

The excavation of a cordoned urn at Benderloch, Argyll

Gavin MacGregor*

with contributions by M Donnelly, J S Duncan, A Jones, S Ramsay
& J Roberts

ABSTRACT

A cordoned urn containing a cremation deposit was found in a private garden at Benderloch, Argyll, and was excavated in September 1996 by Glasgow University Archaeological Research Division (GUARD). A range of post-excavation analyses were undertaken to aid interpretation of the activities which may have taken place prior to the final act of burial. Analysis has shown that a prolonged sequence of mortuary rites may have preceded the burial. Indeed it can be suggested that the urn saw two phases of use and may not have been made specifically for use in burial. Material encrusted on the interior of the urn yielded a radiocarbon date of (AA-26980) 1626–1408 cal BC. The project was funded by Historic Scotland and monitored by the West of Scotland Archaeology Service.

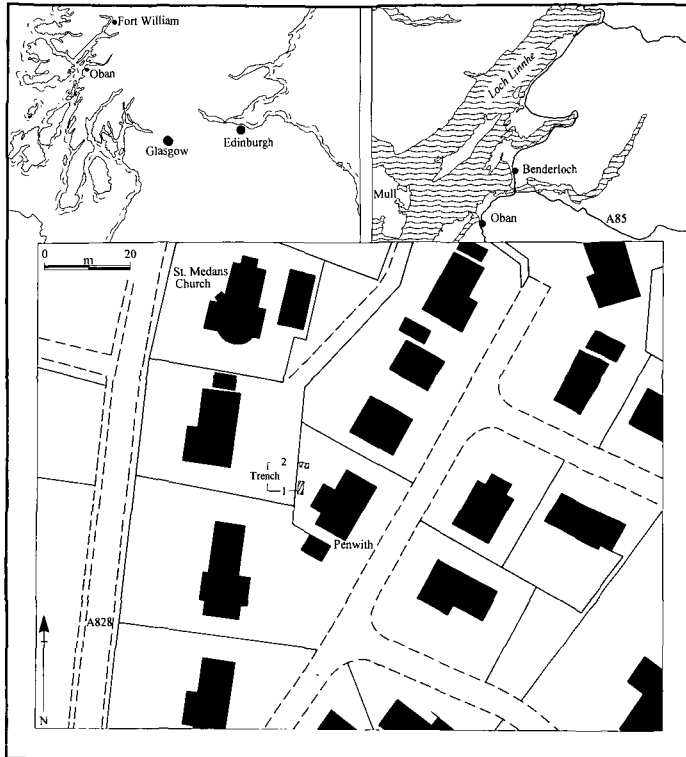
INTRODUCTION

An urned cremation deposit was discovered in the garden of a private house at Benderloch (NGR: NM 9051 3835) by the owners, Mr & Mrs Harvey, in September 1996 (illus 1). Mr & Mrs Harvey informed the Lorn Archaeological Society, who in turn alerted West of Scotland Archaeology Service (WoSAS), of the discovery. After visiting the find spot and assessing the level of archaeological intervention required, WoSAS advised Historic Scotland, and arrangements were made for the excavation and post-excavation treatment of human remains and associated finds. This exercise was in accordance with policy for the treatment of human remains in archaeology (Historic Scotland 1997), where Historic Scotland undertakes to arrange for the early archaeological investigation of accidentally discovered human remains, and for an appropriate level of recording and reporting.

Fieldwork was carried out in late September by Glasgow University Archaeological Research Division (GUARD); the contents of the urn were subsequently excavated under laboratory conditions and a programme of post-excavation analyses was undertaken with the following aims:

- 1 To analyse the cremated bone in order to identify the number of individuals present, their age and sex, and to identify any evidence of pathologies.

* Glasgow University Archaeological Research Division (GUARD), Gregory Building, University of Glasgow, Glasgow G12 8QQ

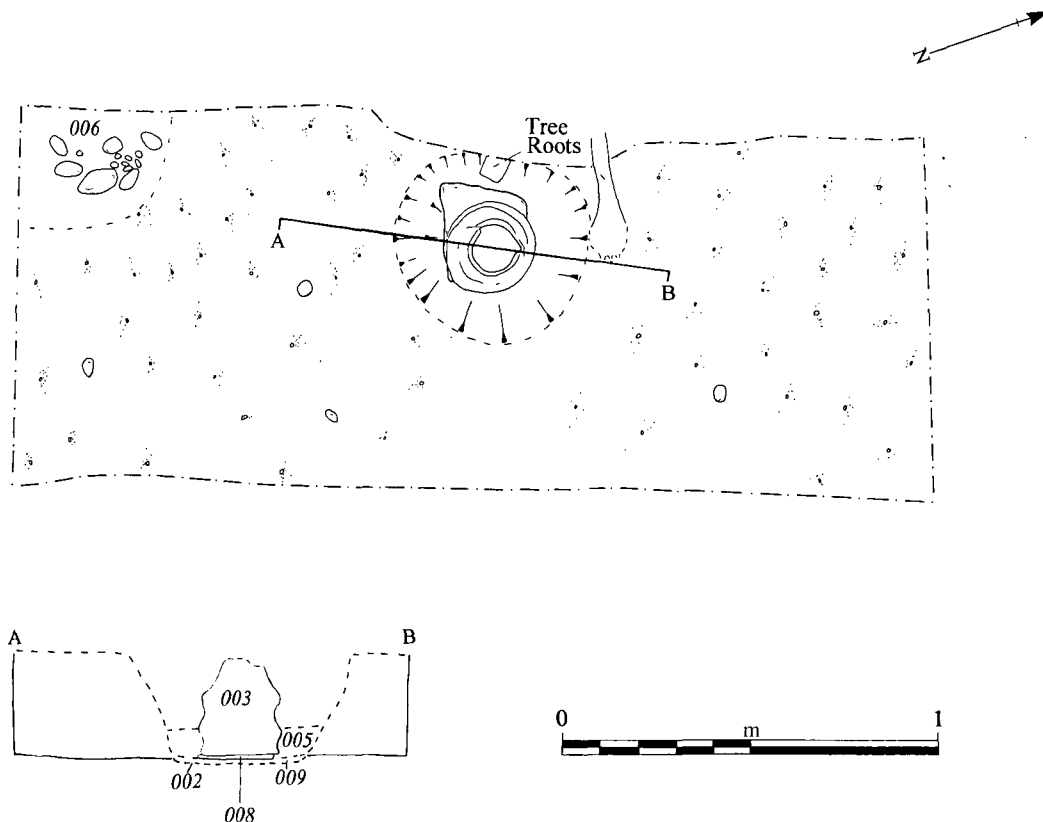


ILLUS 1 Site location map. (Based on the Ordnance Survey map © Crown copyright)

- 2 To obtain information on the nature of the mortuary ritual through analysis of the human bone deposits.
- 3 To assess whether ancient DNA had been preserved in the cremated human bone (should more than one individual have been represented, analysis of DNA would have been undertaken in order to investigate possible familial links).
- 4 To analyse residues absorbed into the fabric of the urn and gather evidence about the additional and/or previous contents (and thus previous use).
- 5 To analyse encrustations adhering to the inside of the urn and gain information about its possible contents, with particular respect to pollen and macroscopic plant remains.
- 6 To analyse pollen from the pit's primary silt fill and gain information about the possible use of plants in the funerary rites.

EXCAVATION

Two trenches were excavated by hand (illus 1). The first measured 1 m by 2.5 m and was centred on the find spot of the urn. The second was located at an adjacent point where Mr Harvey, the owner, indicated that another archaeological feature might be present. The topsoil in each trench was removed by hand to the surface of the subsoil (raised beach deposits) below. This comprised small to medium-sized pebbles and frequent cobbles in a matrix of red/brown sand or orange sand. A sample of the topsoil (50%) was sieved from Trench 1 to recover any artefacts associated with the burial deposit.



ILLUS 2 Features excavated in Trench 1

TRENCH 1 (ILLUS 1 & 2)

Following removal of the topsoil, cleaning the surface of the trench revealed that a pit containing an inverted urn was the main feature. The only other possible archaeological feature identified was a group of cobbles (006) situated in the south-west corner of the trench.

The urn & grave pit The urn had been accidentally broken at its base by a crow-bar used by Mr Harvey to break the ground. Furthermore, by the time GUARD arrived to excavate the urn, previous investigation by Mr Harvey had already created a circular hole around the urn about 0.2 m deep and 0.5 m in diameter. Thus, a large proportion of the original or primary pit fill had already been removed, which made it difficult to ascertain the original cut. What remained of the pit was excavated to the point where the rim of the urn was revealed. At this point the pit was 0.4 m in diameter with a depth of 0.28 m from the surface of the subsoil. The primary pit fill (005) was a light brown/orange sandy silt.

In order to lift the urn in one piece, this portion of the trench was 'box-sectioned' to facilitate access. The remaining fill was excavated by hand, exposing a stone slab (008) upon which the urn had been placed upside down. The urn had either been placed off centre on the slab or had moved during backfilling, as the rim was overhanging the edge of the slab to the east. In order to prevent the contents (004) of the urn from escaping, the urn and slab were undercut and acid-free tissue paper used to plug the gap at this point. The urn was then bandaged and supported with a polyurethane frame in order to lift it in one piece, together with the slab.

Basal silt After the urn and slab were lifted, the remainder of the pit was excavated. Beneath the slab was a light orange/brown sandy silt (009), some 0.02 m in depth, which appeared to represent a primary silt formed after the pit was cut and perhaps left open to the elements. Pressed into its upper surface were several fragments of cremated bone which were immediately visible upon lifting the slab.

Pit with cobbles After the topsoil had been removed a group of cobbles was observed in the south-west corner of the trench. Excavation revealed that they lay within a pit (007) with sloping sides and a flat base, measuring 0.2 m deep and at least 0.3 m wide. The fill (006) was a brown silty sand (the cobbles were confined to the upper 0.1 m of the fill). No bulk sample was taken, but the remainder of the pit is preserved *in situ* beyond the edges of the cutting.

Struck quartz The sieved topsoil from Trench 1 (50%) produced a small assemblage of what appeared to be struck quartz. This was retained for analysis and is described below (see Donnelly).

TRENCH 2 (ILLUS 1)

While digging to the north of the urn, Mr Harvey had uncovered a slab beneath the topsoil. To investigate its potential archaeological significance, topsoil was removed and the area around the slab was hand-cleaned within a cutting 0.8 m north/south by 1.2 m east/west.

The slab was found to be broken into two pieces but had originally measured 0.32 m by 0.25 m. It lay within a matrix of topsoil and sub-angular medium stones. This was removed to expose the eastern edge of a large pit (at least 0.8 m north/south by 1 m east/west). Fragments of charcoal were observed on the upper surface of this feature and one fragment of burnt bone was recovered. After consultation with WoSAS and Historic Scotland, no further archaeological work was undertaken and the trench was backfilled. The feature is preserved *in situ* and may contain a second burial.

POST-EXCAVATION ANALYSES

The following specialists' reports are edited versions. The full texts of all reports, including catalogues, form part of the project archive at the National Monuments Record of Scotland.

CORDONED URN

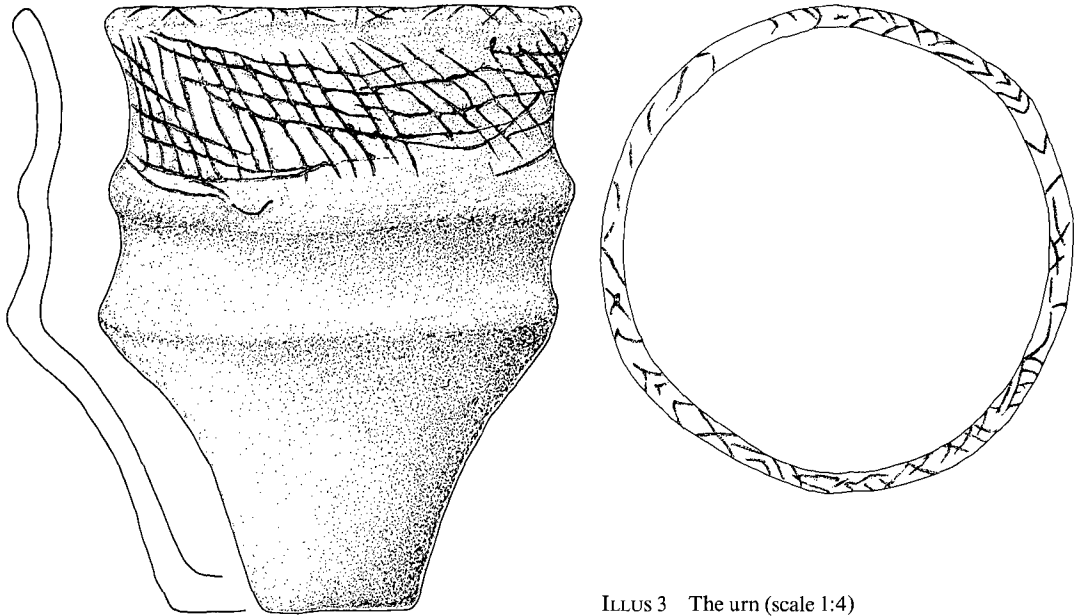
Andy Jones

Form and manufacture (illus 3)

The cordoned urn stands 320 mm high and has a volume of 16,220 cc. Its body has two cordons spaced 40 mm apart, with the upper cordon positioned 80 mm below the rim. The second cordon demarcates a pronounced inturn in the profile, where the urn tapers towards a narrow flat base, with a diameter of 100 mm. The wall thickness varies between 11 mm and 13 mm. The rim is flat with slightly rounded edges and has a diameter of 275 mm.

The fabric of the urn is a mixture of clay and angular, grey, igneous rock inclusions, probably basalt. The inclusions occur at a frequency of 30% and measure 10–30 mm.

The urn was manufactured in two pieces, the first consisting of the lower body including the double cordoned area extending towards the base, and the second comprising the decorated neck and rim area. Lines of smoothing are visible internally and externally at the point where the two major sections of the urn meet and was evidently part of the process of their bonding. There is no



ILLUS 3 The urn (scale 1:4)

evidence of coil construction; instead it appears that the vessel was built in slabs of 200–300 mm length. The slab construction is evident from the pattern of cracks on the surface.

The decoration on the body has been incised with a sharp, thin point. Some of these thin incisions appear to have partly closed, suggesting that the vessel was fairly damp when being decorated. At several points the rim decoration appears to be an extension of the vertical incisions on the vessel's exterior surface; for this reason it is suggested that the vessel stood upright while being decorated.

The external surface of the urn is orange to buff, and the internal surface is dark grey-black. The vessel was probably fired in a bonfire and was overturned when fired. This is evident from the differential oxidation/reduction profile of the vessel walls.

Use wear

The main evidence of use is the encrustation on the internal surface of the vessel. This is confined to the lower 200 mm of the vessel wall, generally below the second cordon and inturn. The encrustation is patchy, and seemed to be localised to two specific places around the inturn, some 80 mm apart, although other small spots occur elsewhere. In one place a penumbra of fire scorching surrounds a patch of encrustation, suggesting that the material was deposited on to the vessel wall while still hot, and may be best considered as sooting produced during cooking (Hally 1983).

Of most interest is a basal sherd which shows fire scorching around the internal edge of the base, rather than on its flat surface. This pattern of fire scorching and sooting suggests that material may have been heated inside the vessel; what is more, differential patterning suggests the urn was lying at an angle during this process.

Cordoned urns

The profile of the Benderloch urn differs somewhat from the typical simple cylindrical or barrel shape, having a more sinuous tripartite profile and slightly flared mouth. Tripartite urns decorated with two cordons are well represented in the archaeological record and date to the second millennium BC. On many of these vessels the decoration is confined to areas above the upper cordon and consists most commonly of cross-hatching, lozenges and triangles, either incised or cord impressed. Morphologically and decoratively the Benderloch urn has a number of parallels in Scotland; tripartite urns with decorated upper bodies are recorded from Brackmont Mill, Fife (Longworth 1967, 63, illus 5); Kipps, West Lothian (Duns 1884, 311); and Magdalen Bridge, Joppa (Lowson 1881, 423, illus 2, 4 & 5).

The rims of most cordoned urns are generally simple in form, and the Benderloch urn is no different. What is more unusual is the decoration on the upper surface of the rim of the vessel; in this respect its closest parallels are from Mikelvie Hospital, Oban (McIsaac 1897, 58; Abercromby 1912, 54) and from Shanwell, Kinross (Anderson 1886, 116–17). Indeed one example from Shanwell (Anderson 1886, 116, illus 1) is very similar to the Benderloch urn, having incised lozenges around the upper body and widely spaced lozenges around the rim area. A number of examples with decorated rims are found in the south-east, including Kinneil Mill, Stirling (Marriott 1971, 86, illus 4.2) and some others already cited (above), from Brackmont Mill, Fife; Kipps, West Lothian; and Magdalen Bridge, Joppa. However, apart from two examples noted above — from Mikelvie Hospital, Oban, and Shanwell, Kinross — decorated rims are rare in the north of Scotland and the Benderloch urn is distinctive in this respect.

CREMATED HUMAN REMAINS

Julie Roberts

The contents of the urn were excavated in laboratory conditions, proceeding in 20 mm spits. These were further divided into quadrants, so that any patterns in the distribution of elements might be identified. In all, 10 spits were excavated. The weight of the bone from the urn was 2956 g in total, which exceeds the average weight of an adult male or female cremation (McKinley 1993). Also within the urn, in the lower spits, was a moderate amount of fine soil with small stones. With the exception of a few fragments of the pot itself and some carbonized material, no other extraneous material was observed.

Individuals

The remains of two individuals were identified. One was an adult, probably female, aged 20–25 years at death; the other was a child aged between 16 months and four years. The relationship between the two individuals is unknown. If it is correct that the urn contained only one adult and one infant, then almost certainly whole bodies, and not just token elements, were interred. This is supported by the fact that all the skeletal elements were represented, including those least often identified in cremation deposits, such as the sternum and the scapula.

Pathology

Not all skeletal pathology is destroyed by the cremation process (Reinhard & Fink 1994). Two pathological conditions were observed on the adult skeletal remains, porotic hyperostosis and ankylosis of one middle and one distal foot phalanx.

Porotic hyperostosis Porotic hyperostosis is the skeletal manifestation of iron deficiency anaemia, which when seen in the eye socket is also termed *cribra orbitalia*. It is characterized by a pitting of the outer layer of the skull or eye orbits, a result of the body's attempt to increase the amount of iron in the blood by expanding the red blood cell-producing marrow (Chamberlain 1994). The condition develops in childhood, but the skeletal effects remain into adulthood. There are many causes of iron deficiency anaemia, amongst the most common being lack of absorbable iron in the diet and a high pathogen load within the body (Stuart-Macadam 1988; Grauer 1993).

The marked pitting characteristic of this disorder was seen on numerous cranial fragments in the Benderloch assemblage. There was no evidence of infectious disease on any of the remains, but this does not exclude infection as a cause of death. The periosteal new bone growth characteristic of infection may have been destroyed by the cremation process. Alternatively, the individual may have suffered from a parasitic infestation or infection which had subsequently resolved, or one which had never affected the skeleton at all. As a result of suffering from iron deficiency anaemia, this young woman would probably have felt tired, weak and lethargic.

Ankylosis of foot phalanges One middle and one distal foot phalanx had become fused together (ankylosis). This condition may have been the result of primary degenerative joint disease, but given the young age of the individual, and the absence of this type of pathology in all other skeletal elements, this seems unlikely. Fusion of the small joints of the feet commonly occurs in rheumatoid arthritis, or sero-negative arthropathies such as psoriatic arthritis or reiters syndrome (Ortner & Putschar 1981; Forrester & Brown 1987), but this also does not usually occur in isolation and, again, the lack of related pathology makes this diagnosis unlikely. Osteoarthritis secondary to traumatic injury (ie crushing and fracture of the phalanges) may, therefore, be a more probable explanation.

Cremation practice: colour and fracture patterns

The predominant colour of the remains was light grey to white, indicating a cremation temperature of between 645 and 940°C (stage IV: Shipman *et al* 1984). There was, however, differential burning of the remains of both individuals, with some elements darker grey. These included the calcaneus, the occipital, the greater trochanter of the femur, some of the phalanges, the talus and all the carpal bones. In addition, some of the inner surfaces of the cranium and the ribs were less well combusted. This pattern suggests that the body was supine and extended, lying beneath the pyre on the ground, or on some other hard surface. A similar pattern of burning was seen in the Bronze Age material from Kirkton, Fife (Roberts 1998), and at Ratho, near Edinburgh (McSweeney 1995). It was interesting to note that the four right carpal bones of the adult were much darker grey on the posterior aspect (if the arm is considered in the anatomical position), suggesting that the palms and wrists were facing upwards, and perhaps just beyond or at the edges of the fire.

The apparent absence of any pyre material and the clean appearance of the bone suggest that they were removed from the pyre after cremation and washed. This practice of 'winnowing' might also account for some of the more extensive fracturing observed (McKinley 1994). The fragmentation patterns and warpage of the bone indicate that the body was fleshed at the time of cremation.

From the condition of the bone it is obvious that much time and care was invested in the cremation procedure and mortuary ritual. The bodies were burned at a high temperature, until the bones were almost entirely calcined. This must have taken some time and the pyre would have required tending throughout. After cremation the bones were carefully removed and probably washed before being deposited in the urn.

DNA ANALYSIS

Gavin MacGregor

The analysis of ancient DNA extracted from archaeological remains has successfully been undertaken in recent years (Brown & Brown 1992; Hanni *et al* 1995). In many cases the samples were of organic material from contexts with conditions for exceptional preservation. Although it is known that heat is an agent which causes damage to DNA, it has been shown that the high temperatures reached during cremation may result in the preservation of DNA by removing the nutrients for microbial attack (Brown *et al* 1995). In the light of the possibility of establishing biological (familial) links between the individuals from multiple interments, samples were submitted to Gordon Curry (Human Identification Centre, University of Glasgow) to assess the potential for extracting ancient mitochondrial DNA. In all, six samples from the two individuals from the Benderloch cremation and five samples from four individuals from cremations at Kirkton, in Fife (MacGregor 1998), were submitted.

Each of the samples was tested for the presence of DNA, but none provided any. Clearly there must be some doubt, therefore, as to the usefulness of the regular application of DNA analysis to the study of cremations of such antiquity.

MAGNETIC SUSCEPTIBILITY

John Syme Duncan

Initial interpretation of the interior encrustation suggested it might be the remnants of hot pyre material adhering to the urn's wall. This seemed problematic as analysis of the cremation deposit suggested it had been washed, thus precluding the possibility of significant quantities of hot pyre material in the urn. Furthermore, the temperature required for pyre material to adhere to the urn's interior would probably have made it too hot to handle (it has been suggested that it would take many hours, or a rainfall, for a pyre to have cooled enough to allow sorting of the bone: McKinley 1989). In order to help clarify this apparent contradiction, magnetic susceptibility analysis of the soil within the urn was undertaken to establish whether or not it had been burnt.

Nine samples, one from each of nine spits of the excavated urn contents, were tested for high- and low-frequency magnetic susceptibility. A control or background sample from the primary silt (ie in the base of the pit) was also analysed. The laboratory sensor used was the Barrington MS2B which reads the mass specific and magnetic susceptibility measurements at high and low frequencies (0.43 and 4.3 kHz). Dual-frequency measurement provides an indication of the form, nature and size distribution of the magnetic minerals in a sample (Clark 1990). Magnetic susceptibility measurements may show quite strong variations, but if the frequency dependence is constant and low, these are probably due to varying concentrations of natural magnetic minerals in the soil. Effects of human activity can be distinguished as areas of high susceptibility accompanied by increased frequency dependence.

Results

The results from each sample are relatively similar, with the low- and high-frequency values showing no great variation (Table 1). This suggests that in all the soils analysed the magnetic susceptibility values all related to natural iron oxides present in the soil. There is no evidence from this data to signify that the soil had been heated or burnt. The greatest dependence present within

the samples analysed was spit 2b with 6.85%. The fact that many of the values demonstrate a negative high-frequency dependence reinforces the diagnosis that no burning of the soil has occurred. This suggests that the soil is not related to pyre or burning activities and may instead have gradually filtered into the urn through hairline cracks.

TABLE 1

Magnetic susceptibility results

Sample	High frequency (cgs standard units)	Low frequency (cgs standard units)	% Frequency dependence
spit 1a (upper)	160	170.57	6.20*
spit 2b	143.94	134.71	6.85
spit 3b	147.97	154.19	4.03*
spit 4c	145.89	150.21	2.88*
spit 5b	148.57	155.23	4.29*
spit 6b	122.14	130.60	6.48*
spit 7b	134.29	127.01	5.73
spit 10d (lower)	142	177.23	19.88*
background	195.79	197.05	0.64*

* Indicates a negative dependence upon high frequency magnetic susceptibility.

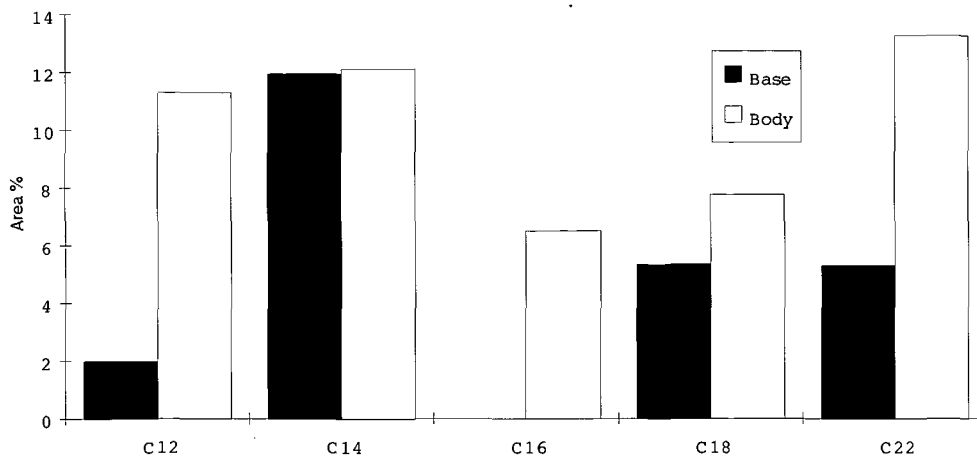
CHEMICAL ANALYSIS

Andy Jones

Although chemical analysis has previously been undertaken on cordoned urns with the aim of determining contents, the results from this analysis were inconclusive (MacKie 1966, 27). Given the specificity of modern gas chromatography techniques, and the high level of preservation of lipids within archaeological ceramics, the most appropriate form of analysis was of extracted lipids and, specifically, fatty acids. The analysis of these particular biochemical compounds in archaeological contexts has been successfully achieved previously and the methodology employed here was developed from earlier studies (Evershed *et al* 1990). The analysis of lipids has both advantages and problems, the primary advantage being their high level of preservation in archaeological material; once they have migrated into the ceramic matrix of the vessel during cooking, their hydrophobic nature allows them to be retained there (Heron *et al* 1991). Although there are problems with the diagenesis of fatty acids during cooking and microbial oxidation from microbes within buried soil matrices (Evershed *et al* 1992), there is no migration of lipids from the ceramic matrix into the surrounding soil. There may, however, be some migration of lipids from the soil into the pot matrix. However, the effects of this process have been shown to be negligible (Heron *et al* 1991). The main disadvantage in the analysis of fatty acid suites is that these are present in a wide range of plant and animal species, making the identification and definition of unknown archaeological residues of fatty acids difficult. However, certain fatty acids are taxonomic markers (present in specific species), and their presence within archaeological residues allows their identification to specific origins.

Sampling

The sampling strategy employed was designed to examine two aspects of vessel use, the generalized use of the urn prior to its deposition and its final use. The first was examined by sampling the clay matrix of the vessel at 0.1 m intervals along a single transect in the interior. This was done using a diamond-tipped drill. The second involved sampling specific areas of apparent



ILLUS 4 Concentration of alkanes in different parts of the urn

encrustation on the interior. Altogether, six samples were taken: three from the matrix and three from various patches of encrustation around the interior. A 0.5 g sample of the matrix or encrustation was sampled in each case.

Results

The results of this work were surprising. It was initially assumed that the encrustation on the interior would prove to be rich in fatty acids, while the matrix would prove to be low in fatty acids. What was found was quite the opposite. There was no trace whatever of organics from the encrusted material on the vessel interior. If this encrustation represents a soot deposit, it is probable that it is carbonized and contains no fatty acids. However, within the matrix of the vessel, comparative gas chromatography results indicated the presence of several alkanes. Alkanes are important structural components of lipid compounds and may exist either with a functional group (such as a carboxyl or hydroxyl group) or as free hydrocarbons.

Analysis of these alkanes indicates that they are part of a homologous series (a series of straight-chain compounds which increase incrementally) which includes Dodecane (C12), Tetradecane (C14), Hexadecane (C16), Octadecane (C18) and Docosane (C22). While it is impossible to identify the precise diagenetic pathway which has caused the observed pattern of alkanes, it is possible that it represents components of fatty acids which have been broken down through diagenesis, although they may simply indicate free alkanes. Since the alkanes comprise a homologous series, and similar patterns have been observed for fatty acids in other archaeological samples (Coles *et al* forthcoming), it can be suggested that we are observing the remnants of fatty acids.

It is possible to draw out more information about the use-life of the vessel since the pattern and concentration of alkanes within the matrix can be plotted according to position in the rim, body and basal area of the vessel. There were no alkanes present in the rim area, though if we examine the presence and concentration of alkanes in the basal and body area, we see a low concentration of alkanes in the basal area and a high concentration around the body of the vessel (illus 4).

Since the migration of lipids into the ceramic matrix occurs at the same rate, the variable nature and concentration of alkanes in different parts of the vessel may indicate specific cooking

practices. Experimental work indicates that different lipid concentrations may occur in certain parts of the vessel depending on manner of use; notably, during boiling in water, the fat content floats on the surface and is absorbed higher up in the vessel (Evershed *et al* 1995). In this instance the concentration of alkanes in the middle of the vessel is far greater than within the basal sample. The profile on the Benderloch vessel indicates that the vessel was probably not full during cooking, since the highest concentration of alkanes was found about 100 mm below the rim. It is possible then that the contents were boiled when the urn was only partly filled, although the exact quantity of the liquid in the urn is difficult to determine without further detailed sampling.

Conclusions

The analysis of the residues from this vessel suggests a number of considerations for future applications of this analytical technique. It would appear from the results that the presence of encrusted material need not be a certain indication of foodstuffs, and if the carbonization process is complete residue analysis may not register any lipid content. The results of analysis of the clay matrix also certainly relate to the use of the vessel, while the surface deposits may be due to a number of pre- and post-depositional factors. The analysis of the clay matrix as opposed to surface deposits is preferable, therefore, especially since there will be less tendency for microbial attack in the core of the vessel (Evershed *et al* 1992).

The vessel was used for cooking some form of foodstuff, probably by means of boiling. However, the pattern of alkanes in the base, body and rim of the urn indicates that it was only partly filled with liquid during this process. What is more, the pattern of sooting on the interior of the base and above the upper cordon suggests that the urn was lying at an angle. Soot deposits may have accumulated above the level of the upper cordon, which also corresponds with the upper level at which food residue was detected, so the urn may have been partly filled and in a tilted position during cooking, possibly as it was loosely propped up in a fire. However, the fire-scorching on the base is unlikely to result from boiling, and may indicate rather that the contents of the urn boiled dry. It is difficult to tell how much the vessel was used prior to deposition, though the absence of any evidence for abrasion on its exterior, and the discrete deposits of soot on its interior suggest its use-life was probably fairly short lived. The relatively low incidence of fatty acids within the matrix of the urn may be the result of a brief episode of use. It remains possible then that food was cooked in the vessel before, or as a component of, the mortuary ritual.

POLLEN AND MACROSCOPIC PLANT REMAINS

Susan Ramsay

A number of Bronze Age cists have been investigated using the technique of pollen analysis. Samples analysed from the floors of these structures have produced evidence for possible floral tributes placed within the cist (Whittington 1993; Tipping 1994). In addition, pollen finds that may have resulted from honey or mead have been found within Food Vessels associated with Bronze Age cists in Scotland (Bohncke 1983; Dickson 1978). With these findings in mind the urn encrustations and the basal silt of the pit were subject to pollen analysis in order to compare them with these previous results.

Results

The pollen analyses from the urn encrustation and the basal fill of the pit are remarkably similar (Table 2). They both have a pollen spectrum consistent with an open agricultural landscape.

TABLE 2
Results of pollen analysis

Pollen and spore taxa	Urn encrustation		Basal fill of pit	
	No	%	No	%
<i>Alnus</i> (alder)	14	12.7	12	9.2
<i>Anthemis</i> type (chamomile type)	—	—	1	0.8
<i>Aster</i> type (daisy type)	—	—	3	2.3
<i>Betula</i> (birch)	9	8.2	14	10.7
Brassicaceae (cabbage family)	1	0.9	—	—
<i>Calluna vulgaris</i> (heather)	—	—	3	2.3
Caryophyllaceae (pink family)	1	0.9	2	1.5
Cereal type (cereals/grass)	3	2.7	2	1.5
Coryloid (hazel/bog myrtle)	6	5.5	7	5.3
Cyperaceae (sedge)	10	9.1	3	2.3
Filicales (ferns)	3	2.7	1	0.8
Liguliflorae (dandelion type)	2	1.8	3	2.3
<i>Pinus</i> (pine)	1	0.9	1	0.8
<i>Plantago lanceolata</i> (ribwort plantain)	4	3.6	10	7.6
<i>Plantago</i> sp (plantain)	—	—	1	0.8
Poaceae (grass)	33	30.0	28	21.4
<i>Polypodium</i> (polypody fern)	—	—	2	1.5
<i>Rumex acetosa</i> type (sorrel)	11	10.0	6	4.6
<i>Sphagnum</i> (bog moss)	4	3.6	4	3.1
<i>Succisa</i> (scabious)	1	0.9	1	0.8
Unidentifiable*	7	6.4	27	20.6
Totals	110	—	131	—

*corroded, crumpled, broken

Grass predominates with ribwort plantain and sorrel also well represented. This suggests open, probably damp, pasture land surrounding the site. The occurrence of other 'weedy' species, such as those belonging to daisy type, chamomile type, and dandelion type as well as the presence of scabious, also supports the conclusion that the local area was a managed agricultural landscape. Cereal type pollen is represented at the site but only at low levels. This pollen type includes some of the wild grasses as well as cereals and so is not definitive evidence for cereal growing nearby.

Several tree species are represented but at relatively low levels. Birch, alder and hazel/bog myrtle would have formed areas of woodland, probably on more marginal, wetter soils. There is some evidence for heather heathland, which could have been colonized by birch, and low levels of sphagnum moss suggest that there were boggy areas nearby. Oak is absent from these pollen spectra suggesting that the majority, if not all, the oak in the area had already been felled by this time.

A pollen diagram from Gallanach Beg, near Oban (Rhodes *et al* 1992) shows a progressive decline in woodland between 5000–2500 BP. Pollen types associated with agriculture are seen to increase, producing a pollen spectrum with significant amounts of grass, ribwort plantain and other ruderal taxa, similar to that seen at Benderloch.

There are some minor differences between the pollen spectra from the urn and the pit. However, it is suggested that these can be accounted for in the following ways. Pollen was poorly preserved on this site, particularly in the basal fill of the pit where 20% of the pollen was unidentifiable. This might explain why the basal fill of the pit appears to have less grass, sedge and sorrel present than the spectrum from the urn. These pollen types were very crumpled and degraded at this site and may constitute a large percentage of the unidentifiable pollen from the pit. The pollen spectrum from the pit contained more pollen types than that from the urn, including daisy and chamomile type as well as heather pollen. However, more pollen grains were

counted from the pit, increasing the chances of finding extra pollen types. None of these extra pollen types is represented by significant percentages and so probably only comprised a minor component of the local pollen rain. It is concluded, therefore, that the two pollen spectra represent the same local pollen rain. (Analysis of a control sample from background topsoil would have helped to refine this interpretation, but none was taken in the field.)

Encrustation on the urn

The encrustation on the interior of the urn yielded very few recognizable plant remains. The only remains were individual tracheids (water-conducting elements). These probably came from a coniferous taxon because of the presence of large bordered pits, each with an apparent torus, in the tracheid walls. It was not possible to take these identifications any further.

Conclusions

The pollen recovered from the urn does not suggest that any form of honey, mead or floral tribute had been placed in the vessel. It may have blown in from the surrounding landscape while the urn was still open, although this seems unlikely as pollen from plants flowering at different times of year are present. Another possibility is that the pollen had been lifted from the ground surface when the cremation remains were collected, or that there was another period of use during which the vessel remained open.

The presence of possible coniferous tracheids in the encrustation suggests that it was formed from pyre material or from a previous use of the urn in which woody material or possibly resin had been involved.

The pollen assemblage from the urn corresponds closely with that from the basal silt of the pit in which the urn was found. The pollen spectra from these contexts suggest that the landscape around Benderloch was relatively open grassland, with a variety of weedy species, often indicative of damp ground, also present. The presence of significant amounts of ribwort plantain suggests that this land was probably used for pasture but the presence of some cereal type pollen may be the result of some small-scale arable cultivation. Some woodland was present but probably only on wetter, marginal land. It may have colonized parts of the heathland and boggy areas, implied by heather and bog moss respectively.

A bank system discovered under peat on the Black Moss of Achnacree, on the Benderloch peninsula, overlay a Bronze Age palaeosol containing two distinct layers separated by an iron pan. Pollen analysis of these layers by Whittington (1993) showed the soil beneath had been pastorally managed grassland because of the dominance of ribwort plantain and grass, while above the iron pan the pollen spectrum was dominated by heathland plants which could have provided grazing for animals. This iron pan formation and change in vegetation was considered by Whittington to be climatically rather than anthropogenically induced. The Benderloch urn and pit pollen spectra have only a minor heathland component but show a greater similarity to the earlier, pre-iron pan, pastoral phase seen at the Black Moss of Achnacree.

QUARTZ

Mike Donnelly

Twenty quartz fragments recovered from the topsoil around the urn in Trench 1 were retained for further examination. A full catalogue forms part of the site archive. All the pieces examined are

of quartz, appearing as an opaque, milky-white variety. The assemblage includes at least a few pieces that appear likely to have been struck or worked. One regular flake (no 4) is rectangular in plan and side elevation and trapezoidal in cross section. The piece appears to have secondary working around one of its long sides and both of its shorter ends. Where distinct, these scars appear to have been struck from both faces, possibly using a form of anvil technique. In effect, the piece resembles an angled Type 2 scraper. Another triangular regular flake (no 5) also appears to have had secondary working applied to two of its sides, although this time it originates from one face only. Two small flakes (nos 6 & 7) exhibit chonchoidal fractures. The remaining pieces include a possible core (no 2), eight pieces of possible knapping debris or debitage (nos 8–12; 16–18), and four other possible flakes (nos 3 & 13–15).

RADIOCARBON DATE

A sample of the encrustation adhering to the interior of the urn was submitted to the Scottish Universities Research Reactor Centre (SURRC) for accelerator dating. This was dated to 3245 ± 50 BP (AA-26980), calibrating at two sigma to 1626–1408 cal BC.

TABLE 3

Radiocarbon dates from Benderloch and Moss of Achnacree (Ritchie *et al* 1974)

Site	Lab no	yrs BP	Cal BC*
Benderloch	AA-26980	3245 ± 50	1626–1408
Achnacree	SRR-219	3309 ± 50	1732–1449
Achnacree	N-1468	2930 ± 80	1380–913

* Calibrated on Oxcal v 2.01 (1993)

Of particular note is the relationship between the Benderloch date and those obtained from the Moss of Achnacree. It seems from these dates that the Benderloch urn was probably being used at a time before the peat on the moss had fully formed. As Ramsay noted above, the analysis of pollen from the Benderloch urn and pit pollen spectra show a greater similarity to the earlier, pre-iron pan, pastoral phase seen at the Moss of Achnacree.

DISCUSSION

The period after death is often a time when social groups reiterate their identity and beliefs through their treatment of the body. It is a time when ritual and the symbolic importance of actions come to the fore. Ceremonies in the interval between death and burial may have taken place over a period of months or indeed years. It is important, therefore, to distinguish between the mortuary phase and funerary phase: during the mortuary phase the body is treated, which may include its laying out, preparation of the pyre, cremation, and any other attendant rites; the funerary phase involves interring or otherwise disposing of the human remains, and also the graveside ceremony. The mortuary phase perhaps allows more scope for variability in the nature and form of associated rites, while the funerary phase is more likely to be constrained by tradition.

Recognizing the extended sequence of events which may have taken place after a death, how then do we approach the interpretation of the results of post-excavation analyses in the present case? It may be productive to consider the results in terms of ichnology, the 'study of traces' (Molino 1992), representing a series of actions which preceded the final act of burial.

The manufacture of the urn is probably the earliest event which can be identified. A time-gap between the construction and deposition of the vessel is suggested by the results of the chemical residue analysis, which indicate it had been used for some form of cooking. It may be,

therefore, that the vessel was not actually made for use as a funerary vessel but as a household item. Liquid was boiled in the urn while it was set at an angle on the fire, a pattern seen on other Bronze Age pots (Barclay *nd*). Botanical analysis of the encrustation supports the idea of a time-gap between the manufacture of the vessel and its final use in holding the cremation deposit, as the pollen within the encrustation appears to represent a large part of a year. Furthermore, it indicates that the vessel was being used to heat material which we would not readily recognize as an everyday foodstuff, as the only identifiable macroscopic plant remains in the encrustation, although present in almost negligible quantities, were tracheids possibly from a coniferous plant, perhaps derived through the resin. Bearing in mind the internal scorching, it is possible that, rather than representing an event where the vessel boiled dry, the encrustation stems from another phase of use where dry material was burnt within the pot.

When considered in conjunction, the evidence from the analyses of residues within the fabric of the vessel and the encrustation on its interior suggest several phases of use. It is proposed that at some point after manufacture the vessel was used to boil organic material, but may also have been used to burn dry material, in a separate event. This was followed by a period of some length when the mouth of the urn was exposed, allowing pollen to adhere to the surface of the encrustations. This interpretation is unexpected, as funerary urns are often thought to have been produced not long after death and exclusively for the rite of burial. Two possible explanations may be suggested: the first is that the urn had been built and used in a household or domestic context prior to its later appropriation as a funerary vessel; the second is that after funerary vessels were made, they underwent an appropriate series of rites or uses themselves before they were considered proper for burial purposes.

Two individuals were identified within the urn, probably an adult female and a young child. The bodies of both individuals were laid on their backs on the ground and the pyre built above them. The time between death and cremation was unlikely to have been very long, as the degree of warpage indicates that flesh still adhered to the bones. After the fire had subsided and the pyre cooled, the burnt bone was carefully collected, then almost certainly washed. Only then was the urn used as a funerary vessel, as the bones were placed within it and covered with a small slab of rock. The circular grave pit had been left open long enough for a silt deposit to form in the base before the slab and urn were deposited. From the smaller fragments of bone scattered across the basal fill, it appears that the individual who held the slab over the mouth of the urn allowed a few bone fragments to spill from the vessel while inverting it within the pit, possibly from a position on the east side. It would appear that no floral tribute was placed within the pit before it was finally backfilled.

This may not have been an isolated burial, as the presence of a second pit with charcoal and bone fragments (the unexcavated pit exposed in Trench 2) serves as a reminder that cordoned urn burials are commonly found in extensive cemeteries.

CONCLUSIONS

The analyses of the cordoned urn and its contents have shed some light on the mortuary ritual which took place prior to the burial of two individuals. Although not definitive, the results of the analyses indicate that the urn had several phases of use. It is impossible to say whether these represent an extended mortuary ritual, ceremonies associated with the ritualization of the urn itself, or perhaps its prior use in a domestic context, for cooking. The analyses have also allowed some interpretative observations on the nature of the events which preceded the insertion of the urn in the ground. The nature and limits of the evidence mean that we can never be entirely

certain of reasons, intentions or events in the past but this should not preclude us from considering the possible actions of prehistoric people during the emotional times surrounding a death.

ACKNOWLEDGEMENTS

Many thanks to Robin and Fay Harvey for their warm hospitality during the excavation and for their continuing enthusiasm and interest in the subsequent post-excavation work; to Jane Clark and Andy Jones for hard work during the excavation and lifting of the urn; to Paul Robins (WoSAS) who monitored the work and characterized the deposits in Trench 2; to Alan Leslie who managed the project for GUARD; to Mel Richmond, Kenny Dunlop, Lesley Farrell and Paul Johnson for providing technical support; to Jill Sievewright for the illustrations; to Gordon Curry for providing not only the facility to attempt the extraction and analysis of ancient DNA from the human bone within the urn but also for his time in discussing its potential; to Richard Jones who offered advice and encouragement on several aspects of the scientific analyses; and to Ian Banks who made useful comments on the report. Final thanks must be for the team of specialists who contributed to the report. The project was funded by Historic Scotland.

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This paper is published with the aid of a grant from Historic Scotland