The Sarsens of the West Woods, Marlborough Downs and Stonehenge

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Abstract: The debate concerning the origin of the Stonehenge sarsens was revolutionised following the release of new geochemical data in 2020. Reacquisition of a sarsen core extracted over 60 years previously, during repairs at the henge, enabled the identity of the immobile trace elements in the core after whole rock ICP-MS and ICP-AMS analysis. Comparison of high-resolution chemical fingerprints from a range of sites in southern England with those from the core, revealed an identical match with three samples from the West Woods, positing the hypothesis that this locality was the source of almost all the sarsens at the monument. At the West Woods, sarsens are widely dispersed, and they appear to have been first exhumed by erosional processes from the Clay-with-flints Formation and later redistributed by mass movement, particularly by solifluction, during multi-periglacial cold stages. The geomorphological character of the area and its relation to several possible haulage routes to Stonehenge are considered.

In July 2020, David Nash *et al* (2020) made a major contribution to sarsen geology with new data arising from a geochemical study of sarsens across southern England and to the unsolved source problem of the sarsen megaliths at Stonehenge. At the time, this triggered widespread interest in the popular press and television and euphoria at English Heritage. Even 'The Sun' newspaper ran a headline 'Mystery of where the giant rocks came from SOLVED'. One journalistic report declared, 'the progress of the investigation became comparable to an Agatha Christie level of interlocking surprises'. The area to be discussed is show in Fig. 1.

The study's principal conclusion suggested that almost all the surviving Stonehenge sarsens had been extracted from the area called West Woods 4 km south-west of Marlborough (SJ 153 662). This exposé came only six months after the publication of the 2019 issue of *Mercian Geologist* 19 (4) which included the writer's paper on the geology of Clatford Bottom and its sarsen stones (Worsley 2019). Notably the confluence of the Clatford Bottom catchment with the River Kennet lies 2 km north of the West Woods. In the *Mercian* paper, attention was drawn to the conventional archaeological doctrine that Clatford Bottom catchment (including Fyfield and Overton Downs) was the most likely source of the Stonehenge sarsens (for example Parker Pearson 2016). The objective of this contribution is to explore the geological background to the West Woods locality, the results of the sarsen geochemical study, and its wider implications. It is perhaps pertinent to note at this juncture that the Stonehenge sarsens are quite distinct from the Bluestones at the same monument about which a controversial new hypothesis relating to their source and transport has very recently been proposed (Parker Pearson *et al* 2021).

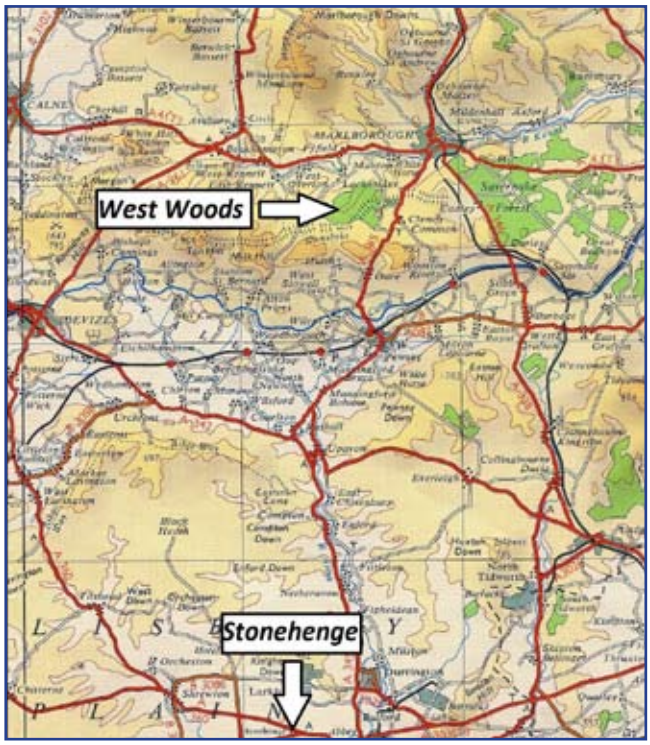

***Figure 1**. The Marlborough Downs – Vale of Pewsey – Salisbury Plain area. The West Woods and Stonehenge are arrowed.*

Background

At Stonehenge archaeologists have universally adopted a numeration scheme devised by Sir William Flinders Petrie, the father of modern Egyptology, for identifying each of the surviving stones, sarsen or otherwise (Petrie 1880). There are 52 sarsens remaining at the site. In 1958, the Ancient Monuments division of the former Ministry of Works, authorized the restoration of several of the sarsen megaliths and this included the re-erection of Stones 57, 58 (uprights) and 158 (lintel), which had formed one of the five central horseshoe trilithon (doorway-like) structures. This had collapsed in AD 1797. After re-erection, one of the two upright components, Stone 58, was judged to need strengthening and three holes were then drilled through the thickness of the stone so that metal tie bars could be inserted. These holes are not now readily visible due to plugs of sarsen capping the holes, Figs. 2 and 3.

Unfortunately, at that time, the now obvious desirability of conserving the extracted sarsen cores was not on the agenda and, critically, the core material

***Figure 2**. Sarsen Stone 58 (arrowed) at Stonehenge, a component of the trilithon horseshoe half circle. During the strengthening of this monolith in 1958, the 'Phillips core' was extracted.*

which might potentially be later used for geological analysis using destructive techniques was thought to be lost. At the request of an Open University based group of geologists, permission was given in 1987 to core 15 bluestone monoliths to facilitate an investigation of their origins. However, under the current English Heritage management regime, there is a virtual ban on further excavation or sampling of any of the stones that constitute the monument. Despite significant advances in petrological techniques, this embargo has effectively stymied new research designed to further understand the site geology until a very recent fortuitous event.

Back in 1958, Robert Phillips, an employee of the Van Moppes diamond drilling company, was given one of the cores as a souvenir of the company's involvement in the restoration work. Initially this was displayed in his office in Basingstoke but when he moved to the USA, following retirement, he was given permission to take the core. After sojourns in the states of New York, Illinois, and California, the core ended up in Florida. Happily, after 60 years guardianship, in May 2018 Phillips decided to return the 1.08 m long core to English Heritage. It is subsamples of this core which have revolutionised the outcome of the new geochemical investigation. Subsequently, in 2019, part of one of the other two missing cores from the same drilling operation was discovered in Salisbury Museum where it is now on public display.

Geological context

The geological framework of the Marlborough Downs/ Vale of Pewsey region is simple with the sedimentary bedrock units being entirely of Cretaceous age. At the base is the Gault Clay overlain by the Upper Greensand Formation with the remaining succession consisting of the Chalk Group. A considerable amount of Chalk was eroded prior to the onset of Paleocene deposition and to the east the latter rocks lie unconformably on the Chalk. This unconformity influences the present-day landscape as it approximately corresponds with the base of the overlying Clay-with-flints Formation which contains the sarsens. Structurally, this sequence is an uplifted basin folded by post-Cretaceous north directed compression. This produced the Vale of Pewsey anticline with an axis roughly east–west and to the north, the complementary syncline of the westernmost part of the London basin.

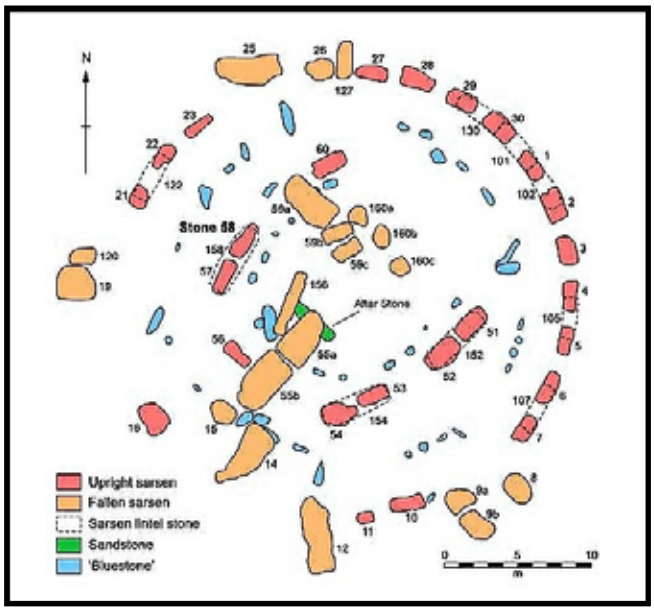

***Figure 3**. All the Stonehenge stones, sarsens and exotics, each identified using Petrie's numeration scheme. Stone 58 is shown in bold.*

Since the anticlinal axis plunges eastwards the Chalk escarpments merge in that direction. The anticline core has been breached by erosion thereby unroofing the Upper Greensand so that it forms the floor of the vale, with the Chalk forming inward facing scarps to the north (Marlborough Downs) and south (Salisbury Plain), with their respective dip slopes beyond. At the western end of the Vale of Pewsey, the Gault clay emerges from beneath the Upper Greensand and once formed marshy ground until nineteenth century drainage. The vale is drained by the headwaters of the Hampshire River Avon and this network breaches the Chalk perimeter in the southern side at Upavon. Accessible accounts of the geology are given by Barron (1976) and Geddes (2003).

Sarsen distribution

As mentioned above, in the region there is an intimate relationship between the Clay-with-flints Formation and the presence of sarsens. Long term erosion of this formation throughout at least the last million years, has progressively exhumed the contained sarsens and where sarsens lie directly on the Chalk, the Clay-with-flints has been entirely removed by natural surficial processes. Numerous cyclic cold/warm stages of the Quaternary have redistributed many of the sarsens and many have formed rock-streams related to periglacial coombe rock deposits in the valley bottoms; sometimes referred to as either 'drifts' or 'sarsen trains'. The distribution of sarsens in the Marlborough Downs region is well portrayed in a map compiled by Williams (1968), Fig. 4. This map evolved from two sources.

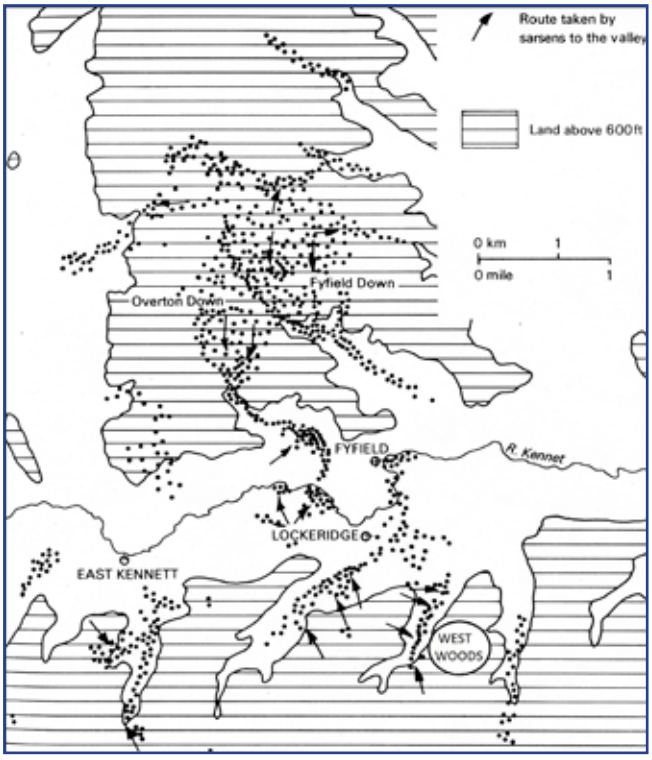

***Figure 4**. The distribution of sarsen stones, c. 1880, in the Marlborough Downs district (modified after Williams 1968)*

First, a study by the Rev. Alfred Charles Smith, who during the period 1852–1889 had served as vicar of All Saints church Yatesbury, a small village 3 km WNW of Avebury. At that time he had a passion for mapping the archaeology of a *c*. 250 km² block of land centred on Avebury ('Abury'), culminating in its publication as a large format folio atlas (Smith 1884). Besides antiquities, he also strove to map all the visible sarsens. However, his mapping was not 100% accurate and some sarsens existing in the landscape today were missed. Second, the Ordnance Survey published maps at both 1:10,000 and 1:25,000 scales in the 1880s and these showed the extant sarsens. Together, these maps enable an appreciation of the degree of sarsen removal for building stone and land improvement over the last *c*. 140 years, with many areas now being sarsen free.

A new Geochemical Study

By his own admission, the David Nash led project was not originally designed to identify the Stonehenge sarsen source location(s) *per se* but rather to eliminate some candidate areas of known sarsen occurrence in southern England. As a result, the project's sampling strategy has some anomalies in that several of the sampling sites have never been linked to Stonehenge, e.g., Castle Rising, in west Norfolk. As the distinguished prehistorian Aubrey Burl has declared 'The source of the sarsens has seldom been disputed. Since the seventeenth century it has been accepted that they came from the Marlborough Downs' (Burl 2007, p 230). Rather ironically, Burl has rejected the hypothesis of human transport of the bluestones from Pembrokeshire (Burl 2001).

Nevertheless, some well-respected archaeologists, including a team from Historic England, have favoured a much more local source on Salisbury Plain, some possibly related to doline infills, for example Bowden *et al.* (2017), despite the geologically based scepticism of Green (1997). Notwithstanding confidence in the Marlborough Downs source hypothesis, one can detect that lingering doubts remain, and this is exemplified by the detailed attention given to two natural sarsens less than 5 km from Stonehenge in Part 1 of Parker Pearson *et al*'s (2020) magnum opus and the statement '… that there might have been many more such megaliths within this area is a distinct possibility'. These are respectively the Cuckoo Stone near Woodhenge (SJ 146 433) and the Bulford Tor Stone (SJ 173 432), both of which were erected as standing stones in the Neolithic before later collapse. Pertinently, the Tor Stone was not discovered until as late as 2005 and whilst it was being investigated 6 km to the north at Neveravon, another large sarsen was unearthed prompting the question of how many more there are to be discovered.

Initially all the 52 surviving Stonehenge sarsens were examined using a portable non-destructive x-ray fluorescence spectrometer (PXRF) to identify the trace elements present and this showed a high level

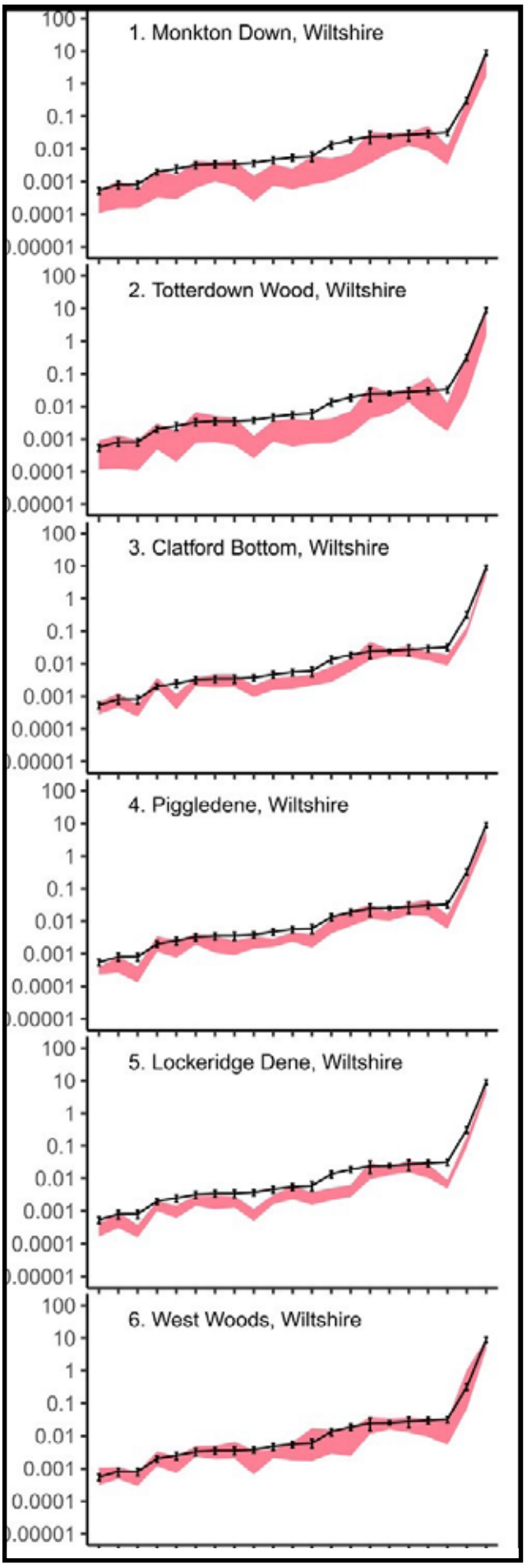

***Figure 5**. Normalised immobile trace element ratios for the six Marlborough Downs sample sites and the Stonehenge Stone 58 core. Pink shaded area delineates the data ranges for each sample, and the black line the median value from the core (after Nash et al. 2020).*

of chemical consistency amongst the stones apart from two anomalous ones, suggestive of a single main source area. It was the unexpected availability of sarsen core material which transformed the research plan by permitting use of high-resolution whole rock inductively coupled plasma mass spectrometry (ICP-MS) and atomic emission spectrometry (ICP-AES) which would give a much better-defined chemistry as shown by the immobile trace elements. This technique requires sample material which has been crushed and subjected to acid digestion. Thus, three subsamples from each of 20 sites along with subsamples from a 67 mm section of the Phillips core from Stone 58, were submitted to a commercial laboratory in Spain for further assay. Six of these sites were from the Marlborough Downs — Monkton Down, Totterdown Wood, Clatford Bottom, Piggledene, Lockeridge Dean and West Woods. When the resulting data were analysed statistically, the big surprise was that the most robust chemical match to Stone 58 was with the three West Woods samples but not with those from the other five local localities. Similarly with those from more distant areas (Fig. 5). Adopting the principle of Occam's razor, the West Woods have now to be considered as the prime suspected source locality. Also, with the benefit of hindsight, it is apparent that this neighbourhood is the one nearest to Stonehenge and on this basis alone, prehistorians ought to have seriously evaluated it earlier.

West Woods

My earlier paper (Worsley 2019), along with others, failed to appreciate that the better known Clatford Bottom is just the more northerly of two similarly named drainage basins respectively north and south of the trunk River Kennet. Both basins drain from their respective watersheds which in their upper parts form the crest of the chalk cuesta. The West Woods lie within the catchment of Clatford Bottom South. Geomorphologically, it forms part of an extensive northward dip slope of the Chalk, with the main Chalk escarpment defining the catchment limit just 2 km to the south. A currently dry valley network with two main drainage lines falls northward, and this is incised to a maximum depth of 20 m. The geological succession within the West Woods consists of an extensive 'Clay-with-flints' bed at least several metres thick lying unconformably over Chalk, primarily Lewis Nodular Chalk, but with the Seaford Chalk just appearing in the most northerly part of the woods. (Fig. 6). Coombe rock/head drapes the lower slopes and underlies the floors of the dry valleys (Fig. 7). The dip slope may in part be inherited from the now exhumed sub-Paleocene unconformity cut across the Chalk.

***Figure 6**. British Geological Survey map of the West Woods area. The Clay-with-flints Formation is in the darker brown and the adjacent lighter brown is soliflucted head derived from the former. Chalk in green. Note the National Trust symbol at Lockeridge where a sarsen rock stream is preserved. (Digimap: BGS 2021 © NERC)*

***Figure 7**. A rare section in the east slope of the main Hursley Bottom dry valley just above the base of the Lewis Nodular Chalk (Middle-Upper Chalk boundary) (SJ 157669). The Chalk has a blocky structure probably related to the former presence of permafrost. The surficial bed is likely due to postglacial downslope movement. Scale bar 1 m.*

***Figure 8**. Exposed West Woods sarsen (SU 155664). This example has recently been moved a short distance during forestry operations. It lies on the south side of a minor tributary dry valley on the eastern flank of Horsley Bottom some 15 m above the main valley floor. Scale bar 1 m.*

The West Woods, managed by Forest England (formerly the Forestry Commission), are effectively a westerly outlier of the Savernake Forest, and cover an area of some 6 km². During the 1920s most of the woodland was clear felled and replanted. Accordingly, most of the current tree cover shows a uniform age structure of about one century but the woodland cover hinders geological mapping and ground navigation. Neolithic activity in the West Woods is confirmed by the presence of several polissoirs and a chambered long barrow close to the southern border at SJ 148 656 (Burl 2002).

Traverses across the woodlands reveal that sarsen blocks are widely distributed throughout (Fig. 8), although the concentrations are variable. The first 1:25,000 scale Ordnance Survey map, sheet SU16, portrayal of sarsen distribution was incomplete and over-emphasized the rock-stream on the floor of Hursley Bottom (Fig. 9), although the current Explorer version shows no sarsens at all! Undoubtedly sarsens remain in abundance within parts of the woodland and on the valley floor (Fig. 10) many of which show partial extraction and the unmistakable signs of former working by masons (Fig. 11). Generally, it was the valley floor rock stream sarsens which sustained the crushed sarsen aggregate business in the 1920s until it went bust due to the product being unsuitable for road metal.

For the geochemical trace element investigation, two samples (WW1 & 2) were collected from two sarsens (Fig. 12) in Wools Grove on the northwestern border of the West Woods (SU 1453 6657), and a third (WW3) from a sarsen on the south easterly facing slope directly above Hursley Bottom (SU 1504 6638). This sector forms the lower part of a spur (interfluve) which extends upwards for over 3 km to Golden Ball Hill at the scarp crest. It also forms the southeasterly flank of the Lockeridge valley which leads up to the Knap Hill col. Noteworthy is the fact that it directly overlooks the rock-stream at Lockeridge Dean, only 700 m distant. Since 1908 this feature has been protected by the National Trust. As previously stated, Lockeridge is another of the Marlborough Downs geochemical sampling localities.

Williams' (1968) pioneering study of the Marlborough Downs was primarily aimed at quantifying the extent of rock-stream movement by solifluction related processes. This work was done over half a century ago and it would be inappropriate to be over critical. He calculated the maximum travel distance in each valley on the premise that the length of the rock-stream as measured from the interfluve to its terminus gave this parameter. For West Woods

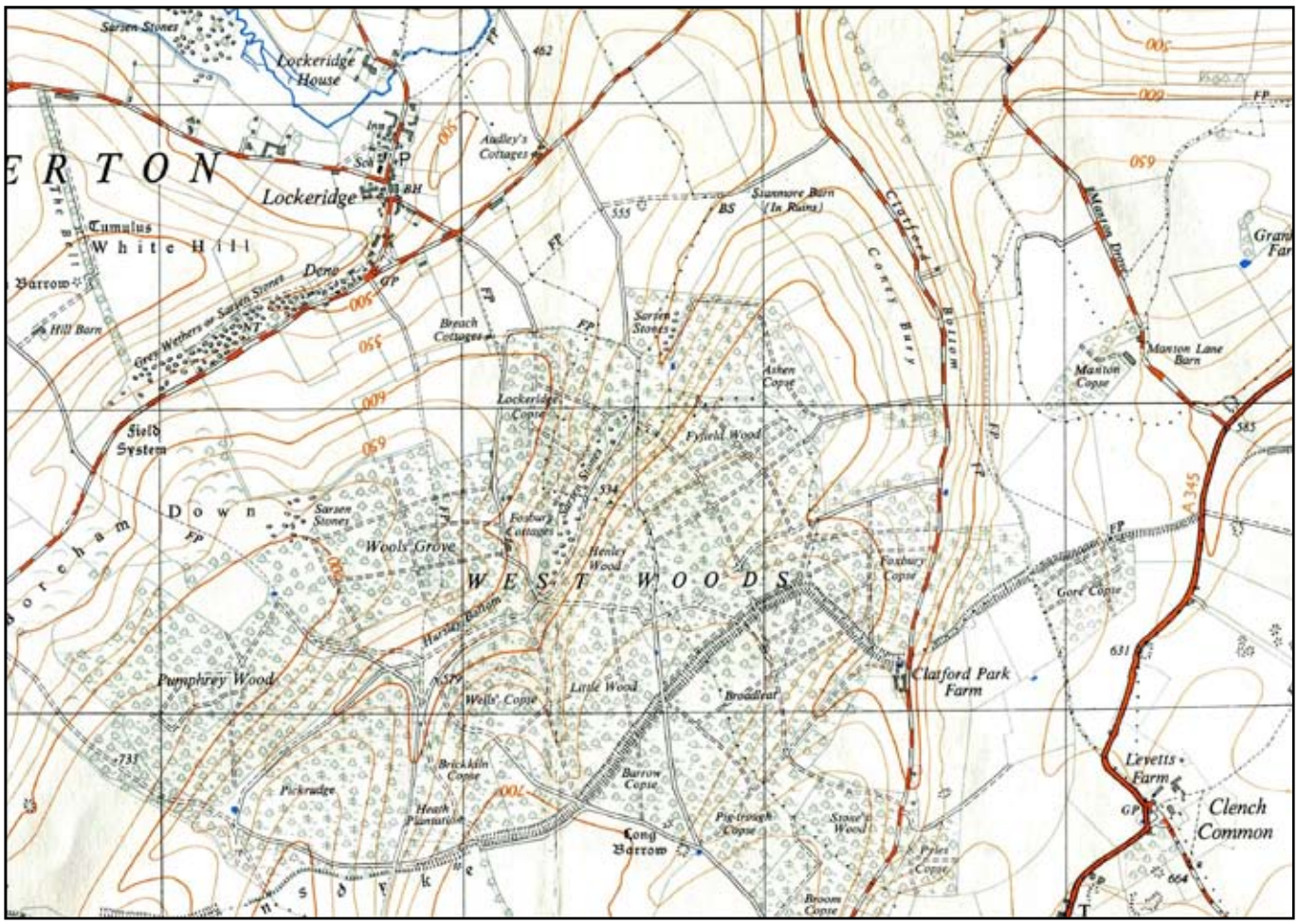

***Figure 9**. The West Woods area including Lockeridge Dean, with contours in feet (Ordnance Survey 1:25,000 scale First Series sheet SSU 16 published 1961). Note the presence of the rock stream in the lower part of Hursley Bottom but also a total absence in Clatford Bottom South – compare with Fig. 4. The current 1:25,000 scale Explorer 157 map of the same area does not show any sarsens at all. This First Series map is currently not available via Edina Digimap. 1 km grid squares.*

he derived a value of 1.8 km and for the adjacent Lockeridge Dene 3.3 km. It can be argued that these values are implausibly excessive, as sarsens would have been shed from the Clay-with-flints Formation widely across the catchment slopes and not from the watershed *per se*. However, more importantly, he envisaged feeding streams of sarsens into the adjacent valley bottoms; from the Wools Grove spur he proposed sarsen movement into Hursley Bottom but also into Lockeridge Dean. Given the present-day landscape morphology, sarsens WW1–2 would more likely move towards the Lockeridge valley by solifluction in a future periglacial environment. An unresolved question is 'why are the geochemical values for the two adjacent valleys different'? Only a more intensive sampling strategy can answer this issue, for example, is it feasible that at least some sarsens at Lockeridge have geochemical fingerprints identical to those of the West Woods samples?

Naturally, the matching process does not include any sarsens, past or present, from areas which lay outside those sampled. The area beyond the West Woods southern limit is a mix of pasture and arable. Bayardo Farm (SU 162 651) is sited adjacent to the woodland boundary but extends southwards towards the main south-facing scarp. The fields are underlain by 'Clay-with-flints' and the more peripheral areas were still heathland until two centuries ago. In the farmyard is a dump of sarsens which have been removed after ploughing (Fig. 13). Apparently, the small ones are dumped in a disused chalk pit close to the farm buildings,

***Figure 10**. Part of the surviving rock stream in 2021 under a woodland cover in the lower section of Hursley Bottom.*

Figure 11. *A sarsen on the floor of Hursley Bottom abandoned by masons after primary splitting. Note the scars on the top of the main fracture surface indicating where wedges have been driven in. Scale bar 1 m.*

Figure 12. *The Wools Grove sarsen which yielded sample WW1. The flaking scar following sampling is visible at the left-hand end. Scale bar 1 m.*

Figure 13. *Some medium-sized sarsens at Bayardo Farm, recently recovered during ploughing operations. Scale bar 1 m.*

but the large ones over 3 m long are buried in the fields where they were found since they outsize the capacity of the farm's lifting equipment (pers. com. Farmer Bull). The Bayardo sarsens are undoubtedly derived from within the Clay-with-flints Formation. Field examination of the wider dip slope outside the arable fields reveals that sarsens are present throughout although at a low density due to historic clearance. It would be interesting to establish the nature of the immobile trace elements of these. The presence of well-rounded flints with chatter marked surfaces is diagnostic of an original Lambeth Group or London Clay Formation source prior to recycling during the post Palaeogene phases of Clay-with-flints creation.

Potential sarsen haulage routes to Stonehenge

Accepting a Marlborough Downs source, four possible different routes which could have been taken by the Neolithic haulers of the sarsen megaliths to Stonehenge have been proposed (see Fig. 14). They are all in the 25–30 km range and importantly purely speculative since no field evidence favouring any of them is currently known.

First, Richard Atkinson, the leader of the last extensive excavations at Stonehenge undertaken in the 1950s, envisaged the sarsens initially being moved to Avebury from source areas lying to the north and east on the Marlborough Downs where today the greatest concentrations lie (Clatford Bottom catchment). After 'arch priest spiritual benison and encouragement' within the then existing circles, and fording the River Kennet, the sarsens would have then gone southwestwards avoiding the higher parts of the chalk escarpment before crossing the western mouth of the Vale of Pewsey and then more or less directly southward to Stonehenge along a route which became the Devizes–Salisbury main road until the military requisition (Atkinson 1979). The two 'Achilles heels' of this proposal are: (a) the need to traverse at least 1 km of Gault clay outcrop and marshy soft ground in the Vale of Pewsey, and (b) ascent of Redhorn Hill, the very steep north facing Chalk scarp of Salisbury Plain.

Second, Patrick Hill, an academic geologist from Carleton University, Ottawa, undertook a reappraisal of Atkinson's suggestions, based on 1958 field work. He subsequently published his proposals in two near identical papers (Hill 1961a, b). Essentially his route commenced at Lockeridge Dene, south of the River Kennet and headed southwest to a col in the chalk escarpment adjacent to Knap Hill at 217 m OD (Fig. 15), down the 50 m high steep scarp, south across the Vale of Pewsey and from Upavon, along the Avon valley to Stonehenge. Significantly (see later), another scarp col 2 km east of Knap Hill at Huish, was also identified as an alternative (Fig. 16). Hill

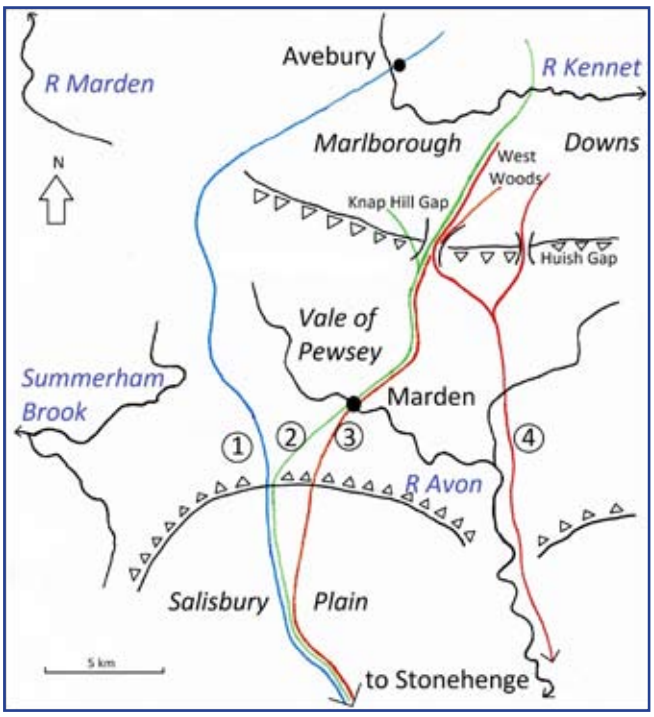

***Figure 14**. The four hypothetical sarsen haulage routes from the Marlborough Downs to Stonehenge proposed by Atkinson ①, Daw ②, Parker Pearson ③ and Hill ④. Note that Daw suggested a subsidiary path from west of the Knap Hill col and that Hill recognized the Huish col as an alternative to that at Knap Hill. Avebury and Marden were important Neolithic henges.*

corresponded with Atkinson to discuss his ideas prior to publication and acknowledges Atkinson's interest. Several factors influenced Hill's thinking and two of the more important will be noted. (1) He realized that many sarsens were present south of the River Kennet and considered invoking a Fyfield Down source as being unnecessary. This is an important point — why go further than is logistically required? (2) The identification of rare opalescent (milky or pearly reflection from the interior of a mineral) quartz pebbles in the Lockeridge sarsens and in some of those at Stonehenge. Curiously, this basic fact has been subsequently overlooked.

Third, Tim Daw, a Wiltshire farmer who has both built a modern Neolithic-type long barrow and maintained a web site 'Sarsen.org', has defined a route based on detailed local terrain knowledge. This replicates much of Hill's as far as the mid Vale of Pewsey, but unlike Hill, he gives some credence to the Fyfield Downs as a contributary potential source. Nevertheless, he also emphasizes possible sources south of the Kennet, both Lockeridge Dene and uniquely two scarp crest potential source sites at Knap Hill and Tan Hill. The latter two sites were included since Greenwood's 1820 map of Wiltshire shows concentrations of 'large sarsens' at these localities. This is another reminder of the fundamental problem related to the historic removal of sarsens from many areas in the region. Daw's route across the Vale of Pewsey is via Marden where the embryonic River Avon forms the southern boundary of the largest known Neolithic henge in the UK with an area of 15.7 ha. This must have been a major convergence and river crossing point. From Marden, the route scaled the north facing chalk escarpment of Salisbury Plain by adopting Atkinson's at Redhorn Hill and then shadowed Atkinson's course down to Stonehenge.

Fourth, Mike Parker Pearson, the eminent archaeologist who led the 'Stonehenge Riverside Project' which has considerably advanced understanding of the Stonehenge enigma. In his engaging popular

***Figure 15**. The wide Knap Hill col at an elevation 217 m OD looking north-east from the Adams Grave long barrow on Walker's Hill (SU 116 637). A Neolithic causewayed enclosure (dated to c. 5400 BP) circles the summit of Knap Hill.*

book, Parker Pearson (2012) devotes a short section to discuss the route issue, illustrated by a map. His analysis was originally triggered by a William Stukeley sketch recently rediscovered in the Bodleian library in Oxford. This showed 11 Stonehenge-type sarsen stones on the north side of the Kennet floodplain near Clatford. Speculatively he surmised that these had arrived at an assembly point prior to being hauled to Stonehenge and accordingly adopted Hill's and Daw's route for the first part of their journey as far as the bottom of the escarpment at Knap Hill, where Hill's proposal diverged eastwards. It has to be stressed that, despite an intensive search of the Clatford locality, no field evidence supporting the prior existence of these sarsens was forthcoming. A modified version of the Clatford hypothesis later appeared in a Special Section on 'Puddingstones and related silcretes' in the *Proceedings of the Geologists' Association* (Parker Pearson 2016), along with the same map. Beyond Marden, Parker Pearson selected a different path to Atkinson's and Daw's up the escarpment onto the Salisbury Plain by opting for what he believed was a gentler inclined ramp east of Redhorn, which climbed up onto Wilsford Hill. However, southwards beyond this ramp lies Water Dean Bottom, a major dry valley network, crossing which necessitated a fall and climb of over 30 m, whereas a diversion westward to Redhorn Hill along the scarp crest, would have avoided this impediment to sarsen haulage. Most recently, as a member of the Nash *et al.* (2020) consortium, Parker Pearson modified his route map by omitting the northernmost leg and commences his route at the West Woods, but rather than take advantage of the Huish col to the immediate south (proposed by Hill as an alternative), his line heads southwest to the Knap Hill col following a gentle dry valley up to Golden Ball Hill. The problem here is that prior to the passage over Knap Hill col, an additional ascent and descent of some 50 m is necessary before joining his previously proposed alignment down to Stonehenge. This makes this proposal very unlikely.

Assuming that the West Woods were the source of the Stonehenge sarsens, I would suggest that the geomorphological attribute of the area indicates that the easiest way south would be via the 213 m OD col through the chalk scarp just north of Huish. A dry valley leading off Hursley Bottom, in the middle of the West Woods, climbs directly and uniformly to the col at Huish (this is 4 m lower than that at Knap Hill). The descent is no steeper than the one at Knap Hill. As Hill realized, if the heights of Salisbury Plain are to be avoided then the alternative is to follow the Avon valley south of Upavon. The Huish col lies directly north of Upavon. Interestingly, Parker Pearson *et al.* (2020), state 'There can be little question that it [River Avon] served as a direct conduit between different places, monument and realms'. Perhaps the pendulum of archaeological opinion is now poised to swing behind Hill's view that the Avon valley, rather than Salisbury Plain with its attendant uphill problems, was the way the sarsens were taken from a Marden staging point.

As Daw (2011) prosaically concluded 'we will never know the full story of the stones and assuming the easiest route is the route they took may be a mistake. After all, if the builders of Stonehenge wanted the easy life, they wouldn't have built Stonehenge'. We

***Figure 16**. The narrow Huish col across the main Chalk scarp at an elevation 213 m OD seen from the east (SU 143 644). Gopher Wood lies on the far side of the col.*

normally assume rational human behaviour, but this can be subject to failure when beliefs intervene. Further, an archaeologist's perception differs from that of a less imaginative geologist. For instance, Josh Pollard stated in his definitive account on Avebury, 'It is tempting to envisage a developing association between stones and sacred realms… The significance of sarsen may have accrued with time as stones became more firmly embedded in stories and myths about the landscape' (pp 72–3, Pollard in Pollard and Reynolds 2002). Clearly, anything might be possible!

Conclusion

In the light of the new geochemical data, currently the West Woods must qualify for elevation to the rank of prime suspect. Prior to the unanticipated availability of the Stone 58 core material, the geochemical investigation was dependent on the non-destructive PXRF data, which certainly was pointing towards a single main source area for the Stonehenge sarsens. The more sophisticated analyses using techniques dependent upon crushed sample material, has enabled a more confident assignment of the West Woods area as that source. However, it would be premature to claim that the mystery has been fully resolved as the case for a more local source on the Salisbury Plain has not yet been disproven and the Lockeridge valley needs further assessment. Also, the source of Stones 26 and 160 at Stonehenge, identified by Nash *et al.* (2020) as having a different chemistry to the majority of the sarsens at the monument, remains unknown. As is frequently the case, more data is required before any hypothesis can be elevated to the rank of theory.

Acknowledgements

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References

Atkinson, R. J. C. 1979. *Stonehenge*. 2nd ed. London: Penguin Books, 224 pp.

Barron, R. S. 1976. *The geology of Wiltshire: a field guide*. Bradford-on-Avon: Moonraker Press, 176 pp.

Burl, A. 2002. *Prehistoric Avebury*. 2nd ed. New Haven: Yale University Press, 314 pp.

Burl, A. 2007. *A brief history of Stonehenge*. London: Robinson, xix, 368 pp.

Bowden, M., Soutar, S., Field, D. & Barber, M. 2017 [corrected ed.]. *The Stonehenge landscape: analysing the Stonehenge World Heritage Site*. Swindon: Historic England, 156 pp.

Daw, T. 2011. *The origin of the Stonehenge sarsen stones*. http://www.sarsen.org

Geddes, I. 2003. *Hidden depths: Wiltshire's geology and landscapes.* (revised ed.) Bradford on Avon: Ex Libris Press, 222 pp.

Green, C. P. 1997. The provenance of rocks used in the construction of Stonehenge. *Proceedings of the British Academy*, **92**, 257–270.

Hill, P. A. 1961a. Sarsen stones of Stonehenge: how and by what route were the stones transported? What is the significance of their markings? *Science*, **133**, 1216–1222.

Hill, P. A. 1961b. The sarsens of Stonehenge: the problem of their transportation. *Geographical Journal*, **127**, 488–492.

Nash, D. J., Ciborowski, J. R., Ullyott, J. S., Parker Pearson, M., Darvill, T., Greaney, S., Maniatis, G. & Whitaker, K. A. 2020. Origins of the sarsen megaliths at Stonehenge. *Science Advances*, **6,** 1–8.*

Parker Pearson, M. 2012. *Stonehenge: exploring the greatest stone age mystery*. London: Simon & Schuster, 406 pp.

Parker Pearson, M. 2016. The sarsen stones of Stonehenge. *Proceedings of the Geologists' Association*, **127**, 370–376.

Parker Pearson, M., Pollard, J., Richards, C., Thomas, J., Tilley, C. & Welham, K. 2000. *Stonehenge for the ancestors. Part 1: Landscape and monuments*. Leiden: Sidestone Press, 502 pp.*

(*free access at – www.sidestone.com/books/stonehenge-for-the-ancesters-part-1)

Parker Pearson, M. *et al.* 2021. The original Stonehenge? A dismantled stone circle in the Preseli Hills of west Wales. *Antiquity*, **95**, 85–103.

Petrie, W. M. F. 1880. *Stonehenge: plans, description, and theories*. London: Edward Stanford, 34 pp.

Pollard, J. & Reynolds, A. 2002. *Avebury: the biography of a landscape*. Stroud: Tempus, 288 pp.

Smith, A. C. 1884. *Guide to the British and Roman antiquities of the north Wiltshire Downs in a hundred square miles round Abury* [*Avebury*]*, being the key to the large map of the above*. Vol. 1, xv, 247 pp; atlas xvi pp. Marlborough: Marlborough College Natural History Society.

Williams, R. B. G. 1968. Some estimates of periglacial erosion in southern and eastern England. *Biuletyn Peryglacjalny*, **17**, 311–335.

Worsley, P. 2019. Geology of the Clatford Bottom catchment and its sarsen stones on the Marlborough Downs. *Mercian Geologist*, **19** (4), 242–252.

* free internet access.

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