THE MARRIAGE OF ASTRONOMY AND CULTURE: THEORY AND METHOD IN THE STUDY OF CULTURAL ASTRONOMY

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Abstract: Three recent independently developed models suggest that some Neolithic and Bronze Age monuments exhibit dual design properties in monument complexes by pairing obverse structures. Parker Pearson's¹ materiality model proposes that monuments of wood are paired with monuments of stone, these material metaphors respectively signifying places of rituals for the living with rituals for the dead. Higginbottom's² landscape model suggests that many western Scottish megalithic structures are paired in mirror-image landscape locations in which the horizon distance, direction and height of one site is the topographical reverse of the paired site – all in the service of ritually experiencing the liminal boundaries to the world. Sims'³ diacritical model suggests that materials, landscapes and lunar-solar alignments are *diacritically* combined to facilitate cyclical ritual processions between paired monuments through a simulated underworld. All three models combine in varying degrees archaeology and archaeoastronomy and our paper tests them through the case study of the late Neolithic/EBA Stonehenge Palisade in the Stonehenge monument complex.

The Stonehenge Palisade

The late Neolithic/Early Bronze Age (EBA) Stonehenge Palisade⁴ was a two kilometre fence of timber posts close to Stonehenge Avenue. Fig. 1 shows how the northern end of this fence came close to the Great Cursus, and then swung south-west in an elbow turn within two metres of the Avenue elbow, and in a diverging angle continued uphill alongside the final section of the Avenue to end nearly 500 m past the Stonehenge monu-

¹ M. Parker Pearson, *Stonehenge*, (London: Simon & Schuster, 2012).

² G. Higginbottom, 'The World Begins, the World Ends Here', at https://www.academia.edu/22473630 [accessed 3 Jan. 2017].

³ L. Sims, 'Entering, and returning from, the underworld: reconstituting Silbury Hill by combining a quantified landscape phenomenology with archaeoastronomy', *Journal of the Royal Anthropological Institute* 15, no. 2 (2009): pp. 386-408.

⁴ R.M.J. Cleal, K.E. Walker, and R. Montague, *Stonehenge in its Landscape* (London: English Heritage, 1995).

Lionel Sims and David Fisher, 'Through the Gloomy Vale: Underworld Alignments at Stonehenge', *The Marriage of Astronomy and Culture*, a special issue of *Culture and Cosmos*, Vol. 21, nos. 1 and 2, 2017, pp. 11–22. www.CultureAndCosmos.org



Fig. 1. The Stonehenge Palisade in its Landscape. Key: 1 Stonehenge Palisade; 2 Robin Hood's Ball; 3 Durrington Walls; 4 Woodhenge; 5 River Avon; 6 Stonehenge Avenue; 7 King Barrow Ridge; 8 Stonehenge Bottom; 9 Stonehenge; 10 Great Cursus; Yellow - Viewshed from Robin Hood's Ball; Grid lines are 1 km grid squares, the vertical grid lines indicate grid north which at the centre of the map is 0° 06' west of true north (Adapted from Cunliffe & Renfrew 1997: Plan 1).

ment. By utilising the details of the Vatcher's excavation of the old subway section of the Palisade ditch⁵ various multipliers have been applied to the reported average 4½ foot posthole depth. Estimates vary from a 6.1 to a 3.4 m high Palisade.⁶ Since this lower estimate poses a greater challenge to our landscape phenomenology and archaeoastronomy methods below, we will assume an average Stonehenge Palisade height of about 3.7 m. Air survey,

⁵ Cleal, *Stonehenge*, p. 155.

⁶ J. North, *Stonehenge: Neolithic Man and the Cosmos* (London: Harper Collins, 1996), pp. 353–56, 365–70.

site excavation and remote sensing⁷ have all revealed that the Palisade was discontinuous with one two metre gap next to the Great Cursus and a large gap beginning about 150 m before the Heel Stone when progressing up the Avenue towards Stonehenge and then for 250 m extending to the old subway terminal excavated by the Vatcher's⁸ before the Palisade recommences in the same line for a further 500 m.

Methodology

Three recent independently developed models suggest that some Neolithic/EBA monument complexes exhibit dual design properties by pairing obverse structures – the materiality,⁹ landscape¹⁰ and diacritical¹¹ models. In this paper we will use each model and the methodologies of site archaeology, landscape phenomenology and archaeoastronomy to interpret these presently known properties of the Stonehenge Palisade. To the extent that each model is inconsistent with the available evidence we will preserve those parts of it which survive such test. To the extent that each model, we will preserve those parts of the initial model which survive this test. To the extent that it is then possible to integrate those parts of the three models which have survived this procedure will be a measure of not just triangulation by three independent models,¹² but of emergence to a higher level of meaning than possible with any one single model.

The Materiality Model

Parker Pearson's materiality model proposes a binary separation between monuments of wood and monuments of stone, each of which provides a focus for a domain of the living separated from a domain for the dead. The evidence of a timber palisade alongside Stonehenge is anomalous to this model. Parker Pearson suggests that the Stonehenge Palisade was never alongside *Neolithic/EBA* Stonehenge, but was a mid-Bronze age field boundary fence. However contrary to his claim that no Neolithic

⁷ C. Gaffney and V. Gaffney, 'The Stonehenge Hidden Landscapes Project', *Archaeological Prospection* 19 (2012): pp. 147–55.

⁸ Cleal, *Stonehenge*, pp. 155–61.

⁹ Parker Pearson, *Stonehenge*.

¹⁰ Higginbottom, 'The World'.

¹¹ Sims, 'Entering'.

¹² Wylie, *Thinking from Things* (London: University of California Press, 2002), pp. 176, 192, 207.

archaeology is associated with the Palisade,¹³ previous excavation has found a Neolithic chalk plaque in the base of the ditch, and late Neolithic arrowheads, Grooved Ware pottery and cattle, sheep and red deer bones all suggesting a late Neolithic date.¹⁴ Parker Pearson's suggestion that worked flint found in the Palisade trench is mid-Bronze Age is undermined by his own admission that it is indistinguishable from Neolithic worked flint and that they were found in the surface or upper to mid-levels of the trench.¹⁵ The architecture of the Stonehenge Palisade strongly indicates a Neolithic/EBA feature, in which facades commonly shield certain viewpoints and prescribe others, such as also at the West Kennet Palisades in the Avebury monument complex.¹⁶

The findings of the Stonehenge Riverside Project have demonstrated that the complex timber circles at Durrington Walls are linked to Stonehenge by two avenues connected to the intervening River Avon. While linked they were not inter-visible yet their dimensions and layout mirror each other.¹⁷ Furthermore, their materials were not exclusively timber or stone as suggested by the materiality model. A stone 'Heel' stone stood in the Durrington Walls short Avenue approaching uphill to the southern timber circle from the River Avon.¹⁸ Similarly at Stonehenge the sarsen lintels were linked by wood-working joints when their inertial mass alone guaranteed stability and stone 16, hidden from its Heel Stone entrance behind the Grand Trilithon stone 56, had its surface rendered as oak bark.¹⁹ Furthermore, the large gap between stones 10 and 12 above the space left by the half-height and half-width stone 11 was probably spanned by a timber lintel (Fig. 2). '...Stonehenge was built to look as if it was made of wood'.²⁰ In short, each timber and stone monument cryptically

¹³ Parker Pearson, *Stonehenge*, p. 236.

¹⁴ Cleal, *Stonehenge*, pp. 437, 482, 448.

¹⁵ Parker Pearson, *Stonehenge*, p. 236.

¹⁶ Cleal, *Stonehenge*, p. 159.

¹⁷ J. Thomas, 'The Internal Features at Durrington Walls: Investigations in the Southern Circle and Western Enclosures 2005–6', in M. Larsson and M. Parker Pearson, eds., *From Stonehenge to the Baltic* (Oxford: BAR International Series 1692, 2007): pp.145–57.

¹⁸ Parker Pearson, Stonehenge, p. 96.

¹⁹ M. Pitts, *Hengeworld* (London: Arrow, 2001): pp. 268, 264.

²⁰ Parker Pearson, *Stonehenge*, p. 334.



Fig. 2 Stonehenge (Phase 3v: Cleal 1995, 167 OR Phase 4: Parker Pearson 2012, 311) in plan view with features identified in text. NB: North East entrance; outer ditch and inner bank; Stone 11 is half height and half width of other stones remaining In outer sarsen circle; Stone 16 is rendered as oak bark and hidden behind Stone 56 when viewing from Heel Stone; Stone 56 is the one remaining upstanding stone of the Grand Trilithon.

included in a minor register a reference to its 'opposite' materiality suggested by Parker Pearson's model. Similarly the timber Palisade is a mirror image of the last two sections of the Stonehenge Avenue in the domain of stone, in which the Palisade 'elbow' closely abuts the Avenue 'elbow' and the line of timbers diverge from this point at roughly equal

angles away from the angled lines of the Avenue (see Fig. 1). In sum, the monuments' designs, excavated archaeology and landscape positioning all suggest that timber and stone structures were contemporary and in dualistic mirroring dialogue with each other. Instead of a categorical distinction between these two building materials then whatever symbolic loadings were placed on each of them by the monument builders in combination they were probably utilised for some fused *diacritical* level of meaning. Parker Pearson suggests that Stonehenge has horizon alignments past the Heel Stone on the winter solstice sunsets and the summer solstice sunrises. the northern major moonrises amongst the north-east entrance 'A' holes, southern major full moon risings and northern major full moon settings from station stones 92 and 94, and summer solstice sunrise from 93 to 94 and 92 to 91.²¹ For Durrington Walls he proposes a summer solstice sunset alignment along its entrance avenue, a winter solstice sunrise from the southern circle's entrance, a winter solstice sunset from the southern circle's inner horseshoe and a winter solstice sunrise from the northern circle's inner four-post square setting (Fig. 3).²²



Fig. 3 Plan view of natural horizon alignments on sun's solstices and moon's standstills at Stonehenge 2500 BC (data from North 1996, appendix 3). Key: N = north, S = south. Bracketed numbers are degrees relative to the west-east axis. Horizon alignment on the upper limb of sun and moon. Natural horizon altitudes in degrees at Stonehenge: NE 0.6, SE 0.7 SW 0.6 NW 0.3

²¹ Parker Pearson, *Stonehenge*, pp. 47–49.

²² Parker Pearson, *Stonehenge*, pp. 79–82.

There are grounds for rejecting some of these claims.²³ For Stonehenge the 'A' holes were in use only in Phase 1, the summer solstice sunrise alignment over the Heel Stone lacks a backsight, while those from station stones 93 and 92 are too short a distance to provide a safe azimuth. For Durrington Walls winter solstice sunrise from the southern circle's entrance fails to take account of the horizon altitude whereas the summer solstice sunrise does.²⁴ Further, this portfolio of alignments does not fit the symbolic structure predicted by the materiality model. If Stonehenge is the focus for the domain of the dead we would not expect a summer solstice sunrise alignment for the start of the longest brightest day but a dark Moon during the week of the winter solstice sunsets at the start of the longest darkest night.²⁵ And if Durrington Walls is a structure that mirrors Stonehenge, we would also expect reversed but matching lunar alignments for Stonehenge.²⁶ Anthropology accepts that all rituals are characterised by a multi-media redundancy and amplification of symbols, and that structures that we find in one dimension of symbolism will be rehearsed and repeated in other associated dimensions.²⁷ Thus we would expect that the monument builder's diacritical symbolism invested in wood and stone will be repeated in horizon alignments that conflates dark Moon with solstice sunsets in a nine-ten year periodic alternation between minor and major standstills.²⁸ This expectation provides a test for our review of the next two models. We therefore retain from the materiality model that the monument complex unified contemporary Stonehenge mirroring monuments of wood and stone, each of which included cryptic elements of their 'opposite' materiality, while this diacritical combination is expected to be replicated in each monument's landscape location and horizon astronomy, and that in its approach to Stonehenge the Stonehenge Avenue had a substantial timber palisade running close to its last two sections.

²³ L. Sims, 'Stonehenge Decoded?', *Culture and Cosmos* 17, no. 2 (2013): pp. 138–42.

²⁴ North, *Stonehenge*, pp. 458–81 and 358–62.

²⁵ L. Sims, 'What is a Lunar Standstill III?', *Documenta Praehistorica* XLIII, (2016): pp. 467–78.

²⁶ North, *Stonehenge*, pp. 365–73.

²⁷ R. Rappaport, 'The Obvious Aspects of Ritual', in R. Rappaport, ed., *Ecology, Meaning and Religion* (Berkeley: North Atlantic Books, 1979): pp. 173–221.

²⁸ L. Sims, 'What is the minor standstill of the Moon?', *Journal of Skyscape Archaeology* 2, no. 1 (2013): pp. 67–76, 95–102.

The Landscape Model

Higginbottom's landscape model²⁹ shows that many megalithic sites in western Scotland, including single standing stones, stone rows and stone circles, have been intentionally located with a careful selection of the horizon even in cases, such as in Mull, where the landscape geomorphology goes against their preferences. Sites are paired such that each display reversed but closely similar horizons, one to the north and the other to the south. When indicated by megalithic structures, distinctive distant northern pronounced horizon features seem to have been chosen to mark the Sun's summer solstice limits and the Moon's major and minor northern standstill limits. The portfolio of features for each site includes combining close and far horizons in approximate cross-cardinal alignments, frequently resulting in each structure nestled into reversed semi-amphitheatre/half-bowl site settings, large bodies of water in the direction of the far horizon, prominent landscape features optimally edging these bodies of water, and together the hill/mountain features and water edges optimally bounding the horizon limits for solstice and major and minor lunar standstill risings and settings. Contrarily reversed megalithic sites with distant horizons to the south indicate pronounced horizon features which mark the winter solstice Sun's horizon limits and the Moon's major and minor southern standstill limits. This dual combined suite encapsulates and combines topography and horizon astronomy which emphasise views of the liminal boundaries between mountain and water. land and sky, celestial risings and settings and lunar-solar cycles. According to Higginbottom, by combining landscape oppositions with celestial transformations alternating between north and south, the monument builders forged a common cultural identity through an appreciation of the enveloping liminal forces that bounded their world. This model presently makes no connection with stone/wood dualism or to screens of any kind that might indicate some connection with Palisade-type structures. Nevertheless its insight into choosing locations which control inter-visibility between paired monument locations we will see is one property of the Stonehenge Palisade.

This landscape model is marked by a strong field survey, virtual modelling and statistical testing methodology which has substantially strengthened and extended earlier work conducted by Ruggles.³⁰ The

²⁹ Higginbottom, 'The World'.

³⁰ C.L.N. Ruggles, *Astronomy in Prehistoric Britain and Ireland* (London: Yale, 1999).

constructed elements of the complex, shared with the materiality model. are optimally located to combine central views of a body of water with paired obverse sites which are not inter-visible. However, the interpretation offered by Higginbottom for the data is problematical. Alignments for each site are shown to be grouped within single topographical horizon features so that the Sun and Moon emerge from one distinct mountain and enter another. But instead of interpreting this as a conflation of the Sun and the Moon in the same small horizon region, the alignments are considered separately. Rather than keeping to the field data finding that obverse sites are optimally separate and their alignments hidden from each other, it is claimed that alignments are paired across them. A southern standstill lunar alignment in one site is linked to the summer solstice in a companion site orientated to the north and vice-versa northern standstill alignments are linked to a companion site orientated to the south on the winter solstice. But Higginbottom's interpretation is weakened by the admission that there is no statistical support for the summer solstice alignments which are required to justify the choice of a full Moon for the high frequency alignments on the southern minor and southern major lunar standstills.³¹ Also, this argument undermines the central principle of the model which emphasises the selection of topographic settings mobilising opposite, alternating and inverse dimensions, not by amalgamating them across obverse sites. Instead, the preferred interpretation is in the service of a prior ad hoc commitment to synchronising solstice alignments with full Moons. This would be equivalent to pairing Stonehenge's axial alignment on winter solstice sunset with Durrington Walls' axial alignment on the northern major standstill moonsets and concluding that the combined monument complex is associated with a full Moon ritual. Rather than 'the monuments clearly highlight[ing] the cosmic order of opposites at the extremes', a separate justification is used for selecting just full Moons full Moon gives a 'spectacular visual display...unaffected by the position in the lunar standstill cycle'.³² Yet position in the lunar standstill cycle *is* marked by the horizon positions of both Sun and Moon rising and mainly setting into the same significant horizon features, and this provides an alternative and simpler interpretation of the data. The sidereal Moon for

³¹ Higginbottom, 'The World', p. 24.

³² G. Higginbottom, A. Smith and P. Tonner, 'A Re-creation of Visual Engagement and the Revelation of World Views in Bronze Age Scotland', *The Journal of Archaeological Method and Theory*', doi: 10.1007/S10816-013-9182-7, (2013): pp. 28–29.

about two years returns to these horizon positions every 27 or so days in a series of time lapsed reversed phases while the Sun only occupies the same position once a year for a week or so. During one of those weeks the Sun comes to meet the Moon and occupy that same horizon region. Then dark Moon will set with the winter solstice sunset to herald the beginning of the longest darkest night to the south and with the summer solstice to the north. Without the requirement for additional explanations, a dark Moon at each solstice automatically offers another 'spectacular visual display' for observing the greatest possible number of stars. The cognitive impact of 'spectacular displays' cannot discriminate between either of these options whereas the landscape model itself suggests the builders placed their monuments to conflate Moon and Sun when simultaneously present at their limits on a single pronounced horizon feature - dark Moon at a solstice. The full Moon interpretation is doubly undermined by Higginbottom's finding of many southern alignments on the major and minor Moon and the winter solstice Sun at these latitudes to be completely or partially obscured below the southern horizon.³³ Why would the monument builders, if they were investing so much thought into carefully selecting horizons, frequently choose exactly the horizon landscape that so dramatically blocks a 'spectacular visual display' of the full Moon? For a culture that believes in a stationary flat earth one interpretation stands out: if the Moon is below the horizon then it must be travelling through the underworld. Since such a cosmology would also understand that when the Moon has disappeared from the sky at dark Moon it must be travelling through the underworld, then the purposeful choosing of sites with interrupted horizon views of the southern standstill moons is consistent with lunar-solar alignments that conflates the Sun's solstice settings with the standstill dark Moon.

Once amending this landscape model by removing an *ad hoc* commitment to full Moon alignments at their standstills, then its finding of mirrored landscape settings is isomorphic with the critiqued materiality model's mirrored monuments in wood and stone. Just as stone and wood structures are each combined with a germ of the other in the materiality model, so each site's landscape horizon is the mimesis of the other. Looking at one site's horizon alignments presents the 'same' horizon shape as its reverse site, and therefore each present the promise of the other. Each horizon is diacritically related to the other. Just as materialities are diacritical in one model, so landscape placement and horizons are in the

³³ Higginbottom, 'The World', pp. 35, 36, 45, 50.

other model. The same diacritical principle applies to both models' 'astronomies'. The mirroring of the materiality model is not just that of reversed duplication, but includes that of mirrored fusion in which the hint or germ of one is included in its mirrored opposite. The landscape model also possesses this property in its horizon alignments of lunar-solar conflation between south and north horizons, each generating culminating solstice dark Moons during major and minor standstills. Rather than the complex and critiqued alignments suggested by Parker Pearson, the landscape model offers a simplified arrangement of alignments consistent with its central principle of alternating cycles and topographies. The critiqued landscape model finds a matching alternation between northern and southern horizons with the addition of an accompanying expanse of water over which can be observed the transit of Sun and Moon at the limits of their cycles culminating with a solstice dark Moon, not full Moon, or with the Moon and Sun transiting below the southern horizon. This combination of topographies and astronomy suggests that prominent horizon peaks reaching to the sky are chosen to contrast with expanses of water and lunar-solar transits below the horizon which reach to the underworld. This interpretation is more consistent with Higginbottom's data and deepens her central interpretive concept of paired obverse landscapes by extending the concept of landscape into the watery underworld. Instead of 'the world begins here, the world ends here'³⁴ the symbolic structure emerging from these two models suggests we need to consider rituals simulating a journey between worlds that include an underworld. This exercise in paring cognate models to the point that they can be integrated therefore suggests that other relevant models should be consistent with diacritical materialities, landscapes and astronomies that extend beyond this world.

The Diacritical Model

Sims' model shows that some Neolithic/EBA monuments are designed using asymmetrically paired categories in a dualistic and reversible monument complex. Just as we have seen that at Stonehenge the stone monument has a hint of wood and that the wooden Durrington Walls has a hint of stone, and in Western Scotland each monument horizon is paired with another monument's matching but reversed horizon, so horizon alignments are also combined asymmetrically with their reverse equivalent in paired monuments whose design categories overlap each other. They are

³⁴ Higginbottom, 'The World'.

organised in dualistic diacritical combinations. According to this model these 'astronomical' and material categories are organised in this compelling alternation in the service of a belief in a cosmos sensed in need of repair and management in forestalling stasis partly by conducting ritual journeys through a simulated underworld.³⁵ Significant common ground exists between this model and the materiality and the landscape models.

Approaching Stonehenge uphill along the Avenue when at the Heel Stone can be seen the winter solstice sunsets between the Grand Trilithon uprights into the Altar Stone, while directly above at an elevation of $4^{\circ}-5^{\circ}$ is an alignment beneath the Grand Trilithon lintel on the southern minor standstill moonsets.³⁶ Moving clockwise round the Stonehenge outer ditch from the Heel Stone to the southern entrance looking from the Station Stone 92 at 90° to the axial alignment a secondary ray touches the back of stone 16. the stone with a surface rendering of oak bark which is hidden from the Heel Stone behind Grand Trilithon stone 56, and continues on to Station Stone 93 to a horizon alignment on the northern major standstill moonsets (Figs. 2 and 3).³⁷ But the same alignment on the northern major standstill is also the axial alignment through the Durrington Walls southern timber circle where it is conflated with the Sun's summer, not winter, solstice settings.³⁸ In combination with this axial lunar-solar alignment at Durrington Walls there are again secondary orthogonal and cryptic alignments onto the winter solstice sunset to the south-west from the inner horseshoe of timber posts and by the subsidiary monument alongside of Woodhenge with its few megaliths in its southern quadrant.³⁹ In all four cases lunar-solar conflated alignments to the south-west are bracketed with stone and those to the north-west with wood. These paired and reversed diacritical alignment combinations do not just overlay an identical syntax of materialities, but also intersect with reversed horizons as predicted by the landscape model. The mainly wooden Durrington Walls has the same dimensions as Stonehenge and therefore presents the 'same' horizon shape as Stonehenge but now the alignments are rotated 90° to look to the northwest rather than the south-west, just as do many stone monuments in Western Scotland. At the Stonehenge monument complex the axis of the paired monuments of mainly stone and mainly wood conflate alignments

³⁵ Sims, 'Entering'.

³⁶ L. Sims, 'The Solarisation of the Moon: Manipulated Knowledge at Stonehenge', *Cambridge Archaeology Journal* 16, no. 2 (2006): pp. 191–207.

 $^{^{37}}$ The same arrangement can be found at Avebury – see in discussion below.

³⁸ North, *Stonehenge*, pp. 347–73.

³⁹ Pitts, *Hengeworld*, p. 264.

on lunar standstills and the Sun's solstices, while secondary orthogonal cryptic alignments are made on the obverse standstills and solstices. The materiality and landscape models' claims therefore withstand refutation when diacritically reformulated and combined with an archaeoastronomy model of lunar-solar conflation. All three models' separate insights, when parsed against the evidence, culminate in their combination. Stone and wood, south and north horizons, minor and major standstills are asymmetrically combined in reversed proportions across a dualistic monument complex.

The integrated model

We argue that each monument is in a relation of reversible dualism with its doppelganger but in a unity which while split is consistent within this dualism. Both lunar alignment minor and major combinations, while endlessly alternating around a nine-year cycle, are united in aligning on the sidereal Moon which in both cases display reversed time-lapsed lunar phases attenuated over the course of one year and both culminate with dark Moon at their respective solstice sunsets.⁴⁰ The cryptic orthogonal alignment within each monument is the germ of the next turning point in the endlessly alternating 9- or 10-year periods of the minor and major standstills⁴¹. And each dark Moon solstice sunset ritual is finalised by solstice sunrise in orthogonal alignments across both monuments and in the subsidiary monuments Woodhenge and the northern timber circle at Durrington Walls.⁴² As the Sun sets and disappears on the western horizon, in a stationary flat earth cosmology, it journeys eastwards past the buried dead through the underworld to be resurrected on the eastern horizon. Just before dark Moon however, the Moon can be seen rising on the east horizon as waning crescent Moon shortly before sunrise. During dark Moon it is then lost in the Sun's glare and after one to three days can then be seen resurrected and *setting* on the western horizon after the Sun sets. For about seven to nine days, until it is first quarter Moon, it cannot be seen rising on the eastern horizon because of the light of the already risen Sun. Therefore the Moon's resurrection takes place while dving on the western horizon. The Moon's symbolic repertoire is more suitable for a cosmology that requires contradiction and complexity rather than the onedimensional Sun. Constant alternation in rituals is built into the monument

⁴⁰ Sims, 'The Solarisation', p. 199.
⁴¹ Sims, 'What is a Lunar Standstill III?'.

⁴² Parker Pearson, *Stonehenge*, p. 89.

design as necessary, managed and controlled in this reversible dualism by the overlapping interplay of each monument's dominant and diacritical aspects. Each ritual can only be completed by moving on to the next. By requiring timed rituals, and so time itself, to keep moving it forestalls any sensed crisis in which time might stop.

The integrated model and the Avebury monument complex

If this model is robust then we would expect the Stonehenge Palisade to be consistent with its key components of diacritically combined stone and wood, north and south horizons, minor and major solarised standstills in the service of simulations of underworld ritual journeys. First we will summarise an earlier partial application of this model, and then move on to the Stonehenge Palisade. In a preliminary study of the Avebury monument



Fig. 4a The Avebury monument complex with features identified in the text. Key: 1 Fox Covert, 2 Beckhampton Avenue, 3 Folly Hill, 4 River Winterbourne, 5 Northern Inner Circle of the Avebury Henge and a double post circle stood approximately where the number 5 is positioned, 6 Southern Inner Circle of the Avebury Henge, 7 West Kennet Avenue, 8 Waden Hill, 9 North Kennet Springs, 10 West Kennet Palisades (see 4b), 11 Sanctuary, 12 Silbury Hill (Adapted from Crocker, 1821).



Fig. 4b. Detail of the West Kennet Palisades. Key: 1 Enclosure 1, 2 Enclosure 2 (Adapted from Whittle 1997, 55).

complex⁴³ the Avebury stone circle and henge and the West Kennet Palisades are shown to be separated and obscured from each other by the intervening Folly Hill and Waden Hill (Fig. 4a). Nevertheless they are linked to each other by the Beckhampton Avenue,⁴⁴ the West Kennet Avenue and the North Kennet springs.⁴⁵ The prescribed routes along these avenues have been carefully chosen by the monument builders to provide intermittent views not of these two monuments but a third - the centrally located Silbury Hill which the avenues skirt at a relatively constant distance. These inter-visibility locations are from the centre of the southern inner circle of Avebury circle, the central structure of Enclosure 2 of the

⁴³ Sims, 'Entering'.

⁴⁴ L. Sims, 'The Logic of Empirical Proof', *Time and Mind* 2, no. 3 (2009): pp. 333–45.

⁴⁵ S. Marshall, *Exploring Avebury* (Stroud: The History Press, 2016), pp. 134–37.

West Kennet Palisades (Fig. 4b), from the Fox Covert start of the Beckhampton Avenue and the Sanctuary end of the West Kennet Avenue. The Avebury Circle combines axial alignments on winter solstice sunset with the southern major standstill moonsets, with an orthogonal alignment on summer solstice sunsets that also intersects diacritically with the timber henge alongside the northern inner circle.⁴⁶ The West Kennet Palisades axial alignment is on the northern minor moonsets and the summer solstice sunsets, both seen setting into Silbury Hill. Between the two large monuments of mainly stone and mainly wood, the smaller stone and wood Sanctuary aligns on the southern minor standstill rises and sets, and provides the diacritical alternation by materials and alignments.47 Integrated into this complex are a digital series of views of Silbury Hill which act as facsimiles of the crescent Moon before, during and after dark Moon.⁴⁸ With its flat summit in-line with the background horizon at its point along the Beckhampton Avenue when it crosses the River Winterbourne and from the Sanctuary, it simulates a Moon that has set and is in the underworld. There is just one place from which an underworld Moon can be observed and that, of course, is the underworld itself. Ritual participants by their own agency when viewing this are led to believe that they must be with the Moon in the underworld. Avenues and monuments serve to simulate a journey through the underworld. This is reinforced within the centre of the southern inner circle to see the cropped chalk top of Silbury Hill as the waxing crescent Moon setting on the south-southwestern horizon at 80° south of west, thirty degrees beyond what it ever does in this world and therefore an underworld alignment, journeying through the underworld to its resurrection on the western horizon.⁴⁹ For those who participated in rituals along these Avenues seeing the Moon in the underworld and within these monuments they therefore simulated a journey through the underworld according to the rhythms of the lunar-solar cvcle.

The integrated model and the Stonehenge Palisade

We have found that diacritically combined materials and alignments predicted by the integrated model are present at both the Stonehenge and

⁴⁶ North, Stonehenge, pp. 271–76.

⁴⁷ L. Sims, 'Toads Turning Time: Verifying Visualisations of the Sanctuary (Avebury, Wiltshire)', (submitted). ⁴⁸ Sims, 'Entering', p. 401, Fig. 6.

⁴⁹ See below.

Avebury monument complexes. However the Avebury evidence for these operating in the service of rituals simulating underworld journeys is reliant on the monument of Silbury Hill, and no such monument exists within the Stonehenge monument complex. The diacritical model predicts that some other arrangement of landscape, structures and their associated 'astronomy' should be present there in the service of the same cosmology.

The materiality model suggests that ritual processions begin at Durrington Walls, descend along a short avenue to the River Avon, then leave the Avon to process along the Stonehenge Avenue in a circuitous route to Stonehenge (see Fig. 1). In this journey from Durrington Walls processionists carry with them its association with wood and main alignment on summer solstice sunsets and the northern major moonsets. The Avenue route leaves the River Avon out of sight of and away from Stonehenge rising up to King Barrow ridge. In the gap between the Old and New King Barrows '...the [Avenue]...seems to have been located at the very point where Robin Hood's Ball comes into view'.⁵⁰ This causewayed enclosure was first built in 3600 BCE and was in use until about 1,600 BCE.⁵¹ Built on the side of a south-east facing hill on the far north-west horizon each of the two encircling ditches provided the material placed uphill for two chalk banks. Seen from below along the Avenue these two chalk walls merge to present the appearance of a single long shallow mound of chalk sitting on the north-west horizon. The angle of view of Robin Hood's Ball from the King Barrow Ridge is about 47° north of west. Continuing westwards along the Avenue to Stonehenge is a descent into Stonehenge Bottom. Just above the 85 metre contour and before entering the flat and boggy⁵² Bottom the eye-height of an adult Neolithic Man⁵³ lines up with the top of the Stonehenge Palisade and the cropped top of the north-west horizon revealing just the chalk crescent of Robin Hood's Ball at about 50° north of west – the alignment previously seen at Durrington Walls southern circle on the northern major standstill moonsets (Fig. 5a). Over the course of one year abstracting lunar observations to just this time-lapsed horizon limit therefore selects thirteen

⁵⁰ S. Exon, V. Gaffney, A. Woodward, and R. Yorston, *Stonehenge Landscapes* (Oxford: Archeopress, 2000), p. 75.

⁵¹ A. F. Whittle and A. Bayliss, *Gathering Time*, (Oxford: Oxbow, 2011), pp. 197, 706, 900.

⁵² Exon, *Stonehenge*, pp. 40, 52.

⁵³ D. R. Brothwell and M. L. Blake, 'The Human Remains from Fussel's Lodge Long Barrow: Their Morphology, Discontinuous Traits and Pathology', *Archaelogia* 100 (1966): pp. 48–63.

reverse phased lunations covering the whole lunar cycle and culminating with dark Moon at summer solstice – a lunar-solar and reversed binary 'astronomy' entering into Robin Hood's Ball. Embedded in the late Neolithic/EBA Stonehenge monument complex Robin Hood's Ball is constructed as a facsimile of the sidereal Moon's upper limb at its northern horizon extreme.



Fig. 5a (left) Virtual model of the view when walking down the Avenue just before dropping below the 85 metre contour, showing the northern major standstill moon setting into Robin Hood's Ball on the north west horizon. **Fig. 5b (right)** Virtual model of the view of Robin Hood's Ball from Aubrey Hole 20 by south entrance to Stonehenge. (Dashed central vertical construction line indicates horizon position of Robin Hood's Ball.)

Continuing along the Avenue and into the Stonehenge Bottom not just the archaeoastronomy but landscape phenomenology brackets the sudden loss of sight of Robin Hood's Ball below the level of the Palisade with the high encircling horizons, and '[t]he walker experiences a negative and outof-worldly state'⁵⁴ through a waterlogged landscape.⁵⁵ Arriving at the Avenue 'elbow' this 'out-of-worldly' sense is reinforced by coming within two metres from the high Palisade. Rising out of the Bottom the Avenue takes a sharp turn and proceeds uphill at 40° south of west⁵⁶ and an altitude of 1° giving an un-obscured ground level view at the centre of Stonehenge to winter solstice sunset. Directly above an upper window raised 4–5° by the Stonehenge lintels captures the southern minor standstill moonsets. The

⁵⁴ Exon, Stonehenge, p. 75.

⁵⁵ Exon, Stonehenge, pp. 40, 42; Parker Pearson, Stonehenge, p. 140.

⁵⁶ R.J.C. Atkinson, 'Some new measurements on Stonehenge', *Nature* 275 (1978): pp. 50–52.

Palisade diverges from this last section of the Avenue at 26°, and rising uphill out of Stonehenge Bottom and away from the lowering Palisade emphasises the sense of coming up out of an underworld. Continuing on to the beginning of the 250 m gap in the Palisade about 150 m from the entrance to Stonehenge allows another view of Robin Hood's Ball, although now at 60° north of west (Fig. 5b).⁵⁷ Once entering Stonehenge moving to the southern entrance the ditch terminals are marked by a human cremation, wood ash and an cattle skull to the left and a grooved ware sherd and cattle mandible to the right and between them both an unobscured line of sight along the edge and at 90° to the line of the Palisade to Robin Hood's Ball at 63° north of west. From this vantage can now be seen the half-height stone 11 probably with its timber lintel, the otherwise hidden stone 16 whose surface is rendered as oak bark, and next to the edge of the western section of the Palisade post-pipe an Iron-Age adult male burial looks north-west also at 90° to the line of the Palisade. These sixteen signifiers suggest that this was a likely prescribed view.

Coming out of the encircling horizons and Palisade from Stonehenge Bottom and then walking up the final section of the Avenue towards Stonehenge during the week of winter solstice, the southern minor standstill of the Moon will be dark Moon. The Moon was last seen as waning crescent Moon rising on the *eastern* horizon just before sunrise to then emerge after dark Moon as waxing crescent Moon on the western horizon. In a stationary flat-earth cosmology the Moon will be perceived as having travelled west through the underworld. Durrington Walls alignment on the northern major standstill of the Moon is repeated by the choice of Avenue route in its sight of Robin Hood's Ball on the same alignment when entering Stonehenge Bottom. Now seeing Robin Hood's Ball again, but at 63° north of west, leaves just one possible interpretation – this is an underworld alignment. Seeing the Moon in its underworld transit therefore reverberates back on the experience of walking westwards through Stonehenge Bottom as a simulation of walking through the underworld in the company of the Moon's westwards underworld transit.

Conclusion

We have seen that the monument builder's careful choice of landscape, monument design and alignments at Stonehenge and Avebury are diacritically organised into asymmetric paired categories in dual monument

⁵⁷ The yellow shading in Fig. 1 also shows this intermittent visibility of Robin Hood's Ball along the Avenue route.

complexes. Three independently developed dualistic models, once parsed against the evidence, all converge to the same emergent reconstruction suggesting that they are embedded in a cosmology driven to keep time turning by organising dual ceremonies simulating a journey through the underworld according to the alternating rhythms of solarised lunar standstills between major and minor standstills. The locally available landscape at Avebury allowed the building of two avenues' prescribed routes and Silbury Hill to symbolically represent a Moon that enters, travels through and emerges from the underworld. At Stonehenge the Avenue and the discontinuous Palisade served a similar function to construct prescribed views of Robin Hood's Ball as a facsimile of the Moon entering and returning through 'the dark and gloomy vale'⁵⁸ of the underworld.

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⁵⁸ Psalms 23:4, Lutheran translation, (1984).

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