The Stones of Stonehenge Project

Investigations in the Nyfer (Nevern) valley in 2012

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Contents

Summary
In 2009, geologists Richard Bevins and Rob Ixer identified a rhyolite source of Stonehenge bluestones north of the Preseli hills in the Pont Saeson district, an area including specifically the impressive crag of Craig Rhosyfelin, not far from the spotted dolerite source at Carn Goedog on the northern edge of the hills, although in a much lower topographic situation. Later, they noted that SH32d, an unsampled stump within the bluestone circle, appears macroscopically to conform to a major class of debitage from Stonehenge, namely their 'rhyolite with fabric', that could originate from Pont Saeson (Ixer and Bevins 2011a). In March 2011 Rob Ixer and Richard Bevins were able to find a precise match between this 'rhyolite with fabric' from Stonehenge and the northwest side of the outcrop of Craig Rhosyfelin.

Follow-up excavations by the Stonehenge Riverside Project and Dyfed Archaeological Trust in September 2011 and 2012 have confirmed that the outcrop at Craig Rhosyfelin was a prehistoric quarry site. Finds include chipped stone tools of flint, quartz and rhyolite, hammer stones, burnt stones, charcoal, a 4m-long monolith lying prone in the quarry, and a stone hole for a standing stone removed from its socket. The quarry bay for the megalith taken to Stonehenge could also be identified, together with a pit dug against its base. The dimensions of the quarry bay indicate that the extracted monolith was 2.50m long, up to 0.45m wide and 0.40m thick, and likely to weigh about a ton or so. The pit at the base of the recess where this monolith was extracted contained charcoal and a knapped flake of rhyolite. It was surrounded by a halo or fan of artefactual debris, extending about 3m in diameter. Amongst this debris were pieces of charcoal, burnt stones and stone tools of flint and quartz; a suite of samples of charcoal for radiocarbon-dating are currently being identified and processed, with full results available some time in 2013.

On the northern edge of the spread of prehistoric quarrying debris, a small bowl-shaped pit contained burnt stones and charcoal. A second concentration of artefacts and burnt rhyolite was found in the immediate vicinity of the prone 4m-long monolith. A large pit, about 5m from the quarry bay for the Stonehenge megalith, contained rhyolite slabs that had once been packed around a monolith standing in this hole. Although this standing stone had been pulled out at some time after the formation of a soil layer probably in the first millennia BC or AD, its base left an impression in the bottom of the pit that shows it was 0.6m wide and 0.5m thick.

Just a mile north of Craig Rhosyfelin lies the hillfort of Castell Mawr. A previous investigation recovered prehistoric flints from the surface of its interior, whilst geophysical survey in 1988 revealed the possibility that this hillfort's ramparts may have been built upon a pre-existing henge (Mytum and Webster 2003). In 2012 we attempted to test this hypothesis by taking samples for optically stimulated luminescence dating (OSL) from two sections of the rampart's exterior; the results should be available some time in 2013. Renewed geophysical survey in 2012 revealed, among other features, traces of two concentric palisade trenches or ditches within the hillfort's interior. Should the primary ramparts of Castell Mawr be Neolithic in date, then this would be the largest henge in Wales. It might thus be significant for understanding the context of the bluestones' production and possible initial installation within a local stone circle, prior to their transport to Stonehenge.

Research Aims

The project aims:

- To identify quarry sites from which Stonehenge bluestones (dolerites, rhyolites and other lithologies) were obtained.
- To better understand settlement and monument construction in the late 4th and early 3rd millennium BC within the Preseli region and their relationship to stone quarrying and its long-distance transport to Salisbury Plain.
- To enhance understanding of the ancestral significance of the Preseli region to late Neolithic communities through an examination of aspects of the 4th millennium BC landscape.

Research Objectives

The project's first phase in 2011 identified four main targets – the quarries (the spotted dolerite source at Carn Goedog [SN129332] and the rhyolite source at Craig Rhosyfelin [SN117362]), a settlement (SN12833328) and circular enclosure (SN1262333780) below Carn Goedog, an arc of standing stones at Waun Mawn (SN0838234046) thought to be a possible robbed-out stone circle, and the hillfort of Castell Mawr (SN1187537768) thought to be a modified Neolithic henge. In addition, geological sampling was carried out at various outcrops in order to identify other potential sources for Stonehenge bluestones on the north bank of the Nevern gorge (SN118373).

In September 2012, the project's second field season, two main foci of research were identified. The first was the rhyolite outcrop at Craig Rhosyfelin where a 30m x 10m trench was excavated along the outcrop's northern face. The objective of this work was to identify areas of prehistoric quarrying of megaliths along the rock face, and to date that activity by radiocarbon and luminescence dating methods.

The second research focus was the hillfort of Castell Mawr, thought by Mytum and Webster (2003) to be a modified Neolithic henge. Cleaning of two cattle-poached sections of rampart at its east end produced samples for radiocarbon and optically stimulated luminescence (OSL) dating. Geophysical survey (with magnetometer and earth resistivity meter) of the hillfort's interior and environs revealed the existence of two concentric circuits of ditches and pits.

In addition, further geological sampling was carried out to identify other potential sources for Stonehenge bluestones. The first of these locales was within Castell Llwydd promontory fort and the second was on the south bank of the Nevern gorge (SN118371).

Craig Rhosyfelin

This site, and immediately adjacent outcrops north of Pont Saeson, was first identified by Richard Bevins in 2009 as a likely source of some of the rhyolite debitage found at Stonehenge (Ixer and Bevins 2009). It matches three foliated rhyolite fragments found in the Cursus field 1km to the northwest of the monument (Ixer and Bevins 2010; Bevins *et al*. 2011), first collected by William Young and J.F.S. Stone (Stone 1947). More rhyolitic fragments were found in 2006 by the Stonehenge Riverside Project and in 2008 at Stonehenge by the SPACES and SRP projects (Ixer and Bevins 2010). It is currently thought that the remainder of the Stonehenge rhyolite sources are likely to come from the north Pembrokeshire region (Ixer and Bevins 2011a).

Figure 1. Craig Rhosyfelin is the NE-SW aligned outcrop in the bottom of the Bryn valley, at the centre of the photograph (see also the frontispiece)

The rhyolite outcrop of Craig Rhosyfelin forms a dramatic ridge of pillar-like stones on the west flank of the Brynberian valley, two miles north of Carn Goedog, with which it is linked by one of the tributaries of that valley. Its western edge is exposed as a near-vertical face by the presence of a small and short tributary valley running northwards on the west side. There are no visible earthworks around the outcrop or within its vicinity, although some of the land upstream to the north has been landscaped as the garden of a modern house. Dense stands of bracken and brambles, however, have obscured some of the ground surface nearest the outcrop's near-vertical sides.

Ixer and Bevins (2011b) have established that a rock sample from the northern end of the outcrop's vertical western edge (Locality 8 in the accompanying figure) provided an exact petrographical match for a number of rhyolite chips from Stonehenge. This highly distinctive texture they have called 'Jovian' as it resembles the weather patterns on that gas giant.

Figure 2: Geological sampling points at Craig Rhosyfelin; the precise match with Stonehenge 'rhyolite with fabric' was found at location 8.

Methodology

Investigation commenced at Craig Rhosyfelin (site code CRF) in September 2011 with geophysical survey (earth resistivity and magnetometry) and a trial excavation (Parker Pearson *et al*. 2011). Discoveries in 2011 included a prone monolith (context 007), identifiable on the geophysical plot in hindsight as an anomaly of high resistance.

In September 2012 an excavation of over 200sq m was carried out against the foot of the outcrop along its northwest face. The trench was rectangular in plan except for a small extension on the west side to find out whether a second area of high resistance indicated the presence of another prone monolith (but it did not).

The topsoil and most of the colluvium (layers 002-006 and 008) were removed with a mechanical excavator, and the remainder of the deposits above the stone scree and quarry floor were excavated by hand. The colluvium (or hill wash) was over 2m deep in parts of the trench; not only has it sealed archaeological layers beneath it but it has also protected them from opportunistic quarrying in the historical period; in contrast, steel wedge-made holes on the southeast side of the outcrop testify to recent quarrying on that side.

Of those deposits sealed beneath colluviums but post-dating the prehistoric quarrying activity, buried soils (020 and 036) were excavated. Continuing the process commenced in 2011, these were sampled for magnetic susceptibility, phosphorous and other elements and bulk sampled for flotation to recover charcoal. Carbonised round wood and a barley grain from layer 020 were radiocarbon-dated in 2011, producing dates in the first millennia BC-

AD. A date on carbonised round wood from the base of the colluvium indicates that its formation commenced in the first millennium AD.

Stratified beneath layers 020 and 036, a thin occupation layer (041) was associated with stone tools and quarrying activity consistent with a Neolithic date. This layer was sampled on a half-metre grid for magnetic susceptibility, phosphorous and other elements and bulk sampled for flotation to recover charcoal. Associated features and deposits were hand-excavated and bulk sampled for flotation. OSL samples were taken from the fill of a pit dug against the base of the recess from which the Stonehenge ‘rhyolite with fabric’ monolith had been removed, and from a deposit of burnt sediments on the north tip of the outcrop.

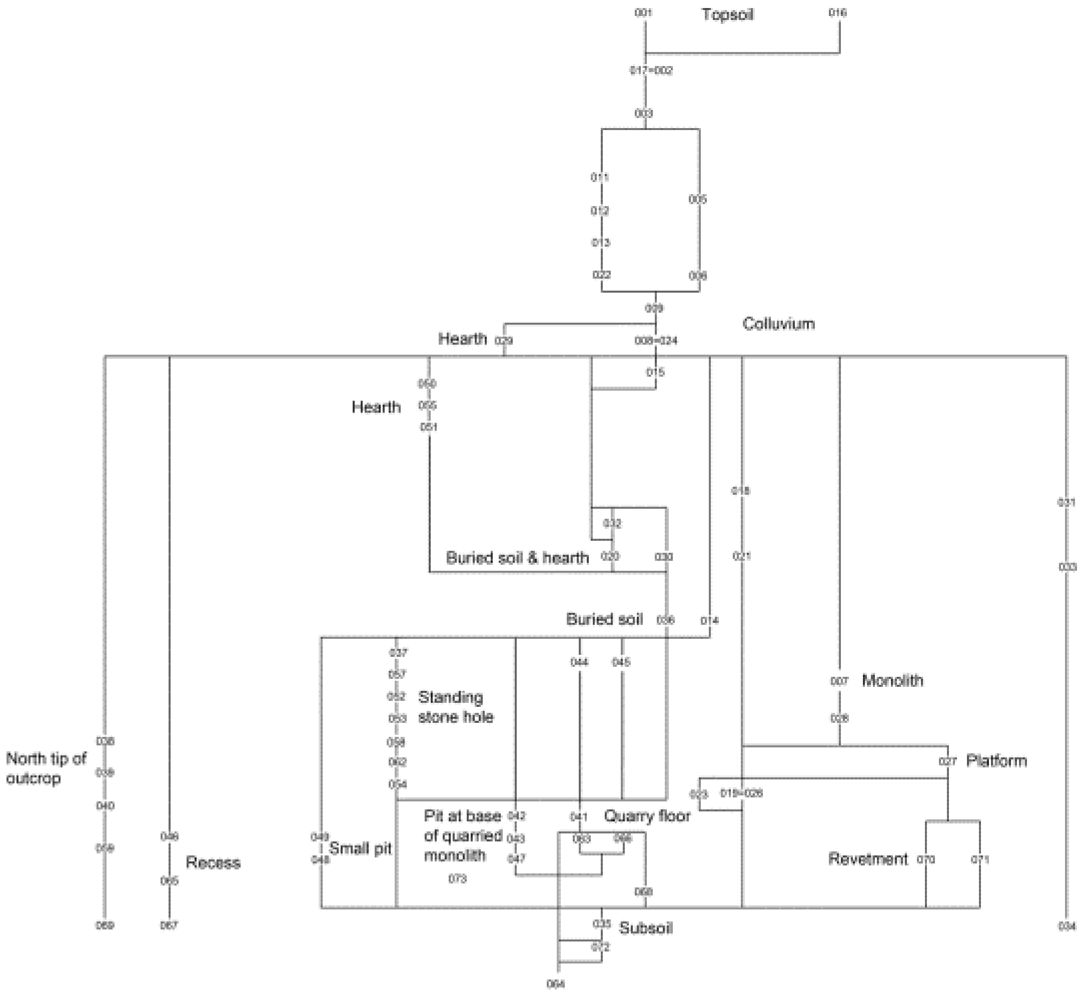

Figure 3. Stratigraphic matrix of contexts within the 2011-2012 excavations at Craig Rhosyfelin.

The pre-quarry sequence

The earliest deposits encountered within the excavation were three layers of sediment likely to be of Late Pleistocene or Early Holocene date. The lowest of these was yellow sandy clay, observed in the base of the large pit for the broken-up standing stone. Above this was a purple-brown layer of sandy clay (064) that could be seen beneath rubble at various places throughout the trench. The uppermost layer was a thick deposit of bright yellow sandy clay (035) confined to the northern end of the trench. This contained large blocks of rhyolite (072) buried beneath the surface of layer 035. The uppermost 0.10m of this layer (035) contained pieces of charcoal; whether these are intrusive from later deposits or were incorporated during its formation remains to be resolved. All three pre-quarry layers contained rhyolite boulders. Layer 035 was dated by OSL to 5410-3590 BC (CRF12-02; X5454; 6500±910 BP).

The quarry deposits

Deposits associated with quarrying were found only in the northern half of the trench, most of them within 5m of the recess from which the Stonehenge 'rhyolite with fabric' monolith (context 073) had been removed (geological sampling location 8). A second, less dense concentration was found around the prone 4m-long monolith and against the rock face from whence it originated (geological sampling location 18). The only artefact found outside either of these two areas was a piece of burnt rhyolite near the southern end of the trench. One of the advantages of opening such a large trench was to be able to identify specific locales of human activity along the outcrop and to see their close correspondence with the geologically pinpointed positions of the two detached monoliths (geological sampling locations 8 and 18).

The floor of the quarry consisted of a spread of rhyolite blocks (context 019=026) on top of a mixed dark brown clay loam (layer 041; 0.05m thick) that sat on the yellow sandy clay (layer 035; 0.06m thick) and purple-brown clay (layer 064). An unmodified beach pebble (SF4), a stone with traces of grinding (SF6) and a possible hammerstone (SF8) were recovered from context 026. The rhyolite blocks on the surface of these two layers petered out towards the northeast end of the trench where the outcrop terminated. The absence of blocks in this area, 5m from the end of the outcrop, can be explained partly by the reduced height of the rock face at its northeast end but it also appears that stones had been cleared from against the outcrop by the time that layer 041 formed.

Layer 041 was a thin deposit of clay loam that extended from the northern end of the outcrop to the spread of rhyolite blocks (context 019=026) and a large 'threshold' slab (070) to the south. From the face of the outcrop, it extended westwards to the edge of a large stone hole (054). It was covered by layers 036 and 020. It contained quantities of wood charcoal and burnt rhyolite fragments (burnt to a red colour). Two worked flints – an awl (SF29) and a snapped flake (SF31) – were found on the interface between the top of layer 041 and the base of layers 020 and 036, together with a quartz chip (SF34) and a quartz flake (SF35). A quartz core (SF38) and a possible quartz core (SF39) were found in layer 041.

After layer 041 was removed, two small concentrations of charcoal (063 and 066) were identified close to the outcrop and pit 047. These could date to before layer 041 was formed or, more likely, are the bottoms of charcoal concentrations within 041.

Figure 4. The zone associated with quarrying debris within layer 041. This formed a 3m-diameter halo or fan around the recess from which a monolith (073) had been removed.

The recess for the Stonehenge 'rhyolite with fabric' monolith (073)

This recess was located about 3m from the northern end of the outcrop, immediately north of geological sample point 8. It was formed by removal of a thin, tapering monolith 2.50m high, up to 0.45m wide and 0.40m thick (073), isolated from the rock face by wide, deep vertical fissures on either side.

A small, roughly semi-circular pit (047), 0.70m in diameter and 0.25m deep, had been dug against the base of the recess. It was the only such pit dug against the face of the outcrop. Its upper fill of dark brown clay loam (042) was packed with medium-sized and small stone blocks, some of them burnt; one of them was a large, thin slab of burnt rhyolite. Its basal fill (043) was hard-packed with a thin slab of rhyolite pressed down the pit's northern side to its base. From this primary fill came a knapped flake of rhyolite (SF40). Layer 042 could not be distinguished from 041, and the two deposits appeared to merge into one at the side of the pit.

Three samples of carbonised roundwood collected in flotation samples from this upper fill (042) of the pit produced three widely variant radiocarbon dates. A sample of *Tilia cordata / platyphyllos* dated to AD cal 428-539 at 95.4% probability (SUERC-42903; 1575±19 BP), another of the same species to 1414-1306 cal BC at 95.4% probability (SUERC-42905; 3081±18 BP) and a hazelnut shell (*Corylus avellana*) to 2836-2498 cal BC at 95.4% probability (SUERC-42906; 4074±19 BP). An OSL sample from this upper fill (042) provided an age overestimate because it had to be taken close to the sloping rock face which has contributed a substantial (and as yet unestimated) percentage of the sample's dose.

The presence of quantities of burnt rhyolite and charcoal within layer 041 surrounding the recess may explain how the Stonehenge monolith was extracted. Whilst hammerstones would have been useful for certain tasks in the quarry, they would have been of only limited use in detaching stones from the rock face. Instead, the stones were probably quarried by fire-setting, heating the selected section of outcrop to create a crack or fissure, a technique used in Neolithic Europe during the 5th millennium BC (Pétrequin *et al*. 2008; Scarre 2011: 65). The monolith could then be eased off but further splitting the rock with carefully positioned wooden wedges that swelled as they became wet.

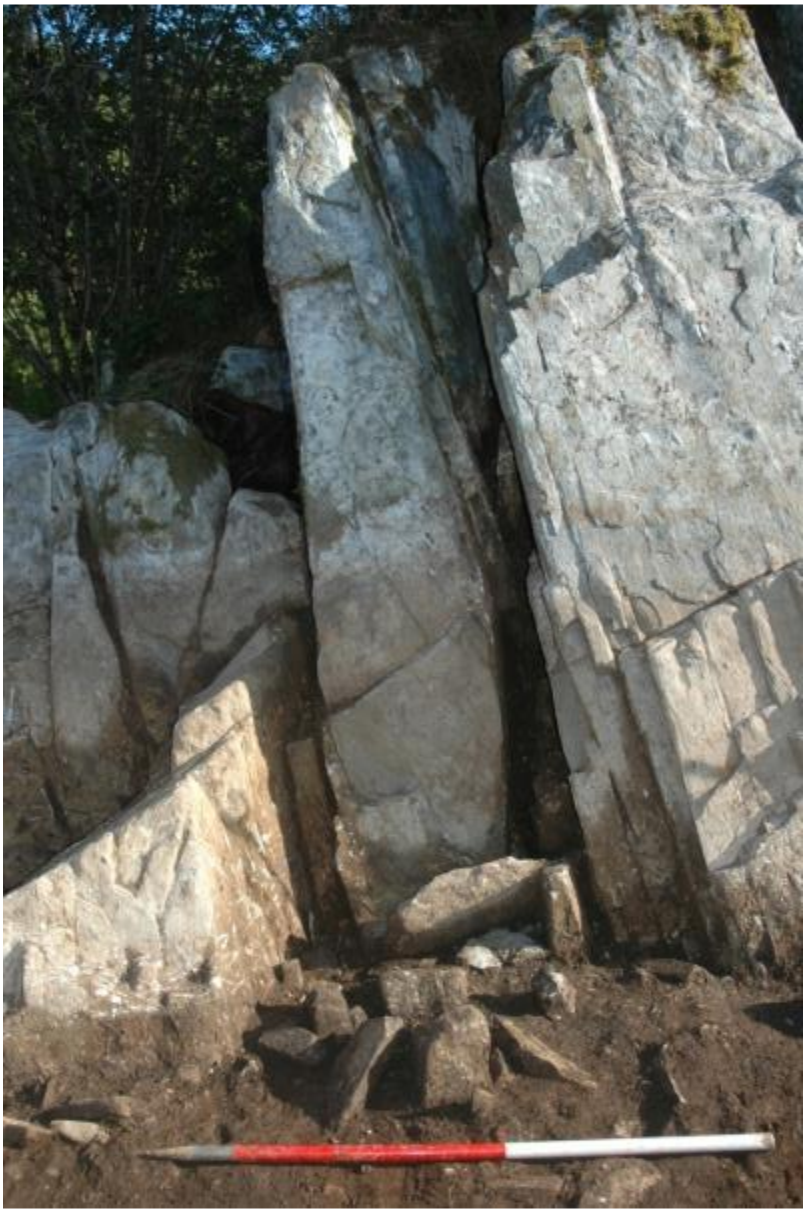

Figure 5. The recess from which a monolith has been removed. Geological sampling location 8 is in the top right of the picture, just right of centre. The surface of pit 047 (unexcavated at this stage) is visible as a cluster of stones at the base of the recess.

Unlike the prone monolith (007), the monolith in the recess was not attached to the living rock at its base; in this part of the outcrop, there was a weathered, horizontal fault line that ran just above ground level. Even so, the rock below the extracted monolith had been cracked and shifted so that it was out of kilter with the alignment of the rest of the rock face. This may have been the purpose of digging pit 047 at its base.

Although chippings of the ‘rhyolite with fabric’ monolith have been identified at Stonehenge (Ixer and Bevins 2011a), the actual monolith has not yet been positively identified. On the basis of macroscopic appearance, it is thought to be SH32d, a laminated ‘spotted dolerite’ stump recorded by Richard Atkinson and Stuart Piggott in 1954 as 0.40m x 0.40m in width and thickness (Cleal *et al*. 1995: 226, fig. 120). These dimensions, including the stone’s profile and angled base (Cleal *et al*. 1995: fig. 141) correspond exactly to those of the stone (073) taken from the recess at a height of 0.3m or more from its base.

Figure 6. A section through the upper fill (042) of pit 047 at the base of the recess from which a monolith (073) has been removed.

Other features within the quarry

Features cut into layers 064 and 035 within the northern part of the trench also included a small bowl-shaped circular pit 3m to the north of the recess, and a large stone hole (054) to the northwest. In addition, there was a shallow scoop (060) filled with a flat slab (061) immediately in front of the recess and semi-circular pit.

The shallow scoop in front of the recess was filled with mid brown clay loam (061) and a foot-sized rhyolite slab lying flat and perpendicular to the rock face. Layer 061 was covered by layer 041. It is possible that the slab was used as a solid surface by those extracting the monolith and lowering it to the ground.

The small bowl-shaped circular pit (048) was 0.55m x 0.48mm in diameter and 0.26m deep. Its fill of grey-brown clay loam (049) contained many burnt rhyolite cobbles and charcoal flecks. Its stratigraphic relationship with layer 041 could not be established.

About 5m northwest of the recess lay a large pit (054), 2.00m x 1.45m diameter and 0.7m deep. The pit was dug after layer 041 had accumulated. In the base of the pit was an impression, 0.60m wide x 0.50m thick, of the bottom of a stone upright. One of the stones (053b) protruded out of the pit at an angle of about 30º, oriented to the north and with its base about 0.3m to the south of this impression. We thought initially that stone 053b was the broken stump of the standing stone but its dimensions are too small and the number of refits too few for this to be a broken standing stone; instead, it is likely to have been a large packing stone, displaced when the standing stone was removed from the pit.

Figure 7. A section through the fill (049) of bowl-shaped pit 048.

The lower fill of this pit was pale cream sandy clay (062) packed with three large blocks of rhyolite to provide support for the standing stone. A fine quartz core (SF36) was found within layer 062. Above this, there was a deposit of large rhyolite blocks (053 and 058), packing stones for the fallen standing stone. Of these, context 058 consisted of the undisturbed, *in situ* packing stones.

Long after its erection, the standing stone was pulled over and removed, after a buried soil (036) had accumulated over the pit fill but before the onset of colluviation (layer 008). The rest of the pit was filled with a mixed deposit of re-deposited yellow subsoil and grey silt (052) and, in the pit's centre, its uppermost fill of fine grey silty clay (057). The latter is probably slumped soil from the old land surface above (layer 036) filling the void of the removed standing stone whilst layer 052 results from disturbance of previously stratified layers within the stone hole.

The stone hole (054) was covered by a heap of rhyolite blocks (037), one of which (037c) conjoins with the smashed stump (053b) of the standing stone. A possible hammerstone (SF32) came from among the blocks in layer 037. The upcast (052 and 057) created by pulling down the stone was very similar to that of a tree-throw, with deep fill material brought to the surface and surface soil forced deep underground. On present dating evidence, this destructive event may have occurred after the middle of the first millennium BC but before the mid first millennium AD.

Figure 8. Pit 054, filled with packing stones; stone 053b protrudes out of the pit on the left hand side.

The recess north of the Stonehenge monolith's recess

About a metre north of the recess from which the Stonehenge monolith (073) was extracted, there is a triangular-shaped recess that contained a sequence of two cultural layers on top of a basal deposit of natural stone clitter (067). The lowest of these was a mottled dark red-brown and grey clay silt (065). This lay on top of a mid-grey-brown silty clay (046) with fragments of charcoal, possibly a dump of hearth ash. Layer 046 lay directly below colluvium (008). Immediately outside the recess, there is a group of five stones set on edge (context 068) into layer 064, some of them at right angles. There was no sign of any cuts for the stones so it is difficult to establish whether they were arranged by human agency or not. One of them has a fire-reddened top, probably burnt when it was exposed within either layer 041 or 020.

The burnt deposit at the north end of the outcrop

The northern tip of the outcrop is formed by two natural upright slabs of rhyolite about 1m apart to provide a recess among the rocks. The western upright has split in two longitudinally and has also lost its top, surviving as two large slabs (context 038) lying within the recess. Traces of burning on the sides of the western upright raise the possibility that the slabs were deliberately detached by fire-setting.

One of the two slabs sealed a deposit of burnt material, consisting of an uppermost layer of black soil and ash (layer 039) and a lower, thicker layer of reddened sediment and burnt rhyolite cobbles (layer 040). This is interpreted as a dump of re-deposited burnt debris, although there is no indication of where the original source of this burnt material lies. Layer 040 was excavated for flotation on the same half-metre grid as layer 041.

A dark red-orange-brown clay silt layer (059) beneath layer 040 was also excavated. Although possibly equivalent to 064 on the west side of the outcrop and thus dating to the Early Holocene or earlier, it contained burnt cobbles and charcoal flecks throughout. Beneath layer 059 was a thick layer of orange, iron-rich, dark brown mottled sediment (069) with charcoal flecks throughout.

Figure 9. The burnt deposit (040) sealed beneath a fallen slab (038) at the north end of the outcrop.

The platform supporting the prone monolith (007)

The southern edge of layer 041 abuts a large horizontal rhyolite pillar (070) and a line of stones (071), several of them placed on edge, bedded into layer 064 and serving as a low revetment wall, up to 0.1m high, separating the stony part of the quarry from the largely stone-free zone to the north. Deposited after this revetment, a layer of small, broken-up stones and grey-brown soil (027) filled the area uphill from the revetment for about 5m to a depth of up to 0.1m. This appears to be a fill of hard core, deposited against the edge of the rubble (019) and forming a low platform. In 2011, layer 027 produced four knapped rhyolite flakes; in 2012 a further rhyolite flake (SF42) was recovered from it. In this area, layer 019 forms a consolidated, relatively level surface of small rubble, beyond 4m from the rock face, along the northeast long side of the monolith and extending beneath it. Layer 019 contained a hammerstone (SF2).

The horizontal pillar (070), 2.2m x 0.55m x 0.4m, has the appearance of a threshold over which prehistoric quarry workers may have envisaged dragging monolith 007 before they abandoned the monolith in the position in which it now sits. Yet there is a 1m-wide zone of flake-scarring and damage on the top surface of this threshold pillar that suggests a previous, unidentified monolith was dragged over it prior to the quarrying of monolith 007. In addition, one of the vertical stumps of rhyolite embedded into layer 064 north of this threshold also has a damaged top surface. It is not clear how a monolith was (or was envisaged as being) transferred onto a wooden sledge and rollers, since the width of the stone-free area for a distance of 3m below the threshold stone is limited.

Figure 10. The 'threshold' stone (070) north of monolith 007, viewed from the northeast. It has been fractured and flaked, perhaps from the weight of a monolith dragged across it.

A group of four long, thin rail-like pillars of rhyolite (context 028) lay on a northwest-southeast axis on top of layers 027 and 019. They were 0.2-0.4m wide and 1.1m-1.5m long. Together they formed three parallel lines with an overall width of 2.1m. They were initially interpreted in 2011 as the end of a series of stone runners or rails along which monolith 007 was manoeuvred. However, when examined in 2012, two of them could be seen to prop up the southwest end of monolith 007.

Within 1.5-4m of the outcrop wall, many of the stones in rubble layers 019 and 026 (the latter post-dating layer 041) are pitched at right angles to the rock face; some towards the northeast end of the trench even appear to have been stacked.

Against the rock face opposite monolith 007, there was a pocket of dark brown-black clay loam (018) in a loose fill with small 'slates' of rhyolite. This was a localised deposit set into larger rubble (019) on both sides (northeast and southwest). It pre-dated the upper colluvium (002=017) but could not be related stratigraphically to other layers lying upon the rubble (026 and 023). Layer 017 contained a large cobble of spotted dolerite with one end heavily flaked and battered (SF19), and a rhyolite flake (SF24).

Figure 11. The stone 'rails' (028) underneath the southwest end of monolith 007

An unsuccessful attempt was made in September 2012 to find the precise location where monolith 007 was detached from the living rock. A wide recess east of monolith 007 (between geological sample locations 17 and 18) was investigated to see if a match could be found with the base and sides of the monolith. A sequence of three layers was excavated against the face of the outcrop and beneath colluvial layer 017. The lowest was orange-brown clay silt (034) with weathered rhyolite fragments, likely to be equivalent to subsoil layers 035 and 064. This was covered by mid-brown clay silt (033) with rhyolite fragments, possibly equivalent to layer 020. Above this, a brown-black clay silt (031) with charcoal flecks is probably equivalent to layer 018.

The prone monolith (007)

The rhyolite monolith (007) is 4.10m long, up to 1.25m wide and 0.54m thick. It lies with its top downhill towards east-northeast at an angle of about 30° to the stone 'rails' on which its west-southwest basal end rests. Whilst its thickness is relatively even, its width varies; it is mostly about 1.1m wide for most of its length and is about 1m wide at its base. Its top end, lying downhill, is naturally weathered indicating that the monolith was detached from the top of the outcrop. Its basal end, lying uphill, is unweathered and fractured, indicating that it has been snapped off from the outcrop.

Figure 12. The rhyolite monolith (007) with its broken shard protruding from its base on the near side and a stone 'rail' beneath its left end. Colin Richards kneels on the platform deposit (027) left of the revetment wall (071) and the 'threshold' stone (070).

The monolith lies with its unweathered face (*i.e*. that side that was prized from the bedrock) lying upwards, indicating that it has been moved from the rock face through 90° in the vertical plane and then rotated through 120° in the horizontal plane. On the basis of comparison with the varying geology along the rhyolite outcrop, it seems that the monolith was detached from the living rock in the immediate vicinity of geological sample 18, about 5m to the south-southeast.

The southeast side of the monolith has a large shard of rhyolite poking out from under its base. This was initially thought to be a prop stone but it is actually a broken-off fragment of the monolith's underside. Its fracture may have been the reason why the monolith was abandoned in the quarry, although there is also a hairline crack across the monolith's upward face. However, there could have been other reasons why the monolith was abandoned: for example, it appears to have slipped forward and sideways off its props.

Other than having been split from the parent outcrop, the monolith has no evidence of working other than two possible flake scars on the upper surface of its southeast corner.

These derive from flakes (0.05m x 0.10m wide by 0.05m long) that have been struck across (not along) the foliations, leaving the negative depressions of bulbs of percussion. There are two curious parallel gouges on its north side about 0.08m apart and 0.10m long, running across the grain of the rock. They are slightly wider at the bottom (nearest the ground) and narrow to points at the top.

The buried soil

Most of the northern half of the trench, especially against the western edge, was covered with a thin layer of grey clay loam (036). This appears to have formed a B horizon of a buried soil (020) although the two layers were not always found in the same place. Finds from 036 included a rhyolite flake (SF30) but others attributed to this layer actually came from its interface with layer 041 below it.

Figure 13. The buried soil (020) at the north end of the outcrop. The fireplace (030) is visible as an orange discolouration just above the right end of the bottom ranging rod.

On the interface between layer 036 and the quarry debris layer 041, there were two small concentrations of charcoal (044 and 045), stratified beneath 036 but on top of 041. The larger of these two concentrations (045) lay within a shallow scoop 0.4m x 0.2m across and 0.02m deep. Carbonised roundwood of *Corylus avellana* (hazel) from layer 044 produced radiocarbon dates of 516-407 cal BC at 95.4% probability (SUERC-43193; 2410±29 BP) and 540-394 cal BC at 91.5% probability (SUERC-43194; 2387±29). Carbonised roundwood of *Quercus* sp. (oak) produced radiocarbon dates of 750-405 cal BC at 95.4% probability (SUERC-43195; 2434±29 BP) and 704-391 cal BC at 95.4% probability (SUERC-43196; 2377±29).

Most of the north/northeast half of the trench was covered with a thin buried soil (020), about 0.1m or less to the west and increasing to 0.2m thick near the outcrop where it appears to have formed from a dense mat of vegetation and organic matter against the vertical side of the outcrop, much as a similar horizon does today above the colluvium here, due to the growth of bracken and the accumulation of dead organic matter at the base of the outcrop. Layer 020 also covered the entire western side of the trench from south to north. In the centre of the trench, around and beneath the monolith, there were very few patches of buried soil (021), most of them being to the west of the monolith. In all cases (020 and 021) the buried soil was a black-brown clay silt with occasional stones and charcoal flecks, although it contained few artefacts.

Finds from within layer 020 included three quartz flakes (SF22, SF23 and SF27, a quartz core (SF25) and possible quartz core (SF26), a flaked tool of rhyolite (SF20) and an unworked prism of clear rock crystal (SF28).

Initial results of environmental analysis of layer 020 in 2011 demonstrate that this layer contained large quantities of carbonised plant remains, particularly twigs and berry seeds. The centre of this deposit appears to have been a small, informal fireplace (030) about 2m from the face of the outcrop, marked only by its orange colour; there was no setting of hearth stones or any stone surround for the fire. The seeds of raspberry, blackberry and wild strawberry, together with hazelnut shells and branch tips suggest an autumn-winter period for the accumulation of this deposit.

There was no clear evidence that this part of layer 020 had accumulated within a walled or roofed structure. Whilst the positions of certain stones on edge could suggest the presence of a partial wall base, there was no evidence for any roof support save for a single small stake hole (032) on the southwest side of the fireplace (030).

The buried soil accumulated after the quarrying events. Some pockets of it lay beside and even beneath the monolith but these soils could have developed long after the quarry was abandoned and before the onset of colluviation. Radiocarbon dates were obtained from carbonised material in the upper and lower parts of layer 020: a carbonised grain of barley in the upper part (sample 15 in layer 020) provides a date of cal AD 540-650 at 95.4% probability (SUERC-38132; 1470±35 BP) whilst carbonised round wood in the lower part (sample 25 in layer 020) dates to 746-394 cal BC at 95.4% probability (SUERC-38134; 2400±35 BP).

Sampling of the buried soil was carried out on a 0.5m x 0.5m grid (a method established for sampling prehistoric house floors; Smith *et al*. 1998); quantities of phosphorous and other elements were recorded using a portable XRF machine whist samples were taken for soil magnetic susceptibility (environmental sample group 005). The extensive buried soil in the northern half of the trench was gridded into 1m x 1m blocks and 100% bulk sampled for flotation to recover charcoal, charred plant remains and micro-debris (environmental samples 006-023). Two further bulk samples for flotation were taken, one (environmental sample 024) from the pocket of 021 southeast of the monolith, and the other (environmental sample 025) from the lower component of 020 in the north of the trench where it was sealed beneath a flat slab and unaffected by any worm action.

The colluvial sequence

The quarry deposits and buried soil were covered by a deep sequence of colluvial layers, between 1m and 2.5m deep. These deposits were deepest along the west side of the trench furthest from the outcrop.

The basal colluvial layers formed multiple lenses of loam and gravel, thinner than the layers of colluvium at the top of the sequence. These were particularly dense and complex in the northern half of the trench, petering out within three metres of the outcrop. This was particularly noticeable on the west side of the monolith where colluvial layers were thick and stony, indicating that much subsoil had been displaced from the western edges of this small valley.

The lowest layer of colluvium was a thin spread of gravel (context 015; up to 0.04m thick) within the central northern half of the trench where it lay upon a patchy lens of brown-grey clay directly on the buried soil (020).

Layer 015 was covered by a 0.1-0.3m thick layer of mid brown silt loam (008=024). Layer 008=024 was dated by OSL to AD 810-1030 (CRF12-04; X5456; 1080±110 BP). Within the northern part of 008=024, within its upper component, there were two dense but shallow deposits of charcoal (context 009, environmental sample 1, 1m x 0.35m; and context 010, 0.25m x 0.11m). A date of cal AD 775-972 (SUERC-38133; 1165±35 BP) was obtained for *Corylus avellana* round wood charcoal from sample 1 in context 009.

Figure 14. The colluvial sequence at the northwest corner of the trench, showing the positions of OSL samples 3 (left) and 4 in layers 005 and 008.

Layer 008=024 was covered by layer 022 (largely stone-free mid-brown clay) in the northwest and by yellow-brown gravel (006) beneath grey-brown silt loam (005). Layer 005 was dated by OSL to AD 780-1040 (CRF12-03; X5455; 1090±130 BP). A sample of charcoal (environmental sample 004) was taken from the basal component of 022 immediately north of the monolith. A spread of flat rhyolite slabs on the top of layer 022 were concentrated against the northwest side of the monolith but were probably deposited by natural agency.

Layer 022 was overlain by a sequence of layers – 013, 012 and 011 – in the western part of the trench, of which 012 is equivalent with 005. Layer 013 was a gritty sand with small-medium sized stones; its clay content increased with proximity to the monolith. Above it, layer 012 was a thin layer of largely stone-free black clay loam, probably a buried soil. Layer 011 was a sandy, gritty silt loam with small stones that can be equated with layer 005 in the north half of the trench.

There were two hearth features at different depths within the lower colluvium (008) in the northeast corner of the trench immediately beyond the northern tip of the outcrop. The lower (and presumably earlier) of these was a surface of burnt and unburnt cobbles (055), 0.2m x 0.8m and 0.08m deep, lying beneath a deposit of grey-brown clay loam and charcoal (050). Positioned on the south side of a large, flat slab, its fire had burned the surface of the rock where the cobbles adjoined it. Southeast of feature 055, within the basal unit of layer 008, lay the rim sherd of a coarse earthenware vessel (SF13) and a possible hammerstone (SF14). Beneath both layers 008 and 050 there was a thin layer of mid grey-brown mixed clay silt (051) running east-west between the outcrop and the burnt flat slab. It lapped against layer 040.

The higher hearth deposit (029), 0.36m x 0.30m and 0.1m deep, within layer 008 was located about 1.5m to the north, against the north side of a small boulder. Among the burnt cobbles forming the hearth base, one may formerly have been used as a hammerstone (SF15) but it is indeterminate. No charcoal survived on the surface of this small hearth. Other finds from layer 008 included a large hammerstone with a heavily battered end (SF17), from about 3m south of monolith 007.

The uppermost layers of colluvium were a band of grey-brown silt loam (003) up to 0.2m thick, beneath a thicker layer of orange-brown loam (002). These two layers were hard to differentiate in parts of the trench. Close to the outcrop, 002 was equivalent to 017 which lapped against rubble (023). A charcoal sample (sample 003) was taken from layer 003 whilst 002 contained sherds of 19^{th} century ceramics. The uppermost layer was topsoil (001) covering the entire trench, with 016 being part of the black topsoil against the rock face. A flint flake (SF11), two rhyolite flakes (SF18) and a hammerstone (SF21) were found in layer 016. A similar layer of black organic soil (014) within a cleft in the rock face in the northwest contained a retouched flint flake (SF1) at its base.

Castell Mawr

This impressive hillfort (SN1187537768; NPRN304047) of 1.52ha lies above the confluence of the Afon Nyfer (River Nevern) and the Afon Brynberian, just a mile north of Craig Rhosyfelin and three miles north of Carn Goedog. It is recorded by the RCAHMW as follows (Wiles 2008):

'Castell Mawr is generally considered to be a later prehistoric settlement enclosure, possibly of two phases, although it has been suggested that it is an earlier ritual or ceremonial henge enclosure reused in the Iron Age. The site was subject to partial geophysical survey in 1988.

The monument occupies the gently rounded summit of a hill. It consists of a 1.3ha oval enclosure defined by: a slight inner bank; a broad and shallow ditch; a prominent outer bank, preserved as a hedgerow and apparently ditched. There are entrances on the north-west and east. The interior is subdivided by a curving west-facing rampart and ditch cutting off the 0.7ha eastern part of the enclosure. No entrance between the two divisions has been identified.

The character of the main enclosure, with a strong outer bank over-shadowing the weaker inner bank, has prompted the suggestion that it represents a Neolithic henge. In support of this flints have been found within the enclosure. However, the prominence of the outer bank may be a product of its reuse as a hedge bank and flints continued to be used into the historic period.'

Figure 15. Castell Mawr from the air, photographed by Toby Driver (RCAHMW).

It has also been described by Murphy *et al*. (2007) as follows:
'Castell Mawr is a bivallate hillfort located on a rounded high hilltop at c.145m above sea level. It is egg-shaped, measuring internally c.130m southeast-northwest and 130 southwest-northeast. The inner bank rises up to 1m above the interior and 2m above a wide shallow ditch. The outer bank rises up to over 3m above the exterior ground surface and in places dominates the inner bank. A field bank runs along the crest of the outer bank. The outer ditch is now virtually ploughed out. The original entrance faces east, at the point of the 'egg', and is a simple gap through the ramparts. In addition there is a modern break through the rampart on the southeast side and a breach through the outer bank on the north side. A boomerang-shaped rampart running north-south, which rises 1.3m above its east side and 2m above the west over a shallow ditch, divides the interior.'

In the wake of geophysical survey in 1988, Mytum and Webster reinterpreted Castell Mawr as 'a Late Neolithic or Early Bronze Age hengiform enclosure, partially re-used in the Iron Age or Romano-British period by an enclosed farmstead in the eastern part of the interior' (2003: 2). Their geophysical survey included both earth resistivity and magnetometry as well as soil magnetic susceptibility. Although magnetometry produced disappointing results, perhaps due to problems with the magnetometer, the other two methods revealed evidence to support their notion that this was a henge. In particular, there was no indication from resistivity or magnetic susceptibility of an external ditch and they concluded that 'it can be confidently assumed that no such feature existed' (2003: 4).

Methodology
Three programmes of investigation were carried out at Castell Mawr (site code CM) in September 2012. One was a geophysical survey (magnetometer and earth resistance) of the interior and exterior of the hillfort. The second was an earthwork survey of the hillfort, completed in all areas except those parts of the ramparts most heavily covered in gorse. The third involved cleaning of the hillfort's external rampart in two locations where it was already eroded by cattle poaching, and sampling of the rampart and buried soil for radiocarbon and OSL dating.

Geophysical survey
The geophysical surveys described here were conducted between 1st and 21st September 2012. Grids were laid out using a Leica Viva differential global positioning system (dGPS). Magnetic survey was carried out using a Bartington Grad601 Single Axis Magnetic Field Gradiometer System (fluxgate gradiometer) with dual 1m Grad-001-1000L sensors over 20m by 20m grids with readings taken at 0.125m intervals along traverses spaced 1m apart, at a resolution of 0.1nT. Earth resistance survey was conducted over 20m by 20m grids using a Geoscan RM15-D resistance meter and a PA5 multi probe array frame in the 0.5m configuration. Data acquired via both methods were output to ArcheoSurveyor 2.5 for minimal processing.

Georeferenced and interpretive plots were composed in ESRI ArcGIS 10. Note that, in Figures 15 and 16, black represents positive magnetic anomalies or areas of high resistance and white represents negative magnetic anomalies or areas of low resistance.

Magnetometry
There are a number of linear positive magnetic anomalies to the northeast of Castell Mawr which are most likely associated with previous field boundaries or a possible enclosure. A

linear positive magnetic anomaly to the east of the Castell is of a difference alignment to the existing and previous field boundaries, which may indicate that it is a prehistoric, geological or agricultural feature It is unclear whether this anomaly is related to a series of positive magnetic anomalies indicative of pits or negatively-cut features adjacent to the bank of the Castell, near the eastern entrance. In the southwest of the survey is a circular positive magnetic anomaly which is 6m in diameter and may represent the drip gulley of a small round house. The positive-negative magnetic anomaly encircling the Castell is most likely caused by the effects of the rising ground associated with the external bank. A similar, but weaker, response can be seen in the interior, where the survey area has approached the small interior bank and the cross bank. Within the eastern section of the Castell interior are a number of curvilinear, weakly positive anomalies which appear to run concentric to the ditch and bank. The outer of these features appears to extend in to the western half of the Castell. It is possible these anomalies represent enclosure ditches or palisade trenches associated with a monument that pre-dates the Iron Age. However, it is also possible that they could also relate to activity in later prehistory. The whole survey area has a range of magnetic responses that are likely to be representative of plough scarring, and it is known that the site has a long history of heavy agricultural use.

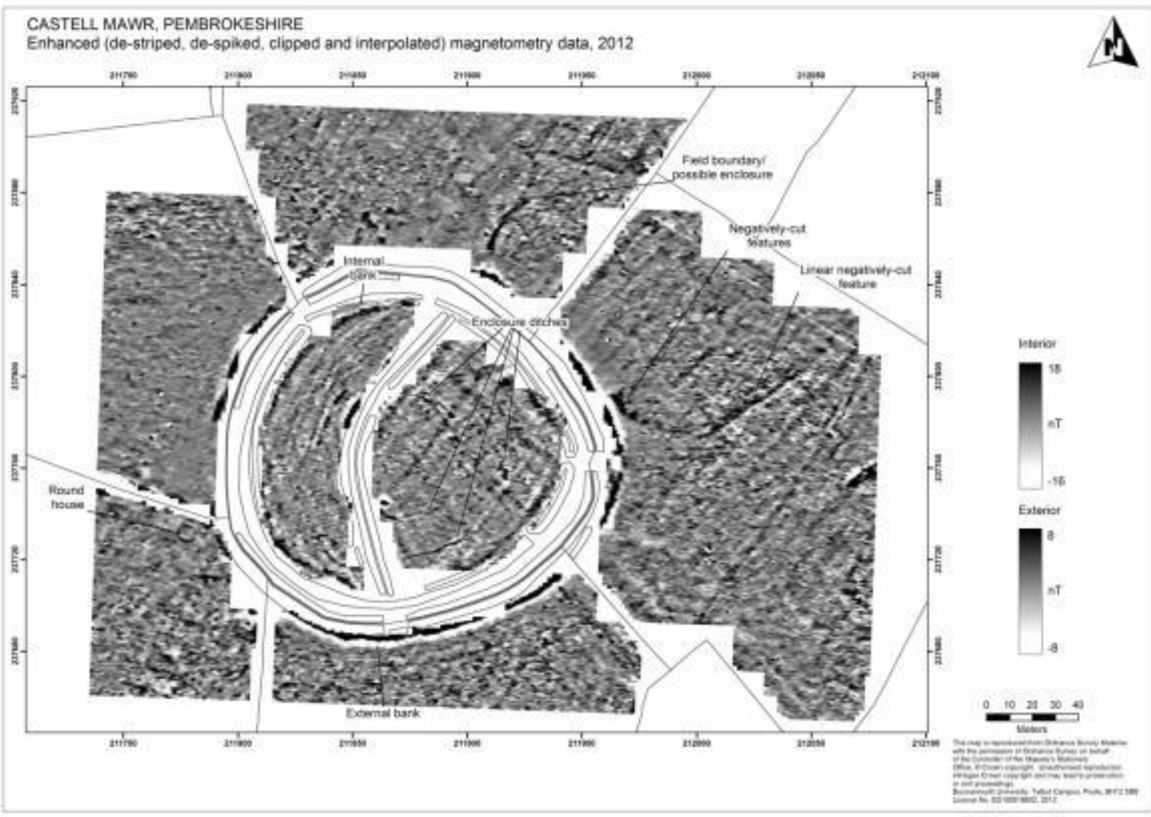

Figure 16. Magnetometry survey plot of Castell Mawr.

Earth resistance

Adjacent to the western entrance of Castell Mawr are several curvilinear anomalies which may be indicative of an external ditch with a causeway, and defensive banks protecting the entrance to the interior. However, the extent of agricultural activity in the fields surrounding the site makes this interpretation uncertain, and these anomalies may be the product of past agriculture. There is further tentative evidence for a partial external ditch surrounding the Castell in the form of low resistance curvilinear anomalies contiguous with the course of the exterior bank. However, this could also be a response to agricultural and animal activity on the site. The interior bank exhibits a clear high resistance response around the majority of its circuit. Adjacent to the west side of the cross bank is a curvilinear area of low resistance that is indicative of the cross bank ditch. Immediately west of this is a patchy area of low resistance. It is unclear whether this a natural feature or represents anthropogenic activity. The data within the interior of the Castell exhibit a greater level of disturbance in comparison with the surrounding fields. This is likely to be due to increased anthropogenic activity within the Castell.

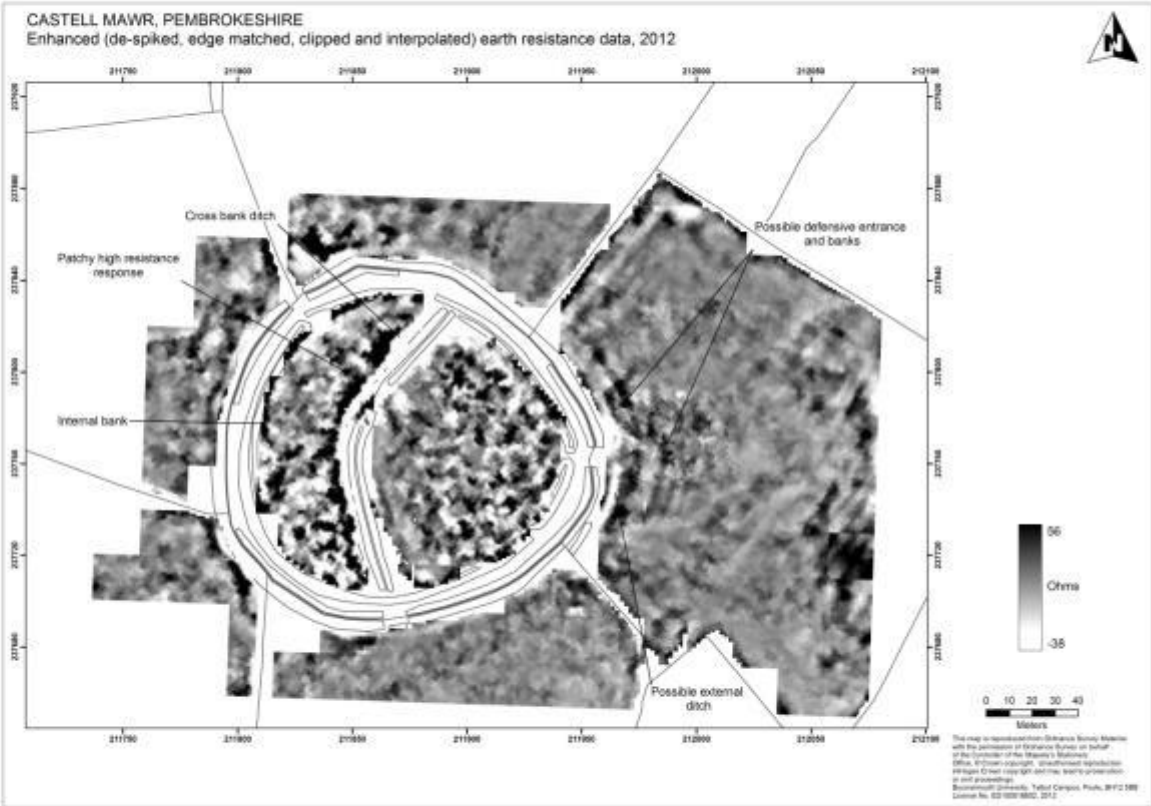

Figure 17. Earth resistance survey of Castell Mawr.

Conclusions

The surveys conducted here have identified possible features both within and outside of the Castell that would be interesting to investigate by trial trenching, notably the concentric enclosure ditches or palisade trenches within its interior. It would also be useful to extend the magnetometry survey to the west of the area where the possible roundhouse has been identified in order to identify any further structures or evidence of activity. The earth resistance survey has identified potential fortification beyond the east entrance. There was little correlation between the earth resistance and magnetometry data.

Excavation

In Trench 1, four OSL samples were taken in a stratigraphic sequence from the top of the rampart to the buried soil (sample 9 in layer 006, sample 10 in layer 002, and samples 11 and 12 in buried soil 004). In Trench 2, eight OSL samples were taken in a stratigraphic sequence from the topsoil to the subsoil (sample 1 in topsoil 1001, sample 2 in 1004, sample 3 in 1006, sample 4 in 1007, sample 5 in 1008, sample 6 in upper 1014, sample 7 in lower 1014 and sample 8 in 1009). Pollen samples were taken in blocks from the buried sol in both trenches (sample 1003 from layer 004 in Trench 1, and sample 1004 from layer 1008 in Trench 2). Bulk samples for flotation (sample 1001 from buried soil 004 and sample 1002 from rampart fill 002) were taken only in Trench 1, from within the slot cut for OSL sampling.

Figure 18. Panoramic view of Castell Mawr, looking north, with Carn Ingli to the left. Trench 1 is on the right hand side of the hillfort, and Trench 2 is centre left.

Trench 1 north of the east entrance

A short section of the external bank, 9m long and 1m high, was cleaned of topsoil (001), mixed deposits of grey-brown bank slip (007) and intrusive root holes, down to the top of the natural mudstone subsoil. This was then recorded in plan and in section as well as in 3-D. A small 0.5m wide slot was cut into the rampart and buried soil at the north end of the trench so that samples could be taken for OSL, radiocarbon dating and pollen analysis.

Figure 19. Trench 1 north of the east entrance at Castell Mawr, viewed from the south.

The orange mudstone that forms the subsoil (005) was covered by a buried soil of reddish-brown hue (004) which could be divided into a relatively stone-free A-horizon about 0.07m thick and a B-horizon about 0.10m thick. Charcoal was picked out by hand from this layer and was also recovered in flotation of a sample from the 0.5m-wide slot. The only artefact from the A-horizon of this layer was a tiny pottery sherd (SF2), too small to be identified to type of vessel or period.

On top of the buried soil lay the primary rampart of re-deposited orange mudstone (002), about 0.5m high. A flotation sample was taken from the 0.5m-wide slot to recover charcoal from this layer but otherwise only a single piece of charcoal could be picked out by hand from the deposit. The only artefact from this layer was a flint core (SF1).

Two layers of light brown, stony fill were found to lie on top of the primary rampart layer (002). One of these was located at the south end of the trench (layer 003) and has extended the north terminal of the rampart so as to narrow the east entrance. It contained two large blocks of stone, one of which was removed during cleaning. The other light brown layer (006) sits on top of layer 002 at the north end of the trench; it is either an upper layer of the rampart or the foundations for a stone-built field wall constructed along the top of the rampart.

Trench 2 south of the east entrance

Trench 2 was located about 70m south of Trench 1, and about 60m from the east entrance of the hillfort. In contrast to conditions within Trench 1, the erosion scar caused by cattle poaching was narrow so the trench was only 1m wide. However, the rampart is considerably higher (2m high) and steeper than encountered in Trench 1.

The subsoil in Trench 2 is completely different to that in Trench 1, being a soft yellow-orange sand (1009) on top of volcanic tuff deposits. The reddish-brown buried soil (1008) is similar in colour to that in Trench 1 but is softer and sandier. The primary rampart (1007) is constructed of medium-sized stones and yellow sand. Above it, a series of sequential layers of yellow and orange sand (1004-1006) constitute the secondary rampart. Layers of topsoil (1001), brown soil (1002) cover the rampart along its top, where the remains of a field wall survive. It is clear that the secondary rampart was already a substantial earthwork prior to the field wall's construction, and is not a product of the rampart's reuse as a hedge bank (*contra* Wiles 2008). There is also a layer of displaced yellow-grey soil (1003) that has tipped down the exterior face of the rampart.

In contrast to Trench 1, there is evidence here of an external ditch (1010) around this part of the hillfort, corroborated by results from the geophysical survey. Only the uppermost parts of this ditch's three upper fills were investigated. The lowest of these was brown loam (1013) beneath brown loam (1012) beneath dark brown loam (1011). This last layer contained a lump of iron slag (SF8) and lay directly beneath the plough soil (1014).

In summary, the ditch (1010) was dug close against the rampart, virtually cutting the primary rampart deposit (1007). It is likely to be less than 3m wide. We suspect that the fill of this relatively shallow ditch is the yellow-orange sand deposited as the secondary rampart (1004-1006). In contrast, the stony primary rampart (1007) is likely to derive from a much deeper ditch, namely the 7m-wide internal ditch of the hillfort.

Figure 20. Trench 2, south of the east entrance at Castell Mawr, viewed from the south. The primary rampart is visible as layers of stones.

Conclusions

The stratigraphic sequences revealed in Trench 1 and 2 support Mytum and Webster's hypothesis (2003) that Castell Mawr's external rampart is a multi-phase construction that has its origins as a Neolithic henge. There is clear evidence of secondary deposition to heighten the external rampart and to narrow the east entrance. The rampart south of the east entrance was also enhanced by digging of a small ditch, although no such external ditch could be found – either by excavation or geophysical survey – to the north of the entrance.

OSL dating of the rampart deposits in Trenches 1 and 2 should provide some absolute dates for this stratigraphic sequence. In addition, it may be possible to obtain radiocarbon dates from round wood charcoal in the fill of the primary rampart and its buried soil.

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Bibliography

Bevins, R.E., Pearce, N.G. and Ixer, R.A. 2011. Stonehenge rhyolitic bluestone sources and the application of zircon chemistry as a new tool for provenancing rhyolitic lithics. *Journal of Archaeological Science* 38: 605-22.

Cleal, R.M.J., Walker, K.E. and Montague, R. 1995. *Stonehenge in its Landscape: Twentieth-Century Excavations.* London: English Heritage.

Darvill, T. and Wainwright, G. 2009. Stonehenge excavations 2008. *Antiquaries Journal* 89: 1-19.

Eogan, G. 1984. *Excavations at Knowth, vol. 1. Smaller passage tombs, Neolithic occupation and Beaker activity*. Dublin: Royal Irish Academy.

Ixer, R.A. and Bevins, R.E. 2010. The petrography, affinity and provenance of lithics from the Cursus Field, Stonehenge. Wiltshire Archaeological and Natural History Magazine 103: 1-15.

Ixer, R.A. and Bevins, R.E. 2011a. The detailed petrography of six orthostats from the bluestone circle, Stonehenge. *Wiltshire Archaeological and Natural History Magazine* 104: 1-14.

Ixer, R.A. and Bevins, R.E. 2011b. Craig Rhos-y-felin, Pont Saeson is the dominant source of the Stonehenge rhyolitic 'debitage' *Archaeology in Wales* 50: 21-32.

Murphy, K., Ramsey, R., Poucher, P. and Page, M. 2007. *A survey of defended enclosures in Pembrokeshire, 2006-07: gazetteer of Ordnance Survey grid squares SN03, SN13 and SN23*. Llandeilo: Dyfed Archaeological Trust. http://www.cambria.org.uk/projects/prehistdefenc/pemsn03sn13sn23.pdf

Mytum, H. and Webster, C. 2003. Geophysical surveys at defended enclosures in the neighbourhood of Castell Henllys, Pembrokeshire. http://www.coflein.gov.uk/pdf/AENT17_06/

Parker Pearson, M., Pollard, J., Richards, C., Schlee, D., Welham, K., Bevins, R., Chan, B., Doonan, R., Pike, A., Ixer, R., Simmons, E. and Tsoraki, C. 2011. The Stones of Stonehenge Project: investigations in the Nyfer (Nevern) valley in 2011. Unpublished report, Univeristy of Sheffield.

Pétrequin, P., Pétrequin, A.-M., Errera, M., Jaime Riveron, J., Bailly, M., Gauthier, E. and Rossi, G. 2008. Premiers éisodes de la fabrication des longues haches alpines: ramassage de galets ou choc thermique sur des blocs? *Bulletin de la Société préhistorique française* 105: 309-34.

Scarre, C. 2011. *Landscapes of Neolithic Brittany*. Oxford: Oxford University Press.

Smith, H, Marshall, P. and Parker Pearson, M. 1998. Reconstructing house activity areas. In U.Albarella (ed.) *Environmental Archaeology: meaning and purpose*. Dordrecht: Kluwer. 249-70.

Stone, J.F.S. 1947 The Stonehenge Cursus and its affinities. *Archaeological Journal* 104: 7-19.

Wiles, J. 2008. Castell Mawr, Meline. Royal Commission on the Ancient and Historical Monuments of Wales. http://www.coflein.gov.uk/en/site/304047/details/CASTELL+MAWR%2C+MELINE/):