Oxford Archaeology: Cassington West CASW05 – as yet unpublished, reference to be added as soon as the site is published, or grey literature.

Cremated human remains report

Human remains

By Sharon Clough

Six cremation burials each containing the remains of a single adult dated to the Late Bronze Age were recovered from individual deposits. The cremated remains were highly fragmented and white in colour varied in weight from 101g- 1573g. Further redeposited cremated material was recovered from eight contexts. Human remains have been found in this period in and around settlements and are thought to form a legitimacy for socio-political power from the close association with the ancestors for the people who resided there.

Table : Deposits of cremated human bone over 100g in weight

Feature Number	Fill Number	Weight (g)
19723	19724	289
19781	19782	836
19797	19798	1573
23191	23192	512
23515	23516	212
23653	23654	101

The process of cremation

The information available from cremated bone is less extensive than that from unburned bone. However, it is possible to make inferences about the pyre technology and what happened to the bone after this rite. When a body is cremated, the skeleton is not destroyed, but changes to the colour and composition of the bones do occur. During the cremation, all the moisture is evaporated out of the bone, and the organic component (chiefly collagen) is combusted, leaving only the mineral portion. The bones also fragment and can become distorted in shape with some shrinkage occurring.

It is mostly the body fat that fuels the heat of a cremation. Observations in modern crematoria suggest that once the temperature has reached about 800 °C the fat will ignite, and the fuel jets can actually be turned off. When the body has been cremated, and the pyre has cooled down, the bone fragments are collected. These may be buried directly in the ground, in a small pit, but more usually they are collected together in an urn or in a cloth bag. If they have been collected in an organic container such as a cloth bag, or even a wooden box, this will not survive the burial process, so it will appear that the cremated bone is "loose" in the soil. Collection of the entire cremated skeletal remains rarely occurs. This may have been because the relatives (or undertakers) were not very efficient in collecting all the cremated bone from the pyre (the pyre would comprise a heap of charcoal, partially burnt wood, and possibly stones or burnt clay from the lining of the fire pit). Or because it wasn't important to collect all the burnt bone, and only a token handful or two was collected for burial. Perhaps only certain body parts were deliberately selected for burial. Notions about a culture can be inferred if they seem to collect, for example, the skull in particular, it may suggest that they think the head is particularly important.

Weight of cremated bone

The six cremation burials from Cassington all have a weight of over 100g. They varied from 101g- 1573g. It is frequently found that 50% or less of the bone available after cremation is included in the burial (McKinley 2000). Experiments (McKinley 1997) have found that it is

fairly easy to collect all the bones from an undisturbed pyre, which often remain in anatomical order. McKinley (2000, 404) states that the weight of bone of an adult cremation from a modern crematoria varies from about 1000 to 3600g. This would suggest that cremation deposit 19798 with the highest weight 1573g comprised the majority of the individual. Whereas the other 5 deposits represent a token amount only. It is possible that the amount of bone collected reflects the status of the individual.

It is expected that in a complete dry skeleton (which is approximately the same as a cremated skeleton) the percentages by weight of the different elements are as follows:

Skull: 18.2% (cranium, facial bones and jaw)	Upper Limbs: 23.1% (shoulders, arms and hands)
Axial Skeleton: 20.6% (vertebrae, ribs, pelvis)	Lower Limbs: 38.1% (legs and feet)

Therefore, if the remains of a complete skeleton were collected then the bone was weighed, the proportions would be expected to be as above. From the six cremation deposits available an average of 74% of the bone fragments were not identified. So any results are tentative. There does not appear to be any collection bias within the cremation deposits (see Appendix Table). The higher weighted cremations had a fairly even distribution of elements. The slightly higher amounts of skull bone observed probably has more to do with the ease they are identified compared to other bones.

Pyre technology

The efficiency of a cremation is influenced by the following factors: the construction of the pyre, quantity of wood, position of the body, tending of the pyre, weather, duration of the cremation and pyre temperature (McKinley 2000, 407; McKinley 1994, 82-84). The cremated bone after the cremation pyre has finished reflects the temperatures achieved during the process. Cremated bone may range in colour from brown or black (slightly charred), through hues of blue and grey, to and the brilliant white associated with full oxidisation (McKinley 2000, 405). All 14 cremation deposits were predominantly white in colour. Only three (19210, 19724 and 23192) had some very occasional black.

Table : Colour of bone with temperature achieved

Red/orange	185 °C
Dark Brown/black	285 °C
Black	360 °C
Dark greyish brown	440 °C
Light greyish brown	525 °C
White	645-1200 °C

The higher proportion of white bone present, the hotter the cremation pyre was. Sometimes, the pyre may be hot, but it may go out too quickly for the whole skeleton to have been fully oxidised (which is what makes the bone turn white). The less oxidised the bone is, the darker it is in colour. Different parts of a body burn at different temperatures. The amount of body fat has a lot to do with how well a body burns. Adults cremate better than children. Therefore, parts of the body with little fat, such as the hands and feet, may not burn as well as the torso. Also, the hands and feet may have lain on the outside of the pyre and therefore received less direct heat.

From this we can infer that there was good pyre technology amongst the cremations at Cassington. The pyre must have reached over 645°C for enough time and the whole of the individual was within the hottest area.

Fragmentation

The average fragment size from the six cremations was 54 mm ranging from 35 - 75 mm. The majority of fragments, 56.1%, were in the 10-4 mm fraction. This was closely followed by >10 mm fraction with 40% of the fragments. This suggests high fragmentation levels, which has affected the identification of some elements (see above). The majority of fragmentation occurs after burial and then excavation. Fragmentation occurs along the dehydration fissures which formed during the cremation process. McKinley (1994, 340-1) observed that in a sample of over 4000 cremations over 50% of bone fragments were in excess of 10 mm in size with the largest fragment 134 mm, with an average maximum fragment size of 45.2 mm (including immature and disturbed cremations). This also suggests that there was more than average fragmentation amongst the Cassington cremated bone.

Through examination of the individually excavated spits (every 20 mm) it has been possible to determine that there was no order seen in the distribution of elements. As previously discussed, it is possible to collect the bones from a pyre in anatomical order and thus deposit them in a container still reflecting this order. This order was obviously not kept for these cremation deposits by the time it reached burial.

Ageing, Sex and pathology

All the cremated bone deposits were found to be adult and from a single individual. Three (19782, 19798, 23192) were possibly from a mature adult (35-64). One cremation burial (23192) may have been a male. Probably due to the majority of the cremation burials having low weights and high fragmentation there were only two observed pathologies. These were root caries on a premolar seen in cremation deposit 23192 and cribra orbitalia (iron deficiency anaemia) seen in the orbit of 23652.

Redeposited cremated material

In addition to the six cremation burials a further eight cremated human bone deposits were found (19210, 19337, 19612, 19621, 19963, 19708, 23520, 23652). In all these contexts the quantity of bone was very small, between 0.5g and 75g, the majority (5) below 10g. It seems most likely that these have been redeposited in later features and may have entered the deposit through many means. With cremation burials being placed so close to settlement activity, it is not unusual to find very small amounts in other features. If the pyre site was nearby or the cremated bone was held in a container in the structure before deposition in the earth then it is likely these very small amounts found their way into other features. It is also possible that small token amounts from a cremated individual were placed in and around a structure, in the same way we scatter ashes in a favourite or significant place today.

Human bone

The four cranial fragments found in deposit 19976 are from an adult individual. These fragments were not burned but very degraded having lost most of the cortical surface and the sides were rounded and abraded. This suggests that these fragments were residual, not placed there immediately after skeletalisation.

Discussion

The ability in the Bronze Age to cremate the dead very efficiently, resulting in fine white, fragmented bone compounds the problem of identification of individual elements and therefore age and sex. The cremated bone deposits from Cassington have revealed limited information, they comprise six cremation burials all of which were adult, with a further eight residual deposits of very low weights. However, inferred from the fact that even the small bones (phalanges of hands and feet) were white is that there was a well tended pyre. Adding

more fuel and stoking the pyre would result in a more even burning of the body and contribute to higher fragmentation levels, which have been observed in these cremation deposits. Only one deposit could be described as 'sooty' from which we can infer that the bones may have been shovelled up whilst still hot, then deposited in water or winnowed. This would cool the bone rapidly causing further fragmentation. The heavy debris would sink to the bottom (bone, large lumps charcoal, grave goods), then when the water was poured off the bone could easily be collected. This could explain why small and large bones were collected, as it is a much quicker method than waiting for the pyre to cool and then labour to collect all the fragments. It could also explain why only one deposit was sooty, the water having 'cleaned' the cremated bone. There was no burning of the surrounding soil from the cremation burials which suggests the cremated bone was deposited when cool.

Spatially there was a wide distribution of the cremated deposits (all 14). Though the deposits with higher weights (<100g) are found mainly in the south-west part of the site. Except for two, they are not directly associated with a structure. The two which are associated a structure (19859/19860), deposits 19798 and 19782, are the heaviest cremations, both of a mature adult. It is possibly significant that these two deposits lie adjacent to one another. Though whether they are contemporary with the structure is not known.

These cremation burials do not represent a cemetery as such. They are more consistent with occasional burial over a long period of time, reflecting a small population. Brück (1995, 256) examined Late Bronze Age human remains and found deposition in post holes at the entrance to settlements, which may have marked out or protected it. She also suggests that establishing family or lineage on one's land was a way of legitimising claims to the area. The cremation burials at Cassington lie within the settlement area and may have been part of this legitimising process. Cremating the body is a two part process, which results in burial of the cremated remains. The site of the funeral pyre and the rite of cremation followed by collection and sorting of the ashes is the first part of this process, perhaps the more spatially liminal part. There is no evidence of a pyre, nor in situ burning on the site at Cassington. It must be assumed that the pyre was away from the settlement and that after cremation, the ashes were brought back to the settlement for burial. This separation of rites may have ensured that any association with liminality or pollution from the first part has dispersed caused by the physical distance between them. The ritual is brought to a close by the interment in the ground of the ashes in and around the settlement. This attitude to the dead is seen further through the excavation on Gardom's edge in the Peak district (Edmonds and Seaborne 2001, 182). Excavation of a building thought to be Late Bronze Age revealed a cremation beneath the floor. The ashes of a young woman were contained in a pit which lay under a single phase timber building. The presence of the ashes suggest that it was customary to keep the dead close. Returning the ashes to rest in and around the dwellings of those who were tied by the closest bonds of blood and descent enabled foundations for close identification with the place they lived. Their location perhaps marked household shrines, or the strong presence ensured fertility of the land.

Appendix - osteological methodology

On site where a deposit was identified as containing cremated bone, it was excavated in spits of 20 mm. These were then processed as environmental samples, which involved wet sieving at 3 fraction sizes. These were <10, 10-4 and 4-2 mm mesh size. The human bone was extracted from the samples in the <10 and 10-4 mm fractions and the 4-2 mm fraction was retained for examination. The weight of the bone retained in each fraction and spit was recorded and its percentage of the total weight of the cremation was calculated. This enabled the degree of fragmentation to be quantified in each cremation. The degree of fragmentation may indicate if further processing of the cremated bones had occurred after the burning of the body on the pyre.

The bones retained from each sieve size were examined in detail and sorted into the following identifiable bone groups: skull (including mandible and dentition); axial (clavicle, scapula, ribs, vertebra and pelvic elements); upper limb and lower limb. The separation of the bone into these groups helps illuminate any deliberate bias in the skeletal elements collected for burial. Each sample was weighed on digital scales and details of colour and largest fragment were recorded. Where possible, the presence of individual bones within the defined bone groups was noted. Any unidentifiable fragments of long bone shafts or cancellous bone, which are often the majority recovered from cremations, were weighed and incorporated into any subsequent quantitative analysis. The prevalence of unidentifiable bone is largely dependent on the degree of fragmentation, whereby larger fragments are easier to identify than smaller ones.

It must also be taken into consideration that some skeletal elements are more diagnostic and more easily identifiable than others and, therefore, more often recorded. This may create bias in calculations of the relative quantities of skeletal elements collected for burial.

Fragments below a certain size are not distinguishable as to whether they are human or animal except microscopically or chemically. This resulted in several deposits being identified as undetermined. Some deposits identified in the assessment as cremated have been re-examined and found to be uncremated.

Age estimations from cremated remains are dependent on the survival of particular age diagnostic elements. In adult cremations, the most useful age indicators are degenerative changes to the auricular surface (Lovejoy et al. 1985) and pubic symphysis (Suchey and Brooks 1990) and cranial suture closure (Meindl and Lovejoy 1985).

Cremated bone was recovered from 28 contexts. On closer examination 14 of these contained enough diagnostic material to determine that they were human bone. One context previously considered cremated bone was found to be unburned human skull. Of these 14 cremated human bone deposits six are considered to have sufficient weight (over 100g) and diagnostic elements to be called a cremation deposit. The remainder are probably residual.

Table : Contexts containing human bone

Context	*Total Weight (g)*	*Colour of bone*	*MNI*	*Age*	*Pathology*	*Comments*
19210	29	white, occ. Blue & black	1	Adult		Cranial and long bone frags
19337	0.5g	white & blue	1	Adult		Tooth root
19612	3	white	1	Adult		Tibia frag
19621	0.5	white	1	?		Unidentified very small frags
19708	75	white, occ. blue	1	Adult		Cranial, vertebral, humeral, tibia frags.
19724	289	white, black and very occ. blue	1	Adult		Tooth roots, cranial frags, vertebral frags, humeral, metacarpal, femoral phalanges frags
19782	836	white	1	Adult - mature		Tooth roots, cranial frags, vertebral frags, humeral, metacarpal, femoral phalanges frags
19798	1573	white, occ. Blue/grey	1	Adult - mature		Tooth roots, cranial frags, vertebral frags, humeral, metacarpal, femoral, tibial phalanges frags. Plus more.
19963	0.5	white	1	?		Skull frag
23192	512	white, occ. Blue & black, sooty	1	Adult - mature	Caries - premolar root.	?male. Tooth roots, cranial frags, vertebral frags, humeral, metacarpal, femoral, tibial phalanges frags. Plus more.
23516	212	white	1	Adult		Tooth roots, phalanges, cranial frags
23520	6	white, occ. Blue	1	?		Unidentified frags
23652	72	white	1	Adult	Cribra orbitalia?	Cranial frags
23654	101	white, v occ blue	1	Adult		Cranial frags, humeral frag

19976 - Adult 4 cranial fragments, not cremated.

Not human, not cremated
19710
23066

Not diagnostic, not cremated
21677

Not diagnostic, cremated
19776
21039
21055
21087
21132
21680
23470
23499

Not cremated, but human
19976

Mislabelled
23657 (should be 23654)

Table : Six cremation deposits weight, element and fragmentation

Deposit Number	Total weight (g)	<10mm weight (g)	10-4mm weight (g)	4-2mm weight (g)	Unidentified %	Skull %	Axial %	Upper limb %	Lower limb %	Maximum fragment size (mm)
19724	289	152	137	-	70.9	15.2	1	7.6	5.1	51
19782	836	375	461	-	66.8	15.07	6.9	3.4	7.6	70
19798	1573	595	861	117	75.6	5.4	5.5	4.8	8.4	75
23192	512	201	303	114	76.1	6.4	0.58	1.36	16	53
23516	212	45	167	-	99.5	0.47	0	0	0	35
23654	101	53	48	-	59.4	30.6	0	9.9	0	45

Bibliography

Brück, J, 1995, A place for the dead: the role of human remains in Late Bronze Age Britain, *Proceedings of the Prehistoric Society* **61**, 245-277

Edmonds, M and Seaborne, T, 2001 *Prehistory in the Peak* Gloucestershire

Lovejoy, C.O, Meindl, R.S, Pryzbeck, T.R. and Mensforth, R.P. 1985 Chronological metamorphosis of the auricular surface of the illium: a new method for determination of adult skeletal age-at-death. *American Journal of Physical Anthropology* **68**, 15-28

McKinley, J, 1994 *The Anglo-Saxon cemetery at Spong Hill, North Elmham, part VIII: The cremations* East Anglian Archaeology Report number 69.

McKinley, J, 1997, Bronze Age 'barrows' and funerary rites and rituals of cremation in *Proceedings of the Prehistoric Society* **63**, 129-145

McKinley, J 2000 The analysis of cremated bone, in *Human Osteology in Archaeology and Forensic Science*, (eds M Cox and S Mays) 403-421 London

Meindl, R S, and Lovejoy, C O, 1985 Ectocranial suture closure: A revised method for the determination of skeletal age at death based on the lateral-anterior sutures, *American Journal of Physical Anthropology* **68**, 29-45

Suchey, J.M, and Brooks, S, 1990 Skeletal age determination based on the os pubis: a comparison of the Acsádi-Nemeskéri and Suchey-Brooks method. *Human Evolution* **5**, 227-238