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Shifting Perceptions: Spatial Order, Cosmology, and Patterns of Deposition at Stonehenge

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The changing cosmological symbolism incorporated in Phases 1 and 2 at Stonehenge is reviewed in the light of new evidence from patterns of deposition prior to the construction of the bluestone and sarsen stone settings. The early structure of the monument and attendant depositional practices embodied a scheme of radial division, including a symbolic quartering primarily demarcated by solstitial rising and setting points. Through sustained ritual practice, however, the motions of the moon came increasingly to be referenced through deposition, particularly of cremations. This evidence seems to contradict earlier claims of a sudden shift in and around Wessex during the mid-third millennium BC *from a predominantly lunar to a predominantly solar cosmology. It suggests instead that interest in solar and lunar events did not necessarily preclude each other and that over the centuries there was a process of subtle change involving the continual reworking of symbolic schemes emphasizing a sense of 'timelessness' and the unchanging order of the universe.*

> I went to live on the [Mescalero Apache] reservation to do dissertation fieldwork with children's free play . . . however [my consultant] insisted I could not understand play without understanding dance, which I could not understand without understanding the girls' puberty ceremonial, which I could not understand without understanding the religion, which I could not understand without understanding the place of the world and its people in the celestial universe. (Farrer 1991, 5)

> Such changes [as the shift in the Stonehenge axis] may seem trivial, but they had a wider significance, for by making this adjustment, the layout of the monument was altered from a lunar alignment to the more famous alignment on the sun. The social changes so evident in the funerary record may have had their counterpart in changes of cosmology. (Bradley 1991, 216)

The tendency to consign things celestial and terrestrial to distinct categories of understanding is a reflection of the principles of Linnaean classification that underlie the Western scientific tradition. It is evident from a range of modern indigenous cosmologies (as well as from the widespread popularity of astrology in the modern Western world) that, outside the context of Western science, perceived interconnections between objects and events in the sky and other aspects of the natural and social world commonly form part of people's understanding of the overall order of things. They also help to determine individual or group action based upon that understanding (Ruggles & Saunders 1993; Ruggles in press).

There are various ways in which actions undertaken in harmony with the cosmos, as perceived and understood by groups of people in prehistoric times, may have led to discernible spatial patterning in the material record. Such patterning has the potential to provide insights into ideas of categorization of space and place, as well as wider cognitive structures and cosmologies. The siting of ceremonial monuments, as well as places of dwelling for the living and the dead, may not only have been closely constrained within landscapes structured according to cosmological principles and charged with meaning, but may also have influenced and helped to shape

cosmological beliefs in later times (e.g. Bender 1992; Barrett 1994; Tilley 1994; Richards 1996a; Bradley 1998a; Edmonds 1999; Tilley 1999).

The extent to which the design and orientation of buildings, tombs and monuments is likely to have incorporated cosmological symbolism, and the probable complexity of the associations expressed, is attested by a variety of modern examples (e.g. Waterson 1990, ch. 8; Parker Pearson & Richards 1994; Ruan 1996; Ruggles 1999a, ch. 9). These also indicate, however, that many cosmological metaphors and the combinations of symbols used to express them, will have been intensely contextual. This raises the methodological problem of the extent to which convincing arguments that particular associations were indeed meaningful can be developed in specific contexts, or how far one must rely on repeated patterns in order to provide some sort of statistical verification (cf. Ruggles 1999a, 159–62). Either way, the challenge is to find an acceptable way of using Western science to conduct our analysis of an inherently non-Western concept system. In looking for repeated patterns, one may hope that the tendency for public ritual expression to change on a slow timescale (e.g. Bradley 1991, 217–18) will increase the likelihood of a sufficient accumulation of common elements in the material record over particular time periods in particular localities. We shall return to this point shortly.

A number of factors make celestial referents especially important as potentially recognizable common elements of cosmological expression (Ruggles & Saunders 1993, 9–14). Chief amongst these is the immutability of the sky and the main celestial cycles, making the celestial realm an exclusively metaphorical resource — an unchanging data base of potential symbols. While the use that is made of this resource is highly culture-dependent, some celestial objects and events, such as the Pleiades, or the rising and setting solstitial sun, are known to have assumed significance in a wide variety of contexts, both ancient and modern. Important too in this regard is our ability to reconstruct to a high degree of reliability the appearance of past skies.

Yet, where astronomical factors have received serious consideration by archaeologists the results tend to be characterized by an uncritical use of the evidence and there is often a lack of clarity, or fundamental errors on a technical level, that strongly affect or even completely invalidate the conclusions reached (for examples see Ruggles 1999a, 144, 249–50). They are also prone to assumptions that need deconstructing. One of the most blatant of these is the assumption that sunrise or sunset on the equinox — or at least the halfway point in space or time between the solstices — is likely to have been a meaningful astronomical event for prehistoric people, and that the directions in which it occurred are likely to have been endowed with special meaning by prehistoric communities. In fact, the very idea of mid-points is itself redolent of Western-style conceptions of space and time as abstractions: amongst prehistoric people such conceptions are likely to have been highly context-rich and context-dependent. People more probably tried to make sense of the passage of time by classifying and categorizing events in relation to their personal or shared experience than by viewing time as an abstract entity. The solstitial positions, marking the physical boundaries between the parts of the horizon where the sun can rise or set, or do neither, might well have been of widespread significance, as is the case in a variety of historical and indigenous contexts. Half-way points, on the other hand, are likely to be meaningless outside the Western scientific tradition (Ruggles 1997a,b). A similar argument extends to mid-quarter days (Ruggles 1999a, 88, 142).

One of the most obvious ways in which cosmological symbolism can manifest itself is in orientation. Patterns of orientation are evident amongst tombs, orthostatic monuments and houses from the Early Neolithic onwards (Ruggles 1999a, ch. 8). Correlations with prominent points in the landscape such as hill summits, or with the rising and setting positions of the sun or moon, are particularly evident amongst local groups of Bronze Age tombs and orthostatic monuments, for example in northeastern Scotland and the southwest of Ireland (Ruggles 1999a, chs. 5 & 6). Celestial associations are likely to have been an integral part of any cosmology. It therefore makes sense to give due attention to (although clearly not to concentrate exclusively upon) astronomical symbolism as a possible influence upon the orientation, as well as the location and other design aspects, of prehistoric constructions. Astronomical aspects of cosmological symbolism have tended to be understudied by archaeologists. This may be an overcautious reaction to the wholly insupportable claims of high-precision astronomical alignments and blatantly ethnocentric interpretations that characterized the work of non-archaeologists in this area up to the early 1980s, before archaeoastronomy began to emerge as a self-critical subdiscipline (cf. Aveni 1989a).

'Alignment studies' devoid of cultural context have now become unfashionable even in archaeoastronomy. Provided, however, they are understood

as indicators of symbolic potential rather than identifications of putative sightlines used (repeatedly) by actual observers, astronomical alignments can form an important element of discourse about the cosmological meaning of architectural elements. In order to avoid prior assumptions about possibly significant astronomical 'targets', it is imperative to present data pertaining to possible astronomical alignments in terms of azimuth, or (by taking the horizon altitude into account) declination. Declination is synonymous with 'latitude' on the celestial sphere. The declination of a point on the horizon provides a direct indication as to which celestial bodies would have risen or set there at any particular epoch in the past. (For a more detailed explanation see Ruggles 1999a, 18.) The advantage of working with declinations is that this avoids restricting attention to, and perhaps prejudicing conclusions in favour of, particular celestial bodies or events. If (say) sets of orientations are aligned consistently upon certain ranges of declination, then this is strongly suggestive (although it does not necessarily provide conclusive evidence) that celestial considerations were important. The declinations can then be examined to suggest which astronomical bodies may have been involved.

It is worth emphasizing further the potential importance of repeated patterns, as opposed to contextual argument, in regard to astronomical alignments. In analyzing alignment evidence it is clearly important to try to distinguish between those alignments which may well have been significant and meaningful to groups of people in prehistory and those which may well have arisen fortuitously, through the interaction of factors unrelated to astronomy. The much-quoted solstitial orientation of the axial stone circle at Drombeg, County Cork, seems much less convincing when it is realized that of some fifty axial stone circles in southwest Ireland, similar in form and general southwesterly orientation, there is not one other that shares a solstitial orientation (Ruggles 1999a, 50 and references therein). On the other hand, we would expect individual and local variations, and changes with time, even in the context of a strong regional tradition, and we can never rule out the possibility that the solstitial orientation of Drombeg was meaningful; indeed, contextual arguments might well be brought to bear to support the idea (e.g. Hicks 1989). At Balnuaran of Clava, two passage tombs, with a clear solstitial orientation that engineering principles were apparently compromised in order to achieve (Bradley 1998b), form the largest complex in a regional group of monuments (the Clava cairns) which as a whole seem to demonstrate a clear pattern of lunar alignment (Burl 1981). Here, the statistical argument, which suggests a lunar significance, is completely at odds with the contextual argument, which suggests a solar one. The most viable explanation may be that the tombs at Balnuaran of Clava, the largest monuments of their type, deliberately incorporated a weight of additional symbolism not found elsewhere (in this case relating to the sun in addition to the moon) (Richard Bradley pers. comm.; cf. Ruggles 1999a, 157).

In general, it is clear that contextual and statistical arguments may have to be combined in careful ways in order to arrive at the best explanations of particular sets of data. In what follows, however, we shall not think of trying to 'explain data' but of examining data — specifically, spatial patterning in the material record — to see the extent to which the evidence tends to strengthen or weaken distinct sets of (initial) ideas, and can thereby be used as a means of trying to distinguish between them. We shall avoid being more specific about issues of theoretical approach or methodological details (but cf. Ruggles 1999a, 147 ff.).

This article addresses an old problem — that of changing cosmological symbolism incorporated at Stonehenge — in the light of new evidence from patterns of deposition prior to the construction of the bluestone and sarsen stone settings. It also seeks to emphasize the importance of a methodological approach that neither considers astronomical alignments in a contextual void nor is uncritically selective of the evidence in support of particular sets of contextual ideas.

Intimations of cosmology in Stonehenge and its landscape

The various phases of activity at Stonehenge have attracted a variety of astronomical speculations over the years, most of them wholly unsupportable (Heggie 1981, 145–51, 195–206; Ruggles 1999a, 35–41). Even for the solstitial axis in Phase 3, there is little agreement as to whether the principal focus of attention was the midsummer sunrise or the midwinter sunset (compare e.g. Burl 1994; Parker Pearson & Ramilisonina 1998). Nor it is clear — if indeed it represented a 'spectacle to be viewed' at all — whether this was for the benefit of a privileged few standing within the interior (e.g. Burl 1987, 205), for people approaching along the axis (cf. Bradley 1993, 50–6) or moving about the monument in other ways (Whittle 1997, 162), or solely for the spirits of ances-

tors (Parker Pearson & Ramilisonina 1998).

It is generally accepted that the adjustment of the main axis to a solstitial orientation represented a deliberate attempt to reinforce the symbolic power of the monument 'as part of the broader sequence of adaption and reconstruction' (Bradley 1993, 100). There is less consensus as to whether this represented the incorporation of celestial referents for the first time (e.g. Darvill 1997, 181), or a switch from different ones (e.g. Burl 1994, 91). The evidence is too weak to support North's (1996) contention that alignments on various bright stars were widespread in Early and Middle Neolithic Wessex (Aveni 1996; Ruggles 1999b). The idea that the horizon motions of the moon may have been particularly significant at earlier times has however been taken seriously by a succession of commentators in recent years, most notably Burl (1987) and Castleden (1993). Indeed, Bradley has suggested that a drastic change from a practice of lunar alignment to one of solar alignment may have been repeated elsewhere in southern England in the Middle Neolithic (Bradley & Chambers 1988, 286–7; Bradley, in Barrett *et al.* 1991, 56–7).

Three indications have contributed to the conclusion that lunar symbolism may have been particularly significant at Stonehenge in Phases 1 and 2. The first concerns the orientations of 65 long barrows on Salisbury Plain which, according to Burl (1987, 26–8), attest to a general interest in the rising moon in Wessex in Early Neolithic times even before Stonehenge 1 was built. Too many orientations, however, lie outside the lunar rising range for these data to differentiate convincingly between this and other possible explanations. For instance, the fact that nearly all the outliers lie to the south of the lunar rising range invites an interpretation in terms of a general practice of orientation upon the moon climbing in the sky rather than just rising on the horizon, but the argument could be applied equally well to the sun (Ruggles 1999a, 126–7).

The other indications relate to structural features at Stonehenge itself. One concerns a complex rectilinear setting of post-holes in the northeast enclosure entrance (Fig. 1), whose interpretation in terms of sightings upon the rising moon from the centre of the circle goes back to Newham (1966). The idea is ruled out, however, on technical grounds (Ruggles 1997a, 214–7; 1999a, 247 n. 141) quite apart from the fact that there are other, archaeologically far more plausible, explanations of the post-holes (Cleal *et al.* 1995, 145; Richards & Whitby 1997, 252–3).

The third indication is the presence of three small post-holes found by Atkinson under the enclosure bank in section C44 on the southeast side, well away from any entrances (Cleal *et al.* 1995, 94). This is in the general direction (from the centre) of the southernmost rising position of the moon (Ruggles 1997a, 218). But the status of the post-holes is uncertain, their stratigraphic relationship with the bank is unclear, and other explanations are possible (Cleal *et al.* 1995, 108).

Perhaps the most ambitious, and archaeologically informed, attempt at reconstructing cosmological schemes is that provided by Darvill (1997). Adopting the view that the evidence 'does not have to be forced into a cosmological order based on lunar events' (Darvill 1997, 181), he argues that the enclosure did not incorporate celestial alignments in its first phase, but was instead built as a symbolic representation of the wider landscape, with elements such as the earthwork bank and the posts held in the Aubrey Holes standing as images of the surrounding hills and woodland (Darvill 1997, 179–81). Considering the layout and positioning of the enclosure within a circular space *c.* 10 km across (defined by the point where the line of the axis from the northeast entrance intersects with the River Avon), Darvill argues that the course of the Avon can be seen to enter and leave this landscape 'in exactly the same relative position as the northeast and south gaps occur in the earthwork at Stonehenge' (Darvill 1997, 179). The view of the enclosure as 'landscape in microcosm' certainly receives support from work undertaken elsewhere on the setting and orientation of henges in relation to major topographical features such as rivers (Richards 1996b; see also Bradley 1998a, ch. 8). The notion of an exact mapping of the course of the Avon on the enclosure, however, is difficult to accept because, in practice, it would have involved aligning two of the three enclosure entrances on points in the landscape which are physically unmarked (being where the River Avon crosses an abstract geometrical construction) and in any case are well out of sight over the horizon. These points of intersection only make sense in terms of an externalized, Cartesian 'plan view' of the landscape which is surely anachronistic in a Neolithic context. We must remember that this was a landscape of woodland and patchy clearance (Allen 1997, 128), and that any sense of its topographical layout would have derived from walking on the ground and not a map-like vantage (cf. Thomas 1993). In any case, the evidence in support of this idea is far from convincing because the suggested radius is selected *post hoc* from a range of possibilities.

In Phases 2 and 3i, Darvill envisages a rework-

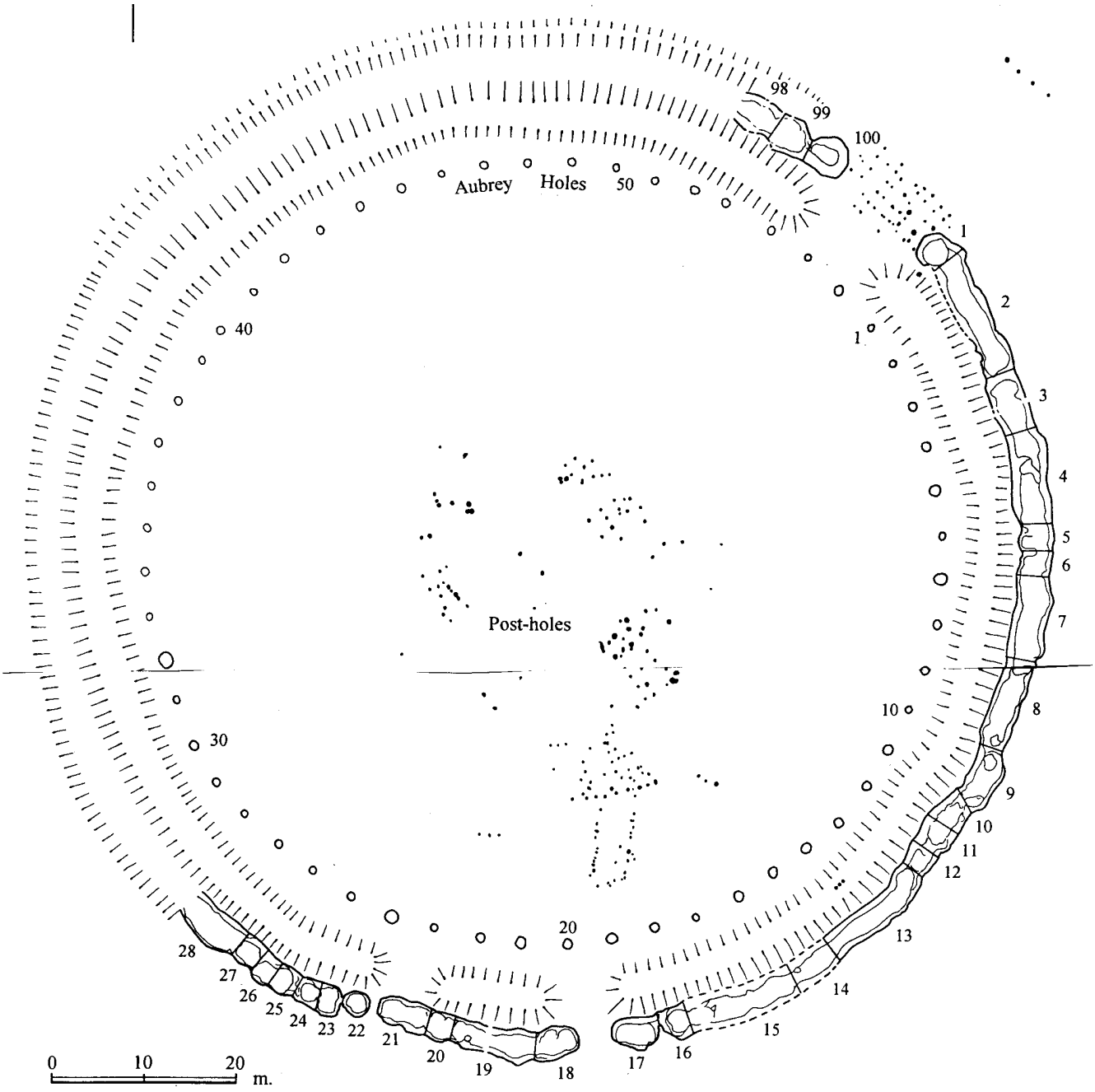

Figure 1. *Stonehenge: Phase 1 and 2 features. (After Cleal* et al. *1995.)*

ing of the single axial ordering of the monument and landscape (a 'linear binary' division) to one that involved their conceptual quartering (a 'linear quadruple' arrangement) (Darvill 1997, 182–9). This involved the creation of two axes, both of which referenced sunrise and sunset at the opposite solstices. The NE–SW axis is made visible in the new axial alignment on the midsummer sunrise, for which the Heel Stone and Stone 97 would have to have been erected at this stage; the NW–SE axis would have been at about 80 degrees to this. The four-fold partitioning of space is extended out of the monument, providing a conceptual quartering of the surrounding landscape. The scheme rides rather rough-shod over the chronology of local developments, particularly by making the assumption that the Stonehenge Cursus is contemporary with Phase 2 (Darvill 1997, 184): the single third-millennium BC

radiocarbon date for this monument is from antler recovered from a pit cut through the Cursus ditch (Richards 1990, 96). It also combines chronologically distinct features such as Beaker burials and Grooved Ware pits (Darvill 1997, fig. 7), although this is countered by the argument of long-term structuration of the landscape.

There are many reasons for wishing to understand something of developments in the world-view which prevailed — to the extent of being most clearly reflected in sacred geographies — in the area surrounding Stonehenge before and during the various phases of construction there. Yet Darvill's scheme dismisses outright the possibility of celestial, and particularly lunar, alignments prior to the creation of the solar axes which in his view form the basis of a quadripartite cosmology that prevails in Phases 2 and 3. This is clearly in stark contrast to those schemes which emphasize lunar orientation as a primary indicator of prevailing world-view until a rather abrupt switch, in the Middle Neolithic, to a prepossession with the sun. As far as the earlier developments are concerned, the complexities of interconnection between different categories that characterize modern indigenous cosmologies (Ruggles & Saunders 1993) make it difficult to accept either that cosmological symbolism was almost exclusively lunar or that no celestial referents were present. In addition, it is clear that both interpretations rely on a selective reading of the evidence and make a number of rather arbitrary assumptions.

Another type of evidence that may be relevant to such a discussion is the spatial patterning of deposition. While there have been a number of studies of depositional practices at Late Neolithic monuments (Richards & Thomas 1984; Pollard 1992; 1993; 1995a; Mount 1994; Thomas 1996, ch. 7), relatively little consideration has been given to the way in which such activity may have been structured in relation to cosmological referents, in particular celestial events. Exceptions are two analyses of patterns of deposition at Stonehenge prior to the construction of the bluestone and sarsen stone settings (Burl 1987, ch. 5, esp. fig. 8; Castleden 1993, 218–20, esp. fig. 88). Both, however, are limited in scope, selective in terms of the material used in their distributional analyses, and reach different conclusions about the transition from a lunar to a solar tradition (Burl 1987, 103) or coexisting practices relating to both the sun and moon (Castleden 1993, 282 n. 78). There is, of course, a range of possible explanations for depositional patterning, not just celestial concerns, and such explanations are not mutually exclusive. Recent publication of the Stonehenge excavations has provided clarification of the primary evidence (Cleal *et al.* 1995), and it is this which provides the motivation for this article.

The following section gives an overview of the nature of the available depositional evidence at Stonehenge 1 and 2, and then proceeds to consider the extent to which it tends to support or run counter to various possible cosmological schemes, with particular (but not exclusive) attention to celestial correlates. We shall also try to distinguish between different possibilities, and to identify the nature of changes or developments through time.

Patterns of deposition at Stonehenge

By comparison with the nearby henge monuments of Durrington Walls and Woodhenge, both of which produced sizeable assemblages of worked flint, bone and pottery (Wainwright & Longworth 1971; Cunnington 1929), there was relatively little depositional activity at Stonehenge during its early phases (1 and 2). That said, material was being brought into the monument and deposited there in what appears to be a highly patterned way. Whilst limited in scale, such activity seems to have contributed to complex forms of spatial classification, emphasizing points of entry and marking out significant axes or sectors within the enclosure. A wide range of meanings might have been articulated through these deposits, and these will be explored together below.

There are obviously problems and limitations in studying depositional patterning from data collected up to eighty years ago. Hawley was selective in the retention of finds, and much worked flint and unidentifiable animal bone was discarded or re-buried (Gardiner, in Cleal *et al.* 1995, 348). Recording was not of a modern standard (nor should we expect it to have been so), though a surprising amount of contextual information is preserved in the form of Hawley's diary notes and finds labels. Hawley's systematic approach does, however, give us confidence that the results of this study are not the product of selective or differential excavation procedures. We know relatively little, though, of activity within the centre of the monument during Phases 1 and 2 owing to the disturbances wrought later by the erection of the stone settings. Another limitation is the extent of excavation, which has left over a third of the ditch uninvestigated. Whilst fortunately providing a resource for future research, this means that we have little idea of depositional activities taking place over a sizeable area of the ditch circuit. Clearly, depositional and post-depositional processes can be com-

plex (Schiffer 1987), and it could be argued that the patterning described here results not from intentional placement, but from a range of more prosaic events. Discussion is therefore focused not simply on the spatial distribution of materials, but also on patterns in contextual association between different material categories and the unusual character of the Stonehenge assemblage in general. Arguments in support of intentionally patterned or 'structured' deposition within Neolithic monuments have been set out in detail elsewhere (cf. Thomas 1999, ch. 4; Whittle *et al.* 1999, ch. 17).

An analysis of depositional patterning was undertaken by one of us (JP) prior to the definitive publication of the Hawley and Atkinson excavations (Cleal *et al.* 1995). This study (Pollard 1993, ch. 3.4), which made use of the Hawley archive in Salisbury Museum and notes on the faunal remains compiled by Wilfrid Jackson (held in Buxton Museum), has been extensively re-worked in the light of additional contextual detail presented in the published report.

Some details of this analysis are given in Box 1. A range of material was intentionally deposited within the ditch of the monument and in the Aubrey Holes during Phases 1 and 2 (covering *c.* 3000–2400 BC) (Figs. 2 & 3). Early in the life of the enclosure, deposits of worked flint, antler, animal bone and carved chalk, along with perhaps one human cremation, were placed on either side of both main entrances and within a limited area of the southeast sector of the ditch. A similar pattern is seen in Phase 2, during which groups of articulated animal bone and pieces of disarticulated human bone were incorporated with increasing frequency. This phase is also characterized by a large number of deposits of cremated human bone, some placed in small pits cut into the tops of the Aubrey Holes and accompanied by a restricted range of specialized artefacts.

Observations on deposition

It has been suggested that the Phase 1 monument incorporates a number of features normally associated with causewayed enclosures, though its construction dates a few centuries after the main currency of such sites (Cleal *et al.* 1995, 113–14). The form of this monument, and that of the analogous site of Flagstones, Dorchester (Healy 1997), may, however, be seen as distinct from earlier enclosures in terms of the regularity of the earthworks (as true circles), and in the case of Stonehenge in the presence of an internal post circle. Whilst both features are more typical of later henges, pigeon-holing the site within predetermined monument categories is probably more of a hindrance than a help: either the site straddles two traditions (Cleal *et al.* 1995, 114) or it represents something different entirely.

Likewise, depositional practices during Phases 1 and 2 incorporate features common to earlier enclosures, later henges, and other categories of monument. The deliberate deposition of cattle bone and partial animal burials within the ditch, recalls practices that are a feature of earlier enclosures (Cleal *et al.* 1995, 113). The placing of cattle mandibles and skulls against ditch terminals abutting major entrances is seen at Windmill Hill, for example (Whittle *et al.* 1999, 359). If a genealogy for the practices at Stonehenge Phase 1 is to be sought, a convincing link can also be made with deposits in the ditches of long barrows, in particular with late so-called 'short' or 'oval' barrows. Similar deposits of flint-working debris, antler, cattle bone and worked chalk — exactly the combination found at Stonehenge — occurred in the flanking ditches of long barrows at Thickthorn Down, Dorset (Drew & Piggott 1936; Barrett *et al.* 1991, fig. 2.11), North Marden, Sussex (Drewett 1986), and closer to Stonehenge at Kingston Deverill (Harding & Gingell 1986). These deposits are associated with rites concerning the human dead and their transformation, as well perhaps with fertility and renewal, and it is not impossible that depositional activity within the Stonehenge enclosure drew upon a similar body of symbolism and meaning. Certainly, by Phase 2 the sizeable quantities of human bone being deposited (first as disarticulated elements, later as cremations) suggest a more direct involvement in ancestor rites and the manipulation of human remains. Links with the past were perhaps being made through the incorporation of ancestral bone and the inclusion of ancient animal bone within the ditch during Phase 1. The form of the monument, the range of material placed within it, and the manner in which it was deposited, may from the beginning have served to present an image of 'time transcended' (Bradley 1991; Whittle 1997, 148).

The deposits are certainly different in kind to those encountered at the later enclosure of Durrington Walls where large quantities of pottery, flint implements and processed bone (much from feasting) were recovered (Wainwright & Longworth 1971; Richards & Thomas 1984). They share points in common with those from Woodhenge, both in terms of general spatial organization and in the inclusion of items of carved chalk and human bone (Pollard 1995a). However, there the resemblance stops. Large amounts of Grooved Ware, animal bone and a sizeable range of

Box 1. ***An analysis of depositional patterning in Phases 1 and 2 at Stonehenge.***

Phase 1

Stonehenge began as a circular earthwork enclosure, 110 m in diameter, with a principal entrance at the northeast, a second smaller entrance at the south, and a third possible to the south-southwest. The ditch was accompanied by an internal bank and a minor counterscarp bank. A circle of 56 pits (the Aubrey Holes) originally containing posts, were enclosed by the earthwork (Fig. 1). The construction of the enclosure can be closely dated to 3000–2950 BC. Phase 1 is defined by the construction of the earthwork and Aubrey Holes, and the formation of the primary silts and an overlying organic dark layer in the ditch (Cleal *et al.* 1995, 63). Although here we follow the published phasing, we recognize that other structural sequences involving elements such as the Aubrey Holes, earthwork and interior timber settings, are possible (Whittle 1996, 464).

The range of artefactual and faunal material from this phase is limited, consisting of finds of worked flint, antler, animal bone and carved chalk (Cleal *et al.* 1995, 348–463; Fig. 2). Antler and worked flint were recovered in quantity, and evidently have a functional relationship with the construction of the enclosure, the former (picks and rakes) being employed as construction tools, and the latter resulting from working of nodules encountered during the digging of the ditch. Whilst items of carved chalk may have been manufactured on site, the animal bone had been brought in from elsewhere specifically for deposition. Nearly all categories of material show manifestly non-random patterns of distribution and association, suggesting carefully orchestrated depositional pratices which served to create or reinstate a complex set of spatial meanings and references within the enclosure from its very beginning. This can be confirmed statistically using, for example, variants of any one of a number of tests used in archaeoastronomy to test for clustering in circular data (Ruggles 1984, 228–45; Patrick & Freeman 1988; Higginbottom & Clay 1999).

Hawley recorded 'layers' of flint flakes, cores and occasional implements on the base of the ditch. A crude indication of distribution and relative density can be obtained from his diary notes, and is here reconstructed (Fig. 1a). The distribution is clearly non-random, the quantity of worked flint being greatest in ditch segments adjacent to the three causeways, with a scatter of localized groups around the rest of the excavated part of the ditch, particularly in its southern sector. Other groups occurred against the shallow ridges between ditch segments. Although it is likely that this material represents *in situ* knapping (Harding, in Cleal *et al.* 1995, 368–70), its distribution implies this was action undertaken with some formality, with reference to significant locations around the ditch circuit. That symbolic significance should be attached to such a seemingly mundane activity as flint-working need not occasion surprise: similar collections of knapping debris are known from long barrow ditches and earlier enclosures, often in association with obviously placed deposits (Pollard 1993, ch. 4.4). Here we might see a bringing to the fore of routinely engendered meanings and associations that working stone could have held (Edmonds 1995, 38–9). The qualities of flint, in particular its density and durability, and the context of its removal from the earth in the construction of the monument, could certainly have invested it with associations of sacred realms (cf. Taçon 1991) — a 'gift from the earth'.

The basic distributional pattern provided by deposits of worked flint, focusing particularly on the entrances, is repeated in other categories of material such as bone, worked chalk and, to a lesser extent, antler. Antler picks were often placed in groups, the largest being located within the western terminal of the main entrance (segment 100). Though functionally related to the construction of the monument, their deposition may again have drawn upon a rich body of metaphorical meanings, perhaps, through annual cycles of growth, concerned with fertility and renewal (Bradley 1998a, 25). Antler also had specific associations through deposition with other categories of material. One group of antler tools from segment 100 was associated with animal bone (a cattle vertebra and red deer pelvis), a chalk ball and a piece of worked antler. Two other chalk balls, from segment 2, were also associated with antler, and a third was found alongside a perforated chalk object (Cleal *et al.* 1995, 71). All the finds of worked chalk from this phase are clustered around the northeastern entrance. Carved chalk objects have been claimed as fertility symbols (e.g. Thomas 1952; Burl 1987, 103), an interpretation that may gain indirect support through anthropological studies of colour symbolism. White (the colour of chalk) is frequently associated with qualities of life, goodness and power (Turner 1967). The hardness and brilliant whiteness of these objects could also have engendered metaphorical connections with dry ancestral bone, which might itself be considered a source of fertility and beneficial potency (e.g. Watson 1982). Both antler and carved chalk could, therefore, have served as symbols of regenerative power.

Alongside the deposits, traces of fire were discovered on the base of the ditch around the northeast entrance (Cleal *et al.* 1995, 69); further emphasizing its importance not just as the principal point of entry into the enclosure, but as the zone of transition between the wider world beyond and the sacred realm within. The properties of transformation of fire might have been seen as a suitable metaphor for the transition between these realms, or indeed between more general states of being (life, death and ancestors, for example).

The small quantity of animal bone from Phase 1 was dominated by cattle, with pig, dog and red deer also represented (Serjeantson, in Cleal *et al.* 1995, 442). Bone was deposited in the terminals adjoining all three entrances, and in the southeastern quarter of the ditch. Large cattle mandibles had been placed on the base of the ditch in each of the two terminals flanking the southern entrance, and an ox skull in a similar position to the west of the minor southwest entrance. These, along with a red deer tibia and possibly other pieces of animal bone, are estimated to have been between 70 and 420 years old at the time of their deposition (Bayliss *et al.* 1997, 48), providing striking evidence of curation and the symbolic value that animal bone could hold. From the right-hand side of the southern entrance (segment 17), in close association with one of the mandibles, were parts of pig skull and cattle leg bone.

Especially notable, given the frequency of worked flint and antler from this sector, is a localized concentration of cattle and dog bone in segments 13 and 14. Although not marked in any obvious way — unless the three post-holes found by Atkinson under the bank in C44 are of this phase — this area of the ditch was repeatedly chosen for deliberate deposits throughout the Late Neolithic. Whilst the deposition of human bone seems not to have been a significant feature of Phase 1, there is a single possible cremation from the base of the ditch in the northern half of segment 13. Adjacent to the post-holes in C44, this appears to mark the point beyond which finds of bone, flint and antler become scarce.

Little material was recovered from the primary fills of the Aubrey Holes, but what does occur seems to have been

intentionally incorporated. Hawley recorded two antler picks from the base of Hole 56, adjacent to the main entrance. (Curiously, at a much later date, during Phase 3vi, a bundle of fresh and curated antlers was deposited in the base of Y Hole 30, occupying a similar position in relation to the entrance: Cleal *et al*. 1995, 260.) Almost diametrically opposite Hole 56, Hole 29 contained ten charred pieces of antler at its base. Other finds include two flint fabricators in Holes 13 and 16, both of which may be from the primary chalk packing. Their position in the southeastern sector corresponds closely with that of deposits in the ditch at this point.

Phase 2

Phase 2 is dated to *c.* 2900–2400 BC, placing it within the later Neolithic of the region (Richards 1990). The posts of the Aubrey Holes were removed, and parts of the ditch witnessed localized backfilling with clean chalk (Phase 2a). Numerous small pits were cut into the ditch silts (Phase 2b), some containing animal bone and small amounts of pottery; other, later re-cuts contained cremations (Cleal *et al.* 1995, ch. 6). There are at least 52 deposits of cremated human bone from this phase, 'such a significant number that the site might be regarded as a cremation cemetery' (Lawson 1997, 23). Also assigned to this phase are the post-hole setting at the main entrance, and other post settings in the centre and towards the southern entrance of the monument. Although assumed to form the remains of one or more timber circles, the internal settings might equally represent rectilinear arrangements of posts.

Depositional activity continued, and is marked by the inclusion of further deposits of animal bone, along with quantities of disarticulated and cremated human bone (Fig. 3). Sequence may exist within this, with much of the cremated bone coming late in Phase 2. A number of the animal bone deposits were also associated with human bone. Amongst the animal bone are species rarely represented in Late Neolithic contexts such as fox, wolf and raven (Serjeantson, in Cleal *et al.* 1995, 445). Antler was still being deposited, notably around the northeastern entrance, and there are further depositions of worked chalk (Figs. 2 & 3). Grooved Ware occurs in very small quantities, perhaps in localized re-cuts (Cleal *et al.* 1995, 350–51).

The deposition of animal bone focused on two areas, around the northeastern and southern entrances, extending east along the ditch as far as the middle of segment 13. Beyond this point, which also corresponds to the location of the cremation in Phase 1 and the limit of bone distribution in the southern part of the ditch in that phase, very little occurred. Cattle skulls again feature as deposits adjacent to entrances, one each occurring on either side of the northeast entrance. That in segment 100 was associated with fox bones, and that in segment 1 with articulated cattle vertebrae and human skull fragments. Several metres to the southeast of the latter (segment 2) was a deposit of a wild pig mandible and humerus along with cattle teeth. The cattle skull from segment 100 was bounded by further bone deposits (in segment 98), including another cattle skull, and the unusual combination of a piglet skeleton and articulated dog paw (assigned to Phase 2a). These were associated with a human skull vault and longbone. A second piglet skeleton, along with other pig, cattle, dog and fox bones occurred high in the secondary silts (Phase 2b) of segment 98. In content this seems to mimic closely the earlier deposit. Ash was again a feature of deposition around the entrance (Cleal *et al.* 1995, 119).

Deposits around the southern entrance mirror those around the northeastern very closely, both in terms of content and respective position within the ditch. Distinctions were also being drawn between the left- and right-hand sides of the entrances as one enters. A second group of articulated cattle vertebrae came from segment 18, in an equivalent position to those in segment 1 (left-hand side of entrance in both cases). Set back slightly from the right-hand side terminal, within segments 13–15 (equivalent to segment 98 beyond the northeastern entrance), were deposits of cattle, pig, red deer, fox and bird bone (note the similar composition to the bone assemblages from segment 98). Human bone, comprising fragments of skull and longbone, was again associated with the animal bone. Overall, the distribution of human bone follows that of animal bone very closely, being focused on the entrances and the southeastern sector of the ditch. Fragments of skull (recalling in their locations the placements of cattle skulls) came from either side of the northeastern entrance and from the minor southwestern entrance. Antler was now being deposited around the southern entrance and in the area of segment 14 (Cleal *et al.* 1995, fig. 229).

Whilst the distribution of animal and human bone closely followed a format established during Phase 1, emphasizing the entrances and the southeastern sector of the ditch, that of worked chalk shows notable divergence. The main focus of deposition is now around the southern sector of the ditch, particularly around the minor southwestern entrance. The worked chalk includes a number of chalk balls, a cup, an axe, perforated pieces and a tabular piece with incised chevrons (Montague, in Cleal *et al.* 1995, 399–407).

Cremations

Numerous deposits of cremated bone were found in small pits cut into the tops of the Aubrey Holes, into the secondary silts of the ditch, and around the bank. Their distribution shows several concentrations. Small clusters occurred in the western ditch terminal flanking the main entrance, and the eastern terminal of the southern entrance. In both instances the cremations had been placed in the right-hand terminal of the ditch as the enclosure was entered, with deposits being absent from the opposing left-hand terminals (Fig. 3). This sense of spatial order, restriction and exclusion extends beyond the ditch. A cluster of 11 cremations was recorded from the southeastern sector of the interior, around Aubrey Holes 11–16. The concentration of animal and human bone in the ditch silts at this point has already been noted.

In the large area of the interior trenched and stripped by Hawley, not a single cremation occurred between the ring of the Aubrey Holes and the centre of the monument, implying a rigid structure of demarcation and exclusion based around the concentric form of the earthwork. It may also be significant that the frequency of cremations from the earthwork and the Aubrey Holes decreases towards the western sector of the monument, although they were present in every undisturbed hole excavated on the eastern and northern sectors of the circuit. Multiple cremations occurred in Holes 5, 12, 17 and possibly 9.

Worked flint, worked chalk, bone pins, antler, animal bone and a pottery vessel were deposited in the upper fills of the Aubrey Holes, sometimes associated with the cremations. The burnt condition of the bone skewer pins suggests they were pyre goods (Cleal *et al.* 1995, 410). Deposits of knapping debris came from the tops of Holes 22 and 32, that from 22 comprising several long narrow flakes with faceted platforms. More 'complex' or atypical deposits came from the southwestern sector, following the distribution of worked chalk in the ditch at this point. From one of several cremations adjacent to Aubrey Holes 14 and 15 came a finely polished gneiss macehead.

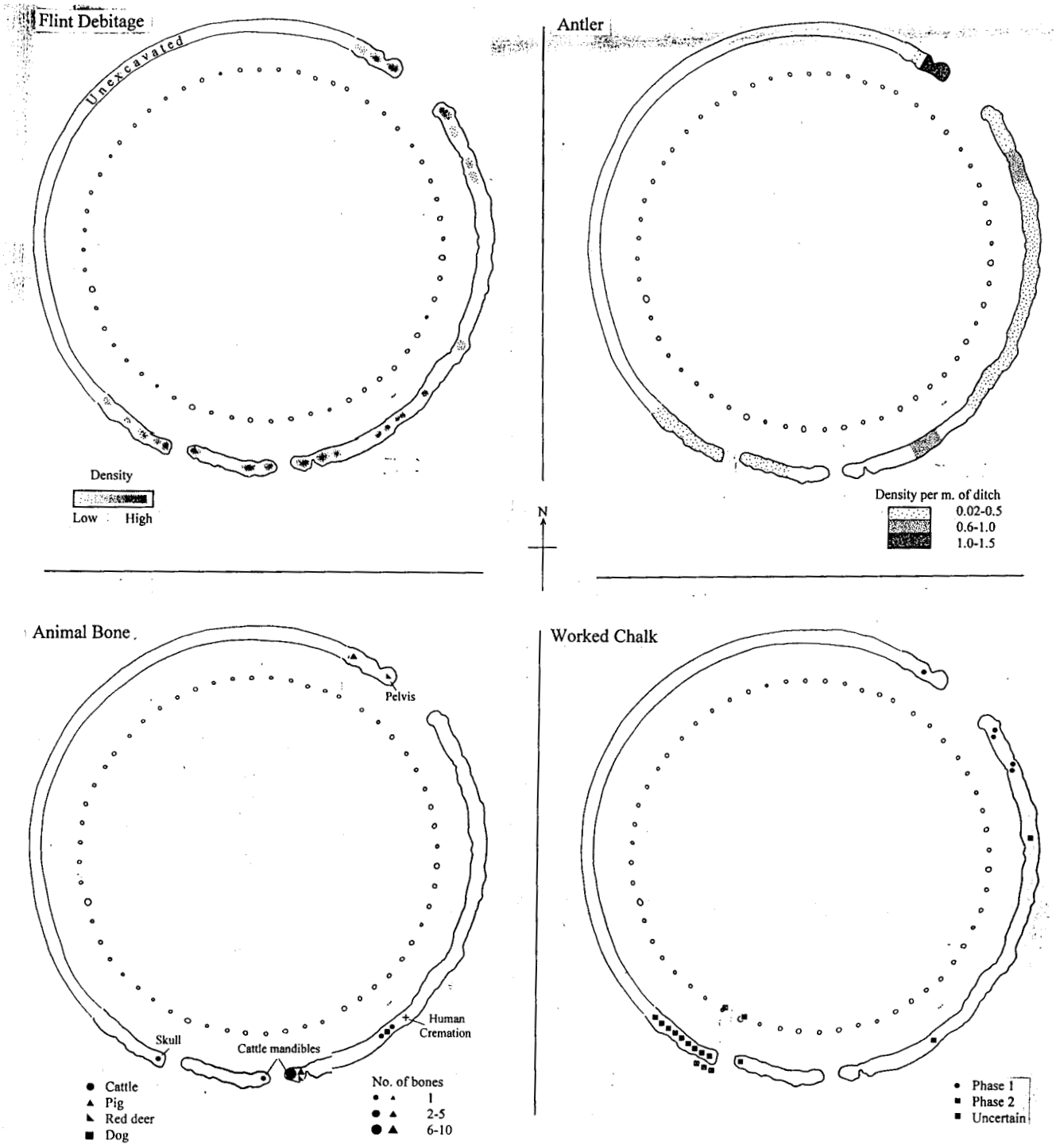

Figure 2. *Stonehenge: Phase 1 deposits. Note that the distribution of worked chalk includes pieces from both Phase 1 and 2.*

flint tools were deposited at Woodhenge, but only a handful of small sherds and flint tools have come from early phase contexts at Stonehenge (Cleal *et al.* 1995, 362, 369). It may have been considered inappropriate to include items closely associated with everyday existence at Stonehenge.

The 'otherworldliness' of the Stonehenge enclosure was given further emphasis by the rather unusual deposits of animal bone and antler. In stark contrast to sites such as Durrington Walls (Wain-

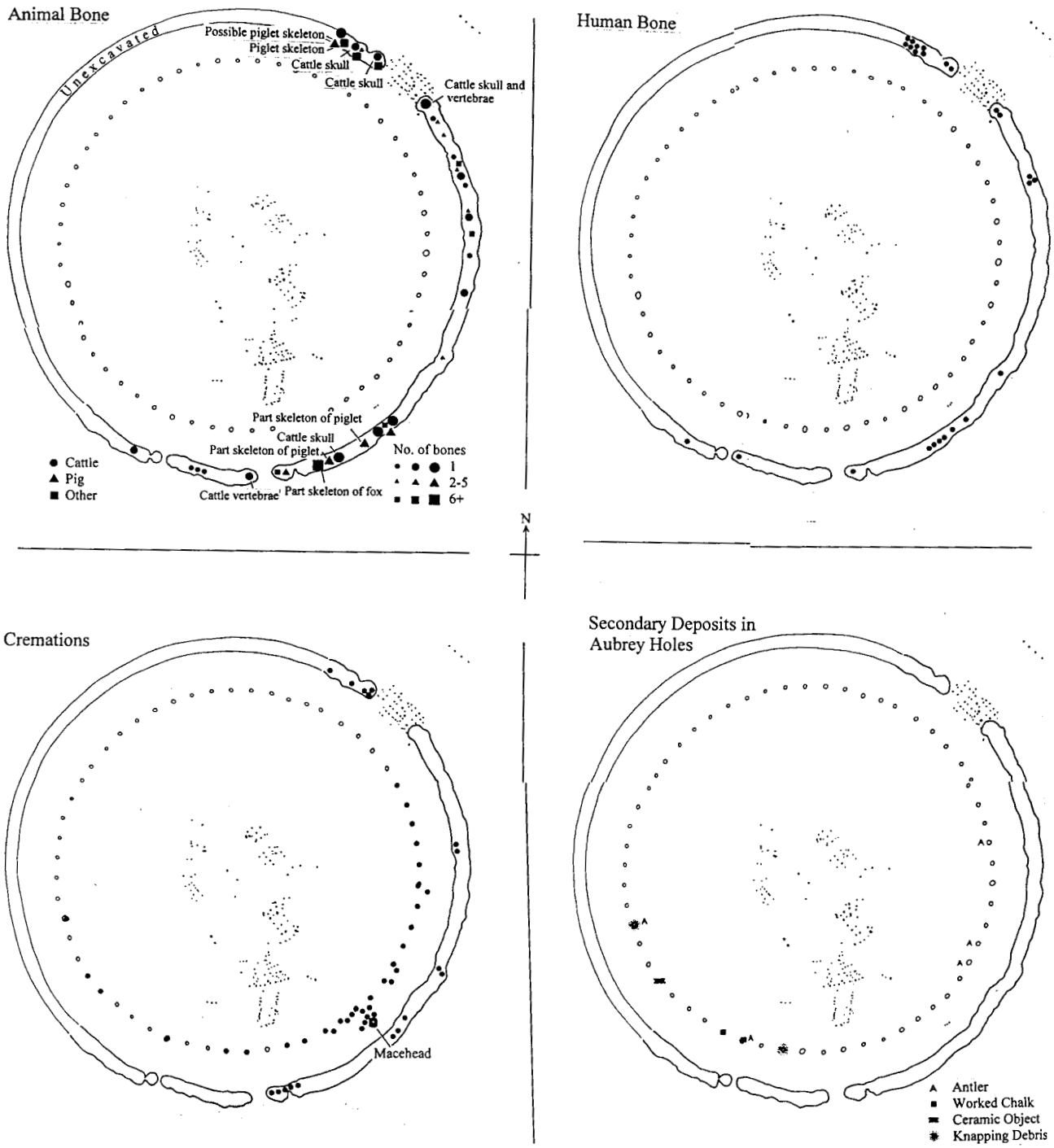

Figure 3. *Stonehenge: Phase 2 deposits.*

wright & Longworth 1971) and Avebury (Gray 1935), an unusually high proportion of the antler from Stonehenge comes from slain animals: 57 per cent in Phase 1, and 27 per cent in Phase 2a (Serjeantson, in Cleal *et al.* 1995, 419). There is also a high percentage of bone from wild species amongst the animal remains in Phase 2. The partial animal skeletons and articulated groups of animal bone (of pig, fox, cattle and dog) are unusual. They can be regarded as symbolically powerful media — material in the process

of transformation, neither in one state nor another — their position within the ditch perhaps serving to mediate the transition between the temporal world of the living on the outside and the timeless realm of ancestors and other spiritual agencies within.

We would argue that a multiplicity of meanings and symbolic references were embodied within the monument and in attendant depositional practices. Antler and worked chalk perhaps had specific metaphorical connections to ideas of fertility and renewal; traces of fire and worked flint signified transformation; the increasing quantities of human bone deposited during Phase 2 might relate to a growing ancestral presence — reference to the past and perhaps to mythic beginnings. The similarity between these deposits and those encountered in late long barrows also suggests a link to the past and ancestor rites. Pottery is notable by its virtual absence; and although animal bone might refer to contemporary subsistence concerns, there is an odd collection of species, including many that are wild, and the assemblage is perhaps not reflective of everyday economic concerns. In many respects the deposits reflect dealings with a wider world, that of spirits (ancestral, animal or otherwise) and other supernatural agencies.

The nature of spatial patterning

Repeated emphasis on particular locations
In both phases, deposition worked within specific spatial orders. The distribution of all categories of material is manifestly non-random (see Figs. 2 & 3), with particular locations being repeatedly emphasized, for instance the terminals around the main northeast and the lesser southern entrance, and the southeastern sector of the ditch in segments 13–15. Small amounts of antler and worked chalk were deposited around the junction between segments 2 and 3 during Phase 1, and animal and human bone during Phase 2. During Phase 2 specialized deposits in the Aubrey Holes and items of carved chalk from the ditch were concentrated in the southwest sector diametrically opposite the main northeast entrance. That this is not a simple backspace/frontspace demarcation is shown by the continued use of the southern entrance at this time. The deposits of animal bone and partial animal skeletons to the west of the northeast entrance and to the east of the southern entrance mirror each other very closely, indicating careful orchestration. Since they appear not to have gone in as a single act, they also imply memory of earlier depositions.

Concentric spatial divisions
In addition to the segmental or radial structuring of deposition, the absence of cremations (late in Phase 2) from within the area defined by the Aubrey Holes strongly suggests the existence of concentric spatial divisions, later echoed in the form of the stone settings.

Sidedness
The spatial organization of deposition is yet more complex. Sidedness (here seen as an asymmetry between opposing terminals of the enclosure entrances) seems to have been important from the beginning. It is even built into the very form of the monument: as Cleal notes, 'at both the northeastern and southern entrances the segment on the right (as the entrance is crossed on entering) is a well formed segment isolated from its neighbour by a surviving ridge' (Cleal *et al.* 1995, 111). The right-hand sides (always taken as when entering the enclosure) of both major entrances are consistently emphasized through deposition. During Phase 1 this takes the form of antler at the northeast entrance and animal bone at the southern; and during Phase 2, of animal bone, to a lesser extent disarticulated human bone, and most strikingly cremations. The same principles of sidedness occur locally within other Late Neolithic monuments, suggesting that this particular feature of the Stonehenge deposits represents a materialization of a more generalized scheme of symbolic orientation, perhaps working from principles of body classification (cf. Hertz 1960; Ellen 1977). There was a cremation on the right-hand side of the entrance into the Durrington 68 timber circle (Pollard 1995b), and another in a similar position just within the timber circles at Woodhenge (Pollard 1995a, figs. 9 & 12). Slightly later in date, but not too far removed in space, the same left/right duality is observable in the deposits in the secondary silts at Site IV, Mount Pleasant, Dorset (Thomas 1996, 220–21).

Relationships to external points of reference
Whilst it can be argued that the location of major deposits around the entrances related to the symbolic mediation of points of entry into the enclosure, the positioning of other deposits in selected areas around the ditch circuit is less obviously linked to the architecture of the monument. The focus of deposition around ditch segments 13–15, for example, does not correspond to any distinct feature of the monument during its pre-stone phases (excepting perhaps the three post-holes under the bank adjacent to segment 13). Here deposition was most likely

enacted in relation to external points of reference, be they pre-existing features in the landscape, a generalized cosmology, or particular celestial events.

The possibility of alignments on existing landscape features receives little support from the evidence. The immediate visual envelope around Stonehenge is fairly limited (Cleal *et al.* 1995, 34–40), and most of the monuments that are visible from the enclosure post-date Phase 2. We have explored the possibility that Phase 1 deposits might lie on alignments with earlier funerary monuments, the ends of the Cursus, or Robin Hood's Ball, and that Phase 2 deposits might likewise fall on these, or on alignments to later Neolithic ceremonial enclosures such as the Coneybury henge and Woodhenge. The only possible instance is a group of two cremations in ditch segment 9 which, if placed on a line from the centre of Stonehenge, align on Coneybury. Given that this is the only instance (remarkably so in a landscape full of 'targets') it is probably fortuitous.

The second possibility is that the positioning of deposits within the ditch worked with reference to one or more cosmological schemes. Specific orientations were clearly important, both at Stonehenge and other later Neolithic monuments in the region. Indeed, the easterly and southerly orientations of long barrows in the vicinity (Burl 1987, 26–8) shows that this was the case even in the earlier Neolithic. The focus of deposition around the southeastern sector of the ditch at Stonehenge is echoed in the similar positioning of deposits at Woodhenge and the Southern Circle at Durrington Walls (Richards & Thomas 1984; Pollard 1995a). The entrances of Coneybury and Woodhenge are to the northeast, following the principal axis at Stonehenge (Darvill 1997, 182–93); those of the Durrington 68 timber circle and the Southern, and perhaps Northern, Circles at Durrington Walls (Wainwright & Longworth 1971; Pollard 1995b) are to the southeast. Another recurrent alignment is to the south, as in the southern entrance and Phase 2 timber 'avenue' within Stonehenge, the positioning of stone settings at Woodhenge (Cunnington 1929, 14), and the timber avenue leading to the Northern Circle at Durrington Walls (Wainwright & Longworth 1971). From this limited set of evidence, the northeast, southeast and south stand out as significant directions within a local later Neolithic cosmology. This cosmology may have been constructed with reference to specific celestial events, and leads us to ask whether it was reflected in and reinforced by depositional practices. In what follows we attempt to 'test' the observed patterning in deposition at Stonehenge against a range of cosmological schemes, thereby avoiding for the moment any fixed ideas about their structure and organization.

Cosmological schemes involving radial divisions of the world

The aim of this study is not to 'explain the data' in terms of particular cosmological schemes but rather to use the data to try to distinguish between the major possibilities. In what follows, we shall consider the azimuths and declinations of the horizon in line with depositional features as viewed outwards from points on an axis through the geometrical centre of Stonehenge. No high precision in the 'defining' observations or exactitude in the position from which they were made is claimed, and it is not considered helpful or enlightening to quote azimuths and declinations to a precision of greater than 1°.

The approach that has been adopted considers radial divisions of the world outwards from a perceived centre, in which different fundamental qualities or sets of meanings may be attributed to different ranges of directions. The 'world' here is both practical and conceptual, since cosmologies provide ontological status for routine behaviour. These schemes differ from others that we have already criticized as inherently 'externalized' in that they are physically observable from the centre, either in the form of direct observations of points in the landscape or of the rising or settings of celestial bodies: we make no statements about points in the landscape beyond the horizon visible from Stonehenge. There is (*pace* Darvill 1997) a fundamental distinction between straight lines radiating from a centre, and circles about that centre, even though both may be represented by simple geometrical constructions on a modern map. Only the former might represent conceptual divisions that resulted from actual observations made from the centre — in other words, from an 'internalized' viewpoint.

Three broad categories of 'radial' cosmological scheme can be distinguished:

a. Divisions of the world into two halves. Apart from Darvill's 'linear binary' interpretation of the Stonehenge landscape, in the early third millennium BC (Darvill 1997, 198), these have received relatively little attention from archaeologists and are not well attested in the ethnographic record.
b. Divisions of the world into four quarters (or, more strictly, into four parts, not necessarily of equal extent). Many known world-views divide the (horizontal) world into four quarters, each quarter being imbued with different fundamental

qualities and meanings. Such cosmologies were, and are still, widespread in pre-Columbian and indigenous Mesoamerica and North America (Young 1989; McCluskey 1993; n.d.). It has been proposed that such schemes were important both at Stonehenge in the later Neolithic (Darvill 1997, 198) and more widely in Neolithic and Bronze Age Britain and Ireland. For example, (roughly) perpendicular axes of symmetry are evident at the Sanctuary (Pollard 1992) and Site IV, Mount Pleasant (Wainwright 1979); hearth orientations in Orcadian houses are strongly clustered around the four intercardinal directions (Richards 1990); and different types of stone appear to have been preferentially used in different quarters of the (solstitially oriented) passage tombs at Balnuaran of Clava (Bradley 1998c).

c. Divisions into more complex sets of radial sectors. World-views incorporating such schemes are well attested in parts of pre-Columbian and indigenous South America, perhaps the best known examples being the *ceques* of Inca Cuzco (Zuidema 1964; Aveni 1997, ch. 5). Only a modest proportion of the *ceque* lines were actually aligned relative to terrestrial or celestial referents, and the assumption that they ran (actually, as opposed to conceptually) straight, over long distances is increasingly being questioned (Aveni 1997, 175). Because of their specificity to context, elements of such schemes are likely to be much more difficult to recognize in the archaeological record.

In addition, we need to check whether there exist significant concentrations suggesting that a special importance attached to a particular radial direction. If this were the case, the horizon declination may show whether it corresponds directly to an obvious recurrent celestial event.

As far as quartering schemes are concerned, it is possible to identify four distinct possibilities:

1. Sectors demarcated by the cardinal directions (azimuths 0°, 90°, 180°, 270°).
2. Sectors demarcated by the intercardinal directions (azimuths 45°, 135°, 225°, and 315°). This might arise where each sector is centred upon the cardinal directions and they are approximately equal in extent. Indeed, each range of directions (as identified in Western terms) might have been conceived as a 'direction', so that orientations that we would regard as being merely within the same sector would have been regarded as being the same (Ruggles 1999a, 148).
3. Sectors demarcated by solstitial rising and setting points. The four sectors would correspond to those parts of the horizon where the sun can rise, set, merely pass over, or never do any of those things. The boundary (solstitial) directions would correspond to declinations of approximately ±24°, which at the latitude of Stonehenge for a horizon altitude between 0° and 1° correspond to azimuths of about 50°, 130°, 230° and 310°.
4. Sectors demarcated by the extreme rising and setting points of the moon. The four sectors would correspond to those parts of the horizon where the moon can rise, set, merely pass over, or never do any of those things. The boundary directions here correspond to declinations of approximately +28° and –30°, which at this latitude for a horizon altitude between 0° and 1° correspond to azimuths of about 41°, 143°, 217° and 319°. (These are not symmetrical about the east–west axis because of lunar parallax: see Ruggles 1999a, 23.) It is important to realize that — unlike the solstitial directions, in whose vicinity the sun appears to rise and set for many days around the actual solstices — the rising or setting moon will only come close to either extreme at monthly intervals during a period of a year or two around every nineteenth year, and even then it will only be seen actually at the theoretical limit if a number of shorter-term cycles happen to coincide (Ruggles 1999a, 36–7).

The four quartering schemes are illustrated in Fig. 4a, in which they are superimposed upon a schematic plan of the Stonehenge 1 enclosure. These four schemes are not, of course, claimed to be the only possibilities, nor were they necessarily mutually exclusive: intercardinal directions and solstitial directions might well have been conceptually indistinguishable, as is the case for the Hopi (McCluskey 1993). Furthermore, obvious as they may seem to us in terms of the overall daily motions of the stars in the sky, it may be a mistake to emphasize the cardinal directions in Western terms: examples are known where concepts of cardinal direction are different from ours — as for example amongst the Chorti Maya of modern Yucatan (Aveni 1980, 40). The third dimension is also an integral part of many Mesoamerican and indigenous North American cosmological schemes (Young 1989, 170).

In Box 2 the various categories of depositional data are examined to determine whether the evidence tends to differentiate between the cosmological schemes listed above, and in particular between the different quartering options. The fact that much of the western side of the monument is unexcavated means that it will often be difficult to distinguish between binary and quadripartite schemes on the

basis of the depositional data. In view of the missing data, the visual display of distributions can also be misleading and for this reason shading has been introduced to indicate the unexcavated parts of the ditch and bank and the unexcavated Aubrey Holes, and hence the radial segments of the monument for which depositional information is not available. In Figures 4b–f, patterns of deposition of particular types of item are shown schematically superimposed on the various quartering schemes in order to illustrate the arguments. (For definitive distribution plots see Figs. 2 & 3.)

Interpretation

Solar quadripartite cosmology and avoidance of the eastern quarter in Phase 1

The distribution of Phase 1 flint debitage suggests that a solar quartering cosmology was important even in the earliest phases of construction of the monument. Other types of deposit do not individually differentiate clearly between alternative possible cosmological schemes, but when taken together, with the exception of the worked chalk at around 54° and 65° which does not fit any obvious celestial referents, there is a general avoidance in Phase 1 of the solar rising portion of the eastern ditch.

In the light of this observation it is interesting to re-examine the question of the orientation of the entrances of the enclosure. All three fall within the northern and southern sectors of a solar quartering, leaving the ditch unbroken throughout the eastern and western sectors where the sun can rise and set. This suggests that previous attempts to interpret the orientation of the main entrance in terms of a direct alignment upon the northerly rising moon may have been mistaken. Nor can we deny that celestial referents may have influenced the orientation of the monument.

This conclusion would imply that the later 'change of axis' to a direct orientation upon summer solstice sunrise represented a shift in the way that the solar connection was expressed, rather than the first expression of such a connection. Already in Phase 2 the avoidance of the sunrise quarter was beginning to break down, with increasing use of this part of the ditch for deposits of animal and human bone, and for human cremations. Indeed, an obvious desire is evident at this time to place human cremations in the eastern quarter, particularly in the Aubrey Holes.

Reference to the moon in Phase 2

The cremations also attest to an extraordinary interest in a relatively narrow sector in the southeast, at an otherwise unmarked part of the enclosure perimeter between azimuths 134° and 142° (although this does precisely correspond to the position of Atkinson's C44 postholes). The same, small, part of the perimeter is also the location of marked concentrations of flint debitage and animal bone in Phase 1, together with the only human cremation dated to this period (although, unusually, antler is entirely absent). Major concentrations of animal and human bone belonging to Phase 2 were also found here.

We do not know whether marked concentrations occurred anywhere in the unexcavated western part of the monument. Nonetheless, the fact that the southeast sector corresponds to the direction of moonrise close to its southern limit, strongly suggests that these cremations and other deposits were placed in relation to the rising moon at propitious times. This does not imply, however, that cosmological associations with the moon necessarily influenced the original design of the monument. Although it has been claimed that the orientation of the main entrance of the initial Stonehenge enclosure was planned in relation to the moon, the evidence seems rather to indicate that the enclosure was planned in relation to a quadripartite cosmology demarcated by the solar solstitial directions. This cosmology is confirmed in patterns of deposition at the earliest stages. Only as successive generations used the monument were the motions of the moon 'discovered' and did they come to assume such symbolic importance that various deposits, including human cremations, were placed with respect to them.

It should not be assumed that non-Western concepts of direction are similar to Western ones. There is ample evidence from pre-Columbian and indigenous groups in the Americas, and from medieval Europe, of a 'direction' being conceived as what we would see as a range of azimuths (Sosa 1989, 132; Köhler 1991, 134). There are compelling arguments for the four directions which are a ubiquitous feature of pre-Columbian and indigenous American world-views (Young 1989; McCluskey 1993; in press) to be understood in this way. It follows that where we find a set of orientations falling within an azimuth range such as one of the sectors in our solar quartering scheme, we should consider that they might have been conceived as pointing in the same direction; it may be unproductive to look for any more subtle or specific meanings (Ruggles 1999a, 148). Indeed there is little in most of the depositional evidence from Stonehenge to compel us to do so, at least in relation to the solar quartering scheme. The

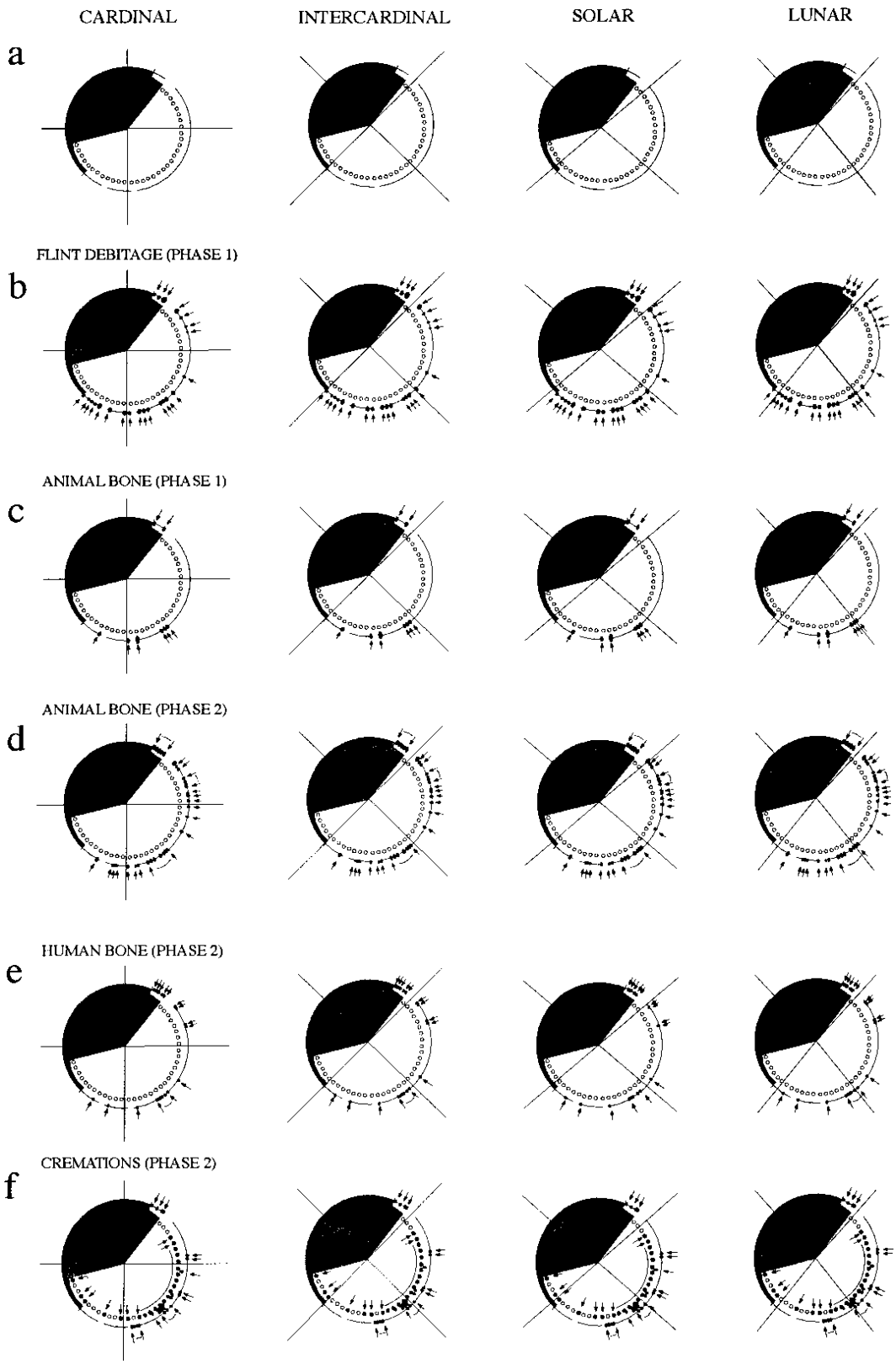

Figure 4. *Stonehenge: schematic representation of quartering schemes and the location of principal deposits. Unexcavated area shown in black.*

Box 2. *Categories of depositional data and possible cosmological relationships.*

Phase 1: Flint debitage

We have already noted that there are concentrations around both sides of each of the three entrance causeways and an almost complete absence of worked flint in the eastern part of the ditch, which is well away from any entrance. The concentrations in the southeast part of the ditch, in the north end of segment 13 and in segments 14 and 15, are interesting because they form an exception to this rule. They fall between azimuths 132° and 149°, which means that under the solar quartering scheme (3), all the main concentrations fall neatly within the northern and southern sectors, that on the eastern terminal of the main entrance being more or less in line with summer solstice sunrise (Fig. 4b). This is not true for the intercardinal and lunar schemes (2, 4) and the data are clearly not consistent with the cardinal quartering scheme (1) or any binary scheme. The evidence is not conclusive, however, as there are minor concentrations in the eastern sector, only the part between azimuths 73° and 115° being completely clear.

Phase 1: Antler

Antler data are only available as average densities per metre of ditch for each segment. Nonetheless there are clear zones of avoidance to the east of the main entrance and around the southern entrance. While there is clear spatial patterning there is no apparent relationship to any of the cosmological schemes proposed and we must assume that other principles were at work.

Phase 1: Animal bone

The main concentration of animal bone in Phase 1 is around the southern entrance. One or two bones were also found by the other entrances. This leaves a few pig bones to the northnortheast at azimuth 26° and the localized concentration of cattle and dog bone in segments 13 and 14, well away from any entrance, between azimuths 142° and 147°. Under either the intercardinal or solar quartering schemes (2, 3) all the Phase 1 animal bones fall clearly within the northern and southern sectors (Fig. 4c). The southeasterly concentration is not technically to the south of the most southerly rising position of the moon, but in practice — since the moon could only have been seen to rise as far south as azimuth 142° under very fortunate circumstances on, at most, a handful of occasions in every nineteenth year — it might well have been perceived to be so. In other words, the data do not discriminate between the three schemes, although the cardinal scheme (1) is firmly refuted once again. So, also, are binary schemes, unless one is prepared to surmise that the 25°–205° axis might have been the one of importance, a conjecture for which there is no independent supporting evidence.

Phase 1: Human cremation

The single human cremation which appears to date to this phase occurs at an azimuth of 139°. A single item cannot discriminate between different cosmological schemes, but it is worthy of note that this obviously exceptional deposit may bear a relationship to the moon. The horizon altitude in this direction is close to 0° and the declination is between –28.5° and –29°. This value, a degree or so inside the theoretical southern limit for moonrise, represents the position where the full moon would be likely to rise around the time of summer solstice for perhaps two or three years before ceasing to do so for another eighteen.

Phases 1 & 2: Worked chalk

Although the phasing is not clear for all the deposits of worked chalk (Fig. 2), it is evident that there was a change of practice in the patterning of deposits of worked chalk between Phases 1 and 2. All the deposits dated securely to Phase 1 are found in the north-east, around the main entrance between azimuths 30° and 65°; whereas there is a strong concentration in quite the opposite direction in Phase 2, running from azimuth 198° (and apparently respecting the southsouthwest entrance, although it had by this time been dug out) to the excavation limit at 224°, together with two scattered pieces at azimuths 84° and 146°. The Phase 1 pattern is seemingly quite different from the patterns of other types of deposit at the time: the only quartering scheme with which it seems consistent is the cardinal scheme (1) (all the deposits fall within the northeast sector). It is also consistent with a binary scheme differentiating between north and south; one would then anticipate that more deposits are present in the unexcavated northwest sector.

Phase 2: Animal bone

Phase 2 animal bone deposits are found all around the ditch and at first sight appear to refute any explanation in terms of a quartering scheme (Fig. 4d). The deposits in the eastern part, however, are still relatively sparse. The main concentrations are on the right-hand side (entering the enclosure) of the main and southern entrances, this sidedness being emphasized by the placing of whole and partial skeletons of piglet and fox close to these right-hand terminals. The main concentrations can also be seen to be distributed in a manner reminiscent of the flint debitage in Phase 1, with sharp cut-offs between azimuths 52° and 138°. This lends tentative support to a solar quartering scheme with the major concentrations being confined to the northern and southern sectors, although the southeasterly cut-off is some 8° further south than is strictly necessary. Taken by itself, this cut-off might be interpreted in terms of an avoidance of the part of the easterly horizon where the moon rises (i.e. a lunar quartering scheme), but the concentration at the eastern terminal of the main entrance argues against this. Another temptation might be to interpret the main concentrations adjacent to the two entrances purely in terms of sidedness in relation to those entrances, and the other main concentration between azimuths 138° and 143° in terms of a direct association with the southern rising moon. Clearly these data do not, as they stand, have the power to discriminate convincingly between several possibilities. Trying to separate animal bones of different types does not seem to provide any significant clarification, although it is perhaps noteworthy that, with a single exception at azimuth 87°, dog bones are only found in the northern and southern sectors and conform to the intercardinal and solar quartering schemes.

Phase 2: Human bone

The main concentration of human bone, which only appears in Phase 2, is to the NNE, from 27° to the excavation limit at 22°. Small concentrations are found to the southeast between azimuths 139° and 151°, and to the northeast around azimuth 72° (Fig. 4e). There are scattered deposits elsewhere, including in three of the four entrance terminals, and a complete avoidance

Box 2. *(cont.)*

of the eastern part of the ditch between 72° and 124°. But for the concentration at 72° and a single deposit at 124° the data would be confined once again to the northern and southern sectors in a solar quartering scheme, but in view of these deposits the explanation is not convincing. It should be noted that the cut-off of the southeasterly concentration of human bone deposits at 139° corresponds exactly to the more prominent cut-off in the animal bone deposits, and that the two distributions are very similar in general.

Phase 2: Human cremations

Cremations in the ditch are concentrated on the right-hand terminals of both entrances and in three small groups in the eastern sector, around azimuths 83°, 116° and 134°. There are none to the west of south in the excavated part of the ditch. Cremations are found in every Aubrey Hole between azimuths 61° (the cut-off beyond Aubrey Hole 2 to the northwest is probable, but not certain owing to later disturbances) and 164°, with a dramatic concentration between 134° and 142°, where cremations were placed not only in the Aubrey holes but around them, mostly between the holes and the ditch. A macehead was found in association with one cremation at azimuth 138°. Even if the cut-off at 61° is real, it does not help to distinguish between potential quartering schemes, since the range from 61° to 164° straddles two sectors in each of them (Fig. 4f). The fact that cremations are also found in several Aubrey Holes round to the southwest and west also provides little to strengthen the case in favour of any particular schemes. There is a clear interest, however, in placing cremations in holes ranging from east-northeast round to southsoutheast, and the concentration in the southeast demands interpretation. Assuming a horizon altitude of 0°, the azimuth range 134° to 142° corresponds to a declination range from –26° to –30°. The latter represents the very southerly limit of moonrise at the time, and the distribution is exactly as one might expect if cremations were placed in line with the rising full moon at midsummer in years close to the eighteen-yearly 'major standstill'. Those cremations occurring to the south of azimuth 123°, could have been aligned in relation to the rising midsummer moon in other years, and those further to the north by the rising full moon at other times of year.

Phase 2: Other deposits in Aubrey Holes

Deposits of antler, worked flint and chalk are found in some of the Aubrey Holes in the southwestern sector. Generally, but not always, these are in the same holes as human remains. The distribution follows the pattern for worked chalk in the ditch. The only quartering scheme with which it seems consistent is the cardinal scheme (1) (all the deposits fall within the southwestern sector), though it is also consistent with a binary scheme differentiating between east and west (one would then anticipate that further deposits are present in the unexcavated northwestern sector).

sole exception is sustained interest in the narrow sector of the enclosure perimeter between azimuths 134° and 142°, and its apparent relationship with a specific lunar event — the rising of the midsummer full moon. In other words, there may be a fundamental difference between the concepts of directionality underlying the solar quartering scheme and the more specific directional relationship between certain deposits — and in particular human cremations — and a specific lunar event which gave rise to the concentration of deposits in a part of the southeastern perimeter.

Movement and sidedness

In emphasizing radial directions from a fixed centre, there is a danger of failing to consider symbolism of orientation relative to the (moving) individual (Darvill 1997, 169–73; Whittle 1997, 161–2). Cosmologies can be conceived in relation to the body and not just in relation to a fixed point within a monument or landscape. Principles of bodily classification are often at the heart of schemes of cosmological ordering. Tilley, following Hertz (1960), has remarked on 'the widespread dualism of right and left hand symbolism . . . in which linkages are set up between the Left and darkness and evil, the cardinal directions west or north, the world of the profane, weakness and death, and Right and birth, the sacred, light, east or south, goodness, fertility and strength' (Tilley 1996, 241). We would not necessarily accept these particular sets of associations as being current in the British later Neolithic, and indeed, as a counterpoint, might note the concentration of human cremations within the southeast sector of Stonehenge (here, death apparently linked to the east). It is clear, however, that principles of sidedness, almost certainly related to wider cosmological schemes, played a structuring role in the organization of deposition. This is clearly visible during Phase 2, with depositional activity focusing on the right-hand sides of the enclosure ditch at both major entrances. In this respect, deposition was not only organized in relation to the overall format of the enclosure, but contextually situated in relation to orchestrated movement of participants in ceremonial practices as they progressed into, around, and out of the monument.

The wider landscape

It may be asked whether the solar quartering scheme operating within the Stonehenge enclosure extended into the surrounding landscape. We should bear in mind that Neolithic cosmologies are likely to have

been conceived not only in relation to single fixed points within the Stonehenge landscape (i.e. Stonehenge itself), but as spatial orderings which were contextual — understood in relation to various monuments, occupation sites, and other sacred or symbolically-charged places in the landscape, as well as to the position and bodily orientation of the individual. Darvill's (1997) argument for the projection of a linear quadruple partitioning of space out of the monument on to the surrounding landscape, although perhaps working as a 'symbolic ideal', therefore becomes problematic, especially beyond the immediate 'visibility envelope'. The example of the Inca *ceques* illustrates the difference between the perceived scheme of straight lines radiating out from Cuzco, as recorded by the chronicler Cobo, and practical reality — the actual layout of the lines on the ground, which often change direction sharply at *huacas* (sacred places marked by shrines) and zigzag through the landscape (Aveni 1997, 160–61; Bauer 1998, 10–11). It is also dangerous to present what was probably quite a fluid social landscape as a static symbolic 'scheme' (cf. Parker Pearson & Ramilisonina 1998) — an ordering principle which somehow defied the changing historical conditions of habitation. The Stonehenge landscape was continually reworked through changing patterns of occupation and new monumental constructions. Time could 'stand still' within monuments, or be presented as standing still through the continuity of the public rituals held there (cf. Bradley 1991) — but the landscape of the 'everyday' was most likely one of piecemeal change and continual renegotiation.

Conclusions

The subject of astronomical symbolism, in the context of Stonehenge as at other conspicuous Neolithic and Bronze Age monuments, has tended to engender extremes of interpretative approach. On the one hand, there have been highly quantitative analyses bearing little or no relationship to current frameworks of ideas within prehistoric archaeology, concentrating on a very restricted subset of the material evidence considered in isolation from its broader archaeological context, and tending to be methodologically flawed in any case (cf. Ruggles 1999a, 38–40, 144). On the other, archaeologists with theoretically plausible and interesting ideas considering a broader range of evidence have tended to be highly selective about that evidence, often making too little effort to use the evidence to 'test' different ideas critically, and sometimes guilty of technical errors as regards the astronomy.

In this article we have attempted a detailed analysis of depositional patterning during Phases 1 and 2 at Stonehenge as a means of testing different cosmological schemes, working on the premise that depositional practices are likely to have been enacted in relation to spatial divisions created and sustained through reference to cosmologies. Our conclusions suggest that the early structure of the monument, and attendant depositional practices, embodied a scheme of radial division, including a symbolic quartering primarily demarcated by solstitial rising and setting points. This is in accord with Darvill's scheme of a 'linear quadruple' partitioning for Phases 2 and 3 (Darvill 1997, 182–9), although we would argue that such a division was present from the very beginning of the monument (Phase 1). Whilst the Stonehenge enclosure was planned in relation to solar solstitial directions, the evidence also suggests that solar- and lunar-derived cosmological schemes were not mutually exclusive, and that it was through long-term ritual practice that the motions of the moon came to be increasingly referenced through deposition. It is perhaps of significance that those deposits most closely allied to the motions of the moon are of human bone (principally cremations). The evidence is also consistent with the possibility that this association between death and the moon may have been present from the beginning, but only gained prominence with the increasing deposition of human remains during Phase 2. On the other hand, the evidence seems to contradict earlier claims (cf. Burl 1987, 65–71; Bradley & Chambers 1988, 286–7; Bradley, in Barrett *et al*. 1991, 56–7; Tilley 1994, 196–7) of a sudden shift in and around Wessex during the mid-third millennium BC from a predominantly lunar to a predominantly solar cosmology.

In one form or another, Stonehenge always embodied notions of time — both of time past and continuity — in a world of punctuated social change. It has been argued that the numerous structural changes to the monument were encompassed within a presentation of a static sacred order (Bradley 1991), and that reference to cosmologies constituted in relation to the repeated and unfaltering motions of the sun and moon may have served to legitimate this. Yet it was through various forms of ceremonial practice and the continual reworking of symbolic schemes that the sense of 'timelessness' and unchanging order of the universe had to operate. Subtle change was an inevitable consequence, and we have outlined this in relation to Phases 1 and 2 by reference to the character of depositional activity. Whilst the monument was initially planned in relation to solar

solstitial directions, it was through participation in ceremonies and depositional activity that lunar-derived schemes took on greater importance. This shift may not have operated in isolation, with relevance only to Stonehenge, but could have served to transform, or could have been transformed by, everyday social practices and broader understandings of the world and its symbolic relations which structured many aspects of routine existence.

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