

## **A Bronze Age Cremation Cemetery at Dallam School, Milnthorpe, Cumbria**

ANDY PLATELL, WITH CONTRIBUTIONS FROM BLAISE VYNER, ANWEN CAFFELL,  
LORNE ELLIOT, JASON MOLE AND JENNIFER JONES

This article presents the results of archaeological works conducted in advance of a development at Dallam School, Milnthorpe, Cumbria. Four cremations were identified, three clustered within 2m of each other and the fourth located 15m to the east. Two were placed in urns, the other two were unurned. Post-excavation analysis of the pottery indicated that fragments of a third urn had been recovered from a plough furrow cutting one of the other cremations. Radiocarbon dates obtained from the burials showed a considerable spread of dates. The two urned burials produced comparable dates of 1420-1260 cal BC, the unurned burial immediately to the northeast produced a date around 300 years later and the unurned burial 15m to the west produced a date 500 years earlier. There is no evidence to suggest that the cemetery was ever covered by a barrow mound or ring cairn and it therefore appears to be a flat cemetery. Although a stone-filled ditch was found in close proximity, this was linear and did not enclose the cemetery. Its relationship to the burials is unknown.

**T**HIS article presents the results of archaeological investigations conducted in advance of a new development at Dallam School, Milnthorpe, Cumbria (NGR: SD 500 817). This development consisted of an extension to the school on waste land to the north of the existing buildings and a new access road and car park on part of the playing fields to the east (Fig. 1). Archaeological Services Durham University was commissioned by the developer to undertake a trial trench evaluation in August 2005 and 13 trenches were excavated across the whole development area. Trench 6, located across the proposed new access road, identified a cremation that was ceramically dated to the Early Bronze Age. None of the other trenches identified any significant archaeological remains. Because of the importance of the find, Cumbria County Council Historic Environment Service specified full excavation of a 60m long by 5.5m wide section of the proposed new access road, incorporating Trench 6 (Fig. 2) and this was excavated between October and November 2005.

The site comprised a level school playing field at a mean elevation of around 29m OD. This levelling had been achieved by a mixture of infill and ground reduction, although the degree of modification had been slight in both cases. Maps pre-dating construction of the school show the area as low-lying and in a shallow valley. The solid geology of the area consists of Carboniferous Limestone which outcrops at a number of places locally but is covered by thin glacial drift deposits elsewhere.

No prehistoric or Roman remains were previously known from the vicinity of the site. The town of Milnthorpe is first documented in AD 1280 (Bingham 1987) but the development area lies outside the historic core of the settlement. A number of earthworks relating to field systems of presumed medieval/post-medieval date are

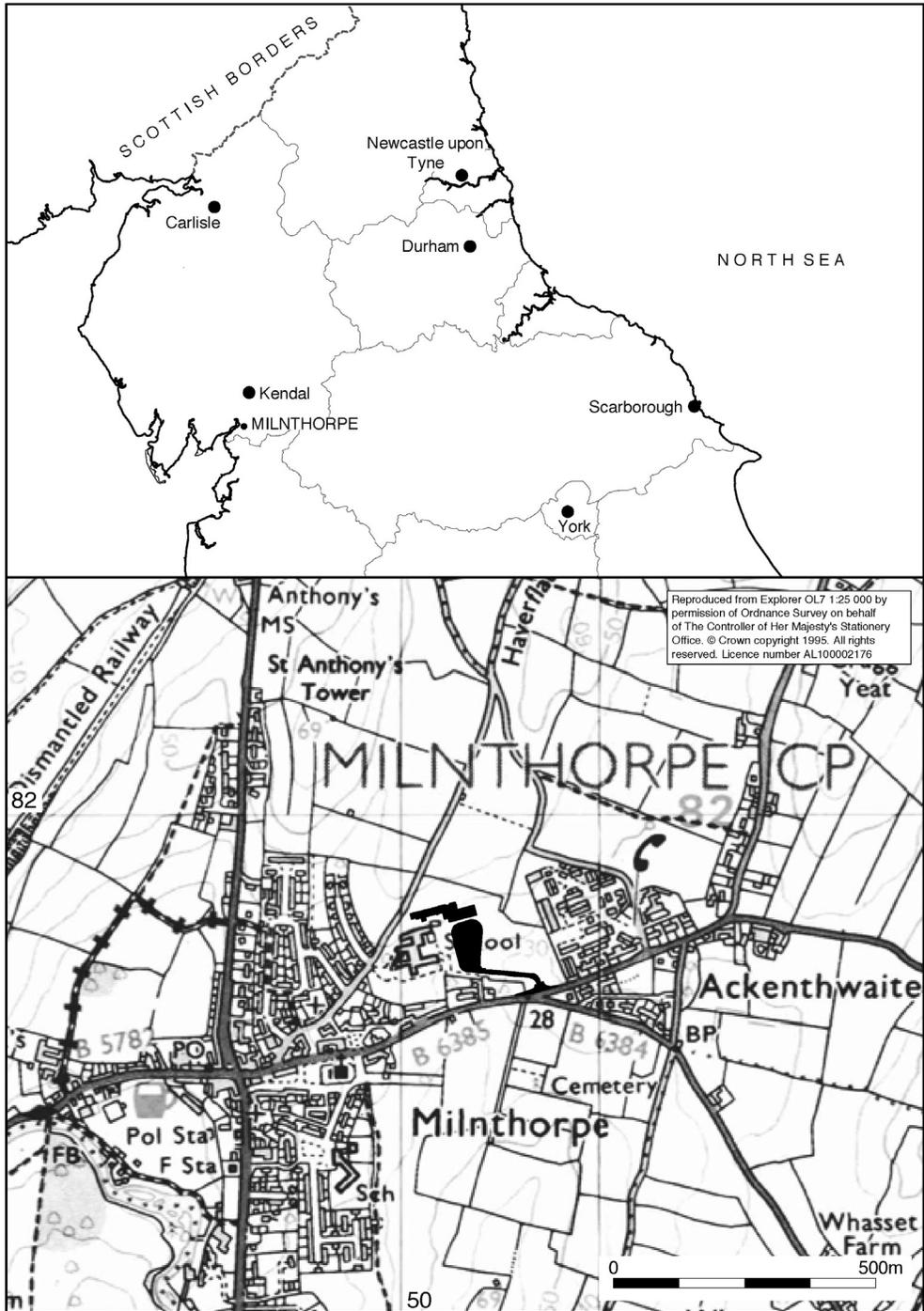


FIG. 1. Location plan.

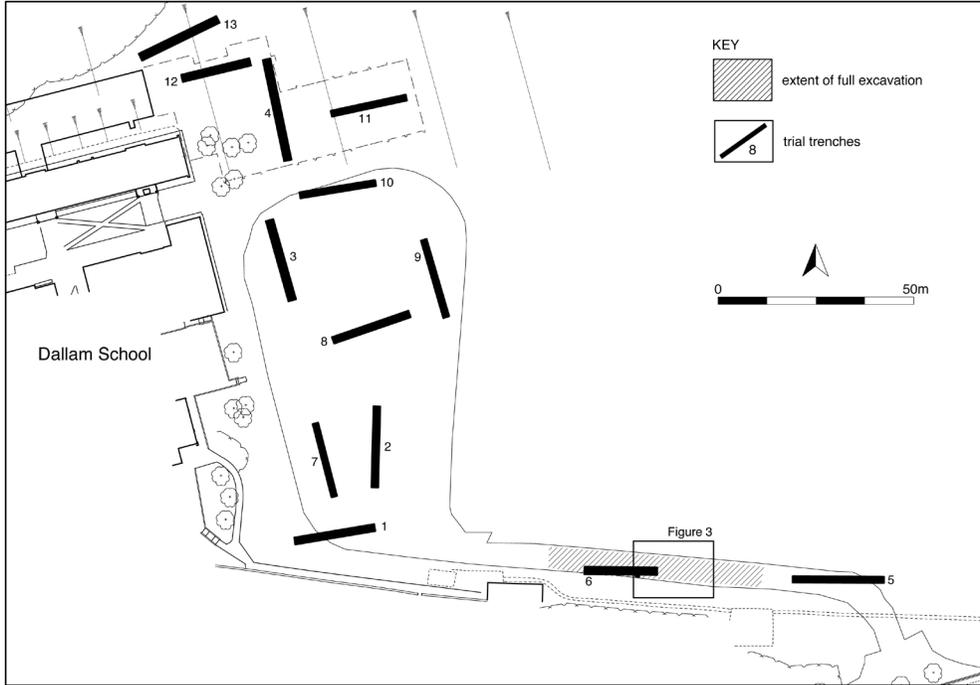


FIG. 2. Excavated locations.

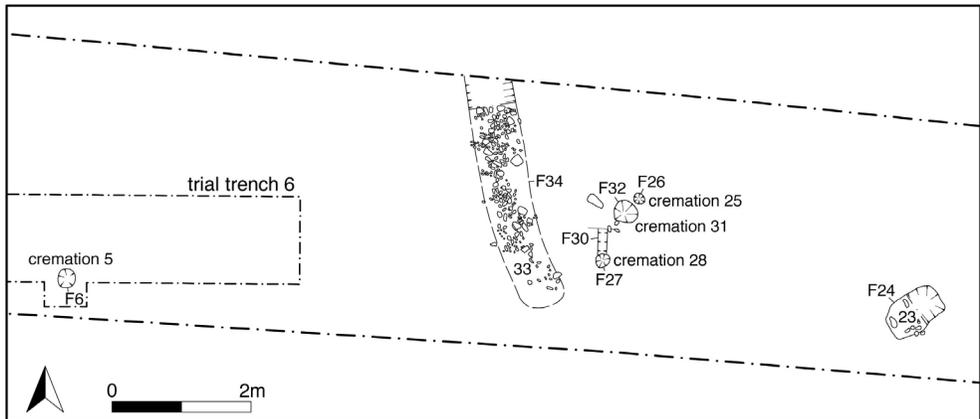


FIG. 3. Excavated features.

present in the surrounding area. The current school was constructed on a greenfield site in 1968.

**The excavation**

The natural subsoil, a rather mixed boulder clay, was reached at a depth of up to 0.5m. Immediately above this was a red-brown silt 22 and then topsoil 21. All archaeological deposits were located below these two deposits and within 10m of each other at the

centre of the trench, 15m to the east of the cremation found during the evaluation (Fig. 3).

Apart from some areas of modern made ground 3 associated with the building of the present school, and a little hillwash 4 on the slope to the north of the school, only one significant feature was found during the evaluation. This was a deposit of silt containing a large quantity of charcoal and some cremated human bone 5 in a circular cut F6; 0.38m diameter by 0.32m deep. Upon excavation a few sherds (possibly originally a single sherd that had broken in situ) of Early Bronze Age pottery (vessel 4) were recovered. One small piece of glass slag was also found, although this is thought to have been accidentally produced by the fusion of sand particles caught up in the funeral pyre.

During the excavation, three cremations were identified, all within 2m of each other and around 15m east of the one found during the evaluation. The northernmost 25 was unurned and placed in a cut F26, 0.25m wide by 0.2m deep, with most of the bone and charcoal being towards the top of the fill.

Around 0.4m to the southwest, cremation 31 was urned and in a cut F32; 0.5m in diameter and 0.4m deep. The urn (vessel 2) was lying on its side and the weight of overlying earth had distorted the vessel (Fig. 4). Analysis of the cremated remains has indicated that the urn contained at least two individuals, an adult and an adolescent. Since the urn was recovered intact and excavated in controlled conditions in the laboratory, and as bone from both individuals was found throughout the urn, this cannot be dismissed as post-deposition disturbance. It must have been an original



FIG. 4. Cremation 31.

feature of the burial. A small particularly concentrated patch of cremated bone 35 overlay the pot and must have been placed in the cut after the urn had been emplaced, possibly in an organic container to account for its concentration within the fill. It is too small a quantity of bone for it to represent a complete individual and must represent a token offering. Analysis of the bones could not determine whether they were from one of the individuals within the urn or derived from an entirely different individual.

The third cremation 28 was also urned, although in this case the urn (vessel 1) was standing upright (Fig. 5). It lay in a cut F27; 0.3m in diameter and 0.23m deep. Because it was not so deeply buried, its top had been damaged by ploughing. Pot sherds and cremated bone were scattered in the fill of a plough furrow 29 to the north of the cut. During the excavation these were all thought to derive from this damaged vessel. However, post-excavation analysis of the pottery indicated that some sherds derived from a third urn (vessel 3) that had been totally disturbed by ploughing. The original location of this third vessel is unknown; it is unlikely to be associated with the unurned cremation 25, as the plough furrow trends in the wrong direction for this and also the undamaged urn lay between them, precluding plough damage in this direction.



FIG. 5. Cremation 28.

Carbonised accretions from inside the two vessels were collected and sent for lipid analysis. However, this analysis produced no significant results. Full details are available in the archive report.

A stone-filled ditch F34; 1.1m wide, was aligned north-south 2m to the west of the cremations. It was 0.5m deep along the northern baulk but thinned southwards so that it was not present at the southern side of the trench. It was almost entirely filled

with sub-rounded pebbles, up to 0.3m in length, set in a red-brown silt matrix 33. No artefacts were recovered from the fill so the ditch remains undated. Although it is spatially close to the three closely-grouped cremations, there is no *a priori* reason to assume that it is connected with them.

A sub-rectangular pit F24; 0.8m by 0.6m and 0.27m deep, was located 6m to the east of the three closely-grouped cremations. It was filled with a dark red-brown silt that contained frequent stones 23. One undiagnostic flint flake was recovered from the fill; no other artefacts were recovered so the pit also remains undated and its relationship to the cremation cemetery is unknown. A soil sample from the pit fill produced no useful environmental information (Archaeological Services 2005b).

## The finds

### *Pottery by Blaise Vyner*

This assemblage derives from four vessels which were probably deposited as funerary vessels, although it appears that there is a fairly wide chronological range represented. Vessels 1 and 2 are associated with cremations placed around 1m apart; vessel 3 is less coherently represented and sherds from this were found close to both vessels 1 and 2. The disposition of the material is perhaps explained by the impact of ploughing. Vessels 1 and 2, although significantly damaged, are more complete than vessel 3. The very small remaining part of vessel 4 appears to have been associated with a cremation which was set some 15m to the west of the principal group.

Vessels 1 and 2 (and the surviving fragments of vessel 3) are all plain urns of Middle Bronze Age date, the date confirmed by radiocarbon dating of associated cremations. Vessel 4 has decorative traits likely to be of Early Bronze Age date and this is confirmed by its earlier radiocarbon date. All four vessels are probably jars; vessel 2 is an open bucket shape, while the other three are of uncertain profile. Vessel 1 has mixed igneous and Coal Measure grits, vessel 2 has Coal Measure grits, vessel 3 has sedimentary grits in a clay matrix which contains occasional quartz dust and vessel 4 has limestone grits.

### *Vessel 1 [F28] (Fig. 6.1)*

Sherds and base from a large hand-made jar, exterior colour light brown-dark brown, interior colour and fabric dark grey, numerous angular small to medium-sized mixed igneous and Coal Measure grits, typical wall thickness 14mm, number of sherds 19, total weight 590g, base fragment weight 780g. The vessel is of uncertain profile, no rim sherds present and no decoration evident. Carbonised accretions on the vessel interior surface.

### *Vessel 2 [F31] (Fig. 6.2)*

Medium-sized hand-made jar, height approximately 250mm, exterior colour mid-brown merging to dark grey in places towards the rim, interior colour dark grey-mid-brown, numerous angular small to medium-sized Coal Measure grits, typical wall thickness 12mm, total number of sherds 92 plus fragments, total weight (including fragments) 1.96kg. This is a bucket-shaped jar with a pinched collar below the simple

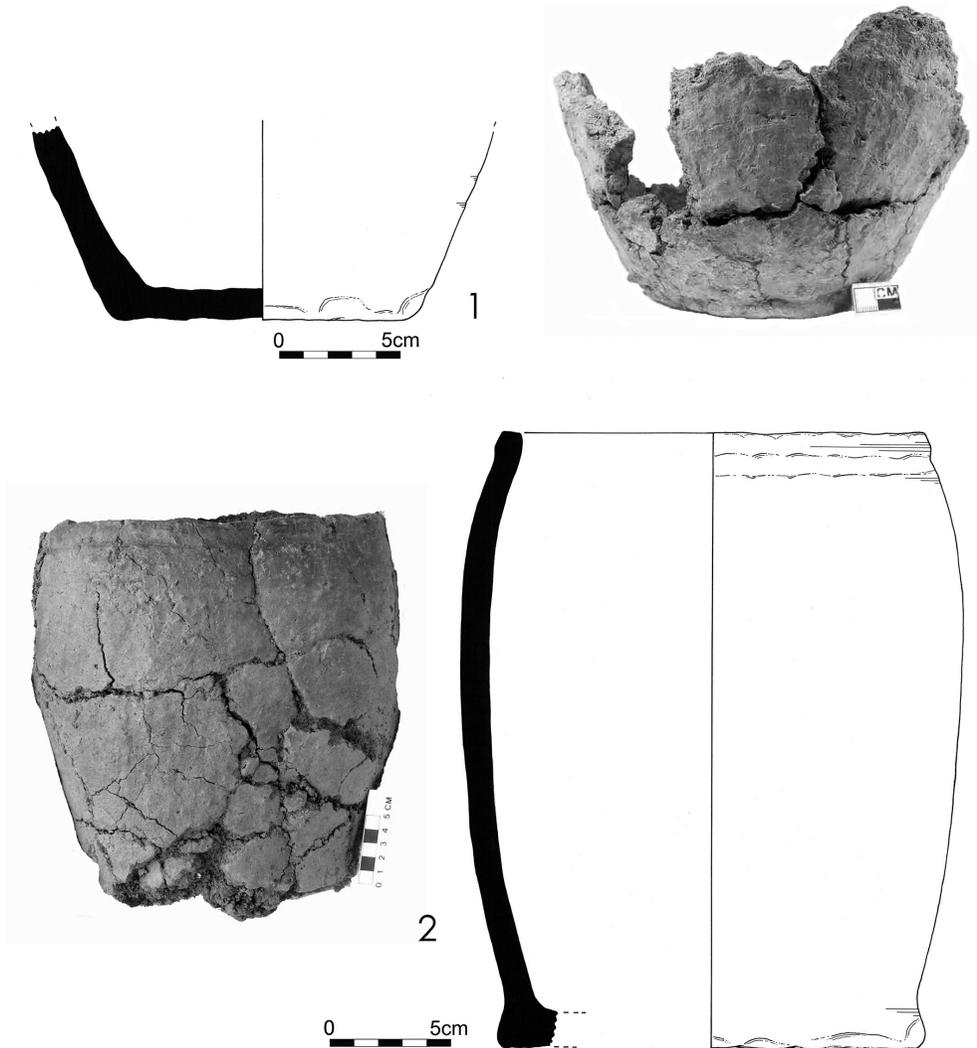


FIG. 6. Plan of structure 419.

near-vertical rim. No decoration is present. Carbonised accretions on the vessel interior surface.

*Vessel 3 (Fig. 7.3)*

Medium-sized hand-made jar, uncertain height, external surface mid-brown to dark grey, dark grey interior surface and fabric, numerous small and medium-sized and occasional large chunks of sedimentary grit, quartz dust in the clay matrix, wall thickness 12mm. This is a plain vessel with unclear profile. Traces of carbonised accretions on the vessel interior surface. Sherds, apparently all from the same vessel, occur in contexts associated with vessels 1 and 2, F28 (seven sherds plus fragments,

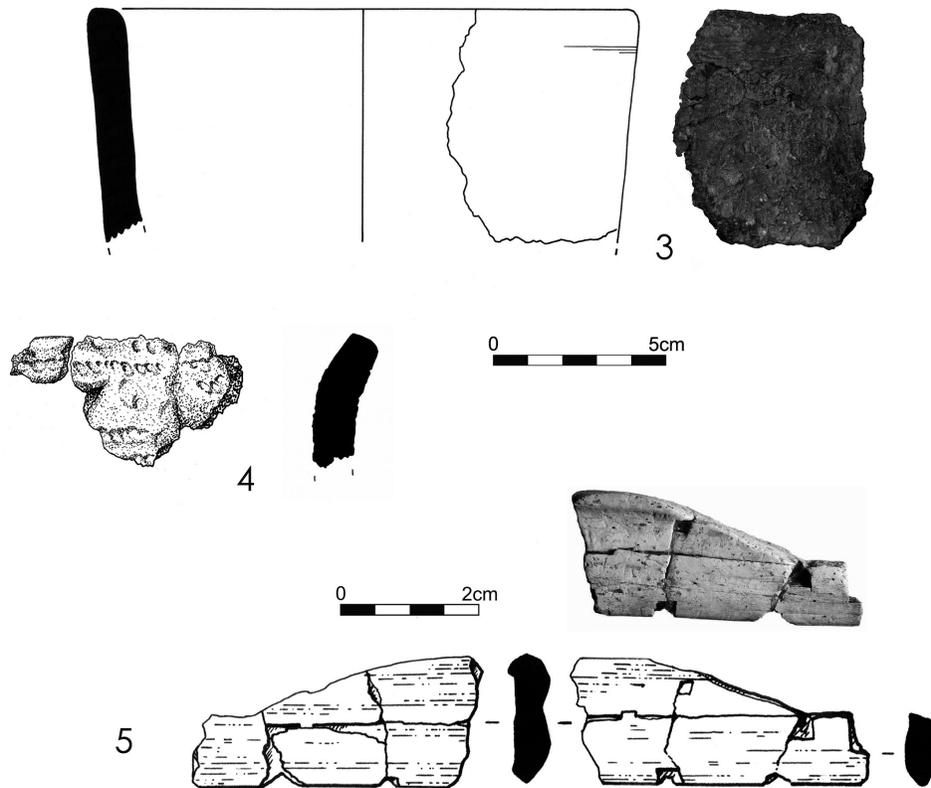


FIG. 7. Medieval ceramic vessel forms.

110g) and F31 (one sherd, 10g), a plough furrow 29 (six sherds plus fragments, 160g), and an unstratified sherd recovered nearby (one sherd, 70g): total weight 350g.

*Vessel 4 [F5] (Fig. 7.4)*

Fragments from a vessel rim with dark grey-black surfaces and fabric. The fabric is soft and laminated and contains numerous small angular limestone grits, typical wall thickness 13mm, four sherds plus fragments, total weight 35g. The surviving fragments appear to show three rows of coarse cord impressions on the inner surface, and two lines of diagonal cord impressions on the external surface.

The main group of vessels and cremation deposits appears to represent a small cremation cemetery. The duration of principal use suggested by the radiocarbon dates extends from the fourteenth century through to the end of the eleventh century cal BC. The cremation some 15m to the west may not be associated, since it has a radiocarbon date indicating that it is some 450 years older than the earliest of the other dates, while the associated vessel (vessel 4) would also seem to be somewhat earlier. If the deposits are associated this would indicate a period of use for the cemetery of around a millennium. Whether or not the deposits form part of a funerary continuum,

is it tempting to see vessels 1, 2 and 3 as representing a self-contained cremation cemetery with a separate focus, although the adjacent linear feature, F34, is unlikely to represent a boundary to such deposits. If originally bounded, it is more likely that a cemetery would have been contained within a ring-ditch. Vessel 4 and the associated cremation is a considerably earlier deposit which may not necessarily have been associated with the later deposits. Gully F34 is not clearly to be associated with any of the cremations, the absence of diagnostic information comparable with that from a pit, F23, which lay some 7m to the east. Further clues to the nature of the activity at this location may lie in the unexamined areas to north and south of the access track.

There are no comparable sites of Middle Bronze Age date from Cumbria; indeed, there is a paucity of excavated evidence for funerary sites of any part of the Bronze Age from this region (Hodgson and Brennand 2006, 41-41). However, comparison may be drawn between vessel 3 in this assemblage and a vessel found during excavations on Temple Sowerby Bypass (Allen 2009, 39). There two sherds from pit 104 are in a very similar form and fabric to vessel 3 and seem more likely to be from a straight-sided jar of Middle Bronze Age date than from the suggested Collared Urn form.

There is more evidence for Early Bronze Age funerary traditions in Cumbria (Hodgson and Brennand 2006, 41-42). Interestingly, this mostly derives from sites where there is no clear evidence for cairn structure. At Ewanrigg a Beaker deposit and adjacent stone cist containing a Food Vessel were set in the top of a gravel knoll, with peripheral Collared Urn depositions (Bewley et al. 1992, 128), and at Oddendale cremation deposits associated with a Collared Urn and an accessory vessel were placed in upper levels of a pre-existing cairn (Turnbull and Walsh 1997, 29-32). Truncated cremation deposits with no associated artefacts at Leacet Hill, Brougham, may also represent a damaged cremation cemetery. Nearby features included an enclosure ditch, fragments of Early Bronze Age pottery and a possible pit alignment (James 2006). The pit alignment and, indeed, the enclosure, at Leacet Hill may be subsequent to the Bronze Age, but the cremations and the Early Bronze Age pottery are reminiscent of the evidence from Milnthorpe. A further flat grave cemetery is present at Allithwaite, on the northern edge of Morecambe Bay. Here there were between 12 and 15 cremation deposits, four of which were associated with Collared Urns. One of the cremation deposits was also associated with a cylinder of long bone with a perforation in one side (Wild 2003, 38-39).

Cumulatively the evidence suggests a tradition of flat grave cremation burial in Cumbria which may have extended from the end of the Neolithic through to the eleventh century cal BC. It is interesting to note, also, the associated deposition of bone items with funerary depositions at Ewanrigg, Milnthorpe and Allithwaite: given the paucity of these artefacts in the burial record, it would appear that these should also be seen as part of a potentially specific north-western English Bronze Age burial tradition.

*Bone object (Figure 7.5) by Blaise Vyner*

Part of a burnt bone object, one edge rounded, but all other edges broken, pronounced groove along the centre section, maximum dimensions 20 x 16mm, 5 mm thick.

Found in the fill of vessel 1 and thus apparently 14th-century cal BC in date. Bone items are not especially common in this period and for the most part are limited to pins, points and tools for preparing skins (Burgess 1980, 270-71). Items of bone are somewhat more common in Early Bronze Age funerary deposits, however, and in this context the relatively large number of bone items associated with cremation deposits at Ewanrigg, Maryport, Cumbria, is of some interest. The finds included two spatulate-headed pins, a winged toggle and a short section of bone tube (Bewley et al. 1992, 326-35). The bone fragment from Milnthorpe is perhaps most closely comparable with the Ewanrigg bone tube, while it also has some similarities with the bone point from Rudston, East Yorkshire, made from an immature bovid metacarpal and also of Early Bronze Age date (Kinnes and Longworth 1985, Fig. 62.365). The fragmentary nature of this item makes further identification difficult, but its short length suggests it is more likely to have been a toggle or tool than a pin.

#### *Flint by Jason Mole*

Flint flake (17mm long x 11mm wide x 3mm thick) with an irregular termination, recovered from pit fill 23. It is grey-brown with a hard fawn cortex on its left lateral edge. The lack of a defined bulb of percussion on the ventral side may indicate the use of soft hammer or indirect percussion techniques. This flake is not chronologically diagnostic.

#### *Other finds by Jennifer Jones*

Slab of fine-grained sandstone, maximum dimensions 110 x 140mm, 12mm thick, missing a piece from one side. Found in the fill of vessel 1, this was probably once a lid to the pot.

Small piece of glass slag recovered from cremation 5. This may be accidentally-created and derived from the fusion of sand particles mixed in with the funeral pyre.

#### **The cremated remains** *by Anwen Caffell*

Cremated remains were recovered from six contexts: four cremation burials radiocarbon dated to the Bronze Age, and bone from two associated contexts. The earliest burial 5 was unurned and recovered during the evaluation. Cremation 28 was contained in an upright urn (vessel 1), which had been truncated by ploughing. Cremated remains from an overlying plough furrow 29 may have been related. A second urn (vessel 2) lying on its side contained cremation 31. A small deposit of bone 35 located on top of the urn may be associated. The final burial 25 was unurned.

Burial 31 contained the largest amount of cremated bone at 1,602.2g, close to the mean weight of bone (1,625.9g) recovered from modern adult cremations (McKinley 1993). The truncated urn (28) contained 246.3g of cremated bone, (15.1 per cent of modern weights). A further 112.6g was recovered from plough furrow 29 that truncated it. Even if this derived from the same burial, the total amount would only be around 350g. Both of the unurned burials contained less than 100g of bone. The minimum number of individuals present in 5, 25, 28, 29 and 35 was one, as there were

no duplicated bone parts. Cremation 31 contained bone from at least two individuals: an adult and a non-adult. The minimum number of individuals across all contexts was three, based on the presence of two adult right temporal bones and the presence of non-adult bones in 31. The age of the adults could not be determined with any degree of certainty. The non-adult in cremation 31 was probably an older juvenile or a younger adolescent (c. 6-15 years). It was not possible to determine the sex of any of the individuals. No pathological conditions were noted.

### *Discussion*

The amount of bone resulting from the cremation of modern adults has a mean weight of 1625.9g (McKinley 1993). However, archaeological cremation burials frequently contain less (McKinley 1997; 2000a; 2006). It is thought that it was not considered essential to collect all the bone, so archaeological examples can be considered 'token burials' (McKinley 1997; 2000a; 2006). She has observed that primary cremation burials from Bronze Age barrows consistently contain more bone than those from cremation cemeteries (McKinley 1997, 142). At Milnthorpe the mean weight of cremated bone per burial was 491.8g. By comparison, at Ewanrigg weights ranged from 8.6g to 4141.1g, with a mean of 806.9g (Bewley *et al.* 1992). Eight of the 23 Ewanrigg burials weighed >1000g, compared to one of the four Milnthorpe burials.

Only cremation 31 contained a quantity of bone comparable to modern data. This was recovered from an intact urn so it is probable that most of the original contents were present. Although this weight of bone is comparable with modern data, at least two individuals were present so it is unlikely that all the bone was collected from each individual. The other urned burial 28 only contained 246.3g of bone although an unknown quantity had been lost by plough damage. The two unurned burials contained much smaller amounts of bone (82.5g and 36.2g). McKinley (1997) observed that unurned burials tended to contain slightly less bone than urned burials. At Ewanrigg urned burials contained on average 1278.2g of bone, compared to 444.4g for unurned ones (Bewley *et al.* 1992). The amount of bone recovered from the unurned burials at Milnthorpe was considerably less and may represent token burials or even cenotaphs (McKinley 2000a; 2006).

The colour of the cremated bone indicates the degree of oxidation achieved during burning, and this in turn is related to the pyre temperature, the duration of the cremation, and the amount of oxygen available (McKinley 2000b, 404-406). The buff-white colour of almost all the bone recovered indicates that full oxidation had been achieved, with bone exposed to temperatures over c. 600°C in an oxygenated environment (McKinley 2000a). This indicates that enough fuel was collected to enable the pyre to burn at high temperatures for a sufficient length of time, and also indicates favourable weather conditions since rain and high winds can hamper successful cremation (McKinley 2006, 81-82). This contrasts with the wider range of bone colours observed at Ewanrigg, where some burials contained darker grey and black bone (Bewley *et al.* 1992) indicating temperatures may not have been as high, burning may not have been as prolonged, or oxygen supply may have been restricted (McKinley 2000b, 404-406).

Identifiable bone comprised a relatively small percentage of the total from each burial. That skull fragments comprised the majority is probably due to the fact that parts of the cranial vault remain identifiable even when they are broken into small pieces (McKinley 2000b; 2004). In contrast, small fragments of long bone are harder to identify to a specific bone, and bones of the axial skeleton are more fragile and so more likely to be destroyed (McKinley 2004b, 300). The relatively small number of tooth roots and small hand and foot bones is slightly unusual, as these are frequently identified (Mayne Correia 1997). It is possible that the way in which bone was collected from the pyre favoured the recovery of larger bones, for example collection by hand; this was suggested at the Roman cemetery of Brougham where a similar situation arose (McKinley 2004).

At least two individuals were identified in 31, the intact urn. These comprised an adult and a non-adult between *c.* 6-15 years old. This combination of an adult and a non-adult is the most typical pattern for dual cremation burials (McKinley 2006, 85). A dual cremation burial was identified at Ewanrigg, although containing the remains of two adults (possibly a male and a female; Bewley *et al.* 1992). Around 5 per cent of cremation burials (from all time periods) contain the remains of two individuals, and it has been suggested that such individuals may have been closely associated during life and that they died within a short time of each other (McKinley 2006, 85). In most dual burials, the individuals had been cremated together on the same pyre and then buried together, but the possibility that the individuals had been cremated separately and their bone later combined for burial, or that the remains of one individual had been added to an existing cremation burial should also be considered (*ibid.*). Since the non-adult bones were distributed throughout the urn and mixed with the adult ones, it is probable that the two individuals were cremated together, or if cremated separately that their bones were mixed together prior to burial (McKinley 1997, 142-143).

The truncated urn 28 contained the remains of an adult, and 5 (the largest of the unurned burials) probably contained an adult. The age of the individuals in the remaining contexts was less certain, but they were most likely adults or older adolescents. Unfortunately, sex could not be determined for any of these individuals. In comparison, at Ewanrigg 13 of the individuals were adults, six were probably adults, and one was a non-adult; the age of the remaining individuals could not be determined (Bewley *et al.* 1992). It was also possible to determine the sex of 11 of the Ewanrigg individuals: six were female and five were male (Bewley *et al.* 1992).

Animal bone (part of a canid radius) was found in burial 28 and in 29 (the plough furrow truncating 28). Animal bone occurs in small quantities in around 16 per cent of Bronze Age cremation burials, and the most common species identified are immature pig or sheep, and birds (McKinley 2006, 84). Most animal bone probably derived from food offerings (*ibid.*), but a dog is more likely to be either a pet or a working animal. Dog bones do not appear in cremation burials in Britain until the Romano-British period (*ibid.*), so the presence of a dog radius here is unusual. However, in 28 the animal bone was recovered from a soil sample, rather than directly from the urn itself, and 29 is a disturbed context anyway. Consequently there is no confirmation

that either fragment was originally within the urn. No animal bone was reported from the burials at Ewanrigg (Bewley *et al.* 1992).

The truncated urn burial 28 contained fragments of worked bone from a single artefact that had been burnt on the pyre. The fragments were distributed across two spits at the base of the urn. The white colouration of the bone fragments indicated that a similar level of oxidation was achieved in the bone artefact as in the bone from the skeleton. Since (as discussed above) not all the bone from the skeleton was collected from the pyre, it is possible that not all pyre goods would have been collected either (McKinley 1997, 132; 2006, 83). Furthermore, some pyre goods would not have survived burning and so no trace of their presence would remain (McKinley 2006, 83). Fragments of worked bone pins, probably associated with items of clothing, have frequently been found in Bronze Age cremation burials (*ibid.*). Worked bone fragments (including beads, pins, a toggle and a tubular object) were found in four burials at Ewanrigg, and as here, these fragments had been burnt on the pyre and were recovered from amongst the cremated bone (Bewley *et al.* 1992).

### **The palaeoenvironmental evidence** *by Lorne Elliot*

Palaeoenvironmental assessments were carried out on bulk samples taken from a number of contexts, including all four cremation deposits. Only the sample from cremation 5 was recommended for full analysis due to the low numbers of seeds present in the others (Archaeological Services 2005a; 2005b). It comprised material indicating the presence of pyre debris, with small fragments of calcined bone and charcoal commonly occurring. Charred botanical remains comprised indeterminate culm bases (possibly grass or sedge), and large numbers of tubers/rhizomes, many of which were identified as false oat-grass tubers. Other charred plant remains included a hazel nutshell fragment, a fruitstone of wild raspberry, a sheep's sorrel nutlet, trigonous and biconvex sedge nutlets, and seeds of ribwort plantain, grasses, goosefoot and the pink family.

Underground plant remains generally described as tubers or rhizomes are frequently found on early prehistoric sites in Britain (Moffett 1991), whilst Robinson (1988) noted that charred tubers of *Arrhenatherum elatius* (false oat-grass) are a common occurrence from Bronze Age and Neolithic contexts, and in particular have frequently been recorded in Bronze Age cremations. Examples of occurrences of false oat-grass within cremation pits have been noted throughout the British Isles and include Ashville, Oxfordshire (Jones 1978), Briar Hill, Northamptonshire (Perry 1985), Bixley, Norfolk (Murphy *et al.* 2000), Beacon Hill Wood, Somerset (Stevens 2008), Scorton, North Yorkshire (Hall & Carrott 2003), Sketewan, Perth & Kinross, Scotland (Mercer & Midgley 1997), Borrás Quarry Wrexham, Wales (Archaeological Services 2010) and Lismullin, County Meath and Tyrrellstown, County Dublin, Ireland (Archaeological Services 2009a; 2008ab).

It has been suggested that these tubers were collected for food (Godwin 1975), or interpreted as the remains of food offerings (Jones 1978), although recent research into potential ancient plant foods regarded *Arrhenatherum* tubers as quite inedible

(Mears & Hillman 2007). Other explanations for their presence include the uprooting of dry grass as fuel for the funeral pyre (Robinson 1988). As dry dead stems of false oat-grass remain upstanding for much of the year it is suggested that they can be readily gathered and that the moist tubers would be more likely to survive the charring process than the dry grass stems. It has also been proposed that these tubers and rhizomes represent the remains of turves burnt in connection with the cremation (Hall & Carrott 2003); possibly as fuel for the pyre (Campbell 2007). They have also been interpreted as *in situ* charring of grassland vegetation beneath the pyre or as the use of turves in the pyre construction (Oake *et al.* 2007). The prevalence of this type of material could also reflect the digging of a pit prior to the pyre construction, as roots and underground parts of plants in the pit sides become exposed to charring during the cremation process. These remains may be more common in deposits of pyre debris rather than in cremation burials (Campbell 2007). In an assessment of assemblages from prehistoric sites by Hall (2003), a list of taxa associated with turves was produced. Species present in this sample (sheep's sorrel, ribwort plantain, grasses and sedges) can be interpreted as the remains of the seed bank buried within the turf/sod. Considering the quantity of tuber/rhizomes and associated weed seeds, it seems likely that the charred assemblage at Milnthorpe represents the remains of burnt turves, which may have formed a structure surrounding the cremation pyre.

Although charred tubers and rhizomes frequently occur in Bronze Age cremation-related contexts, they seldom approach the high concentrations seen at Milnthorpe (443 in total, of which 154 were identified as false oat-grass). The occurrence of large numbers of basal culms, probably of the grass family is also uncommon, although similar quantities of grass culm bases and rhizome fragments, as well as charred moss stems and small-seeded legume seeds, were recorded in a Bronze Age cremation pit at Barrow Hills, Oxfordshire (Moffett 1991). These charred remains were from a deposit of soil and charcoal banked up against one side of a cremation burial pit and clearly separate from the cremated bone and grave goods. This material was interpreted as tinder and possibly representing pyre debris. Hall (2003), however, suggests this assemblage may have originated from turves. Also identified within this ritual context were tubers of pignut (*Conopodium majus*) or great pignut (*Bunium bulbocastanum*). Moffett notes that pignut tubers generally grow deeper than the main mass of grass roots in turf and would not have been uprooted without difficulty; therefore they were unlikely to be used as kindling and were thought to be food remains. She suggests that if they were from turves then the turves would have been dug rather deeply.

The use of turves in archaeological contexts is well documented, and has recently been reported for features from an early prehistoric site at Borrás Quarry in Wales (Grant & Jones 2009). A collection of Neolithic pits was identified, displaying characteristics implying a continuous-firing process generally referred to as 'clamp' firing. It was suggested the material for the clamp would have consisted of sand, gravel and turf, which may have been excavated from a number of adjacent sub-oval 'quarry' pits. The clamped fires were classed as either cooking pits or clamp kilns for the manufacturing of pottery vessels. These kiln structures would leave little if any evidence after firing, especially after disturbance such as ploughing; however, plant macrofossil analysis of one of the pit fills provided possible evidence for the covering

with turves (Archaeological Services 2010). Indeterminate charred tubers and weed seeds of sedge and ribwort plantain, although few in number, were recorded within the tertiary fill, (probably representing collapsing of a turf structure): however, these remains were absent from the primary fill, and therefore are unlikely to have been kindling. An experimental reconstruction undertaken at Butser Ancient Farm (2002) provides a good demonstration of this type of clamp kiln.

Further evidence for the use of clamp kiln/turf superstructures is provided by excavations of two possible kiln sites of Neolithic origin at Allt Chrisal, on the Outer Hebridean island of Barra (Branigan & Foster 1995). Analysis of a pottery sherd from one of the kilns indicated that it was fired at a temperature between 650°-700°C. An experimental research project into making Neolithic pottery was undertaken at Harray, Orkney (Harrison 2008). Using limited evidence of kiln construction based on the turf superstructures on Barra and at the Knowes of Trotty, Harray (Card *et al.* 2006), a circular turf-walled kiln was built, producing a maximum temperature of 1031°C during the firing process, a temperature that is more than sufficient to allow bone to become fully oxidised during a cremation. A similar reconstruction to fire replica Bronze Age urns using a turf kiln structure was carried out at Down Farm, Sixpenny Handley (Crumbleholme 2009). Air inlets were built into the turf walls and a scattering of broken pottery lined the bottom of the firing chamber in order to allow oxygen to circulate within the structure. During the firing the flames were contained by the turf structure, improving the efficiency of the fuel and keeping the heat in contact with the pottery. The turf was set ablaze, but was only burnt on the surface (approximately an inch in depth). The use of a woven willow lid was also suggested in order to control the temperature. The abundance of tubers recorded at Milnthorpe may represent the collapsing of such a turf wall on to the pyre, forming part of the pyre debris. McKinley (2006) notes that in the British Isles, the climate would have been a determining factor in when cremations could be undertaken and that it may have been necessary to await a relatively dry day, which may extend to several weeks at certain times of the year and in certain localities. However, much of the available evidence suggests that cremation was undertaken shortly after death (*ibid.*). It may be considered that the use of a turf structure similar to the above reconstructions was used at Milnthorpe rather than the conventional view of a solely timber based construction (*cf.* McKinley 1997). In addition to improving the fuel efficiency of the cremation pyre process, such a structure may increase the number of days that a cremation could have taken place, especially if some form of covering was included. Further experimental work may be required to demonstrate the practicality of such a structure.

The good condition and preservation of many of these tubers, rhizomes and culms at Milnthorpe is surprising considering the high temperatures required for cremations, and perhaps provides further evidence for the use of turves. It is suggested that the white colour of the cremated bone from this context (see above: the cremated remains) implies that the bone fragments were exposed to temperatures in excess of *c.* 600°C. This is further highlighted by the choice of oak as the main source of fuel, which allows temperatures in excess of 500°C, as discussed below. Direct contact of the

tubers with the intense heat of the pyre, may therefore seem unlikely, and the level of preservation may be a result of a more superficial charring.

False oat-grass readily colonises disturbed ground, including abandoned arable, and spreads in grassland provided that little grazing is occurring (Pfitzenmeyer 1962). It is also widespread in long-established hay meadows, which are regularly cut for hay but ungrazed or lightly grazed (*ibid.*). The presence of this tuber indicates areas of this particular grassland community near the site. The presence of open grassland or meadow is further indicated by the small plant macrofossil assemblage, with charred seed remains such as sheep's sorrel (*Rumex acetosella*), ribwort plantain (*Plantago lanceolata*), sedges (*Carex* sp) and members of the grass family (*Poaceae*). A series of small scale, but significant woodland clearance episodes were identified throughout the Bronze Age, from pollen studies of Foulshaw Moss on the opposite side of the River Kent estuary (Wimble *et al* 2000). A small peak of anthropogenic clearance indicators such as ribwort plantain and grasses is noted between 3000-2000BC, coinciding with a fall in the values of tree species such as elm (*Ulmus*), ash (*Fraxinus*) and lime (*Tilia*). These cultural indicators reach over 10 per cent of the pollen sum from *c.* 2000-1300 cal BC coinciding with a significant increase for sedges. The abundance of false oat-grass tubers as pyre debris may provide further evidence supporting an open grassland habitat nearby. The inclusion of pyre debris reflects the proximity of the pyre site as bone for burial may be transported, but it is unlikely that pyre debris would be too (McKinley 2006).

The charred hazel nutshell fragment and wild raspberry fruitstone within the plant macrofossil assemblage, possibly represents food offerings placed on the funeral pyre, indicating that wild foods continued to play an important part in diet during the Bronze Age. Hazel nutshells are frequently recorded from prehistoric sites as they offered a highly nutritious food source, which was easily gathered and could be stored with little preparation (McComb & Simpson 1999). The remains of fruits have previously been recorded from cremation-related contexts such as at Castletown Tara, County Meath, Ireland (Archaeological Services 2009b), where elderberry fruitstones and apple endocarps were recorded.

#### **Charcoal analysis** by *Lorne Elliot*

Charcoal was collected from the residue and flot of context 5. Oak charcoal accounted for over 80 per cent of fragments, hazel was approximately 15 per cent and willow/poplar less than 1 per cent. Tyloses were noted in some of the oak fragments indicating the presence of heartwood (stemwood or large branchwood). Long latewood growth was noted in most of these fragments. Many of the oak and hazel fragments comprised radial cracks and low vitrification. Some of the hazel was soft and brittle with possible signs of insect degradation.

Radial cracks and low vitrification noted in many of the fragments are characteristics generally associated with small branchwood and twigs (Marguerie & Hunot 2007). However, rapid combustion at high temperatures can cause tissue deformation, fissures and vitrification (Schweingruber 1978). Marguerie & Hunot (2007) state

that alteration of the anatomical structure and vitrification may result from specific conditions of combustion or taphonomy, and can reveal the state of the wood before combustion, such as burning damp or green wood. The predominance of oak charcoal is unsurprising as studies indicate that this wood was usually chosen for prehistoric cremations (O'Donnell 2007). It is believed that oak was favoured as it allows the high temperatures (500+°C) needed to burn body fats and maintain combustion (*ibid.*). This timber may have provided the bulk of the fuel for the cremation process. Smaller proportions of charcoal from different species are likely to be the remains of brushwood infill or pyre goods (Campbell 2007), thus explaining the occurrence of hazel and willow/poplar at Milnthorpe, although hazel also makes a good fuel (O'Donnell 2007). The poor condition of some of the hazel fragments and possible insect degradation may indicate that dead or re-used wood formed part of the kindling material.

Charcoal analysis of a 'clamp' pit at Borrás Quarry, mentioned above, (Archaeological Services 2010) provided evidence that oak was used as a main fuel in producing high temperatures. Apart from a single fragment of *Maloideae* (hawthorn, whitebeams, apple), the tertiary fill was comprised entirely of oak. The primary fill was also predominantly oak, although a large proportion comprised fragments of hazel and *Maloideae*, more than likely representing kindling material beneath an oak structure or pile, as demonstrated by the reconstruction at Butser Ancient Farm (2002). Radial cracks and low vitrification were noted in many of the fragments, an indication possibly of a similar combustion process to the Milnthorpe sample.

### Radiocarbon dating

Cremated bone samples from each of the four discrete burials were sent for AMS dating at the Scottish Universities Environmental Research Centre (SUERC). The entirely plough-disturbed urn (vessel 3) was not dated as no material was identified that could unambiguously be associated with it. Full details of the results, including lab codes and calibrated and uncalibrated dates, are provided in Table 1. The two urned cremations produced almost identical dates of 1420-1260 cal BC at the 95 per cent confidence level. The urned cremation immediately to the north east produced the significantly later date of 1120-920 cal BC, while the cremation found during the evaluation produced the significantly earlier date of 1950-1750 cal BC, both at the 95 per cent confidence level.

Table 1: Details of radiocarbon dates

Lab code	Context	Radiocarbon Age	Calibrated Age	
			68% probability	95% probability
SUERC-33451	28	3080±30 BP	1410-1365; 1360-1315 cal BC	1420-1260 cal BC
SUERC-33452	31	3065±30 BP	1395-1305 cal BC	1420-1260 cal BC
SUERC-33453	5	3530±30 BP	1920-1870; 1850-1770 cal BC	1950-1750 cal BC
SUERC-33454	25	2845±30 BP	1050-970; 960-930 cal BC	1120-920 cal BC

CALIBRATED age ranges determined with University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3)

## Discussion

Two urned and two unurned cremations were excavated at Dallam School, Milnthorpe. In addition, fragments of a third urn, disturbed by later activity, were recovered from a plough rut. All were located within 15m of each other, and all but one of the cremations were located within 2m of each other. A stone-filled ditch and a pit were also identified nearby.

There is no evidence to suggest that the cemetery was ever covered by a barrow mound or ring cairn and it therefore appears to be a flat cemetery. Although a spread of stones was present immediately to the west of the main grouping of burials, these stones were the fill of a ditch rather than an upstanding feature. The relationship of the ditch to the cemetery is unclear. It is only present on one side of the main grouping of burials (separating these from cremation 5), and it is linear, so it does not even enclose part of the cemetery. It is undated and therefore could be an entirely unrelated feature. The pit to the east is similarly undated and therefore possibly also unrelated.

The four radiocarbon dates obtained from the burials showed a considerable spread of dates. Although the two urned burials produced comparable dates of 1420-1260 BC, the unurned burial located just 0.4m to the north east produced a date around 300 years later. Even if the age ranges for this cremation and for the two urns are all condensed to their minimum limits, there is still an age gap of 140 years. However, since the age probability ranges are slightly skewed in opposite directions, this age gap is even more pronounced at the 68 per cent confidence level (with a minimum age gap of 255 years between 1050-930 cal BC for cremation 25 and 1395-1305 cal BC for cremation 31). It is therefore very improbable that this age gap is simply a statistical quirk and it should be taken as a real aspect of the site chronology. In addition to this, the unurned cremation to the west produced a date 500 years earlier than those for the two urns. While the pottery report suggests that this latter cremation may be an unrelated deposit, an alternative view is that this should be regarded as part of the same funerary monument, with the differences in the pottery merely representing the evolution of pottery styles throughout this time. Given the paucity of Bronze Age cremation cemeteries in the archaeological record, it is improbable that two totally unconnected burial sites should be located so close together. It is known that burial sites involving barrows or cairns were frequently reused, or were in use for a long period of time (Higham 1986, 110-114) and many were probably always intended as places of multiple burial, serving communities over long periods of time (Petersen 1972). The evidence from Milnthorpe suggests that this site should be seen in a similar light.

For people to have returned to the same place to add new burials over such a long period of time, the site must have been marked in some way to make it recognisable within the landscape. However, no archaeological features were identified that could plausibly have acted as such a marker, and there are no obvious natural features of the landscape that could have acted in this fashion. Although the landscape has been slightly modified by the recent construction of the school and the levelling of its playing fields, the site appears to have originally lain within a shallow valley and is therefore not in a prominent position, although this valley could perhaps once have contained a natural spring or pond. Whatever feature marked the cemetery, whether

this was natural or deliberately created, it is probable that it lay outside the rather limited excavated area.

Since there were only five burials (assuming vessel 3 was from a plough-damaged burial) and these showed a wide spread in dates, then whatever values are taken for the population of the area during this period, these burials can only represent a tiny fraction of this total population. While some burials may have been completely lost to later activity, and others may lie in unexplored ground outside the development area, this cannot entirely account for the deficiency in numbers. Only a very small part of the total population can have been buried in this cemetery. A number of reasons may be postulated for selective burial of part of the population, such as economic or social status of the individual, or their age or sex. The burials at Milnthorpe included both adults and an adolescent, but otherwise there was no evidence to help elucidate why these individuals were selected.

Few Bronze Age cremation cemeteries have been excavated in lowland Cumbria (Hodgson and Brennand 2006, 41) and there are no other Middle Bronze Age examples, although Early Bronze Age cemeteries are slightly better represented. The nearest example is at Allithwaite, around 12km to the south west (Wild 2003). Ten cremations were found, four of which were in inverted Collared Urns. At least one of the others is thought to have been in an organic container that had totally rotted away. They had been placed in natural fissures in the bedrock and were in a flat cemetery, with no indication that they had ever been covered by a barrow or cairn, or that the cemetery was otherwise bounded. Radiocarbon dates in the range 3570-3470 BP were obtained, giving calibrated dates of around 2100-1750 cal BC for the cemetery. A natural spring (concreted over) is present next to the cemetery. It is unclear if this had been present at the time the cemetery was in use and, if so, if this had influenced its location. Two other urns have previously been found in Allithwaite (Stockdale 1864), although few details are available about these.

At Ewanrigg, near Maryport (Bewley *et al.* 1992), 26 cremation burials were located around a central cist inhumation. A second cist inhumation was present just outside this grouping. Eight of the cremations were in Collared Urns; four of these were upright, three were inverted and one was on its side. Radiocarbon dates from these ranged from 3700-3400 BP, giving calibrated dates between 2460 cal BC and 1520 cal BC. The cemetery was sited on the top of a natural knoll and no indication was found for any covering mound or cairn, or for any bounding ditch.

A Bronze Age cremation cemetery has recently been excavated at Overby Quarry, Aikshaw, near Aspatria. Full analysis of the results has not yet been carried out; however, initial results (Town 2010) indicate that around 30 pits containing cremated material were excavated. The total number of unurned cremations is uncertain as a number of the excavated pits only contained small quantities of bone and it is not yet clear if these should be counted as full cremation burials or as token deposits. Eight of the cremations were in urns, most of which are thought to be Collared Urns (1750-1500 cal BC) although one has been tentatively identified as a Food Vessel (2000-1700 cal BC). Several of the urns had been emplaced in an inverted position.

A pit excavated during the evaluation produced a calibrated radiocarbon date of 1900-1650 cal BC, but radiocarbon dates have not yet been produced from the main excavation.

The burials were closely grouped within a small area, measuring around 110 square metres, and consisted of a central group that was surrounded by an outer ring of cremations. No evidence was found for the burials being within a barrow or ring-cairn. Unless all evidence for this has been ploughed away, this would suggest they were in a flat cemetery. There was also no evidence for a boundary to the cemetery. A number of linear ditches were excavated a little to the south east, although they did not extend around the cemetery and their relationship to it is currently unknown. A number of non-cremation pits were found within the cemetery; these are thought to be broadly contemporary as two of them were cut by cremations. It has been suggested that a central post pit, containing a distinct post-pipe, may have held a post or monument to act as a focus for the cemetery. There was a high degree of intercutting between features in the centre of the cemetery; the excavators have suggested that this implies it was in use for a considerable time.

At Leacet Hill, Brougham, near Penrith, ten unurned cremations were found closely grouped together (James 2006). No other features were found in the close vicinity, although an enclosure ditch and a possible pit alignment were found in other parts of the site. A radiocarbon date of 1820-1755 cal BC was obtained from one of the cremations and a similar date was obtained from the enclosure ditch. Two sherds of Bronze Age pottery were recovered from elsewhere in the excavation, although none were found near to the burials. The whole site had been slightly truncated by ploughing but no evidence was found to suggest that the cemetery had been enclosed or contained within a barrow or cairn.

A number of other urned cremations have previously been recorded from Cumbria. Most have been exposed by quarrying and were not inspected *in situ* by professional archaeologists. Few details are therefore available about them. At Garlands near Carlisle, 21 urns (and six accessory vessels) were discovered in a sand pit in 1861 (Hodgson 1957). A collection of at least nine vessels from Maryport probably came from a similar cemetery (*ibid.*). At Aglionby four complete urns and a fragmentary one, together with a fragmentary inhumation and an unrecorded number of unurned cremations (which were found in heaps 'as if they had been deposited in skin bags') were recovered from a sand quarry (*ibid.*). At Stainton Head on Furness, two collared urns were recovered from a sand pit (Fell 1957). At Ireleth Mill on Furness, several urns arranged in a straight line were recovered during the construction of a reservoir (Spence 1935) and a similar line of urns has been recorded near Cartmel (Stockdale 1864).

The Milnthorpe cremations display a number of parallels to these other excavated examples. At Milnthorpe one of the two intact urns was on its side. This is fairly common and is paralleled at Ewanrigg. The urn contained remains of at least two individuals, an adult and an adolescent. Again this is a fairly common practice (around 5 per cent of all burials from all periods) and a parallel can be found at

Ewanrigg (although in that instance it was of two adults). An unidentified bone item was present in one of the cremations; again this has parallels in Cumbria at Ewanrigg and Allithwaite. A cremated dog bone was identified; this is unusual for this period, though is known from later in the archaeological record. However, the bone came from a disturbed context and can not be guaranteed to be directly associated with any of the cremations that were recovered.

The earliest of the cremations at Milnthorpe, to the west of the main group, contained pyre remnants in the form of a large quantity of charcoal. Analysis has indicated that the main wood used was oak, with smaller amounts of hazel. Large numbers of tubers/rhizomes, many of which were identified as false oat-grass tubers, were also present. These may have been gathered as kindling for the pyre, but could indicate that the pyre was partly composed of turves.

The cemetery dates from the period of first significant forest clearance in the area. Detailed palynological research backed up by extensive radiocarbon dating at Foulshaw Moss 4km to the west, and Heslington Moss 7km to the northwest, has shown that there were several small clearance operations during the period 3000-2000 cal BC, but the first episode of significant clearance dates from around 2000 to 900 cal BC (Wimble *et al.* 2000). Cereal grain first appears in the record at this time. Following this, there was an episode of woodland regeneration before larger-scale clearance episodes during the later Iron Age and in historical times (*ibid.*).

Evans (2008) has recently provided a detailed study of patterns of occupation and land use in Cumbria through the Neolithic and Bronze Ages, including the burial practices. She argues that funerary monuments typically had long and complex histories of use and narrow typological classifications of the end product of such monuments frequently obscured much of this earlier history. Token deposition of small quantities of cremated bone and charcoal was common. As time progressed from the Neolithic into the Bronze Age, there was a gradual shift away from burial in larger ceremonial monuments to smaller, more localised sites that frequently appropriated natural features of the landscape. The cemetery at Dallam fits into this general pattern.

## Notes and References

- C. Allen, 'The prehistoric pottery, in J. Zant, Archaeological investigations on the A66 Temple Sowerby 2006-2007', CW3, 9 (2009) 29-46
- Archaeological Services, *Dallam School, Milnthorpe, Cumbria: archaeological evaluation*. Unpublished report 1321 (Archaeological Services Durham University 2005a)
- Archaeological Services, *Dallam School, Milnthorpe, Cumbria: archaeological excavation*. Unpublished report 1355 (Archaeological Services Durham University 2005b)
- Archaeological Services, *Bay 1 Tyrrellstown, Co Dublin, Ireland; plant macrofossil, charcoal and cremated bone analysis*. Unpublished report 2103 (Archaeological Services Durham University 2008a)
- Archaeological Services, *Bay 2 Tyrrellstown, Co Dublin, Ireland; plant macrofossil, charcoal and cremated bone analysis*. Unpublished report 2104 (Archaeological Services Durham University 2008b)
- Archaeological Services, *Lismullin 1, M3 Motorway Project, Co Meath, Ireland; plant macrofossil, charcoal, cremated bone and mollusc analysis*. Unpublished report 2204 (Archaeological Services Durham University 2009a)

- Archaeological Services, *Castletown Tara1, M3 Motorway Project, Co Meath, Ireland; plant macrofossil, charcoal, cremated bone and mollusc analysis*. Unpublished report 2040 (Archaeological Services Durham University 2009b)
- Archaeological Services, *Borras Quarry, Wrexham; palaeoenvironmental analysis*. Unpublished report 2450 (Archaeological Services Durham University 2010)
- R.H. Bewley, I.H. Longworth, J. Browne, J.P. Huntley and G. Varndell. 'Excavation of a Bronze Age cemetery at Ewanrigg, Maryport, Cumbria', *Proc. Prehist. Soc.* **58** (1992) 325-54
- R.K. Bingham, *The Chronicles of Milnthorpe* (Milnthorpe, 1987)
- K. Branigan & P. Foster, *Barra: Archaeological Research on Ben Tangaval*. Volume 1 (Sheffield, 1995)
- C. Burgess, *The Age of Stonehenge* (London 1980)
- Butser Ancient Farm 2002 [www.butser.org.uk/iafimg5\\_hcc.html](http://www.butser.org.uk/iafimg5_hcc.html)
- G. Campbell, Cremation deposits and the use of wood in cremation ritual, in J. Harding & F. Healy (eds.) *The Raunds Area Project: A Neolithic and Bronze Age Landscape in Northamptonshire*. (Swindon, 2007)
- N. Card, J. Downes, & P. Sharman, *Knowes of Trotty, Harray, Orkney: Excavation 2006*. Unpublished data structure report (Orkney Archaeol. Trust 2006)
- W. Crumbleholme, 2009 [www.crumbleholme.plus.com/beakerfolk.htm](http://www.crumbleholme.plus.com/beakerfolk.htm)
- H. Evans, *Neolithic and Bronze Age Landscapes of Cumbria*, BAR **463** (Oxford, 2008)
- C. Fell, 'Middle Bronze Age urns from Furness', *CW2*, **57** (1957) 9-12
- R. Gale, & D. Cutler, D., *Plants in Archaeology; Identification Manual of Artefacts of Plant origin from Europe and the Mediterranean* (Otley, 2000)
- H. Godwin, *The History of the British Flora*, 2nd Edition. (Cambridge, 1975)
- I. Grant, & N. W. Jones, *Excavations at Borras Quarry, Wrexham, 2008: Interim Report*, (CPAT Report No. 971 2009)
- A. Hall, *Recognition and Characterisation of Turves in Archaeological Occupation Deposits by means of Macrofossil Plant Remains*. Centre for Archaeology Report **16/2003** (English Heritage 2003)
- A. Hall, & J. Carrott, *Plant Remains from Excavations at Hollow Banks, Scorton, near Catterick, North Yorkshire*, Technical Report **PRS2003/85** (Palaeoecology Research Services, 2003)
- S. Harrison, *An experimental prehistoric pottery firing at Harray, Orkney*. *Antiquity* **82** Issue 317 Project Gallery (2008)
- N. Higham, *The Northern Counties to AD 1000* (London, 1986)
- K. Hodgson, 'Three unpublished collections of Bronze Age pottery; Netherhall, Garlands and Aglionby', *CW2*, **56**, (1956) 1-7
- J. Hodgson, and M. Brennan, The prehistoric period resource assessment, in M. Brennan (ed.) *The Archaeology of North West England*, 23-58, published as *Archaeology North West*, **8** (2006)
- R. James, 'A Bronze Age enclosure and cremation cemetery at Leacet Hill, Brougham', *CW3*, **6**, (2006) 27-43
- M. Jones, The Plant Remains, in M Parrington (ed.) *The Excavation of an Iron Age Settlement, Bronze Age Ring-ditches and Roman Features at Ashville Trading Estate, Abingdon, Oxfordshire 1974-76*, CBA Research Report **28** (1978)
- I. A. Kinnes, and I. H. Longworth *Catalogue of the Excavated Prehistoric and Romano-British Material in the Greenwell Collection* (1985)
- D. Marguerie, & J-Y. Hunot, 'Charcoal analysis and dendrology: data from archaeological sites in north-western France'. *Journal of Archaeological Science* **34** (2007) 1417-1433
- P. M. Mayne Correia, Fire modification of bone: A review of the literature, in W. D. Haglund & M. H. Sorg (eds.) *Forensic Taphonomy: The Postmortem Fate of Human Remains*, (Boca Raton, 1997) 275-293
- A. M. G. McComb, & D. Simpson, 'The Wild Bunch: Exploitation of the Hazel in Prehistoric Ireland, *Ulster Journal of Archaeology*'. **58**, (1999) 1-16
- J. I. McKinley, 'Bone fragment size and weights of bone from modern British cremations and the implications for the interpretation of archaeological cremations', *Int. J. Osteoarchaeol* **3**, (1993) 283-287
- J. I. McKinley, 'Bronze Age 'Barrows' and Funerary Rites and Rituals of Cremation'. *Proc. Prehistoric Soc.* **63**, (1997) 129-145
- J. I. McKinley, Phoenix rising; aspects of cremation in Roman Britain, in J. Pearce, M. Millett & M. Struck (eds) *Burial, Society and Context in the Roman World*, (Oxford, 2000a) 38-44
- J. I. McKinley, The analysis of cremated bone, in M. Cox & S. A. Mays (eds.) *Human Osteology in Archaeology and Forensic Science* (London, 2000b) 403-421

- J. I. McKinley, The human remains and aspects of pyre technology and cremation rituals, in H. E. M. Cool (ed.) *The Roman Cemetery at Brougham, Cumbria: Excavations 1966-67*, *Britannia Monograph Series 21* (London, 2004) 283-309
- J. I. McKinley, Cremation ...the cheap option? In R. Gowland & C. Knüsel (eds.) *Social Archaeology of Funerary Remains* (Oxford, 2006)
- R. Mears, & G. C. Hillman, *Wild Food*, (London, 2007)
- R. Mercer, & M. S. Midgley, 'The Early Bronze Age Cairn at Sketewan, Balnaguard, Perth & Kinross', *Proc. Soc. Antiq. Scot.* 127 (1997) 281-338
- L. Moffett, 'Pignut Tubers from a Bronze Age Cremation at Barrow Hills, Oxfordshire, and the Importance of Vegetable Tubers in the Prehistoric Period'. *Journal of Archaeological Science* 18 (1991) 187-191
- P. Murphy, S. Anderson, T. Ashwin, & S. Mays, Zoological, environmental and botanical evidence, in T. Ashwin & S. Bates (eds.) *Excavations on the Norwich Southern Bypass, 1989-91, Part 1: Excavations at Bixley, Caistor St Edmund, Trowse, Cringleford and Little Melton*, *East Anglian Archaeology* 91 (2000) 217-229
- M. Oake, M. Luke, M. Dawson, M. Edgeworth, & P. Murphy, *Bedfordshire Archaeology: Resource Assessment, Research Agenda and Strategy*, *Bedfordshire Archaeology Monograph* 9 (2007)
- L. O'Donnell, Charcoal and Wood, in E. Grogan, L. O'Donnell & P. Johnston (eds.) *The Bronze Age Landscapes of the Pipeline to the West, an Integrated Archaeological and Environmental assessment*, (Wicklow, 2007)
- A. Perry, The carbonized plant remains in H. M. Bamford, (ed.) *Briar Hill excavation 1974-1978 Northampton Development Corporation Archaeol Monograph* 3 (1985)
- F. Petersen, 'Traditions of multiple burial in later Neolithic and early Bronze Age England', *Archaeol. J.* 129 (1972) 22-55
- C.D.C. Pfitzenmeyer, 'Arrhenatherum elatius (L.) J & C Presl'. *J of Ecol.* 50 (1962) 235-45
- Robinson, M., The significance of the tubers of *Arrhenatherum elatius* (L.) Beauv. from Site 4, cremation 15/11, in G. Lambrick, (ed.) *The Rollright Stones: Megaliths, monuments and settlement in the prehistoric landscape*, *English Heritage Archaeological Report* 6 (1988)
- F.H. Schweingruber, *Microscopic Wood Anatomy* (Birmensdorf, 1978)
- J. Spence, 'Report of the committee for prehistoric studies 1933-35', *CW2*, 35 (1935) 259-261
- C. Stevens, *Beacon Hill Wood, Shepton Mallet, Somerset: Middle Bronze Age Urned Cremation Burial*. Unpublished report BHN07/W67060 Wessex Archaeology for The Beacon Hill Society (2008)
- J. Stockdale, *Annals of Cartmel*, (Ulverston, 1864)
- M. Town, *Overby Quarry, Aikshaw, Aspatria, Cumbria; archaeological excavation*, unpublished report 715/08 North Pennines Archaeology Ltd (2010)
- P. Turnbull, and D. Walsh, 'A prehistoric ritual sequence at Oddendale, near Shap', *CW2* 97 (1997) 11-44
- C. Wild, 'A Bronze Age cremation cemetery at Allithwaite, Cumbria', *CW3*, 3 (2003) 23-50
- G. Wimble, C.E. Wells, & D. Hodgkinson, 'Human impact on mid-and late Holocene vegetation in south Cumbria, UK'. *Veget Hist Archaeobot* 9 (2000) 17-30

