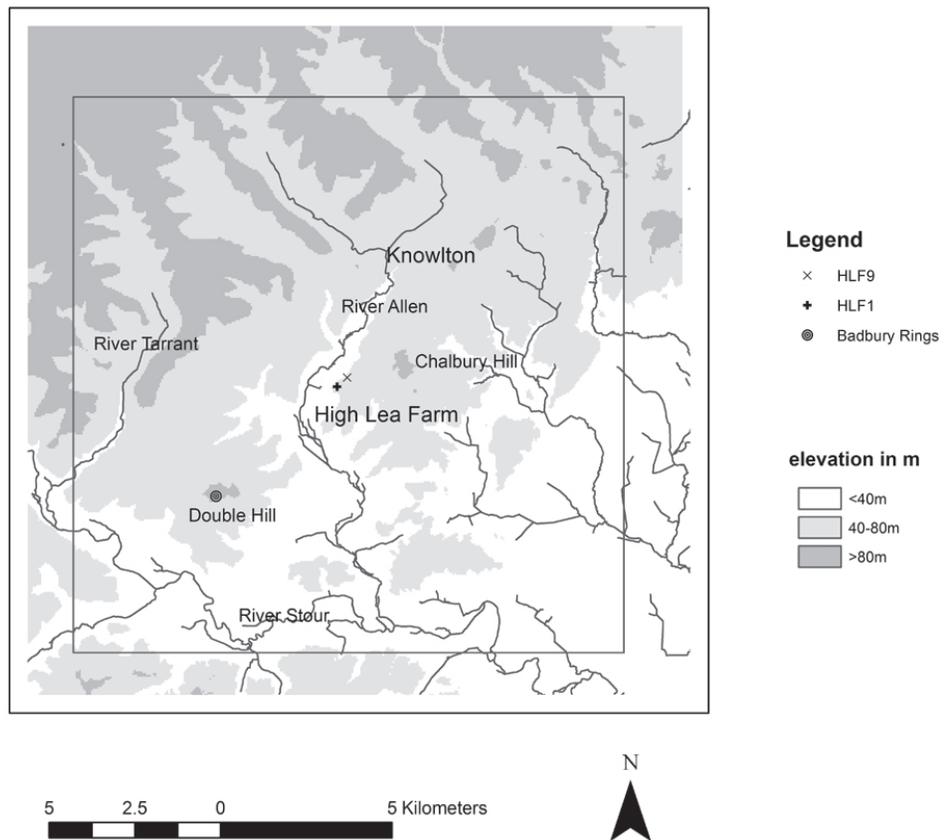


Figure 1: The ring ditches identified at High Lea farm from geophysical survey, together with dashed lines indicating suggested linear arrangements. This figure is a redrawn and amended version of Figure 6 from Gale, Laver, and Russell 2007, 102, the amendment being the addition of lines. Original is copyright of the Dorset Natural History and Archaeological Society

Figure 2: The locations of the two High Lea Farm barrows of particular interest, and other places discussed in this article, including the double hill, on which Badbury Rings and High Wood stand today, Chalbury Hill, the most visually dominant hill as seen from High Lea, and Knowlton, the centre of a large complex of Neolithic and Bronze Age monuments. The inner box contains the study in which the locations of monuments and find spots were examined for evidence of clustering. The map was (along with Figures 4 and 5) created using Terrain50 data from the Ordnance Survey. Contains OS data © Crown copyright and database rights 2016



be likely to receive less damage from ploughing. A comprehensive excavation of HLF9 discovered the remains of a turf mound, some 1 m in height, capped by a layer of chalk debris likely to be about at least 0.6m thick. Beneath the centre of this mound was a burial pit, approximately rectangular in shape, containing two cremations. The primary burial was radio carbon dated to 1948 – 1747 cal. BC (95% confidence) 3524 +/- 38 BP UBA 18003. The whole burial mound was enclosed by a circular ditch.

The spatial arrangement of the barrows formed three approximately straight lines, converging on HLF1 (Fig. 1). The northern line from HLF8 consisted of eight barrows, the central line from HLF9 consisted of four barrows, and the southern one from HLF13 consisted of four. Barrow HLF17 seems to be an outlier. HLF1 stood on a higher part of the field which acts as a near horizon to that below, and would have visually dominated the view from the other barrows in that direction. It was also the most elaborate barrow, encircled by a double ditch. The far horizon behind HLF1 was dominated by a double hill, 4.7 km away, the lower part of which is now covered by High Wood and the higher part is now surmounted by Badbury Rings, a multivallate Iron Age hillfort (Fig. 2).

### Understanding the arrangement of the barrows in visual terms

It is proposed that the spatial organisation of the cemetery highlights the view between the two larger barrows, upwards from the lower one (HLF9) to the higher, more elaborate one (HLF1) and the double hill beyond.

The first reason for proposing this is the visual prominence of HLF1 over the others, standing proud on the near horizon above them, against the far background of the double hill. Conversely, from HLF1 the other barrows would have fallen visually well below the NE horizon, 3km distant, and would not have stood out in the same way. This is apparent from observation today from the sites of these barrows. From the visual prominence of HLF1 is inferred the primacy of the view from the other barrows up towards it.

The pattern can also be expressed quantitatively by computing the altitude from one location to a second, this being the angle, relative to the horizontal plane, of the line of sight of the second location from the first. The altitudes of the top of HLF1 as seen by a person at ground level at the three terminal barrows, were, from HLF8 0.5°, from HLF9 0.4°, and from HLF13 0.1°.

These calculations assumed that the top of mound of HLF was 1.6 m above ground level, like that of HLF9. Conversely an observer standing at ground level at HLF1, looking down to the tops of the mounds of these barrows below it, saw them with negative altitudes (HLF8 -0.5°, HLF9 -0.3°, HLF13 -0.2°). From HLF1 the horizon behind each of these barrows was much higher than the top of the barrow (with altitudes of 0.3° for that behind HLF8, 0.7° for that behind HLF9, and 1.5° for that behind HLF13). The altitude of the horizon was higher than that of the barrow in each case (HLF8 0.8° higher, HLF9 1° higher, HLF13 1.7° higher). These calculations assumed that the tops of the smaller mounds HLF8 and HLF13 was 1m above ground level, and that for HLF9 was 1.6m. The above calculations and those following were carried out on Ordnance Survey map data using the *GETDEC* programme (Version 4.00, Ruggles 2002). The altitude of the horizon in each point was computed using the *Horizon* programme (Smith 2014).

Secondly, looking downwards from HLF1 the three lines of barrows would have splayed out in different directions: looking upwards from the terminal barrows the lines converge in one place, directing vision towards it. This direction of vision is most evident from the other large barrow, HLF9, from which the other two lines of barrows defined an area pointing upwards from each side, to HLF1, and it is argued here that this implies that the view up from HLF9 to HLF1 is the most important in the cemetery.

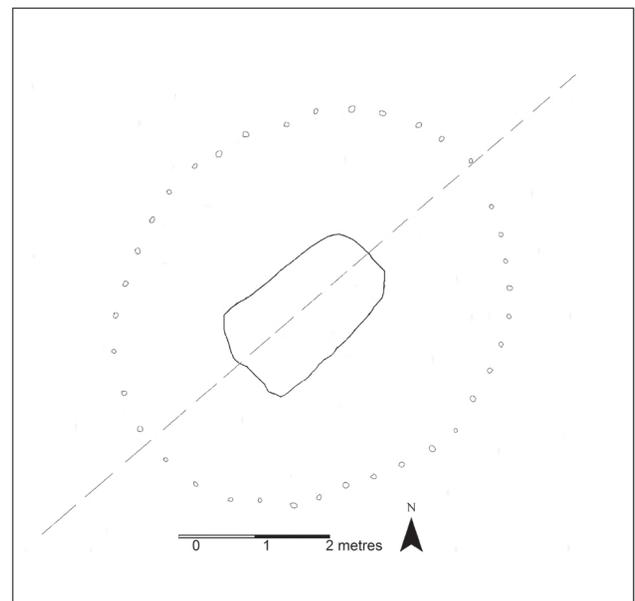
A further reason is that observers at the sites of each of the three terminal barrows would have seen HLF1 against different backgrounds: only one, at HLF9, would have seen HLF1 framed against the double hill. An observer at HLF8 would have seen HLF1 to the south of the hill, while one at HLF13 would have seen it to the north of the hill. The azimuths (horizontal compass bearings) of the centre of HLF1 and the northern and southern edge of the double hill visible from the sites of each of the terminal barrows are; for HLF8 216.4° (221.8° to 228.2°); for HLF9 228.5° (222.8° to 229.6°); and for HLF13 244.4° (223.9° to 230.6°). The fact that only the view from HLF9 foregrounds HLF1 against the double hill is inferred as supporting that this is the primary visual axis of the cemetery.

It is suggested that HLF1 and HLF9 are the most

important barrows because they are the largest. This interpretation draws on findings that larger, more conspicuous, barrows in Dorset tend to be constructed in higher places (Peters 1999). Round barrows were often constructed in visually strategic locations, from which they could be seen from afar. This is taken to show that these are the two major barrows in the cemetery and that their visual relationship is of major importance.

In addition, a key aspect of the architecture of HLF9 is oriented towards HLF1 and the double hill. The longer axis of the burial pit below it is oriented in a very similar direction to that of the central line of barrows, pointing towards HLF1. Examination of the measured plan made during excavation showed this to be 222° / 42°, and this was confirmed by theodolite measurement of contemporary marking of the outline of the surface of the pit (Figure 3). This orientation is towards the southern end of the double hill, about 6° south of HLF1, as seen from HLF9. Excavation of the two other barrows found no burial pits, and so offers no evidence relevant to direction. This inbuilt orientation is taken as further evidence of the primary importance of the view from HLF9 to HLF1.

Taken together these five reasons are taken as the basis for arguing that barrows HLF1 and HLF9 are the most important, and the view up from the latter to the former and the hill behind is the primary visual axis of the cemetery.



*Figure 3: The azimuth of the longer axis of the burial pit beneath the centre of HLF9 (represented by the dashed line) is 222° or 48°. The pit is shown here surrounded by the remains of post holes*

### Suggested explanations for the arrangement of the barrow cemetery

This argument, that the barrows were organised to highlight the view from HLF9 to HLF1 and the double hill behind it, provokes two mutually compatible explanations of the arrangement. First, did it demonstrate that the double hill was salient to the constructors of the barrow cemetery? Secondly was it related to the fact that the Winter Solstice sunset at that time occurred against the hill? These suggestions are now explored.

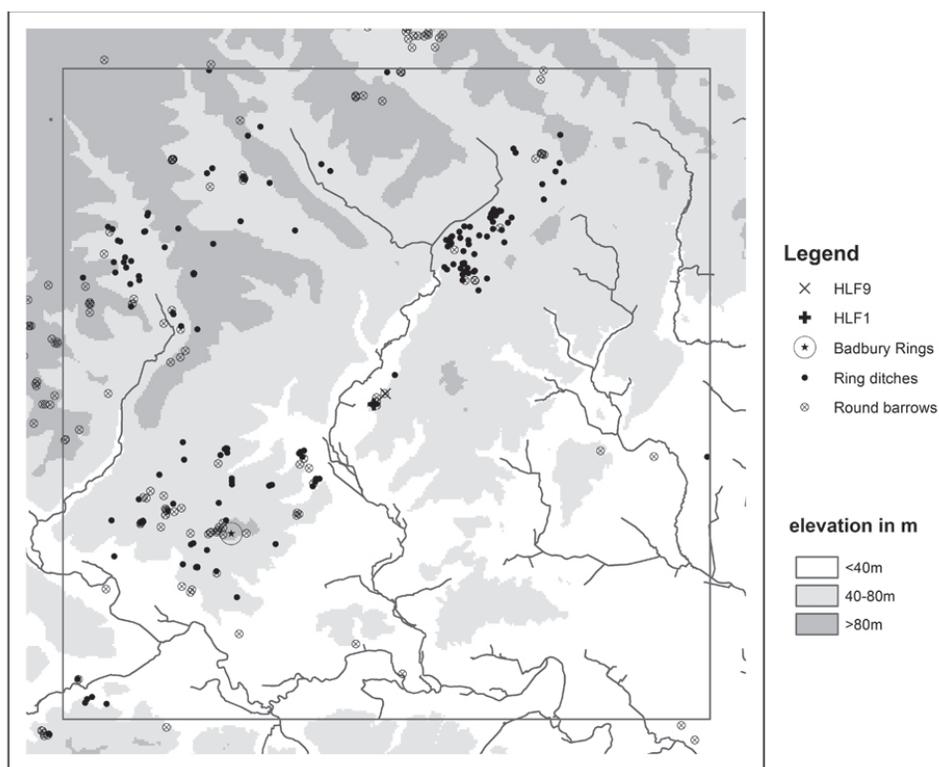
### Was the double hill a significant place during or prior to the Bronze Age?

It is possible that the alignment indicated that the double hill was a particularly significant place for the constructors of the barrow cemetery. If this were so, it might be expected to be apparent in either a clustering of activity there, signified through the presence of monuments, or finds of objects, or, more ambiguously, in a completely sterile area surrounded by indications of activity. This idea was tested by creating and analysing a dataset of locations of monuments and find spots dating from periods up to and including the Bronze Age. The search area was a square 8km in

each cardinal direction from HLF9, 256km<sup>2</sup> in area. An additional zone of 2 km around the study area (144 km<sup>2</sup> in area) was added to reduce the possibility of failing to notice clusters that straddle the boundary of this area, so-called 'edge effects' (Conolly and Lake 2006, 91). The systematic search process accessed data from the National Record of the Historic Environment (NRHE) through the *Pastscape* website (Historic England 2016). The locations of monuments and find spots were plotted on a Geographical Information System (*ArcGIS* 10.0) and the distributions were examined visually for each prehistoric period separately, to assess whether there was any clustering around the double hill.

No such clustering was apparent in the 34 lithics from the Palaeolithic or the 44 from the Mesolithic, nor in the 12 long barrows, 6 pits, 6 henges, and 27 lithic find spots of the Neolithic. In contrast, there was a distinct cluster of the 169 Bronze Age round barrows and 174 ring ditches, particularly on the west of Badbury. There were also clear clusters on the east side of the Allen valley around Knowlton, and on higher ground to the north and west of the headwaters of the River Tarrant (Fig. 4). The hill was also surrounded by a particularly rich cluster of Bronze Age find spots and

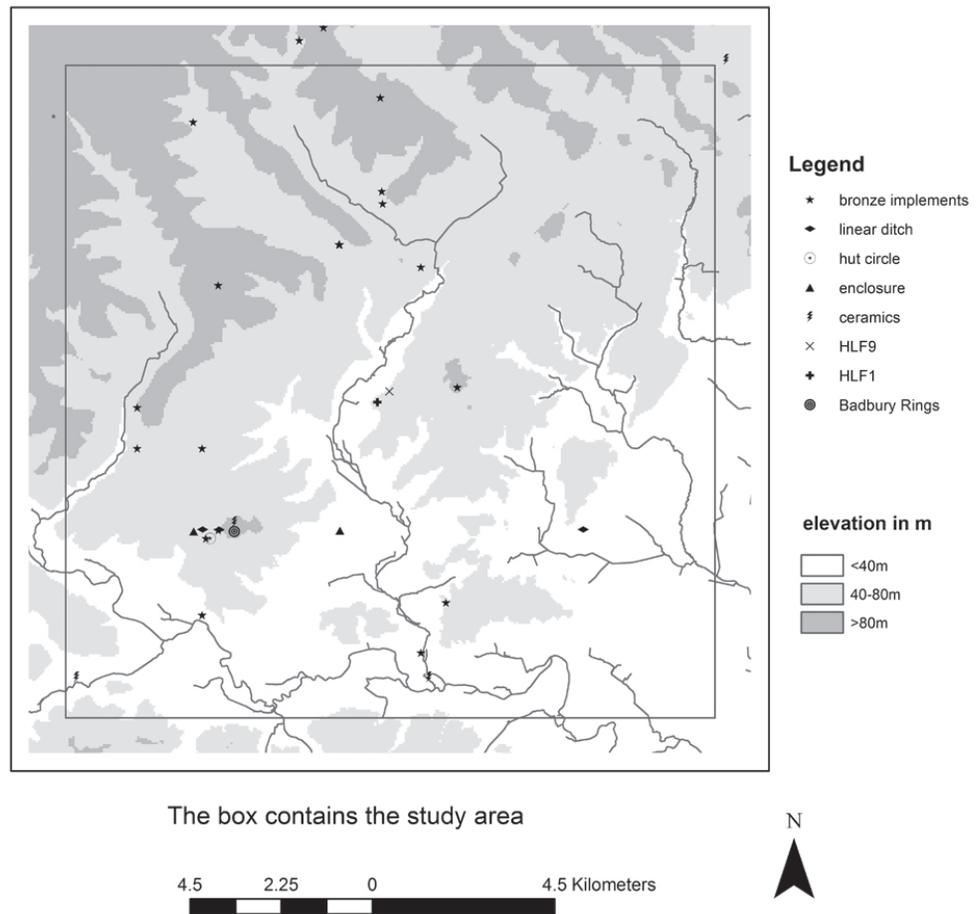
Figure 4: The locations of barrows and ring ditches in the study area are illustrated, as well as those in an exterior buffer zone (to guard against misleading edge effects). The three main clusters can be seen at Knowlton, around the double hill, and on higher ground to the West and North of the head waters of the River Tarrant. This data (and data in Figure 5) is taken from the National Record of the Historic Environment maintained by Historic England



The box encloses the study area.



Figure 5: The locations of find spots of Bronze Age metal implements and ceramics are depicted, together with the locations of structures dated to the Bronze Age, including linear ditches, a hut circle, and an enclosure. This illustrates a notable cluster of variety of Bronze Age remains to the west of the double hill



other monuments (Fig. 5), richer than those elsewhere in the study area. This included ceramics, a hut circle, an enclosure (Papworth 1992), a Middle Bronze Age rapier (Oliver 1936, 27) and a substantial palisaded linear ditch which probably marked land boundaries (Gingell and Dawson, 1987).

of finds, together with funerary monuments, implies that the area around the double hill was a significant place for both ritual and practical purposes. Unfortunately, these finds offer few direct dates that would allow temporal comparison between them and the construction of the cemetery at High Lea Farm.

A finding of relevance to possible artefacts in the prehistory of the Badbury area is the results of an excavation of a portion of the Bronze Age linear earthwork alluded to above, which was found 550m to the southwest of the ramparts of Badbury Rings (Vacher and Vacher 1965, Gingell and Dawson 1987). This Bronze Age palisaded bank and ditch, probably part of a continuous boundary ditch, was subsequently overlain by an Iron Age bank and ditch, which was itself enlarged prior to the Roman invasion. Beaker pottery was found in adjacent small pits and Iron Age pottery and a Roman ballista bolt

were found in the enlarged Iron Age bank. This shows how Neolithic and Bronze Age constructions and monuments in this significant area were reworked, and possibly destroyed, in subsequent periods, and may be underrepresented in the current palimpsest of remains.

The search employed did not include data from the 'National Trust Historic Buildings, Sites, and Monuments Record Register' (NTHBSMR) which includes details of other finds from the area around the double hill, arising from the active involvement of the National Trust archaeologist responsible for the Kingston Lacy Estate. The reason for eschewing this source was that this might bias the results towards greater reporting, which may reflect greater opportunities for finding artefacts and the vestiges of monuments, rather than an actual greater prevalence. The NTHBSMR recorded a wider range of finds than the NRHE such as a bronze palstave found at Badbury (Papworth and Smith, 1988), an early Bronze Age inhumation (Papworth 1999) and five further stretches of linear ditches typical of the Bronze Age, found close to Badbury. Bowen's (1990) survey of linear ditches around Cranborne Chase described the area around

Badbury as the second largest block in Dorset (p. 12), with a notable pattern that the ditches did not connect with the hillfort. In discussing an investigation of ring ditches at Badbury Papworth (2000, 148) concluded that 'the area was already sacred in the Early Bronze Age'.

The clustering of ritual monuments and finds from the Bronze Age is consistent with the notion that the double hill was a focus for activity, in the broad period when the barrow cemetery was constructed. It thus supports the notion that it was a significant place for the constructors of High Lea barrow cemetery. Neither of the other two large clusters of burial mounds, around Knowlton and in the upper Tarrant valley, was clearly visible from High Lea (as determined by direct observation and by examining a GIS viewshed, showing the area that could be potentially seen from HLF9). Conversely, the most prominent hill visible from High Lea, Chalbury Hill, 1.5 km to the North East, (with an altitude of  $1.9^\circ$  from HLF9, compared to the  $0.6^\circ$  of the double hill) shows only two signs of use during the Bronze Age, in the form of a Late Bronze Age urn containing a cremation and a reported set of bronze chisels. The nearest evidence of a funerary monument to Chalbury Hill is a ring ditch 1.5 km to the west. Within that distance from the centre of Badbury there are 18 ring ditches and 15 round barrows. Thus, the largest and most visually dominant hill, as seen from High Lea, is almost devoid of traces of Bronze Age activity, while the double hill has a high density of such traces. The organisation of the cemetery, pointing towards Badbury, is much more likely to be due to the special significance of Badbury, rather than the physical prominence of the hill.

**Does the organisation of the cemetery point towards the Bronze Age Winter Solstice sunset?**

Viewed from HLF9, HLF1 stood against the double hill near the point where the Winter Solstice sunset occurred during the Bronze Age, and where it occurs today. Each point on the horizon viewed from a specific location corresponds to a value of astronomical declination. The value of declination can be calculated from knowledge of the latitude of the location of the observer, the azimuth of the point on the horizon as seen by the observer, and the altitude of the point as seen from the position of the observer. Values of declination for celestial events occurring on the horizon are known. That for the last gleam of

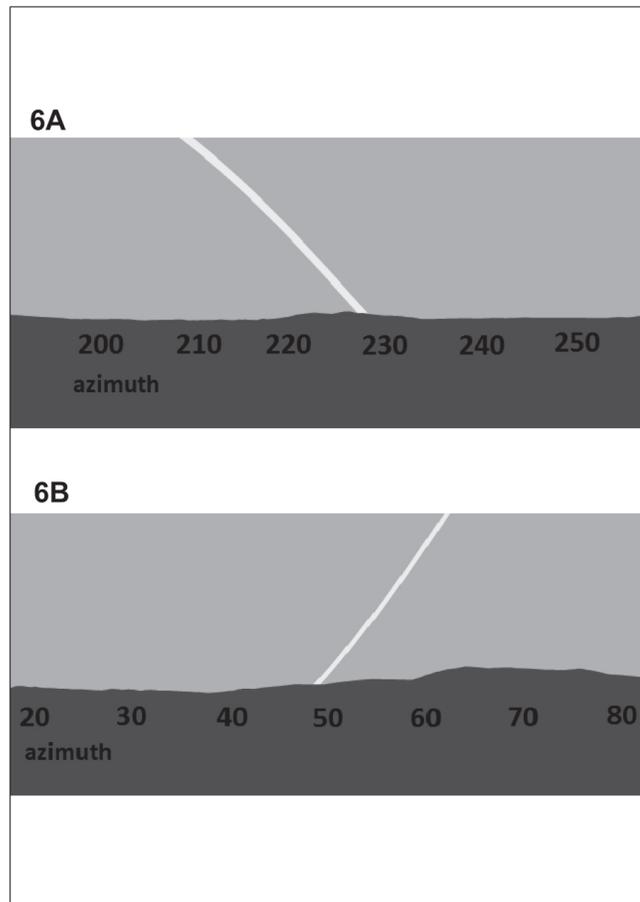


Figure 6: Two dimensional profiles of (6A) the summer solstice sunrise as seen from HLF1 in 2000 BC, at an azimuth of  $50.8^\circ$  and a declination of  $23.7^\circ$  and (6B) the winter solstice sunset as seen from HLF9 in 2000 BC, at an azimuth of  $230.4^\circ$  and astronomical declination of  $-23.7^\circ$ . Each image is marked with positions of azimuths at  $20^\circ$  intervals. They were created with the software *Horizon* developed by A.G.K. Smith, © A.G.K. Smith and created with *Terrain 50* data from Ordnance Survey. Contains OS data © Crown copyright and database right 2016

the sun at the 2000BC Winter Solstice sunset is  $-23.7^\circ$ : that for the equivalent in 2000AD,  $-23.2^\circ$  (Ruggles 1999, p 57). Preliminary calculations were made using Smith's (2014) *Horizon* programme, which produces two-dimensional and three-dimensional models of horizons from digital models of the landscape (in this case based on Ordnance Survey *Terrain 50* data). These computations suggested that the sunsets corresponding to declinations of  $-23.7^\circ$  and  $-23.2^\circ$  would occur (to an observer at HLF9) at azimuths of  $230.4^\circ$  and  $231.5^\circ$  respectively (Fig. 6). On this basis, at about the date that this barrow cemetery was constructed, a person standing at the base of HLF9 could have seen HLF1 silhouetted centrally against the double hill, near the point where the most southerly sunset of the year crossed the horizon, before it started moving northwards again during the following days

and weeks. The results of computational models are suggestive and benefit from testing through direct observation.

Therefore, an attempt was made to verify the position of the 2015 Winter Solstice sunset by direct observation on the two clear evenings on December 22 and 24 but these were thwarted by low lying cloud.

A subsequent horizon survey of the appropriate part of the horizon as seen from the central barrow surface of HLF9 was carried out using a theodolite, following procedures recommended by Ruggles (1999, pp 164-171) and Prendergast (2015). The results were used to calculate the declination of points on the horizon to establish those associated with the values of  $-23.7^\circ$  and  $-23.2^\circ$ .

The survey found that the points close to the declinations of interest occurred in a treeless area just by the northern edge of Badbury hill, that ranges from azimuth of  $230.2^\circ$  to  $232.42^\circ$  (depicted in Fig. 7). The positions of sunsets within this area were interpolated in each case by calculating the proportion of declination range from each side of this area, and translating that into the proportion of the azimuth range from each side of the area. This assumes that these two measures are completely correlated, which may not be precisely correct, but, in the case of a smooth slope, is probably sufficiently accurate. The interpolated azimuth for the 2000 BC sunset was  $231^\circ$  and that for the AD 2000 sunset was  $232^\circ$ . These are depicted in Fig. 7. The predicted position of the Winter Solstice sunset in

2000 BC was very close to the northern edge of double hill, whilst that in AD 2000 should now be visible at just to the north of this, above a lower point between the Badbury hill and a small hillock to the north of it (NGR 396536,103667). The predicted position of the Winter Solstice sunset in AD 2000 can be confirmed or disconfirmed by direct observation during a solstice period when visibility allows. From these analyses an observer at the site of HLF9 in 2000 BC would have seen the sunset  $4^\circ$  north of HLF1 rather than above it.

These observations suggest that the line of barrows from HLF9 to HLF1 was aligned on a central point of the double hill about  $4^\circ$  south of point at the edge of the hill where the Winter Solstice sun set at the time when these barrows were constructed. The annual southward movement of the daily sunset stopped and then reversed when it reached the edge of the hill close to where barrows were aligned on it.

Might this directionality indicate the reverse, an alignment from HLF1 towards HLF9 and the 2000 BC Summer Solstice sunrise on a prominent spot, analogous to Badbury, in the North East? The projection of the lines from HLF1 towards and beyond HLF9 (azimuth approximately  $48^\circ$ ) and the other two terminal barrows (HLF8, azimuth approximately  $36^\circ$ ; HLF13 azimuth approximately  $64^\circ$  degrees) were examined. These three lines were compared with the point on the horizon where the first gleam of the Summer Solstice sunrise would have been visible from HLF1 in 2000 BC. The astronomical declination of that

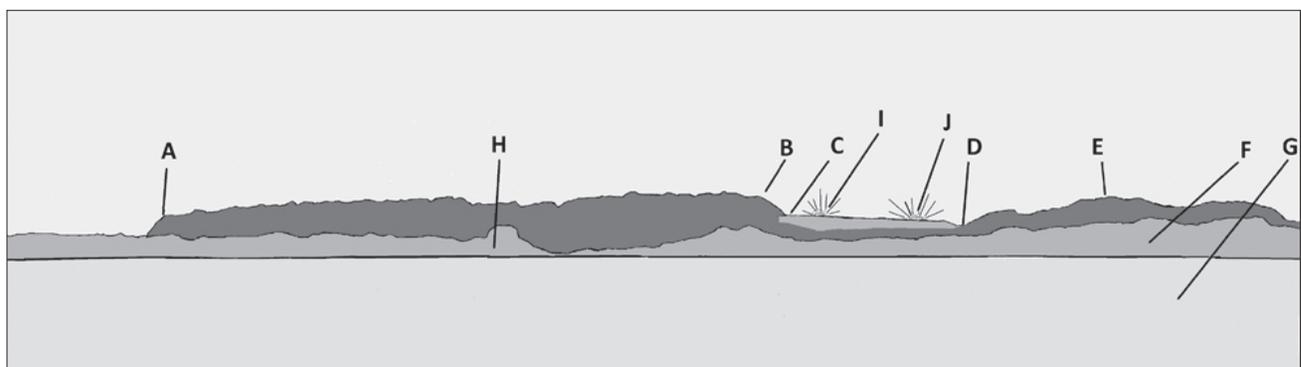


Figure 7: The results of the theodolite horizon survey performed along the southwest horizon visible from the centre of barrow HLF9. The positions marked, together with their azimuth and astronomical declination are: A top of southern point of the tree-covered double hill  $223.2^\circ$ ,  $-27.4^\circ$ ; B top of the northern point of the tree-covered double hill  $230.0^\circ$ ,  $-24.11^\circ$ ; C the edge of the base of the northern edge of the tree-covered double hill  $230.2^\circ$ ,  $-24.1^\circ$ ; D The northern edge of the tree-free open area sloping downward from point C  $232.4^\circ$ ,  $-23.0^\circ$ ; E The summit of the tree-covered hillock (at NGR 396536,103667)  $233.3^\circ$ ,  $-22.3.0^\circ$ . Feature F depicts the hedge at the western edge of Kings Field, enclosing the barrow cemetery, by the near horizon. Feature G depicts parts of Kings Field. Point H depicts the approximate centre of HLF1 at NGR azimuth  $226.9^\circ$ . Point I marks the location of the last gleam of the midwinter solstice sunset in 2000BC, as calculated from a theodolite horizon survey (azimuth  $230.4^\circ$ , declination  $-23.7^\circ$ ). Point J depicts the location of the last gleam of the midwinter solstice sunset in 2000AD, calculated from a theodolite horizon survey (azimuth  $231.5^\circ$ , declination  $-23.2^\circ$ )

point is 23.7 degrees (Ruggles 1999, p 57) which, using the *Horizon* model, would have corresponded with the point on the horizon with an azimuth of 50.8 degrees. This is not close to any prominent position (Figure 6), nor to any nearby sites which might *a priori* have been posited, such as the Neolithic complex of Knowlton, or Pentridge Hill, which has been observed to play a pivotal visual role for the Dorset cursus (Tilley 1994, chapter 5). This provides no support for the notion that the arrangement of barrows indicates an alignment from HLF1 to the Summer Solstice sunrise. The evidence provides much stronger support for an alignment on the Winter Solstice sunset.

### Discussion

These results support the notion that the spatial organisation of barrows 'pointed' towards the double hill, with HLF1 acting as a foresight to viewers at HLF9, fairly close to the southern pivotal point of the sun's annual movement, and in a locale rich in ritual monuments constructed at around the same time as High Lea cemetery. The evidence that the double hill was a place of major significance to Bronze Age people strongly supports the view that at the time some of them built the High Lea cemetery they orientated it towards this place that they probably regarded as sacred. On that basis, the time consuming, effortful, and intentional construction of the cemetery is unlikely to be random.

The modern landscape has changed since the Bronze Age and some of these changes are relevant to this study. The Iron Age development of Badbury Rings on the northern part of the double hill resulted in significant reshaping of the hillside closest to the edge where the prehistoric solstice sunset was seen from HLF9. This was probably most evident in the lower part where the banks and ditches were formed. The area of grassland visible to the north of the ramparts was close to an intersection of two Roman roads. The extensive remodelling and reuse of the area around the hill may have destroyed evidence of earlier use of the site. The Vachers' (1965) discovery, described above, that a Bronze Age ditch and bank south west of Badbury Rings was enlarged and extended twice during the Iron Age emphasises this possibility. Excavation of other major Dorset hill forts such as Maiden Castle (Sharples 1991),

and Hengistbury Head (Barton 1992, Cunliffe 1987) has revealed traces of use extending back to the Neolithic, and to the Mesolithic, and Palaeolithic in the case of Hengistbury Head. A Mesolithic tranchet axe was found at the hillfort closest to Badbury, Buzbury Rings (Palmer 1970, 173). This pattern of long term use and reuse of sites on which hillforts were built might also apply to Badbury. The double hill has not been extensively excavated, and the evidence available for activity prior to the Iron Age might underrepresent this. The clustering of a variety of finds, together with the barrows and ring ditches, implies that the double hill was a significant area for both ritual and settlement during the Bronze Age, with the possibility that it had been a significant place in the landscape before then.

The fact that there may have been significant reshaping of some aspects of the landscape emphasises the difference between this study and most archaeoastronomical studies in the British Isles, which, with notable exceptions, have been carried out in mountainous regions in Scotland and Ireland in which the details of the horizon have not changed significantly over millennia. One exception, near High Lea Farm, is the recognised midwinter solstice sunset alignment seen from the northern end of the southern component of the Dorset Cursus, at Bottle Brush Down (Green 2000, p 61). From this point the sun can be seen setting into a long barrow in the centre of the cursus on Gussage Cow Down, a location which Woodward's review of the prehistoric activity there suggested had been of sacred importance (2000, p 70). Archaeoastronomical studies carried out in upland areas of Britain lead to conclusions that Neolithic and Bronze Age people built structures in places from which specific types of views and astronomical events would be visible (Higginbottom and Clay 2016, Higginbottom, Smith, and Tonner 2015) and contained internal directionality linked to those events (Ruggles 2015b). These events usually involved predictable lunar and solar movements across the horizon, and structures pointed towards them with a fair but not precise degree of accuracy (e.g. Ruggles 1999 p.74). These conclusions are all relevant to the current study. In this case the solstice sunset was visible against a far horizon, and this limit to the movement over the year was marked by

the clear edge of a hill. The structure of the barrow cemetery had a large-scale pattern emphasising the south-westerly view from one extensive barrow to another, approximately reflected in the orientation of the burial pit in HLF9. The barrow HLF1 could be considered as functioning as a manmade foresight for observation from HLF9.

The vestiges of the severely damaged smaller barrows that were excavated could give no indication of alignment in any direction. It is possible that evidence confirming or disconfirming the hypothesis put forward here has survived in the form of the direction of a burial pit in the remains of HLF1. If such existed it might be readable by the means of non-destructive geophysical survey involving the most sensitive caesium gradiometry, which was utilised on HLF9. The evidence considered here supports the notion that an astronomical factor was involved in the organisation of the cemetery. The alignment was close rather than exact, which is not unusual in alignments from prehistoric Britain. Respecting the Winter Solstice sunset, albeit inexactly, is compatible with the notion of respecting the importance of the double hill, and doing both together may have enhanced the meaning of the cemetery.

Within archaeoastronomy Ruggles (1999, p156) has argued that one example of a credible orientation may be a chance occurrence, and therefore the case that it is an intentional alignment could be assessed more robustly by testing for its occurrence in many similar sites. Hence the strong argument for programmes of testing sets of similar monuments, such as has been carried out into recumbent stone circles (Ruggles 1984, Ruggles and Burl 1985). This is a strong argument, but not without limitations such as its inapplicability to unique sites, such as Stonehenge, and the fact that sets of similar sites in different landscape settings often gives a range of results. This lack of strict uniformity in direction has provided creative tension, leading to revisiting assumptions about how monuments were used. Examples of this include questioning about where the users of recumbent circles might have stood (Henty 2015), or whether monuments defined a view across which celestial events would move, rather than indicating a single alignment (Silva 2015). There has been little examination of astronomical

factors in the arrangement and location of British barrow cemeteries; indeed, influential reviews of barrows (e.g. Woodward 2000, Last 2007) do not include this topic. Studying barrow cemeteries, like that at High Lea, would provide a context for the current study, and might prove productive. The vestiges of High Lea cemetery were only uncovered through extensive fieldwork. If similar types of patterns existed elsewhere they might require a similar amount of effort to identify them, and therefore the failure at present to identify similar arrangements may not imply that the current case is unique. It may also reflect archaeologists' lack of knowledge of, or interest in, astronomical factors, which could be understandable in the light of lack of training in the appropriate techniques, as well as notorious controversies in archaeoastronomy, and its association with New Age enthusiasms.

Regarding this perspective as a possibly fruitful one, which could be easily applied, could result in greater insights into the rationale of prehistoric structures. A contemporary example comes from the development, by a team of leading research archaeologists, of a theory about the location of Stonehenge based on an astronomical alignment of parallel periglacial and other landform features (Allen et al 2016). Given the everyday familiarity of preindustrial societies with the celestial phenomena and their movements, the extensive evidence from all inhabited continents that people have built structures to indicate or use these phenomena (Ruggles 2015a, *passim*) is not surprising. With the current ready availability of practical tools, such as the *Horizon* programme, archaeologists might find that considering astronomical factors to be easier and more productive than it was in the past.

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## REFERENCES

- Allen, M.J., Chan, B., Cleal, R., French, C., Marshall, P., Pollard, J., Pullen, R., Richards, C., Ruggles, C., Robinson, D., Rylatt, J., Thomas, J., Welham, K. and Parker Pearson, M. 2016. 'Stonehenge's Avenue and "Bluestonehenge"', *Antiquity* **90**, 991–1008.
- Barton, R.N.E. 1992. *Hengistbury Head, Dorset. Volume 2: The Late Palaeolithic and Early Mesolithic Sites*, Oxford University Committee for Archaeology, Oxford.
- Bowen, H.C. 1990. *Archaeology of Bokerley Dyke*, HMSO, London.
- Conolly, J., and Lake, M. 2006. *Geographical Information Systems in archaeology*, Cambridge University Press, Cambridge.
- Cunliffe, B. 1987. *Hengistbury Head, Dorset. Vol.1, The prehistoric and Roman settlement, 3500BC-AD 500*, Oxford University Committee for Archaeology, Oxford.
- Gale, J., Cheetham, P., Laver, J., and Randall, C. 2004. 'Excavations at High Lea Farm, Hinton Martell, Dorset: an interim report on fieldwork undertaken during 2002-3', *Proceedings of the Dorset Natural History and Archaeological Society* **126**, 160–166.
- Gale, J., Hewitt, I. and Russell, M. 2008. 'Excavations at High Lea Farm, Hinton Martell, Dorset: A third interim report on fieldwork undertaken during 2006-7', *PDNHAS* **129**, 105–114.
- Gale, J., Laver, J. and Russell, M. 2007. 'Excavations at High Lea Farm, Hinton Martell, Dorset: an interim report on fieldwork undertaken during 2004-5', *PDNHAS* **128**, 100–106.
- Gingell, C.J., and Dawson, R.J. 1987. 'An Earthwork near Badbury Rings in Dorset', *PDNHAS* **109**, 65-78.
- Green, M. 2000 *A Landscape Revealed: 10,000 years on a chalkland farm*, Tempus, Stroud.
- Grinsell, L. V. 1959. *Dorset Barrows*, Dorset Natural History and Archaeological Society, Dorchester.
- . 1982. *Dorset Barrows: Supplement*, Dorset Natural History and Archaeological Society, Dorchester.
- Henty, L. 2015. 'An examination of the divide between archaeoastronomy and archaeology' in Silva, F., and Champion, N. (eds.) 2015. *Skyscapes: The Role and Importance of the Sky in Archaeology*. Oxbow Books, Oxford.
- Higginbottom, G., Smith, A.G.K., Tonner, P. 2015. 'A re-creation of visual engagement and the revelation of world views in Bronze Age Scotland', *Journal of Archaeological Method and Theory* **22**, 584-645.
- Higginbottom, G., and Clay, R. 2016. 'Origins of standing stone astronomy in Britain: New quantitative techniques for the study of archaeoastronomy', *Journal of Archaeological Science: Reports* **9**, 249–58.
- Historic England, 2016. *Pastscape - information on England's archaeology and architecture*. Historic England, London. Available from <https://pastscape.org.uk/> [Accessed 4 July 2016].
- Last, J. (ed.) 2007. *Beyond the grave: new perspectives on barrows*. Oxbow Books, Oxford.
- Oliver, V.L. 1936. 'Bronze Age rapiers and swords from Dorset', *PDNHAS* **58**, 26-29.
- Palmer, S. 1970. 'Some Mesolithic sites in North Dorset', *PDNHAS*, **91**, 173-74.
- Papworth, M. 1992. 'Excavation and survey of Bronze Age sites in the Badbury area', *PDNHAS* **114**, 48-76.
- . 1999 'Kingston Lacy, High Wood inhumation', *Proceedings of the Dorset Natural History and Archaeological Society* **121**, 155-58.
- . 2000. 'Evaluation excavation, Badbury Romano-Celtic temple. Interim report', *PDNHAS* **122**, 148-150.
- . 2011. *The Search for the Durotriges : Dorset and the West Country in the Late Iron Age*, The History Press, Stroud.
- Papworth, M., and Smith, D. 1988. 'A palstave from Shapwick', *PDNHAS* **109**, 123.
- Peters, F. 1999. 'Farmers and their ancestral tombs: A study of the inconspicuous barrows of central Dorset and their relationship with the secular landscape', *PDNHAS* **121**, 37-48.
- Prendergast, F. 2015. 'Techniques of field survey', in Ruggles, C. L. N. (ed.) 2015. *Handbook of Archaeoastronomy and Ethnoastronomy*, Springer, New York.
- Ruggles, C.L.N. 1984. 'A new study of the Aberdeenshire Recumbent Stone Circles, 1: Site data.' *Archaeoastronomy* **6**, S105-132.
- . C.L.N. 1999. *Astronomy in prehistoric Britain and Ireland*. Yale University Press, New Haven.
- . 2002. *GETDEC Version 4.00*. Downloaded from Clive Ruggles Homepage [online] Leicester, Leicester University. Available from: <http://www.cliveruggles.net/> [Accessed 10 January 2008].
- . (ed.) 2015a. *Handbook of Archaeoastronomy and Ethnoastronomy*, Springer, New York.
- . 2015b. 'Analysing orientations' In Ruggles, C. L. N. (ed.) 2015 *Handbook of Archaeoastronomy and Ethnoastronomy*, Springer, New York.
- Ruggles, C.L.N., and Burl, A. 1985. 'A new study of the Aberdeenshire Recumbent Stone Circles, 2: Interpretation.' *Archaeoastronomy* **8**, S25-60.
- Sharples, N. 1991. *Maiden Castle: Excavation and Field Survey 1985-86*, English Heritage, London.
- Silva, F. 2015. 'The view from within: a 'time-space-action' approach to megalithism in central Portugal' In Silva, F., and Champion, N. (eds.) 2015. *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxbow Books, Oxford.
- Smith, A. G. K. 2014. 'Horizon (Version 0.13)', Available from: <http://www.agksmith.net/horizon/>, [accessed 12 June 2015].
- Tilley, C. 1994. *A phenomenology of landscape: paths, places and monuments*. Berg, Oxford.
- Vacher, F.de M., and Vacher, H.L. 1965. 'Excavation of an earthwork near Badbury Rings, Dorset' *PDNHAS* **11**, 101-2.
- Woodward, A. 2000. *British barrows: A matter of life and death*. Stroud: Tempus.