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Identifying the Origins of Decapitated Male Skeletons from 3 Driffield Terrace, York, through Isotope Analysis

Reflections of the Cosmopolitan Nature of Roman York in the Time of Caracalla

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In August 2004, beneath the former gardens of an eighteenth-century mansion on Driffield Terrace, in the city of York, United Kingdom, the York Archaeological Trust revealed part of a large, highly unusual nonattritional Roman period cemetery population comprising eighty individuals, forty-eight (60 percent) of whom had been decapitated from behind with a very fine, sharp blade; the heads were placed in the graves with the rest of the body but not in anatomical position. Investigators recognized very early that this was an extremely unusual, if not unique, finding because of the very high proportion of decapitated adult males, a practice that had been encountered previously only sporadically in contemporary cemeteries. The cemetery is located southwest of the city walls, near the main Leeds-to-York road at the Mount, which is the highest point in the area and on the edge of the largest glacial moraine in Britain (Clark et al. 2004).

To investigate whether the origins of the decapitated individuals were as unusual as the cemetery population profile, investigators selected six adult male individuals for lead, strontium, and oxygen isotope analysis. Isotope analysis of archaeological human remains has been used for over twenty years to provide evidence for geographical origins using these three systems (Molleson et al. 1986; Sealy et al. 1995; White et al. 1998; Price et al. 2006). Elements present in ingested food and water are incorporated into teeth and bones. Because isotope ratios of some elements vary geographically, and on the assumption that ancient people sourced the bulk of their diet locally, these differences can be used as proxy indicators to draw conclusions about whether individuals were of local or nonlocal origin (see Forgey this volume for an exploration of Nasca trophy head origins using ancient DNA). Tooth enamel, a skeletal tissue that is highly resistant to alteration during life and after burial (Ericson 1993; Wang and Cerling 1994; Hoppe et al. 2003; Trickett et al. 2003; Montgomery, Evans, and Cooper 2007), represents childhood origins and diet and is, therefore, a useful tissue for investigations of whether early-life residency is consistent with the place of burial.

Strontium derives from rocks, and its isotope ratios are indicative of the surface geology or, in some regions, unconsolidated drift (such as loess) of the home region (Bentley 2006). Oxygen isotope ratios of rainfall vary geographically with latitude, altitude, and distance from the sea; because the ratio of biogenic phosphate is related to that of drinking water, oxygen ratios provide an indication of the climatic regime prevailing in the home region (Dansgaard et al. 1975; Longinelli 1984; Fricke et al. 1995). The oxygen isotope ratios measured in either the phosphate (used in this study) or carbonate fraction of tooth enamel can be converted to precipitation and thus compared to contour maps of d^{18}O values of precipitation such as those for Britain produced by Darling and colleagues (Darling et al. 2003; Darling and Talbot 2003). There are several published calibration equations (Longinelli 1984; Luz et al. 1984; Levinson et al. 1987; D'Angela and Longinelli 1991; Iacumin et al. 1996; Evans, Chenery, and Fitzpatrick 2006; Hoppe et al. 2006; Daux et al. 2008; Chenery et al. 2010) but no consensus as to which is the "right" one. All will provide slightly different results, and even the most accurate equation may change with location, climate, culture, and time period. Given this current uncertainty, and because we do not always know where people were sourcing their water (e.g., wells, springs, rivers, lakes) or whether they modified it subsequently through boiling or brewing, all of which could affect the local oxygen isotope ratio considerably (Darling et al. 2003; Brettell 2008; Daux et al. 2008), allowing for a larger margin of error than simply the analytical uncertainty when interpreting oxygen isotope ratios is probably wise. This approach has been used in this chapter.

As outlined for strontium, lead isotopes record the geological origin of the lead and enter the food chain through soils, water, plants, and animals. Prior to the large-scale metal production and transport that occurred during the Roman period (Hong et al. 1994; Rosman et al. 1997), lead may thus provide similar information to that associated with strontium. However, following the widespread extraction and use of lead ore for metal products, which in England occurred during the Roman period (Tylecote 1992; Montgomery 2002; Budd et al. 2004), the natural lead compositions of humans are frequently swamped by anthropogenic lead and provide evidence of the cultural sphere they inhabited rather than geographical origin. In conjunction with the levels of lead present, the lead isotope ratio can, therefore, provide information about an individual's exposure to anthropogenic metals and pollution and may be able to discriminate between urban and rural populations (Montgomery 2002; Montgomery et al. 2005).

The Geological Setting

The Vale of York is an extensive, low-lying, alluvial basin that was once a large glacial lake but is now a rolling landscape of glacial deposits and flat floodplains. The bedrock geology of the vale (figure 6.1) and of the wider Yorkshire region comprises a sedimentary sequence of silicate and marine carbonates that increase with age from east to west (British Geological Survey 2001). The

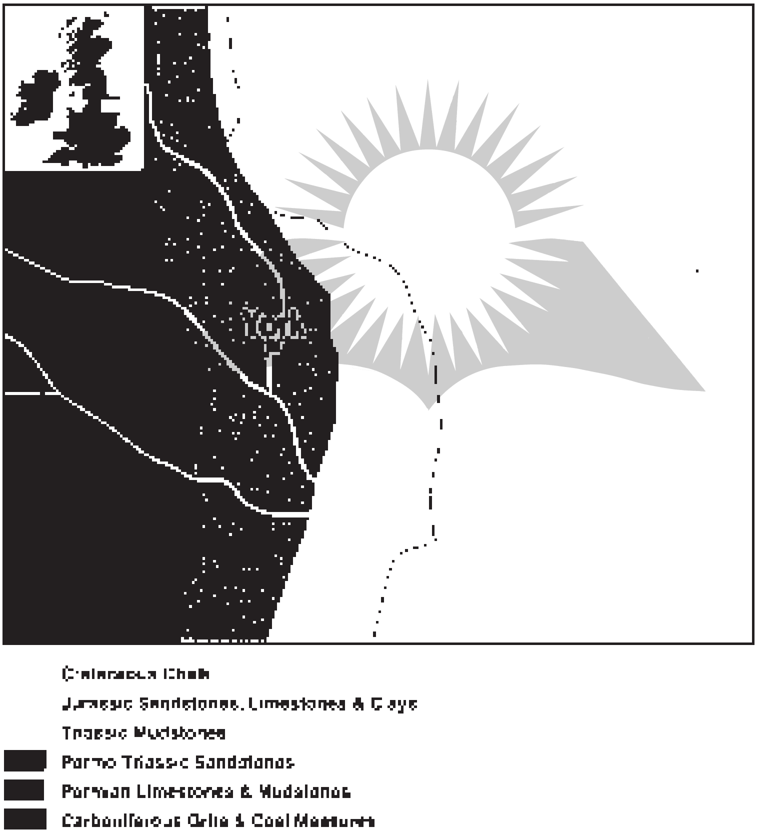

Figure 6.1. Simplified geological sketch map of the Yorkshire region of the British Isles, centered on the city of York. The map shows the sequence of sedimentary rocks of increasing age from east to west. Unconsolidated drift deposits in the Vale of York are not shown.

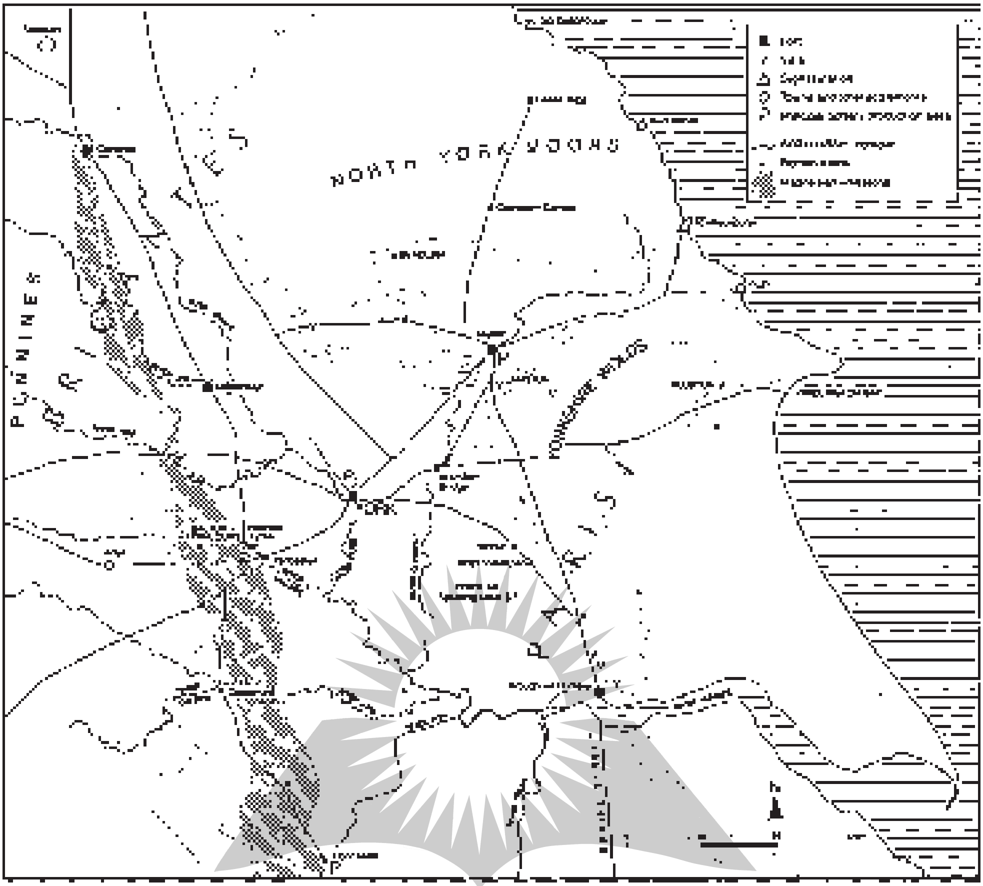

Figure 6.2. Roman York in regional context. Courtesy Patrick Ottaway.

Permo-Triassic sandstones and marls that crop out in the York region are largely concealed by Quaternary sediments, principally of glacial, lacustrine, aeolian, and riverine origin (British Geological Survey 1977). The city of York, and Driffield Terrace in particular (Ottaway 2005), is located on the largest glacial moraine in Britain (Clark et al. 2004), which stands above the marshy lowland of the valley of the Ouse. The North York Moors, Hambleton Hills, and Howardian Hills, which are formed mainly of Jurassic sandstones, clays, and limestones, form the eastern boundary along with the Yorkshire Wolds, which largely consist of Cretaceous Chalk. On its western side, the vale is flanked by low foothills of Permian Magnesian limestones, beyond which are the Carboniferous uplands of the Pennines.

The Site

Graced with the social amenities familiar to the Roman world—baths, temples, and other public and private buildings—York (Eboracum; figure 6.2), founded by the Romans in AD 71, was the site of a legionary fortress and colonia (settlement of Roman citizens) and was an imperial residence on two occasions: during the reign of Septimius Severus (AD 193–211) and that of Constantine the Great (ca. AD 274–337). The Mount was the area through which the road to Tadcaster (Roman Calcaria) ran. It was lined with tombstones and *mausolea*, some of which were recovered during building works in the eighteenth through early twentieth centuries (Ottaway 1993). A large cemetery was also excavated in the 1950s at Trentholme Drive (Wenham 1968), and a few burials from the Mount have been excavated since, but the present sample of eighty burials is the largest found since the 1950s. The area of the cemetery from which the burials were recovered was located at the highest point in the local landscape, on a small, steep glacial moraine, as noted above. The Trentholme Drive cemetery, which apparently did not contain any decapitated burials, was at the foot of, rather than on, this prominent landscape feature (figure 6.3).

In total, eighty skeletons were recovered from two separate excavations conducted between 2004 and 2005 (Hunter-Mann 2005; Ottaway 2005) on the properties of 1–3 and 6 Driffield Terrace, less than 50 meters apart (this number includes a single inhumation excavated during building work at 129 The Mount). They were subjected to full osteological analysis, including the compilation of a skeletal inventory, assessment of age and sex, collection of metric and nonmetric data, and recording and photographing of pathological conditions.

The burials on both sites appeared to follow no specific alignment, and there was some intercutting of graves, indicating that the burials had occurred over a period of time (figure 6.4). Four individuals from 1–3 Driffield Terrace were interred as double burials (Ottaway 2005; figure 6.5 [SK15, SK16]), with individual skeletons placed directly on top of one another, while 6 Driffield Terrace had one double burial, one triple burial, and one burial with four individuals (Hunter-Mann 2005). The evidence indicates contemporaneous burial of multiple individuals within single graves. Only four individuals out of the fifty-six excavated from 1–3 Driffield Terrace had been buried in coffins (Ottaway 2005), while nearly all of the graves excavated from 6 Driffield Terrace contained evidence for coffins (Hunter-Mann 2005). Evidence for grave goods, shoes, and clothing was limited. Two individuals had pottery vessels,

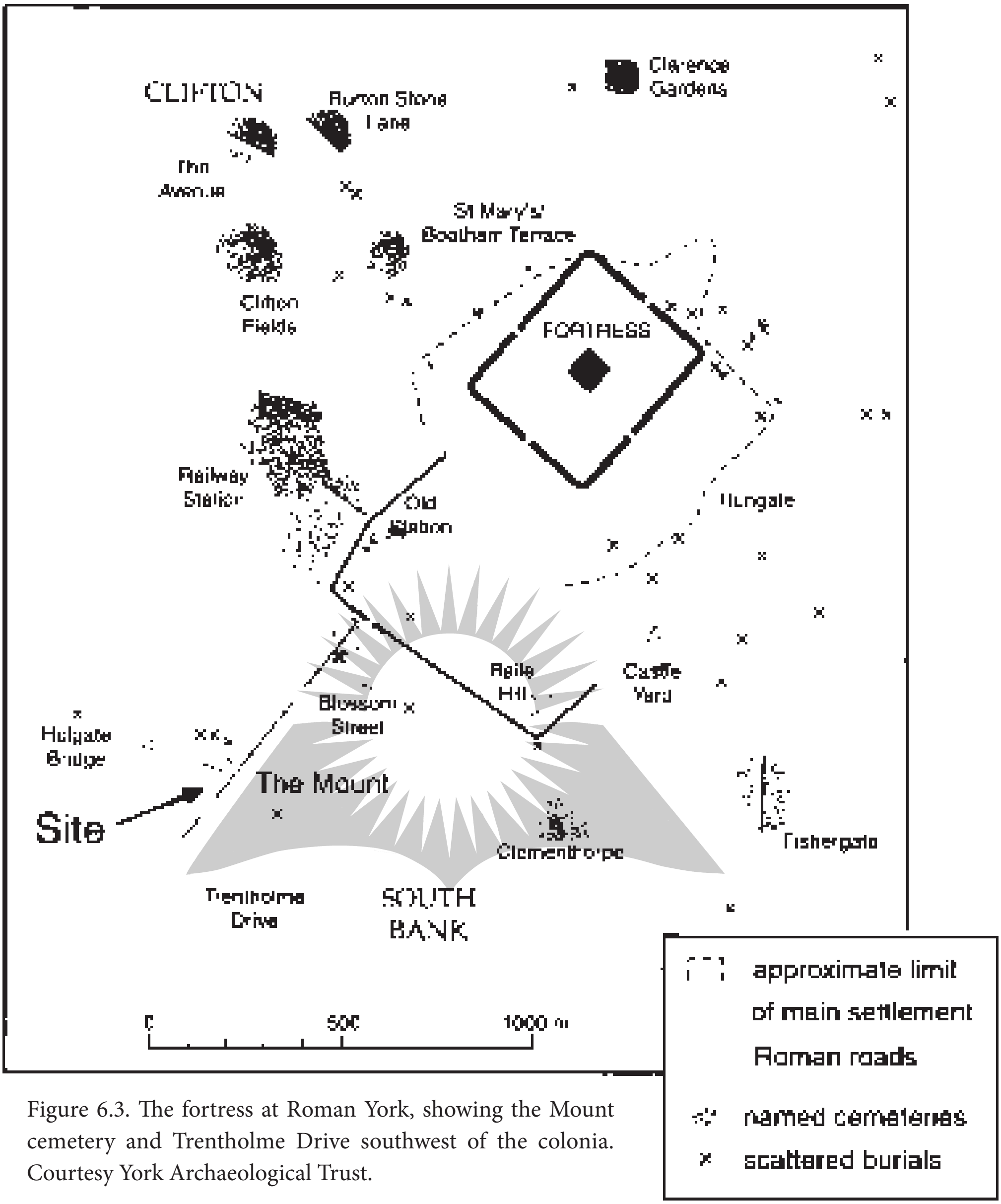

Figure 6.3. The fortress at Roman York, showing the Mount cemetery and Trentholme Drive southwest of the colonia. Courtesy York Archaeological Trust.

and two were buried with the partial skeletons of chickens (Ottaway 2005), while five individuals from the site were buried with hobnail boots (*calcei*). The presence of hobnail boots in the grave of one individual from 6 Driffield Terrace was the only evidence for shoes or clothing from any of the graves at this site (Hunter-Mann 2005).

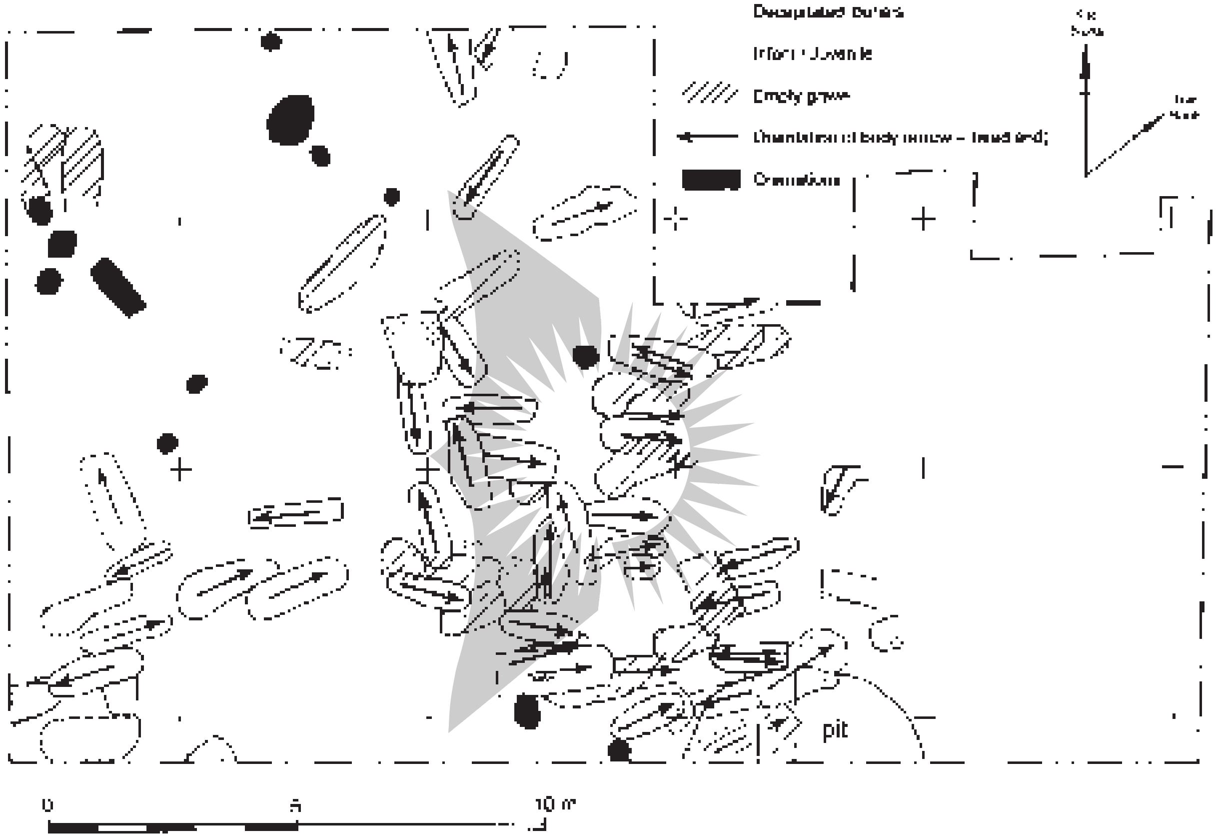

Figure 6.4. Plan view of the cemetery at 3 Driffield Terrace, showing the lack of any consistent grave alignment and the intercutting of burials. Courtesy York Archaeological Trust.

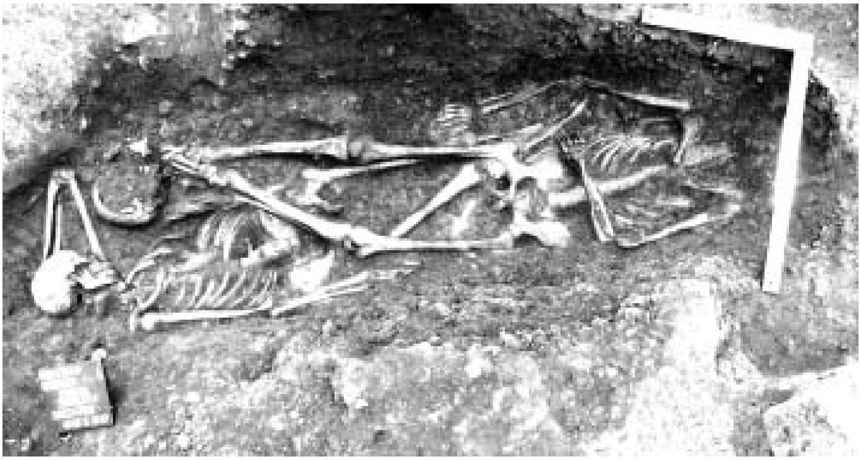

Figure 6.5. Double burial of decapitated individuals SK15 (4146) and SK16 (4147) from 3 Driffield Terrace. Courtesy York Archaeological Trust.

The Decapitations

Of the eighty individuals from Driffield Terrace, forty-five had osteological evidence for decapitation, with another three having contextual evidence (the head not in correct anatomical position in the grave but no surviving cut marks due to loss of relevant elements); this represents 79 percent of the sixty-one individuals who had crania and cervical vertebrae surviving. Cuts affected vertebrae from the uppermost cervical (C-1) to the second thoracic (T-2) (figures 6.6, 6.7), and the number of cuts on individual skeletons ranged from one or two cuts, which was the most common finding, to eleven separate cuts on six of the cervical vertebrae from the same individual. Seven individuals also had cuts to the mandible, and three had cuts to the mastoid process (usually associated with cuts through the upper cervical vertebrae), while one individual had a cut to the clavicle, one had cuts to the clavicle and scapula, and one had cuts to the first rib; all of these were associated with cuts through the thoracic vertebrae. Two individuals also had numerous cuts to the mandible with large parts of the bone missing (figure 6.8 [SK33]). Decapitation alone is unlikely to have produced such cuts, and they may represent deliberate acts of facial disfigurement.

Where the cuts through the vertebrae could be assigned a direction, the vast majority came from the posterior (see figure 6.7). Where cuts originated anteriorly, the individual also had cuts from the posterior. The nature of the cut marks suggests that a very fine and sharp blade was used to chop through the neck, as the majority of the vertebrae were sliced through their full

Above: Figure 6.6. Cleanly bisected cervical vertebra from SKl7 (4130), 3 Driffield Terrace. Courtesy York Archaeological Trust.

Left: Figure 6.7. Posterior view of cervical and upper thoracic vertebrae of SK47 (4471), 3 Driffield Terrace, showing multiple cuts to the posterior of the vertebrae. Original diagram produced by Caroline Needham with additions by authors. Courtesy York Archaeological Trust.

Right: Figure 6.8. Mandible from SK33 (4253), 3 Driffield Terrace, showing multiple cuts. Courtesy York Archaeological Trust.

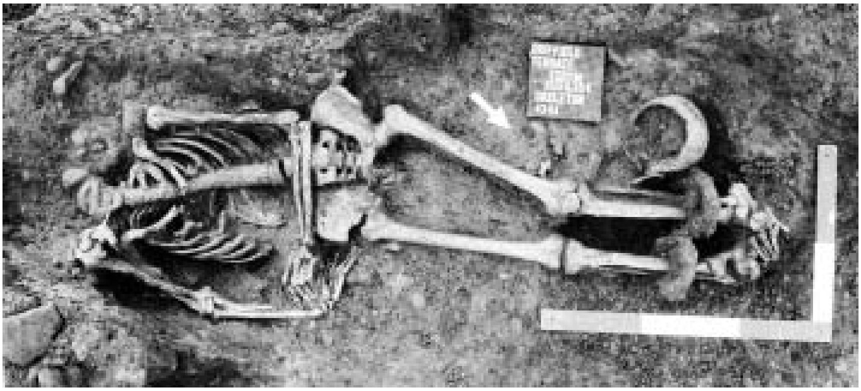

Figure 6.9. Decapitated individual SK37 (4344) from 3 Driffield Terrace, buried wearing heavy iron rings around his ankles. Courtesy York Archaeological Trust.

Figure 6.10. Second cervical vertebra of decapitated individual SK37 (4344) from 3 Driffield Terrace, depicting rougher cut to the inferior arch and body. Courtesy York Archaeological Trust.

thickness from a single blow with very little fracturing and fragmentation of the bones, although there was some splitting of the laminae. The only exception to this was, perhaps significantly, the individual buried with the iron rings around his ankles (figure 6.9 [SK37]), whose second cervical vertebra was cut and fractured (figure 6.10), which may suggest that a different type of weapon or a different method was used to perform this decapitation. The polishing (smoothness) of the cut surfaces indicates that the cuts were perimortem and that the bone contained the same amount of collagen as it did in life (Wenham 1989). The splitting of the laminae indicates that the musculature and ligaments were present and intact when the decapitation took place (Boylston et al. 2000: 246).

Decapitations have been found during previous excavations of a number of Romano-British cemeteries. Philpott (1991: 79–80) notes ninety-eight examples of decapitated burials with a frequency of 6.1 percent of all inhumations from cemeteries where decapitation was found. Roberts and Cox's (2003: 158) study, which includes information from sites discovered after the publication of Philpott's survey, reports fifty-eight decapitations (5.5 percent of the total number of inhumations from relevant cemeteries). The largest number of affected individuals from any one site was fifteen out of ninety-four burials (16 percent) from Cassington, Oxfordshire (Clarke 1979: 373), followed by twelve out of eighty-eight burials (14 percent) from Kempston, Bedfordshire (Boylston et al. 2000). The percentage of affected individuals from Driffield Terrace, using the ratio of decapitated individuals to the total number of inhumations, is therefore nearly four times higher than that recorded for any other Romano-British cemetery. Philpott (1991: 79) notes all ages and both sexes among the decapitated individuals, with a large number of older women represented, while Boylston (2000: 368) notes that a small number of children and infants also were decapitated. All of the cemeteries where decapitation has been found appear to be normal attritional cemeteries with both sexes and a full range of ages represented among both the decapitated individuals and the cemetery population as a whole. This is not the case for the Driffield Terrace cemetery.

Various authors have noted that the most common method of decapitation was from the front of the body, with precise, incised cuts (e.g., Harman et al. 1981: 165; Philpott 1991: 80; Boylston 2000: 368). This observation has led many writers to interpret the decapitations as some form of postmortem burial rite (Clarke 1979; Harman et al. 1981; Philpott 1991). One of the few previously recorded exceptions to this pattern is the set of six decapitated individuals from Cirencester, Gloucestershire, in which five of the decapitations were performed from behind (four males and one female) with an extremely sharp blade. Wells (1982: 194) interpreted these decapitated individuals as victims of penal execution. Execution is also the preferred explanation for decapitations from the Anglo-Saxon period; decapitations occurred from behind, and individuals were often buried in awkward positions with the hands positioned as though tied (Reynolds 1997; Hayman and Reynolds 2005).

In addition to the decapitations, five individuals, four of whom had been decapitated (SK3, SK8, SK16, SK45), had other perimortem blade injuries. Two of these (SK8, SK16) were stabbing wounds that would have penetrated the soft tissues of the lower abdomen, and one (SK45) was a cut to the distal femur that would have sliced through the muscles of the thigh. These injuries may represent attempts to incapacitate the individual. The other two (SK3, SK15) perimortem blade injuries are "parry"-type fractures to the forearm and hand, which often occur when an individual attempts to defend the face and head from attack. Sixteen individuals (ten of whom were decapitated; one nondecapitation was a six-to-seven-year-old child) had evidence for perimortem cranial trauma, the majority of which were blunt force. Out of the total of eighty inhumations, fifty-five were decapitated or had perimortem blade injuries or cranial trauma (68.7 percent, or 90.1 percent of the sixty-one individuals who had crania and cervical vertebrae). The patterns seen in this population are different from nearly all of the Romano-British cemeteries where decapitations have been recorded. One interpretation is that the Driffield Terrace decapitations represent some form of execution of the sort suggested for Cirencester and the Anglo-Saxon period.

Demographic Profile

The population from Driffield Terrace comprises mostly young- to middle-adult males with an average stature 3.5 centimeters above the average for males from Roman Britain (see Werner 1998: 39; Conheeney 2000: 286; Roberts and Cox 2003: 142). Of the eighty individuals, only six (7.5 percent) were under the age of 18 at the time of death: two fetuses/neonates (up to one month old), one young child (1–6 years), one older child (7–12 years), and two adolescents (13–18 years). An additional three individuals (3.8 percent) were either adolescents or young adults (around 16–25 years). Of the adult individuals, ten (12.5 percent) could not be assigned to a more precise age cohort. Of the remaining sixty-one adults, the majority (*n*=45, or 56.3 percent of the eighty individuals) died between the ages of 26 and 45; fourteen died as young adults (19–25 years); only two individuals lived past age 45. This age structure does not reflect the expected pattern for preindustrial populations, in which the youngest age classes experience very high mortality, with a decline toward adolescence (figure 6.11); mortality rates rise again in young adulthood, but the majority of individuals survive into mature adulthood (Chamberlain 2000: 106). This profile, which describes an attritional cemetery population, is better seen in the Roman cemetery in eastern London, where 25 percent of the individuals were 18 years old or younger at the time of death, 31 percent of deaths occurred

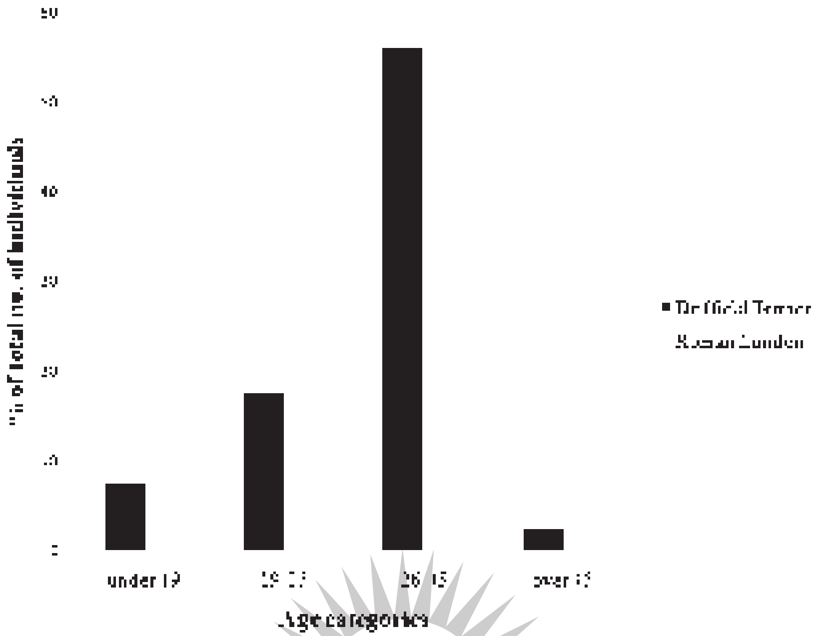

Figure 6.11. Differences in age structure in the populations from Driffield Terrace and the eastern cemetery of Roman London.

between the ages of 26 and 45, and 10.5 percent of individuals survived past the age of 45 (Werner 1998).

At York, 88.8 percent of the population (n=71) were adults, not counting those three individuals who were either adolescents or young adults; only 7.5 percent of the York cemetery population was 18 years or younger. Compared with the pattern seen in London, the York sample has double the number of individuals dying between the ages of 26 and 45 and far too few subadults and mature adults. This would suggest that the population from York does not represent a normal attritional cemetery population (see Gowland and Chamberlain 2005). The fracture profile of the population seems to relate to interpersonal violence, with the majority killed by decapitation (i.e., decapitation is the mode of death) or after having sustained blows to the head or postcranial blade injuries. The age profile of the cemetery, with all individuals being male or probable male, suggests a military context, a premise that is supported by the taller-than-average stature for the population, since the Roman army had height standards for recruits (Friedl 1992: 35).

Methods and Samples

Six of the adult male skeletons excavated from 3 Driffield Terrace were selected by one of us (Tucker) for isotope analysis (table 6.1). The individuals included two nondecapitated skeletons (SK10 and SK35) representative of other nondecapitated individuals from the site; one double decapitation burial (SK15 and SK16; their heads were switched at the time of burial [see figure 6.5]); and two decapitated individuals (SK33 and SK37), one of whom (SK37 [see figure 6.9]) was wearing heavy iron rings on each ankle, which appear to have been cold-forged onto his legs some considerable time prior to death (Rogers 2005), based on infections of the tibiae and fibulae. The head of SK37 (see figure 6.9) was found by his left tibia, and the head of SK33 (mandible depicted in figure 6.8) was found beyond his feet. As is typical for this site, the latter four individuals had been decapitated by cuts through the cervical vertebrae: SK15, by cuts to C-3 to C-4; SK16, by cuts to C-6; SK33, by cuts to C-1 to C-5; and SK37, by cuts to C-2, with additional cuts to the parietals and left temporal, while the occipital is missing.

A small sample of enamel and dentine was carefully removed with a dental saw from a second or third mandibular molar from the six male skeletons (table 6.1) and cleaned of all surface tissue using tungsten carbide dental burrs. Although the recently excavated teeth had not been glued into the alveolar bone, they were found to be stuck fast, probably as a result of the clay burial soil, and this made the teeth extremely difficult to remove without damaging the surrounding alveolar bone. Because of the importance of undertaking this work with minimal destruction, the enamel was removed while the teeth remained in situ in the mandible. Consequently, and as a result of tooth

Table 6.1. Sample details of individuals examined by isotope analysis

Context no.	Skeleton	Sex	Age (years)	Tooth sampled	Notes
4089	SK10	Male	36–45	M2 lower left	Nondecapitated control
4146	SK15	Male	26–35	M3 lower right	Decapitated double burial—skull found with SK16's postcranial skeleton
4147	SK16	Male	36–45	M3 lower right	Decapitated double burial—skull found with SK15's postcranial skeleton
4253	SK33	Male	26–35	M2 lower right	Decapitated
4263	SK35	Male	36–45	M2 lower right	Nondecapitated control
4344	SK37	Male	36–45	M2 lower right	Decapitated, shackled

morphology and alignment, for two individuals (the double burial of SK15 and SK16) the enamel could not be removed from the second molars without the risk of damaging the teeth on either side, so the third molar was sampled. Second mandibular molar tooth crowns mineralize between the ages of 2.5 and 8 years (Gustafson and Koch 1974), while the timing of enamel formation in third molars can be assumed to derive from the period of life from approximately 10 to 16 years of age, although the development and age of eruption of this tooth is the most variable of all the permanent teeth (Hillson 1996). Enamel preservation for all teeth was graded as good following the methods of Montgomery (2002).

The enamel samples were removed and sealed in containers and transferred to the clean laboratories at the Natural Environment Research Council (NERC) Isotope Geosciences Laboratory (NIGL), Nottingham, United Kingdom. The isotope compositions of strontium and lead were obtained using a Finnigan MAT262 thermal ionization multicollector mass spectrometer. The reproducibility of the international strontium standard, NBS987, during a period of analysis did not exceed ±0.000030 (2s), or ±0.004 percent (2s). All samples were corrected to the accepted value of $^{87}Sr/^{86}Sr=0.710250$ to ensure that there was no induced bias through mass spectrometer drift. Strontium isotope data are presented as $^{87}Sr/^{86}Sr$ ratios. Lead isotope fractionation was monitored with suitable-sized (20ng) runs using NBS981, and data were corrected for fractionation using the associated standards run. Reproducibility of the isotopes ratios, based on repeated determinations of the NBS981 standard (2s, n=19), are as follows: ±0.15 percent for $^{208}Pb/^{204}Pb$; ±0.11 percent for $^{207}Pb/^{204}Pb$; ±0.07 percent for $^{206}Pb/^{204}Pb$; ±0.04 percent for $^{207}Pb/^{206}Pb$; and ±0.08 percent for $^{208}Pb/^{206}Pb$. Laboratory contamination, monitored by procedural blanks for both lead and strontium, was negligible.

The oxygen isotope ratios of silver phosphate obtained from enamel using a modified method of O'Neil and colleagues (1994) were measured by continuous-flow isotope ratio mass spectrometry (CFIRMS) using a TC/EA (high-temperature-conversion elemental analyzer) coupled to a Thermo Finnigan Delta Plus XL isotope ratio mass spectrometer via a ConFlo III interface. Samples were analyzed in triplicate, corrected, and converted to the Standard Mean Ocean Water (SMOW) scale against NBS120C in-house reference material. The reproducibility over the analytical period for NBS120C and "batch control" ACC1 were ±0.18‰ and ±0.15‰, respectively. The measured ratios were converted to drinking-water values using the equation of Levinson and colleagues (1987) after a correction of +1.4‰:

$$d^{18}O_{\text{Drinking Water}} = (d^{18}O_{\text{Phosphate Oxygen}} - 19.4) / 0.46$$

Table 6.2. Isotope data

Sample no.	Tissue	$\delta^{18}O\ PO_4$ [a]	$\delta^{18}O_{dw}$ [b]	$\delta^{18}O_{dw}$ [c]	Sr ppm	$^{87}Sr/^{86}Sr$ [d]	Pb ppm	$^{206}Pb/^{204}Pb$ [e]	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{207}Pb/^{206}Pb$	$^{208}Pb/^{206}Pb$
DRIF-10	Enamel	15.0	-12.6	-11.3	67	0.709563	1.1	18.42	15.54	38.21	0.844	2.076
DRIF-10	Dentine				153	0.709077						
DRIF-15	Enamel	18.9	-4.1	-4.5	73	0.714202	1.8	18.37	15.58	38.23	0.848	2.081
DRIF-15	Dentine				216	0.711442						
DRIF-16	Enamel	17.7	-6.8	-6.7	71	0.709407	0.4	18.39	15.55	38.24	0.846	2.079
DRIF-16	Dentine				177	0.710044						
DRIF-33	Enamel	17.4	-7.4	-7.1	131	0.708920	0.7	18.46	15.57	38.31	0.843	2.075
DRIF-35	Enamel	17.4	-7.3	-7.1	67	0.709401	2.4	18.50	15.58	38.33	0.842	2.072
DRIF-37	Enamel	18.2	-5.7	-5.8	42	0.708924	0.7	Pb isotope sample failed				

[a] Mean enamel phosphate. External and sample reproducibility was estimated at ±0.18‰ (1σ).

[b] Calculated using Levinson's equation (Levinson et al. 1987) after correction for the difference between the average published values for NBS120C and NBS120B used by Levinson.

[c] Calculated using Daux et al. 2008: Equation 4.

[d] External reproducibility was estimated at ±0.004% (2σ).

[e] External reproducibility was estimated at ±0.15% for $^{208}Pb/^{204}Pb$; ±0.11% for $^{207}Pb/^{204}Pb$; ±0.07% for $^{206}Pb/^{204}Pb$; ±0.04% for $^{207}Pb/^{206}Pb$; and ±0.08% for $^{208}Pb/^{206}Pb$ (2σ, n=19).

The correction accounts for the difference between the best estimate (+20.0±0.5‰) for NBS120B, applicable to Levinson's calibration data, with the NIGL value for NBS120B of +21.4‰ (Chenery et al. 2010). This latter value is the equivalent of the modern standard (NBS120C) value at NIGL of $d^{18}O$=21.71±0.35‰ (1s, n=11). The NIGL value for NBS120C is in agreement with the international recognized value for NBS120C (Chenery et al. 2010). Drinking-water values were also calibrated using Equation 4 of Daux and colleagues (2008); this equation produces comparable $d^{18}O$‰ values, which, given analytical reproducibility and the difficulties in accounting for seasonal variation or the cultural modification of drinking water, would not significantly alter the interpretation of the values presented here (table 6.2).

Results and Discussion

Lead Isotope Analysis

The enamel lead concentrations for the six individuals range from 0.4 to 2.4 parts per million (ppm). When compared to data for archaeological British populations, these are not unusually high concentrations (figure 6.12) and reflect a childhood snapshot of exposure rather than the long-term accumulation in adult tissues. To put this in a modern context, a study of living children at the Broken Hill lead-mining community in Australia by Gulson and colleagues (Gulson, Howarth, et al. 1994; Gulson, Mizon, et al. 1994; Gulson and Wilson 1994; Gulson et al. 1996) concluded that low exposure resulted in enamel-lead concentrations of <2 ppm, whereas high exposure produced enamel-lead concentrations of ~2–10 ppm. In Britain, pre-Roman populations usually have enamel lead levels of <1 ppm (figure 6.12), and the lead tends to have variable isotope ratios that reflect the composition of local rocks (and therefore geographic origins) rather than exposure to anthropogenic pollution such as water from lead pipes, food and drink produced in lead cooking pots, food additives, medicaments, inhalation of airborne pollutants, or accidental ingestion of lead in the environment via dust from dirty hands (Montgomery et al. forthcoming).

From the Roman period onwards, lead concentrations tend to rise, and this is coupled with a "cultural focusing" (Montgomery et al. 2005) of the $^{207}Pb/^{206}Pb$ ratio to ~0.846, which is characteristic of English ore lead (Rohl 1996). The lead isotope sample for SK37 failed. SK35 is therefore unusual in that the concentration indicates exposure to anthropogenic ore sources but the source of the lead does not seem to be solely from English deposits. This may also apply to SK10 and SK33, whose lead isotope ratios differ from those

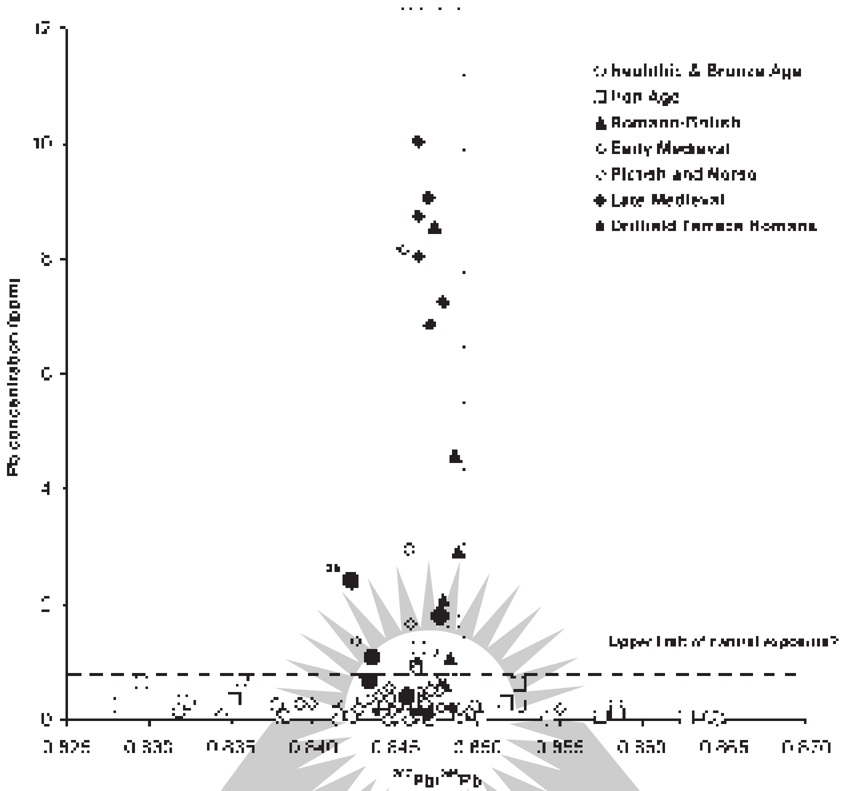

Figure 6.12. Plot of enamel lead concentrations against lead isotope ratio for the Driffield Terrace individuals in comparison with data for British individuals since the Neolithic. The plot illustrates the "cultural focusing" of lead isotope signatures as a result of anthropogenic extraction and use of metals: individuals with high levels of lead all have $^{207}Pb/^{206}Pb$ ratios ~0.846. SK35 and SK10 display unusual lead compositions for pre-nineteenth-century British individuals. Data sources: Montgomery 2002; Montgomery et al. 2005; Montgomery 2009; Montgomery et al. forthcoming.

obtained from other late-Roman period individuals excavated in England (figure 6.13). In contrast, SK15 and SK16 both have lead isotope compositions that are entirely consistent with exposure to English ore lead sources. Such lead ratios indicate exposure to sources of younger lead such as the Mesozoic ore deposits of the Mediterranean region (Stos-Gale et al. 1997; Boni et al. 2000; Sayre et al. 2001). Unfortunately, as a consequence of the extensive mining and transport to continental Europe of metal resources during the Roman period, exposure to English ore lead (or other ore sources with similar isotope ratios) could have occurred anywhere in the Roman Empire where such lead was exported and used (Boni et al. 2000). The lead data can thus provide no

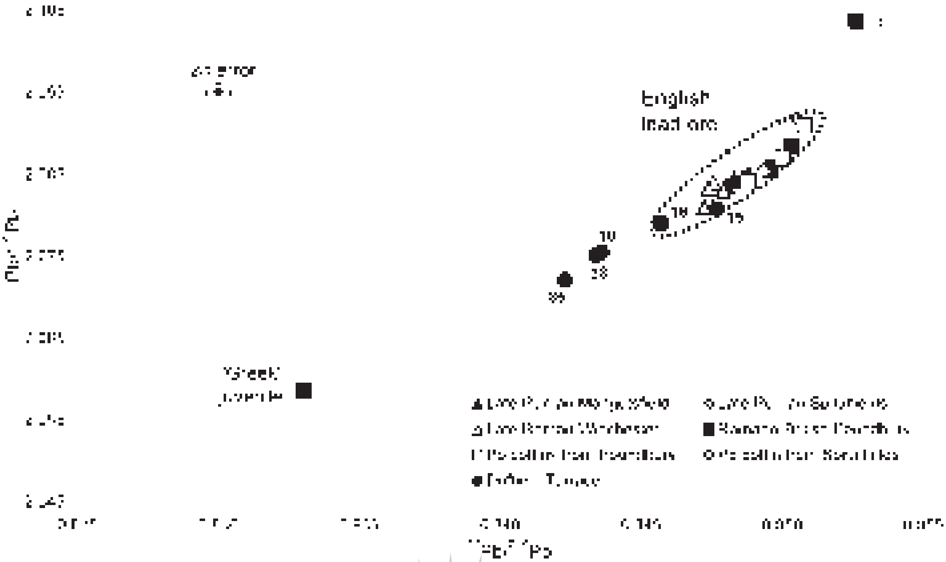

Figure 6.13. Plot of enamel lead isotope ratios of the Driffield Terrace individuals (SK37 missing) with other data from contemporary burials from England. The vast majority of individuals with a lead concentration >1 ppm fall within the field of English ore lead (denoted by the dashed oval), as do all the lead coffins. The "Greek" juvenile from Poundbury has a very different ratio, but this is consistent with the English Chalk from which it was excavated. SK35, SK33, and SK10 fall outside the English ore lead field. Data sources: Montgomery 2002; Montgomery et al. forthcoming; for Poundbury, Molleson et al. 1986.

evidence for specific origins but do indicate that SK35 and possibly SK10 and SK33 are inconsistent with cultural exposure to solely English lead pollution and may be explained by exposure to pollution of a different origin during the first sixteen years of life.

Strontium Isotope Analysis

The enamel strontium isotope ratios and compositions of the six individuals range from 0.70892 to 0.71420. The range of published ratios for human tooth enamel from England is not much larger than this: most tend to fall within 0.707 and 0.714 (Montgomery 2002; Evans and Tatham 2004; Montgomery et al. 2005; Evans, Chenery, and Fitzpatrick 2006; Evans, Stoodley, and Chenery 2006; Montgomery, Cooper, and Evans 2007). Similarly, the range of strontium concentrations is 42–131 ppm, which is consistent with values obtained from modern and archaeological humans in England, where concentrations of ~50–150 ppm are usually found (Montgomery 2002; Brown et al. 2004;

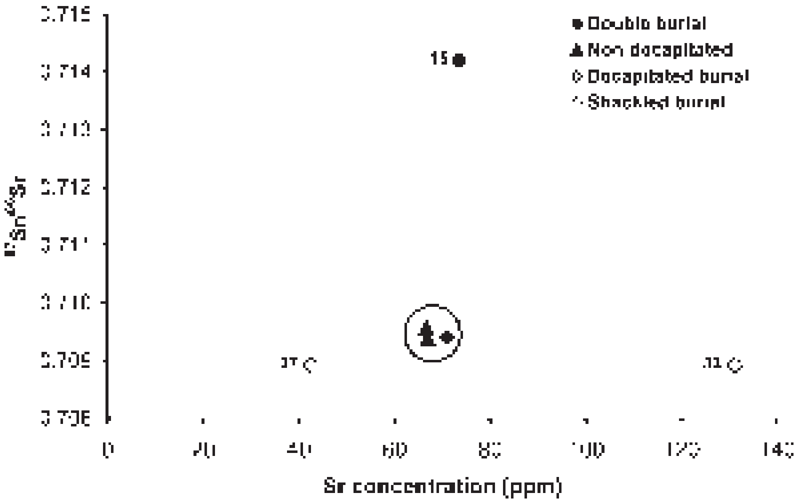

Figure 6.14. Plot of strontium isotope ratios against strontium concentrations of the Driffield Terrace individuals. The circle encloses a cluster of three individuals (SK10, SK16, SK35) who have very similar strontium compositions. 2s errors for the strontium isotope ratios are contained within the symbols.

Evans and Tatham 2004; Montgomery et al. 2005; Evans, Chenery, and Fitzpatrick 2006; Evans, Stoodley, and Chenery 2006; Montgomery, Cooper, and Evans 2007). Figure 6.14 shows that three individuals cluster together (SK10, SK16, SK35) and the remaining three are separated on the basis of their isotope ratio or their strontium concentration.

For three of the teeth analyzed, a sample of the crown dentine was also processed. In modern individuals, these two co-genetic tissues have the same strontium isotope ratio, and because neither subsequently remodels, they retain these values until burial (Montgomery 2002). Although enamel is highly resistant to postmortem diagenesis, buried dentine, particularly in the case of its strontium composition, tends to equilibrate with the soil (Budd et al. 2000; Hoppe et al. 2003; Trickett et al. 2003), and a change in strontium isotope ratio towards that of the soil pore fluid is usually present, coupled with an increase in strontium concentration (Montgomery 2002). Diagenetic mixing vectors between enamel and crown dentine from the same tooth can, therefore, in the absence of environmental samples, be used to provide an estimate of the local soil strontium values rather than providing information from the individual's lifetime (Montgomery, Evans, and Cooper 2007). This is illustrated in figure 6.15, and while none of the three samples is likely to have entirely

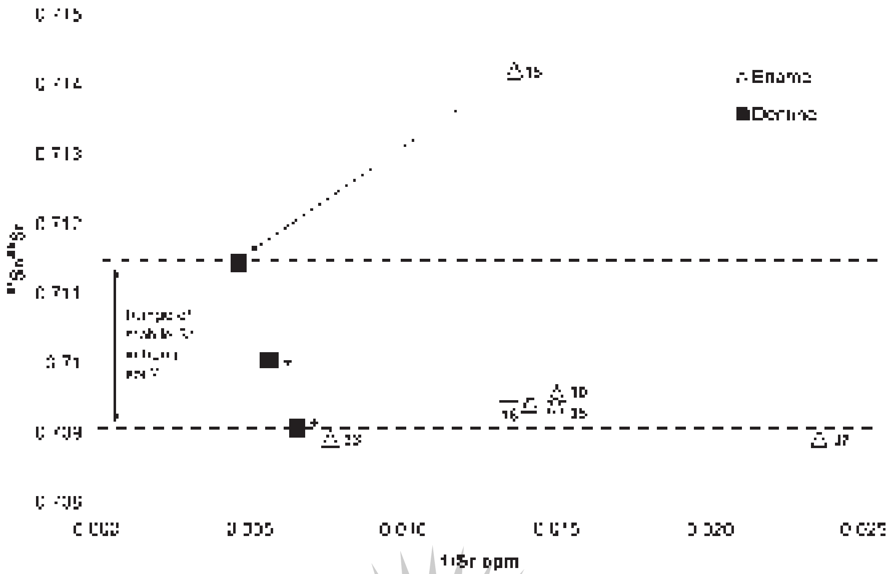

Figure 6.15. A plot of strontium isotope ratios against the inverse strontium concentration for enamel and, for three teeth, crown dentine of Driffield Terrace individuals. Diagenetic vectors for enamel-dentine pairs are shown and used to estimate the possible range of strontium present at the site. The cluster of three individuals (SK10, SK16, SK35) that fall within this range indicates that these three have a strontium composition consistent with local values.

equilibrated with the mobile strontium in the burial soil, the mobile strontium in the glacial drift overlying the Permo-Triassic bedrock of York is likely to have a $^{87}Sr/^{86}Sr$ ratio somewhere between 0.7090 and 0.7115. This is a wider range than the 0.7096 to 0.7105 previously suggested for Triassic biospheres (Montgomery et al. 2009).

The range illustrated in figure 6.15 is likely to be too wide (given that it is produced from only three incompletely equilibrated dentine samples) but may simply reflect the heterogeneity of the minerals and source rocks within the glacial till. Biosphere ratios between 0.7090 and 0.7105 would be consistent with Jurassic and Triassic sedimentary silicate rocks in England (Montgomery 2002; Evans and Tatham 2004; Montgomery et al. 2006; Montgomery et al. 2009), and these rocks may all have contributed to the glacial till in the area (Clark et al. 2004). The cluster of three individuals—SK10, SK16, and SK35—falls within this 0.7090–0.7105 range, which adds weight to the suggestion that these individuals were local residents. In contrast, SK33 and SK37 have lower strontium isotope ratios (<0.709) that are indicative of origins in regions of marine carbonates such as chalk and limestones (Montgomery et al. 2000; Evans and Tatham 2004; Evans, Chenery, and Fitzpatrick 2006; Evans, Stoodley, and Chenery 2006; Montgomery, Cooper, and Evans 2007). Such rocks are present in the Cretaceous, Jurassic, and Permian terrains that form the higher ground surrounding the Vale of York basin and may provide local places of origin for these two individuals. SK15 has a radiogenic isotope ratio that is rarely found in English burials and suggests origins in regions of Paleozoic, possibly granitic, rocks that are not found in Yorkshire or, indeed, most of central and eastern England; the main outcrops in Britain are to the west in the Lake District or Wales or to the north in Scotland.

Oxygen Isotope Analysis

The measured enamel phosphate $d^{18}O$ ranges from 15.0‰ to 18.9‰. This is a wide range of values for indigenous Britons and, when calibrated to drinking-water values, produces a $d^{18}O$ range of -4.1‰ to -12.6‰. The modern-day range for mean annual precipitation (the source of drinking water) in Britain is -4‰ to -9‰, as indicated in figure 6.16; however, values above -6‰ are only found in the extreme west of Britain and those above -5‰ occur only in the Outer Hebrides (Darling et al. 2003; Darling and Talbot 2003). Three of the individuals (SK16, SK35, SK33) have oxygen isotope ratios that are consistent with eastern England, in general, and York, in particular, and their strontium compositions would not contradict this conclusion. However, this group is not entirely composed of the same three individuals who formed the cluster of strontium compositions in figure 6.14: one individual (SK10) in this strontium cluster has an unusually low $d^{18}O$ ratio, which is inconsistent with any location in the British Isles and is indicative of high latitude, high altitude, or inland continental European regions. Such enamel phosphate $d^{18}O$ ratios have, for example, been obtained from Inuit in medieval Greenland (Fricke et al. 1995). The strontium isotope ratio would, however, suggest that this would be a region of young Mesozoic rocks rather than granitic or older Paleozoic terrains. SK15 and SK37 have oxygen isotope ratios above -6‰, and these are indicative of origins in western England, although SK15's ratio would only be consistent with the Outer Hebrides.

There are two complicating factors to consider before an interpretation can be made. First, how valid is it to compare oxygen isotope ratios obtained from archaeological enamel to maps of modern precipitation? And second, although the isotope ratios obtained for four of the individuals are consistent with origins in England—and Occam's razor would suggest that this is the most parsimonious explanation—isotope analysis is an exclusive technique that can rule out places of origin but cannot discriminate among the many

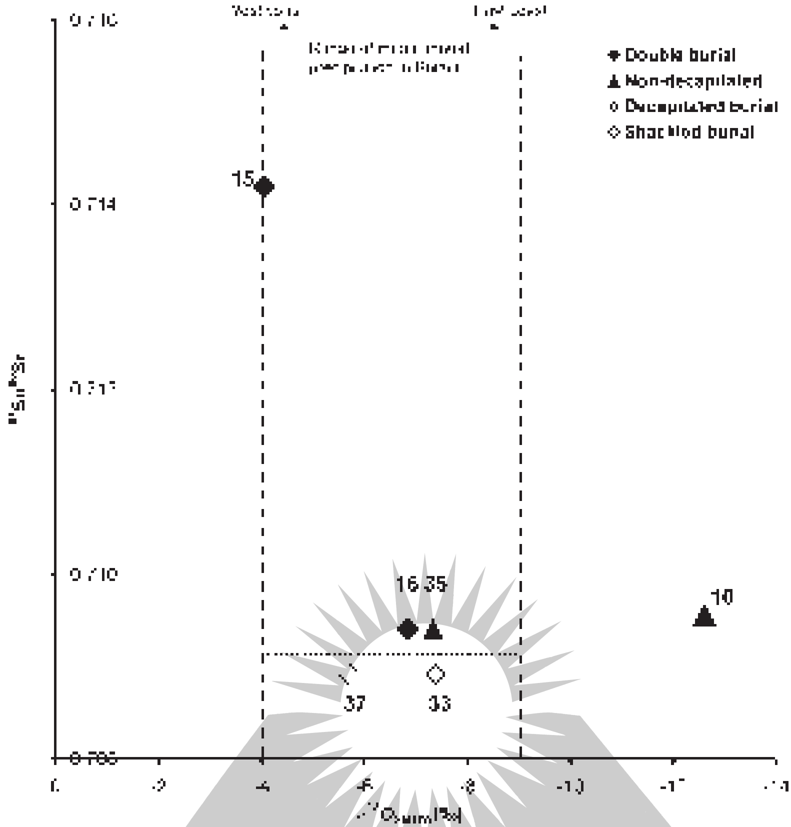

Figure 6.16. Plot of strontium isotope ratio against oxygen isotope ratio for Driffield Terrace individuals. The dashed vertical lines represent the extent of mean annual oxygen isotope ratios in the modern British precipitation. Oxygen isotope ratios above -6‰ occur solely down the extreme west coast of Britain. Samples falling below the horizontal dotted line are consistent with regions of marine carbonates such as chalk and limestone. Errors are within the symbol for strontium (2s) and shown at ±0.5‰ for oxygen, which takes into account the additional error associated with the conversion of measured phosphate values to precipitation.

possible places throughout the world that may also be characterized by a similar isotope profile to that of eastern England. Archaeological knowledge may suggest that many of these places make little or no sense in the time period under investigation, and for reasons of space and lack of available data, listing them all may be impossible, but it should always be borne in mind that only in very rare instances may a truly unique profile be found.

Is it valid to assume that the climate difference between Britain in the second century AD and today is negligible? The individuals in our study were living in what is known as the Roman Warm Period, when grape cultivation was widespread in Britain and average temperatures were thought to be ~2°C warmer than those of today (Lamb 1977, 1995). Temperature can affect both weather and patterns of rainfall in complex ways that may vary considerably depending on topography and latitude, even in a relatively small island such as Britain (Lamb 1981). Moreover, individual teeth record seasonality on far smaller time scales than the majority of climatic proxies can hope to do, and differences between two individuals may be due to a single anomalously warm or cold year. Nonetheless, there is mounting evidence from current research across Europe for cultivation taking place much farther north and on higher ground, slightly lower sea levels (due to steric effects), and raised temperatures in the proxy records in the Roman Warm Period (Swindles, personal communication 2009). For example, a shift to notably warmer and drier summers resulting in water deficits in Britain and Ireland has been documented in the first few centuries AD (Swindles et al. 2010), along with upland clearances on the English Pennines to create fields that are today no longer suitable for agriculture (Bartley and Chambers 1992), and in continental Europe there is evidence that some of the Alpine passes were also ice free in winter between 2.25 and 1.7 kyr BP—the Roman Warm Period (Vollweiler et al. 2006). Increased aridity and temperature can certainly affect the d^{18}O ratios of groundwaters through increased evaporation (Darling et al. 2003; Leng and Anderson 2003; Gazis and Feng 2004; Hoppe et al. 2004); the result is that the waters become enriched in the heavier ^{18}O isotope and thus the d^{18}O ratios shift towards ratios indicative of warmer climates. All these considerations indicate that if there was a difference between the d^{18}O ratios of modern-day precipitation and that of Britain in the Roman Warm Period, it would result in enamel phosphate ratios that are shifted towards less negative ratios, that is, the oxygen isotope range for Britain in figure 6.16 would move to the left. However, given published estimates that a 2°C temperature rise would produce a shift of only 1‰ in mean annual d^{18}O ratios of rainfall (Rozanski et al. 1992, 1993), based on current evidence, any systematic shift in population d^{18}O enamel ratios during this period is not likely to exceed 1‰. This would clearly have no effect on the conclusion of non-British origins for SK10, as this individual would move farther away from the British field. Neither would this difference be sufficient to make SK16, SK33, SK35, or SK37 inconsistent with an origin in Britain. It would, however, bring SK15 into the range for the west coast of Britain.

Comparative data from other Romano-British skeletons from Winchester and the Lankhills Roman cemetery of Winchester, which are located on the Cretaceous Chalk of the South Downs in southwestern England, are shown

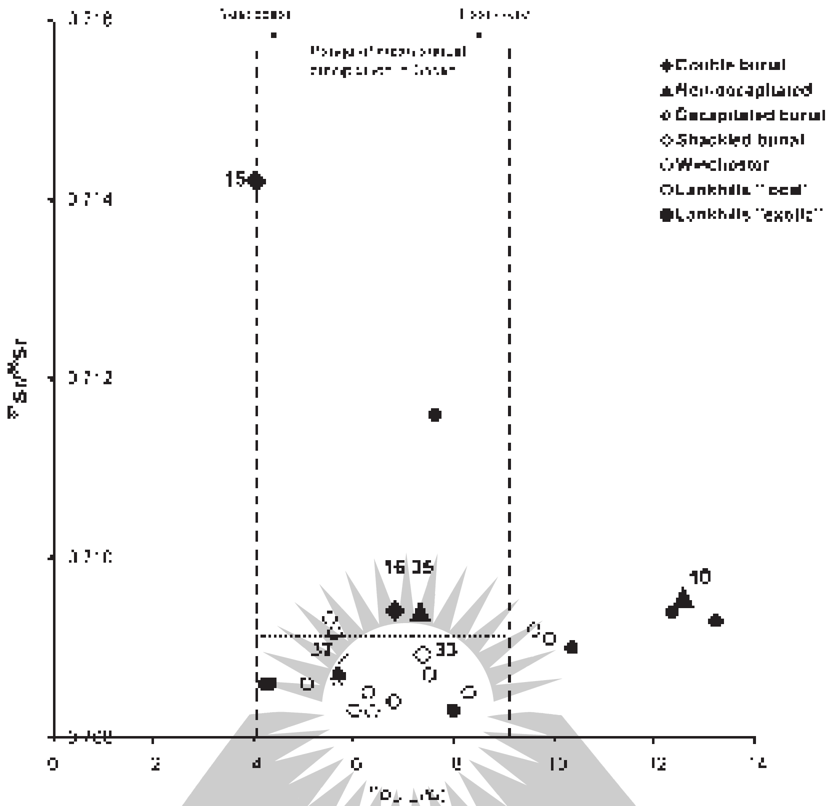

Figure 6.17. Plot of strontium isotope ratios against oxygen isotope ratios for the Driffield Terrace skeletons and comparative contemporary Romano-British burials from Winchester (Montgomery et al. 2008) and the Lankhills Roman cemetery of Winchester (Evans, Stoodley, and Chenery 2006) in southern England. The dashed vertical lines represent the extent of the oxygen isotope ratios in British precipitation. Individuals falling below the horizontal dotted line have strontium isotope values consistent with marine carbonates such as chalks and limestones and are probably too low for the Vale of York. Individuals SK16 and SK35 are consistent with the Vale of York for both strontium and oxygen isotope ratios.

in figure 6.17. The majority of these data are consistent with origins on the Cretaceous Chalk (they fall below the horizontal dotted line), but several individuals from both the archaeologically defined “local” and “exotic” (see Evans, Stoodley, and Chenery 2006) groups have oxygen isotope ratios that are inconsistent with an origin in Britain. Of particular note are the two “exotic” individuals from the Lankhills cemetery—Lankhills 81, a possible male of 30–35 years of age at death, and Lankhills 426, a possible male of 25–35 years of age at death—that have the same isotope profile as SK10, a result that strongly suggests similar origins outside Britain for these three individuals. Several individuals from the Winchester and Lankhills sites have strontium and oxygen ratios that would indicate they had local origins on the Cretaceous Chalk of southern England; such a profile is also shared by SK37.

Summary of Composite Isotopic Results

To summarize the individual results obtained:

- SK10—The oxygen ratio is too low for this nondecapitated individual to have originated in Britain or most of northern Europe and indicates that he originated somewhere extremely cold or at a high altitude. The lead isotope composition would support a non-English origin. The Alps and possibly the Italian Apennines are possibilities and would also be consistent with the strontium results. Alternatively, the origin could be somewhere far inland and continental with young Mesozoic rocks, such as eastern central Europe. The observation that this individual has a highly unusual $d^{13}C$ ratio indicative of consumption of C4 plants such as millet (G. Müldner, personal communication 2009) strongly supports a non-British origin and may indicate an origin in eastern central Europe (see Le Huray and Schutkowski 2005; Le Huray 2006).
- SK15—The oxygen isotope ratio is consistent with only the extreme west coast of Britain (e.g., the Outer Hebrides) and is too high for most of northern Europe. The radiogenic strontium isotope ratio indicates origins in Paleozoic or granitic terrains. Therefore, this decapitated individual may have originated somewhere warm with old rocks such as Sardinia, Corsica, the southernmost tip of Italy, or North Africa around the Red Sea region but not Mediterranean Africa, which is unlikely to provide such radiogenic strontium values.

Table 6.3. Summary of isotope results

Skeleton	Lead	Oxygen	Strontium	Overall
SK10	Nonlocal?	Nonlocal	Local	Nonlocal
SK15	Local	Nonlocal	Nonlocal	Nonlocal
SK16	Local	Local	Local	Local
SK33	Nonlocal?	Local	Local	Local?
SK35	Nonlocal	Local	Local	Nonlocal?
SK37	NA	Nonlocal	Local	Nonlocal

- SK16, SK33, and SK35—The oxygen and strontium results are consistent with origins in the north/east Yorkshire region. However, they are also consistent with much of present-day France, Germany, Holland, Denmark, and southern Norway. The lead compositions of SK35 and SK33 are unusual for English burials and suggest exposure during childhood to non-English ore lead from Mesozoic ores such as those found in the Mediterranean region (Boni et al. 2000).
- SK37—This shackled and decapitated individual has an isotope profile that indicates origins in western Britain in regions of chalk or basalt. There, rocks are restricted in their outcrop: basalt is principally found in Scotland and chalk in southern England. As figure 6.17 shows, the results for SK37 would be entirely consistent with Cretaceous Chalk in southern England. Alternatively, if this individual did not originate in Britain, there are many places around the Mediterranean Sea that would be suitable places of origin.

In summary (table 6.3), oxygen and strontium isotope ratios suggest that two decapitated individuals (SK16, SK33) may be of local origin and one decapitated individual (SK37) may have originated in the southwest of Britain or the Mediterranean region—these three individuals have low levels of lead that suggest little childhood exposure to anthropogenic sources. There are hints, however, from the lead isotope ratio that SK33 was not exposed to English ore lead as a child. More work is needed to clarify this. Two individuals (SK10, nondecapitated; SK15, decapitated) are unlikely to have originated in Britain, and one nondecapitated individual (SK35) has a lead composition that is highly unusual for English ore lead or archaeological skeletons—these three have the highest enamel-lead concentrations, which are highly likely to derive from childhood exposure to pollutant, anthropogenic lead such as from lead piping, lead vessels, and food additives.

Conclusions

The Location of Roman Cemeteries

Roman cemeteries occur along the approach roads to urban centers. These cemeteries form a repeated though not exclusive pattern (see Pearce 2000) throughout the Roman Empire, whether along the Via Appia in Rome (Patterson 2008) or along the road from London to Colchester, which passed through Aldgate in Roman London (Barber and Bowsher 2000). Other examples are found along the major approaches to the more completely investigated Verulamium, Roman St. Albans (Hertfordshire, United Kingdom), which include large concentrations of burials along Watling Street, the major route to the north in the Roman period; the Folly Lane site, along the route to Colchester (Niblett 1999); the King Harry Lane site to the southwest and Winchester; and the St. Stephen's cemetery site, south towards London (see Niblett 2000: 97, fig. 10.1). The Roman elites, especially, chose to be buried along the major approach roads, often on high points overlooking the urban center; this is the case for the still-extant tomb of Caelia Metella, the wife of the Triumvir Crassus, which is situated at a high point along the Via Appia, the main route from Rome to the southeast and the port at Roman Brindisium (modern Brindisi, Puglia, Italy; Toynbee 1971: 155).

The burials at Driffield Terrace, York, are located along the main approach road from the south, the former Via Praetoria (Hutchinson and Palliser 1980), on a promontory, so such a prime location might be expected to be reserved for people of high status. Given that decapitations are often associated with individuals considered to have been social outcasts in the Roman period (Boylston et al. 2000; Philpott 1991: 84–85, 232), as well as in the post-Roman period (Harman et al. 1981; Buckberry 2008; Reynolds 2008), this prime location might seem a contradiction. Importantly, Reynolds (2008) argues that the increasingly formalized nature of decapitated burials in the seventh and eighth centuries AD reflects the rise and increasing political and social control exerted during early medieval state formation in England (see also O'Donnabhain this volume for medieval Ireland). These might include criminals and social outcasts, but this category need not imply that decapitated individuals were of lower social status.

In the Roman world, the demise of the condemned was determined by social status. Those of lowly status might be meted death in a myriad of ways, including by crucifixion, being burned alive, or being thrown to beasts. Those of higher social status, however, had more control over the form of their fate. Such individuals might be offered exile, suicide, or beheading, a rapid but honorable form of execution (Hope 2000: 112). Thus, the burials at Driffield Terrace are unlikely to be those of common criminals; a far more likely explanation is that they were men of higher status whose mode and manner of death merited burial in a location befitting their status. This would suggest that such individuals were of higher social status (as indicated by their relative stature; see Floud et al. 1990; Steckel 1995; Bogin 1999: 303ff.), and that, despite the pattern in which their severed heads were deposited in the graves, would indicate not only a pattern to their manner of death but also that their bodies were recovered for organized and otherwise normative burial. The controlled and repeated manner of their decapitation, the paucity of other weapon-related traumatic injuries, and the relatively lengthy time span covered by these burials would seem to exclude death in battle.

Although a number of healed fractures were observed, along with evidence for perimortem cranial blunt-force trauma caused by blows of significant force, there was little evidence for unhealed postcranial fractures, and those that do occur suggest that they may have been received in the course of an attempt to disable or subdue the victim in the perimortem interval (i.e., injuries to the axial skeleton occurred about the same time as other postcranial injuries), for the majority of perimortem injuries are directed at the neck. The unhealed blunt-force cranial injuries may have come with these attempts to subdue the individual or from after-death treatment of the severed heads.

Historical Context

The period from which these inhumations date, stretching from the late second to the early third century AD, marks a tumultuous period within the Roman Empire and one that affected and was influenced by events in York. In the first chapter of his *Ecclesiastical History of the English Church and People*, Bede (1968) relates that in AD 189 the Roman emperor Septimius Severus, an African from Lepcis Magna in North Africa, came to Britain when nearly all the tribes allied to Rome deserted under the imperial pretender Albinus. Albinus would eventually be defeated by Septimius Severus at a battle fought at Lugdunum in Gaul (modern-day Lyon, France). Severus's seventeen-year reign was marked by violent civil wars and punitive raids into present-day Scotland, perhaps as far north as the Moray Firth, north of modern Aberdeen. In the closing years of the second century, Caledonians and an allied group called the Maeatae made forays into the north of present-day England, capturing and holding Eboracum (York) for a period of time (Cary and Scullard 1975). These incursions, brought about by the vacuum left by Albinus's withdrawal of the Roman soldiery from Britain in his bid for the imperial purple, made the most northern border of the empire so unstable as to demand the presence of the emperor to restore political order.

Under Septimius Severus, York became capital of Britannia Inferior, and the emperor took up residence there for periods of time in the early decades of the third century. The Severan dynasty saw the final demise of the Roman Senate's authority over the selection of the emperor and the emergence of what Cary and Scullard (1975: 499) refer to as a "military monarchy" centered on the emperor himself. Pogrom-like killings and executions were a common feature of politics during this period. The two individuals who were not decapitated (SK10 and SK35) do not appear to have originated in Britain and may thereby support the notion that there was an ethnic component to those treated in this manner. Emperor Antoninus, an "irredeemable lunatic" (Girling 2006) otherwise known as Caracalla, the eldest son of Septimius Severus, who came to York in AD 208, was a chief protagonist in such killings. Among others, Caracalla assassinated his brother and co-ruler Geta and the praetorian prefect and his father-in-law Gaius Fulvius Plautianus and family, including Caracalla's wife, Fulvia Plautilla (Grant 1985: 110, 122), the latter after being denounced for an alleged plot against his father, Septimius Severus. An example of the fate that befell those who opposed these military monarchs comes with the demise of Albinus, who either stabbed himself or was stabbed to death during or shortly after the battle at Lyon. The pretender's head was sent to Rome as a grisly warning, and his sons, who at first had been granted pardons, were later beheaded, along with their mother (Grant 1985: 117).

An enduring legacy of the Severan dynasty was the increased cosmopolitan nature of the empire that came with the origins of the emperor and his sons. As noted above, Septimius Severus came from Tripolitana (modern-day Libya). His wife, the redoubtable Julia Domna, who variously bore the nickname the "Philosopher" and the title "Mother of the Camp and the Senate," was of Syrian origin and gathered in her intellectual circle the philosopher Philostratus and the physician Galen (Grant 1985: 111). The praetorian prefect, Plautianus, although of the *gens* Fulvii (an old Roman patrician family), also hailed from North Africa and was a fellow-townsman of Septimius Severus from Lepcis Magna. These far-flung and mixed origins provide textual indications that accords well with the disparate origins attested by the isotopic results of this study. The diverse origins of these men—from what were the Roman provinces of Britannia Inferior, Britannia Superior, Gaul, eastern European provinces of the Roman Empire, and Syria/Judea, as well as from the Italian peninsula and North Africa—contrast with their apparently similar fate as casualties of state-sponsored Roman proscription.

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