

ANTIQUITY

a review of world archaeology



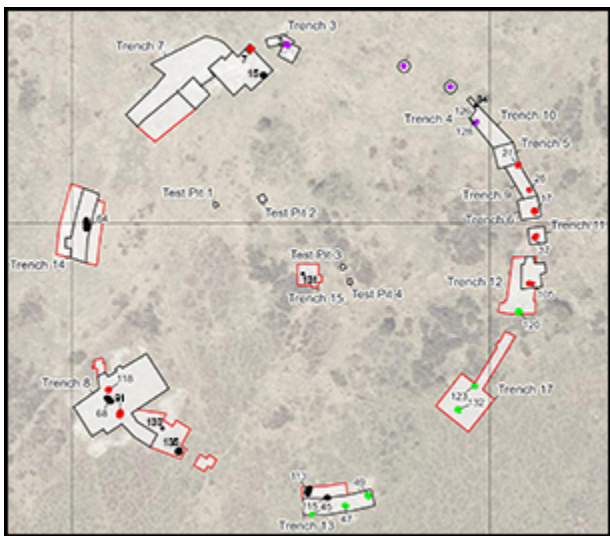
CAMBRIDGE
UNIVERSITY PRESS

How Waun Mawn stone circle was designed and built, and when the Bluestones arrived at Stonehenge

Journal:	<i>Antiquity</i>
Manuscript ID	AQY-DE-22-192
Manuscript Type:	Debate
Keywords:	Waun Mawn, Stonehenge, Stone circle
Research Region:	Britain & Ireland
Abstract:	Darvill's argument that the plan of the known features at Waun Mawn can be reworked into a series of linear monuments suffers from a major error. He has based his argument on a partial plan, published in 2021 but subsequently superseded by a much more detailed plan published after the 2021 excavations (Parker Pearson et al. 2021a; Parker Pearson 2022; see our Figure 1). His specious argument therefore simply omits many of the excavated features that make up this stone circle. The reader should ignore Darvill's Figure 1 and refer only to our plan to understand the site.

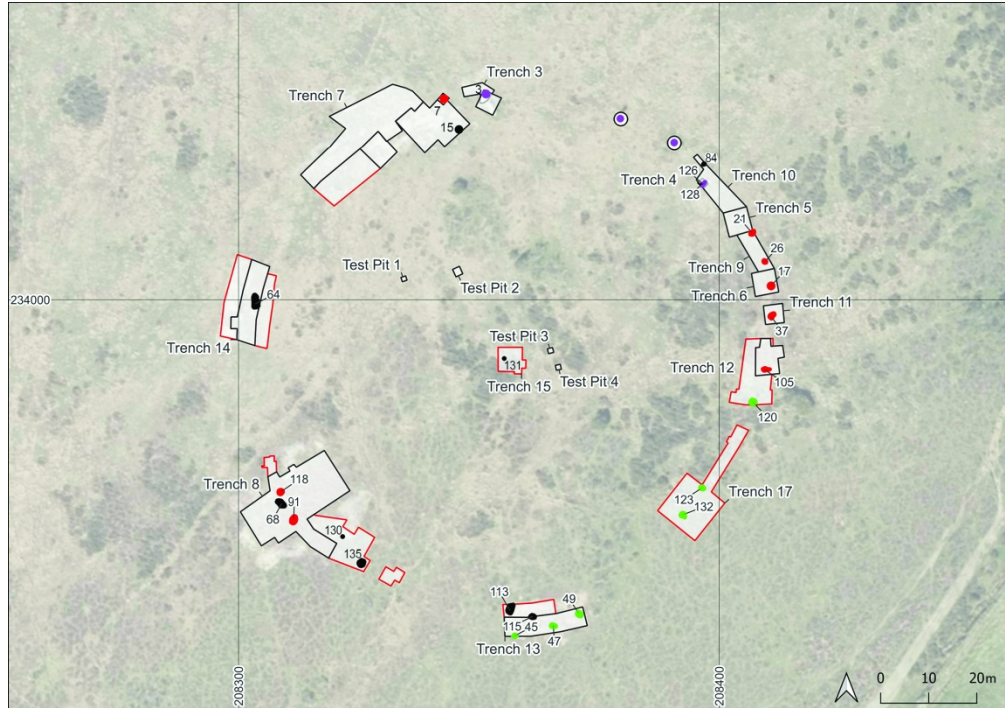
SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

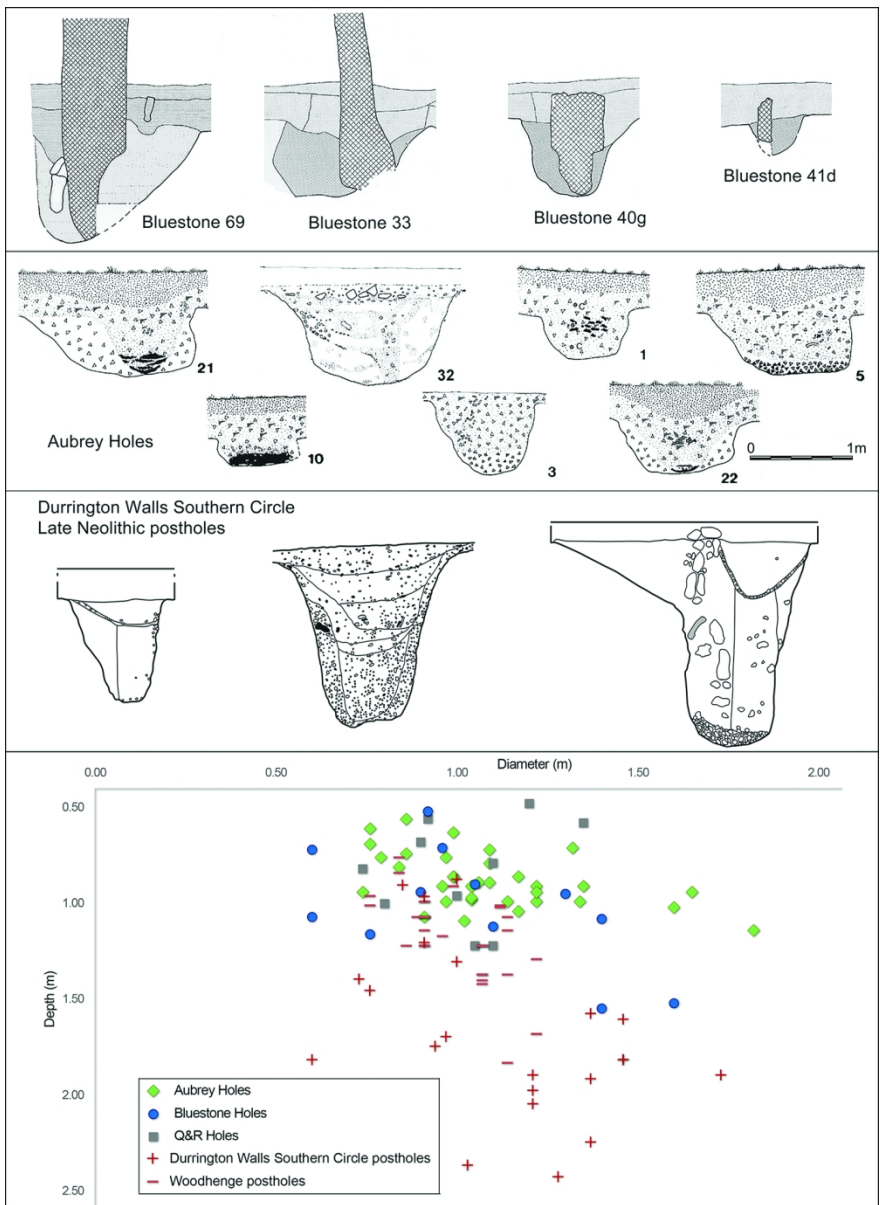


25x22mm (300 x 300 DPI)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



1
2
3 **[For DEBATE section]**
4

5 **How Waun Mawn stone circle was designed and built, and when the Bluestones arrived**
6 **at Stonehenge**
7

8 Mike Parker Pearson^{1,*}, Josh Pollard², Colin Richards³, Kate Welham⁴, Timothy
9 Kinnaird⁵[ORCID: 0000-0001-6530-314X], Aayush Srivastava⁵, Chris Casswell⁶, Dave
10 Shaw⁷, Ellen Simmons⁸, Adam Stanford⁹, Richard Bevins^{10,11}, Rob Ixer¹, Clive Ruggles¹²,
11
12 Jim Rylatt¹³ & Kevan Edinborough¹⁴[ORCID: 0000-0002-7668-0749]
13
14
15

16
17 ¹ Institute of Archaeology, University College London, UK

18 ² Department of Archaeology, University of Southampton, UK

19 ³ Archaeology Institute, University of the Highlands & Islands, Orkney, UK

20 ⁴ Department of Archaeology, Anthropology & Forensic Science, Bournemouth University,
21 UK
22

23 ⁵ School of Earth and Environmental Sciences, University of St Andrews, UK

24 ⁶ Reclaim Heritage, Spalding, UK

25 ⁷ Allen Archaeology Ltd., Lincoln, UK

26 ⁸ Department of Archaeology, University of Sheffield, UK

27 ⁹ Aerial-Cam Ltd., Upton upon Severn, Worcestershire, UK

28 ¹⁰ Department of Natural Sciences, National Museum of Wales, Cardiff, UK

29 ¹¹ Department of Geography & Earth Sciences, Aberystwyth University, UK

30 ¹² Department of Archaeology & Ancient History, University of Leicester, UK

31 ¹³ Past Participate, Sheffield, UK

32 ¹⁴ Ecology and Heritage Partners Pty Ltd., Melbourne, Australia

33 * Author for correspondence ✉ m.parker-pearson@ucl.ac.uk

34
35
36
37
38
39
40
41
42
43
44
45 *Received: 1 August 2022; Accepted: 3 August 2022*
46
47

48 *In response to Timothy Darvill's article, 'Mythical rings?' (this issue), which argues for an*
49 *alternative interpretation of Waun Mawn circle and its relationship with Stonehenge, Parker*
50 *Pearson and colleagues report new evidence from the Welsh site and elaborate on aspects of*
51 *their original argument. The discovery of a hearth at the centre of the circle, as well as*
52 *further features around its circumference, reinforces the authors' original interpretation. The*
53 *authors explore the evidence for the construction sequence, which was abandoned before the*
54 *completion of the monument. Contesting Darvill's argument that the Aubrey Holes at*
55
56
57
58
59
60

1
2
3 *Stonehenge originally held posts, the authors reassert their interpretation of this circle of cut*
4 *features as Bluestone settings.*
5
6
7

8 **Introduction**

9
10 In responding to our *Antiquity* article, ‘The original Stonehenge?’ (Parker Pearson *et al.*
11 2021b), Timothy Darvill (2022) questions both the interpretation of Waun Mawn as an
12 unfinished stone circle and the suggestion that elements of the site were subsequently
13 removed to Stonehenge. His argument that the plan of the known features at Waun Mawn
14 should be understood as a series of linear monuments, however, suffers from a major error: it
15 is based on a partial plan, published in 2021, which has been superseded by a much more
16 detailed plan published following the 2021 excavations (Parker Pearson *et al.* 2021a; Parker
17 Pearson 2022; see Figure 1). His argument therefore omits many of the excavated features
18 that make up this stone circle. As such, the reader should ignore Darvill’s Figure 1 and refer
19 only to our plan to understand the site. How do we know that Waun Mawn is an unfinished
20 circle? Because it has an entrance, convincing arcs of stoneholes, and—most significantly—
21 a centre. Amongst other features discovered during further investigations in summer 2021,
22 we identified a hearth located at the exact centre of the 110m-diameter Waun Mawn circle.
23 [FIGURE 1, 20cm colour, place landscape]
24
25
26
27
28
29
30
31
32
33
34
35

36 **Building the unfinished stone circle of Waun Mawn**

37 The bowl-shaped hearth at the centre of the circle was partially covered by deposits from the
38 base of a large, long-vanished tree. While we await radiocarbon dates on samples of the wood
39 charcoal from the hearth and the layers immediately above, we can consider the context of
40 both the hearth and the tree. These features were uncovered within a 5 × 5m trench located in
41 the centre of the unfinished circle (Figure 1). Not only does the hearth lie at the exact centre
42 of the circle, but it is also the only hearth so far detected within a total excavated area of more
43 than 1200m² at Waun Mawn. Given that it could only have been so precisely positioned
44 during the laying out of the circle, or at least while the stones were extant, the hearth is likely
45 to be contemporaneous with the construction and/or use of the circle.
46
47
48
49
50
51
52

53 The hearth was covered by the upcast from a fallen tree, indicating that it was originally set at
54 the foot of a large standing tree. A number of tree roots and tree holes have been found at
55 various locations during the excavations at Waun Mawn, which, on the basis of radiocarbon
56 dates on wood charcoal, potentially date to anywhere between the Early Mesolithic (8000–
57 6000 BC) and the Roman period of AD 43–410 (Parker Pearson *et al.* 2021b). Yet none of
58
59
60

1
2
3 these other tree features are as large as the remains of the 3m-diameter base of the tree at the
4 centre of Waun Mawn. It is possible that an unusually large and ancient tree was chosen as
5 the centre from which to lay out the stone circle. We cannot say what species this tree was,
6 but oak is a reasonable guess, given its size and the ubiquity of *Quercus* charcoal in the
7 immediate context and more widely around Waun Mawn.
8
9

10
11 Excavations in 2021 also uncovered a further three stoneholes and five pits around the
12 circle's circumference (Figure 1). These five pits (and another excavated in 2018) all lie
13 along the southern arc of the circle's circumference, but never held standing stones.
14
15

16
17 Continuing a line south-westward from the last stonehole in the east (stonehole 105 in Trench
18 12), they provide evidence that this circle was abandoned mid-construction. One of the pits
19 (pit 120) lies at the end of an arc of stoneholes, with which it shares similar spacing,
20 suggesting that this hole was dug to receive a stone that was never erected. The other pits in
21 this south-eastern arc are similar, and are probably also to be interpreted as preparation pits
22 for stones that were never erected. On the Waun Mawn stoneholes generally, we note that the
23 fills of these features were clearly distinguishable and carefully recorded by a very
24 experienced team; Darvill's (2022) observation that he personally believes that the
25 photograph of one of these stone sockets (Parker Pearson *et al.* 2021: fig. 6) resembles a field
26 clearance scar is therefore unconvincing.
27
28

29
30 Although at least 140m of the circle's 345m circumference remains unexcavated (parts of it
31 are protected as a Scheduled Ancient Monument and as a Site of Special Scientific Interest
32 [SSSI], limiting the scale and extent of excavations), it is evident that there are significant
33 gaps along the western and southern arcs. This suggests that probably no more than 30 per
34 cent of the circle was ever completed.
35
36

37
38 In 2021, we also re-investigated the entrance of the circle, which is orientated on the
39 midwinter solstice. This work revealed that, what had been thought in 2018 to be the
40 stonehole for the entrance's lefthand stone (now recumbent), was, in fact, a robbing hole.
41 Charcoal samples from this hole and the low mound accumulated around it provide a possible
42 date for the stone's toppling of sometime around or after 2000 BP. More importantly, the
43 actual stonehole (128) for the lefthand stone was positioned within 0.10m of a large stakehole
44 (discovered in 2021) and both of these features lie on an alignment from the position of the
45 central tree towards midwinter solstice sunrise. The stonehole forming the righthand side of
46 the entrance (21), 15m to the east, also had a stakehole in the bottom of its fill. Notably, these
47 are the only two stoneholes out of the 10 so far excavated that have associated stakeholes.
48
49
50
51
52
53
54
55
56
57
58
59
60

As an incomplete stone circle, Waun Mawn offers an unparalleled insight into the likely sequence of construction of such monuments:

1. Light a fire in a bowl-shaped hearth at the foot of an ancient tree chosen as the centre of the circle;
2. erect a post along the circumference on an alignment from the tree towards the midsummer solstice sunrise;
3. erect a second post 15m from the first to mark the other side of an entrance to the intended circle;
4. erect standing stones (in stoneholes 128 and 21) beside each post to form this north-east-facing entrance;
5. erect two standing stones (stoneholes 91 and 118) at the opposite (south-west) side of the circle to the entrance;
6. erect standing stones in two arcs, one 30m long in the east and one 60m long in the north; and
7. dig preparation pits (45, 47, 49, 120, 123, 132) to hold standing stones in a 70m-long arc in the south and south-east.

At this point, construction of the circle was abandoned, leaving two long arcs incomplete—one on the south and south-east side and the other on the west and north-west. These could effectively be considered the ‘sides’ of the monument, since the frontal façade and entrance had already been erected, as had the two stones marking the rear (south-west side).

Dismantling the stone circle of Waun Mawn

Whilst four stones remain *in situ* at Waun Mawn, eight empty stoneholes reveal that other stones have been taken away. Our hypothesis is that these stones were removed when the incomplete stone circle was dismantled. We await further radiocarbon dates on wood charcoal from fills of the holes left by removal of these eight stones. A set of OSL determinations, however, allows refinement of the probable date before which the stones were removed. Drawing on results from samples taken in both the 2018 and 2021 field seasons, it is likely that the monoliths were removed before or during 3490–2870 BC (3180±310 BC).

OSL dating of the packing fills of the stoneholes excavated in 2021 has also refined the likely date of the circle’s construction. The OSL dataset comprises 302 field measurements, of which 239 were progressed to laboratory characterisation, fully contextualising the 31 discrete dating samples. The OSL technical report will be published in due course, alongside

1
2
3 the monograph describing the full excavation results. We can report here, however, that the
4 monoliths were erected in the mid to late fourth millennium BC, potentially as late as 3520–
5 2940 BC (3230±290 BC). The depositional age for the packing fill of one stone socket (118)
6 has returned a combined age of 3710–3350 BC. Our estimate is that the circle was
7 constructed *c.* 3400 BC (Parker Pearson *et al.* 2021b).
8
9

10 Based on the OSL, a date of 3490–2870 BC for the removal of the stones is consistent with
11 the construction dates for Stonehenge Stage 1, both for the enclosing ditch (2995–2900 cal
12 BC) and for Aubrey Hole 32 (3080–2890 cal BC; Parker Pearson *et al.* 2020: 166–68). This
13 raises the possibility that Waun Mawn’s dismantled stones were among the Bluestones taken
14 to Stonehenge. Yet geological analysis of the extant stones at Waun Mawn and of chippings
15 from one of the empty stoneholes (91) reveals that these materials probably derive from
16 unspotted dolerite outcrops at Cerrig Lladron, west of the two locations identified as sources
17 of Stonehenge’s unspotted dolerites (Bevins *et al.* 2022). On the balance of probability, few,
18 if any, of the stones taken from Waun Mawn ever ended up at Stonehenge.
19

20 Even if Waun Mawn was not the source of any of Stonehenge’s Bluestones, however, it must
21 still be considered as a place of significance in the Stonehenge story. The abandonment of the
22 Waun Mawn circle before its completion suggests either some form of breakdown in
23 community/cooperation or external disruption of what was intended to be a major monument.
24 The stones of the Preseli Hills are integral to Stonehenge and understanding the local use of
25 Bluestones near to their quarries and prior to their use at Stonehenge widens our knowledge
26 of the Neolithic of southern Britain, particularly the relationship between Wales and Wessex.
27
28
29
30
31
32
33
34
35
36
37
38
39
40

41 **So when did the Bluestones arrive at Stonehenge?**

42 The ring of Aubrey Holes at Stonehenge belongs to Stage 1 of its construction, starting 3080–
43 2950 cal BC and ending 2865–2755 cal BC at 95% probability (Marshall in Parker Pearson *et*
44 *al.* 2020: table 11.7 [the date ranges used by Darvill have been revised]). Various arguments
45 have been rehearsed over the last 100 years about whether or not the Aubrey Holes contained
46 Bluestones (Parker Pearson *et al.* 2020: 164–69). Our *Stonehenge Riverside Project* team
47 have been fortunate to not only re-excavate an Aubrey Hole but also to excavate numerous
48 other Neolithic stoneholes and postholes in the surrounding chalk landscape (e.g. Parker
49 Pearson *et al.* 2020: 215–300). As a result, telling the difference between these two types of
50 cut feature is now relatively easy. Of course, the standards of early twentieth-century
51 excavations make this task more difficult for the Aubrey Holes, but there is a statistical
52 means of discrimination between postholes and Bluestone holes.
53
54
55
56
57
58
59
60

1
2
3 At Stonehenge and Durrington Walls, postholes tend to have a width:depth ratio of $\geq 1:1.10$,
4 whereas Bluestone holes have a ratio of $\leq 1:1.10$ (Parker Pearson *et al.* 2009: fig. 8; 2020: fig.
5 4.5). In other words, postholes are deeper than stoneholes. The Aubrey Holes are shallow—
6 clearly shallower than postholes of similar diameter (Figure 2). Even though three Aubrey
7 Holes are greater than 1.5m in diameter, they are all less than 1.3m in depth. The maximum
8 depth range of the Bluestone holes, including the Q & R Holes, is just over 1.5m. Thus, as
9 postholes are deeper than stoneholes, it is unlikely that the Aubrey Holes held anything other
10 than stone.
11
12
13
14
15
16

17 [FIGURE 2, 13.5cm colour]

18 Darvill argues that the Aubrey Holes held posts rather than stones on the basis of the absence
19 of Bluestone chips in their basal deposits (as opposed to their secondary deposits, in which
20 such chips are plentiful). Such chips are supposedly the result of breakage during a
21 monolith's erection, so why are they absent from the bases of the Aubrey Holes if they once
22 held stones? Chalk is a soft rock, whereas most of the Bluestones are of hard, igneous rock;
23 therefore, it would always have been unusual for fragments to become detached from a
24 monolith (whether dressed or unworried) while inserting or removing it from its surrounding
25 chalk. Most of the Aubrey Hole basal layers are likely to have been packing deposits inserted
26 around a raised monolith. If the Bluestones inserted into the Aubrey Holes were undressed,
27 no chippings would have been present in the area to be incorporated into these basal packing
28 deposits (note that 27 Bluestones present at Stonehenge today are undressed). Our excavation
29 of seven stoneholes at nearby Bluestonehenge failed to find a single chip (Parker Pearson *et*
30 *al.* 2020: 215–300). The likely origin of the chips found in the Aubrey Holes' secondary
31 deposits is from several possible events: removal of (and consequent damage to) Bluestones
32 at the end of Stage 1; dressing of Bluestones (which may have occurred in Stage 2); and/or
33 their working-down and intentional breakage (probably in Stage 5).
34
35
36
37
38
39
40
41
42
43
44
45

46 Turning to the origins of the Bluestones in the Preseli Hills, there is further evidence that they
47 belong with the start of Stonehenge Stage 1. Radiocarbon dates of 3020–2920 cal BC and
48 3270–2910 cal BC for the end of quarrying at the two Preseli outcrops from which the
49 Stonehenge Bluestones were extracted are unusually close to the start dates for Stonehenge
50 (Parker Pearson *et al.* 2019). In such a scenario, some or even all of the Bluestones could
51 have come direct to Stonehenge from their quarries. The hypothesis that we consider to be
52 most plausible, however, is that some or even all of the quarried Bluestones were first erected
53 in one or more stone circles that were dismantled and then moved from south-west Wales to
54 Stonehenge and Bluestonehenge in the thirtieth century BC. Within the varied mix of
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Bluestone sizes and types—spotted dolerite, unspotted dolerite, sandstone, andesite, three types of dacite and three types of rhyolite—the strongly cleaved andesite, for example, would have been a poor initial choice for long-distance transport direct from a quarry. So why were those stones selected? It may have been the monument(s) rather than the individual stones *per se* that were selected for transport to Salisbury Plain.

Conclusions

In the light of Bevins *et al.*'s (2022) new analysis, which reveals that the stones at Waun Mawn have no geological match to the 43 surviving Bluestones at Stonehenge, it may be that none of Waun Mawn's stones ever reached the Wessex monument. Waun Mawn, however, was most certainly a stone circle, albeit unfinished and partially dismantled. Intriguingly, its plan is similar to the Bluestones' arrangement in the Q and R Holes of Stonehenge Stage 2, a circle that was probably also unfinished, being left similarly incomplete along its west side (Atkinson 1979: 205–206; Cleal *et al.* 1995: 180, fig. 80; Parker Pearson *et al.* 2022: 82–83, fig. 3.1). We suggest that this similarity of plan is because both circles were built in the same sequence of stages, with the Q and R Hole circle abandoned at a slightly later stage to that of Waun Mawn. Based on the dimensions of the Aubrey Holes as consistent with holding Bluestones rather than timber posts, and the radiocarbon dates from the Preseli quarries, the case for the Bluestones arriving at Stonehenge during Stage 1 is also very strong.

The abandonment and later dismantling of Waun Mawn provides insight into the process of stone circle construction and raises intriguing new questions about the background to the creation of Stonehenge—we now know that monuments were erected close to the quarries and subsequently dismantled, at around the same time as the unparalleled transporting of approximately 80 Bluestone monoliths to form two Neolithic stone circles 170 miles away on Salisbury Plain. Hypothesising as to why this happened is beyond the scope of this brief reply.

References

- ATKINSON, R.J.C. 1979. *Stonehenge: archaeology and interpretation*. Harmondsworth: Penguin.
- BEVINS, R.E., N.J.G. PEARCE, M. PARKER PEARSON & R.A. IXER. 2022. Identification of the source of dolerites used at the Waun Mawn stone circle in the Mynydd Preseli, west Wales and its implications for the proposed link with Stonehenge. *Journal of Archaeological Science: Reports* 45: 103556. <https://doi.org/10.1016/j.jasrep.2022.103556>

- CLEAL, R.M.J., K.E. WALKER & R. MONTAGUE. 1995. *Stonehenge in its landscape: twentieth-century excavations*. London: English Heritage.
- PARKER PEARSON, M. 2022. Archaeology and legend: investigating Stonehenge. *Archaeology International* 23: 144–64. <https://doi.org/10.14324/111.444.ai.2021.09>
- PARKER PEARSON, M. *et al.* 2009. Who was buried at Stonehenge? *Antiquity* 83: 23–39. <https://doi.org/10.1017/S0003598X00098069>
- 2019. Megalithic quarries for Stonehenge’s Bluestones. *Antiquity* 93: 45–62. <https://doi.org/10.15184/aqy.2018.111>
- 2020. *Stonehenge for the ancestors. Part 1: landscape and monuments*. Leiden: Sidestone. <https://doi.org/10.1080/00665983.2021.1894754>
- 2021a. Waun Mawn and Gernos-fach: the *Welsh Origins of Stonehenge* project. Interim report of the 2021 season. Unpublished report deposited at the Dyfed Historic Environment Record.
- 2021b. The original Stonehenge? A dismantled stone circle in the Preseli Hills of west Wales. *Antiquity* 95: 85–103. <https://doi.org/10.15184/aqy.2020.239>
- 2022. *Stonehenge for the ancestors. Part 2: synthesis*. Leiden: Sidestone.
- WAINWRIGHT, G.J., with I.H. LONGWORTH. 1971. *Durrington Walls: excavations 1966–1968*. London: Society of Antiquaries.

Figure captions

Figure 1. Plan of the unfinished and dismantled stone circle of Waun Mawn, Pembrokeshire. Remaining stones, standing and recumbent (purple), are shown, with stoneholes of dismantled standing stones (red), pits dug for standing stones but never used (green) and other features (black). Viewed from the hearth (131) at the centre of the circle, the midsummer solstice sun rose within the entrance formed by stoneholes 128 and 21 (figure by C. Casswell).

Figure 2. The relative sizes and shapes of a selection of Aubrey Holes (in profile) compared with holes for Bluestones 69, 33, 41d and 40g from Stonehenge and with holes for posts at Durrington Walls (after Wainwright, with Longworth 1971; Cleal et al. 1995; figure by the authors, with re-drawings by permission of Historic England and the Society of Antiquaries of London).