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Stonehenge's Avenue and Bluestonehenge

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Stonehenge has long been known to form part of a larger prehistoric landscape (Figure 1). In particular, it is part of a composite monument that includes the Stonehenge Avenue, first mapped in 1719–1723 by William Stukeley (1740) who recorded that it ran from Stonehenge's northeast entrance for over a kilometre towards the River Avon, bending southeast and crossing King Barrow Ridge before disappearing under ploughed ground. He also noted that its initial 500m-long stretch from Stonehenge was aligned towards the midsummer solstice sunrise.

Archaeological excavations during the 20th century revealed that the Avenue consists of two parallel banks with external, V-profile ditches, about 22m apart. The dating, phasing and extent of the Avenue, however, remained uncertain. Its length could be traced no closer than 200m from the River Avon (Smith 1973), and the question of whether the Avenue's construction constituted a single event had not been entirely resolved (Cleal *et al.* 1995: 327).

Our investigations were part of a re-evaluation of Stonehenge and its relationship to the River Avon in 2008–2009, involving the re-opening and extension of trenches previously dug across the Avenue during the 20th century and digging new trenches at West Amesbury beyond the then-known limit of the Avenue. The result of this work was the discovery of a new henge at West Amesbury, situated at the hitherto undiscovered east end of the Avenue beside the River Avon. Inside that henge were found the remains of an earlier circle of stoneholes, formerly holding small standing stones, that has come to be known as 'Bluestonehenge'.

Two of the aims of the Stonehenge Riverside Project (SRP) were to establish whether the Avenue was built in more than one phase, and whether it actually reached the river, thereby addressing the theory that Stonehenge was part of a larger complex linked by the river to Durrington Walls henge and its newly discovered avenue, two miles upstream (Parker Pearson & Ramilisonina 1998; Parker Pearson *et al.* 2007). A further opportunity to investigate the Stonehenge Avenue arose in August 2013 when Wessex Archaeology excavated along the line of the decommissioned A344 road (constructed in the 1760s) that runs across the Avenue close to Stonehenge, with the aim of examining the condition of the Avenue and its ditches where it lay under the road (Wessex Archaeology 2015).

This paper describes the most significant results from these 21st-century investigations along different parts of the Stonehenge Avenue and at West Amesbury henge, beside the River Avon. These were primarily along that part of the Avenue nearest Stonehenge (the solstice-aligned section of the Stonehenge Avenue) and at West Amesbury henge (within which is the former stone circle of

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Bluestonehenge). Other investigations at the Avenue bend (500m northeast of Stonehenge; see Figure 5) are not included.

The solstice-aligned section of the Stonehenge Avenue
Richard Atkinson's 1956 trench C48 (Cleal *et al.* 1995: fig. 178; SRP's Trench 45) was re-opened and extended by hand 2m southwards to form a trench 4m x 26m (Figure 2). Atkinson's photographs and section drawing revealed gullies within the Avenue that were interpreted as periglacial fissures (Cleal *et al.* 1995: 311) but their orientation parallel with the Avenue's axis suggested the possibility that they were, in fact, artificial features, such as palisade trenches or footings for timbers laid in order to slide stones or sledges.

On excavation in 2008, the gullies were confirmed to be surprisingly large and deep periglacial stripes, consisting of 0.5m deep and 0.4m wide fissures in the chalk bedrock (Figure 3), filled with clean, beige-coloured silt formed from an admixture of material derived from weathered or soliflucted chalk and reworked aeolian loessic silt deposits (Figure 4). They were considerably more substantial than the much smaller periglacial stripes (less than 0.2m wide and 0.1m deep) observed in other trenches beside the Avenue and at its bend, and considerably deeper than many others regularly recorded on the chalk more widely. They are entirely natural features that formed long before human activity in the Holocene.

Earth resistance and fluxgate magnetometer surveys reveal linear anomalies running along the line of the Avenue, but cart-tracks running within it on the same axis are partly responsible for these geophysical linear anomalies (see also Darvill *et al.* 2012a: 83–4). These cart-ruts are only 0.08–0.18m deep, far shallower than the periglacial fissures, and are visible in the magnetometer surveys as the thin linear anomalies that dominate, especially near the Avenue bend. Stronger and wider anomalies near the start of the Avenue are more likely produced by the periglacial fissures.

Periglacial stripes are frost-heave cryoturbation features primarily created by *in situ* freeze–thaw alteration of the chalk, combined with ice removal and solution of loose chalk material (West 1968: 73–4). On the Wiltshire chalk, these cryoturbation structures are found on slopes of generally greater than 2° but less than 5° (Williams 1973: 26–7; French 1976): the 'general result is … of parallel gullies orientated in a downhill direction' (Evans 1968: 14), and usually in a slight diagonal direction across the slope.

The presence of extraordinarily large and closely spaced periglacial stripes within the Avenue is possibly explained by the presence of natural ridges on either side of the concentration of stripes, and a natural dishing of the area between. These stripes are not water-cut channels *per se*, but freeze–thaw channels which, once created, will have encouraged water movement down them. Freeze–thaw action within and between the two natural ridges will have accentuated periglacial cryoturbation and infill processes, thus enlarging the periglacial stripes. The ridges can be seen in Hawley's photograph of his excavations outside Stonehenge's northeast entrance (Hawley 1925: plate X; Cleal *et al.* 1995: fig. 184) and are visible as earthwork features running for 150m or so from the Heel Stone (Field *et al.* 2012: fig. 10) but not as far as the Avenue bend (Figure 5).

These two natural ridges (each *c.*6m wide) were initially thought to result from differential weathering of the chalk surface, with those areas beneath the Avenue banks being protected to a greater degree. However, the ridges are far wider than the banks, which are up to 4.3m wide and stand only 0.1m high. As is the case with the bank and ditch enclosing Stonehenge (Cleal *et al.* 1995: fig. 48), such a degree of differential preservation of bedrock can only be achieved at the base of a very substantial bank, thus certainly not possible in the case of the Stonehenge Avenue's insubstantial banks.

There is no evidence for the natural ridges having being formed by cultivation outside the Avenue's banks reducing the soil/chalk level, thus leaving the Avenue banks and underlying chalk artificially raised. There is no evidence of any plough-soil or plough-marks up against the sides of the Avenue within Trench 45; field banks and lynchets have been mapped in this landscape but much further away (Field *et al.* 2012). Nor is there any evidence of ploughing – ancient or modern – in another trench (Trench 44), just 50m away; furthermore, absence of ploughing is indicated in that trench by the sharp boundary of sarsen chips in its shallow soil (Parker Pearson 2012: 251). Finally, differential plough erosion is not a persuasive explanation for formation of the narrow hollow between the two natural ridges.

The 2008 excavation across the Avenue in Trench 45 revealed few features. One of these was a small tree-hole cutting through the ancient land surface. Another was an irregular, shallow pit (or a pair of pits) lying within the Avenue. This pit went undetected during the 1956 excavation but was found in 2008 to be 1.7m E–W x 1.4m N–S x 0.23m deep, containing sarsen and bluestone chips as well as a small red deer antler pick at its base. The pit was partly covered by the edge of the Avenue bank but whether this was primary upcast or secondary material from re-cutting of the Avenue ditch could not be determined. The slightly 'dirty' appearance of the upcast chalk in this part of the bank suggests the latter.

Many of the 3,535 small flakes and fragments of sarsen and 71 bluestone fragments in Trench 45 came from two patches of buried soil beneath the Avenue banks, confirming that dressing of Stonehenge's stones was carried out prior to the Avenue's construction (see also Pitts 1982: 101–2; Hawley 1925: 23). Excavation of Trench 44, 50m to the northwest, confirmed that the Avenue was cut through the eastern edge of a 100m-wide (east–west) spread of sarsen debris deriving from the dressing of monoliths outside the Stonehenge enclosure (Parker Pearson 2012: 248–52).

The 2013 excavation by Wessex Archaeology along the line of the A344 road

The road surface and sub-base were removed by machine, down to the lowest chalk and flint bedding layer which lay directly over the natural chalk (Figure 6). Some but not all of this bedding layer was also removed, exposing parts of both Avenue ditches. These were cleaned by hand, and slots excavated through them; the northern edge of the Heel Stone ring-ditch was also exposed, and a narrow slot excavated through it. Finds from the Avenue ditches included 110 pieces of struck flint, recovered from throughout their fills, and nine fragments of bluestone and sarsen from their tertiary fills.

Since some of the bedding layer remained unstripped, the sides of the Avenue ditches were only established at the two excavated slots, and not across the full width of the road. In areas within the Avenue where the bedding layer was removed the natural geology was exposed; this consisted of degraded chalk with the periglacial stripes aligned northeast–southwest. The Avenue ditches (and the natural geology) had not been significantly truncated by the road construction, both ditches surviving to depths of 0.75–0.8m, comparable with the sections to the immediate north and south previously excavated by the Vatchers and by Pitts (Cleal *et al.* 1995: fig. 180; Pitts 1982: fig. 13). Not surprisingly, there were no surviving traces of the Avenue banks.

Geology and the solstice: a meeting of earth and heavens

It is possible that the two 6m-wide parallel ridges would have been observable by prehistoric people as upstanding features, and the periglacial stripes as areas of lusher vegetation growing on the fissures' greater depth of soil, in this largely open landscape of Salisbury Plain in the early Holocene (Figure 7; Allen & Gardiner 2009; 2012). This remarkable coincidence of a geological landform on a solstitial axis has to be considered as a feature which was meaningful to people of the 3rd millennium cal BC, so much so that they later embellished and accentuated it by heightening the natural ridges with artificial banks flanked by ditches.

Appreciation of this solstitial alignment is perhaps easiest when facing towards the midsummer solstice since there is a clear view down the Avenue to the distant northeastern horizon. In the opposite direction southwestwards to midwinter sunset, one can only see the very near horizon (and, from just above the Avenue elbow, the tops of the taller stones, already in place by the time of the Avenue ditches' construction [see below]), but not the far horizon. However, when walking southwestwards, an observer would see the stripes leading up to – and they can be followed up to – the nearby horizon, where a view opens up into the further distance. When seen from this part of the Avenue, some 250m away from the sarsen circle, the solstitial sun would have set diagonally into the top left of the monument. This is about half a degree (or one solar diameter) higher than the distant horizon. Since the sun comes down at around 45 degrees to the horizontal, the azimuth of the sunset from here was about half a degree to the left of (further south than) the axis of the monument (and the direction of solstitial sunset as viewed from within the monument itself). Passage southwestwards along the stripes would thus involve an element of hierophany (sacred revelation) which is missing in the other direction.

Such views are likely to have been possible in the Neolithic and even earlier in the Holocene, because of the limited growth of forest on the chalk uplands of Salisbury Plain. Evidence from buried soils, pollen and mollusca reveals that the Stonehenge landscape was largely deforested by the 3rd millennium cal BC and that earlier post-glacial woodland regeneration was incomplete and patchy (French *et al.* 2012).

The discovery that the Avenue ditches follow the general direction of this series of natural striations adds a new dimension to the interpretation of the solstitial alignment of the Avenue. With these periglacial features forming a natural approach to the monument, they may have been a key factor in defining its axial orientation. On one hand, this solstitial alignment might have been considered merely a fortuitous coincidence of nature. On the other, with the striations visible in the different patterns of vegetation, they could have been thought of as deliberately aligned upon the rising summer solstice and setting winter solstice sun. As an auspiciously aligned natural feature, they might have been considered a powerful affirmation of cosmic harmony (*cf* Ruggles 2007: 318; 2014: 2239–41 for examples in Polynesia).

A similar phenomenon has been noted at another Neolithic ceremonial complex in Britain, the Ness of Brodgar in Orkney, Scotland (Card 2013) where a large, walled settlement is located on a natural peninsula between the stone circles of the Ring of Brodgar and the Stones of Stenness (Richards 2013: 64–118). The Brodgar peninsula is aligned roughly southeast–northwest along the solstitial line of midwinter sunrise–midsummer sunset (Nick Card & Euan MacKie pers. comm.). As seen from the Ness, the midwinter solstice sunset (on the other solstitial line) occurs behind the prominent Hills of Hoy (Nick Card pers. comm.). The Ness was thus a prominent natural place in the Neolithic not only because of the terrestrial landscape but also because of the natural solstitial possibilities that it offered.

Closer to Stonehenge, the 100m-long Durrington Walls avenue (see Figure 1) is aligned within 1° of midsummer solstice sunset (Ruggles 2006: 19–20; Parker Pearson *et al.* 2007: 633). Its artificial flint surface, constructed in *2515–2480 cal BC* (*95% probability*) and leading to the midwinter solstice sunrise-oriented entrance of the Southern Circle (a concentric timber circle), was laid upon a natural deposit of frost-shattered flint that formed a natural 'avenue' along the bottom of a roughly solstice-aligned dry valley.

Finally, Stonehenge's proximity to a line of three Early Mesolithic postholes that held large pine posts (1m in diameter), just 250m to the west of the Avenue (Allen 1995), hints at the possibility that this unusual solstitial alignment formed by the ridges and stripes was recognized long before the Neolithic. These vertical pine posts or tree-trunks were erected, probably one after the other, most likely in the first half of the 8th millennium cal BC (Marshall *et al.* 2012: 12) by hunter-gatherers, three millennia before the beginning of agriculture in Britain. Monuments built by hunter-gatherers are generally rare; whilst large pits are known from this period (Allen & Gardiner 2002; Murray *et al.* 2009), the Stonehenge postholes are unparalleled anywhere in northern Europe's Early Mesolithic. It is also notable that the adjacent stretch of the River Avon has revealed traces of Mesolithic activity, notably at Blick Mead, from the 8th millennium cal BC through to the late 5th millennium cal BC (Jacques & Phillips 2014; Pitts 2015), making it potentially an unusually 'persistent place' (Barton *et al.* 1995) within the early Holocene.

It is entirely possible that the ridges and stripes were known in the Early Mesolithic, only to be forgotten and rediscovered millennia later in the Late Neolithic. Yet the long chronological sequence at Blick Mead and the Stonehenge environs' evidence in the Neolithic prior to Stonehenge for large-scale gathering at the Coneybury anomaly (Richards 1990: 40-61) and labour mobilization at long barrows and the two cursuses (Richards 1990: 72-93; Thomas *et al.* 2009) raises the possibility that the pair of natural ridges and large periglacial stripes were attributed significance over millennia. That said, however, there is no indication from positioning or alignments of these long barrows and cursuses that the pair of natural ridges featured in people's awareness during the earlier Neolithic period.

West Amesbury henge and the riverside end of the Avenue

Two trenches excavated in 2008 and 2009 at the riverside end of the Avenue revealed its two ditches running southeast towards the River Avon (Figure 8). The width of the Avenue here is 19.3m, slightly narrower than at the Stonehenge end. Its ditches here are up to 1m wide x 0.6m deep, containing at their base closely spaced holes for posts or stakes, 0.08m–0.18m in diameter. The uppermost fill of the east ditch produced a quantity of flint flakes, blades, cores and a ripple-flaked oblique arrowhead (Parker Pearson 2012: 67), a projectile form dating to *c.*2600–2400 cal BC.

The evidence for palisades in the Avenue ditches raises questions about the palisades' likely length. Did they extend from this end of the Avenue as far as the area excavated in 1973, some 130m away (Smith 1973)? The riverside terminal of the Stonehenge Avenue remains unlocated; it was not revealed by geophysical survey, and the extent of excavation in 2009 in this area was restricted by the protected status of this site as a scheduled ancient monument. Nonetheless, the Avenue has to have ended within 5m north of West Amesbury henge, a small henge at the riverside.

The henge was originally *c.*30m in diameter. Its bank was *c.*3m wide but is almost entirely missing (although its eroded remnants have preserved a pocket of brown forest soils containing a modest assemblage of 268 Late Mesolithic-?Early Neolithic flints, including two microliths). The lack of redeposited bank material in the henge ditch suggests that the henge had a relatively wide berm. The henge ditch was probably circular, 2.6m wide x 1.2m deep with a V-shaped profile (Figure 9). On its east side, the ditch appeared to narrow to a terminal that probably formed the north side of an east-facing causeway or entranceway. On the north side, two opposite, protruding ditch sides suggest the former presence of a north-facing entrance, 2m wide, but removed in antiquity before silts began to accumulate in the ditch bottom. Nearly a third of the henge ditch on its south side has been eroded by the River Avon.

The primary fill of the ditch on its northeast side produced a broken-off tip of an antler pick, embedded in a pocket in the bedrock and dating to 2460–2210 cal BC (95% confidence; weighted mean 3859±17 BP of SUERC-23207, 3825±30 BP, OxA-20351, 3891±29 BP, and OxA-20357, 3858±27 BP; T'=2.5; T'[5%]=6.0; *v*=2; Ward & Wilson 1978). Further east, a placed deposit in the ditch terminal consisted of two large pieces of antler, an antler pick, a cattle sacrum, a cattle rib, a small quartzite hammer-stone, small sherds of Grooved Ware and a small assemblage of worked flints. Beaker pottery came from the layer above this.

Bluestonehenge

Within the centre of West Amesbury henge, nine stoneholes (Table 1) were identified within two trenches dug in the west and north sides of the monument (Figure 10). Five of them lay entirely within the trenches (B–E, J) and four lay partially or largely within the baulks of the trenches (A, F, I, K). All the stoneholes had ramps positioned on the outside of the circle, perpendicular to its circumference, and all stoneholes were set within an inter-connecting arc-shaped feature. The ramps give the arc of Stoneholes A–F a scalloped fringe. We believe that these ramps relate to the removal rather than the erection of monoliths within the pits; their shallow, fan-shaped forms are very different to ramps associated with the insertion of posts into postholes (*e.g.* Wainwright with Longworth 1971: fig. 12).

Distances between centres of Stoneholes A–F average 1.16m. If this spacing was continuous around the circle then the circle's radius would have been about 4.85m and its circumference 30.45m, providing spaces for 26 standing stones.

The stone circle was preceded by a flat-bottomed, 0.85m-deep pit (pit AA), cut by Stoneholes A and B. Within the circle's cut features, finds from contexts associated with the stones' removal includes a few indeterminate sherds (in Stoneholes A and B), a chisel arrowhead (from Stonehole A), a micro-denticulate blade, and a flake of micaceous Mesozoic sandstone (of southern English provenance) from Stonehole D, and two antler picks. One pick from the ramp of Stonehole A dates to 2470–2210 cal BC (95% confidence; OxA-21278; 3884±30 BP). The other from the fill of Stonehole C dates to 2470–2200 cal BC (95% confidence; SUERC-27051; 3855±30 BP). A fissured and pitted fragment of pig humerus from the void left by removal of the stone in Stonehole C was radiocarbon-dated to 2840–2470 cal BC (95% confidence; SUERC-26460; 4040±35 BP).

Finds from construction layers were very few. Packing layers in Stonehole J included a micro-denticulate blade, a deer tooth and the tip of a worked bone point, whilst those in Stonehole K included a chisel arrowhead. The deer tooth dates to 2480–2230 cal BC (SUERC-32162; 3890±30 BP).

Bluestone monoliths

There are good reasons for identifying the holes A–F and I–K as stoneholes and not pits or postholes:

1. The holes are too shallow for posts, given their widths. They are most closely comparable with the bluestoneholes at Stonehenge (see Parker Pearson *et al.* 2009: fig. 8).
2. A direct comparison of posthole and stonehole was possible within the circle itself, since a posthole of similar diameter (with post pipe) was inserted into the backfilled, dismantled circle; it was deeper (1.4m below the top of the bedrock) than any of the stoneholes.
3. There was no evidence for any hourglass-shaped disturbance which might have been caused by levering posts back and forth to loosen them.
4. The considerable weight of the uprights, enough to cause compression through the cushion layers (see below) and into the soft decayed chalk bedrock beneath, indicates the presence of stone rather than timber uprights.
5. The imprints left by such compression reveal a variety of basal cross-sections from oval to rectilinear to triangular and indented, in contrast to the usual circular cross-sections of Neolithic timber posts.

Although no bluestone chips were found within Bluestonehenge, we can be confident that these stones were not local sarsens but bluestones:

1. The dimensions of the stones' imprints and voids are directly comparable to Stonehenge bluestones, whose thin pillar-shaped forms are much narrower than any of the slab-like sarsens from either Stonehenge or Avebury.
2. The basal imprints of each stone exhibit characteristics shared with Stonehenge's bluestones, namely rectangular, oval and triangular cross-sections. In particular, the imprint of Stone D (Figure 13) is similar to the distinctively indented cross-section of Bluestone 68 at Stonehenge (Figure 14; Gowland 1902: fig. 7; Cleal *et al.* 1995: figs 116, 122 & 124).

Sequences of erection and dismantling

One of the curious features of the stoneholes' construction was the diversity of methods for preparing the hole to take the stone. In Stoneholes A, C, D and F the preparation for the stone involved the laying of a relatively flint-free cushion of clay. In Stoneholes B and J, a pad of compacted clay and flint nodules was laid down first, followed by a flint-free clay 'cushion'. In Stonehole E, an elaborate nest of flint nodules was constructed but without a clay 'cushion'. Packing layers also varied, with some laid multiply and horizontally, and others tipped in at an angle. The variation in stonehole preparation suggests that different methods were involved in erecting each of the stones, perhaps employed by separate groups with responsibility for each stone.

The current ground surface has been built up by centuries of deposition and cultivation in this area of West Amesbury's medieval village. Topsoil depth of 0.3m is probably far greater than it was in prehistory; a best guess estimate for soil depth when the circle was constructed might be 0.1m. The standing stones might thus have been set 0.85m–1.35m (average 1.12m) into the ground. This compares closely to the depths of bluestone oval and circle sockets at Stonehenge, mostly 0.8–1.3m below ground surface (average 0.98m–0.99m BGS).

The sequence of stone removal involved loosening the standing stone, with varying degrees of disturbance of the packing, and then hauling out the monolith, estimated to have weighed *c.*2 tons, at angles between 30° and 70° to the horizontal (Figure 11). Some of these angles are considerably steeper than the likely average angle of 35° for withdrawal of monoliths from the Aubrey Holes (Cleal *et al.* 1995: figs 51–55) and may even have required heavy lifting gear in the form of a large, timber A-frame.

Dating the Avenue

Six radiocarbon measurements from samples from excavations at various locations along the Avenue have previously been obtained; one from AERE Harwell (HAR-2013), two from the British Museum

(BM-1079 and BM-1164), two from the Oxford Radiocarbon Accelerator Unit (ORAU; OxA-4884 and OxA-4905), and one (I-3216) from Teledyne Isotopes (USA) (Allen & Bayliss 1995). Two of these measurements can be excluded – I-3216 on the grounds that it contains bones from different trenches and BM-1079 because of potential contamination by humic acids (Allen & Bayliss 1995: 518–19). For this project, replicate samples from a small red deer antler pick laid on the base of a pit within the Avenue were dated at ORAU and SUERC.

The three measurements on this antler pick from Trench 45 (OxA-20011, OxA-20350 and SUERC-23205) are statistically consistent ($T'=5.8$; $T'(5\%)=6.0$; $\nu=2$; Ward and Wilson 1978) and a weighted mean has therefore before taken before calibration (SAV 045 [1027]: 3827±17 BP).

Stratigraphy indicates that the antler pick from the 2008 excavation was deposited after initial construction of the Avenue bank but prior to the rebuilding of the bank created by a second episode of re-cutting of the Avenue ditch. The most suitable model is:

1. Ditch cutting, dated by OxA-4884;
2. Ditch silting/re-cutting, dated by HAR-2013 below/within junction of primary fill and re-cut;
3. Ditch re-cutting, dated by OxA-20011, OxA-20350, and SUERC-23205 under bank of re-cut;
4. Ditch silting after re-cutting, dated by BM-1164 about 0.5m above the ditch bottom in a re-cut.

This model shows good overall agreement between the radiocarbon dates and stratigraphy ($A_{model}=70$; Figure 12a). An antler (OxA-4884) recovered from the bottom of the Stonehenge terminal of the north ditch provides the best estimate for the date of construction of the Avenue of *2500–2270 cal BC* (*93% probability*; Figure 12a) and probably *2420–2285 cal BC* (*68% probability*). The model also provides an estimate for the re-cutting of *2250–2135 cal BC* (*67% probability*; *re_cut;* Figure 12a).

Dating Bluestonehenge

Four samples were dated from contexts most likely associated with the removal of uprights from the stoneholes. The deer tooth from the primary fill of Stonehole J only provides a *TPQ* of 2480–2230 cal BC (SUERC-32162; Figure 12b). It could potentially be residual but just as likely may have been introduced as a contaminant into this packing layer when the standing stone was removed. The pig humerus from the disturbed upper fill of Stonehole C provides a *TPQ* for the removal of its stone of 2840–2470 cal BC (SUERC-26460; Figure 12b).

The two radiocarbon dates on antler picks from Stoneholes A and C, falling within the 25th–23rd centuries cal BC, most likely date the dismantling of Bluestonehenge, not its construction. Dates on charred cereal grains from the primary fills of the stoneholes are all medieval, highlighting the problems of bioturbation of small items in chalkland stratigraphy (Atkinson 1957). The only diagnostic find from the stoneholes' primary fills is a chisel arrowhead (*c.* 3400–2600 cal BC) from Stonehole K. The radiocarbon date from the deer tooth may indicate that Bluestonehenge was erected after 2465–2295 cal BC (68% confidence) but, alternatively, the tooth may be intrusive. If so, the chisel arrowhead indicates that the stone circle was erected early in the 3rd millennium cal BC – perhaps contemporary with a bluestone circle in the 56 Aubrey Holes in 3000–2920 cal BC (Parker Pearson *et al.* 2009; Darvill *et al.* 2012b: 1026) – and the radiocarbon dates show it being dismantled after the first quarter of the 25th century cal BC.

While Bluestonehenge's date of construction remains unclear, the date of its dismantling falls in the same time-period as the construction of the Avenue and West Amesbury henge. In engineering terms, it is logical that the orthostats were removed prior to the construction of the henge's bank and ditch. But what happened to the 26 or so bluestones? The answer is that they probably went to Stonehenge, perhaps transported along the line of the Avenue since this provides the gentlest gradient between the two points, as far as the Avenue bend. Stonehenge stage 3 dates to this period (*2405–2225 cal BC* to *2300–2105 cal BC* (*95% probability*); Figure 12b), when its hitherto-blocked entrance was re-opened, by removing sarsen Stones D and E, and an arc/circle of bluestones was erected in the centre of Stonehenge (Darvill *et al.* 2012b: 1026). Although not enough of the central area at Stonehenge has been excavated to reveal more than an arc of five bluestoneholes, they have a similar spacing and estimated ring diameter to the stoneholes at Bluestonehenge.

Conclusion

The discovery of West Amesbury henge and, within it, the dismantled remains of Bluestonehenge stone circle, adds a new dimension to our understanding of Stonehenge as a composite monument of two circles linked by a ceremonial avenue. It also emphasises the likely significance of the River Avon, beside which West Amesbury henge is located. This research supports the idea that Stonehenge's first stage (as a bank and ditch enclosing a bluestone circle) was accompanied by a smaller bluestone circle beside the River Avon.

The dismantling of this stone circle at West Amesbury occurred around the same time as the digging of the Avenue's ditches, and a rearrangement of bluestones at Stonehenge during its stage 3, from which time onwards Stonehenge displayed the total of 80 or so bluestones estimated to have been set up there (Atkinson 1956: 49, 68). Just why the two monuments were merged into one at this time is a mystery, but the sequence in the ditch of West Amesbury henge – constructed at or shortly after the dismantling of the stone circle – provides a clue. The structured deposit placed in the terminal of this henge ditch contained sherds of Grooved Ware and yet the layer immediately above, and subsequent layers, contained Bell Beaker sherds. This stratigraphic transition coincides well with estimates for the end of Grooved Ware in the Stonehenge area in *2460–2320 cal BC* (Figure 12; Barclay and Marshall 2011: 180) and the start of Bell Beakers in *2475–2360 cal BC* (*95% probability;* Marshall in Parker Pearson *et al.* forthcoming). The arrival of Bell Beakers and accompanying continental European styles of mortuary practice and material culture signalled a major social and cultural transition in Britain, including the decline of large-scale labour mobilization for megalith-building.

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Figures

Figure 1. The Stonehenge landscape, showing Stonehenge, the Stonehenge Avenue and Bluestonehenge. Drawing by Joshua Pollard.

Figure 2. Trench 45 across the Avenue. The northeastern half is that part excavated by Atkinson in 1956 (and re-excavated in 2008) and shows the outer ditches as well as the periglacial stripes. The southwestern half was excavated in 2008 and shows the outer ditches and the shallow wheel-ruts overlying the much deeper periglacial stripes. Drawing by Irene Deluis.

Figure 3. The long section through the central part of Trench 45 with the topsoil removed. The periglacial fissures are especially deep and wide between the two chalk ridges. Drawing by Irene Deluis.

Figure 4. Trench 45, viewed from the northeast. Photo by Adam Stanford.

Figure 5. Stonehenge Avenue earthwork, with the natural ridges marked in blue and a suspected natural gully marked in green. The Early Mesolithic postholes lie 200m west of Trench 45. Trenches excavated along the Avenue in 2008 are outlined in red. From Field *et al.* 2012, courtesy of English Heritage.

Figure 6. Excavation beneath the tarmac of the A344 road, viewed from the east and showing periglacial stripes between the Avenue ditches. The position of the 2008 trench is marked in red. Photo by Adam Stanford.

Figure 7. Periglacial stripes showing as vegetation marks in lightly grazed grassland at Grimes Graves, Norfolk. Photo by Joshua Pollard.

Figure 8. Trenches at the riverside end of the Stonehenge Avenue, showing the Avenue ditches, West Amesbury henge ditch and the stoneholes of Bluestonehenge. The estimated extent of the Avenue is marked in brown. Drawing by Irene Deluis.

Figure 9. West Amesbury henge ditch enclosing the stoneholes (A–K) of Bluestonehenge. Later features (apart from the large posthole) have been omitted. Drawing by Irene Deluis.

Figure 10. Bluestonehenge under excavation, viewed from the north. Each person stands in a dug-out stonehole. Photo by Adam Stanford.

Figure 11. Section through Stonehole F, showing the filled-in void left after removal of the upright in antiquity. Drawing by Irene Deluis.

Figure 12. Probability distributions of dates from the Stonehenge Avenue (a) and from Bluestonehenge (b) with selected parameters for the Stonehenge Avenue, the introduction of Bell Beakers into Wessex (Parker Pearson *et al.* forthcoming: fig. 2), the end of Grooved Ware (Barclay and Marshall 2011) and the beginning and end of Stage 3 at Stonehenge (Darvill *et al.* 2012b: fig. 2). Each distribution represents the relative probability that an event occured at a particular time. For each radiocarbon date, two distributions have been plotted: one in outline which is the result of simple radiocarbon calibration, and a solid one based on the chronological model used. The other distributions correspond to aspects of the model. For example, the distribution '*re_cut*' is the estimate for when the re-cutting of the Avenue ditch took place. The large square brackets down the left-hand side of the diagram and the OxCal keywords define the overall model exactly.

Figure 13. Three-dimensional image of the circular depression, 0.14m deep and 0.5m in maximum diameter with a distinctive indentation (0.1m across) on its northeast side, in the base of Stonehole D of Bluestonehenge. This particularly convincing evidence of compression by a standing stone compares closely with the cross-section (inset right) of Stonehenge's Stone 68

(cross-section measured at grass level, 1.4m above the monolith's base). Image by Adam Stanford.

Figure 14. Stone 68 at Stonehenge, an indented dolerite pillar within the bluestone horseshoe; *left* photographed from the northeast, *right* three-dimensional image viewed from the northwest. Gowland (1902: figs 7 & 13) recorded the depth of this monolith, as well as its ground-level cross-section (see Figure 13) but its full three-dimensional shape below ground is as yet unrecorded. Images by Adam Stanford.

Table 1. Dimensions (in metres) of the Bluestonehenge stoneholes and their ramps (Stoneholes F, I & K lay largely outside the trenches so only small portions of them were excavated).

Stonehole	Pit			Ramp			Basal impression		
	Depth	Width	Length	Width	Length	Angle °	Depth	Width	Length
A	1	1.4	0.75	1.2	0.8	10	0.1	0.3	0.33
B	1.15	1.1	0.95	0.95	0.9	10	0.06	0.43	0.34
C	1.2	1	1	1	0.85	35	0.18	0.55	0.4
D	1.3	1.5	1.8	–	0.9	15	0.14	0.6	0.6
E	0.95	1.2	1.45	1.1	1.2	32	–	–	–
F	–	1.75	–	–	–	–	–	–	–
I	–	–	–	–	–	–	–	–	–
J	1.1	1.5	1.5	1.2	1.25	20	–	0.7	0.65
K	–	–	–	–	–	–	–	–	–

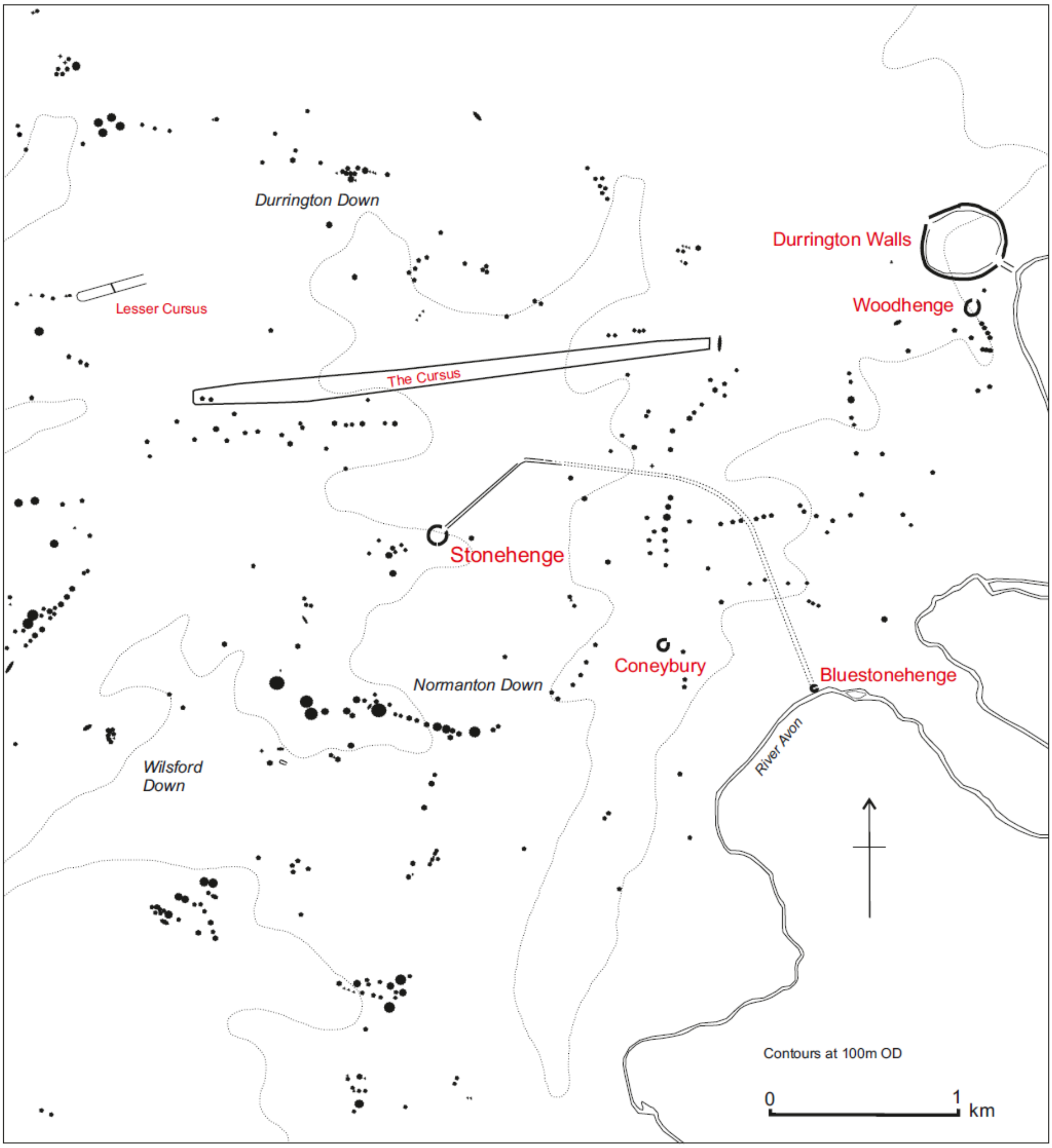

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig 5.

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

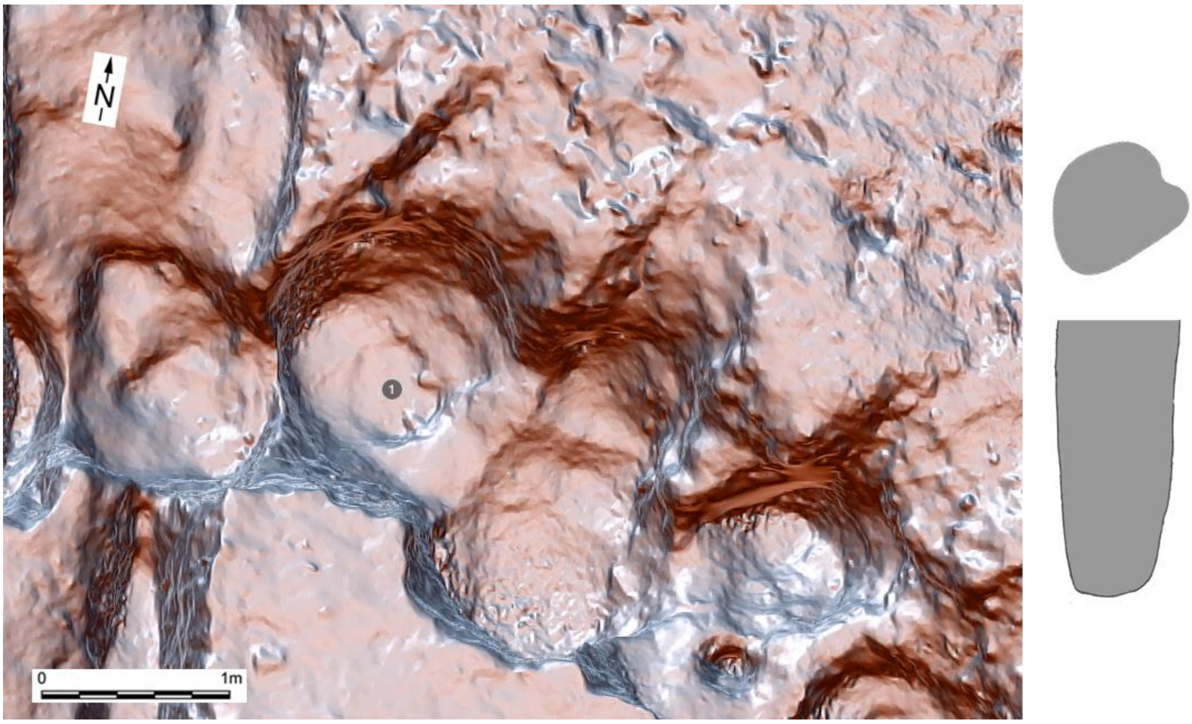

Fig. 13

Fig. 14