

David Furlong and John Smout

# Avebury

Southern Inner Circle



## Counting the Stones

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## A Consideration of the Number of Stones in the Outer Ring of the Southern Inner Circle at Avebury

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David Furlong and John Smout - September 2013

### Abstract

As well as a vast outer circle the Avebury henge, in Wiltshire UK, contains two inner circles known as the Northern Inner Ring and the Southern Inner Ring. Both of these circles were largely destroyed in the 17<sup>th</sup> and 18<sup>th</sup> century with the development of the village of Avebury. This article re-assesses the issue of the number of stones in the outer ring of the Southern Circle.

Antiquarian William Stukeley in his book *Abury a Temple of the British Druids with Some Others Described*, published in 1743, claimed that there were 30 stones in this ring (Stukeley, 1743). Nearly two hundred years later, in his book *The Avebury Excavations 1908-1922*, H. St. George Gray stated that '*the southern group has an approximate diameter of 336 ft.*' and '*There appear to have been twenty-eight or twenty-nine stones in this circle, at an average distance of 30 ft apart*' (Gray, 1935 p. 190). Isobel Smith, based on her excavation work with Alexander Keiller, followed Gray's suggestion, by tentatively proposing 29 stones (Smith, 1965). English Heritage, following Smith, has affirmed a 29 stone circle (Malone, 1989). The problem with the Southern Circle is that most of its northern section was completely destroyed with the housing development of the village, so that the question about whether 29 or 30 stones existed in the original circle must be speculative. Nevertheless by carefully piecing together all of the evidence, using some of the most recent technological developments, the likely stone count and their approximate positions can be determined.

Gray's assertions can be dismissed very easily, when a little maths is applied to his figures. A circle of 336 ft would have a circumference of 1056 ft. Divide this distance by 30 ft and the stone count is 35 stones not 28 or 29 as he stated; or 1056 ft divided by 29 gives an average spacing of 36.4 ft not 30 ft. Clearly Gray never checked his statements. Smith's stone count, on the other hand, needs to be tackled in more depth as it is derived from more detailed and exacting excavation work.

The article begins chronologically with a 'tour' description by Stukeley on what he saw and understood from his trips to Avebury between 1719 and 1724 (Piggott, 1985). The proposal presented by Smith is explored in depth, indicating the possible reasons why she arrived at 29 stones, as well as highlighting some flaws in her argument. The evidence will then be weighed against Stukeley's perception, providing some new insights en route, before concluding that Stukeley was most probably correct in asserting that there were 30 stones in the outer ring of this circle.

### Stukeley's Tour description of the Southern Inner Circle - Background

As well as providing many maps and sketches Stukeley also gave a 'tour' description of the Southern Inner Ring, relating to the position of the stones as he perceived them to be in his visits. This narrative taken from *Avebury Reconsidered* (Stukeley, cited in Ucko et al, 1991 p.279) has a short commentary following each of Stukeley's individual stone descriptions. For reference purposes one of Stukeley's maps is shown in Fig.1.

## Stukeley's Description and Commentary

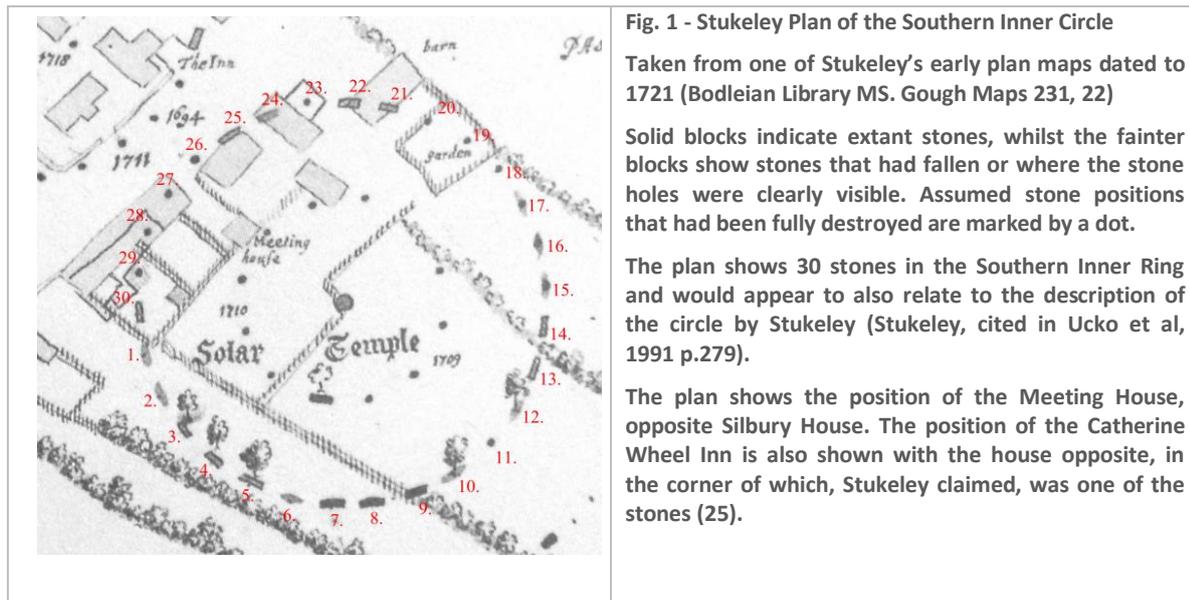


Fig. 1 - Stukeley Plan of the Southern Inner Circle

Taken from one of Stukeley's early plan maps dated to 1721 (Bodleian Library MS. Gough Maps 231, 22)

Solid blocks indicate extant stones, whilst the fainter blocks show stones that had fallen or where the stone holes were clearly visible. Assumed stone positions that had been fully destroyed are marked by a dot.

The plan shows 30 stones in the Southern Inner Ring and would appear to also relate to the description of the circle by Stukeley (Stukeley, cited in Ucko et al, 1991 p.279).

The plan shows the position of the Meeting House, opposite Silbury House. The position of the Catherine Wheel Inn is also shown with the house opposite, in the corner of which, Stukeley claimed, was one of the stones (25).

1. *Beginning in Pasture 1, entering from the Town Street where on the left hand is a garden wall built (of) the stone that stood in its place.* [This is the position of stone 1 from Keiller's plan and stone 109 in the modern idiom. It is now indicated by a concrete plinth erected by Keiller (Smith, 1965). The entrance to this pasture must have been similar position to the present gate opposite the Red Lion inn. Stukeley here suggests that the stone walling that runs alongside this entrance, which can still be seen today (Fig. 2), was composed of the broken parts of this stone.]
2. *Next to which are two hollow holes the seats of as many Stones of the outer circle of this temple.* [Stones 2 (108) and 3 (107), which were excavated by Keiller (Smith, 1965), are at present marked by concrete plinths.]
3. *Three stones next are fallen but lie not much diminished; by the side of each is growing an ash tree, whence probably the stones were thrown down.* [Stones 4 (106), 5 (105) and 6 (104): there is a discrepancy here between the plan and the description. In the plan ash trees are shown in front of stones 3, 4 and 5, not 4, 5 and 6. Stones 4 and 5 were re-erected by Keiller (Smith, 1965); stone 6 clearly still existed in a fallen state in Stukeley's time, but has since disappeared.]
4. *The next is standing, of a handsome figure.* [Stone 7 (103) one of the original undisturbed stones.]
5. *Another lies along by the hedge side.* [Stone 8 (102) was re-erected by Keiller (Smith, 1965).]
6. *Entering Pasture 2 the first stone is standing.* [Stone 9 (101) this stone is due south of the Obelisk].
7. *The lodgement of the next is visible and a young ash tree planted in its room.* [Stone 10, which had already gone in Stukeley's day. The ash tree is shown in his plan.]
8. *The next has a little rising above the level of the ground.* [Stone 11.]
9. *The next has a great cavity left and a young elm tree planted therein.* [Stone 12: the cavity or depression here can still be seen.]
10. *The next to that is standing.* [Stone 13 has now gone.]
11. *In pasture 3 the first is standing.* [Stone 14 is no longer standing, although its position shows as a possible buried stone on the resistivity survey and has been marked on the NMR plan.]

12. *The 2nd has a hollow.* [Stone 15 also shows as a possible buried stone on the NMR plan.]
13. *The next a perfect vacuity.* [Stone 16 similarly shows as a possible buried stone on the NMR plan.]
14. *The next to that a very deep hole and great breadth.* [Stone 17 (122): the depression here is also still clearly visible today and was re-measured as part of this study. From stone 1 to stone 17 Stukeley's descriptions matches with the evidence that can be determined from different surveying techniques and their positions can be accurately determined. Any changes in the stone numbers must therefore occur with those stones that existed under the buildings or rear gardens that front Green Street.]
15. *The next stood by the pails of the garden.* [Stone 18 would have stood close to the present garden fence. This position fits broadly with what has preceded so far with respect to spacing and is the probable position of this stone. Perhaps at one time the stone formed a natural boundary marker for the garden plot.]
16. *In that garden there were two.* [Stone 19: Stukeley's plan (Fig. 1) and commentary, suggests two stones stood here. However when looking at his 3D plans in relationship to the 1886 OS map and on Google Earth (Fig. 2) only one stone could have existed in the garden plot. This might still exist, as a buried stone, in the most easterly property facing Green Street, known as Carpenter's Cottage.]
17. *And two in the barn adjoining; one whereof remains in the floor.* [Stones 20 and 21: The barn is clearly shown in Stukeley's plan (Fig. 1). If one stone only existed in the garden then this would be stones 20 and 21. The first is drawn half way down the southern side of the barn and second on the northwest corner. It would seem that one stone had already disappeared, with the other still showing in some form. From the detailing in Stukeley's plans it is not possible to say, which of the two stones might still have existed. Clearly the position of lost stones was not easy for him to determine.]
18. *The next destroyed since last year to build the next house.* [Stone 22: Stukeley shows the barn as being over stone 22 but as suggested this is unlikely. The 1886 OS sheet shows a property over this placement, which has subsequently been demolished. It looks to have been in the rear garden of one of a pair of semi-detached properties shown, in Fig 3, as 1 The Red Houses, Green Street.]
19. *One or two more did lie in the floor of that house.* [Stones 23 and 24: two stones are shown in Fig. 1. The 1886 OS sheet shows properties here that have subsequently been demolished.]
20. *The next lies now by the Street side under the corner of an house directly over against the inn.* [Stone 25: Almost certainly this is part of the house known as 6 Green Street, which stands opposite the position of the Catherine Wheel Inn, where Stukeley stayed on his Avebury trips. This stone is considered in greater depth later in the article. In Stukeley's plans stone 25 is marked at the corner, or in front, of the detached cottage. There is a problem here in that the circle's projected circumference suggests the stone should have been close to its rear wall, not its front. However most of the side wall and part of the front of the present property is composed of stone, with the rest being brick. Is this what Stukeley saw? (See Fig. 2) This stone is also indicated on a plan by A.C. Smith published in 1881 (Smith, 1881). Stone count number 26 is shown as a dot on Stukeley's plan, suggesting that it had already been removed some years earlier.]

21. *The next that was in the garden was destroyed to build the meeting house.* [Stone 27: The garden in front of the Meeting House can be readily identified as it still exists today. Stukeley shows the original building, with a double pitched roof, set close to the rear boundary fence, in the position of the present Victorian extension. The oldest part of the present chapel must have been built soon after Stukeley's time, which was probably why the stone that stood there had been removed. The possible position of this stone could have been picked up in the archaeological report [Oxford Archaeology, 2002] from the work carried out at the Meeting House in 2002. If so the stone would have been close to the northwest corner of the present main building.]
22. *The next is left in a barn or stable floor.* [Stone 28: Stukeley's comment here suggests that this stone might still have existed in some form in his time.]
23. *The next stood in a garden but now demolished.* [Stone 29: the position of this stone is shown on Gray's plan dated to 1908 (Gray, 1935). It was first recorded by A. C. Smith in 1884 when he states :

*"I have also to record that a large stone, which would have occupied a north-western portion in the southern temple, once stood in the garden of Mr Pratt, where a plum tree now stands; and that this stone is recollected by Robert Clements and other inhabitants of Avebury, though it was destroyed years ago."* (Smith A.C., 1884 p.142).

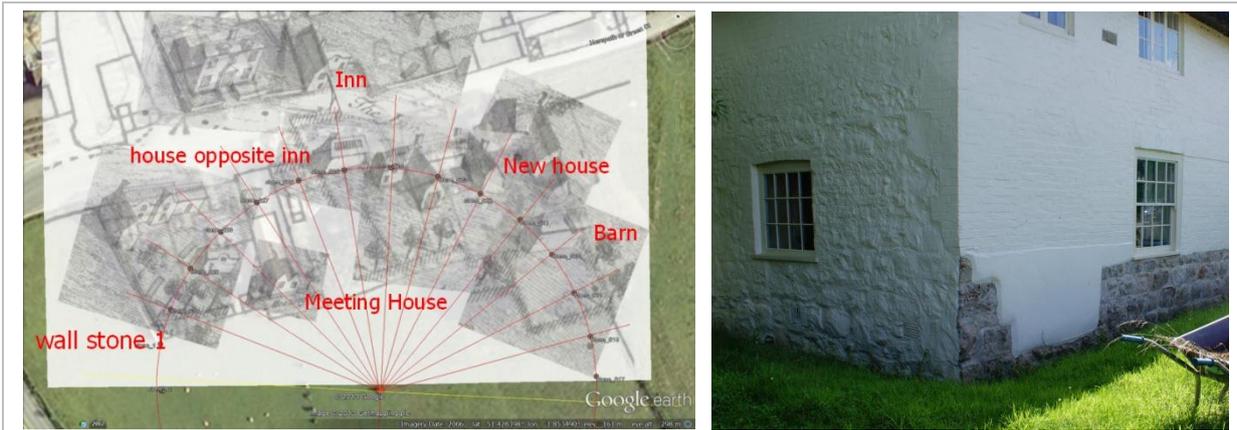
There is an anomaly here in that Stukeley suggests that the stone was '*now demolished*' and his plan in Fig. 1 shows it simply as a dot (missing stone); whilst Smith suggests that the stone could be remembered by villagers, probably a hundred years after Stukeley. In other of Stukeley's plans the stone is indicated as recumbent so perhaps he initially missed seeing it.]

24. *The last is at present buried in the same garden, which completes our number of 30.* [Stone 30: could there still be a buried stone in the rear garden on the most western property in Green Street?]

### **Issues and Anomalies - Stukeley**

Stukeley's description is reasonably clear although there are anomalies with his stone count as indicated in stone 19 above. Furthermore these ambiguities are found in different forms from his many sketches and maps. It is possible that his preconceptions on the number of stones could have influenced what he 'saw'. Regrettably, even in his day many of these stones had already disappeared.

The map shown in Fig. 1 appears to be one of his more accurate renditions as the comparison with the current 1:2500 scale OS sheet illustrates (see Fig. 3). Other of his plans showed greater inaccuracies. Fortunately the house at the corner of cross-roads in the centre of Avebury, called Silbury House, still exists today and this acts as a reference datum point for assessing the placement of the stones and the houses and cottages that existed in Stukeley's day. This property is directly opposite the 'Meeting House', the site of which was marked by Stukeley. As can be seen from an overlay of Stukeley's map shown in Fig.1 with the OS sheet there is a reasonable congruence between the rear boundary fence and the roads, whilst the garden to the east of the plan is skewed (Fig. 3).



Stukeley's 3D plan overlaid onto 1886 OS sheet and then onto Google Earth and 6 Green Street corner detail



Photos of Silbury House, the garden wall along side Stukeley's stone 1 (109) and the front of the Meeting House

Fig. 2 - Pictures and Plan Relating to Stukeley's 'Tour'

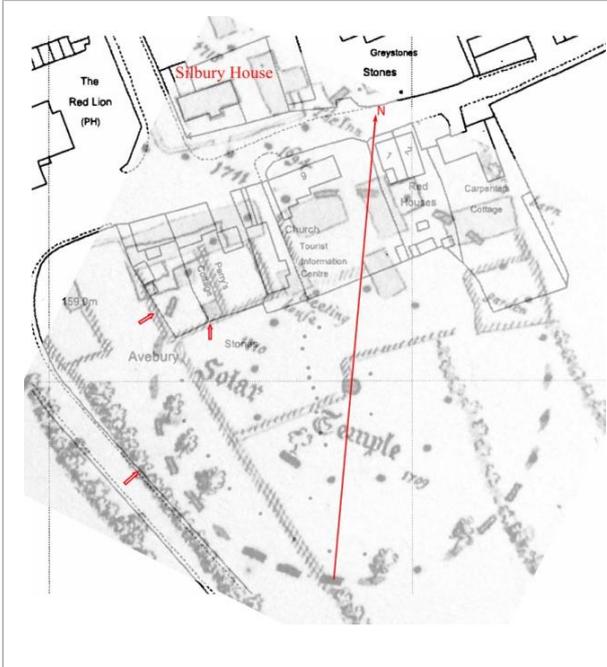


Fig. 3 – Overlay of Plan in Fig. 1 onto Modern OS Sheet

Silbury House, which still exists today, is shown along with some points of congruence between the two plans, which are marked by arrows (MS. Gough Maps 231, 22). This map is dated to 1721, whilst Fig. 4 map is 1724.

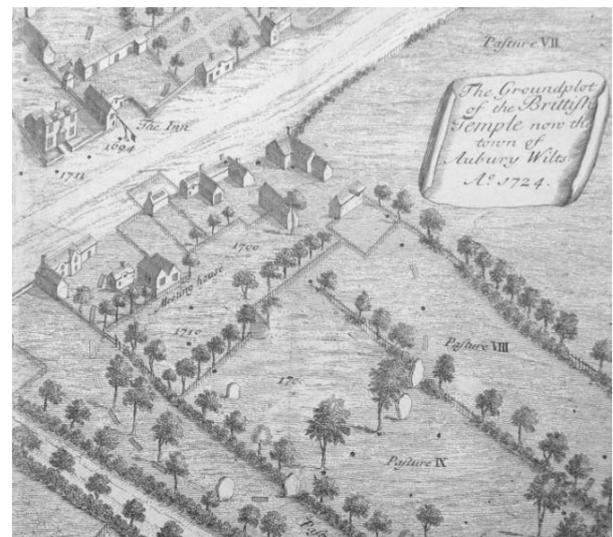


Fig. 4 – One of Stukeley's 3D Plans Dated 1724

As can be seen in this plan the position of the Meeting House is off-set to the left. It should have been placed in the building plot to the right. Additionally not all of the stone positions are shown (MS. Gough Maps 231, 304).

This is compared with one of Stukeley's three dimensional (3D) plans, where the southern section of the site has been nudged to the west and the alignment between 'Silbury House' and the 'Meeting House' is now off-set (Fig. 4). It was clearly difficult for Stukeley to record with certainty the stone

positions, despite his many visits to the site. Suspicious individuals could have concealed information or made it difficult for him to accurately note what he saw or presumed. This plan has been dissected in Fig. 2 to fit with the 1886 OS sheet and then overlaid into Google Earth.

### Isobel Smith's Account

Isobel Smith, wrote up her account on the excavations carried out with Alexander Keiller in *Windmill Hill and Avebury: an account of the excavations of A. Keiller*. As well as providing a 'tentative' plan of the site, as she imagined it to be, she also made commentaries on the number of stones that might have existed (Smith, 1965). It is worth recounting what she stated for the Southern Circle.

*"The circle appears to have been laid out with a peg and string on a radius of very close to 170 ft., as shown in Fig. 68....."*

*The spacing of the nine stones and stone-holes on the excavated arc of the circle indicates that the standard interval aimed at was 36ft., as in the Outer Circle. The range variation is as follows:*

<i>Stones 101-2 and 106-7</i>	<i>interval</i>	<i>32-33 ft.</i>
<i>Stones 102-3 and 103-4</i>	<i>interval</i>	<i>35-36 ft.</i>
<i>Stones 107-8 and 108-9</i>	<i>interval</i>	<i>36-37 ft.</i>
<i>Stones 104-5 and 105-6</i>	<i>interval</i>	<i>37-38 ft.</i>

*Assuming that the average interval of 36 ft. is maintained round the remainder of the circle, and that the estimated radius is approximately correct there would have been a total of twenty-nine stones." (Smith, 1965 p.198).*

### Issues and Anomalies - Smith

The first anomaly in Smith's figures is why she chose a radius of 170 ft for the circle. She would have had at her disposal the original measurement figures from the Keiller archives, shown in Fig. 6 (Keiller, 1939). These provide an average radius of 166.46 ft. In fact only one of the stones (109) at 172.65 ft is in excess of her claimed average. It is possible that she would have been aware of the work of Alexander Thom, whose book published in 1967 on the *Megalithic Sites in Britain* gave a diameter of 125 megalithic yards or 340 ft for the inner circles at Avebury (Thom, 1967). However, she makes no reference to Thom's work so the reasons for her choice must be speculative. Our own researches into the radius of the Southern circle suggest the possibility of two distinct arcs one of 170 ft and the other of 165.5 ft, with different centres, probably derived from the side of the Obelisk stone (Furlong and Smout, 2013). Nevertheless, if we accept Smith's mean figure of 170 ft we can explore further the reasons for her suggestion of a circle of 29 stones.

A circle with a radius of 170 ft would have a circumference of a little over 1,068 ft. If this figure is divided by 36 ft, the claimed average spacing, then the derived number is 29.67. Clearly one cannot have a fraction of stones so the number had to be rounded either up or down. Smith chose to round this figure down probably on the assumption that this spacing best fitted the evidence she perceived and also because she chose as her starting point stone 101. As will become apparent, this stone is particularly significant because it is almost exactly due south of the Obelisk. It was from this stone that Smith established her number sequence running clockwise around the circle.

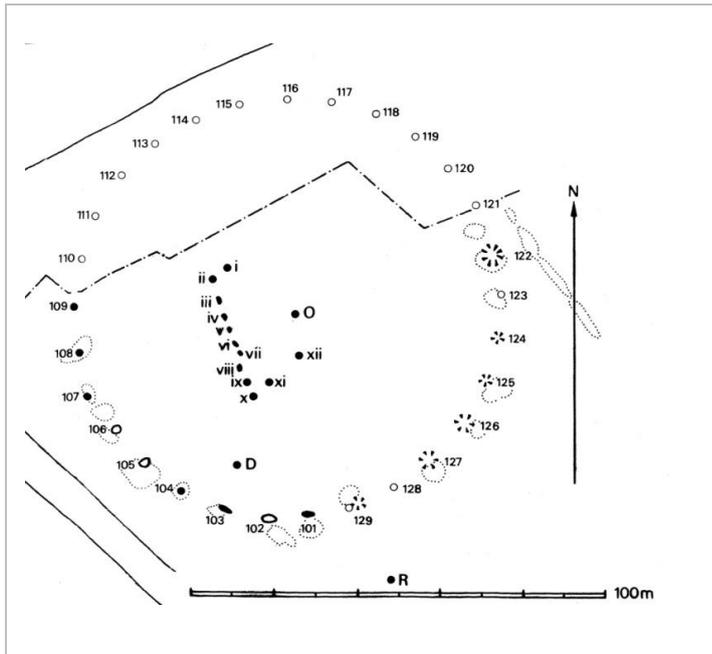


Fig. 5 - Smith's plan of the Southern Inner Ring

This shows 29 stones along with her stone referencing (Smith cited in Ucko et al, 1991).

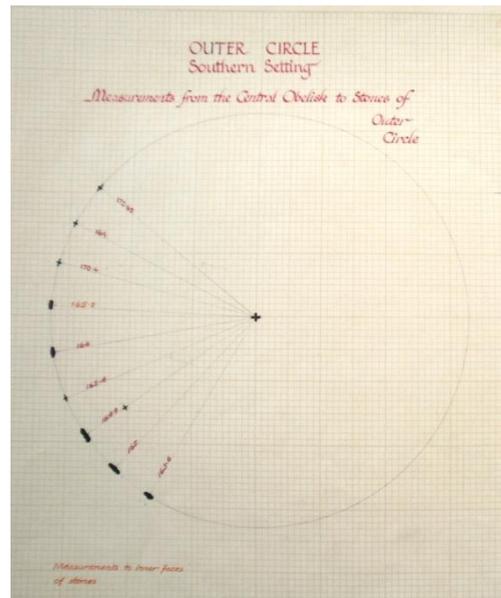


Fig. 6 - Measurements from the Keiller Archives

This shows the distances from the known stone positions to the Obelisk (Keiller, 1939).

Additionally she would have known the azimuth of stone 109 from the Obelisk marker as well as the azimuth of the large depression in the east of the circle, which Smith shows as stone 122.

From Google Earth maps and from theodolite survey these two azimuths can be shown as:

1. Obelisk to stone 109 = 278.68 degrees
2. Obelisk to stone 122 = 83.94 degrees

The difference between these two azimuths is 194.74 degrees, which gives a circumference distance in this sector of just under 578 ft. When this is divided by the 16 stone placements a mean spacing for the stones of 36.11 ft is obtained, which is reasonably close to Smith's claimed average of 36 ft. For comparison Stukeley suggested a spacing of 35ft for stones 101 – 105 on one of his maps (Bodleian Library MS. Eng. Misc.c.533, 53v-4)

This calculated figure of 36.11 ft can be compared with the nominal spacings for a 29 or 30 stone circle and their differences noted:

- 29 stone circle would have a mean spacing of 36.83 ft, - difference < + 0.72 ft
- 30 stone circle would have a mean spacing of 35.60 ft, - difference > - 0.51 ft

As can be seen from these figures the known southern segment of the circle, between stones 109 to 122, provides inconclusive proof on whether the circle had 29 or 30 stones. The figure tips marginally in favour of 30 stones because of the smaller difference between the calculated and mean figures, but not conclusively so. One can extrapolate further by looking at the mean spacings for the northern sector of the circle, which would demand an average increased spacing to 37.65 ft for a 29 stone circle or a decrease to 34.93 ft for a 30 stone circle. The question that needs to be

addressed is which of the two is the more likely? Whether the spacing between stones expanded in the northern sector or contracted?

### Reassessing the Known Stone Positions

The position of Stones 101 – 109 can be accurately confirmed both by their physical existence and from Keiller’s excavations, now marked by concrete plinths. The position of stones 122 – 129 has been assessed by geophysical survey and through ground depressions. Fig. 5 above shows the correlated position of the stones. The angular relationship of these 17 stone positions can be calculated through Google Earth and are assessed in Table 1. The section coloured blue shows the original nine stones from which Smith made her calculations. The mean angle, from Table 1, is 12.17 degrees, which translates into a distance of 36.11 ft or 11 m. What is also striking about these figures is the variation between the distances, which do not on the surface appear to conform to any regularity. Nor incidentally do they correlate with the spacings that Smith suggested. For example spacing 101 to 102 is 35.28 ft not 32-33 ft as Smith claimed.

More significantly, a closer examination shows that the stones positions appear to be set in pairs on either side of a north-south axis. This can be shown by looking the stones set on either side of stone 101, which, as already stated, lies due south of the central Obelisk stone. This is shown in Table 2.

**Table 1**  
**Southern Circle - spatial distances**

		<u>Degree</u>	<u>Diff - deg</u>	<u>Spacing ft.</u>
Smith's stone number	121-122	83.94		
	122-123	95.41	11.47	34.03
	123-124	108.58	13.17	39.08
	124-125	120.18	11.60	34.42
	125-126	131.40	11.22	33.29
	126-127	145.68	14.28	42.37
	127-128	158.14	12.46	36.97
	128-129	168.44	10.30	30.56
	129-101	180.74	12.30	36.49
Smith's original	101-102	192.63	11.89	35.28
assessment	102-103	204.62	11.99	35.57
	103-104	216.93	12.31	36.52
	104-105	229.95	13.02	38.63
	105-106	242.12	12.17	36.11
	106-107	254.28	12.16	36.08
	107-108	266.84	12.56	37.27
	108-109	278.68	11.84	35.13
sixteen spaces				
		Mean	<b>12.17</b>	<b>36.11</b>

**Table 1 – Angular position of stones and hole depressions in the Southern Inner Circle**

Table 2 shows the paired relationship of stones on either side of stone 101.

Stone	Degree									
109	83.94								96.80	
108	95.41	East						85.33		
107	108.58						72.16			
106	120.18					60.56				
105	131.40	Solstice			49.34					
104	145.68			35.06						
103	158.14		22.60							
102	168.44		12.30							
101	180.74	0							South	
129	192.63		11.89							
128	204.62		23.88							
127	216.93			36.19						
126	229.95	Solstice			49.21					
125	242.12				61.38					
124	254.28				73.54					
123	266.84	West						86.10		
122	278.68								97.94	
		diff	0.41	-1.28	-1.13	0.13	-0.82	-1.38	-0.77	-1.14

**Table 2 – Paired Angular position of stones and hole depressions in the Southern Inner Circle**

From Table 2 it can be seen that the maximum divergence between the east-west pairings is -1.38 degrees, whilst the overall mean difference is -0.75 degrees. It should also be noted that, in most instances, the angles in the western sector are marginally greater than in the east. This difference can best be explained if the circle was set out to align to astronomical events, such as the rising and setting of the sun, moon and stars.

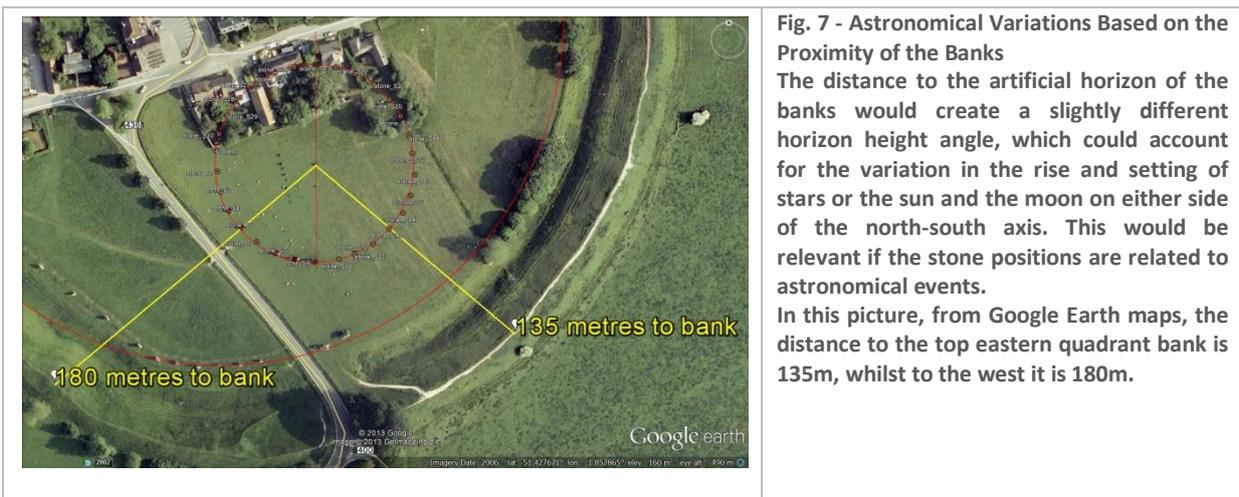
Coincidentally, from calculation, it can be shown that stone 126, highlighted in Table 2, is aligned to the setting of the sun at the winter solstice, whilst stone 105 would appear to have been aligned to its winter solstitial rise. At this stage it is too early to state with any certainty, to which astronomical bodies other stones might point, although the evidence would appear to suggest that they are so aligned. Whilst the brightness of the sun or moon, will always show emerging or setting on a clear day on the horizon line, stars are somewhat different and are more susceptible to atmospheric changes. Their normal extinction angle, when they appear or disappear, is about two degrees (2°) above the horizon but this is also tempered by the brightness of the star, the closeness of the horizon and atmospheric pressure.

The present horizon heights, from the position of the Obelisk, looking east towards the Marlborough Downs and west towards Morgan Hill, Cherhill Downs and Windmill Hill are all below this 2° extinction angle. Only Waden Hill at 2° - 37', in the south to southwest sector, is higher. However, if the banks of the original henge were originally over 6 metres in height as proposed by Burl, then this would have created an artificial horizon for large sections of the site (Burl, 1979). There is some complexity in checking this out, as the Southern Circle does not sit in the middle of the henge, nor are the banks evenly placed around the circle. From the southern and western entrances the distance between the Obelisk and the bank varies from between 150 - 240m, whilst between the southern and eastern entrances the distance is 135 - 204m (Google Earth, 2013). Additionally there is about a one metre difference in height from east to west across the henge. Finally, from an

observer's perspective, horizon heights will vary depending upon their height and whether sitting or standing. This is particularly important with close horizons, as in the case of the bank.

Taking these factors into consideration, by calculation a 2 degree horizon datum looking west from the Obelisk would require a bank height of a little over 6.5 metres. This is marginally higher than suggested by Burl but not extensively so. The same bank height in the eastern sector, however, because it is closer to the Obelisk, would create an artificial horizon of around 2.5 degrees. It should be remembered that stars will always appear or disappear around 2 degrees, unless the horizon is above that height, whilst the sun and the moon will be fixed to the actual horizon level.

With these two datum heights it is possible to test whether this could explain the slight displacement of the east and west stone positions from the central N-S axis. For this purpose the rise and set position of the star Sirius, in 2900 BCE, is used. Using a computer generated astronomical programme (StarCalc 5.73) Sirius' rising azimuth would have been 49.12 degrees from due south, whilst its setting azimuth would have been 50 degrees. The difference between these two azimuths is about -0.9 degrees. This can be compared with the mean displacement of the stones between the eastern and western sectors of -0.75 degrees (Table 2). This close correlation supports the view that the stone placements could have been based on astronomical alignments to the sun, moon or stars from the created artificial horizon of the bank. This is shown in Fig. 7.



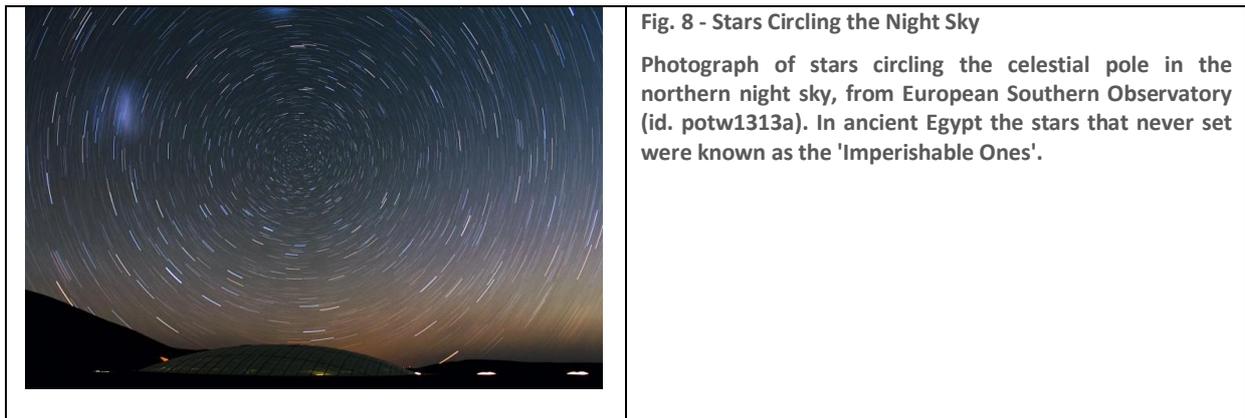
The question that now needs to be addressed is whether this mirroring of stones continued for the northern sector of the circle; the part that has now disappeared under the houses and gardens that front Green Street.

### The Northern Sector of the Southern Circle

Regrettably, with the complete destruction of the northern sector of the circle, there are few clues on which to base an assessment. We have Stukeley's accounts and maps, with all their anomalies (Stukeley, 1719-1743); we have the archaeological excavation carried out by Oxford Archaeology, on the western corner of the Meeting House (Oxford Archaeology, 2002), which suggested a possible stone hole and we have the Gray's map, showing the position of a stone from a plum tree (Gray, 1935). With so little to go on and without further evidence, some assumptions must be inevitable. Additionally, the artificial horizon height of the bank changes the closer to the north point of the circle because of the increased distance. Possibly significant also is the lack of hills in this northern sector of the site, which might have been a reason for placing the temple in this location. This

position effectively provides a 60 degree window looking north, unencumbered by any topographical features, giving a clear view of the northern night sky and the stars that circle the celestial pole.

The first magnitude stars and asterisms in this sector of the night sky do not really rise or set. They simply circle the celestial pole throughout the year and their positioning would have been one way of determining the seasons (Fig. 8). With the possible exception of Deneb, it is not until we get to the constellation of Cassiopeia, which would have risen on an azimuth of 35 degrees, in 2900 BCE that there are any major asterisms or stars that would have broken the horizon line in this part of the henge. Bright stars like Vega, Arcturus or the 'Plough' constellation would have all been clearly visible to the ancient Avebury people, circling this heavenly pole.



Additionally, at the latitude of Avebury, this northern section lies outside the orbital swings of the sun and the moon. So even if it is possible to approximately position the stones in this sector of the circle one can never be certain to which stars, if any, they might have pointed.

Fig. 9, based in the Google Earth Map, shows the circle divided into quadrants derived from the four cardinal directions. The existing stones or the known stone positions are shown. From this plan it can be seen that the southern half of the site contains 15 stones, with stones 108 and 123 lying south of the east-west divide. The symmetry of the stone positions can be also perceived on either side of the north-south axis. This axis would be most important for any circle with astronomical features as this would set the datum line around which the stars, both northern and southern, or the sun and moon, would circulate. Supporting this notion, a north-south datum alignment has been noted in many other stone circles throughout the British Isles and was clearly important to the Neolithic peoples of this period (Burl, 1996).

On the assumption that the Avebury Southern circle is based on astronomical observation then one would then expect symmetry in stone placements on either side of this central axis. If the northern sector contained 14 stones, to complete a 29 stone circle, then there should be no stone marking the north point, with stones set on either side of the alignment. If on the other hand the northern sector mirrored the southern, incorporating 30 stones then one would expect to find a stone marking the north node. If a north point stone can be shown to exist then the odds are tipped heavily in favour of a 30 stone circle; if not then 29 stones become likely. In Stukeley's plan (Fig. 3) this north point stone equates with stone 24. The question is whether its position can be determined with any degree of accuracy and, additionally, can Stukeley's observations be trusted?

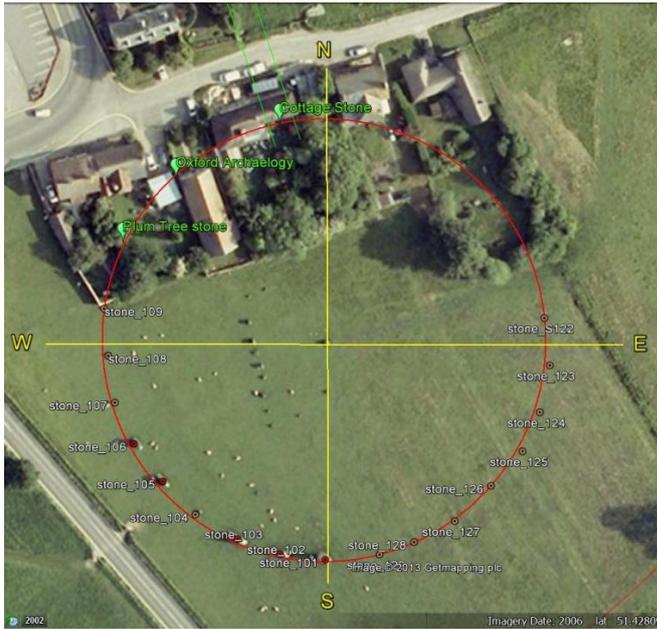


Fig. 9 - Circle Overlay into Google Earth

The known stone positions are shown as well as the division of the circle by the four primary directions. As can be seen 15 stones would have stood south of the East-West bisector of the circle.

The possible stone positions from Stukeley (opposite the inn), Oxford Archaeology (northwest corner of the Chapel) and the plum tree on Gray's map are marked in green as is also the building sight lines from the position of the Catherine Wheel inn.

The first primary question is whether it is possible to fix a position of a stone on the north point of the circle?

### A North Point Stone

All the stones in the northern sector have been buried or destroyed and their positions are unknown from any archaeological excavation. However Stukeley, living much closer to the period of the stones destruction is able to give some helpful insights. To reiterate from his 'tour', of stone 24 he states:

*"One or two did lie in the floor of that house"* (Stukeley, cited in Ucko et al, 1991 p.279)

Figures 3 and 4 from page 6 show the approximate position of stone 24 as Stukeley thought it to be. It would seem from his plans that the house, which lies furthest to the east, now known as Carpenter's Cottage, probably existed in some form, in 1724. Fig. 10 and 11 detail the above plans, showing the possible developmental changes in Avebury between 1721 and 1724 with a new house appearing alongside the eastern field boundary hedge.

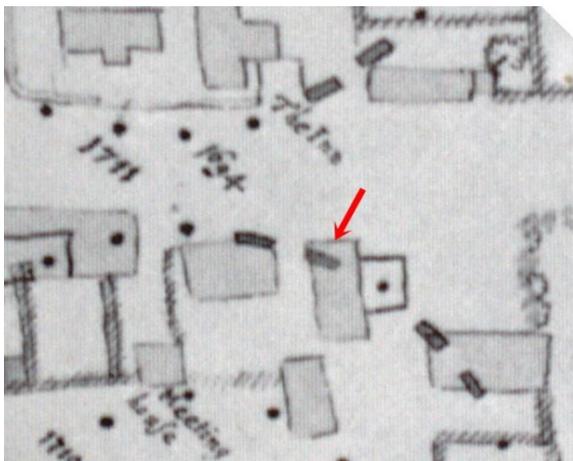


Fig. 10 - Detail from one Stukeley's Maps

Stone 24 is highlighted by red arrow (From MS. Gough Maps 231, 22).

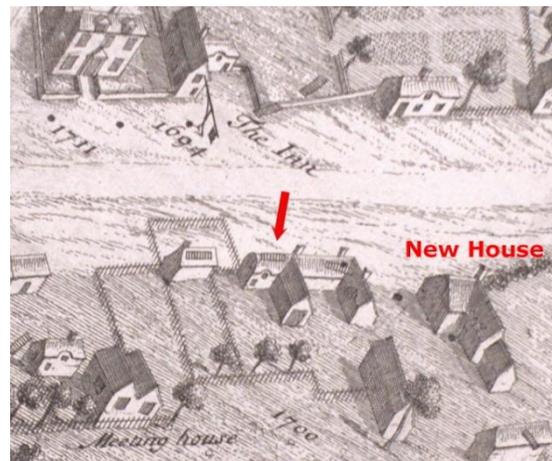
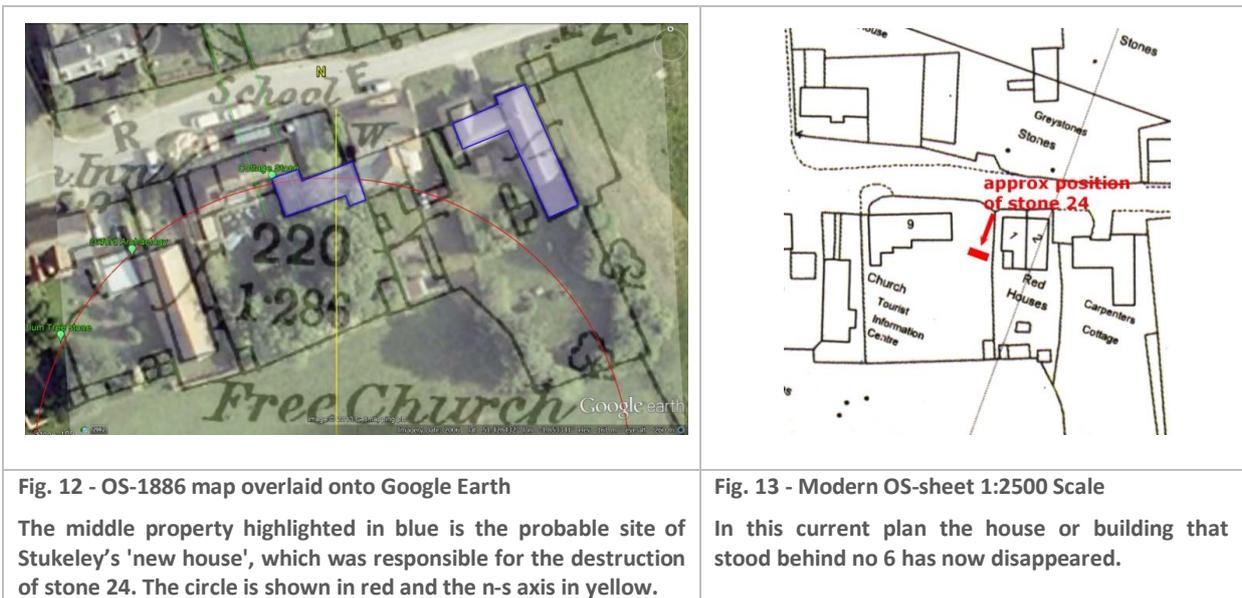


Fig. 11 - Detail from one of Stukeley's 3D Plans

Stone 24 is highlighted by red arrow, with the position of a new house indicated (From MS. Gough Maps 231, 304).

These maps can be compared with the OS - 1886 map overlaid onto Google Earth and a modern OS map for comparison.

Developmental changes can be compared as shown between Figs. 12 and 13. The building in Fig. 12, shown in blue in the centre of the plan, now no longer exists (Fig. 13), probably because it was an old structure and deemed unsuitable. The building shown as Carpenter's Cottage in Fig. 13, would appear to have been erected in Stukeley's day. It is a Grade II listed building dated circa 17<sup>th</sup> century (English Heritage Building ID 311497). Additionally the semi-detached properties known as 1 & 2 Red Houses must have been erected after 1886, following the demolition of the properties that then existed to their rear. From these plans, Stukeley's stone 24 must have stood in the present garden of number 6 Green Street, probably close to the boundary fence with number 1, The Red House, in Fig. 13. This correlates with the north point of the circle.



Without excavation it is impossible to know for certain whether a stone stood at this point. Indeed, with the building that once stood here all trace of a stone hole could have long since disappeared. Nevertheless the demolition of these buildings could have provided an opportunity for careful excavation had the opportunity been taken. What these plans show is that if Stukeley was correct in his observations, then a stone must have stood very close to the north point of the circle, the position of which is highlighted in Fig. 13. This supports Stukeley's view that the circle contained 30 stones.

### The Stones of the Northeast Quadrant

Before looking in more detail at the stone positions of the northwest quadrant it is worth briefly examining the considered stone positions between Smith's stone 122 and the north point stone.

Stukeley shows six stones and seven spaces in this section. The azimuth of stone 122 from Table 1 is very close to 84 degrees. This effectively gives a 12 degree or 35.6 ft average spacing between these stones. This fits within the spread of stone placements for the existing stones. More exact positions for their placement could possibly be determined from astronomical calculations or perhaps from

geophysical survey work at some future stage. This lends further weight to a 30 stone rather than 29 stone circle.

### **The Stones of the Northwest Quadrant**

A number of stone positions have been recorded in this section, which contains the area of greatest anomaly. As will be shown, the stone placements that have been recorded here do not easily fit with either a 29 or 30 stone circle. The positions will be considered in turn following Stukeley's tour description.

### **The Cottage/House Stone - 25**

Moving ante clockwise the next stone in the circle from the north point is Stukeley's stone 25. He claimed that it existed under the corner of a house "*directly over against the inn*" (Stukeley, cited in Ucko et al, 1991 p.279). In his many plans this stone is shown as still existing, albeit in a recumbent or determinable form. The inn no longer exists, although its position can still be accurately placed from the 1886 OS survey. This is shown in Fig 10. The house opposite, 6 Green Street, is more problematic. The Listed Building Register states:

*Block of 3 cottages, now 1 house. C17, extended C18 and 1833. Colourwashed sarsen, chalkstone and brick, with thatched roof. Two storeys, 4 bays. Central 2 bays of lobby entry C17 plan, with a half-glazed door under flat canopy. Sixteen-paned sashes to left, and 3-light windows. This building extended first to right by one bay and rear bay forming wing, with boarded door and C19 timber windows. Second extension to left as third cottage, datestone reading: High Street Cottages, 1833. Door blocked and 16-pane and other windows. Roof hipped over both ends bays. (English Heritage Building Grade II, ID 1365948)*

Clearly part of this building had to be the property Stukeley showed in his plan as being opposite the inn. If the information from the register is correct then the original cottage must have been in the centre of the present house, with the 'stone', now inside. Possibly this stone was broken up and this is what forms the eastern gable end of the present property.

One other conundrum exists here in that Stukeley shows the stone at the front of the house and maintains that it existed '*by the Street side under the corner of an house*' and not in the rear of the property as the circle projection dictates (Fig. 12). It was for this reason that the authors initially suspected that another house must have existed to the rear of the present property. This cannot be the case, so the questions remains on whether Stukeley took the broken stone parts in the front of the house to have been the position of the stone or whether the circle, in this segment, was of much greater arc than previously suspected. This seems unlikely. Either this stone, stood outside of the circle's circumference or Stukeley mistook, what he saw.

Assuming that the stone stood to the rear of the original central property then it must have been on an azimuth of 348 degrees from the Obelisk. This would give a 12 degree or 35.6 ft difference between this stone and stone 24 at the north point. This is commensurate with the stone placements in the northeast quadrant.

The next stone in the sequence would be stone 26. Of this stone Stukeley makes no direct reference and it is shown as a dot on his plan. The stone itself must have stood under the right hand extension of number 6.

### The Chapel or Meeting House Stone

Stukeley maintained that a stone existed in the chapel garden, which was demolished to make way for the new Meeting House building. This would have been stone 27 in his sequence. The position of the chapel boundaries still exist today so this stone must have resided between azimuths 319 - 329 degrees from the Obelisk. In 2002 the Oxford University Archaeological unit carried out a site management for a new drain that needed to be laid alongside the western edge of present chapel buildings. They identified a possible stone hole at the north-western corner of the building (see Fig. 14).

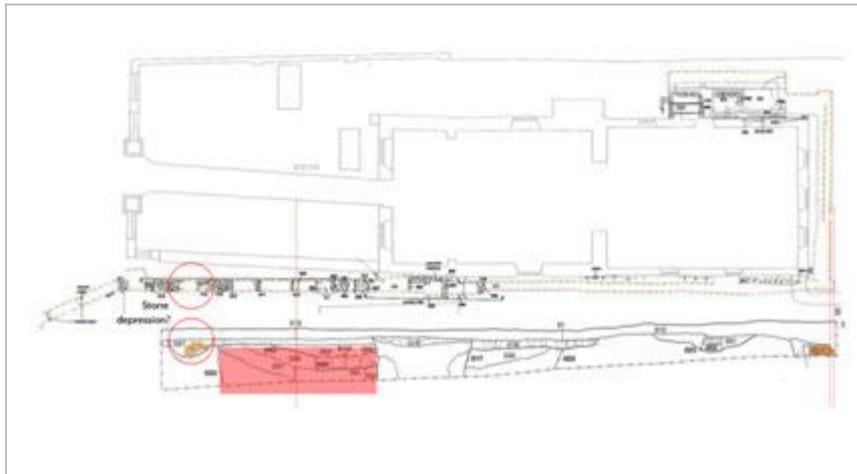


Fig. 14 - The Chapel Survey Showing Position of Possible Stone Hole



Fig. 15 - Photo of Drain Trench

The position of this possible hole would suggest that the stone stood close to the western front edge of the chapel and therefore closer to 319 degrees than 329 degrees. Unfortunately, from this evidence alone, it is impossible to say whether it was the centre of the stone hole or either side of it, or indeed, a burning pit rather than a stone hole, because it was not fully excavated. If the placement of around 348 degrees for stone 25 is correct then the angular difference here would be 29 degrees, for two stone placements, with an average of 14.5 degrees or 43 ft per space. This is somewhat larger than the greatest spacing in the known stone positions and it would therefore lie outside of the scale in Table 1. Some doubt must therefore exist about the position of this stone, unless it was placed to determine some astronomical alignment, such as a lunar extreme, that could have caused this shift in stone positioning. The more likely position for a stone here would be in front of the present chapel building. Because of the lack of proper excavation work it is impossible to draw any conclusions about this proposed stone hole and its position must therefore remain anomalous.

### The 'Plum Tree' Stone

The 'Plum Tree' stone was recorded by A. C. Smith on his plan dated 1884, and was shown as being very close to Stukeley's stone 25. This must be incorrect as the stone placement would have then been under the cottage, which clearly dated back to Stukeley's time. Gray's plan published in 1935 shows the stone in the rear garden of Perry's Cottage. Its position can be assessed against a Google Earth map as having an azimuth from the Obelisk of 297 degrees.

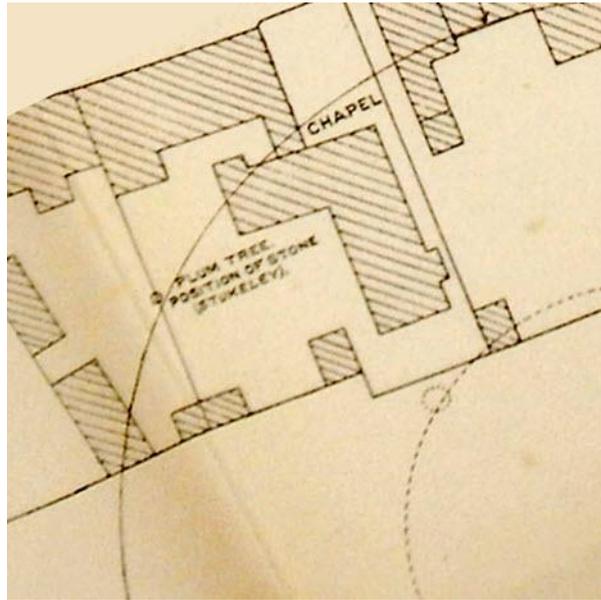


Fig. 16 - The 'Plum Tree' Stone from Gray  
Map dated to 1935 but is the position accurate?

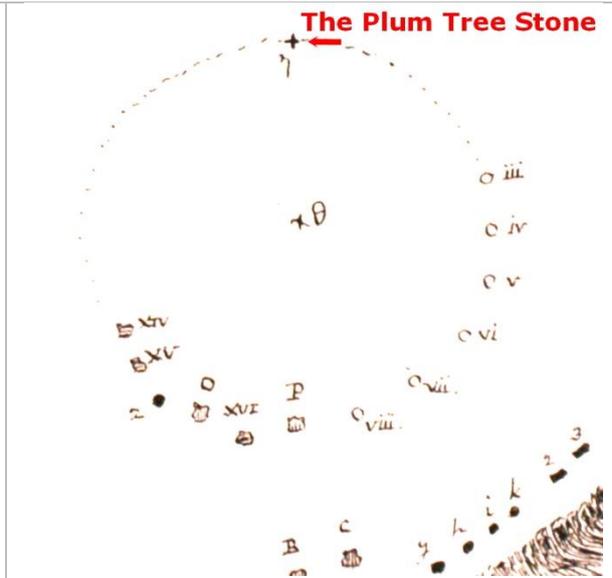


Fig. 17 - The 'Plum Tree' Stone from A.C. Smith  
Map dated to 1884 but this must be incorrect.

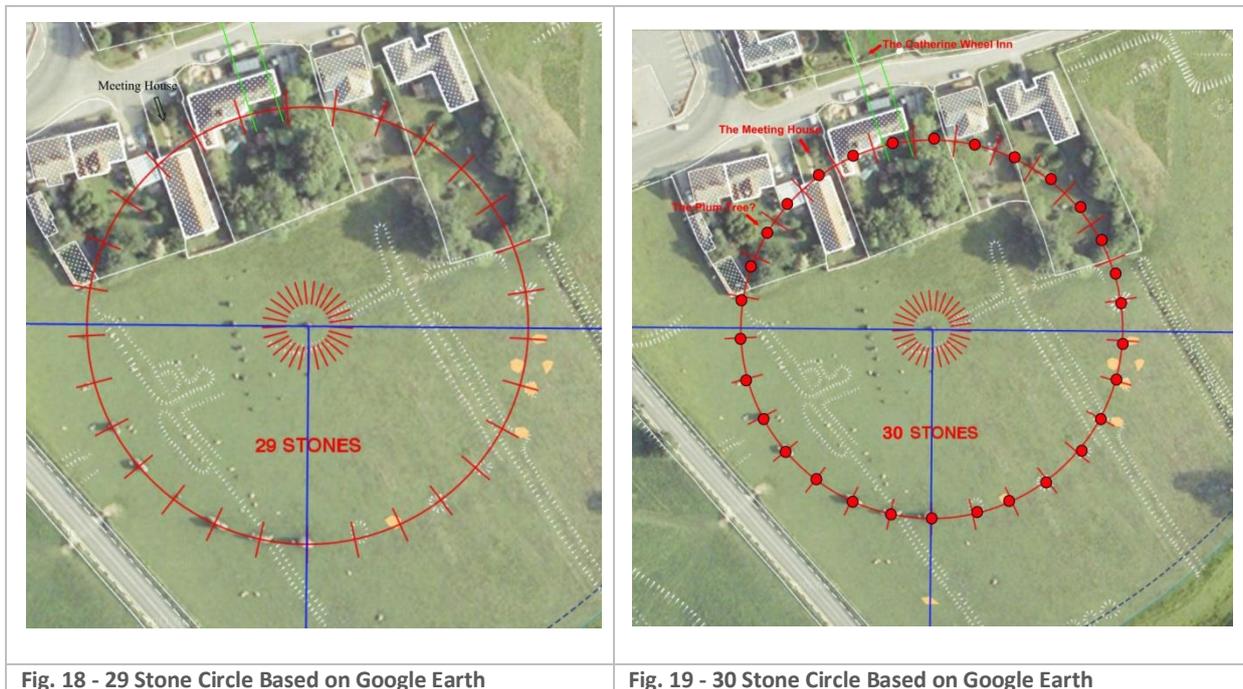
If the position of the Plum Tree stone is correct then the angular distance between this stone and stone 109 would be 19 degrees or around 56 ft. Stukeley shows another stone fitting between these two, in which case the angular spacing would then drop to just under 10 degrees each or around 30ft. Neither of these distances easily fit with the other known spacings. This highlights the problems when trying to assess whether 29 or 30 stones best fits this circle and further more whether these suggested stone placements are accurate.

Looking east and relating the 'Plum Tree' stone back to the north point then the potential five spaces would span 63 degrees giving an average placement of 12.6 degrees or 37.38 ft each. This would better fit a 29 stone circle than one of 30 stones. However a gap then of some 56 ft to stone 109 seems improbable.

It is these issues that make the determining of the number of stones within this sector of the circle so difficult, as one set of data appears to contradict another. For example, from Table 1 the angular distance between the stone 109 and the north point can be shown to be 81.32 degrees. If 6 stones originally fitted here, as Stukeley suggested, then the average spacing would be 11.6 degrees or 34.4 ft. If only 5 stones existed in this sector then the mean spacing would increase to 13.55 degrees or 40.2 ft. Moving clockwise from stone 109, based on these figures then the 'Plum Tree' stone position would not fit with the 29 stone pattern, being better placed to a 30 stone sequence, whilst the possible stone hole by the Meeting House, fits a 29 stone sequence but not one of 30 stones.

This suggests that there must be inaccuracies with these two positions. The most likely scenario is that the 'Plum Tree' stone was possibly slightly further around the circle and that the Meeting House stone was also to the east of the proposed placement by Oxford Archaeologists. Without further survey work we cannot be sure.

Figs 18 and 19, based on Google Earth maps, highlight the two circle possibilities and the problems in fixing the stone positions. The 29 stone circle has stone positions shown as red lines, whilst the 30 stone circle shows them as red dots. In Fig. 19 these proposed placements can be compared.



### Comparisons

The primary assumptions, in the above plans, are that the spacing in Fig. 15 would continue to follow evenly around the circle, whilst in Fig. 16 the stone positions are mirrored between north and south. Some of the pros and cons for the position of the stones in the northern sector, for each circle, are weighed in Table 3.

Circle	For	Against
29 stones	<ul style="list-style-type: none"> <li>- Represents a reasonable fit for full circle.</li> <li>- Congruence with the position of a possible stone alongside north-west corner of the chapel.</li> <li>- Considered by Smith and others since her time to be the correct number of stones.</li> </ul>	<ul style="list-style-type: none"> <li>- Is not supported by Stukeley and does not relate to some of his stone positions, particularly the stone opposite the inn and the stone in the north point of the circle.</li> <li>- Does not fit with the position of the 'Plum Tree' stone.</li> </ul>
30 stones	<ul style="list-style-type: none"> <li>- Maintains symmetry for the site.</li> <li>- Stone positions fit better for a stone opposite the inn, the north point stone and the 'Plum Tree' stone, assuming that these stones are correctly placed.</li> <li>- Would fit with an astronomical perspective.</li> <li>- Incorporates an N-S axis, which was often built into the design of circles and other ritual sites (Burl, 1976).</li> </ul>	<ul style="list-style-type: none"> <li>- Is not congruent with the position of a stone at the north-west corner of chapel.</li> <li>- Spacing of stones more problematic in the north-west sector.</li> </ul>

Table 3 - Pros and Cons for both 29 and 30 Stone Circles

## 29 or 30 Stones

In widening the scope of this enquiry it is worth considering why the builders of Avebury should have chosen either 29 or 30 stones for the Southern Inner Ring. Proponents of the 29 stone circle, such as author Robin Heath, often argue a case for this number because it reflects a lunar cycle based on the approximate number of days in a lunar month (Heath, 1998). Heath demonstrates that on the assumption of the Northern Inner Circle having 27 stones in its ring then a very simple method could be used for:

*'clocking of lunar cycles, sidereal and lunation'* (Heath, 1998 p.194).

The method, perhaps similar to how the Aubrey holes might have been used at Stonehenge, would involve moving a stone or wooden marker on a daily basis around the circles, effectively providing a 27 and 29 day count. On the completion of each full cycle markers would also need to be used against the stones in the larger circle, which, for the Heath system to work, would need to number or incorporate 107 stones. Using this method a system of establishing ritual days based on lunar cycles could be discovered.

Modern research has begun to confirm the potential use of sites like Stonehenge for assessing solar, lunar and sidereal cycles, so it is not implausible for a system, such as Heath's, to have been used in Avebury. However, it raises the question on why create such a vast edifice when something on a much smaller scale, such as the Sanctuary site could work just as well. The Southern Inner Ring would rank third equal in size alongside the Northern Inner Ring at Avebury and the Ring of Brodgar in the Orkneys. The only stone circles of greater diameter are the outer ring at Avebury and the largest of the Stanton Drew circles. Heath's system would require a high level of quite sophisticated ritual activity around the henge on a daily basis and could be prone to abuse or error, which would be much less likely in a smaller more contained site like Stonehenge.

Set against the 29 stone argument are the existing megalithic edifices, which incorporate a 30 stone count, the most notable of which being Stonehenge, seventeen miles to the south of Avebury, with its 30 stone Sarsen circle (EH website). Two circles already mentioned, Stanton Drew, in Somerset, is thought to have had 30 stones in its larger ring (EH website) and the Ring of Brodgar, in the Orkneys, is considered to have held 60 stones (Orkneyjar website). Mitchell's Fold circle in Shropshire, is another 30 stone circle site (EH website). There is no solid evidence to support a 29 stone count, or a multiple of it, in any of the major stones circles of Britain (Burl, 1976), so why would Avebury be an exception? Additionally the number 30 has a certain inherent symmetry, which could well have been of significance to the Neolithic peoples in that it incorporates, through its 5 x 6 factors, both pentagonal as well as hexagonal geometric patterning.

Stukeley affirmed a 30 stone circle but can we trust his evidence? Even within the short description of the 'tour' cited here there are errors and anomalies and, as has been noted elsewhere, he had a penchant to project his own pre-conceived ideas onto a site (Ucko et al, 1991). Nevertheless, in many instances he has been found to have provided an accurate description for many different archaeological monuments (Piggott, 1985). He was also correct in his description of the southern section of this circle as modern studies have attested. We are assuredly indebted to him for the enormous wealth of information that he has garnered, so equally his evidence cannot just be dismissed. With respect to the number of stones in the Southern Inner circle, Ucko et al in *Avebury*

*Reconsidered* declined to be drawn into the debate preferring just to cite the perceptions of Aubury, Stukeley and Smith (Ucko et al, 1991). In a similar vein, Joshua Pollard and Andrew Reynolds in *Avebury: The biography of a landscape* list the Inner Northern and Southern circles as 'comprising rings of between 25 – 30 stones' (Pollard and Reynolds, 2002 p. 86). Those that have a vested interest in determining the number of stones, like Heath, will cite the number of stones that best suits their pet theory.

### **Conclusion**

The evidence presented here highlights the problems in determining the number of stones in the northern sector of the circle because of its destruction. The known stone positions, in the southern sector, do not indicate clearly whether the ring had 29 or 30 stones, so this cannot be used to extrapolate a definitive case one way or another. The honest scientific answer here, based on the known position of stones, would be to state that the circle could have contained either 29 or 30 stones.

When the evidence from Stukeley is added to the mix, then the weight of proof tips significantly towards this being a 30 stone circle; placing it alongside some of the other great circles that also contained 30 stones. Whether further research will clarify this position must be speculative as it is unlikely that any excavations will take place in this northern sector. Furthermore the extent of building development would, most probably, have destroyed any evidence of the stone hole positions, although geophysical survey work might reveal some of the missing stones particularly in the gardens of Carpenter's or Perry's cottage. Further research into the circle's astronomical function could prove helpful and other insights from the Northern Inner Circle might shed more light on the composition and function of this stone ring.

### **Acknowledgements**

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