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Author(s): Sims, Lionel

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Lighting up dark Moon: ethnographic templates for testing paired alignments on the Sun and the Moon

Lionel Sims (University of East London)

Abstract

Recent research in archaeology interprets North West European late Neolithic and early Bronze Age monuments as addressing an earlier and resilient ritual code of ancestral hunter-gatherers. Recent palaeo-anthropology suggests that these hunter-gatherers possessed a unitary cosmology. The sex-strike model predicts this cosmology was tied to the rhythms of the moon, with particular symbolic potency attached to dark moon. This paper suggests that solilunar alignments at later Neolithic and Early Bronze Age monument are best interpreted attempted to preserve and estrange ancient lunar rituals within an emerging solar cosmology. Stonehenge 3ii-v, as one spectacular example of a whole class of monuments with similar main alignments, doubles winter sunset with southern minor standstill moonsets which synchronises the longest night with dark moon. This finding fatally weakens other interpretations that prioritise summer, risings and full moon.

The new archaeology and anthropology of prehistory

In the last three decades paradigm shifts in both archaeology and anthropology have transformed our understanding of prehistory. The earlier view of the archaeology of the North West European Neolithic assumed that a civilising wave of monument-building farmers swept aside 'primitive' hunters (Renfrew 2001, Runciman 2001). It is now thought that sedentary intensive farming was late and local in NW Europe, starting in the middle Bronze Age, and coincided not with the beginning but with the ending of monument building. The new view is that late Neolithic and early Bronze Age monuments were built by cattle herders who continued to hunt and who sometimes planted, and who migrated along the hunting trails of their Mesolithic ancestors. Rather than as part of civilising mission to break with the past, the monument builder's intention was to bend their waning connection with an ancient hunting cosmology to the new circumstances of the Neolithic (Thomas 1999, Whittle 1996). Similarly, a reversal has taken place in the anthropology of cultural origins. The earlier view assumed that the slow accumulation of modern human physical traits had developed in tandem with a growing repertoire of cultural victories simultaneously across Africa, Asia and Europe over the course of millions of years. The present view is that modern humans established culture in sub-Saharan Africa as late as 120 thousand years ago, and when first successfully leaving Africa 70 thousand years ago eventually displaced all other archaic humans (D'Errico 2001, Stringer 1996). These paradigm shifts are of great significance to archaeoastronomy. The new understanding of Neolithic culture points to a continuation through metamorphosis of a more ancient hunting cosmology. The new understanding provides an opportunity to test archaeoastronomical data against the expectations of what happened when these hunting cultures collapsed to be replaced by 'socially complex' Neolithic cultures.

The recent return to evolutionary theory within anthropology has assessed the evolutionary costs and benefits of various types of middle-late Pleistocene human coalitions (Dunbar 1999). When climatic changes undermined the viability of female self-provisioning, Darwinian selection pressures would have favoured the stabilisation of strategies to undermine dominant individuals' competitive behaviours (Boehm 2001). It has been found that matrilineal coalitions in particular would have accrued substantial evolutionary benefits by phase-locking their economic and ritual routines to the rhythms of the moon (Knight 1991, Knight 1995, Power 1999, Power 1997). More specifically, this 'sex strike' model predicts that the time of maximum ritual potency and sacred observance would have been at dark Moon (Knight 1991, Watts 2005). When the moon had left the night sky would be the time for women-as-wives to withdraw from temporary marriage and seclude themselves. This would signal to men-as-husbands to prepare and deliver collective hunting services. These women could have called upon their brothers, if necessary, to assist them in this seclusion strategy. Significant provisioning advantages would be gained by such late-Pleistocene mothers of highly dependent offspring over those females following more competitive strategies.

As a cosmology this model predicts that ‘time’ in Palaeolithic hunting cultures was governed by a bi-polar logic of dark/full moon alternation. While dark moon was the signal for the imposition of strict and rigid sacred taboos that affected all of life, full moon was the signal for the relaxation of taboos, and return to a profane life. At the end of a successful monthly collective hunt and surrender of meat around the time of full moon, women would no longer need to seclude themselves. In sum, sex-strike theory predicts that the period of waxing moon was constructed as a sacred period of strict seclusion and taboos against ‘marital’ sex, while waning moon was a profane period of temporary ‘marriage’ and cooked meat. These predictions fit well with suggestions that earliest astronomical motifs were part of a deep bi-polar cultural syntax (Levi-Strauss 1969), were lunar not solar (Frolov 1977-79, Marshak 1972), and emphasised dark moon not full moon (Marshak 1972).

By about ten thousand years ago, at the end of the Palaeolithic, mega-faunal extinctions in Europe would have undermined the optimum material preconditions for a lunar-scheduled forager coalition. Following a lunar-governed time schedule for hunting and ritual would have become maladaptive. Nevertheless, the great time depth to such routines and respect previously afforded to women’s collective seclusion would have prompted concerns that group solidarity and ritual itself might be undermined. Theory would then predict a protracted and contradictory accommodation to local conditions combined with attempts to respect the form of ancient rules. More specifically, we would predict that if we find monument double alignments on the sun and the moon, this could be interpreted as a complex syntax in which a more ancient lunar cosmology is becoming displaced and appropriated to an emerging solar cosmology. Sex-strike theory therefore predicts a period of disengagement to control, modify and transcend a Palaeolithic cosmology throughout the Mesolithic and into the Neolithic. Evidence from the ‘ethnographic present’ suggests that the agents controlling this disengagement would have been high status men attempting to usurp and monopolise ritual power from matrilineal coalitions (Knight 1991).

These paradigm shifts point to a single conclusion – that culture was a recent achievement of Palaeolithic hunter gatherers, it still echoes in the ethnographic present, and it focussed the concerns of the monument builders of the Neolithic and early Bronze Age. This allows us to investigate North West European monuments by theory-testing from the hypothesised properties of this ancient big-game hunting cosmology. For paired alignments of the moon and the sun we would expect to find them arranged to preserve and confiscate lunar properties into solar symbolism, with especial emphasis on dark moon symbolism inserted into an estranging solar cosmology.

Archaeoastronomy of stone monuments

Over the last three decades archaeoastronomy has confirmed a tendency amongst the stone monuments of the late Neolithic and early Bronze Age in the British Isles for an orientation towards the south-west which pair alignments on the setting winter solstice sun *and* the moon at its southern standstill moonset limits. In at least five regional groups of monuments of the late Neolithic and early Bronze Age, in all accounting for 323 monuments, their main alignments focus on winter solstice sunset and the southern major or minor moonsets. These are: 64 Scottish recumbent stone circles (Ruggles 1999a), 28 Clava cairns (Burl 1981), 189 West Scotland stone rows and 48 SW Ireland stone rows (Ruggles 1999b), Avebury stone circle and Stonehenge’s Phase 1, Phase 2 and Phase 3 (North 1996). This strengthens other researchers who have called attention to the especial emphasis on solar orientations in the winter half of the year - ‘[t]he evidence for prehistoric interest in obvious astronomical events such as midwinter sunrise and sunset is almost universally accepted.’ (Ashmore 1999, pg. 28)(See also (Barnatt 1978, Burl 1976, Burl 1979, Burl 1988, Burl 1999, Sims Forthcoming)). While this paper will concentrate on interpreting the astronomical symbolism of Stonehenge 3ii-v (Cleal 1995), its astronomy was the ‘same’ as 322 other monuments, including Stonehenge’s own two or three earlier incarnations.

The main alignment at Stonehenge

Claims for a summer solstice sunrise alignment at Stonehenge should be discounted. No back sight has ever been located at the centre of the monument to fix an alignment with the Heel Stone; an upright Slaughter stone would

have obscured sight of the Heel Stone from the centre; no clear horizon can be seen to the north east; and the summer sun does not rise over the Heel Stone, but three solar diameters to its left. There are strong reasons to accept that the main alignment is to the south west rather than the north east: the north east entrance through the encircling ditch and the Avenue were the main route into the monument for all phases of its construction, and both look to the south west; the ‘dishing’ of stone 1 keeps the winter solstice alignment open when viewing from the left hand side of the Heel Stone; the nearest trilithons are aligned to focus on the Heel Stone; the Altar Stone provides a durable and raised horizon into which the winter sun will appear to set into the apparent centre of the monument when viewing from the Heel Stone.

When we imagine a reconstructed sarsen Stonehenge from the Heel Stone in elevation view, rather than plan view, the paradox is created of observing an almost solid-seeming wall of stone (see Figs. 170-176 in North 1996). This ‘obscuration’ effect does not work in the reverse direction, towards the north-east and summer solstice sunrise. From about 11 metres before the Heel Stone, approaching the monument uphill along the Avenue, and right up to the ‘entrance’ between stones 1 and 30, just two gaps could have been seen along the main axis. The lower gap was aligned on winter solstice sunset. Anyone processing slowly along this axis from the right hand side of the Heel Stone would have experienced the effect of the sinking winter sun being held still, the upward movement of the walker’s eye exactly cancelling out the sinking movement of the setting sun. When standing on the left hand side of the Heel Stone, the upper gap is aligned on the southern minor standstill moonsets (see Fig. 170 in North 1996). Both these alignments can be seen by an adult male observer of average height for the late Neolithic and early Bronze Age, and the Heel Stone ditch allows a variety of standing positions to allow for observers of variable height.

These properties of sarsen Stonehenge are internal to the monument, and a product of the design principles of duplicated circles and arcs of lintelled stone pillars in concentric, nested and tiered ranks. This design creates the paradoxical property of what in plan view is a monument full of gaps, but which in elevation view appears to be an almost solid wall of stone. The height of the grand trilithon created a protruding upper window proud of the encircling lintels of the outer circle. This allowed the double function for the grand trilithon of a lower alignment on the setting winter solstice sun and an upper alignment on the southern minor standstill moonsets. It is not appropriate to prefer an inaccurate summer solstice sunrise alignment to the north east which does not utilise these defining features over two accurate alignments to the south west which do. For these main reasons Stonehenge 3ii-v, in keeping with the main alignments found at other stone monuments in the British Isles, is aligned on winter solstice sunset not summer solstice sunrise.

Previous interpretations of the Stonehenge main alignment

The winter solstice sunset, seen in the lower window at Stonehenge, takes place over the course of about a week once a year. The upper alignment on the southern minor standstill moonsets, however, takes place once every nineteen years over the course of a year. Within archaeoastronomy, four interpretations have been suggested for alignments on lunar standstills: extreme horizon risings/settings of the major standstill (Morrison 1980); point estimate of the geocentric extreme declination of the moon’s trend movement in the nodal cycle (Thom 1971); reversed horizon movements of the moon’s southern minor standstill (North 1996); and luminosity of standstill full moon (North 1996, Ruggles 1999a). Challenges can be made to all four of these interpretations.

Morrison (1980) suggested that monument builders preferred alignments on the major standstill, since these were extreme parts of the horizon never reached by the sun and only reached by the moon once every nineteen years. The minor standstill, in contrast, took place on a part of the horizon within the sun’s extremes, and the moon could set in this region at any part of its nineteen year cycle. However, Ruggles (1999) has shown that monuments with southern standstill lunar alignments are as likely to choose the minor standstill as the major standstill, and North (1996) has shown that Stonehenge 3ii-vi had its main alignment on the southern minor standstill moonsets.

Archaeoastronomical field work over the last 25 years does not therefore support Morrison's hypothesis that monument builders had little interest in the minor standstill of the moon.

Thom (1971) suggested that soli-lunar alignments of the early Bronze Age were evidence for eclipse prediction abilities, and that such double alignments were a component of astronomical measuring devices to calculate the 18.61 year nodal cycle which governs eclipses. However, since a horizon alignment does not directly or accurately measure the moment of the geocentric extreme necessary to make such a calculation, Thom suggested that further extrapolation devices accompanied the monuments to interpolate the true value. Again, in extensive field work re-examination of many of the monuments studied by Thom, Ruggles (1999) has found no evidence for such extrapolation devices, or for levels of accuracy up to 1' of arc claimed by Thom. Instead of any evidence of designs confirming eclipse prediction, Ruggles found a large number of monuments aligned on southern lunar standstill moonsets in particular, made to a range of accuracy between 6' and 1°.

North (1996) suggested that the 13 or so lunistics of the southern minor standstill moonsets could be observed alternating in the upper grand trilithon window (see also Morrison 1980). He assumed that these sinusoidal movements of the geocentric extreme declinations of the standstill moon were replicated at the horizon. If true this would present, in contrast to the sun's horizon movements, a reversed horizon swing before the moon continued its southward migration after its minor standstill period. North thought the builders might have considered this property 'magical'. Two main objections can be made. First, this suggestion cannot explain why other monuments, including Stonehenge 1 & 2, selected the southern major standstill, which has an extended horizon reversal. Second, these sinusoidal movements occur during the moon's mid-transit, and cannot be observed on the horizon.

Finally, is the suggestion that the builders were selecting for an alignment on the full moon (Burl 1981, North 1996, Ruggles 1999a). Four main objections can be made. First, most of the stone monuments which have been found to have soli-lunar alignments focus on winter solstice. Yet during winter the full moon is on the northern horizon, and most stone monuments' lunar alignments are on the southern standstill not the northern. Second, if the builders required the luminosity of the full moon we would expect the lunar alignment to be on the rising moon, not on the setting moon as most are. Third, North (1996, 471-3) calculates that seen from the Heel Stone the height of the grand trilithon upper window subtended an angle of about 8' arc. Since the diameter of the moon is about 30' of arc, then the upper window was never designed to frame the full moon. Fourth, a standstill lasts for about a year with 13 lunistics, and all of these return to the 'same' horizon alignment. Since it has already been established that the levels of accuracy of such alignments do not meet the high fidelity claimed by Thom, and since distinguishing full moon from all the other lunistics of a standstill would require such levels of accuracy, it remains to be demonstrated what criteria are being mobilised to pick full moon.

We have not found any compelling argument to accept that the builders of these ancient monuments were interested in summer sunrise, extreme horizon alignments, eclipse prediction, reversed horizon swing, or full moon. Nevertheless nearly three decades of painstaking field work has shown that many of the monuments were indeed aligned on lunar standstills. The conclusion can only be drawn that the builders must have been selecting for some other *horizon* properties of lunar standstills. These properties should be sought.

Remaining properties of a horizon alignment on a lunar standstill

Common to all four of the previous interpretations is that they consider lunar alignments as separate from solar alignments. But a double alignment allows us to investigate the emergent properties of their association. For 'one' direction to function for two alignments suggests the builders were motivated to achieve a conflation between the two. The monument's binary design itself suggests this, with the sarsen circle of thirty stone pillars repeated by an inner bluestone circle of 59 or 60 stones, and the trilithon horseshoe repeated by the nineteen bluestones arranged in a nested horseshoe. If the lunar alignments were instead meant to complement, rather than conflate, a solar

alignment, then there would have been no reason to seek a single double alignment with the challenging architecture of serried ranks of tiered and lintelled sarsen pillars.

If we reduce the alignment properties of sarsen Stonehenge to the main axis windows of the grand trilithon, this allows us to compare the double alignment of winter solstice sunset and the southern minor standstill moonsets with the seven other theoretically possible double alignments of lunar standstills with the sun's solstices (Fig. 1). It will be seen that the builders of sarsen Stonehenge selected that combination, W2, which allowed a superior moon setting above winter sunset. However the same architecture could have equally well have chosen any one of the seven other possible combinations (W1, W3-W4, E1-E4). By comparing their choice of W2 with these other possibilities we will isolate the priorities they sought for this main alignment at Stonehenge.

The combination W2 allows the moon to be placed above the sun. But three other combinations also allow this property – W4, E1 and E3. By rejecting these three the builders rejected pairing the moon with summer solstice sunset, summer solstice sunrise and winter solstice sunrise. Therefore the builders did not want, for their main alignment at Stonehenge, any association with summer or risings or both. The remaining four other combinations would have had the sun above the moon. But one of these, W1, would have paired winter solstice sunset with the setting moon at the extreme of its range. Yet this unique property of the moon is clearly secondary to the builders, since they chose the southern minor standstill which places it above the sun. Therefore the builders were not seeking a winter *calendrical* pairing between the moon and the sun, but a *ritual* pairing with the moonsets dominant over the winter sunset.

Figure 1 Schematic representation of the eight possible horizon pairings of the sun's solstices and the moon's standstills

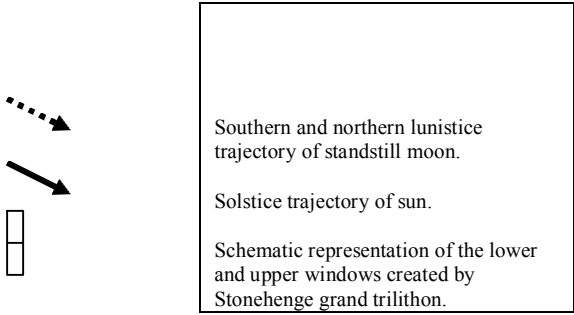
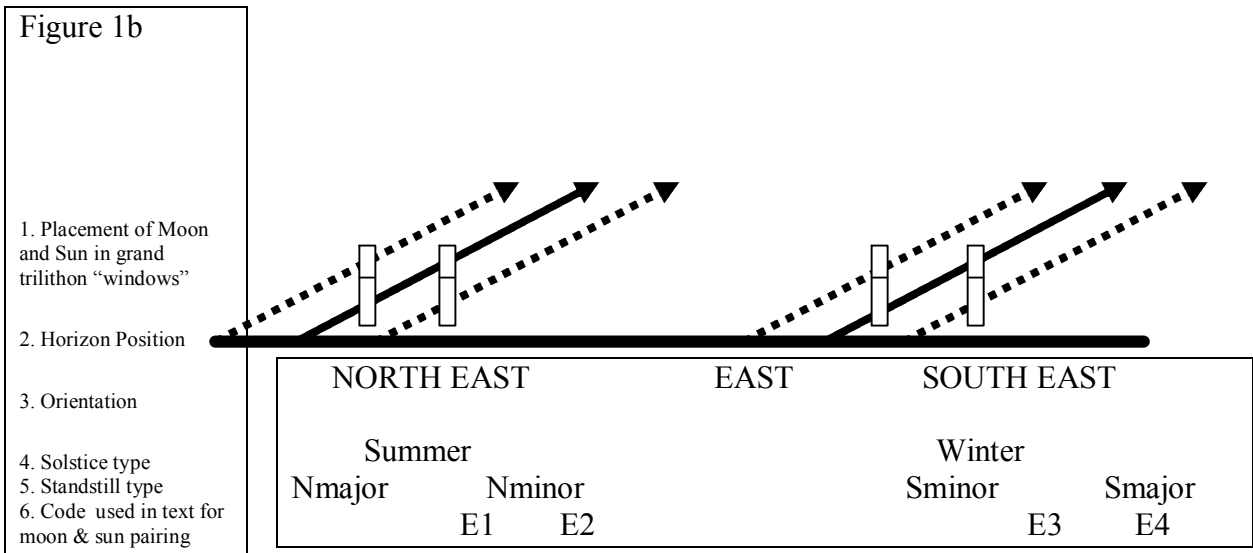
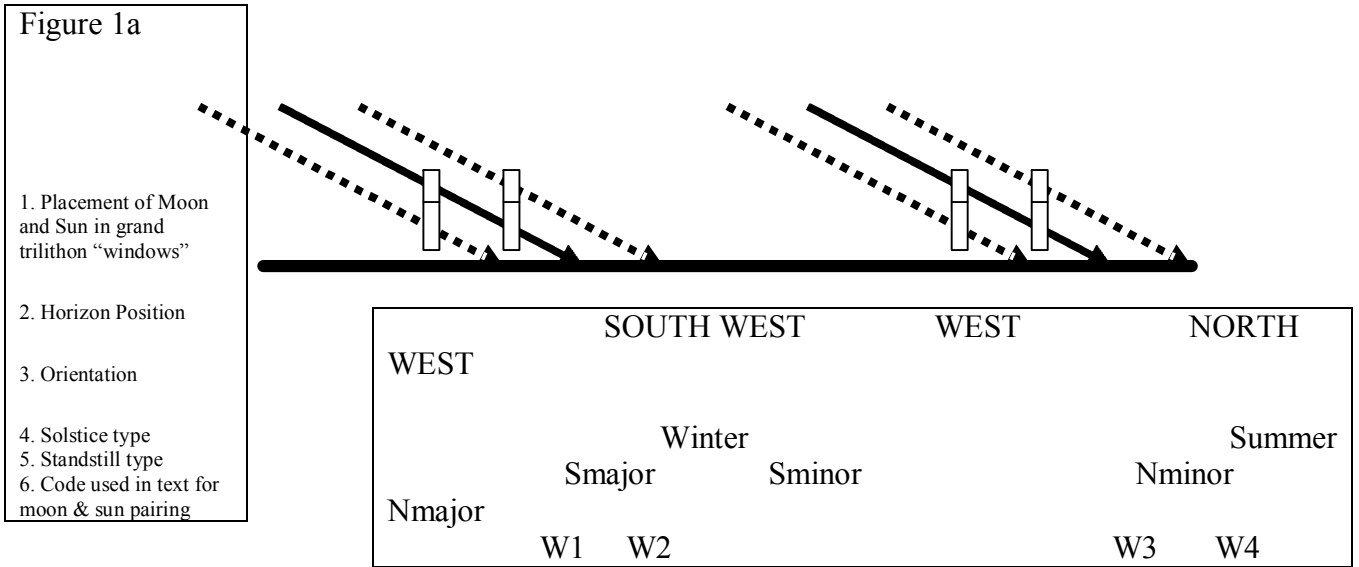
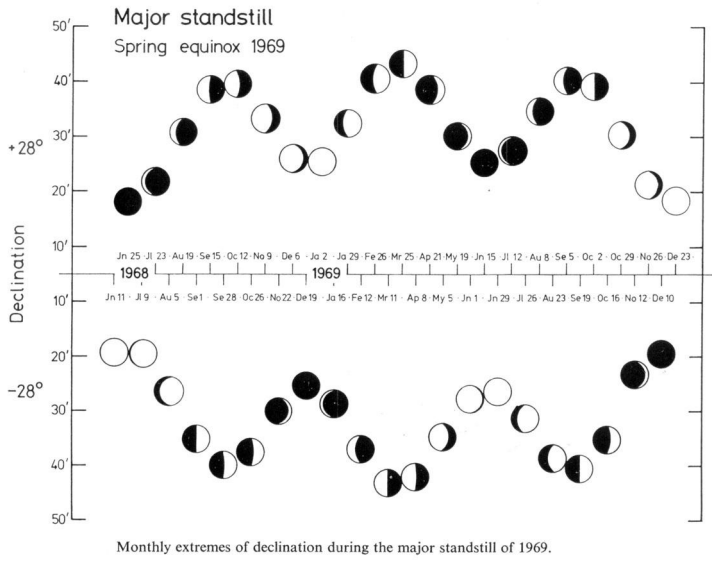
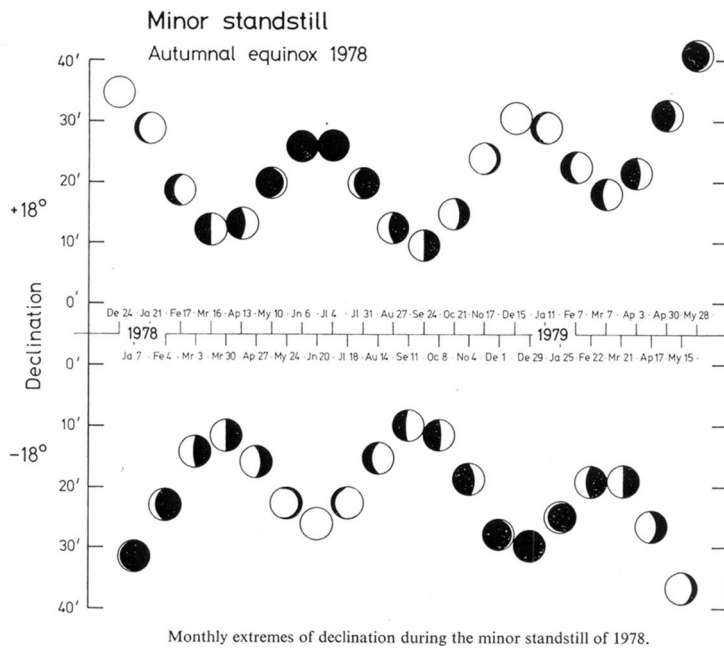


Figure 2 Monthly (geocentric) extreme declinations of 1969 major standstill and 1978 minor standstill, by date and lunar phase

a.



b.



Note

1. 'Month' here means *sidereal* month.
2. 'Geocentric extreme declination' occurs during the moon's mid-transit. The sinusoidal perturbation shown in this figure cannot be observed by a *horizon* alignment.
3. Adapted from Morrison 1980.

Other than the respective placement of the sun and the moon at each of the solstices and standstill lunistics, only at a lunar standstill twice every nineteen years does the binary logic of dark/full moon alternation phase lock with the sun's solstices. It can be seen from Fig. 2 that the northern lunistics, whether at major or minor standstills, always present a full moon at winter solstice and a dark moon with summer solstice. It is the reverse for southern lunistics, which present a full moon at summer solstice and a dark moon at winter solstice. Therefore a double alignment to the south west which combines winter solstice sunset with either the southern major or the southern minor moonset guarantees the start of the longest and darkest night.

Setting aside the sinusoidal perturbation in Fig. 2, which we have already shown to be a property of the geocentric extreme declination which is not observable at the horizon, one final property emerges from a double alignment of a solstice sun with a lunar standstill. It can be seen that all thirteen lunistics would set within the same narrow band of the horizon (a range of just over 1°), with the additional complex property that over the course of a year they scroll through a full range of lunar phases in reverse sequence.

Conclusion

In summary, the properties of a double alignment on winter solstice sunset and southern standstill moonsets limit the symbolic range of any associated rituals. A solarist interpretation cannot explain an alignment on a disappearing sun coupled with an invisible moon. A calendrical interpretation cannot explain the choice of doubling the sun with a superior moon. An interpretation which assumed alignments on a full moon cannot explain the selection for dark moon. Sex-strike theory predicts that these hunters timed their ritual and economic routines according to lunar cycles. The central defining principle of this logic relied on the sacred seclusion of women's coalitions at the time of dark moon. Once hunting and gathering could no longer guarantee survival at the end of the Palaeolithic, women's monthly seclusion rituals would have interfered with a more flexible requirement to hunt, gather and innovate whenever circumstances allowed at *any* time of the month. Other means would have had to be found to keep groups together. The symbolic and ritual implications of disengagement with lunar-scheduled coalitions of secluding women would have been profound. Displacement of women's ritual leadership could have been facilitated by ritual specialists eventually displacing monthly rituals onto a solar timescale. Preserving the sacredness of dark moon rituals according to the logic of solstice alternation, with the added complexities of lunistic sidereal alignments scrolling lunar phases in reverse order, would have been one way for a group of ritual specialists to accommodate this cosmological crisis.

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