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The Origins of Avebury

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Introduction

Alongside Stonehenge, the passage graves of the Boyne Valley and the Carnac alignments, the Avebury henge is one of the preeminent megalithic monuments of the European Neolithic. Its 420m diameter earthwork encloses the World's largest stone circle, in turn enclosing two smaller, yet still colossal megalithic circles of c.100m diameter and complex internal stone settings (Figure 1). From two of its four entrances lead avenues of paired standing stones that together extend for c.3.5km linking with other monumental constructions. It sits within the centre of a landscape rich in later Neolithic monuments, among them Silbury Hill and the West Kennet palisade enclosures (Smith 1965; Pollard & Reynolds 2002; Gillings & Pollard 2004).

Avebury and Stonehenge are inscribed within the same World Heritage Site. Recent programmes of research have contributed much to enhancing knowledge of Stonehenge's prehistory (Parker Pearson 2012) . The same cannot be said of Avebury. The last major programme of excavation within the henge was undertaken by Alexander Keiller in the 1930s (Smith 1965). Furthermore, good dates for the hypothesized phases of construction at Avebury and other monuments in its environs remain thin (Pollard & Cleal 2004). We can be confident that the main Avebury earthwork was created around 2500 cal BC, but this seals a primary bank whose precise date is uncertain; the same remains true of the Southern and Northern Inner Circles and the megaliths they enclose. Chronology is pertinent as it frames our understanding of how the henge and its megalithic settings came into being – whether through incremental development, or as a notionally planned entity. On current evidence, we prefer the former, and here make the case for a long history for the monument's primary development arguing that events pre-dating the first phases of earthwork construction and stone erection at Avebury had a direct bearing on the monument's subsequent development. That in turn forces us to consider how matters of landscape inhabitation and historical memory relate to the origins of great monuments (Barrett 1994; Pollard 2012, in press).

Avebury before the henge

The Upper Kennet Valley of central southern England within which Avebury is sited became a major focus for settlement, tomb building and periodic gathering by the second and third quarters of the 4th millennium BC (Whittle, Bayliss &Healy 2011). Several areas of occupation spanning the 4th into the earliest 3rd millennium BC can be identified on and around the low saddle of ground upon which the Avebury henge was constructed. Sherds of earlier Neolithic plain bowl pottery and worked flint were found during the 1930s' excavations under the western circuit of the henge bank (Smith 1965: 224-6). This might be linked to a phase of early plough cultivation exposed in a trench through the bank at the Avebury School Site (Evans 1972: 273). Middle Neolithic ceramics and lithics were recovered from the pre-henge soil at two locations under the south-eastern section of bank (Gray 1935; Smith 1965: 184). Another concentration of pottery and flintwork comes from within the Southern Inner Circle (SIC) – notable as the only such scatter encountered within the henge interior – which we shall return to below.

In the zone immediately surrounding the earthwork are other areas of early and middle Neolithic activity, attested by flint scatters, a pit containing plain bowl pottery close to the northern end of the West Kennet Avenue, and a tree-throw with similarly early ceramics associated with an early 4^{th-}millennium radiocarbon date within 100m of the east entrance (Pollard *et al*. 2012). Other 4th-millennium BC occupation traces are known from low ground and mid slope locations within 1km of the henge: to the west in the Winterbourne valley (Evans *et al.* 1993, 151-3), to the east along the foot of Avebury Down, and to the south on Waden Hill (Thomas 1955) and the line of the West Kennet Avenue (Smith 1965, Pollard et al. 2015). Regionally, the settlement record is strong. For the first quarter of the 4th millennium the current record could indicate dispersed and small settlement foci, with greater aggregation following post-3700 cal BC (notably on Windmill Hill: Whittle et al. 1999).

A key question is the degree, or otherwise, to which these early episodes of activity influenced the siting of the henge and its architecture. Were former episodes of significant settlement and the people and lineages connected to them remembered? Could the conscious retention of memory relating to such explain the ontological shift from a place of routine practices to one that was deeply sacred, as indexed by the creation of the henge and its megalithic settings? Our view is that some events and their material traces did matter in an historical sense and were referenced in the building of the megalithic settings.

The Southern Inner Circle (SIC)

The megalithic settings of the SIC visible today are a product of a programme of excavation and reconstruction carried out by Alexander Keiller in 1939 (Smith 1965). Utilising a 50 foot (15.24m) grid of squares subdivided into 25 foot (7.62m) quarters, Keiller's intention was to excavate areas unencumbered by village houses and gardens. The outbreak of war curtailed this operation, but a substantial area was excavated, including the western arc and interior (Figure 2). Within the circle was the site of one of Avebury's largest stones: the Obelisk; observed and named by the 18th-century antiquary William Stukeley (Ucko et al. 1991). During the course of this work Keiller discovered a wholly unexpected 30.8m-long line of former stone holes to the west of the Obelisk. Medieval stone burial pits cut along the same line contained distinctive reddish sarsens much smaller than other Avebury megaliths (with maximum dimensions of 1.3 – 2.4m). Labelled the ‘z-feature’ the presence of stone-holes perpendicular to the ends of the line (stone i and xi) hinted that the whole may have formed a rectangular setting (Smith 1965: 198-201, figure 69). The excavations also revealed the stone-hole of a megalith (Stone D) that did not appear to be part of either circle or z-feature, and a cluster of post-holes, gullies and pits to the immediate north of the Obelisk. The z-feature has remained something of an enigma. Smith suggested that if the excavated features were duplicated in reverse on the east side of the Obelisk the whole might resemble the peristalith of an early Neolithic long barrow (1965, 250). From a critical re-evaluation of the Keiller excavation archive it is evident that the stone-holes excavated by Keiller were far too large for the z-feature stones he re-erected into them. Taking the excavated stone-holes of the main SIC ring as a baseline (Stones 102, 104, 105-9), we have a range of 1.70-2.50m in maximum length, holding stones standing 2.74-4.15m in height. With the exception of stone-hole xii, which genuinely was for a small stone, the z-feature stone-hole dimensions fall comfortably within this range (Table 1). The stone-holes originally held much larger stones, equivalent in size to those making up the SIC and this explains the difficulty Keiller had in matching z-feature stones to stone-holes and his decision to raise these megaliths above the bases of ‘their’ stone-holes (by between 0.15 and 0.40m) when re-erecting them (Smith 1965: 199).

The antiquarian record

The earliest antiquarian records of the SIC comprise the plans of John Aubrey from1663, Walter Charleton (1663) and William Stukeley’s plan and written narrative compiled between 1719-24. The veracity of these records were discussed in forensic detail by Ucko et al. (1991) which revealed few definitive areas of agreement between them. Charleton’s schematic plan depicted the Obelisk surrounded by a perfect circle of 13 megaliths. An alternative was provided by Aubrey in his Plan A, which offered a more confused picture of the SIC settings (Figure 3A). Aubrey mapped a portion of the arc of the SIC, within which were four large stone positions and two smaller stone symbols annotated with the letter ‘z’. To the north-east are three further stones. Missing is any record of the Obelisk. By the time Stukeley began recording the site 56 years later, a combination of entropy and active destruction had taken its toll. The Obelisk had fallen and much of the complexity hinted at by Aubrey had gone (Figure 3B). A single megalith stood in a rather anomalous location with regard to the SIC stones leading Stukeley to propose the existence of a second concentric inner circle. Although Smith associated this stone with Keiller's Stone D, Ucko et al. demonstrated that it corresponded to the location of Keiller's stones ix, x, and xi (1991: 216). Despite their insistence that it was 'a small stone' (1991: 215), Stukeley's drawings show a substantial stone, comparable in basal dimension to the main SIC stones; much larger than the stones of Keiller's z-feature (Figure 4). In this location Keiller's records show only a multi-lobate destruction pit and his argument that this masked the stone-holes of three small z-feature stones is questionable. On balance of evidence a more straightforward interpretation is that it related to this single, more substantial megalith.

A Neolithic house

Within the SIC Keiller excavated two features which he labelled 'Natural Fissure (?)' and a cluster of gullies, pits and post-holes to the immediate north of the Obelisk (Figure 5). This included a series of shallow hollows (maximum dimension 2.7m x 1.8m) interpreted as medieval marl pits. Of greater significance are the parallel lengths of gulley, defining a structure c.6.9m wide and c.6.8m long (though the southern extent has been impacted by the destruction of the Obelisk). Running between the gullies was a line of three oval pits or post-holes with hints of a shallow slot linking the westernmost. A fourth pit was located on the approximate central axis to the north. Whilst Keiller was content to assign a prehistoric date to the pits/post-holes he was confident that the gullies were part of a much later open-ended structure that had been opportunistically built against the fallen bulk of the Obelisk, using the latter as an ersatz rear wall. He toyed with the idea of it being a pigsty, while his supervisor, W.E.V. Young, suggested it may have been a cart shed. By the time of the formal publication of the fieldwork these features had been reduced to the status of field boundary ditches (Smith 1965: figure 69).

The medieval date assigned to the pits and structure can be questioned. No medieval pottery came from the gullies, and only three sherds from one of the pits. This is surprising given the high density of 12th-14th-century pottery recovered from the overlying soil (up to c.100 sherds per 25 foot square). The small amount of pottery from one of the pits is likely intrusive since rabbit burrows were recorded. They may well be naturally formed features (e.g. tree-throw pits) of prehistoric date. However, it is the gulley-defined structure that takes on special significance once Keiller's unsupported claim for a Medieval origin is rejected. On several lines of evidence, we argue for a prehistoric, and specifically Early Neolithic, date:

- Its axis is parallel to the excavated line of z-feature stone-holes; and it occupies the geometric centre of the SIC, which is set just to the north of the Obelisk.
- It is associated with a localised spread of Neolithic flintwork and pottery, otherwise rare from the interior of the monument.
- The plan of the features bears a remarkable resemblance to those of smaller Early Neolithic houses from Britain and Ireland.

The spread of artefactual material includes 346 pieces of worked flint from soil contexts in the area of the SIC: 334 flakes, nine scrapers, a knife, retouched flake and polished axe. There are 138 worked flints from the z-feature stone-holes and burial pits, features belonging to the Obelisk, and from the gullies. Amongst this material are two awls, a fabricator, knife and bifacially retouched flake. The debitage includes blades and narrow flakes, and several thinning flakes. Such an assemblage is consistent with an Early Neolithic domestic site. Smith records 30 sherds of Early Neolithic bowl and undecorated Peterborough Ware from stone-holes 104-6, I, iv, viii and ix (1965: 226). Much of this material is slightly weathered. Relatively fresh sherds of Neolithic bowl were recovered from stone-hole x. It is the distribution of this material that is particularly striking: the greatest concentration of worked flint being firmly focussed on the gulley-defined structure, with a c.20m lower density 'halo' around this (Figure 2). Comparison can be made with artefact spreads around the early Neolithic buildings at Hazleton North (Saville 1990) and Ascot-under-Wychwood (Benson &Whittle 2007).

The most expedient interpretation is that this is a Neolithic house (Figure 6). Keiller was correct to interpret the gullies as wall trenches: unfortunately, descriptions of fills and sections are lacking. Three of the prehistoric pits sit within the interior, central and perpendicular to the gullies. Their small diameter makes it more likely they are post-holes of an internal division. The fourth is set at the end of the structure in a central, gable-end position. Taken together, they form a plan that has close parallels with a number of small post- and trench-constructed houses of the 38th–early 37th centuries cal BC from mainland Britain and Ireland (Smyth 2014; Gibson 2017). At close to 7m square, the Avebury structure falls comfortably within the size range (Gibson 2017: fig. 14). Close parallels include Fengate, Cambridgeshire (Pryor 1974), Ballintaggart 1 and 3, Co. Down, Newrath, Co. Kilkenny (Smyth 2014), and Horton, Berkshire (Barclay et al. 2012), among others. The larger structure at White Horse Stone, Kent (Booth *et al.* 2011), was constructed within clear sight of a substantial sarsen spread, much as the Avebury building would (Gillings & Pollard 2016). This would be the first such early Neolithic house to be identified in Wessex (Barclay & Harris 2017: 231).

The 2017 survey

To further investigate the possible connection between the house and the excavated portion of the z-feature more data was needed. Since Keiller, fieldwork in the SIC has been limited to a campaign of inconclusive geophysical survey in 1989 alongside more ad hoc mapping of parchmarks (Ucko et al. 1991: 220). More recent surveys elsewhere at Avebury have demonstrated conclusively how effective soil resistance survey can be in detecting buried sarsens; likewise GPR (e.g. Gillings et al. 2008; Papworth 2012). Given the known presence of substantial buried sarsen stones at Avebury alongside highly compacted stoneholes (the upright sarsens weighing anywhere between 15 and 100 tonnes) it is surprising that no large-scale GPR surveys have been attempted, despite the success of GPR in detecting buried megaliths on the Beckhampton Avenue (Gillings et al. 2008: 64-6).

In April 2017 0.567 hectares were surveyed to the east of the areas excavated by Keiller (Figure 5). Soil resistance survey was carried out using twin-probe and square arrays, and this was complemented by GPR. The resistance results are presented in Figure 7 where a number of anomalies indicative of former megaliths can be identified, taking the form of discrete high resistance anomalies (marking buried stones), moderately high responses (either deeply buried stones or concentrations of stone debris) and lower resistance features (destruction pits). Some of these had been previously identified by Keiller (as hollows) and as generalised anomalies in 1989; a number had not. There are also SE-NW (and perpendicularly) aligned linears corresponding to former boundaries (some of which are clearly visible in the field as earthworks) along with probable drainage features.

Although not indicated on the interpretation plot, it is interesting to note that the interior of the SIC seems to be characterised by a higher resistance. The SW-NE band of low resistance crossing the top third of the plot likely reflects the complex sequence of medieval and post-medieval boundary ditches that criss-cross this area (Gillings et al. 2008: fig. 8.8).

A number of clear anomalies are visible in the time-sliced GPR results (from the surface to a depth of 3.1m) (Figures 8). An interpretation is presented in Figure 9 where the level of re-inscription (i.e. over-drawing) can be read as a direct proxy for the persistence of the features with depth. Alongside linear boundaries belonging to medieval property divisions and general noise adjacent to the modern gardens, 16 stone-related (1-16) and three other features (A-C) have been identified (see Figure 8 and Table 2). Adjacent to a modern boundary and manifest as a zone of high-resistance as well as an amorphous GPR anomaly, Feature A most likely derives from medieval and/or post-medieval structural activity. Feature B is the edge of Keiller's 1939 excavation trench. Other anomalies correspond to elements of Neolithic monumental architecture:

- ***Feature C.*** A sub-circular feature evident in the GPR data at a depth between 0.5 and 0.9m below the present surface. This appears to comprise a series of discrete, small circular anomalies most likely post-holes or pits.
- ***Features 1-3, 6.*** Buried sarsens associated with the continuation of the z-feature setting.
- ***Features 4-5.*** Destruction pits/debris relating to the continuation of the z-feature setting.
- ***Features 7-8, 11, 13, 15.*** Substantial, deeply buried sarsens of the SIC.
- ***Features 10 and 12.*** Probable destruction pits (low resistance) and compressed sockets (GPR reflection) of the SIC.
- ***Features 9 and 16.*** Probable destruction pits (low resistance) and compressed stone sockets (GPR reflection) relating to a pair of stones that form a linear alignment with anomalies 10 and 6.
- ***Feature 14.*** A spread of large fragments of sarsen or packing stones, resulting from the destruction of a substantial SIC sarsen.

- ***Feature ?*** A possible stone position visible in the GPR data (depths 0.3 – 0.6m) but masked in part by debris relating to the modern boundary. There is a tendency for later boundaries to align on standing stones (see Gillings et al. 2008: fig. 8.8).

Features 1 to 6 mirror the position of the excavated z-feature stone-holes. Taken together, they form a 30x30m square megalithic setting aligned upon the axes of the house.. In the case of the buried sarsens, the maximum dimension of the GPR responses have been recorded as a proxy for the size of the buried stone, along with an estimate of the depth of the burial pit (Table 2). Anomalies 1-3 and 6 fall at the upper end of the range for the smaller z-stones, whilst 7, 8, 11, 13 and 15 are comparable in size to the main SIC settings. In all cases the depth of burial is within the known range (Gillings et al. 2008: 25, table 9.1). Sufficient of this square had survived into the 17th century for both Aubrey and Stukeley to be able to record its remnants. This would suggest that the constituent megaliths had not been dismantled or reconfigured in prehistory. The excavated sarsens and the unusually large stone-holes encountered by Keiller point to a mixture of larger and smaller stones. Potentially set in alternate fashion, the result would be a play on the contrast between the grey of the larger sarsens and distinctive orange-red colouring of the surviving z-stones. In its own right the megalithic square is a highly unusual monument. The closest parallel is provided by the 'cove' inside Site IV, Mount Pleasant (Wainwright 1979, 28-31). At 6m square, the latter is considerably smaller.

Additional new features include the sub-circular anomaly seemingly cut by the SIC, and two lines of stone-holes radiating from the centre. The former is reminiscent of a double concentric circular anomaly identified by Ucko et al. in the Northern Inner Circle (1991: pl. 67). Of the latter, the SW line comprises the Obelisk, stone xi, stone-hole D, stone 103 of the SIC, and a rectangular feature recorded by Keiller as a natural fissure that may well be a stone-hole; the SE line, is made up of stone-hole xii, and features 6, 9, 10 and 16.

The sequence reconsidered

Our preferred structural sequence for these newly identified features begins with the putative house, followed by the erection of the Obelisk and the square stone setting. The SIC and lines then follow (Figure 10 & Table 3). The circular anomaly may pre-date the SIC, but at present direct dating evidence is lacking. By analogy with other structures the putative house should fall in the second quarter of the 4th millennium BC. Sherds of Neolithic bowl and Peterborough Ware from stone-holes i, iv, viii and ix of the square setting are presumably residual (Smith 1965, 226), though some are quite fresh. Perhaps this and the Obelisk were constructed in the late 4th or early 3rd millennia BC; an horizon that might also see the erection of the Cove stones inside the Northern Inner Circle (Gillings et al. 2008: 164-5).The lines form a final megalithic phase. They each have a different origin point and both appear to have been carefully keyed into stones of both the square and SIC, implying that the former were already in place. Smith (1965: 227) claimed there were weathered sherds of Beaker (in fact in an Early Bronze Age fabric) from beneath clay packing in a stake-hole close to the edge of stone-hole D (1965: 227), but the stake-hole cannot be definitively related to the stone-hole. Overall, we may be seeing activity spanning as much as 1,500 years, from the Early Neolithic to Early Bronze Age.

Conclusion

If our re-reading of the structure within the SIC as an Early Neolithic house is correct, the implications for understanding Avebury's origins are profound: the ancestry of one of Europe's great megalithic monuments can be traced back to the monumentalisation of a relatively modest dwelling. This would accord with Julian Thomas' view that 4th-millennium BC tombs and houses/halls played an active role in the creation and commemoration of foundational social groups (Thomas 2013, 294). Eventually encased within the centre of the 'deepest' space of the henge, we hypothesise that it was the connections that this erstwhile building had with a significant, perhaps founder, lineage which led to it taking on an especial (mytho-)historic importance; and for the status of the site to move from the quotidian to the sacred. With regard to this transformation from 'mundane' to monumental structure Avebury is not unique in kind. The process is seen in the histories of a number of Neolithic monuments. One can note the construction of earlier 4th millennium BC chambered tombs over former houses (e.g. at Hazleton North, Gloucestershire: Saville 1990), and the later reworking of large free-standing buildings/ halls into henges, and timber and stone circles (e.g. Stenness, Orkney, and Coneybury, Wiltshire: Bradley 2003; Richards 2013; Pollard 2012). What marks Avebury out as exceptional is the heightened significance and long-term resonance of this act of ontological transformation.

The early Neolithic house at Avebury would not have lasted long (perhaps a generation or two), though decay of daub walls would likely have left a visible earthwork trace that was subsequently carefully respected. Later acts of pit digging and artefact deposition highlight the long-term memory work that could attend the visible traces of Early Neolithic houses. Hey et al. (2016: 60) draw attention to the deliberate digging and filling of later Neolithic Grooved Ware pits into the house/hall sites of Yarnton (Oxfordshire), White Horse Stone (Kent) and Littleour (Fife). A Middle Neolithic pit group was carefully dug between the traces of two early 4th millennium BC houses at Llanfaethlu, Anglesey (Rees & Jones 2015), while at Cat's Water, Fengate, Cambridgeshire, Peterborough Ware pits were dug along the edge of a centuries-old house (Pryor 2001, 48-9).

Since its unexpected discovery in 1939 the z-feature at Avebury has presented an interpretative conundrum. Smith came close to our preferred explanation when she considered a link with Early Neolithic funerary architecture: the settings within the SIC deliberately echoing elements of a long barrow and the Obelisk standing in for a burial deposit (1965: 251). However, instead of a tomb, the z-feature settings can now be seen to commemorate a form of domestic architecture. The temporal currency of that commemorative reference was extended through further monumental elaboration. Neolithic house forms changed with time, from square and rectilinear early in the British sequence, to more oval and rounded forms later on (Smyth 2014). It may be that an explicit link with concepts of the house and household was maintained at Avebury with the subsequent enclosure of the square megalithic setting surrounding the erstwhile house by the SIC, replicating on a truly monumental scale the square-in-circle format of later Neolithic houses and halls (Bradley 2003).

As a coda, given the frequency with which Early Neolithic houses in Britain and Ireland occur in pairs or small groups, we might expect there to be more at Avebury. In this regard, the Cove that sits in the centre of the Northern Inner Circle amidst a confusing array of un-investigated stone settings, might offer a good candidate for a second foundational building.

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Figure Captions

Figure 1 The Avebury Monument (Incorporates data (c) Crown Copyright/database right 2007. An Ordnance Survey/(EDINA) supplied service).

Figure 2 The Southern Inner Circle showing recovered lithic densities.

Figure 3 A: Aubrey's 'RUDE SKETCH' (after Long 1858). Blue square denotes SIC. The stones in red were originally drawn by Aubrey at half the size and marked with a 'Z' notation. B: Stukeley's Frontispiece (1743) - surviving stone is indicated by the arrow.

Figure 4 Stukeley's views of the SIC (1743) with the surviving stone indicated. A: Tab XVI & B: Tab XVII

Figure 5 Features excavated and interpreted by Keiller.

Figure 6 The house structure and comparators.

Figure 7 Soil Resistance results.

Figure 8 Key GPR depth slices.

Figure 9 GPR interpretation.

Figure 10 The Southern Inner Circle (Incorporates data (c) Crown Copyright/database right 2007. An Ordnance Survey/(EDINA) supplied service).

Tables

Southern Inner Circle (SIC) stone-holes have a Mean of 2.07m and standard deviation of 0.27m		
Keiller Number	Smith re-numbering (1965)	Maximum Dimension (metres)
ZX	i	2.00
Z1	ii	1.80
Z2	iii	2.40

Z3	iv	2.00
Z4	v	2.00
Z5	vi	-
Z6	vii	-
Z7	viii	2.30
Z8	ix	-
Z9	x	-
Z10	xi	2.50
Z11	xii	0.75

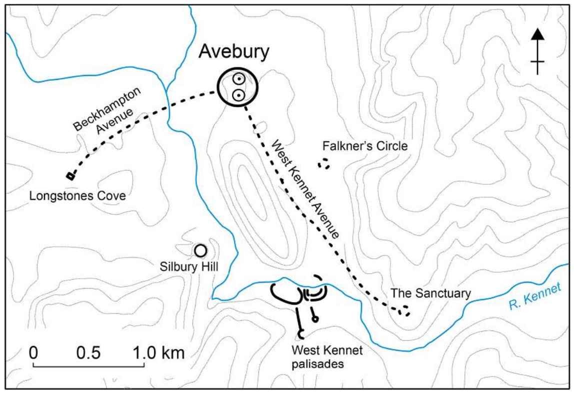
Table 1. Dimensions of ‘z-feature’ stone-holes

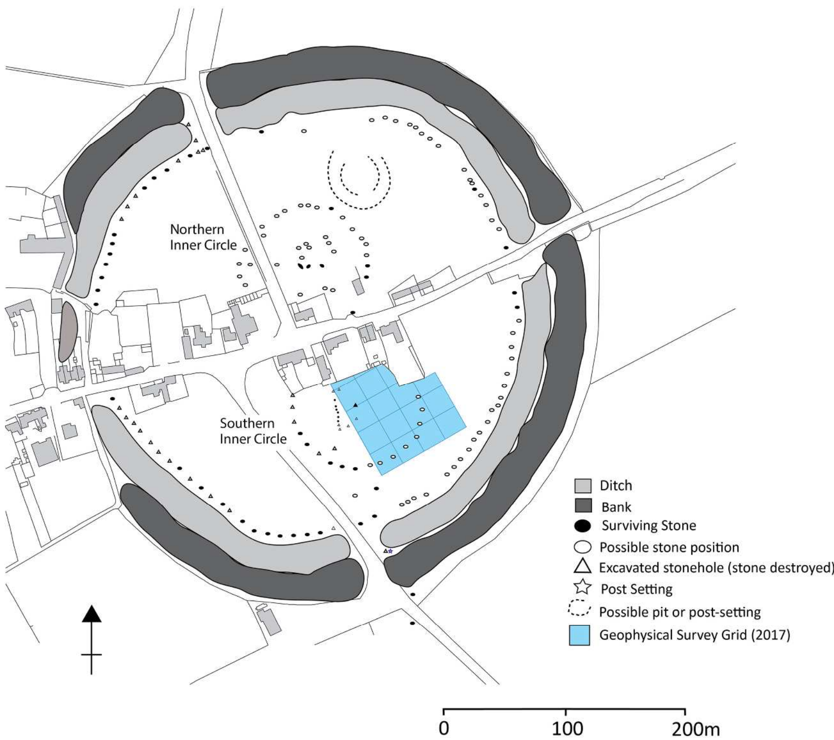
Anomaly	Maximum dimension of GPR response (m)	Maximum depth at which anomaly detected (m)
1	2.6	1.1 – 1.4
2	2.7	1.1 – 1.4
3	2.4	0.8 – 1.1
6	2.8	1.2 – 1.6
7	4.2	1.4 – 1.7
8	4.5	1.4 – 1.7
11	4.8	1.7 – 2.0
13	4.1	2.2 – 2.5
15	3.7	1.4 – 1.7
Maximum dimension range for excavated z-stones = 1.3 – 2.4m		
Maximum dimension range for SIC stones (allowing a metre for the unexposed base) = 3.74 – 5.15m		

Table 2 – maximum dimensions and depths of buried sarsens

Description	Comments
House	First phase of structural activity
Obelisk, erected in SE corner of former house	After house structure had decayed, perhaps surviving as a low earthwork
30m diameter square setting of megaliths (large and small)	Respecting the axial orientation and centred upon the house.
Post or pit circle truncated by SIC	Potentially an early feature
100m diameter circle of large sarsens (SIC) centred upon house and square	Contemporary with (or following) square setting
Linear stone settings radiating to the SE and SW	keyed into the stone positions of the SIC and square; truncating post/pit circle.

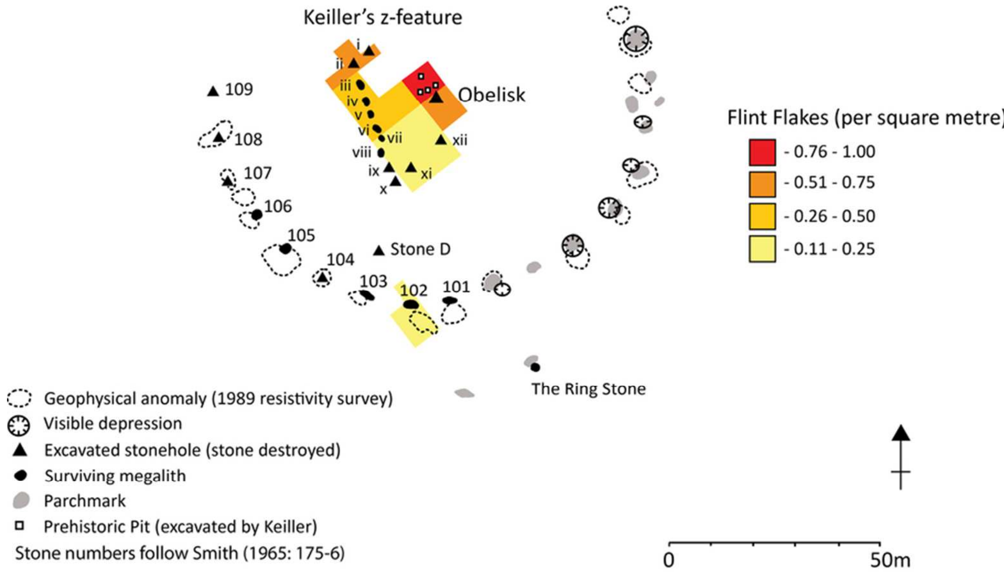
Table 3 – suggested phases of activity





The Avebury Monument (Incorporates data (c) Crown Copyright/database right 2007. An Ordnance Survey/(EDINA) supplied service).

184x267mm (300 x 300 DPI)

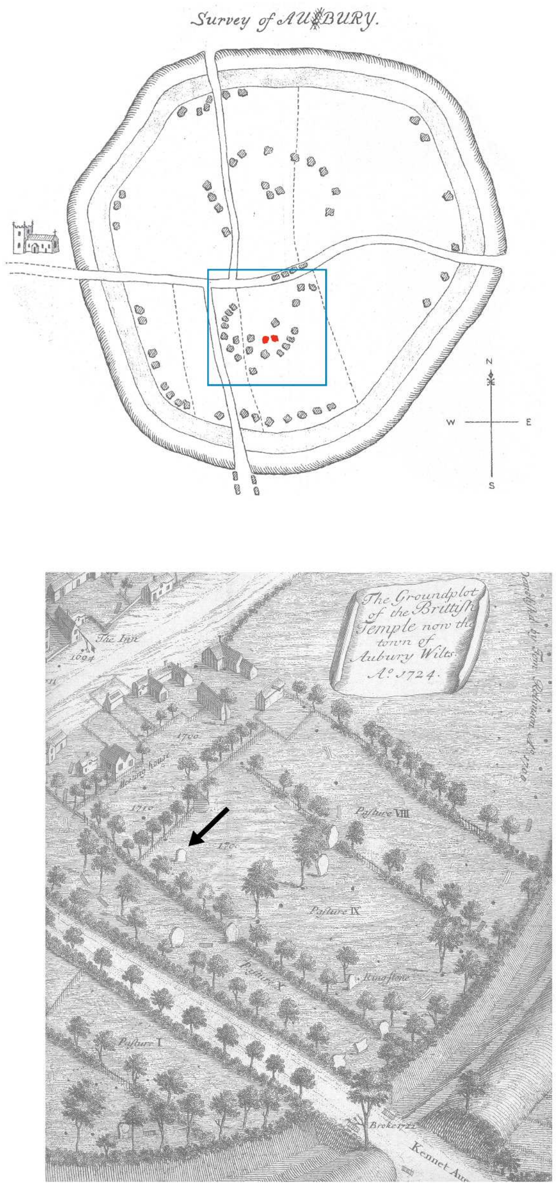


The Southern Inner Circle showing recovered lithic densities.

76x43mm (300 x 300 DPI)

A

B

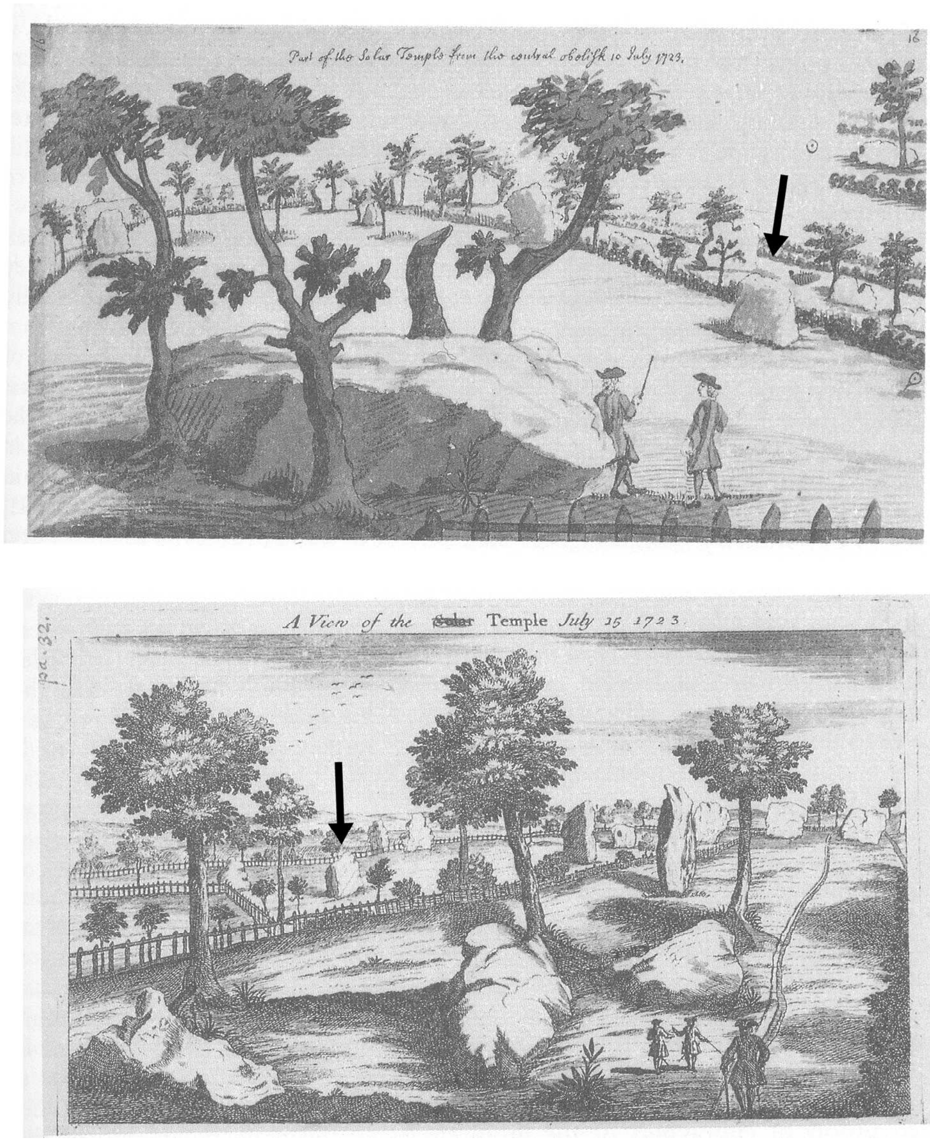


A: Aubrey's 'RUDE SKETCH' (after Long 1858). Blue square denotes SIC. The stones in red were originally drawn by Aubrey at half the size and marked with a 'Z' notation. B: Stukeley's Frontispiece (1743) - surviving stone is indicated by the arrow.

184x365mm (300 x 300 DPI)

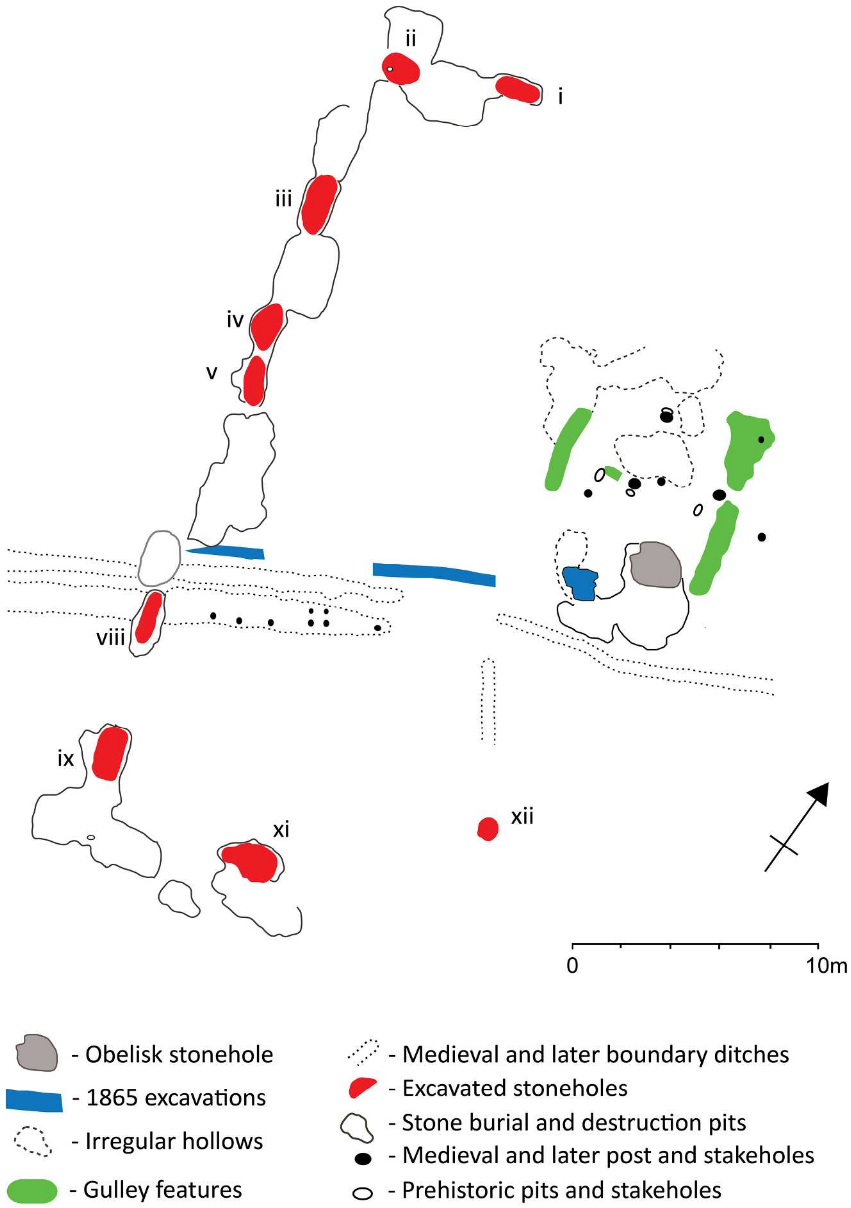
A

B



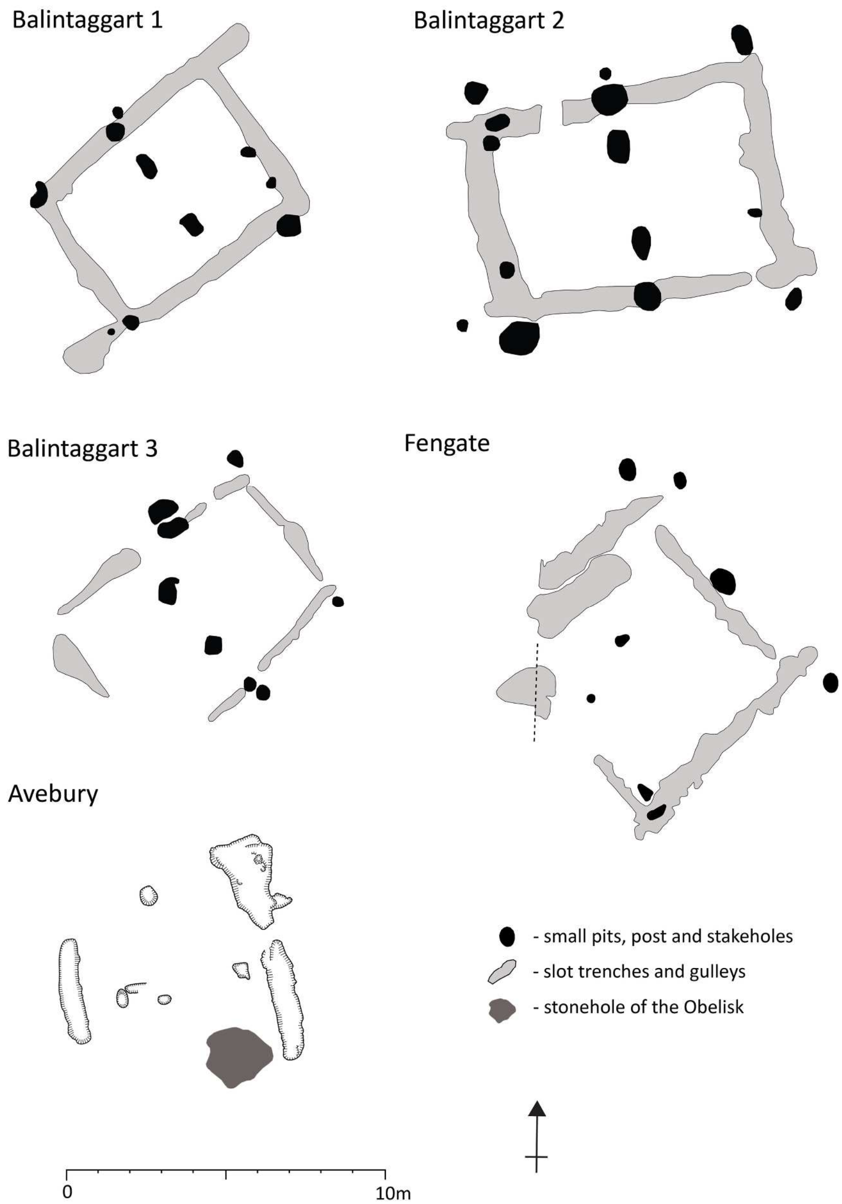
Stukeley’s views of the SIC (1743) with the surviving stone indicated. A: Tab XVI & B: Tab XVII.

152x173mm (300 x 300 DPI)



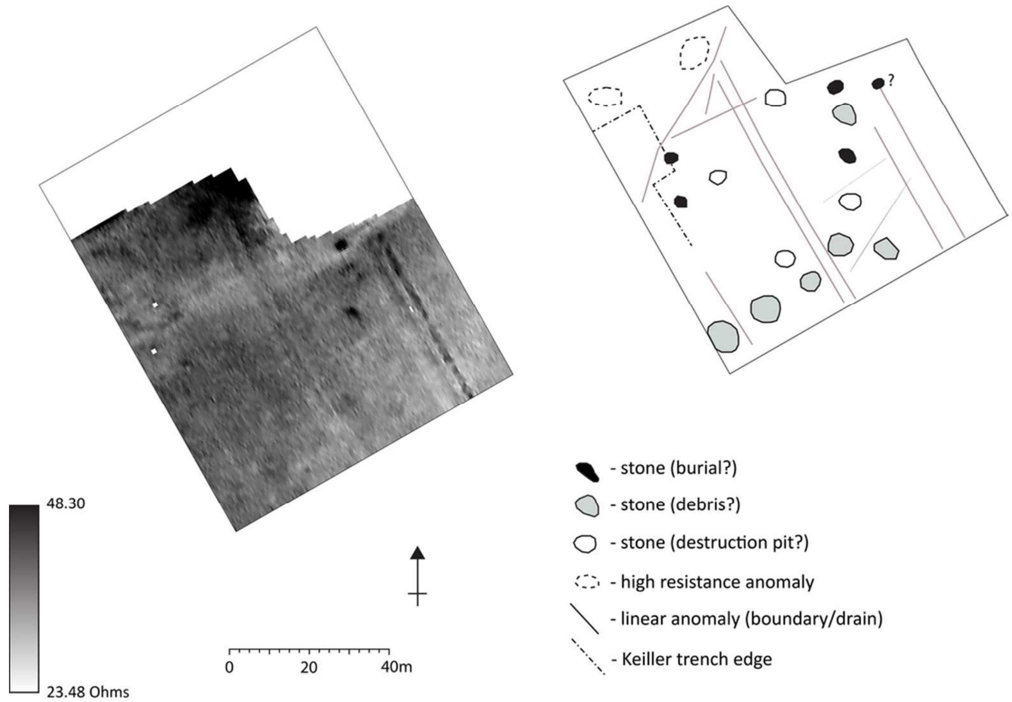
Features excavated and interpreted by Keiller.

184x263mm (300 x 300 DPI)



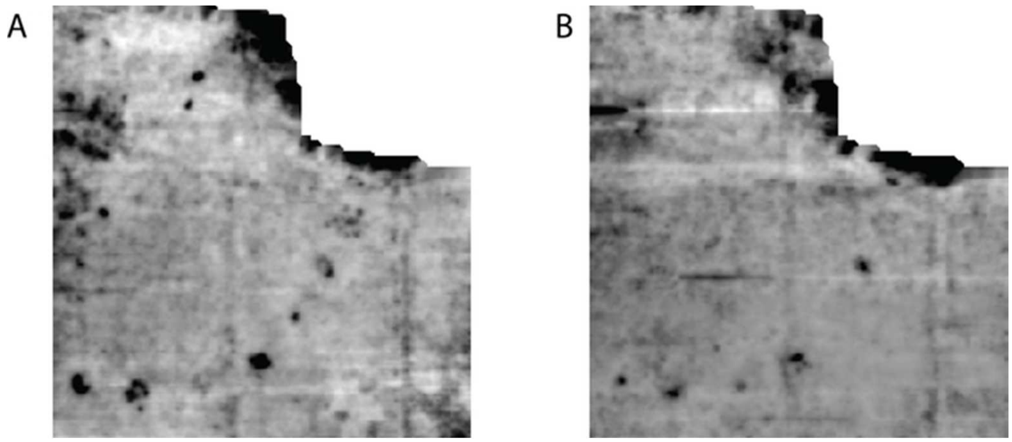
The house structure and comparators.

184x266mm (300 x 300 DPI)



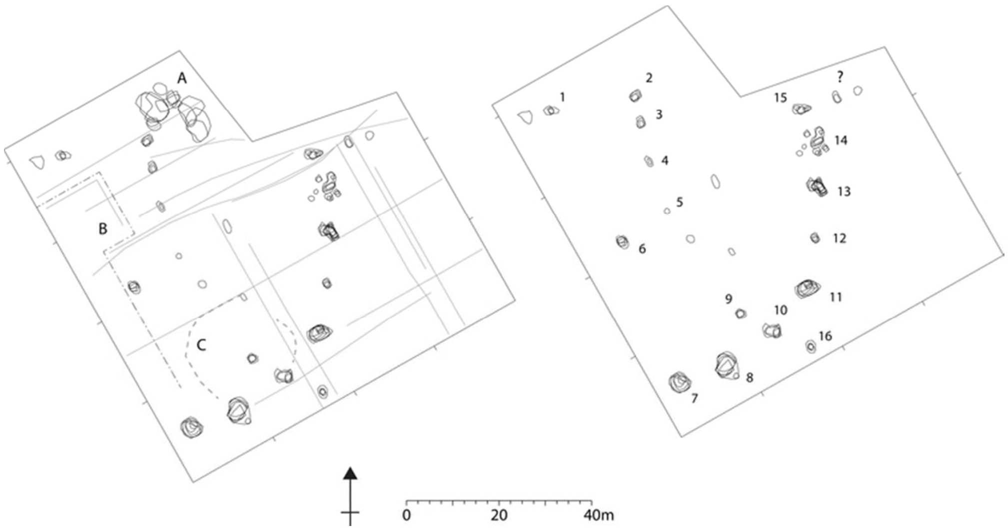
Soil Resistance results.

93x65mm (300 x 300 DPI)



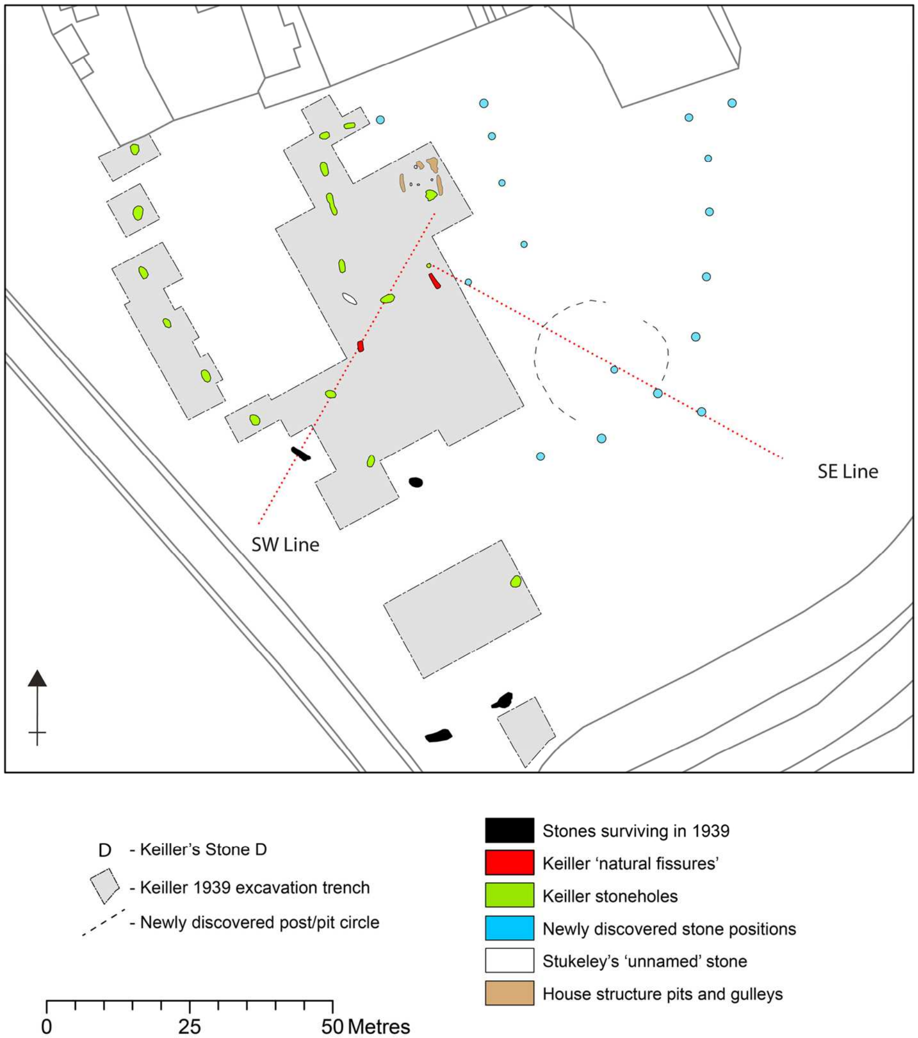
Key GPR depth slices.

58x25mm (300 x 300 DPI)



GPR interpretation.

70x36mm (300 x 300 DPI)



The Southern Inner Circle (Incorporates data (c) Crown Copyright/database right 2007. An Ordnance Survey/(EDINA) supplied service).

145x156mm (300 x 300 DPI)

The Origins of Avebury – Detail of Geophysical Survey

Introduction

Whilst the entire henge has recently been surveyed using gradiometry as part of Darvill and Lüth's on-going surveys of the Avebury landscape are features that have proven stubbornly unresponsive to gradiometer survey limiting its effectiveness in the detection of stone-related features. Take for example the provisional results collected by Darvill and Lüth across the Southern Inner Circle which show little beyond metallic debris (Darvill & Lüth 2014). The extent of prior resistance surveys in the area of the Southern Inner Circle is indicated in Figure 1. The area was covered in 1989 by the Ancient Monuments Laboratory using an RM4 and DL10 twin probe configuration and a typical 1m sampling interval (see Clark 1990, Fig 35 for a photographic record of this survey). The results were published by Ucko *et al.* (1991: 219-220) and reflect the instrumentation and data processing options available at the time. The results of this survey were far from conclusive, the authors noting that "[a]lthough resistivity anomalies are present throughout the survey data, it is not possible to discriminate with any confidence between those reflecting possible prehistoric features and those which are natural or spurious" (Ucko et al. 1991: 220). They illustrated this by noting how Keiller's excavated area is indistinguishable (in terms of anomalies) from the remainder, concluding that the "whole of this area of the site therefore continues to be an enigma" (ibid). A more recent survey (2003) was carried out by Martin Papworth of the National Trust, using RM15 instrumentation and a 0.5 x 1.0m sampling resolution. This demonstrated conclusively how effective soil resistance survey was in detecting buried sarsens, but focused solely upon the eastern half of the quadrant, not extending as far to the west as the Southern Inner Circle (Papworth 2012).

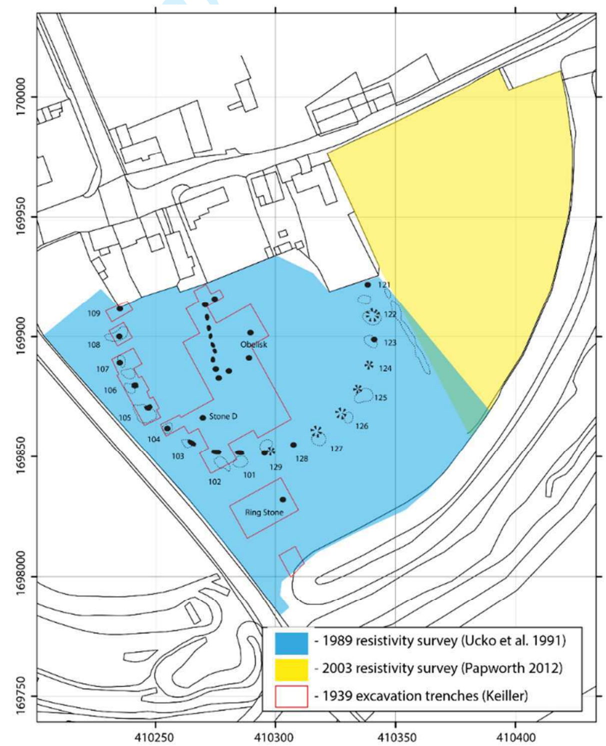


Figure 1 – Previous soil resistance surveys in the south-eastern quadrant of Avebury. Image incorporates data ©Crown Copyright/database right 2012. An Ordnance Survey/EDINA supplied service.

Given the known presence of substantial buried sarsen stones at Avebury alongside highly compacted stoneholes (the upright sarsens weighing anywhere between 15 and 100 tonnes) it is particularly surprising that to date no extensive GPR surveys have been attempted at Avebury, despite the success of GPR in detecting buried megaliths in an evaluation carried out in 2000 as part of work on the line of the Beckhampton Avenue (Gillings et al. 2008: 64-66).

The 2017 survey

An area of 0.567 hectares was surveyed to the immediate east (and over-lapping with) the area excavated by Keiller in 1939. The survey area also overlapped with the Papworth survey block further to the east. In practice 12 full and 5 partial 20m^2 grid squares were surveyed, aligned as closely as possible to a reconstruction of Keiller's own excavation grid (Figure 2).

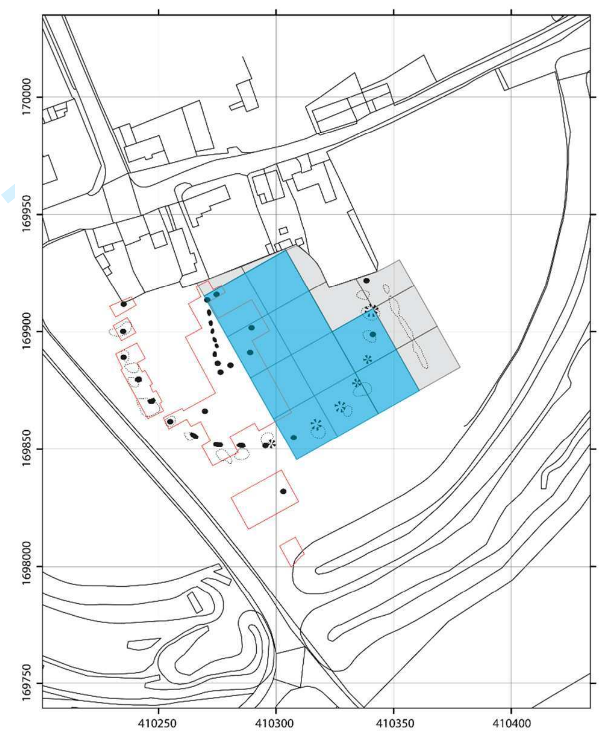


Figure 2 – The survey area (shaded grey). The Square Array resistivity survey was limited to the subset of full squares (shaded in blue). Image incorporates data ©Crown Copyright/database right 2012. An Ordnance Survey/EDINA supplied service.

The Soil Resistance Survey

Soil resistance survey was carried out initially using a Geoscan RM85 with a multiplexed 3 probe parallel twin array, with a probe spacing of 0.5m and traverse and sampling intervals of 0.5 and 1.0m respectively. In an attempt to maximise the amount of information recovered this was followed by a second survey of 10 of the full grid squares using a 0.75m square array (Clark 1990: 46-47) with a traverse interval of 1.0m and sampling interval of 0.25m (Geoscan RM85 & MSP25 cart). To remove any twin-peaking effects two sets of readings were logged at right-angles to one another ('alpha' and 'beta' datasets). All data was processed using the Geoplot 4 (Beta) software suite and the survey grid was geo-referenced using a Leica DGPS post-processed to Ordnance Survey CORs data. It should be noted that at the time of survey the ground was unexpectedly dry, with local National Trust staff noting anecdotally that the preceding winter had been the driest in memory. This was certainly noted during the twin-probe survey, where high contact resistance resulted in very noisy data across a number of the grids where the mobile probes had not been inserted to a sufficient depth. These grids had to be re-surveyed. In the case of the cart-based square array, where insertion depth could not be altered, it resulted in excessively noisy data that masked any archaeological features (as is evident in Figure 5). In light of this it would be prudent to repeat the square array survey at a later date when ground conditions are much wetter. The results of the survey are presented below. Figure 3 displays the basic data, with the high and low-pass filtered datasets displayed in Figure 4.

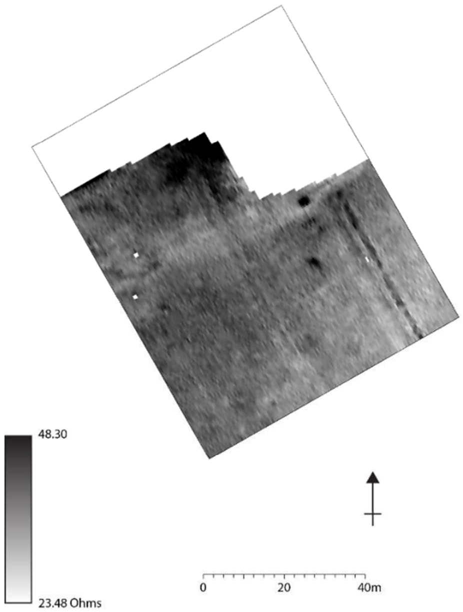


Figure 3 – the twin-probe resistivity results (displaying +/- 3 standard deviations)

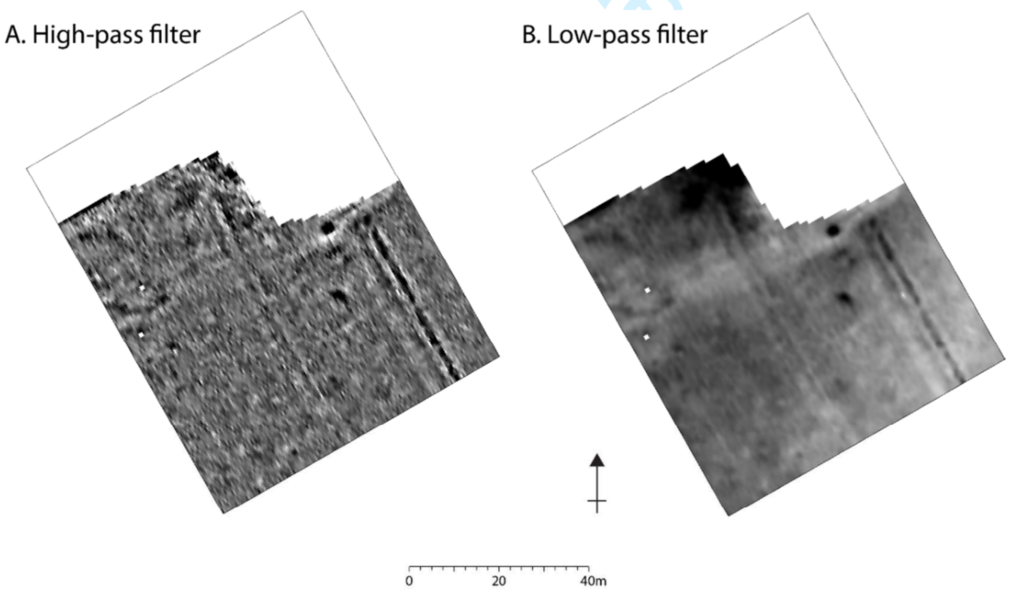


Figure 4 – the data after A. High-pass filtering (to emphasise smaller amplitude anomalies) and B. Low-pass filtering (to emphasise broader trends). Data is displayed at -3/3 standard deviations.

The results from the square array survey are presented in Figure 5 – please note that only full grid squares without substantial linear earthworks (that made traversing the cart impossible) were surveyed as indicated on Figure 2. With the exception of the faint traces of the main NW/SE boundary feature, the noisiness of the data makes it difficult to discern any clear archaeological features. What is interesting is that the area of the Keiller trench does appear to be visible as a markedly quieter band on the SW edge of the survey area – presumably the looser fill retaining more moisture and thus ameliorating the contact-resistance issues encountered across the remainder of the surveyed area.

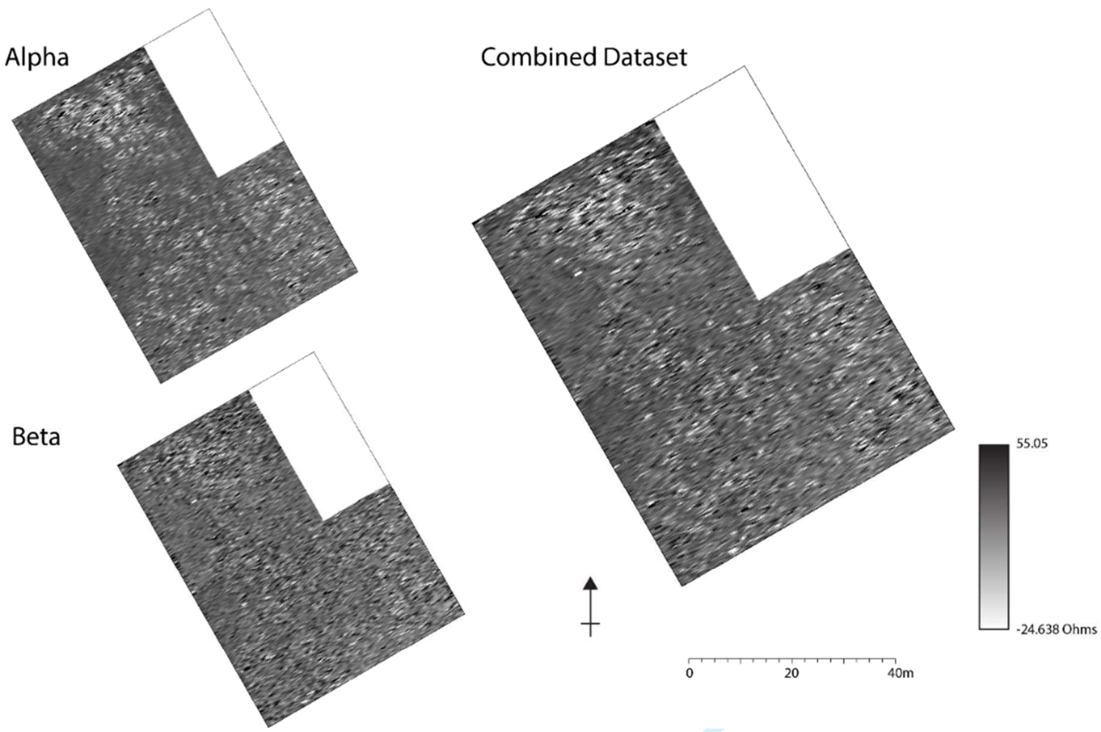


Figure 5 – Square array resistivity data – Alpha, Beta and combined datasets

GPR Survey

The GPR survey was conducted using a Sensors and Software Noggin Plus system with 500Mhz antenna and Smartcart. Data were collected along traverses spaced 0.5m apart along the x direction of each survey grid across target areas of the sites in the northern, central and southern areas of the survey. Data were processed using GPR Slice software. The different survey profiles were presented in their relative positions, and all profiles were then processed to remove background noise. A bandpass filter was applied to each profile to remove all high and low frequency readings. The presence of hyperbola in the data were utilised to produce an estimation of signal velocity through the deposits at each site, facilitating a calculation of the depth of different features across each site. Profiles were then converted into grid data and were sliced horizontally to produce a series of time slices through each survey area, from the surface to a depth of 3.1m (Figure 6).

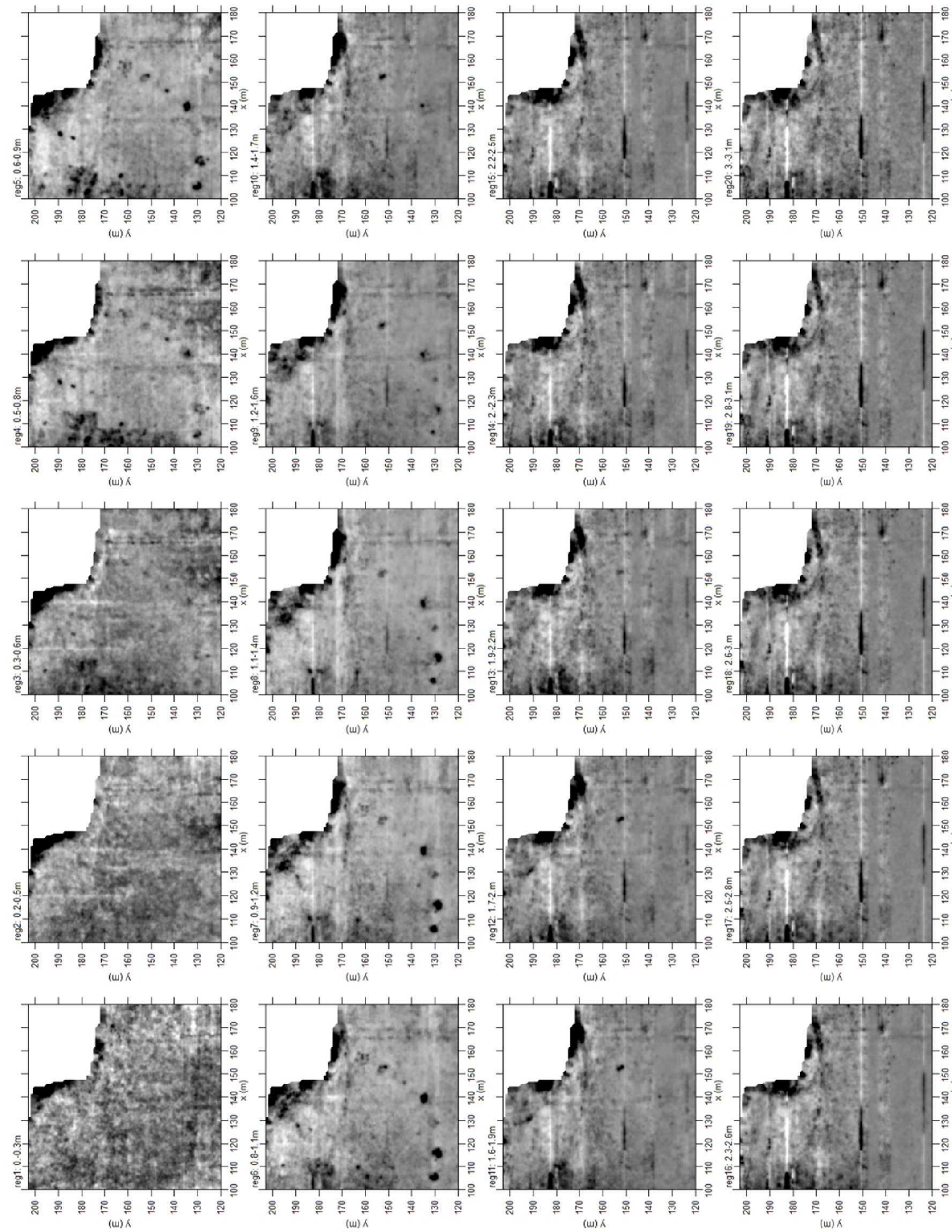


Figure 6 – GPR depth slices from surface to 3.1m

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