Osteological Analysis of the Cremated Bone from Banbury Lane, Middleton Cheney, Northamptonshire.

A Report for Archaeological Services and Consultancy Ltd.

December 2012

Project: OA1038

Abstract

Analysis of the cremated bone recovered during an excavation of a multi-period site on the land at Banbury Lane, Middleton Cheney, Northamptonshire (NGR SP 4968 4235; Site code 1531/MCB), undertaken from May to July 2012 by Archaeological Services and Consultancy Ltd, was carried out in order to identify and quantify the material excavated.

Three deposits of cremated bone were excavated. Burial [2063] was contained within an inverted collared urn which had been placed into a pit. Two further unurned burials, [2086] and [2121], were also excavated from small pits. Burial [2063] has initially been identified as being of early Bronze Age in date from the vessel type and associated finds of a copper pin and ceramic spoon. Modified animal bone was also recovered during the analysis of burial [2063]. The three burials were located in close proximity to each other, though there is no direct archaeological evidence of the relationship between them. Independent AMS dating was undertaken for each context, confirming that the human bone dated to between 2604-1885 cal. BC and 1965-1736 cal. BC.

Osteological analysis of the cremated bone indicates that the inverted collared urn burial [2063] contained the near complete remains of one sub-adult individual aged between 11 and 12.5 years. Unurned burial [2086] similarly contained the near complete remains of one individual, an adult that was likely to be female. Unurned burial [2121], however, contained a smaller quantity of bone and was likely to contain the incomplete remains of at least one individual. Evidence was found of sub-adult elements as well as elements that may have been adult or sub-adult. All three contexts contained significant quantities of charcoal, representing pyre debris. The bone from all contexts was fragmented in a similar pattern, with some breakage occurring as a result of post-depositional processes. The majority of the fragments present were fully oxidised, with only a few elements incompletely cremated, notably denser parts of the skull from [2063]. Skeletal zonation revealed that all burials contained a similar distribution of elements from the body and that there was likely to be a similar method of pyre management and bone retrieval for all three contexts.

The cremated bone burials from Banbury Lane, Middleton Cheney provide a rare opportunity to investigate funerary practices during the early Bronze Age involving cremation. Cremated bone burial during this period in central England is discussed with the implications for interpreting the burials analysed here.

1. Introduction

This report contains the results of the osteological analysis of the cremated bone recovered during an excavation of a multi-period site on the land at Banbury Lane, Middleton Cheney, Northamptonshire (NGR SP 4968 4235; Site code 1531/MCB), which was undertaken from May to July 2012 by Archaeological Services and Consultancy Ltd., for which a full archaeological report is currently in preparation (Cuthbert, pers. comm.).

The cremated bone deposits were recovered from Area 1 of excavation. Three deposits of cremated bone [2063], [2086] and [2121] were excavated from three individual pits [2056], [2089] and [2120] respectively. The deposits were fully excavated on site, with [2063] and [2086] being excavated in spits and subsequently bulk sampled whereas [2121] was excavated and sampled in 3 spits (Cuthbert pers. comm.). Cremation 1 [2063] was contained within an inverted collared urn in pit [2056]. Grave goods consisting of a ceramic spoon and a copper alloy pin were also included in the urn. AMS dating of the human bone from this burial provided an independent date of between 1965-1736 cal. BC. The burials of cremation 2 [2086] and cremation 3 [2121] were unurned. The human bone from burial from burial [2086] was dated to 2040-1886 cal. BC and from burial [2121] was dated to 2064-1885 cal. BC. All the burials, therefore, belong to the Early Bronze Age period. The burials clustered in close proximity to each other and other pits of Late Neolithic and Bronze Age date. A series of postholes forming round-house Structure [2081] was also located approximately 20m SE to the location of the burials, though AMS dating of charcoal from the central post-hole suggests this structure is slightly later in date, though possibly contemporary with burial [2063], dating to between 1889-1661 cal. BC.

The osteological analysis aims to provide a detailed description of the nature of the cremated bone present, to quantify and differentiate, where possible, between animal and human cremated bone, to assess the age, sex and presence of pathological changes and to identify any evidence of pyre technology used during the cremation process.

2. Methods and Process

The cremated material was analysed according to the standards laid out in the guidelines recommended by the British Association of Biological Anthropologists and Osteologists in conjunction with the IFA (Guidelines to the Standards for Recording Human Remains, Brickley and McKinley (eds) 2004) as well as by English Heritage (Human Bones from Archaeological Sites: Guidelines for producing assessment documents and analytical reports, Centre for Archaeology Guidelines, 2002).

- The material was analysed macroscopically and where necessary with the aid of a magnifying glass for identification purposes.
- The material was sorted into three fractions of 10mm, 5mm and 2mm using UKAS accredited calibrated sieves.
- The material was weighed using calibrated digital scales to an accuracy of 0.1g.
- The material was analysed without prior knowledge of associated artefacts
- The material was recorded on an Access database, a copy of which is contained in the archive.

2.1 Reasons for the Analysis

Osteological analysis was carried out to ascertain:

- The type of deposit
- Total weight of the bone
- Degree of fragmentation
- Identification and quantification of human bone
- Demographic data
- Pathology data
- Efficiency of the cremation
- Presence and type of pyre goods
- Presence and type of pyre debris

3. Type of Deposit and Disturbance

3.1 Introduction

Recording of the type of deposit of cremated bone is necessary to make fair comparisons between different deposits from across a site, between contemporary sites and between cremated bone deposits from different historical contexts. Recording the type of deposit allows inferences to be made about the state of preservation of the material interred and how this may have affected bone content and fragmentation. This information is essential for accurate analysis of cremation processes due to diagnostic analytical techniques being based upon the weight and size of bone fragments present.

3.2 Observations

The nature of the deposit of the cremated bone was assessed during field excavation and recorded on the relevant context sheets. This information was subsequently classified according to the categories suggested by Brickley and McKinley (2004) and recorded on the Access database provided.

3.3 Results

The bone fragments under analysis were recovered from three separate pits. Cremation 1 [2063] was contained in an inverted collared urn which had been placed in a pit (cut [2056]). The pit had then been backfilled with soil context [2064]. A deposit of the surrounding soil matrix had fallen on top of the original contents of the urn after deposition. Post-depositional damage had occurred, likely to have been caused by ploughing, removing the base of the urn. This burial was, therefore, categorised as an 'urned burial' that had been 'disturbed' (McKinley, 2004).

Unlike [2063] described above, there was no extant container associated with the skeletal remains from Cremation 2 [2086], which had been placed in pit cut [2087]. Although, the top of the pit had been truncated by a plough furrow, the majority of cremated bone deposit was recovered from the base of the pit. The burial was, therefore, identified as an 'unurned burial' that was 'slightly disturbed'.

The bone from Cremation 3 [2121] was similarly not associated with any extant container but the concentration of bone revealed in section of pit cut [2120] during excavation suggested that it may have been placed within an organic container such as a bag or bundle. The lower fill [2121] of the pit containing the burnt bone was sealed on top by fill [2122]. This burial was recorded as an 'unurned burial' that was 'undisturbed'.

4. Quantification of Cremated Bone

4.1 Introduction

An assessment of the quantity of bone recovered may give an indication of how representative the bone deposit is of the original human remains cremated as part of a funerary rite. Many factors can contribute to the completeness of the skeletal remains contained within cremated burial deposits. From a relatively undisturbed context, the quantification of bone may yield insights into customary funerary practices, cremation techniques and the recovery processes employed.

McKinley (1993) found that modern cremation processes resulted in the production of between 1227.4g and 3001.3g of bone. From this she inferred that the cremation of a whole body and deposition of the remains in an archaeological context would realistically produce between 1001.5g and 2422g of cremated human bone. Whal (1988) found that average weights for cremated bone deposits dating to the Roman and Migration period from Suderbrarup, Germany were significantly lower, however; for men, 744.1g, for women, 472.2g and for children 224.4g (cited in Carnegie and Filmer-Sankey, 1993).

Excavation of cremated bone burials from Bronze Age sites in the region of Middleton Cheney indicates that several factors, both cultural and taphonomic, have contributed to the amount of bone recovered. Animal burrowing was noted at the excavation of a Bronze Age barrow at Earls Barton, Northamptonshire and as a result only 8g of re-deposited cremated bone was retrieved (Jackson 1984, p.10). At Finmere Quarry in North East Oxfordshire, two early Bronze Age cremation burials contained only a very limited amount of bone, with 4g being recovered from an unurned burial and 137g being contained within an accessory vessel (Hart *et al*. 2010, p.123). In contrast, a Bronze Age inverted cremation urn from Upton, Northamptonshire, contained 2300g of bone (Foard-Colby and Carlyle, 2008, p.7). This variation of weights from local sites is in accordance with the general observations made by McKinley (2001), who has found in her analyses that weights of cremated bone from Bronze Age burials can range from 50-2500g.

4.2 Observations

The total amount of bone present in this context was weighed and subsequently analysed for identifiable fragments. Full quantification of bone is given in the database.

4.3 Results

The results of the quantification analysis are summarised in Table 1 below:

Context	***2063***	***2086***	***2121***
Total Weight of Cremated Materials (g)	1184.5	1080.3	740.6

Table 1: *Results of the quantification of bone present*

The quantity of cremated bone present suggests a complete or almost complete individual may be present in each of contexts [2063] and [2086], although the weights are at the lower end of the scale for those expected of complete individuals. The weight of bone recovered from context [2121] is more ambiguous and may represent only the partial remains of an individual.

The highest quantity of bone was recovered from the urned burial, which may upon initial consideration suggest that the container has perhaps prevented some depletion of material or that more fragments of bone were collected for such deposition. However, the difference in weight between the cremated bone of the urned and unurned burials overall is small and it is difficult to assess the full impact of differences in post-depositional disturbance and taphonomic factors between the contexts. Variation in burnt bone weights may also be affected by the original size and weight of the skeleton prior to cremation, which differs between individuals of different ages and robustness.

5. Bone Fragmentation

5.1 Introduction

The observation and quantification of bone fragmentation is essential in assessing its impact on the quality of the overall data retrieved from the analysis of cremated bone. It may also be an indicator of practices carried out during the cremation process and give an insight into pyre technology. Fragmentation of bone is assessed by sorting all bone fragments into three sieve fractions (10mm, 5mm and 2mm) and comparing the proportion of bone in each fraction (McKinley, 2004). Measurement of the maximum bone fragment length is also recorded.

The fragmentation of bone can occur for several reasons, i.e. from the raking of the remains during the cremation process, the collection and the subsequent interment of the remains, making it difficult to assess whether bone was deliberately fragmented as part of the cremation ritual (McKinley, 1994b, 2001). It is, however, generally believed that both the excavation and post-excavation processes can lead to the largest amount of damage caused to the remains (Lange *et al*., 1997, McKinley, 1994b).

5.2 Observations

Observations of the weight of bone present in each sieve fraction and the percentage of each fraction of the total weight of bone were recorded on the Access database forms contained in the archive.

5.3 Results

Table 2 below summarises the results of the quantification of cremated bone present by sieve fraction weight and percentage of total weight. The analysis indicates that for all contexts the majority of the fragments were between 5 and 10mm in length, with approximately equal proportions of larger and smaller fragments present in contexts [2063] and [2121], although slightly more large fragments were present in context [2086] than smaller ones. This may suggest some consistency in the cremation, retrieval and deposition processes undertaken. There is no evidence to suggest that the smaller deposit of bone in context [2121] underwent more handling and breakage than the two more substantial deposits. It is noteworthy that the unurned burial [2086] produced larger fragments in comparison to the urned remains in context [2063]. This is in contrast to the observation that in archaeological contexts, urns generally protect the integrity of cremated bone fragments in the burial deposit (McKinley 1994a, p.340).

Context	***2063***		***2086***		***2121***	
>10mm Weight	292.3	*24.7%*	347.3	*32.1%*	146.3	*19.8%*
>5mm Weight	661.6	*55.9%*	544.0	*50.3%*	407.3	*55.0%*
>2mm Weight	229.8	*19.4%*	159.2	*14.7%*	155.3	*21.0%*
Total Weight of Cremated Materials (g)	1184.5		1080.3		740.6	
Maximum Bone Fragment Size (mm)	59.6		73.9		47.7	
Average Bone Fragment Size (mm)	10		10		5	

Table 2: *Weight by fraction of cremated bone from [184]*

Interestingly, a small number of fragments could be re-associated during the osteological analysis. This indicates that that some fragmentation occurred as part of post-depositional processes and that some fragments would have been larger when they were originally deposited. It was observed at excavation that soil had infiltrated the urn in [2063] and it appears, therefore, that taphonomic factors have directly caused further fragmentation of the bone after it was placed into the urn.

The maximum sizes of 59.6mm ([2063]), 73.9mm ([2086]) and 47.7 ([2121]) are all consistent with the maximum fragment sizes recovered from the inverted collared urn cremation burial at Upton, Northamptonshire, where the maximum measurements of bone excavated from spits within the urn ranged from 53.0 – 64.5mm (Foard-Colby and Carlyle, 2008). Soil had infiltrated this urn such as has occurred with the urn from Middleton Cheney and this explains the similarity of the fragment sizes. A pattern of bone deposition according to size was observed at Upton; larger bone fragments were found at the base the urn, as was the case with the remains from the accessory urn at Finmere Quarry, North East Oxfordshire (Hart *et al*. 2010, p. 100). Unfortunately, the base of the urn found at Middleton Cheney had been removed through ploughing. There was no evidence of any spatial patterning of the bone retrieved from the remainder of the urn [2063] or in either of the two unurned burials [2086] and [2121].

6. Identification of Cremated Bone

6.1 Introduction

Identification of particular elements of the human body serves to confirm the presence of human bone and to assess the minimum number of individuals contained within one context. It may also give an insight into any particular areas of the body that may have been purposefully collected following cremation. The absence of elements, especially those that are smaller, may be due to the lack of their survival as a result of fragmentation during the cremation, post-depositional preservation conditions or may be due to their loss during the cremation and retrieval process.

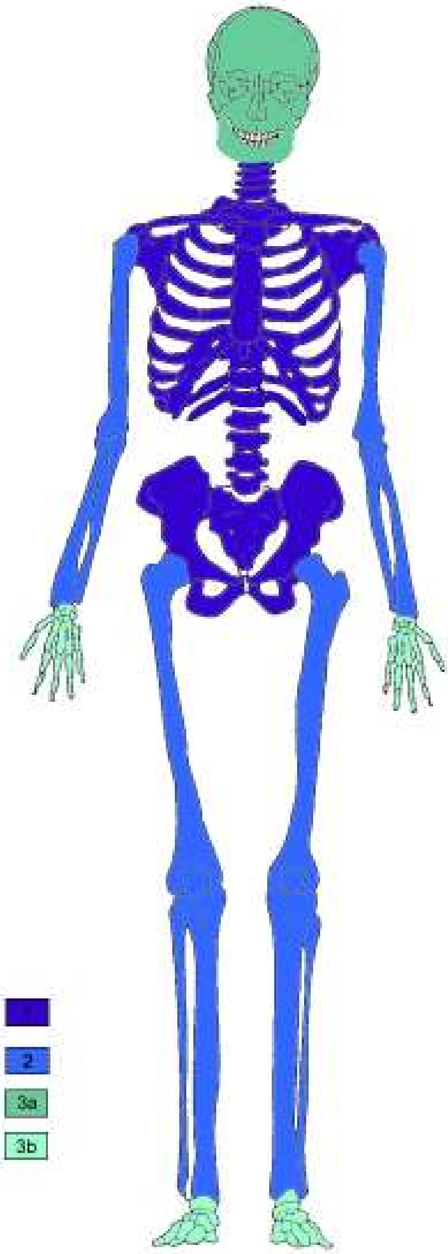
The vast majority of Bronze Age cremated bone burials contain the remains of a single individual, with only approximately 5% of burials from all periods containing repeated elements, thereby demonstrating the presence of more than one person (McKinley, 2001). Bronze Age cremated bone burials often contain small elements such as tooth roots and the small bones of the hands and feet, as was the case at Upton, Northamptonshire (Foard-Colby and Carlyle, 2008, p.7) and at Finmere Quarry in North East Oxfordshire (Hart *et al*. 2010, p.123). It has been suggested that this results from the removal of the upper levels of the burnt out pyre allowing the retrieval of small bones (McKinley 2008, p.3), possibly through sweeping together remains on a flat surface, rather than hand collection, such as is observed at open-air cremations in India today.

Animal bone is frequently found in Bronze Age cremated bone deposits (McKinley, 2001) but the differentiation of small cremated animal bone fragments from human bone fragments can be difficult. Generally, cremated animal bone is identified from morphological features or on account of the density of the cortex (the outer wall) of long bone fragments. However, this latter method tends to discriminate positively for the identification of animal bone rather than conclusively identifying human individuals since there is invariably some overlap between the two given the potential number of skeletal elements and the variation between human individuals. Animal bone can be distinguished from human bone at the microscopic level by comparing the circularity of osteons, with a correct classification of 76.5% of samples (Crescimanno and Stout, 2012), although this technique has not been applied to cremated bone. Additionally, mitochondrial DNA analysis has been used to differentiate between cremated human, pig, sheep and horse bone from archaeological deposits (Pusch *et al*., 2000). Both these techniques require specialist analysis that is beyond the scope of the present assessment.

6.2 Observations

All fragments present were scanned for the purposes of locating them to a particular element within the human skeleton. All specifically identified elements were recorded on the database and categorised according to four areas of the body i.e. skull, torso, upper limb and lower limb. Each category of bone was weighed and presented as a relative percentage of the total weight of all identified human fragments.

In addition, bone elements were also assessed according to a zonation of the skeleton. This allows more ambiguous fragments of bone, such as long bones, to be associated with an anatomically diagnostic body zone without requiring a specific identification of a bone element.



The skeletal zones are classified as following:

Zone 1 - Torso

Zone 2 – Appendages

Zone 3a – Skull

Zone 3b – Extremities (i.e. hands and feet)

The fragments from each zone were weighed and presented as a relative percentage of the total weight of bone recovered at the 5mm and above sieve fractions. These percentages can then be compared to the approximately expected values from a complete skeleton (based on Krogman 1978, cited by Charlier *et al*. 2008, p. 50):

Zone 1 – Torso: 20%

Zone 2 – Appendages: 55%

Zone 3a – Skull: 20%

Zone 3b – Extremities: 5%

6.3 Results

Osteological analysis of the cremated bone confirmed that human remains were positively identified in all three burial contexts. The results of the observations made regarding identification of human bone are presented in Table 2 below:

Context	***2063***		***2086***		***2121***	
Total Weight of Identifiable Human Fragments (g)	139.2		108.0		16.3	
Skull Fragments (g)	53.8	*38.6%*	31.0	*28.7%*	2.5	*14.4%*
Torso Fragments (g)	73.7	*52.9%*	22.7	*21.0%*	12.0	*69.0%*
Upper Limb Fragments (g)	8.4	*6.1%*	34.9	*32.3%*	0.1	*0.6%*
Lower Limb Fragments (g)	3.3	*2.4%*	19.4	*18.0%*	2.8	*16.1%*
Minimum Number of Individuals	1		1		1	

Table 2: *Identification of Human Bone*

The osteological analysis of the identified elements indicates that there were no repeated elements present in any of the burial deposits and, therefore, each burial represents a minimum of only one individual.

Overall, only a small proportion of bone could be categorically identified and assigned to a particular element due to the majority of fragments being between only 5-10mm in size. This was particularly evident in context [2121], where only 2.2% of the total bone present could be identified, compared to the 11.8% from context [2063] and 10.0% from context [2086]. It is interesting to note that [2121] contains the fewest identifiable fragments when considering the fact that the pattern of bone fragmentation (see above) varies little from the other two burials. It is also pertinent that the urned burial [2063] contained more identifiable fragments.

From the zonation of bone elements, presented in Table 3 below, it is apparent that those elements containing more cancellous, or spongey, bone, such as vertebrae, are under-represented in all contexts. This has been observed in cremation burials elsewhere (McKinley, 1997; 2000; 2008). It is clear that in contrast, the appendages, consisting of the denser long bones of the arm and leg, are well represented. This pattern in skeletal representation is likely to be due to differentiation in preservation between the more fragile cancellous bone and robust long bones.

Context	*2063*	*2086*	*2121*	*Expected Value*
Zone 1: Torso (g)	82.1	24.9	25.5	-
%	*8.6*	*2.8*	*4.6*	*~20%*
Zone 2: Appendages (g)	243.1	271.1	149.9	-
%	*25.5*	*30.4*	*27.1*	*~55%*
Zone 3a: Skull (g)	89.8	99.8	40.1	-
%	*9.4*	*11.2*	*7.2*	*~20%*
Zone 3b: Extremities (g)	28.1	16.6	4.5	-
%	*2.9*	*1.9*	*0.8*	*~5%*

Table 3: *Zonation of cremated bone fragments*

A similar pattern in the zonation of fragments is seen in all the burials (See Figure 1), suggesting that there was no preferential selection processes in bone retrieval or preservation between contexts according to skeletal zone. Fragment identification reveals, however, that there is some difference in the presence of specific elements when comparing the burials to each other.

Context	*2063*	*2086*	*2121*
Skull	*Right mandibular head and ramus; Left coronoid process; Right mandibular body. 14 tooth root fragments, 3 complete roots with crowns absent, 2 single root and 1 double (mandibular?); one complete tooth crown very eroded, possible 1st right maxillary premolar, developing crown of mandibular M3, three crown fragments unidentified; two right zygomatic fragments that can be reassociated (orbital border/frontal process), one left zygomatic fragment (orbital border/frontal process); Pars basilaris fragment, occipital. Temporal mandibular fossa. Petrous portion of*	*Left superior portion of eye orbit, frontal bone inferior portion of glabella, right nasal bone (almost complete), superior portion of vomer, right zygomation arch, left zygomatic superior frontal process, right mandibular condyle, right mandibular coronoid process, part of left mandibular condyle, inferior portion of right mandibular ramus, fragment of frontal bone with sagittal crest, portion of right temporal bone at the zygomatic root, 3 fragments of unsided temporal bone, 35 tooth root fragments, including single and double rooted teeth. Possibly 3 maxillary single rooted teeth*	*One side of mandible body fragment (exposed alveolar bone). Eight tooth roots, single, including possible second mandibular premolar; Tooth crown fragments.* *Cont.*

Cont.

	temporal unsided. Fragments of occipital squame.	*representing anterior dentition and 6 mandibular single rooted teeth representing anterior dentition. One double rooted tooth molar tooth present;21 partial fragments of tooth crowns. None identifiable.*	
Axial	*Nine fragments of vertebral bodies, lumbar and lower thoracic, 27 neural arch fragments present, mainly zygapophyseal joints; 40 identifiable rib fragments present; one lateral portion of right clavicle; one iliac crest fragment; 9 fragments of innominate including one ischial fragment. Medial clavicle epi.*	*Extremely fragmentary. 8 zygapophyseal joints survive and one partial body with partial arch. Two spinous processes. Partial arch of the atlas vertebra. One partial unsided ischial tuberosity and part of ischial ramus. Two fragments of ilium.*	*Two fragments of vertebral neural arches. Odontoid process of atlas; superior neural arch and body frags of 1 cervical vertebra; 1 frag of ilium; 1 frag of ilium including partial greater sciatic notch. 1 lumbar zygampophyseal joint. 4 rib frags. Clavicle fragment - left?*
Upper Limb	*Two radial distal epiphyses; one distal ulna epiphysis, unsided; one distal ulna diaphysis; one radial head epiphysis; one distal 1st metacarpal fragment; 3 metacarpal heads; 7 distal proximal/middle phalanges fragments, 3 distal phalanges, 1 proximal epiphysis of middle phalanx; 2 metacarpal diaphyseal fragments; 1 left lunate fragment.*	*Almost intact humeral head - 2 fragments that can be reconstructed. Distal end of a right radius, partial. 3 fragments of humeral trochlea. Two humeral diaphysis fragments. Complete left lunate, partial left capitate, partial left scaphoid. Part of an unsided trapezium. Three fragments of carpal bones. 2 distal portions of hand phalanges (proximal?). 1 complete distal hand phalanx. 1 partial distal 1st hand phalanx. 2 portions of distal hand phalanges. 1 proximal articular surface/ proximal portion of proximal 1st hand phalanx. 1 distal end of ulna left.*	*Distal hand phalanx 2-5.*
Lower Limb	*One metatarsal head, 5 distal fragments of proximal phalanges; 2 sesamoid bones; 2 distal phalanges; 1 metatarsal diaphyseal fragment; 5 diaphyseal fragments of proximal phalanges.*	*Portion of distal femoral condyle articular surface, portion of tibial condyle articular surface, portion of proximal femoral diaphysis with lesser trochanter (unsided). Portion of unsided femoral diaphysis with linea aspera. One distal end of unsided 1st metacarpal, one proximal end of unsided 1st proximal phalanx, two superior portions of talus.*	*One distal metatarsal head + diaphysis. Femur diaphysis fragment. Distal toe phalanx 2-5.*

Table 4: *Identified Human Skeletal Fragments*

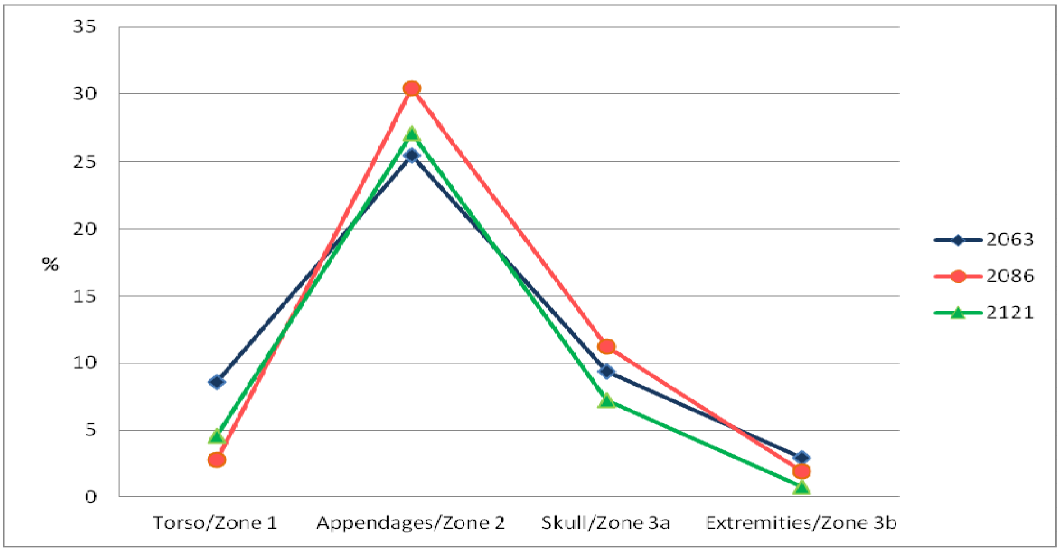


Figure 1: *Skeletal Zonation of Cremated Bone Burials*

As is illustrated in Tables 2 and 4, tooth roots and small bones of the feet and hands were present in both urned and unurned burials [2063] and [2086] respectively but these elements were comparably under-represented in the identified fragments from burial [2121], as were identifiable cranial bone elements. This is in accordance with the general observation from the bone quantification that this burial represents only the partial remains of one individual. There were no elements present in context [2121] that were repeated in either [2063] or [2086], so there is no evidence to confirm that context [2121] represents an additional, third individual.

Very small complete elements, such as sesamoid bones, a distal toe phalanx and a lunate bone, all measuring c. 5-10mm, as well as fragments of larger bones are present in all contexts. This corroborates the pattern of bone fragmentation and skeletal zonation observed, where no selection of or deposition of particular sizes or types of bone was indicated in any of the burials.

7. Demographic Data

7.1 Introduction

Demographic data recorded from human cremated bone gives an indication as to the age and sex of the individual. This information is derived from the macroscopic examination and metric assessment sexually dimorphic elements (e.g. Gejvall, 1969) as well as analysis of dental and bone development recommended by Buikstra and Ubelaker (1994) and Smith (1991). A large sample of well-preserved cremated bone deposits can provide a valuable insight into the demographic structure of the archaeological population and also into any ethnocentric funerary practices associated with the age and sex of the individual cremated.

7.2 Observations

Observations of material present and any indicators of age and sex were noted on the recording forms contained on the database. No fragments present were large enough to allow metric assessments to be undertaken so any observations were based upon morphological features.

7.3 Results

An overview of age and sex assessment of each burial is presented in Table 5 below.

Age

[2063]: Several elements present in this urned burial were observed to be unfused i.e. the skeletal elements were in a state of development. Such elements included vertebral bodies with unfused endplates, unfused epiphyses at the distal end of the radius and ulna, proximal radius, distal metacarpals, middle hand phalanges, distal metatarsals and iliac crest in addition to unfused metaphyses of unidentified long bone fragments. This indicated that the remains were those of a sub-adult. In addition, two teeth were observed to be in an incomplete state of development and this allowed a more accurate estimation of age at death to be made. One 1st right maxillary premolar was present at the development stage A1/2, found at an age of 11.1-11.9 years (Smith, 1991). Also present was the developing crown of an unsided mandibular third molar. This tooth was at development stage Cr3/4 – Crc, providing an age at death estimation of between 11.6 and 12.3 years (Smith, 1991). Overall age at death was, therefore, estimated to be between 11 and 12.5 years.

[2086]: Although it was not possible to directly observe the state of fusion of the long bones, there was an absence of any unfused elements. The vertebral end plates were noted to be fused. This indicated that the remains represented an adult individual, of an age over 25 years at death.

[2121]: Four fragments of unfused metaphyses or epiphyses were noted amongst the remains from this burial. Also present was an atlas (2nd cervical vertebra) with a fully fused *os terminale*, observed to fuse generally around the age of 12 years (Scheuer and Black, 2004, p.200). These remains could represent one older sub-adult aged between approximately 12-18 years or possibly one sub-adult and one adult. As the skeletal identification has shown, there are no repeated elements to confirm that more than one individual was present so it is not possible to confirm or refute either possibility.

Sex

[2063]: The age assessment of these remains indicated that they represented a sub-adult individual. The sex of sub-adult remains cannot be assessed through observation of skeletal morphology and can only be confirmed through DNA analysis. The sex of this individual was, therefore, unobservable.

[2086]: Morphological assessment of the supra orbital margin and glabella profile suggested that this individual was possibly a female. The complete lunate bone present was observed to be small. Additionally, metric assessment of the vertical diameter of the humeral head provided a measurement of 40.4mm. This value falls well within the range expected of females (34.5mm-45.0mm, mean = 41.8mm) observed by Gejvall (1969) in modern cremated remains. The range for males was 40.0mm-52.5mm with a mean of 44.4mm. It should be noted, however, that shrinkage of cremated bone can diminish the accuracy of metric sex assessment with the result that some males can be miscategorised as females (Thompson, 2002). Overall, however, the consistency of the observations made indicate that these remains were likely to be those of a female.

[2121]: Only one fragment contained in this burial, the sciatic notch of the ilium, was a sexually dimorphic element. Unfortunately the fragment was not complete enough to make any observations regarding sex. Additionally, since sub-adult fragments cannot not be analysed for sex estimation and it is unknown if this particular element was sub-adult or adult, no reliable observations could be made.

Context	***2063***	***2086***	***2121***
Age: Epiphyseal Fusion	*Nine fragments of vertebral bodies, lumbar and lower thoracic, neural arches fused but vertebral end plates unfused, age <20; 27 neural arch fragments present, mainly zygapophyseal joints; one unfused iliac crest fragment, age <17-20 years. Several unidentified unfused epiphyseal fragments present from long bones and foot/hand.*	*Vertebral end plates fused = adult (25 years +).*	*Four fragments with unfused metaphyses/epiphyses. Atlas odontoid peg (os. terminale) is fused: ~ 12 years plus..*
Age: Dental Development	*Possible 1st right maxillary premolar, development stage A1/2, age 11.1-11.9; Developing crown of mandibular M3, unsided though possible from exposed right mandibular crypt/socket , development stage Cr3/4 - Crc, age 11.6-12.3*	*Unobservable*	*Unobservable*
			Cont.

			Cont.
Sex: Observations	*None*	*Supra orbital margin = 2. Glabella profile = 2 but only partially present. Lunate is small. Humeral head measurement = 40.4mm. Female, Gejvall (1969).*	*Greater sciatic notch is not complete enough to use for sex estimation*
Age Estimation	**Sub-adult: 11-12.5 years**	**Adult: 25+ years**	**Sub-adult (?12+ years or possibly an additional adult)**
Sex Estimation	**Unobservable**	**Possible Female**	**Unobservable**

Table 5: *Observations of Age and Sex Estimation*

8. Pathology Data

8.1 Introduction

Palaeopathology is the study of diseases of past peoples and can be used to infer the health status of groups of individuals within a population as well as indicate the overall success of the adaptation of a population to its surrounding environment. Pathologies are categorised according to their aetiologies; e.g. congenital, metabolic, infectious, traumatic, neoplastic etc. Any pathological modifications to the bone are described. The size and location of any lesion is also noted. Pathology data is usually restricted, however, by intrinsic nature of cremated bone, although if fragment size is large enough, pathological changes may be observed.

8.2 Observations

Observations were recorded on the Access database forms present in the archive.

8.3 Results

Some microporosity and macroporosity was observed on the superior aspect of the humeral head from context [2086], representing degenerative joint disease. This disease is most common as a primary condition in older adults but can occur in younger individual secondary to trauma (Salter, 1999).

No pathology was recorded in either contexts [2063] or [2121].

9. Efficiency of the Cremation

9.1 Introduction

Effective cremation of a human body requires basically two elements: burning at high temperatures and a sufficient length of time of the application of this heat. Differences in temperature and length of time of exposure will result in variation in how the bone is burned. Complete burning will result in complete oxidation of the organic element of bone, leaving the mineral portion remaining (McKinley, 1994a, Lange *et al.*, 1987).

Holden *et al.* (1995a and 1995b) reports that generally, the range of colours seen in burnt bone relates to the temperature to which the bone was exposed:

Brown/Orange	= Unburnt
Black	= Charred (*c*.300°)
Blue/Grey	= Incompletey Oxidised (*c*.600°)
White	= Completely Oxidised (>600°)

The colour may vary from bone to bone as different elements of the body may be exposed to different temperatures for different lengths of time. It is, therefore, essential to record any differences in colouration according to skeletal elements affected and to the aspect of the element (i.e. interior, exterior) affected. The extent of the burning or oxidation of the bone represents the relative success of the cremation processed applied and contemporary knowledge of pyre technology. More recently developed techniques, such as X-ray diffraction (XRD), thermogravimetric analysis (TGA), infrared spectroscopy and differential thermal analyses (DTA), can be undertaken as a method of independently assessing the changes within the skeletal microstructure upon exposure to heat and thereby confirm more reliably the temperatures that the bone has been exposed to (Piga, *et al.,* 2009; Harbeck *et al.,* 2011). These methods also provide an indication of how likely the bone is to yield successful extraction of DNA (Harbeck *et al.,* 2011).

Observations of dehydration of the bone should also be recorded. Shrinkage of bone due to dehydration can amount to a 25-30% decrease in cross-section width and accordingly approximately a 5% decrease in length (Lange *et al.* 1987). Evidence of dehydration presents itself on the bone fragments in the form of fissuring, transverse, concentric and parabolic cracking, especially on articular surfaces of long bones and cranial vault fragments (Lange *et al.*, 1987; McKinley, 1994a). These are generally interpreted as occurring due to the result of cremating the bone when soft tissue was still present on the bone. However, more recent observations confirm that caution should be taken in this interpretation as there is little difference between the forms of fissuring occurring in fleshed and defleshed, fresh bone (McKinley, 2000, p.405; Gonçalves *et al.*, 2011; Correia, 1997).

9.2 Observations

Observations were noted on the recording forms contained in the database. Generally, the bone was observed to be white in colour but a small amount variation was noted. A small number of fragments were blue-grey in colour as a result of being incompletely oxidised during the cremation process.

9.3 Results

The results of the analysis of colour variation in the fragments of bone suggest that the vast majority of bone present was completely calcined or oxidised (Murray *et al.*, 1993). This suggests that the bone had been exposed to a temperature of at least 600° for a substantial period of time. It was noted that the bone fragments had become a brown-yellow colour due to staining by the local soil matrix.

Only a small amount of blue-grey colouration was observed and the majority of the elements affected belonged to the skull of the sub-adult remains from [2063]. The elements affected were the denser areas of the skull, such as the petrous portion of temporal bone and occipital squame. The endocranial surfaces of the skull bones were most consistently affected. Also exhibiting blue-grey colouration in context [2063] were the endosteal areas of two rib fragments and one zygapophyseal joint of a vertebra was a blue/black colour. Overall, the pattern of colouration suggests that the head was not exposed to the same temperature as the rest of the body, or at least to the same temperature for the same duration. This may suggest that the heat from the cremation may not disseminated equally around the body on the pyre, possibly due to natural factors such as wind direction, possibly because there was a structural shift in the pyre as it burned or perhaps due to certain skeletal elements becoming disarticulated and moving away from the direct source of heat.

Fissuring, transverse and longitudinal cracking was present on the vast majority of the elements and changes were consistent across all three cremated bone deposits. Long bone fragments exhibited thumbnail, dendritic, longitudinal and transverse fissuring with some warping present. Epiphyses also exhibited some fracturing and fissuring. Cranial fragments exhibited warping with some concentric fissuring present. The presence of both transverse and longitudinal fissuring confirms that the bone has been cremated long enough for substantial amount of dehydration of the bone to occur, in concordance with the coloration of the bone. The bone could have been fleshed or defleshed but was certainly fresh and rich in collagen at the time of cremation.

10. Presence and Type of Pyre Goods

by Tania Kausmally with Sylvia Warman

10.1 Introduction

Pyre goods are those items that were placed on the pyre and have been deliberately included for interment along with the cremated human bone. These can consist of objects manufactured from glass, ivory or metal, for example, which may have formed items of personal adornment. Metal items may only leave a trace of their presence in the form of staining on the bone, especially those manufactured from copper alloys.

It is most common for animal bone to be included with deposits of human bone (e.g Wells, 1960). It is generally perceived that these represent animal sacrifice or food offerings to the dead (McKinley 1994b, Bond 1994,). Williams (2005) has suggested, furthermore, that the deliberate admixture of animal and human cremated remains is deeply significant and may be associated with shamanistic rituals often observed ethnographically whereby not only can animals symbolically represent totemic ancestor lineages and but also both human and animal beings are seen to dynamically and mutually co-exist: 'Animals were more than symbols of identity but agents of transformation, enabling the dead to be reconstituted into a new social status in death' (Williams, 2005).

The deliberate inclusion of animal remains is documented in Ibn Fadlan's contemporary account of Viking cremations (Broendsted, 1965), for example, reveals that the dead were often cremated with their pets and pieces of meat from sheep, goats or pigs were placed by the head as a food offering. Animal remains appear to have been equally important in the role they played in cremation rituals during the Bronze Age; approximately 16% of burials of cremated bone contain faunal remains and typically include sheep or pigs and birds (McKinley, 2001). The lack of grave goods found during the Bronze Age compared with the presence of pyre goods indicates that their presence is strongly linked to the funerary rituals carried out through the cremation (McKinley, 2001). The use of wild animals as funerary goods appears to increase in the Early Bronze Age in Oxfordshire and includes species such as red deer, roe deer, boar and eagle at Radley Barrow Hills (Hind, 2006). Artefacts such as worked bone pins, bones combs and antler objects have also been recovered as pyre goods (McKinley, 2001).

Fragments identified as potentially representing animal remains were assessed in order to establish the following:

- Quantity of remains

- Identification of elements present
- Identify remains to species
- Identify minimum number of individuals (MNI)
- Identify age and sex of the animal
- Identify extent of burning
- Evidence of butchery or animal disturbance

10.2 Observations

Observations regarding the identification, quantification and percentage of identifiable animal bone present were recorded on a form contained in the database. Each fragment was weighed using calibrated digital scales to an accuracy of 0.1g. The colour was recorded according to Holden *et al.* 1995a and 1995b. A maximum measurement was recorded for each fragment. Analysis was carried out macroscopically and under a high power microscope (x10) where necessary.

10.3 Results

The results of the analysis of the animal bone are presented in Table 6 below:

Context	*Taxon*	*No.of frags.*	*Element*	*Portion*	*Side*	*Max.Size (mm)*	*Weight (g)*	*Burning*
2063	Medium mammal	1	Skull	Petrous/ Temporal?	?	12	0.22	White
2063	Medium mammal	1	Skull	Petrous/ Temporal?	?	9.4	0.15	White
2063	Medium mammal	1	Skull	Petrous/ Temporal?	?	9.4	0.19	Grey
2063	Medium mammal	1	Vertebra	Epiphysis	?	13.4	0.49	Grey
2063	Medium mammal	2	Long bone	Shaft	?	17.5	0.36	White
2063	Small Ungulate	1	Radius	Shaft	R?	22	1.38	Ivory
2063	Fox/Dog	1	Radius	Shaft	?	16.8	0.91	Black/ white
2063	Fox/Dog	1	Radius	Shaft	?	36.1	1.87	Ivory
2063	Medium mammal	1	Tibia	Prox.epip	?	13.2	0.50	Black
2063	Medium mammal	3	Metapodial?	Shaft	?	27.5	1.19	Ivory
2063	Small mammal	1	Long bone	Shaft	?	11	0.31	Grey/ white
2063	Small mammal	1	Long bone	Shaft	?	6.7	0.15	White

Table 6: *Results of the analysis of the faunal remains*

Animal bone fragments were only identified from the urned sub-adult burial, context [2063]. A total of 15 fragments of cremated animal bone were present. A number of fragments could be matched, making up a total of 12 bone portions. The bones weighed a total of 7.72g (0.15-1.87g) and measured 6.7 to 36.1 mm.

Many of the fragments could not be identified to specific elements as they were too small, with very limited morphological features present. The majority of the fragments derived from long bones (73.33% (11/15)) with only 20.00% (3/15) from the skull and 6.67 (1/15) from the spinal column. Of the long bones, three fragments were identified as possible radius, one possible metapodial and one proximal epiphysis of a tibia. The elements represented were from both meat rich areas of the animal and those of low food utility such as heads and feet (O'Connor 2000, p.165).

Bone portion	***Weight***	***No. of Bones***	**%**
Skull	0.56g	3	20.00
Vertebrae	0.49g	1	6.67
Long bone	6.67g	11	73.33
Total	7.72g	15	100.0

Table 7: *Quantification of Elements by Zone*

Only three fragments could be identified to a possible species. Two of these elements were likely to be fragments of radius of either fox (*Vulpes vulpes*) or dog (*Canis domesticus*) and one was the right radius of a smaller ungulate, such as sheep or goat (*Ovis sp./Capra sp*.). The remainder of the fragments were identified to the generic categories of either small or medium sized mammal. The 'medium mammal' fragments were 'sheep/goat sized'. Due to the difficulty in identifying remains it is therefore possible that the fragments identified as 'small mammal' could fall into the category of 'medium mammals' if the specific element was identified. Therefore, the minimum number of individuals remains at 2 and the faunal bones are likely to represent one small carnivore and one small ungulate.

Fox and dog are commonly found on Early Bronze Age sites. Serjeantson (2001, p. 32) notes a frequency of approximately 28% for the South East of England. The wither's height for dogs during this period varied from 43-63cm (Serjeantson, 2011, p. 31) with the smaller sizes being consistent with foxes. Sheep/goat represent approximately 20% of the main domesticates (Cattle, pig, sheep/goat) in the Neolithic and Early Bronze Age (Serjeantson, 2011, p. 14). By the Early Bronze age, only few sites had faunal remains but from these it appears that sheep was the dominant species over cattle and pig, which was almost non-existent (Serjeantson, 2011, p. 67). Sheep were far more dominant than goat in the archaeological assemblages in Southern Britain and were approximately the size of Soay sheep (Serjantson, 2011, p. 29). Serjeantson (2011) records the presence of sheep remains on 80.6% of Late Neolithic and Early Bronze Age sites in Southern Britain.

Ageing information was present on one vertebral fragment, with a fully fused epiphyseal ring, suggesting an adult individual. The species was not identified but the fragment was sheep sized.

Sex could not be identified as not morphological features were present.

Information on cremation could be gained from the colour of the bone. The colour of the bone was highly variable ranging between black, grey, ivory and white. With the black being heated at the lowest temperature (charred ~300º) and the white bone completely oxidised (>600º). The variability of burning depends on the fat content on the bone and the proximity of the fire, which varies from element to element. The calcined (white/white-grey) state of the bones indicated burning above 450°-500°C (Lyman 1994, 389). The bone did not display any evidence of warping but did show transverse and longitudinal cracking and splitting, which suggests that the bone was at least green or fleshed at the time of cremation (Lyman 1994, 387).

Butchery marks were present on two elements identified as possible radius of fox or dog (13.33% (2/15). The elements had been crushed, causing distortion and hindering positive identification, though the fragments appeared to be from the same element (or type of element). One of the fragments (Plate 1) measured 16.8mm and had been severed at both ends with the cut surface showing bevelled edges to both posterior and anterior, with a series of fine lines on the surface cut either by a saw or by a knife cutting the bone in a forwards and backwards movement to create the series of striae. The margin of the cut surface displayed a series of transverse knife marks appearing as 'slip marks' created in the process of cutting the bone. A flange of bone was present around the inner cortex of the shaft, suggesting that the cut was not quite complete and that after severing with a blade from either side of the bone, the shaft was snapped into two halves, leaving a hinge of bone remaining in the centre. The anterior portion of the bone had a series of three diagonal knife marks running along the shaft as well as a series of finer shorter knife marks appearing in random directions.

The second bone (Plate 2) measured 36.1mm and had one severed surface and one modern break. The cut surface had a similar bevelled edge both to the posterior and anterior aspects. A series of knife marks were present along the margin of the cut surface, again most likely representing 'slip marks' in the cutting process.

Shaft cut marks on the radius are commonly noted in butchering processes, with these type of diagonal marks on the anterior aspect of the radius associated with filleting/skinning marks (Type

RCp-6) (Binford 1981, p. 133). Binford noted that bone may have been subject of further cutting to reduce the size of the bone to fit into cooking vessels (1981, p. 133). However, the identification of fox/dog in association with cut marks on the bone is relatively uncommon in the archaeological assemblage (Hambleton 2008, p. 37). Knife marks on these mammals, although indistinguishable from cuts of skinning for cooking purposes, are more likely to be associated with skinning for fur, as foxes were commonly hunted for their pelt (Allen 2004, p. 91) and even dog were subjected to this treatment (Nieuwof 2012, 113). Hambleton (2008, p. 85) noted that fox was one of the wild animals most frequently found partially articulated, suggesting that they may have been utilised in a different manner than typical “food species”. Nieuwof (2012, p.118) also noted that dog was treated in a similar manner to humans in a burial context in terms of location, suggesting a close association between humans and dogs. In this context, post-mortem modification could well have served ritual purposes (Nieuwof 2012, p. 113).

Plate 1: *Possible fox/dog radius with multiple cut marks. The bone was severed both ends with a sawing action and snapped off. MCB [2063].*

Plate 2: *Possible fox/dog radius with cut marks along severed margin. MCB [2063].*

11. Presence and Type of Pyre Debris

11.1 Introduction

The presence and type of pyre debris is analysed in order to ascertain the nature of pyre technology and can be used to provide an insight into the type of deposit. Recent experimental reconstructions of pyre sites have determined that distinct features and types of debris can be left by former pyre sites and in particular that the use of different materials alters the type and form of deposit (Marshall, 2005).

11.2 Observations

For burial [2063], charcoal was recorded as being 'frequently' present in the fill of the urn [2063] and abundant charcoal was observed in the flot from the environmental sample. The back fill of the pit [2064] contained only a small amount of charcoal. Both contexts [2063] within the urn and [2064] outside the urn contained only a few fragments of likely fuel ash slag.

Similar to the urned burial [2063] described above, charcoal was observed as 'frequent' within the fill of the pit containing [2086] and the majority of the bone and charcoal was recovered from the pit base. Abundant charcoal was noted in the flot of the environmental sample from burial [2121].

11.3 Results

Pyre debris is consistently present in all three deposits in the same contexts as the burnt bone. It appears that the funerary rituals undertaken did not require that all the pyre debris was deposited separately, a practice observed elsewhere in Bronze Age burials (McKinley, 2008). The deliberate inclusion of pyre debris in the fill of Bronze Age cremation graves has been interpreted as indicating the proximity of the burial location to the site of the pyre, even if there is no direct evidence of a pyre site (McKinley, 2008). However, given the portability of cremated remains in containers, only substantial amounts of pyre debris found uncontained within pits or features may suggest close proximity of the pyre site. Even so, this does not rule out the possibility of pyre debris also having been placed in an organic container and carried some distance.

Similar sites in the locality of Middleton Cheney exhibit a range of behaviours with regard to pyre debris deposition. No debris was found within the fill of the collared urn cremation burial at Upton, Northamptonshire (Foard-Colby and Carlyle, 2008), despite the fact that the urn contained the almost complete remains of one adult individual. At Finmere Quarry in North East Oxfordshire, no charcoal was observed in the urned cremation burial, either within the pit or within the urns. However, a charcoal rich fill in a pit was discovered containing a very small quantity of human bone. Within 6m of these cremation pits, 3 further pits containing charcoal rich deposits without burnt bone were also excavated and dated to the same period as the urns (Hart *et al*. 2010, p.106). The bone deposits here were small and described to be 'token' (Hart *et al*. 2010, p.100).

At Weldon, Northamptonshire, there was evidence of burning in situ (Jackson 1974). Six Bronze Age cremations were found in shallow pits or depressions or associated with dark ashy patches, though to be the site of the fire or small pyre. The subsoil beneath ashes showed traces of reddening, which suggested they were *in situ* and that this had been the site of the fire. Pit 2 also had reddened sides up to 7cm in thickness and was thought to have contained a fire, possibly representing a *bustum* style cremation pit (See Dodwell, 2012, pp. 141-149). Similarly, the excavation of a Bronze Age barrow at Earl's Barton, Northamptonshire revealed a rectangular burnt surface, fire reddened with a scatter of charcoal and a burnt plank or log, located under the centre of the barrow (Jackson, 1984, p.9).

There was neither any evidence of pyre debris being dumped in nearby pits nor of a pyre site at Middleton Cheney. The significant quantities of pyre debris present along with the deposits of human bone suggest that there was a less thorough sorting of bone from debris than found at Upton. Evidence for burning in situ is rare as pyre sites are vulnerable to later disturbance and truncation (McKinley 2001), so little inference can be made from the lack of evidence found at Middleton Cheney. However, the lack of evidence for substantial quantities of debris in other dumps or pits, such as has been found at Finmere Quarry, might suggest that the site of the cremation pyre was outside of the area of excavation and that the cremated remains had been transported to this specially selected spot for burial.

12. Conclusion

The osteoarchaeological analysis of the cremated bone recovered from Middleton Cheney confirmed that all three burials contained human remains (See Table 6 below).

	2063	***2086***	***2121***
Type of deposit	Urned burial	Unurned burial	Unurned burial
Disturbance	Disturbed	Slightly Disturbed	Undisturbed
Total weight of cremated materials	1184.5g	1080.3g	740.6g
Quantification of bone -Human	139.2g	108.0g	16.3g
Minimum Number of Individuals	1	1	1
Demographic data: Age	Sub-adult: 11-12.5 years	Adult: 25+ years	Sub-adult: 12+ years (+ Possible Adult)
Demographic data: Sex	Unobservable	Possible Female	Unobservable
Pathology data	None	Degenerative Joint Disease Humeral Head	None
Maximum Fragment Size	59.6mm	73.9mm	47.7mm
Degree of fragmentation – average fragment size	10	10	5
Efficiency of the cremation	White (95%) Blue/Grey (5%)	White 100%	White 100%
Presence and type of pyre goods	15 fragments animal bone including 2 modified fragments fox/dog and small ungulate.	None	None
Presence and type of pyre debris	Abundant Charcoal in Enviro. Sample Few fragments ?fuel ash slag	Abundant Charcoal in Enviro. Sample	Abundant Charcoal in Enviro. Sample

Table 6: *Summary of Osteoarchaeological Observations for the Cremated Bone Burials*

Urned burial [2063] was associated with the remains of a sub-adult individual aged between 11 and 12.5 years, whereas unurned burial [2086] contained the remains of an adult, likely to be a female and at least 25 years of age at death. This individual exhibited degenerative joint disease of the shoulder. Unurned burial [2121] represented only the partial remains of a minimum of one individual, with some sub-adult bone fragments being present. The nature of this deposit of burnt bone is more ambiguous than the other burials, both of which contained sufficient amounts of bone to represent a complete body. It has not possible to ascertain if the fragments from burial [2121] are associated with one, or possibly even both, of the other burials or represents the partial remains of a third individual.

An assessment of the relationship between the deposits of cremated bone could only be independently established using DNA analysis. Whilst DNA has successfully been extracted from Bronze Age cremated bone (Brown, 1995), it does not survive in bone that has been heated to 700° or above for a substantial period of time (Harbeck *et al*. 2011). Additionally, mitochondrial DNA is more likely to survive than nuclear DNA in cremated bone (Finegan *pers*. *comm*., Harbeck *et al*. 2011). Mitochondrial DNA (mtDNA) is of more limited use in identifying individuals and matching bone fragments since it is maternally inherited and shared by all maternal relatives (Parsons and Weedn, 1997, p. 112). It would not be possible, therefore, to differentiate between bone fragments belonging to a group of individuals related maternally using solely mtDNA, although it may be possible to establish maternal kinship.

Analysis of the identified human bone elements and fragmentation patterns revealed some interesting observations regarding recovery techniques and deposition. Given that bone fragments upon handling and processing, as well as post-deposition, it was clear from the consistency in the size of fragments between burials that each deposit of bone had received similar post-mortem treatment. The pattern of zonation of elements also suggested that there was no evidence of preferential selection of elements from particular areas of the body or fragment sizes between the deposits, both for complete and partial individuals. Nonetheless, it was interesting to note that there were higher quantities of identifiable elements in the deposits of complete individuals. This may indicate that the deposit of partial remains [2121] were the remnants of a selection procedure based perhaps in part upon the recognition of elements. However, there may also be other unknown factors contributing to the composition of the bone deposits, such as pyre management techniques or disarticulation of elements during the cremation process. All three burials contained complete small bones and an abundance of charcoal mixed in with the cremated bone deposits, indicative of a collection method of bone involving sweeping the remains together, rather, than solely hand-picking all elements from the pyre debris. The vast majority of the bone was cremated to at least 600° for a substantial period of time to complete the oxidation process, the exception being denser parts of the skull of sub-adult burial [2063]. Post-deposition preservation of the bone was very similar for all three burials, irrespective of the mode of burial. Any preservation effects that may have been afforded by the provision of the urn in [2063] were negated by the subsequent disturbance by ploughing and infiltration of soil into the container. The younger age of the individual in combination with these taphonomic effects resulted in a reduced maximum fragment size and less bone being present than in the unurned burial of the adult female [2086].

Only the urned cremation burial [2063] of the sub-adult contained pyre goods. These consisted of the skeletal remains of a small carnivore, probably fox or dog, as well as a small ungulate, such as a sheep or goat. The modified fragments of fox or dog represent the discarded lower limb portions, likely to be a bi-product of skinning for pelt preparation. It is not possible to distinguish between skinning for fur or meat and there is a possibility that a fox or dog skinned for its fur could also have been consumed. However, evidence from contemporary sites suggests that diagnostic butchery marks on canid remains are rare. Being a bi-product, the modified fragments do not confirm whether the deceased was wearing the pelt at the time of cremation but it is clear that the fragments of fox/dog were of ritual significance in this funerary context, whether as a totemic type of offering or associated with an item of personal adornment for the deceased or the bereaved. Small ungulates such as sheep are frequently recorded in Bronze Age cremation deposits and, though these fragments exhibited no sign of butchery, they could either represent a food offering or remnants of a funerary feast.

Cremation was practised as a funerary rite throughout the Bronze Age, though predominantly in the early and middle Bronze Age periods (McKinley 2001). A shift in funerary practices occurred during the transitional period from the Neolithic to the Early Bronze Age, reflected by the diversity of burial practices in Oxfordshire (Hind 2006), Northamptonshire (Chapman 1999) and Buckinghamshire (Biddulf, 2008) at this time. In general, there was a change from communal burials of commingled remains associated with large monuments, such as causewayed enclosures, henges, chambered cairns, long and oval barrows and mortuary enclosures towards the more individual, cremated bone burials of the Bronze Age in round barrows and flat cemeteries, though these are often situated near to Neolithic monuments. Early Bronze Age burials have been excavated at Radley Barrow Hills, Devil's Quoit complex, Yarnton, Gravelly Guy, Stanton Harcourt and Dorchester in Oxfordshire. Grave goods are recorded as present at several of these sites, indicating an increase in the use of wild animals for such items in the Early Bronze Age (Hind 2006). Species included red deer, roe deer, boar and eagle at Radley Barrow Hills. More exotic goods have also been discovered, such as amber, shale, jet, faience, copper neck rings and awls, polished flints, antler picks and antler combs. There has been some evidence for biers and coffins from Beaker burials in the area. Although traditionally regarded as a Bronze Age practice, some cremation burials from Oxfordshire have been dated to the early Neolithic period and radiocarbon dating is crucial to accurately identify the age of many cremated bone deposits (Hind 2006).

In Northamptonshire, similarly dated changes in funerary customs are seen, with disarticulated and articulated inhumation burials dating to the Neolithic associated with mortuary enclosures at Aldwincle, Grendon and Tansor, in addition funerary monuments at Briar Hill, Dallington, Southwick, Cotton Henge and Redlands Farm, Stanwick. These sites continue to form a focus for funerary activity into the Early Bronze Age, although at this time, barrow and flat cemeteries also appear, such as at Cowthick near Weldon, Ashton Roman Town and Warmington (Chapman 1999). Three large Bronze Age cemeteries are recorded in Northamptonshire at Briar Hill, Chapel Brampton and Kelmarsh, containing at least 27, 28 and 21 cremated bone burials respectively (Chapman 1999). Inhumation and cremation burials are often discovered from the same sites. At Aldwincle, Northamptonshire, two Bronze Age inhumation burials of male adults were excavated from barrows with a large number of grave goods, including arrowheads, a scraper, a spatula, a boar's tusk and a grindstone. Both individuals had been interred in coffins. One of the skeletons was in a disarticulated state and partially burned. Two cremated bone burials were also discovered and were poorly oxidised (Jackson 1976). Similarly at Weldon, Northamptonshire, both inhumation and cremation burials were discovered, three of the six cremation burials being accompanied by collared urns, two of which were accessory vessels (Jackson 1974). Some sites, such as at Weldon, reveal evidence of burning *in situ* and suggest interment of cremated bone at the site of the cremation ceremony. The excavation of a Bronze Age barrow at Earls Barton, Northamptonshire also revealed that the mound covered the original pyre site and was radiocarbon dated to 1219-1264 BC (Jackson 1984).

A cremation burial in a collared urn as well as an unurned cremated bone deposit was inserted into a barrow mound containing planked-lined inhumations at Gayhurst Quarry, Buckinghamshire (Biddulf, 1998), suggesting that here also, cremation chronologically followed inhumation as a funerary practice. In Milton Keyenes, several ring-ditches have been excavated revealing the remains of cremated individuals. At Warren Farm ring-ditch, a cremation burial was discovered containing the remains of female between 15-20 years of age and of a neonate. The remains of a second, cremated neonate was located outside of the ring-ditch (Biddulf, 1998). One cremated individual aged between 8-16 years old was found east of the River Ouzel, dating to 1693-1305 cal. BC and the Cotton Valley ring-ditch was found to enclose two cremation burials placed in inverted collared urns thought to date to 1977-1208 cal. BC. (Biddulf, 1998).The vast majority of evidence for funerary practice in Buckinghamshire during the Neolithic and Early Bronze Age period, however, is from inhumation burials. No evidence for burning in situ has been reported.

Evidence of pyre technology from this period suggests that large timbers, usually oak, were used to construct the frame of the pyre with brushwood infills of cherry, sloe and alder (McKinley 2001). In some cases during this period, such as at Earl's Barton, mounds were constructed over the collapsed pyre containing the human remains, whereas in others remains were collected and interred. Re-deposited pyre debris that has been recovered from ring-ditch fills, such as at Twyford Down, Winchester, where the line of tipping indicated that the interior area of the ring may have been used as a pyre site (McKinley 2001). Pyre debris has also been noted to have been deliberately deposited in small pits as well as in the backfill of cremation burials. Mound burial was also common during the Bronze Age and was an important means of creating monuments to the dead for the living in the surrounding landscape. Their substance, form and location would have important symbolic significance and would have formed part of the structured understanding of the environment and people's place in it (Tilley 1994). Thus, the construction of a barrow would have represented a significant social investment by a population. It has been observed that many Bronze Age funerary landscapes would have been relatively open pasture lands (Parker-Pearson, 1999) and that colours and undoubtedly other properties of purposefully selected materials may have played an important role in the construction of barrows and their contextual 'viewscape', such as that at Upton Pyne 284b in East Devon (Owoc, 2006.) Here a Bronze Age mound containing the remains of at least 3 infants had been capped with an orange clay subsoil. McKinley (2001) notes that the primary burials within mounds are frequently those of adult females and infants, possibly denoting the practice of matrilocal residence at this time, a pattern also detected in Buckinghamshire by Green (1974, cited by Biddulf, 1998).

In contrast, cremation burials are also found in flat cemeteries or in small groups, such as those at Middleton Cheney, and these have been noted in both Oxfordshire and Northamptonshire. Due to the lack of over-ground demarcation, these are usually found unexpectedly and it is more difficult to understand these types of deposits due to their comparative rarity and seemingly sporadic discovery. A number of these burials show similarities and appear to be located outside of ring ditches, such as at Finmere Quarry (Hind 2006). It is interesting to note the parallels between the small group at Middleton Cheney and Finmere Quarry, where a small cluster of pits were noted in close proximity. Nonetheless, the cremation pits contained only token bone deposits and the neighbouring pits contained pyre rich deposits at Finmere Quarry. At Middleton Cheney, much more bone was present and there were no pits containing only pyre debris. The mode of deposition within an inverted collared urn for burial at Middleton Cheney [2063] was very similar to that at Upton, Northamptonshire. Here, the urn contained similarly complete remains but no pyre debris, unlike at Middleton Cheney where abundant charcoal was recovered from all three burials. The evidence suggests that the sorting and dumping of pyre debris at all these sites was undertaken using different approaches and that localised differences are present in cremation and burial practices.

Also of note at Middleton Cheney is the presence of the urn, copper pin and ceramic spoon, all provided for the sub-adult burial as funerary goods as well as the modified dog/fox and small ungulate elements representing pyre goods. No similar finds were present in the burial of the adult or deposit of incomplete remains. Similarly at Finmere Quarry, the pair of collared urns was associated with sub-adult remains. The few cremated bone burials reported in Buckinghamshire also appear to consist of young individuals and sub-adults. This seemingly special treatment of young and sub-adult remains in at least some flat cemeteries in central England may be in keeping with some observations made of cremated bone burials in barrows of the Bronze Age. However, the remains contained in an urn at Upton were adult (although no pyre or funerary goods were deposited) so rituals were clearly localised in form.

The osteological analysis of the cremated bone deposit has provided independent evidence for the practise of cremation during the Early Bronze Age in central England, raising questions regarding the nature of these deposits and local funerary rites:

- One of the deposits is now known to contain a small amount of cremated remains that do not represent a complete individual. How does this relate to the other two burials? Are there similar burials in the locality?
- What is the significance of the animal bone in the deposit of burnt material? Is there evidence of other faunal remains at Middleton Cheney?
- Is the pottery present typical of vessels interred with cremated bone at other sites?
- How do these burials relate to other features on site at Middleton Cheney?
- Does the context of this deposits reveal any spatial or temporal patterning in the ritual landscape during the prehistoric period?

The evidence presented by this analysis suggests that highly developed funerary rituals of symbolic significance had taken place at Middleton Cheney. It is clear that further research and the recovery of more comparable material would allow a greater insight into burial practices of this nature in the area to be gained.

13. Future Recommendations

No further analysis of the bone is required at this stage, though future DNA research of the bone may help clarify the nature of the relationship between the three deposits in terms of kinship and identity. It may also be possible that further identification of the animal bone fragments could be investigated using DNA analysis.

14. Acknowledgements

Osteological analysis and report writing were carried out by Gaynor Western and Tania Kausmally of Ossafreelance. Thanks are due to Martin Cuthbert of Archaeological Services and Consultancy Ltd. for the provision of context information.

REFERENCES

Allen, T., Barclay, A. and Lamdin-Whymark, H.	2004	Opening the wood, making the land. The study of a Neolithic landscape in the Dorney area of the Middle Thames Valley. In Cotton, J & Field, D, *Towards a New Stone Age: aspects of the Neolithic in south-east England*. CBA Research Report series 137. York: Council for British Archaeology, pp. 82-98.
Biddulf, K.	1998	*Neolithic to Early Bronze Age Buckinghamshire: A Resource Assessment*. http://thehumanjourney.net/pdf_store/sthames/phase3/County/Neolithic%20&%20Early%20 20Bronze%20Age/Neolithic%20&%20Early% 20Bronze%20Age%20Buckinghamshire.pdf
Binford, L	1981	Ancient Men and Modern Myths. New York: Academic press.
Brickley, M & McKinley, J. I. (eds)	2004	Guidelines to the Standards for Recording Human Remains. *IFA Paper No. 7* in association with BABAO.
Bond, J. M.	1994	The Cremated Animal Bone. In The Anglo-Saxon Cemetery at Spong Hill, North Elmham: Part VIII The Cremations. McKinley, J. *East Anglian Archaeology* 69
Broendsted.	1965	*The Vikings.* Penguin.
Brown, K. A., O'Donoghue, K. and Brown, T. A.	1995	DNA in Cremated Bones from an Early Bronze Age Cemetery Cairn. In *International Journal of Osteoarchaeology* (5), pp 181-187.
Buikstra, J. E. and Ubelaker, D. H.	1994	*Standards for Data Collection from Human Skeletal Remains* Arkansas Archaeological Survey Research Series no. 44
Carnegie, S. and Filmer-Sankey, W.	1993	A Saxon 'Cremation Pyre' from the Snape Anglo-Saxon Cemetery, Suffolk. In Filmer-Sankey, W. (Ed) *Anglo-Saxon Studies in Archaeology and History,* Vol. 6, Oxford: Oxbow Books.
Champman, A.	1999	*An Archaeological Resource Assessment of the Neolithic and Bronze Age in Northamptonshire*. East Midlands Research Framework: Resource Assessment of Neolithic and Early Bronze Age Northamptonshire. Northamptonshire Archaeology.

Charlier, P., Poupon, J., Goubard, M. and Deschamps, S.	2009	"In This Way They Held Funeral for Horse-Taming Hector": A Greek Cremation Reflects Homeric Ritual. In Schepartz, L., Fox, S. and Bourbou, C. (eds.) New Directions in the Skeletal Biology of Greece (Hesperia Supplement). Princeton, New Jersey: American School of Classical Studies at Athens, pp. 49-56.
Correia, P. M. M.	1997	Fire Modification of Bone: A Review of the Literature. In (eds) Haglund, W.D. and Sorg, M.H. *Forensic Taphonomy: the Postmortem Fate of Human Remains.* Florida: CRC Press LLC, pp. 109-138.
Crescimanno, A. and Stout, S. D.	2012	Differentiating Fragmented Human and Nonhuman Long Bone Using Osteon Circularity. In *J. Forensic Sci.* Vol. 57, 2, pp.287-294.
Dodwell, N.	2012	Early Bronze Age Busta in Cambridgeshire? On-Site Experiments to Investigate the Effects of Fires and Pyres on Pits. In Mitchell, P. and Buckberry, J. (eds) *Proc. 12th Annual Conference of BABAO.* BAR S2380. Oxford: BAR.
English Heritage	2002	*Human Bones from Archaeological Sites: Guidelines for producing assessment documents and analytical reports*. English Heritage, Centre for Archaeology Guidelines.
Foard-Colby,A. and Carlyle, S.	2008	*A Bronze Age Cremation Burial from Upton, Northampton: Upton Flood Attenuation* (Phase 2) Archaeological Watching Brief. Northamptonshire Archaeology 08/78.
Gejvall, N. G.	1969	Cremations. In Brothwell, D. and Higgs, E. (eds.) *Science in Archaeology* (2nd Edition) London: Thames and Hudson, pp. 468-479
Gonçalves, D., Thompson, T. J. U., and Cunha, E.	2011	Implications of Heat-Induced Changes in Bone on the Interpretation of Funerary Behaviour and Practice. In *Journal of Archaeological Science* (38), pp. 1308-1313.
Hambleton E.	2008	*Review of middle Bronze Age - late Iron Age faunal assemblages from Southern Britain*. Research Department Report Series number 71-2008. English Heritage.

Harbeck, M., Schleuder R.,Schneider, J., Wiechmann, I., Schmahl, W.W. and Grupe, G.	2011	Research Potential and Limitations of Trace Analyses of Cremated Remains. *Forensic Science International* (204), pp. 191-200.
Hart, J., Kenyon, D. and Mudd, A.	2010	Excavation of Early Bronze Age Cremations and a Later Iron Age Settlement at Finmere Quarry, North East Oxfordshire. *Oxoniensia* (75), pp. 97-132.
Hind, J.	2006	Neolithic and Early Bronze Age Oxfordshire. Solent Thames Research Framework. Draft copy. http://oxfordshirelocalhistory.modhist.ox.ac.uk/pdf/STRF%20Neolithic%20and%20early%20bronze%20Age.pdf
Holden, J. L., Phakey, P. P. & Clement J. G.	1995	Scanning Electron Microscope Observations of Heat-Treated Human Bone. In *Forensic Science Int.* 74: 29-45
Jackson, A. D.	1974	Bronze Age Burials at Weldon, Northamptonshire. *Northamptonshire Archaeology*, 9: pp. 3-12.
Jackson, A. D.	1984	The Excavation of a Bronze Age Barrow at Earls Barton, Northamptonshire. *Northamptonshire Archaeology* (19): pp. 3-30.
Lange, M., Schutkowski, H., Hummel, S. & Herrmann, B.	1987	*A Bibliography on Cremation.* Strasbourg: PACT.
Marshall, A. J.	2005	Experimental Cremation of Prehistoric Type. http://www.brad.ac.uk/acad/archsci/field_proj/amarsh/cremexp.htm
Lyman, R.E	1994	Vertebrate Tahonomy. Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press.
McKinley, J.	1993	Bone Fragment Size and Weights of Bone from Modern British Cremations and their Implications for the Interpretation of Archaeological Cremations. In *Internat. J. Osteoarchaeology* 3, 283-7.

McKinley, J.	1994a		Bone Fragment Size in British Cremation Burials and its Implications for Pyre Technology and Ritual. In *J. Arch. Sci:* 21, 339-342
McKinley, J.	1994b		The Anglo-Saxon Cemetery at Spong Hill, North Elmham: Part VIII The Cremations. *East Anglian Archaeology* 69
McKinley, J.	1997		The Cremated Human Bone from Burial and Cremation-Related Contexts. In (ed.) Fitzpatrick, A. *Archaeological Excavations on the Route of the A27Westhampnett Bypass, West Sussex,1992. Volume 2: the Late Iron Age, Romano-British and Anglo-Saxon cemeteries.*Salisbry, England: Wessex Archaeology Report No. 12, pp. 55-72.
McKinley, J., Smith, P and Fitzpatrick, A. P.	1997		Animal Bone from Burials and Other Cremation Related Contexts. In (ed.) Fitzpatrick, A. *Archaeological Excavations on the Route of the A27Westhampnett Bypass, West Sussex,1992. Volume 2: the Late Iron Age, Romano-British and Anglo-Saxon cemeteries.*Salisbry, England: Wessex Archaeology Report No. 12, pp. 73-76.
McKinley, J.	2001		*Bronze Age Cremation.* Transcript from a presentation made at the conference of The Cremation Society of Great Britain. Pharos International: 5-10.
McKinley, J.	2008		*Beacon Hill Wood, Shepton Mallet, Somerset (BHN07/W67060). Middle Bronze Age Urned Cremation Burial*. Wessex Archaeology.
Murray, K. A. & Rose, J. C.	1993		The Analysis of Cremains: A Case Study Involving the Inappropriate Disposal of Mortuary Remains. In *J. Forensic Sciences*: 3, 98-103.
Nieuwof, A.	2012		Of dogs and man. Finds from the Terp region of the Northern Netherlands in pre-Roman and Roman Iron Age. In Raemaeters DCM, Esser, E, Lawrence RCGM and Zeiler, J.T (eds) *A bouquet of archaeozoological studies. Essays in honour of Wietske Prummel*. Barkhuis & University of Groningen Library.
O'Connor, T.	2000		The Archaeology of Animal Bones. Stroud: Sutton Publishing.

Owoc, M.	2006	Beyond Geoarchaeology: Pragmatist Explorations of Alternative Viewscapes in the British Bronze Age and Beyond. In Robertson, E. C., Seibert, J. D. and Fernandez, D. C. *Space and Spatial Analysis in Archaeology.* UNM Press, New Mexico.
Parker-Pearson, M.	1999	The Earlier Bronze Age. In Hunter J. and Ralston, I (eds). *The Archaeology of Britain.* Routledge. London.
Parsons, T. J. and Weedn, V. W.	1997	Preservation and Recovery of DNA in Postmortem Specimens and Trace Samples. In (eds) Haglund, W.D. and Sorg, M.H. *Forensic Taphonomy: the Postmortem Fate of Human Remains.* Florida: CRC Press LLC, pp. 109-138.
Piga, G., Thompson, T. J. U., Malgosa, A. and Enzo, S.	2009	'The potential of X-ray diffraction in the analysis of burned remains from forensic contexts', *Journal of Forensic Sciences*, 54 (3), pp.534-539.
Pusch, C. M., Broghammer, M. and Scholz, M**.**	2000	Cremation practices and the survival of ancient DNA: burnt bone analyses via RAPD-mediated PCR. In *Anthrop. Anz.* 58 (3): pp.237-251.
Salter, R.	1999	*Textbook of Disorders and Injuries of the Musculoskeletal System*. 3rd ed. Maryland: Williams and Wilkins.
Scheuer, L. and Black, S.	2004	*The Juvenile Skeleton*. London: Elsevier Academic Press.
Serjantson, D.	2011	*A Review of Animal Remains from the Neolithic and Early Bronze Age of Southern Britain.* Research Department Report Series number 29-2011. English Heritage
Smith, B. H.	1991	Standards of Human Tooth Formation and Dental Age Assessment. In Kelly, M.A. and Larsen, C. S. (eds.) *Advances in Dental Anthropology.* New York: Wiley-Liss, pp. 143-168.
Thompson, T.	2002	The Assessment of Sex in Cremated individuals: Some Cautionary Notes. In *Can. Soc. Forens. Sci. J*. Vol. 35 (No. 2), pp. 49-56.

Thompson, T. J. U., Gauthier, M. and Islam, M.	2009	'The application of a new method of Fourier Transform Infrared Spectroscopy to the analysis of burned bone', *Journal of Archaeological Science*, 36 (3), pp. 910-914.
Tilley, C.	1994	*A Phenomenology of the Landscape: Places, Paths and Monuments*. London: Berg Press.
Wells, C.	1960	A Study of Cremation. In *Antiquity* XXXIV, 29-37.
Williams, H.	2005	*Cremation in Early Anglo-Saxon England.* http://www.ex.ac.uk/archaeology/rcremation.html
Williams, H.	2008	Towards an Archaeology of Cremation. In (eds) Schmidt, C. W. and Symes, S. A. *The Analysis of Buried Human Remains.* London: Elsevier, pp. 239-270.

THE ARCHIVE

Type	No	Type	No
Basic Context & Weights Recording Form	3	CD-Rom Database	1
Bone Fragment Analysis Recording Form	3		
Pyre Technology Recording Form	3		

COPYRIGHT