Human remains in archaeology

A handbook

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CHAPTER THREE

Disposal and preservation of the dead

3.1 Introduction

The focus of this book is the analysis and interpretation of human remains from archaeological sites. Two of the most important factors that will determine the type and quality of the remains analysed are how the dead were disposed of and what happened to the body after death, before it was excavated. The first section of this chapter briefly describes and summarises methods of disposal through time from the Palaeolithic to the Early Modern period, with a focus on Britain, although it should be appreciated that people around the world have treated and do treat their dead in very many different ways (eg see Barley 1995; Parker Pearson 1999a).

In Britain today the majority of the dead are cremated rather than inhumed; this is because cremation is generally cheaper, is perceived as 'cleaner', and graveyards are filling up fast in our overcrowded country. However, as McKinley (2006, 81) has emphasised, modern cremations are 'stripped of "ritual" and reduced to a utilitarian means of disposing of the dead': this is very different from what we see in the past. Cremation was legalised in Britain in 1884, and the building of crematoria was most intense between 1950 and 1969 (Davies 1995, 2005). People are, of course, also using more novel methods of disposing of the dead, for example dispersing cremation ashes in fireworks (http://www.heavensabovefireworks.com), and many are opting for natural 'green' burials in coffins of traditional materials (http://www.somersetwillow.co.uk), often in rural areas that are considered to be more 'wildlife friendly' than conventional burial grounds (http://www.naturaldeath.org.uk). In effect, people are taking greater control over what happens to them following death, and hopefully embracing death as a part of life, as we see in other countries of the world (Carmichael and Sayer 1991). Prior to the Roman period, which was characterised by an expansion of formal cemeteries, there was greater diversity in the treatment of the dead, including a leaning towards more 'natural' disposals similar to those currently gaining in popularity.

3.2 Disposal of the dead

> *The provision of a final resting place for someone's mortal remains is generally a carefully thought through procedure which may have taken days, months or even years to plan and execute. Burial is thus a deeply significant act imbued with meaning*
>
> (Parker Pearson 1999a, 5)

(i) Introduction

Societies through time have disposed of their dead to show respect, for health reasons, and to fulfil religious obligations (Iserson 1994); the word 'burial' comes from the Anglo-Saxon word 'birgan' which means to conceal, and the dead have been buried in a wide variety of ways over the long time span for which we have evidence for human occupation (Figure 11). Archaeologists have also, since time immemorial, had a strong interest in excavating human remains from funerary contexts. Unfortunately that interest has not always been driven by a desire to discover information about the people themselves through their remains, and we have seen, and still see, many instances where associated grave goods have been the target of investigations. Thankfully, in Britain (at least now) we have systematic and scientific approaches to, and an interest in, the excavation of the whole of the funerary context, ultimately providing an integrated understanding of how people lived and died. The study of the mortuary context is not without its challenges in archaeology. Scholars over the years have suggested that archaeologists will never understand mortuary practices as they were so complex (Tarlow 1999), and studies of methods of disposal of the dead in traditional societies have further supported this concern (Ucko 1969). 'The simple equation of practice with belief, and the existence of cross-cultural regularities or of stable and conservative rituals and traditions cannot be taken at face value' (Parker Pearson 1999a, 44). Nevertheless, study of disposal of the dead in archaeology is alive and well! We will now look at the most common methods of disposal in Britain from the early prehistoric to post-medieval periods.

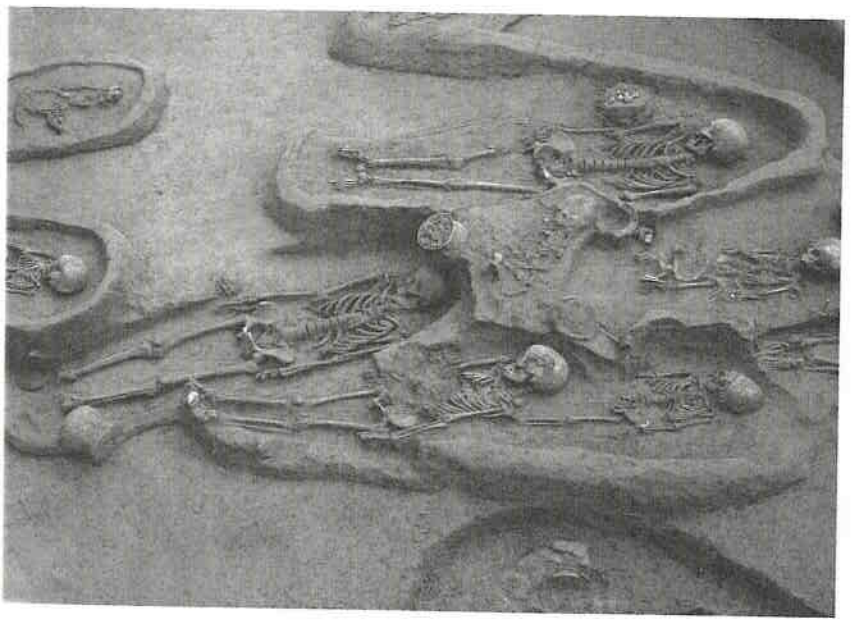

Figure 11: Burial from the late Neolithic site of Man Bac in Ninh Province, North Vietnam (1500–1000 BC) (with permission of Lorna Tilley, Australian National University)

(ii) Prehistory

Finding the dead who were buried in the past can be a challenge and all those that were buried in Britain from prehistory to the Early Modern period have certainly not yet been discovered and excavated, and never will be. This might be because the areas in which they were buried have not seen archaeological attention yet, perhaps because they are in rural areas that are not under threat of modern building development, or because the places in which they were buried do not preserve human remains (eg acidic soils of Scotland and Wales and parts of south-east England). However, it could equally be because their burial sites are just not visible. There have been extensive debates about when humans first developed an awareness of death, but it is generally agreed that it occurred within the last 100,000 years (Middle/Upper Palaeolithic) and possibly around 25,000–20,000 BP. It is also accepted by many that Neanderthal burials from the Middle Palaeolithic were likely deliberate, such as Burial 4 in Shanidar Cave, Iraq where it appears that flowers had been placed on the grave indicating that the burial had occurred during the summer (Leroi-Gourhan 1989). Prior to discussing the disposal of the dead in prehistory, a note on the dates used for specific sites should be provided. Based on Scarre (2005), for the Paleolithic period dates will be given in 'years ago' (years before present [BP]) and the other dates have been provided in calendar years (BC/AD).

In Britain there are few human remains that have been excavated for the Palaeolithic in general. This could be due to the fact that population density would have been very low at that time, the available areas for occupation would have been restricted to the south-west of England and Wales (free of ice), and at that time there was no recognised funerary practice. The burial environment and, to a certain extent, how long a body has been buried, affect the survival of human remains, making discovery and subsequent excavation rare. Thus, for the Palaeolithic, these factors probably contribute to the lack of evidence. Most of the evidence for human remains comes from cave sites in the south-west of England and Wales, for example the Lower Palaeolithic site of Pontnewydd Cave in Wales dated to *c* 225,000 BP (Cook *et al* 1982). While the oldest remains of humans have been found at Boxgrove in Sussex dated to the Lower Palaeolithic at 500,000 BP (Roberts and Parfitt 1999), and Barnfield Pit, Swanscombe in Kent (*c* 400,000 BP: Stringer and Hublin 1999), the oldest known formal 'ceremonial' site where human remains are deposited is at Paviland Cave in Wales, dated to *c* 24,000 BP, or the Upper Palaeolithic (Aldhouse-Green and Pettitt 1998). Here a male was buried with walrus ivory bracelets and perforated seashells, and covered with red ochre. A recent find of a humerus from Eel Point on Caldey Island, south Wales, dated to 24,470±110 BP (Gravettian or Mid-Upper Palaeolithic) is suggested possibly to have come from a cave and it becomes the third oldest anatomically modern human remain from Britain (Schulting *et al* 2005). There have been also human remains of Late Upper Palaeolithic date, mainly skull fragments, found in Gough's Cave (11,820±120 BP–12,380±110 BP), and in Sun Hole Cave (12,210±160 BP), Cheddar in Somerset (Currant *et al* 1989; Barton 1999). At the latter site there is clear evidence for deliberate deposition of adults and children.

Figure 12: Neolithic chambered tomb at Camster, Caithness, Scotland (with permission of Chris Scarre)

In the Mesolithic (8000–4000 BC), which commenced just after the end of the last Ice Age, Britain became an island as sea levels rose (Mithen 1999). Again the discovery of human remains from this period in Britain is rare. Some skeletal material from Gough's Cave in Somerset has been dated to the Mesolithic (*c* 5100 BC: Newell *et al* 1979) and there are other cave sites that have produced human remains of this date. For example, Aveline's Hole in the Mendip hills, Somerset, is the earliest scientifically dated cemetery, which was in use *c* 8200 BC (Keith 1924; Schulting 2005). It was discovered and excavated in the late 18th and early 19th centuries and 50–100 skeletons were found articulated on the cave floor. Unfortunately, the remains were 'lost' before analysis (http//:capra.group.shef.ac.uk/5/avelineshole.html), but between 1914 and 1933 the University of Bristol Spelaeological Society excavated the fragmentary remains of around twenty individuals. Recent research has found evidence of childhood stress in the teeth and bones, and toothpick grooves on the teeth (Jacobi 1987; Schulting and Wysocki 2002; Schulting 2005). Microwear analysis on the teeth suggests that plant foods probably played an important part in the diet, more than would be expected for a hunter-gatherer group, but stable isotope data suggests high consumption of animal protein. At cave sites in Derbyshire and Wales, for example Caldey Island (Schulting and Richards 2002), fragmentary skeletal remains have been excavated, while in Scotland excavations of shell middens have revealed some evidence for the disposal of human remains, usually in the form of bone fragments and teeth (for example, those excavated on the island of Oronsay, Orkney: Mellars 1987). These Palaeolithic and Mesolithic people were hunter-gatherers and often on the move searching for wild animals and plants; consequently, one would not normally expect to find formal cemeteries. However, in some areas of Europe such as Scandinavia formal cemeteries of these periods *are* found.

It is not until the Neolithic and the first agricultural communities in Britain (4000–2500 BC) that a plethora of very visible burial monuments appears. This includes earthen long barrows and stone cairns (Figure 12), with or without internal chambers for the placing of the dead, for example Belas Knap in Gloucestershire, Wayland's Smithy in Berkshire (Atkinson 1965) and West Kennet in Wiltshire (Piggott 1962). Usually the skeletal remains are found disarticulated, meaning the skeleton is not anatomically positioned. Thus, the deposit may contain the bones of many people mixed together, representing successive disposals of the dead, possibly following other treatment such as exposure of the body and/or 'curation' of remains. At West Kennet around 50 unburnt inhumed individuals were excavated from the central chambers; most of the disarticulated remains and finger bones had been placed in gaps in the stone walling of the chambers. At some sites, there appears to be 'zoning' of the burial chambers into areas for males and females and different age groups, including at West Kennet (Whittle 1999). Formal resting places for the dead also included passage graves (eg in Ireland – Newgrange, County Meath: O'Kelly 1973, and the north of Scotland – eg Maes Howe on Orkney; Henshall 1963 and 1972), the ditches of causewayed enclosures (eg Hambledon Hill, Dorset), henges, round barrows (north-east England), and latterly in the Neolithic, houses. From the middle Neolithic onwards individual burials are also found under cairns or in small enclosures (eg Radley, Oxfordshire: Bradley 1992; Whittle 1999). At Hambledon Hill there appears also to have been a mixture of mortuary treatments, including exposure, excarnation, and probable defleshing (McKinley pers comm, November 2007). Clearly the range of different disposal sites and methods used for the dead is impressive and illustrates how important these monuments were in society at

Figure 13: Bronze Age barrows at Lambourn, Berkshire (with permission of Chris Scarre)

that time, how it would have needed many people to construct them, and also how significant the treatment of the dead had become.

During the Bronze Age (2600–800 BC) both cremation and inhumation were practised. McKinley (1997) provides a very good overview of funerary rites and rituals of cremation in Bronze Age contexts, and has also described what cremation pyres consisted of (McKinley 1998, 18), although the few pyre sites that have been found that are of Bronze Age date have been covered by a barrow. Crouched individual burials were made in graves beneath round barrows (Figure 13) in southern England (eg Crichel Down, Dorset) or in stone-lined graves (cists) sealed beneath cairns in northern England and Scotland; this was a change from the Neolithic where collective burial was the norm. However, in the 'Beaker' period (see below), there appears to be growing evidence for collective graves (McKinley pers comm, November 2007). By the middle Bronze Age cremation was universal (Parker Pearson 1999b), and from this point on burial appears to have been more closely associated with settlements (Ray 1999). At certain points in the Bronze Age, characteristic grave goods such as 'Beaker' pottery (*c* 2000–1600 BC), and rich items (*c* 1700–1500 BC), appear and have been utilised to signify 'Beaker' people/culture and 'Wessex' people/culture (for example, West Overton G6b: Smith and Simpson 1966; and Bush Barrow, Wiltshire, respectively). At Bush Barrow, the male burial was accompanied by a range of rich grave goods, including three metal daggers and an axe, a probable helmet, a lozenge-shaped plate of sheet gold, and a macehead (Megaw and Simpson 1979). In the Wessex culture, barrows were clustered together and different forms are noted: 'bell', 'bowl', 'disc', and 'pond'. In the later Bronze Age, there is little evidence for burials and it is likely that disposal of the dead took place in locations that are essentially the most invisible to the archaeologist, such as in water. However, while cremation appears to have been most common, there is evidence for other disposal methods, such as formal inhumation burial.

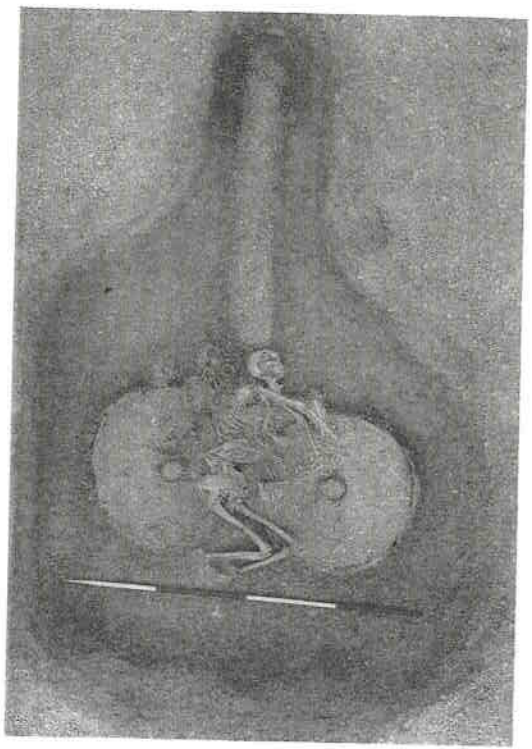

Figure 14: Iron Age chariot burial from Wetwang Slack, Yorkshire (with permission of Oxford Archaeology)

Disposal of many of the dead in Britain in the Iron Age (late 800 BC–AD 100) was likely by excarnation or the scattering of cremated remains, and there appears to have been some interest in disposal at watery places such as rivers (Darvill 1987; Bradley 1998). Cunliffe (2005) defines three stages of mortuary behaviour in Iron Age Britain. The 8th to 6th centuries BC saw the preference for cremation coming to an end, but inhumations were still very rare. In the 5th to 1st centuries BC (middle Iron Age) inhumation and excarnation were practised, and regular cemeteries with crouched burials are also seen. Bodies and redeposited disarticulated and decomposed human remains were also disposed of in pits and ditches on settlement sites, for example at Maiden Castle in Dorset (Goodman and Morant 1940). It is clear from the remains excavated that excarnation was practised, where the dead body was initially exposed to the elements, but also excarnation without exposure. There was a particular interest in the head, as seen on some settlement sites where remains of skulls are more common than other parts of the body (Cunliffe 2005). Burials with grave goods were not common in southern England until the late Iron Age (100 BC–AD 43) and river finds also increase at this time (Bradley 1998). In specific regions of the country we see different burial traditions (Stead 1979; Haselgrove 1999): for example, in north and east Yorkshire, the Arras tradition is characterised by the grouping together of small barrows in large cemeteries (eg at Burton Fleming), rich vehicle burials (eg at Wetwang Slack, Figure 14), and individual barrows surrounded by rectangular ditched enclosures (Cunliffe 2005). In south-west England disarticulated unburnt remains are seen on settlement sites and in hillforts (Darvill 1987), and there are individual crouched burials in cist graves set in rows (eg at Harlyn Bay, Cornwall where 130 inhumations were found). In the late Iron Age, cremation was reintroduced to the south-east of England, but there was also, from the late 2nd century BC until the Roman invasion, a group of elite individuals that were buried with weapons or mirrors, depending on the sex of the person (Cunliffe 2005); most are found in Yorkshire. We must not of course forget the famous bog body, that of Lindow Man from Cheshire (Brothwell 1986), also dated to the Iron Age and illustrating a more unusual method of disposal for this period.

Compared to previous periods, there are few burials apparent, which can perhaps be explained by unconventional (and invisible) disposal; indeed, over large parts of Britain there is no evidence of burial. In the 1st century BC, not only do more formal cemeteries appear (Hill 1995), but cremation reappears, as seen, for example, in the burials from the Aylesford cemeteries in Kent. By the Roman conquest in AD 43 cremation burial in an urn was a very common method of disposal, although inhumation continued even after the Roman Conquest (Whimster 1981).

(iii) The Roman period

Burial practice in Roman Britain was 'dynamic and regionally varied' (Philpott 1981, 1). When the Romans conquered Britain in AD 43 both inhumation and cremation were practised, although inhumation was rare in some regions. At the Roman Conquest the predominant burial rite in the south and east of England was cremation, and this did continue (*ibid*). However, from the middle of the 2nd century AD there was a clear switch to inhumation, reflecting changes in Italy and the Western provinces which had occurred earlier in the century.

Inhumation burials are found in a number of urban and rural contexts from the mid-2nd century onwards: major towns, small towns, forts and vici, and villas, and also as isolated burials in and around buildings (Esmonde Cleary 2000); from the mid-3rd century inhumation burial was common in all the Roman provinces and was maintained until the end of the Roman era in Britain (Philpott 1981). In major towns such as at Winchester, Hampshire (Clarke 1979), Cirencester, Gloucestershire (McWhirr *et al* 1982), and Colchester in Essex (Crummy *et al* 1993), cemeteries were usually placed next to roads; in the Roman Empire burial within the boundary of a town was forbidden (because of sanitary precautions and the fear of defilement: Toynbee 1971). In effect, 'the dead were the first of a town's citizens to be encountered on entering the town, and the last to be left behind on quitting it' (Esmonde Clearly 2000, 136). Very few burials have been excavated from forts and vici (but see Cool 2004), such that Esmonde Cleary (2000, 129) states that, 'the study of burial at military sites can hardly even be described as being in its infancy'. Similarly, burials at villa sites are rare (eg Lullingstone, Kent: Meates 1979; Rudston, east Yorkshire: Stead 1980), although not for infant burials (Rebecca Gowland pers comm, November 2007). Nevertheless, other contexts for Roman burials include the reuse of prehistoric monuments, disposal in wet places (wells, shafts, pits), and particular body parts have even been found at some sites, for example skulls at the mid 2nd-century AD site of Walbrook, London, where younger males were identified (Bradley 1998; Bradley and Gordon 1988). Infants (up to 18 months old) tended to be treated separately and are rarely found in adult cemeteries until the 4th century AD (Philpott 1991). They were disposed of in shallow 'scoops' under floors, in pits and ditches, in enclosures, and occasionally in discrete infant cemeteries. Grave goods are rare (coins and pottery).

Inhumed bodies were placed supine (on their backs) in an extended position with varied positioning of the arms, hands, legs and head, usually in an earth-cut grave (*ibid*). In some rural areas, even as late as the 3rd century AD, the late Iron Age crouched burial tradition continued (but this was more common in the early Roman period). Also, the evidence for decapitated burials in the Roman period (eg at Driffield Terrace, The Mount, York: Hunter-Mann 2006; Figure 15) shows some continuity with the Celtic veneration of the human head, but prone and/or decapitated individuals are relatively rare and are mostly found in the 3rd and 4th centuries AD. The skulls of decapitated individuals may be missing or buried separately nearby, replaced on the neck area in the correct anatomical position, or placed elsewhere in the grave (Philpott 1991).

The poor were placed directly in simple marked graves, or occasionally in wooden coffins, while the rich were buried in elaborately decorated stone or lead coffins (Toynbee 1971). Sometimes the grave was lined with stone slabs or ceramic tiles and some bodies were shrouded, had coverings of gypsum plaster or lime, or were embalmed (Philpott 1991). By the 3rd and 4th centuries AD, the majority of burials were simple and unfurnished. Grave goods to honour the dead and make them feel comfortable in the afterlife included pottery and glass vessels, food for the journey to the underworld, coins in the mouth, armour and

Figure 15: Burial with grave goods from the Roman cemetery of Driffield Terrace, York (with permission of York Archaeological Trust)

weapons, cooking implements, gaming counters, and children's toys (Toynbee 1971). Women were often accompanied by toilet boxes with mirrors, tweezers and cosmetics, and also jewellery. With the adoption of Christianity in the 4th century AD, there is a decline in grave goods, the most common inclusions being hob nails from boots. Orientation of the body with the head to the west, facing east, is a feature often associated with Christianity.

By the middle of the 3rd century, cremation was rare (Wacher 1980), but some rural areas and small towns continued the tradition, and even in London there is evidence for cremation in a late Roman context (Barber and Bowsher 2000). In fact, evidence now suggests that cremation was actually more common than has been believed, especially in northern frontier areas (eg Cool 2004) and in towns such as Winchester and London (McKinley pers comm, November 2007). During the mid-1st to 3rd centuries the majority of cremations took place on pyres away from the final burial site, but in close proximity, and the cremated bone was collected and placed (mainly) into pottery jars (Philpott 1991). The container was then placed in an earth-dug pit which may have been lined with wood, stone slabs or tiles; occasionally brick chambers were constructed. Less common was cremation in situ. Many cremation burials were accompanied by grave goods, especially pottery vessels, but also non-ceramic items such as vegetable food remains (Barber and Bowsher 2000). At the late Romano-British site of Brougham in Cumbria, McKinley (2004a) excavated and analysed 322 contexts and sub-contexts containing cremated bone. There were urned, unurned, and otherwise 'contained' cremation burials with or without associated

pyre debris in the grave fills, along with accessory burials (related to the main burial, urned, or unurned), discrete formal pyre debris deposits, and cenotaphs (very small quantities of bone buried outside the confines of the cemetery). Pyre debris consists of 'all the material remaining at the pyre site after the bone and pyre goods intended for "formal" burial have been removed' (McKinley 2004a, 284). Redeposited pyre debris often contains cremated bone and fuel ash (charcoal), pyre goods, and possibly burnt flint/clay/soil and fuel ash slag; pyre debris has been found for most periods in Britain where cremation has been practised (eg at Brougham and also at the Eastern Cemetery in Roman London: Barber and Bowsher 2000); it signifies that there has been a 'formal' burial close by (McKinley 2000a, 2004a).

(iv) The early medieval period

Inhumation and cremation (urned or unurned remains) were both practised in the early medieval period (*c* AD 410–*c* 1050), but only inhumation is seen in the later part of the period. Cremation was certainly predominant in East Anglia and Yorkshire but not in the south and south-east of England. The vast majority of East Anglian and Yorkshire cremation burials were urned (Figure 16), as were most in the south of England, but rites varied (McKinley pers comm, November 2007). Certainly by AD 600 in southern Britain cremation had been superseded everywhere by inhumation (Hills 1999). Both rites included the provision of pyre/grave goods and grave goods, respectively, although by the 7th and 8th centuries those provisions had diminished. By the 8th century, high-status graves have also disappeared and more simple inhumation graves with no grave goods are found. This illustrates a major shift away from the religious beliefs of the late Roman period (Lucy 2000). Unique evidence for burial at this time is represented by a special mound burial dated to the 7th century AD at Sutton Hoo in Suffolk (Carver 1998). Here, a richly furnished grave, which included Christian artefacts, illustrates the strong and extensive links that England had with the east, including Scandinavia, Egypt and eastern Europe (Lucy and Reynolds 2002).

In the 5th to 6th centuries the position of the body tended to be supine and extended, with the arms by the sides and legs straight or slightly bent (Figure 17, and Daniell and Thompson 1999); the head was usually at the west end of the grave. However, prone (laid on the front, and possibly seen as punishment) and crouched burials (foetal position) have been noted (Figure 18), along with burials made on their sides. As we have seen for the Roman period, large inhumation cemeteries are seen, for example at Castledyke South, Barton-on-Humber, east Yorkshire (late 5th/early 6th to late 7th century AD) (Drinkhall and Foreman 1998), and at Edix Hill, Barrington, Cambridgeshire (6th–7th century AD) (Malim and Hines 1998), along with occasional large cremation cemeteries such as at Spong Hill in Norfolk, the largest cremation cemetery excavation to date (6th century AD) (McKinley 1994a). Between the late 8th century and the 11th century, Viking settlement spread across much of England but the evidence for (pagan) burial is sparse (Daniell and Thompson 1999). Two sites in Derbyshire,

Figure 16 (right): Cremation urns at Anglo-Saxon Spong Hill, Norfolk (Number 1665: Urn numbers 2192 and 2193 of two older adult cremations; copyright: Norfolk Historic Environment, Norfolk Museums and Archaeology Service)

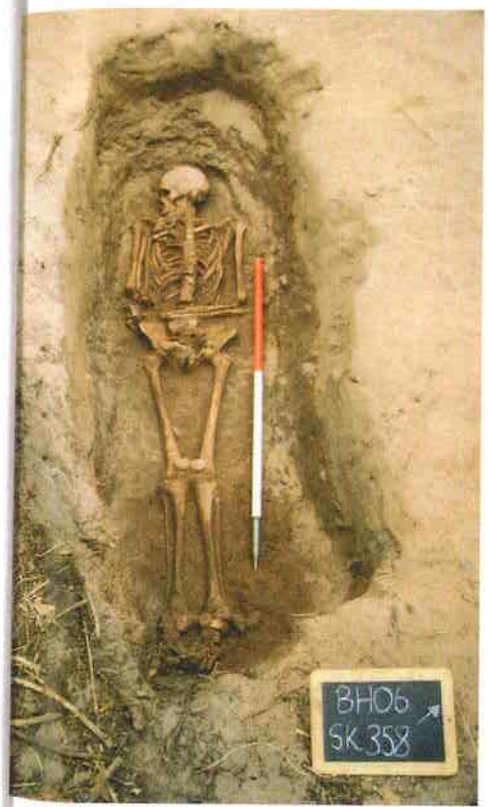

Figure 17 (below left): Extended Anglo-Saxon burial at Bamburgh Castle, Northumberland (with permission of Sarah Groves and the Bamburgh Castle Project)

Figure 18 (below right): Crouched Anglo-Saxon burial at Bamburgh Castle, Northumberland (with permission of Sarah Groves and the Bamburgh Castle Project)

however, do illustrate how different the disposal of the dead could be at that time, even when the sites were in close proximity (4km) (J D Richards 1999): at Ingleby (9th–10th century AD), cremations were found and the remains reburied following excavation (McKinley pers comm, November 2007), while at Repton there were individual inhumation burials and a mass grave (9th century AD. Christian burials are also seen in churchyards later in the period, for example at the 10th- to 11th-century cemetery at Raunds in Northamptonshire (Boddington 1996).

(v) The late medieval period

During the late medieval period (*c* AD 1050–1550) Christianity, as advocated by the Catholic Church, prevailed and burial for the majority was by inhumation of the unburnt corpse in graveyards associated with parish churches (eg at St Helen-on-the-Walls, York: Dawes and Magilton 1980). There are other 'contexts' too that have produced human remains from formal cemeteries, for example leprosy hospitals (eg that of St James and St Mary Magdalene, Chichester, Sussex: Magilton *et al* 2008); non-leprosy hospitals (eg St Bartholomew's, Bristol: Price and Ponsford 1998); monasteries (eg St Andrew, Fishergate, York: Stroud and Kemp 1993); mass graves (eg victims of the battle at Towton, Yorkshire: Fiorato *et al* 2007; and victims of the 14th-century plague at East Smithfield, London: Hawkins 1990; Margerison and Knüsel 2002; Figure 19); and charnel houses (eg at Rothwell Church, Northamptonshire: Roberts 1984; Garland *et al* 1988).

Figure 19: Part of the 14th-century Black Death cemetery at East Smithfield, London (with permission of the Picture Library, Museum of London and Andy Chopping)

The majority of people were buried in an east–west orientation, with the head to the west, supine and in an extended position (Figure 20). Higher-status burials were afforded coffins of wood, lead or stone (Roberts and Cox 2003), but for the vast majority, a simple shroud was used (Daniell 1997). Some graves were lined with stone, tile, metal, or brick and in some cases head supports in the form of stones or pillows were placed in the grave or coffin (Gilchrist and Sloane 2005). Grave goods were rare but can be seen early in the period, just after the Norman Conquest. For example, at St Nicholas Shambles, London, pebbles had been placed in

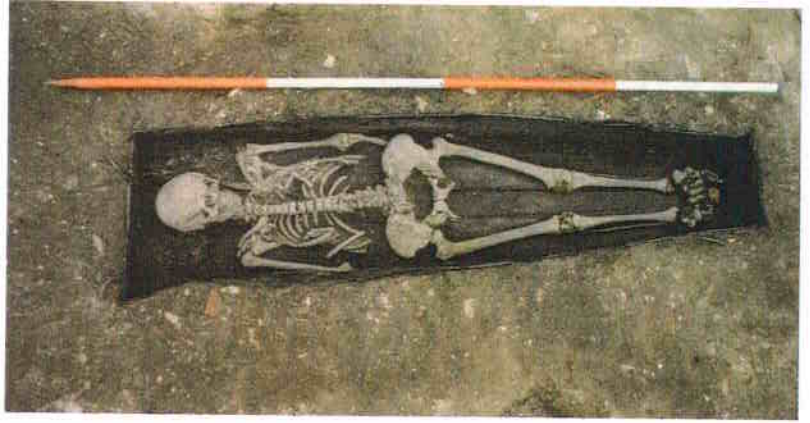

Figure 20: Burial in coffin from the late medieval site of Hull Magistrates Court (copyright: Humber Archaeology Partnership, with permission of Dave Evans)

the mouths of four people, and priests could be buried with a chalice and/or paten, as at St Giles, Brompton Bridge, North Yorkshire (Cardwell 1995). Late medieval cemeteries, like many of their early medieval counterparts, can be very large and most are associated with urban contexts, although rural cemeteries have also been discovered and excavated (for example a large part of the cemetery at Wharram Percy, North Yorkshire: Beresford and Hurst 1990; Mays *et al* 2007).

(vi) The post-medieval (Early Modern) period

From around AD 1550–1850 (the post-medieval or Early Modern period), a different and more diverse burial practice is seen, although inhumation dominated until the end of the 19th century. The Reformation in the 16th century placed emphasis on the resurrection of corporeal remains which led to the desire that mortal remains should not be disturbed (Roberts and Cox 2003). Of course, with very overcrowded cemeteries it was not always possible to avoid disturbance as new burials disturbed old, the exception being the privileged in society who could pay to be buried inside the church and so got some protection. The Reformation opened the way for a number of changes in religious practice that impacted on burial, with the later nonconformist movement also developing distinctive styles of burial ground such as those of the Quakers (Stock 1998). People also invested in new civic cemeteries. Large urban cemeteries with individual discrete graves are also evident at this time, for example at Cross Bones burial ground, Southwark in London (Brickley *et al* 1999), St Martin's in Birmingham (Brickley *et al* 2006), and the high-status crypt at Christ Church, Spitalfields, London (Adams and Reeve 1993; Molleson and Cox 1993). At St Martin's (Figure 21), a total of 857 burials were recorded at excavation, 86% of which were in simple earth-cut graves. Within the earth-cut graves the most common burial was in a wooden coffin with metal fittings, although brick-lined graves, chambered vaults and family vaults were also noted. In general, however, post-medieval burials are less commonly excavated and analysed (but see Cox 1998), and it is only in recent years that an increase in excavation of these sites has been noticeable due to modern development in British urban contexts.

Figure 21: Burial vault of the Warden family at the post-medieval site of St Martin's-in-the-Bull Ring, Birmingham (with permission of CgMs Consulting, Birmingham; supplied by Amanda Forster, Birmingham Archaeology)

(vii) A note on cremated burials

Cremations are found in all periods from the Bronze Age to the early medieval, and it is clear that cremation burial played a significant role in the lives of our ancestors. As McKinley (1994c, 132) states 'A cremation is more than simple collections of human bone', and, 'cremated bones represent not only the physical remains of one or more individuals, but also the production of a series of ritual acts that comprise the disposal of the dead by the mortuary rite of cremation' (McKinley 2000b, 403).

Cremation will dehydrate and oxidise the organic parts of the body – an appropriate temperature, a specified time, and enough oxygen are necessary prerequisites for a 'successful' cremation. In modern circumstances it takes from around one to one and a half hours to cremate a body at a temperature of between 700 and 1000°C (McKinley 2000b). In the past, of course, open pyre cremation would have been the norm, as seen in some pictorial and documentary sources, and still practised in some parts of the world today such as India and Nepal. Layers of timber set in a rectangle and infilled with brushwood (on a flat surface or over a pit) allow circulation of oxygen, support the body and pyre goods, and provide a fuel source for the cremation to take place (McKinley 2000b). Experimental cremations indicate that temperatures >1000°C are achievable in a pyre. Climate is an important consideration as wet conditions present problems, which may lead to temporary burial (this may also be done to allow time for the family to prepare for the funeral). In the case of the Roman upper classes, the body lay in state for seven days, although most Romans were cremated and buried shortly after death (McKinley 2006).

Cremation burials have a particularly special place in archaeology because, until very recently, they have been relatively ignored by the bioarchaeologist as being particularly time consuming to analyse and not generating useful information. However, McKinley (2000b, 2000c, 2006) has highlighted well the immense possibilities for understanding many aspects of our ancestors' lives through studying their cremated remains. In particular, she has pointed out the previous lack of attention paid to excavating and analysing the 'whole' cremation deposit, which allows us to explore the ritual act of cremation in the past. In that deposit may be found cremated human bone, fuel ash from the pyre, pyre goods (ie burnt with the body) and grave goods (only incorporated at the time of the burial). Most pyre goods are found with urned burials, and are most common in Anglo-Saxon cremations (McKinley 1994c). Personal items, food remains, gifts, animals representing joints of meat or just pets, and worked bone and antler are also found in cremated remains (eg see Bond and Worley 2006 on animal remains). It may also be possible to learn about aspects of the cremation ritual, for example the position of the body on the pyre, and pyre technology, by analysing the presence of staining of pyre goods on bones or even adherence of the same.

Important in the analysis of cremation deposits is to look at the physical and stratigraphic relationships between the components of the cremation, and record pre-excavation bone fragment size as there is a tendency for the bones to fragment even more following excavation (McKinley 1994b, 2006). Additionally, the deposit is examined for charred plant remains (flotation) and also wet sieved down to 1mm in order to retrieve the smallest fragments of bone and other inclusions. The position of the corpse on the pyre during cremation may be inferred, along with the efficiency of the cremation (colour of the bone and appearance of the pyre 'goods' and debris). A range of colour is often seen in the bone fragments from any one cremation, from brown/black, through blue, to buff/white, and there is a relationship between temperature and colour (lighter bone indicates that there was sufficient oxygen available to enable the cremation process to proceed – oxidation). A shortfall of oxygen or a poor fuel supply can lead to incomplete cremation. For example, clothing, the position of the head, arms or legs, collapse of the pyre or insufficient fuel may affect oxygen supply (McKinley 2004b); in fact, the body is not a good conductor of heat (*ibid*). The weight of the cremated bone analysed will also suggest how efficiently it was collected following the cremation process – relatives, friends, or professional collectors would have gathered the remains and the time taken to do this may reflect how 'important or popular' the person was. McKinley (2000b) also emphasises the importance of distinguishing between multiple cremations (corpses cremated on the same pyre), multiple burials of cremated remains (one vessel/grave for remains from a few separate cremations), and multiple graves (remains from separate cremations and burials in one grave).

Thus, the act of cremating a body and disposing of it creates a very special archaeological context which necessitates very detailed analysis of the cremated bone, and the remains of fuel, pyre and grave goods in order to reconstruct the series of ritual acts which lead to such contexts on archaeological sites.

3.3 The effect of funerary context on study

From this brief survey of methods of disposal of the dead through time in Britain, it is easy to see that the ways in which people buried their dead will have a great impact on, firstly, whether they are identified in the archaeological record, secondly how they are excavated and, thirdly, the quality of the information that it is possible to record from the skeletal remains. A recent survey of health through time (Roberts and Cox 2003) identified many more skeletal remains from the Roman period onwards. The prehistoric samples, being smaller, cannot be used as representative of the populations living at the time. The analysis of isolated fragments of bones in a shell midden of the Mesolithic period will generate much less information about the people they represent than multiple discrete individual skeletons from a late medieval urban cemetery. Likewise, as the majority of Roman burials are from urban civilian contexts, we can learn very little about rural populations or military personnel at that time. Nevertheless, the wealth and variety of funerary contexts have produced much useful data from the human remains analysed but the data has to be considered with respect to the limitations outlined.

3.4 Summary

In prehistory it is not until we reach the Neolithic period that the evidence for burials increases, with inhumations in a variety of funerary monuments, and also at ritual sites such as causewayed enclosures. In the Bronze Age, both inhumation and cremation burials were made under barrows and cairns, while in the Iron Age both cremation and inhumation of the corpse continue, although the evidence of burial is scarce and probably reflects the nature of some methods of disposal of human remains. In the Roman period a lot of our evidence comes from urban inhumation cemeteries, but also some very large cremation cemeteries. The early medieval period sees, initially, cremation and inhumation, but later a move towards inhumation only; this practice continues into the late and post-medieval periods.

3.5 Key learning points

- the history and development of funerary practice in Britain has great variety
- funerary monuments are particularly striking in the prehistoric period
- as social complexity develops through time, disposal of the dead becomes much more formalised
- funerary practice through time illustrates how the corpse was treated and some of the influencing factors
- disposal methods affect visibility of the buried dead, and the amount and quality of information obtainable from skeletal remains
- many more skeletal remains have been excavated and analysed from the Roman period onwards

3.6 Preservation

Golden lads and girls must,
As chimney-sweepers, come to dust.
(Shakespeare, *Cymbeline*, **IV, ii**)

(i) Introduction

The information that can be generated by the study of human remains from archaeological sites can vary enormously and depends on many factors inherent in the survival of the remains through to examination; Waldron nicely illustrates factors affecting survival (1987, figure 6.1). It does not take much thought to realise that a preserved body potentially will contain far more information about that person than a skeleton, or indeed the remains of a cremated body. Likewise, if a bioarchaeologist is studying several hundred well-preserved skeletons from a late medieval cemetery, this will produce a more realistic perspective on the life of the population from which those people derived than examining a few fragmentary and poorly preserved skeletal remains from a Bronze Age barrow. In this chapter the different ways in which human remains are preserved into the archaeological record, and ultimately into the laboratory situation, are explored.

(ii) Decay of the body

The body decays through two processes (Mays 1998). Firstly, autolysis occurs whereby there is destruction of the body tissues by enzymes released after death (proteins which increase the rate of biochemical reactions), and secondly there is putrefaction (decomposition) whereby the soft tissues decay because of the presence of micro-organisms. When a person dies the bacteria which are present normally in the intestines invade the body tissues, along with micro-organisms from the grave environment, such as the soil. As a result of putrefaction, the soft tissues become liquid and gas is produced, which swells the body. If there is a lot of protein in some tissues then decay will be slower (eg hair – see Wilson 2001 on the survival of hair in archaeology; Figure 22). The chemical processes that occur during putrefaction of the body's fat, protein, and carbohydrate are complex and can influence the decay of bone (Garland and Janaway 1989). Following the decay of the soft tissues of the body, the bones (composed of protein – mainly collagen; and mineral – mainly hydroxyapatite) will decay; their protein-mineral bond will alter according to physical, chemical, and biological factors (see below). Mann *et al* (1990) suggest that it takes about ten to twelve years for the body of an adult to decompose to a skeleton, and half that time for a child, but it very much depends on the many factors discussed below. Once a body has decayed to a skeleton, the decay of bones and teeth proceeds in a complex way (Millard 2001). Although a fair amount is known about the deterioration of cortical bone, there is much we need to know about the enamel and dentine of the teeth, different types of bone such as immature lamellar bone, and the microscopic structures within bone

Figure 22: Hair and hair pin preserved on a post-medieval skull from Matterdale, Cumbria (with permission of Jaime Jennings)

such as osteons (*ibid*). Data also suggest that the external appearance of bone may belie how well-preserved the bone is throughout its structure (Garland 1987; Bell 1990). Ultimately, all these factors affect the deterioration or preservation of bones and teeth and so influence the quality of the human remains that are discovered, excavated, and analysed.

(iii) Environments of preservation

Taphonomy is the field that describes this scientific study of the processes that happen to a body after death, and the many interlinked factors that are involved can be divided into intrinsic and extrinsic; these factors may accelerate or delay the decay of bodies. It should be noted, however, that even if conditions appear to be the same for different buried bodies, they may decay at different rates. For example, Mant (1987) describes two people being killed at the same time, being buried in the same graveyard in adjacent graves, and decaying at different rates. In his study of forensic contexts such as mass graves, he noted emaciated people being skeletonised earlier, bodies buried in coffins decaying faster because of poor drainage of decomposition products, and clothing giving better preservation to a body than a coffin.

If one considers briefly the world in which we live today, a great range of environments exists with different mean temperatures and humidity, and indeed potential for survival of human remains. For example, in the Arctic and

Antarctic freezing temperatures and dry air create an environment which can preserve buried bodies very well; the excavation in the 1970s of 15th-century AD Greenland mummies from Qilakitsoq, 450km north of the Arctic circle on the west coast of Greenland, saw the preservation of six women and two children, along with their clothing (Hart Hansen *et al* 1991). A more unusual mode of preservation of a body in the cooler, damp climate of a north European context can be seen in the remains of a woman at St Bees, Cumbria, England, dated to AD 1300. Here the body had been covered in embalming wax/resin, wrapped in a shroud of linen, placed on a lead sheet and then in a wooden coffin, and the space between the lead-sheeted body and the coffin packed with clay. It is likely that the lack of oxygen inside the coffin preserved the body well, although there has been a suggestion that the person had been embalmed abroad and then transported to Cumbria for burial (Chamberlain and Parker Pearson 2001). It is clear that many different factors may contribute to the decay or preservation of a body.

Experiments on the preservation of bodies have been, and are being, done at the 'Body Farm' in Knoxville, Tennessee, made famous through Patricia Cornwell's novel (Bass and Jefferson 2003). These experiments started in 1981 and involve donated bodies being disposed of in different ways in an enclosed compound. For example, bodies have been deposited in shade, in full sun, in woodland, in the boots of cars and on back seats, on the ground, in graves, and in water. These experiments provide invaluable data for understanding the decay rate of human remains both in archaeological and forensic contexts; in the latter case it is particularly important to be able to assess time since death as this might help to solve the crime. As Bass, in Bass and Jefferson (2003, 275) states, 'My goal for the data was simple. Anytime a real-life murder victim was found, under virtually any circumstances or at any stage of decomposition, I wanted to be able to tell police – with scientific certainty – when that person was killed'. There have also been similar experiments in Europe but mainly using pig remains; these are apparently good analogues for human bodies as the decomposition process and rate are similar (Morton and Lord 2002).

(a) Intrinsic factors

Intrinsic factors refer to those characteristics inherent in the body, including the bones, at the time of disposal that may affect whether, and how well, the body or derivatives of it survive. Some of these are described below to show their impact on the survival of human remains.

Size, shape, density, and bone mineral content

As Millard (2001, 637) states, 'Bone is popularly regarded as a dry, inanimate, uncomplicated and robust material'. This could be no further from the truth as many factors can influence how well preserved it is. Generally speaking, children's bones are smaller, less dense, and have less mineral in them than

adult skeletons; they thus have less chance of survival into the archaeological record. However, the adult skeleton contains small bones too and those of the hands and feet are often partly absent once the skeleton has been excavated; compare, for example the size of the femur to one of the wrist bones. Waldron (1987) found in his study of the skeletons from a Romano-British cemetery at West Tenter Street, London, that the densest and relatively heavier bones of the skeleton (eg the top part of the femur and one of the forearm bones, or ulna, along with parts of the lower jaw or mandible) survived better than less dense and lighter bones. Some parts of the bones are also much more porous than others and have a larger surface area, and are therefore are more likely to decay, for example the spongy bone of the vertebrae of the spine and the top and bottom ends of the long bones of the arms and legs. Nevertheless, the external, or cortical, layer of the long bones does tend to survive well purely because in adult skeletons that layer is very dense. For example, Willey *et al* (1997) documented the mineral density of bones against survival of different parts of the skeleton at an AD 1350 massacre site in south-central Dakota, USA. They found that density had a strong impact on survival of bones and fragments, ultimately affecting calculations of the minimum number of individuals represented. The teeth of course are the best survivors of burial, the outer white enamel being hard and very resistant to decay; this explains why early hominid remains thousands and even millions of years old are often represented by just teeth or fragments of them.

Age and sex

The bodies of infants (birth to end of first year) and children (two years to puberty) are much smaller than those of adults and therefore will 'disappear' from the archaeological record more quickly. Once the body is represented by a skeleton, the bones, being smaller and more fragile, may also decay faster than those of an adult. Therefore, age at death may inherently affect how fast a body decays, and the younger the person is the faster it will potentially decay. However, older people with osteoporosis (loss of bone mass) will also be more susceptible to faster decay. Generally speaking most cemetery sites have fewer non-adult skeletons than those of adults, non-adult meaning ones whose bones and teeth have not fully developed; this is surprising considering historical sources which suggest there was high infant mortality in the past. For example, the London Bills of Mortality from 1728 to 1850 show that in the period up to 1800 over 30% of deaths were in children in the first two years of their life (Roberts and Cox 2003), and the figure rose to 40% for children aged five or less. This was, of course, because of high levels of childhood disease and the traumatic effects of weaning.

Although infant and child skeletons in cemeteries make up a smaller proportion than the figures quoted here, this is not to say that archaeologists do not find and excavate the remains of non-adult bones, just that they are less frequent than adult skeletons (see table 2.1 in Lewis 2007). This may be because they

are often buried in shallower graves and this affects survival (McKinley pers comm, November 2007). However, they may also survive better at some sites because they are found in burial environments which aid preservation. Some archaeological sites in Britain have revealed large proportions of non-adult skeletons which indicate that, if the conditions are right, there is an equal chance of the survival of child and infant skeletons. For example, of over 1000 burials at the Romano-British camp at Poundbury, Dorset, 374 skeletons were non-adults (Farwell and Molleson 1993), and at the early medieval site of Raunds Furnells in Northamptonshire with over 360 burials, 208 were non-adults (Powell 1996). It may be that differential burial practices, and perhaps infanticide in some cultures, along with excavation techniques (including whether soil is sieved or not to find the smaller bones) also greatly influence the number of sub-adults in an archaeological sample of skeletons. However, as described above, the bones of infants and children have low amounts of mineral in them, which makes them 'softer' and more likely to suffer from crushing in the soil matrix and be subject to decay in acidic soils (Guy *et al* 1997).

The bodies and skeletons of males are generally speaking more robust than those of females and therefore one would expect the former to be better represented within the archaeological record than the latter (as seen by Lieverse *et al* 2006), although this is not always the case. Women are also more susceptible to osteoporosis (especially post-menopause, and with increasing age), and therefore if the bones are less dense and ultimately more fragile then they will decay faster in the ground. A study of a Siberian cemetery in the Lake Baikal region dated to 5000–3700 BP showed that adolescents and young to middle-aged adults (12–20 years, 20–35 years, and 35–50 years at death) were much better preserved than infants, children, and older adults (Lieverse *et al* 2006). An obese person will also decay much faster into a skeleton after death than one who is thin because of the large amounts of flesh available to feed micro-organisms and maggots (Bass and Jefferson 2003).

Disease

If a person had a health problem when they died then it is likely that the disease process will speed up decomposition, for example if a person had an infection of the blood (septicaemia). Likewise, if a person had an open wound or wounds at death, this enables decomposition to occur faster than normal because micro-organisms can enter the body more easily. When it comes to the skeleton, most diseased bones are inherently more fragile; the bones of a person with a bone tumour, osteoporosis, or an infectious disease will often deteriorate faster in the ground than the bones of a person without any disease. The contents of the gut, including micro-organisms, can also accelerate the deterioration of the body, along with (certainly today) medicinal drugs in the body.

(b) Extrinsic factors

Perhaps of more complexity are the many extrinsic factors that can slow down or speed up decay processes, and they should be considered as factors that act in combination (along with intrinsic factors). These can be usefully divided into the environmental features of a cemetery site, the flora and fauna, and the activities of humans (Henderson 1987). Space does not allow a full description of all these factors.

Disposal methods

How the body is disposed of can also influence survival to excavation as we have seen above. Is the body buried or cremated? Lieverse *et al* (2006) found that skeletal remains that had been charred and calcined were less complex and more fragmented than those unaffected by fire at the prehistoric site of Khuzhir-Nuge XIV in Siberia. How was the person buried? For example, burial in clothing or in a shroud, or with decompositional matter such as straw or wood shavings in coffins, may attract insects, thus hastening decay, while burial in a coffin might produce an anaerobic environment (lack of oxygen) which will be good for preservation. Obviously the material of the coffin is of fundamental relevance – a lead coffin is most likely to have an anaerobic environment, and so preserve bodies well, while a wooden coffin can attract insects, is less airtight, and may increase decay of the body. If a body is left exposed to the elements before final burial (excarnated), then scavengers and the effects of the environment, such as climatic factors, will take their toll on its survival (see Duday 2006 for more details). If a body has been deliberately embalmed then it may survive longer as an intact body. While embalming, which leads to artificial mummification and slows the decay processes, has been practised since around 3000 BC in Egypt (Snape 1996; Chamberlain and Parker Pearson 2001), its success in preserving the body varies. Embalming today, using chemicals, is primarily for public health reasons and for presenting the body acceptably for public viewing; it is also suggested that the process preserves the body for longer than would be the case if it was not embalmed, ie until it is buried (Iserson 1994), although there appears to be some dissent here amongst some people because it is not often done very thoroughly. Cryogenic suspension is another technique that has been introduced in recent times whereby the dead body is frozen and maintained at a very low temperature. The idea is that the body can be resuscitated if, for example, there are medical developments which can be used to treat a previously untreatable disease (Iserson 1994).

In addition to the factor of place of burial – eg in a cemetery grave, in a chambered tomb, or in a watery place or crypt – the time between death and burial as well as burial and excavation will certainly have some impact on survival of the remains. The people buried in the Christ Church, Spitalfields, London, crypt and dated to the 18th and 19th centuries were exposed to several factors that preserved bodies and skeletons well, for example coffins, an internal burial space, and a short time between burial and excavation (Molleson and Cox

1993). Whether a burial site is disturbed by human or non-human intervention following disposal of the dead will also affect preservation. A shallow grave, for example, could potentially be disturbed by ploughing activities (see Haglund *et al* 2002 for a discussion of the effect of cultivation on buried human remains).

Burial environment following disposal

The soil microbiology and chemistry, together, will of course have a significant impact on the survival or decay of body tissues, including bones. Microbial attack, for example, can increase the porosity of the bone (Jans *et al* 2004), while the water content of the grave can aid decay of the body or, if the grave is very waterlogged and thus anaerobic, microbial activity will be inhibited and the body tissues may be preserved (such as with bodies buried in peat bogs in northern Europe: Turner and Scaife 1995). The impact of water on the survival of a body or skeleton relates to relative humidity, mean annual rainfall, and whether there is any drainage (Henderson 1987). The presence or absence of oxygen also plays a crucial role in the rapidity of the body's decay.

An alkaline (or higher pH) burial environment/soil will preserve a body better than an acidic soil but, in the case of bog bodies, a lack of oxygen and an acidic environment combined can generate very well-preserved bodies. Acidic solutions will, however, dissolve the mineral part of the bone and an acidic sandy soil will accelerate decay, as in the famous sand bodies or stains of Sutton Hoo, Suffolk, England (Bethell and Carver 1987; Carver 1998). A lower temperature and humidity will be better for preservation, along with burial at a reasonable depth; bodies buried close to the surface suffer possible later disturbance by humans and other animals, and are subject to exposure to more oxygen, which hastens decay. The decay rate doubles, generally speaking, with a 10°C rise in temperature, and micro-organisms are more active in warmer soils. Of course, the significance of the location of the burial (latitude and longitude), and in what season it was buried, will relate to the standard temperature in that location and season.

Interference in the grave by animals such as rodents (including gnawing of bones), and insects, along with the infiltration of plant roots and rootlets can cause much disturbance to the body (and bones). These processes may accelerate decay, and even the pressure of the soil can damage bones. Roots of plants secrete acids and these can etch the surface of bones but the etched areas are lighter in colour than the rest of the bone and hence are identifiable as post-mortem damage (White and Folkens 2005). If a body is buried close to the surface then scavenging larger mammals may take parts of the body away (eg a polar bear: Merbs 1997), and weathering of the bones may occur, thus compromising preservation.

(iv) Extremes of heat, cold, wetness and dryness, and their effect on survival of human remains

Generally speaking, if conditions are very hot, very cold, very wet, or very dry, the body may be preserved extremely well and the potential information that

can be derived ultimately increases. In Britain, however, these extremes are rarely present and skeletal remains largely conform to the norms outlined above – except for the occasional bog body, and preserved bodies in post-medieval sealed coffins. A broader geographical perspective is therefore useful in this section, in order to outline the possibilities for extraordinary preservation of bodies. The reader is directed to Aufderheide (2000), a magnificent work on the scientific study of mummies around the world, and also Lynnerup (2007); these are key places to find out everything you need to know about mummified bodies in the archaeological record!

(a) Dry and hot places

We have already seen that if a burial area is dry and hot then human remains will potentially survive very well; the dryness and low humidity decreases or stops decomposition resulting from insect activity. It is in these environments that the term 'mummification' is particularly appropriate, where the soft tissues are preserved in a dehydrated state (Chamberlain and Parker Pearson 2001, 82); here we might have spontaneous or natural mummification (accidental), intentional natural mummification (deliberately disposed of in a place where natural mummification occurs), or artificial mummification (where there is direct human intervention to prevent decay, eg the use of embalming).

Egyptian mummification (Figure 23)

In Egypt, prior to deliberate mummification, natural mummification occurred in the dry desert environment during the pre-Dynastic period (*c* 4500–3000 BC). Deliberate mummification started around 3500 BC, the method consisting of wrapping the bodies in linen and using resin and linen padding (Chamberlain and Parker Pearson 2001). By about 2500 BC (4th Dynasty) the removal of the organs of the body was recognised as a method for inhibiting decomposition, but it was not until the beginning of the Middle Kingdom (2025–1700 BC) that natron (a mineral containing hydrated sodium carbonate found in salt deposits and lakes) was used to dry out muscle before resin and wrappings were applied to the body. These Middle Kingdom bodies appear to have been mummified by removing the internal organs through the abdomen, and the brain through the nose. The organs were soaked in natron. As the body was being bandaged ointments were poured onto the body; individual limbs and digits were bandaged separately, incorporating small artefacts, and then the whole body bandaged (*ibid*). Later, in the New Kingdom (1550–1069 BC), a wider variety of oils was used, along with more resin. Clearly, mummification in Egypt, whether artificial or natural (through dessication), allowed exceptional preservation of the body, including rare examples of parts of the body (eg a placenta with a female mummy dated to 1550–1080 BC: Mekota *et al* 2005).

Figure 23: Mummy of Asru, Temple of Kamak, Thebes, Egypt (Late Period, *c* 900 BC) (with permission of The Manchester Museum, University of Manchester)

The Chinchorro mummies of Chile (Figure 24)

The first evidence of artificially prepared mummies comes from the arid coastal Atacama Desert of northern Chile and southern Peru dated to as early as 7000 years old (Bahn 2002). The mummies, usually buried in cemetery groups, were generally wrapped tightly for natural mummification to occur but others were covered with clay and black or red pigment, and some had clay masks. A further type of mummification involved removal of the skin, soft tissues and organs, and then the wrapping of the bones and tying of sticks to them for reinforcement. The body cavities were filled with vegetable matter, the skin replaced, and the whole body covered with clay. Grave goods included textiles, bags, skins, bone and stone artefacts, and fishing implements such as hooks and nets. It is suggested that these people were mainly exploiting the sea as hunter-gatherers for their food but that they also ate plants and animals from the land. Studies of these mummies are providing much information about the life of these hunter-gatherer people, including evidence that they were fairly healthy, and there is continued surprise that these early people practised such complex funerary procedures.

Figure 24: Chinchorro child mummy with artificial mummification, red style (*c* 2000 BC) (with permission of Bernardo Arriaza)

The mummies of the Taklimakan Desert, north-west China (Figure 25)

In one of the world's most arid areas, the Taklimakan Desert in Xinjiang Province, China, the country's oldest spontaneously mummified bodies were first reported in 1994 (Barber 1999; Mallory and Mair 2000). A truly remarkable find, some of these mummies date back to 4000 years ago, and are extremely well-preserved, with colourful clothing. The question that has always surrounded the mummies is where these people came from, because they appeared to have Indo-European facial features, and associated archaeological and historical data support this suggestion. The answer lies in the Silk Road, and particularly the part that goes through the Tarim Basin, along which the mummies have been found. The Silk Road stretched thousands of miles from the west all the way to eastern China, and for several thousand years it was a very important trade

route. Amongst the finds of mummies, one dated to 1200 BC, of a young female from Loulan, was dressed in furs. She has been very well studied and was discovered to have suffered anthracosis of the lungs and head lice, and had blood group O (Aufderheide 2000). Another from Cherchen was that of a man dated to around 1000 BC; he had light brown hair and wore deerskin boots, trousers, and a shirt, along with felt leggings (Kamberi 1994, in Aufderheide 2000). Some of the weave patterns on the clothing were likened to a Celtic design (Barber 1999). There have also been finds of paintings of people with blue and green eyes in the area, Celtic-style tattoos on some of the mummies, and even ancient DNA data, that all suggest biological links between Europeans and the mummies (Francalacci 1995). This collection of mummies has much potential, following more scientific investigation, to provide us with a detailed picture of the characteristics of the people in this area of China and the outside influences that had an impact on the population.

Figure 25: Male mummy covered in arrows, from Small River Cemetery #5, Xingjian, China (dated to *c* 1800 BC) (with permission of Victor H Mair)

(b) Dry and cold places

Cold, freezing temperatures and a lack of humidity also delay the decay of bodies, and some have been discovered from the coldest parts of our world. While freezing temperatures do preserve soft tissues, the action of freeze-thaw cycles can affect their ultimate preservation (Micozzi 1997).

The Iceman of Italy

In 1991, a male body around 5000 years old was found in ice on the Austrian/Italian border. He was excavated and then extensively studied (Bahn 2002). Not only was an array of artefacts found with the body – including a bow and arrows, a copper axe, a backpack made of wood and leather, birch bark containers, and a net of grass twine – but there was also a set of clothing consisting of a cap, coat, leggings, belt, loincloth, shoes, and a cloak (made of goat hide, bearskin, deer-hide, and calf skin). The body was very well-preserved, even revealing over 50 tattoos and clues to how he died (Spindler 1994). A CT scan (computed tomography – a sophisticated X-ray technique, which shows 'slices' of the body), revealed a flint arrowhead in his shoulder, and wounds to his wrist and hand which might be defence wounds, but

Figure 26: The head of a boy mummy from Cerro El Plomo, Chile (dated to between AD 1480 and 1540) (with permission of Mario Castro)

it is probable that he died between the ages of 40 and 53 years through exposure to high altitude weather.

Inca sacrificial victims, north-west Argentina (Figure 26)

High up in the Andes, on the border of Chile and Argentina, archaeologists found the frozen bodies of three children at the summit of Llullaillaco volcano. At 6723m, this is even higher than where the Iceman described above was discovered. The bodies were of two girls (six and fifteen years of age) and one boy (seven years old) dated to around 500 years ago (Bahn 2002). It is suggested that these children were sacrificial victims of the Inca, chosen for their beauty and made to take large amounts of coca and narcotics before being sacrificed on top of a mountain. They were buried in separate tombs below a stone platform. Their soft tissues, and even blood vessels filled with blood, were preserved, and the hair of one of the girls was seen to have evidence of narcotics in its structure. Along with remarkable body preservation, wonderfully brightly coloured clothing was recovered together with fabulous artefacts such as jewellery, figurines, and pottery.

The mummies of Greenland

In the 1970s two Inuit graves dated to around AD 1475 were found by two brothers on a hunting trip at Qilakitsoq on the west coast of Greenland, under a protective natural rock overhang. In grave I a six-month-old baby, a four-year-old boy, and three women aged around 25, 30, and 45 years old were found. In Grave II, three women were found, two aged 50 years and one aged 18 to 22 years (Hart Hansen *et al* 1991). Skin and fur clothing were also preserved on the bodies. They had been preserved by the action of cold dry air circulating through the stones over the grave. The remarkable preservation allowed the visualisation of tattoos on the women's foreheads, and even signs of smoke inhalation into the lungs, probably from burning sea mammal fat for light, heat, and cooking. By analysing tissue type it was possible to establish that in Grave I was a grandmother, two daughters and one or two grandchildren, and in Grave II two adult sisters could have been present, along with a younger woman.

(c) Wet places

Nearly three-quarters of the earth's surface is covered with water, including the sea, rivers, and lakes, and bodies may be disposed of in any of these contexts (eg see Figure 27). Each one of those watery contexts will hold specific characteristics which may delay or accelerate decay of either accidentally or deliberately deposited bodies. For a detailed account of the decay of bodies in watery environments, see Haglund and Sorg (2002), but for the purposes of this section a few examples will be helpful.

Figure 27: Burial in a rice paddy in Hanoi, Vietnam (with permission of Simon Fowler)

Bodies in bogs of northern Europe (Figure 28)

Probably as famous as Egyptian mummies are the many peat bog bodies of northern Europe (Ireland, Britain, the Netherlands, Germany, and Denmark). Peat is comprised of the accumulation of partly decomposed plants in water (Aufderheide 2000), and there are different types of peat according to the plants contained in it. In northern Europe sphagnum moss occurs in raised peat bogs where some of the plant's components are converted to an acid called sphagnan when it dies, and then humic acid, a sphagnan product. These chemicals reduce the growth of micro-organisms and tan collagen fibres (Chamberlain and Parker Pearson 2001), thus preserving soft tissues. In these anaerobic acidic peat bogs, while the mineral of the bones dissolves, the hair, skin, ligaments and tendons survive well. There are several factors that lead to good preservation of the bodies, including a lack of oxygen and no scavengers, and an inherent low temperature. It is in these raised peat bogs that nearly all the 700+ bog bodies with preserved soft tissues have been found (Aufderheide 2000).

Probably the most famous group of bog bodies comes from Denmark, and more recently Britain. In Denmark, Glob (1969) described the remarkable body of Tollund Man, dated to 220 BC, found in 1950 with a cap and belt on his body, and a noose around his neck. Study of his intestinal contents revealed that he probably died during the winter because of the plants present, and also that he had suffered from intestinal worms. More recently, in Cheshire, England, Lindow Man was found in 1984 (Brothwell 1986); he was in his mid-20s and 1.68cm (5ft 6in) tall (Stead 1986). He had a skull fracture, fracture-dislocation of the neck, and a laceration to the neck, likely contributing to his death; there was also evidence of osteoarthritis in his joints. His gut contents were analysed and illustrated that his last meal was likely an unleavened bread made of wheat, oats, and barley, with no indication that this was a 'special' meal (Holden 1986).

Many of these people died in the Iron Age and Roman periods (800 BC–AD 500) and sometimes, but not as frequently as thought, of what appears to have been a gruesome death by murder. Evidence for stab wounds, asphyxiation (choking or hanging), and unhealed wounds to the body, including the head, have all been noted. However, bogs could have been used traditionally for burial by some communities, and people could have accidentally drowned while crossing them, or been mugged and deliberately pushed into the bog; indeed, attempts to rescue people who ended up in the bog, it is suggested, may have led to wounds to the body that have been misinterpreted (Briggs 1986). Most of the bodies were of young adults or non-adult individuals, with no differentiation or selection between the sexes, but there were some who showed health problems that likely affected their lives, and many were possibly of high status (because of their undamaged hands and fingernails: Chamberlain and Parker Pearson 2001). Why in these periods were people placed in bogs? It may well be that they were places with some religious or ritual significance; we know for example that in the Iron Age water was certainly a special place for activities such as votive offerings.

Figure 28: Female bog body from Meenybraddan, County Donegal (dated to 730±90 BP) (described in Delaney and Ó Floinn, 1995; reproduced with permission of Don Brothwell)

Bodies in the Florida Swamps, United States

In Windover, central Florida, one of the earliest cemeteries in the US was found dating to 7000–6000 BC; it served people who hunted and gathered (Chamberlain and Parker Pearson 2001). These people were buried originally in waterlogged peat; now the site is covered by a seasonal lake and the chemical constituents of that lake appear to have preserved the bodies extremely well. This situation did not particularly preserve whole bodies, as the remains were mainly skeletons, but parts of the brain were present inside some of the skulls; microscopic study illustrated that

some of the original brain cells had survived. It was possible to extract and amplify ancient DNA from some of this tissue (Doran *et al* 1986). Brain tissue has survived in other burial contexts and it is suggested that this is because it contains lots of fats, which can convert into fatty acids, leading to the formation of the waxy compound of adipocere, usually in anaerobic environments (Chamberlain and Parker Pearson 2001).

The sailors of the Mary Rose, *England*

Detailed consideration of how bodies decompose in the sea is given by Sorg *et al* (1997), but generally speaking bodies buried in the sea decompose about four times faster than those buried on land, and even faster if the water is warm (Iserson 1994). However, even though the vast majority of the crew of Henry VIII's warship, the *Mary Rose*, drowned in July 1545 when the ship sank, their skeletons were very well preserved (Stirland 2000). The sinking occurred very rapidly and, after the ship came to rest on the sea floor in clay just off the south coast of England, four tides a day provided strong currents, flowing east–west and north-east–south-west, which deposited silts in the ship. The anaerobic nature of this environment arrested decomposition of the organic materials, including the skeletal remains of the sailors. Ninety-two individuals were reconstructed from the deposit of disarticulated bones found, although the minimum number of individuals was calculated as 179, based on the number of skulls and lower jaws; this represents 43% of the 415 crew known to have been on board when the ship set sail. Through analysis of the skeletal remains, it was possible to infer that they were all strong robust males, and that within the crew there was a group of specialist war bowmen, supported by the presence of preserved bows and arrows in the ship.

(d) Other unusual preservation of human remains

Death by volcanic eruption (Figure 29)

In AD 79 Vesuvius erupted in southern Italy and volcanic ash and lava covered large areas, including the settlements of Pompeii and Herculaneum, around the Bay of Naples. It was estimated that around 15cm of ash fell per hour. People who took cover in their houses were killed as buildings collapsed from the weight of ash on roofs (Bahn 2002) and many of those who tried to escape were either buried by the heavy ash fall or asphyxiated by volcanic gases. The buried settlements were only excavated in the 20th century, and amongst the astonishing remains of Pompeii were found the perfect shapes of bodies imprinted in the solidified ash; these were filled with plaster of Paris to create a cast, and thus some of the bodies could be reconstructed. Many had their knees flexed, the forearms raised, and hands clenched, which indicate the person was probably crouching to protect themselves and that they were exposed to a high temperature which leads to shortened muscle fibres (Chamberlain and Parker

Figure 29: Cast of the body of a victim of the volcanic eruption in AD 79 at Pompeii, Italy (with permission of Luigi Capasso)

Pearson 2001). At Herculaneum people fled the town to the sea shore and into boat huts where their bodies were found represented as skeletons; their deaths were probably the result of inhalation of volcanic ash and suffocation. This example illustrates that even though human remains may not be found at a site, bodies may be reconstructed using other means (which can be likened to the 'bodies' recreated by Anthony Gormley, described in Chapter 2).

The Fenghuangshan Tomb 168 in China

In the 1970s the body of a high district official called Sui Xiaoyuan was found in Siyang, China. He was buried in a wooden tomb chamber which contained four rooms (Bahn 2002). The body was placed in two coffins, inner and outer, and the coffins sealed with an airtight and waterproof seal. This preserved the body extremely well, including skin, the inner organs, and the brain, and detailed microscopic examination revealed the microstructure of the cartilage and muscles. The man had died at aged 60 years, was 1.68m (5ft 6½in) tall and weighed 52.5kg (*c* 8st 3lb), and the blood group AB was identified (Bahn 2002). It was even possible to suggest what health problems he had: inflammation of the gall bladder, a gastric ulcer, tapeworms, whipworms, liver fluke, and disease of the arteries. Preservation of the body was determined to have occurred because of the 'perfect geological, hydrological and climatic environment provided by the [burial] context' (Bahn 2002, 63).

The mummies of Cladh Hallan, South Uist, Western Isles of Scotland (Figure 30)

In recent years excavations at Cladh Hallan on the island of South Uist have revealed late Bronze Age/Iron Age roundhouses (Parker Pearson *et al* 2005) with dates ranging from 2200 to 700 BC. In these roundhouses the burials of three children, a male, and a female were found. Four of the burials had been placed in the ground a long time after death but before the peaty sand floors of the houses had been constructed. The nature of the burials are suggested to represent prior mummification and post-mortem manipulation of body parts. The male and female skeletons were buried in a tightly flexed position. Two of the female's teeth had been placed in her hand and the male skeleton appeared to have been comprised of the bones of three different people; there was no evidence that there had been disturbance of the grave once formed. As a result of studying the burials using microstructural, contextual, and dating methods, it is suggested that a local method of mummification was practised, perhaps to secure 'these select dead people a place in the afterworld' but also that they were 'the past personified, the ancestors in embodied form, the guardians of ancient traditions' (*ibid*, 543). This remarkable find has extended discussions about the extent of mummification in the ancient world and taken the subject beyond the famous mummies of Egypt, South America, and the Arctic into a part of the world where one would not expect to find evidence of mummification.

Figure 30: Late Bronze Age burial from Cladh Hallan, South Uist, Outer Hebrides, Scotland (with permission of Mike Parker Pearson)

3.7 The effect of preservation on study

Clearly there are many advantages to studying bodies compared to skeletal remains. Soft tissues are preserved, potentially containing important health information and also cultural influences such as tattoos. It may also be possible to determine the blood group of the person and look, through ancient DNA analysis, at relationships between people and also the occurrence of disease that does not reveal itself in the skeleton. The gastrointestinal contents of bodies may display the constituents of the person's last meal, and hair might provide information on hairstyles and the care of hair, while a study of the nails might suggest whether a person worked or not, and indeed whether they cared for their nails. Clothing is also often preserved with bodies and can illustrate cultural aspects of the population such as 'fashion' styles or status, and also what materials were being exploited. However, it should be appreciated that preserved bodies are often isolated individuals and therefore any interpretations can be biased and not representative of the population from which the person derived; they may also be 'special' people whose disposal and preservation was specific to their 'social group'. Nevertheless, because all the tissues are preserved, a body can be subject to a wider range of techniques of analysis than would be possible for skeletal remains.

3.8 Summary

There have been some remarkably well-preserved human remains found around the world, ranging from skeletons to mummies, but clearly the environment of deposition is very influential in determining how much of a body survives to be excavated and studied. In Britain, the vast majority of the human remains that bioarchaeologists study are skeletal remains, principally unburnt, but sometimes cremated, with very few preserved bodies (usually in exceptional circumstances). Although we are familiar with the main factors that are advantageous to the preservation of human remains, it is usually impossible to disentangle the multitude of factors that lead to preservation and/or decay in any one funerary context.

3.9 Key learning points

- the processes of decay of all parts of the body should be considered even though it is skeletal remains that are usually studied; survival of the skeleton can also be influenced by soft tissue decay
- decay of bodies ultimately affects the evidence available for research purposes
- external preservation appearance of bone can be deceptive as internal preservation may be very different
- experimental 'burials' allow us to understand how bodies decay and are useful for archaeology and forensic situations

- intrinsic (internal to the body) and extrinsic factors affect decay rates, but in Britain the burial environment is the major factor
- extremes of heat and cold, along with dryness and wetness, can preserve bodies well

CHAPTER FOUR

Before analysis: excavation, processing, conservation, and curation

Excavation and analysis are complicated by the heterogeneous circumstances in which human remains are encountered and the diversity of mortuary customs around the world

(Ubelaker 1989, 1)

4.1 Introduction

The previous chapter outlined the main factors that can affect whether human remains survive in the ground to be discovered and excavated. This chapter focuses on how human remains are excavated; how they are processed following excavation; what can be done to conserve skeletal remains; and how they should be curated. Because in Britain the majority of human remains found are inhumed or cremated, the emphasis is on skeletal remains. However, it should be noted that, even though each excavation that involves human remains has different conditions, there are still general principles that should be followed.

Obviously, in this chapter, we are getting closer to analysing the human remains in a laboratory situation. However, it is not only methods of disposal of the dead, and what happens to bodies when they are disposed of, that affect the quantity and quality of what is left of a body to analyse. We have to consider the measures by which the remains were excavated and handled in post-excavation. Methods of conservation of human remains and their ultimate curation will also affect how much information is potentially present to record, although in most British excavations human remains are not subject to conservation measures except in rare circumstances when a museum wishes to put the remains on display (McKinley pers comm, November 2007). Human remains are a non-renewable resource. Therefore, a body may be very well preserved in the ground but inappropriate methods of recovery of that body may compromise its integrity; likewise, the human remains may be very well excavated but poorly handled in post-excavation processing. Finally, a skeleton may have been well excavated and processed but it could have been curated in poor-quality storage, with a lack of temperature and humidity control, thus leading to deterioration of the remains.