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Preliminary report on a Viking warrior grave at War Memorial Park, Islandbridge

MAEVE SIKORA, BARRA Ó DONNABHÁIN AND NIAMH DALY

ABSTRACT

The discovery of a Viking sword and spearhead was reported to the National Museum of Ireland in 2007. The artefacts were found accidentally when a trench for electrical cables was being dug at the War Memorial Park in Islandbridge, Dublin. A rescue excavation was undertaken in order to recover any other artefacts that may have been damaged during the ground works. A disturbed inhumation and three copper-alloy objects were found in the course of the excavation. This report is a preliminary summary of the findings of the excavation. It is suggested that the finds together represent the grave of a Scandinavian warrior. The results of isotope analysis on teeth found during the excavation are also presented.

BACKGROUND

The discovery of an iron sword and spearhead was reported to the National Museum of Ireland in October 2007. The artefacts had been found in 2004, by Mr Liam Byrne, a contractor laying electrical cables in the War Memorial Park at Islandbridge, Dublin.[1]

The site of the discovery was in the garden of a lodge immediately inside the entrance to the War Memorial Park off South Circular Road.[2] The park, which occupies an area approximately 1km from east to west, was laid out in the early 1930s as a memorial to those Irish who died fighting in the First World War. It is situated on the south side of the Liffey, west of South Circular Road and north of Con Colbert Road. On the first edition of the Ordnance Survey 6-inch-to-one-mile map, it is marked as the townland of Inchicore

1 Mr Byrne had made a number of attempts to report the find. The 2007 report was initially made to Tom Condit, Archaeologist, National Monuments Section of the Department of the Environment, Heritage and Local Government, through Denis O'Sullivan, head gardener at the War Memorial Park in Islandbridge. Thanks are due to Margaret Gormley, Hugh Bonar, Denis O'Sullivan and all the Office of Public Works staff at the War Memorial Gardens who assisted on the excavation. Thanks are also due to Carol Smith and Fiona Reilly for assistance on the excavation. 2 IGR 312592 234167.

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North. The land slopes downward from the ridge at Inchicore to the river at Islandbridge. As Clarke notes, the highest point to which the tide now flows is the weir at Islandbridge which may have been built in the early 1300s by the Knights Hospitaller of the nearby priory of Kilmainham (Clarke 2002). The underlying rock of the area is calp limestone and overlying the bedrock are deposits of boulder clay (Clarke 2002).[3]

The site where the artefacts were discovered is located on the edge of what was known as 'the great pit', a gravel pit that was in use in the 1860s. A number of Scandinavian furnished burials were discovered through gravel extraction at that time (Wilde 1866). This area is described by Sir William Wilde as being 'in the fields sloping down from the ridge of Inchicore to the Liffey, and to the south-west of the village of Islandbridge, outside the municipal boundary of the city of Dublin' (Wilde 1866, 13). The first edition (1844) Ordnance Survey map shows a long, narrow pit extending from the backs of houses fronting onto South Circular Road, almost to the eastern edge of the Memorial Garden. A larger-scale map published in 1868 (from an 1867 survey) shows a gravel pit having extended northwards all the way along behind the row of houses on South Circular Road.[4] Wilde notes how the burials were found resting on the gravel, which underlay dark alluvial soil varying from 'eighteen inches to two feet in depth' (Wilde 1866, 14).

The gate lodge beside the north-eastern corner of the War Memorial Park was built in the 1930s, when the park was laid out. The northern boundary of the front garden of the lodge appears to have been changed in the mid-1990s or early 2000s to allow for a new footpath and road to the north. The size of the garden appears to have been reduced and a new boundary wall was built, running north-west/south-east. The foundation of this wall appears to have disturbed the burial discussed below.

THE 2004 DISCOVERY

When found, the sword was lying flat, and the spearhead was discovered in the spoil heap. The finder also mentioned seeing human remains in the trench, which he thought had remained in the ground when the trench was backfilled. He suggested that the remains had been under or beside the boundary wall of the Memorial Park. The National Parks and Wildlife Service commissioned a geophysical survey of the area but, while a few areas of archaeological potential were noted to the west of the site, nothing was found in the immediate area where the burial was discovered.[5] No distinctive anomalies suggesting the existence of further burials were noted (Nicholl 2008).

3 See also O'Brien 1998 for a map of the area showing the contours. 4 We are grateful to Stephen Harrison for drawing our attention to this map. 5 08R174, undertaken by John

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In late 2008, the National Museum of Ireland conducted a small rescue excavation in order to recover any other associated artefacts that might have been disturbed in the course of the digging of the cable trench. The potential recovery of any human remains, albeit disturbed, was particularly important given the fact that so few were retained from Viking graves discovered in the nineteenth century.[6] Sexing of Viking graves in Ireland has therefore been largely dependent on the nature of the grave-goods and while for the most part this is reliable (Harrison 2001, 66), the examination of associated human remains is clearly preferable.

ARTEFACTS FOUND IN 2004

Iron sword (2007:215): The sword found by Liam Byrne is a large, single-edged iron sword. It can be classed as a Rygh type 491 (R491) sword, or a Petersen Type C sword (Rygh 1885, 28; Petersen 1919, 66–70). The tip of the blade is broken. The extant blade measures 68.5cm long by 5.5cm wide at the guard, tapering to 4cm at the broken tip. The grip and pommel were apparently intact when found but were broken by the time they were taken into the National Museum. The sword would have measured 85.5cm in total length when found. No traces of other metal were found when the sword was x-rayed, but traces of wood and leather, probably from the scabbard, have been noticed on the surface of the blade.[7]

This type of sword is distinguished by its very heavy weight and appearance. The pommel is five-sided and its shape has been compared to a cocked hat (Walsh 1998, 226). It is generally considered to be an early type: Petersen suggests that it developed from an earlier Migration-period weapon, and considers it to be a Norwegian type that was in use up to the mid-ninth century. Petersen lists over one hundred examples from Norway. The type has a wide distribution across the country (Petersen 1919, 66–70). Both single- and double-edged swords of this type are known, but the majority of examples in Norway are single-edged, and these are generally considered to be the earlier form (Graham-Campbell 1980, 67).

In his 1998 article, Aidan Walsh counted eight examples of this type known from Ireland (Walsh 1998, 226). Six of the type C swords found in Ireland are single-edged and only two are double-edged. Six come from the Kilmainham/

Nicholl. The geophysical survey did show areas of potentially significant anomalies in the part of the park closest to the river; however, without excavation it is not possible to state whether these features are archaeological, modern or natural (Nicholl 2008). **6** Apart from recent excavations carried out by Simpson at Ship Street Great and South Great George's Street (Simpson 2002, 2003, 2004) and O'Donovan's work at Golden Lane (O'Donovan 2007), human remains are lacking for a large proportion of furnished Viking graves in Dublin. **7** We are grateful to Carol Smith and Jennifer Mulrooney of the Conservation Department in the National Museum of Ireland for the analysis of the sword during

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Islandbridge grave-fields, one was found at a crannog in Moynalty Lough, in the townland of Moynaltyduff, Co. Monaghan, and one is unprovenanced (Walsh 1998, 226–7). The vast majority, therefore, come from graves in Dublin. Within the Dublin provenance, Harrison and Ó Floinn note that single-edged swords have a limited distribution, and have only been found in the Kilmainham/Islandbridge complex (Harrison and Ó Floinn forthcoming).

Iron spearhead (2007:216): The spearhead found in 2004 is also of iron and an x-ray has shown that it has seven copper-alloy rivets in the socket. Five of the rivets pierce the socket from one side to the other, while the lowermost piercing is actually formed of two rivets, which meet in the centre of the socket. The tip of the blade appears to have been deliberately bent backwards on itself in antiquity. It is an exceptionally long example, measuring approximately 57cm in total length. The blade measures 4cm in maximum width and the socket is 16cm long. The spearhead is of a similar type to a number discovered at Kilmainham/Islandbridge in the nineteenth century (Bøe 1940, 62–4) and which Harrison and Ó Floinn now term 'Dublin type' (Harrison and Ó Floinn forthcoming).[8] The blade is slender and does not have a prominent mid-rib like the Scandinavian types. In his catalogue, Bøe (1940, 26) noted that several examples of this type of spearhead were found at Kilmainham/Islandbridge, as well as in other localities in Ireland, but that the type is very rarely found in the Scandinavian North. Bøe comments that the slender shape of the blade and the socket and the sloping transition from blade to socket is characteristic of this type (ibid., 26). This type is also characterized by the lack of a prominent mid-rib and the presence of one to four copper-alloy rivets in the socket. Bøe compares the type to Rygh's R529 but he notes that in the Irish examples the sockets were shorter in comparison with the length of the blade (ibid., 26). He suggests some local influence in their manufacture, and refers to them as an Insular type.

The example found in 2004 conforms broadly to this so-called Insular type, even though some differences are also apparent: it has a higher number of rivets than average – seven – and at 16cm the socket is longer than the average. One example of Bøe's Insular type, from Strokestown, Co. Roscommon, is of similar length to the 2004 find, being 42.5cm long (Bøe 1940, 88).[9] Another example found at Islandbridge, and on display in the National Museum of Ireland (Bøe 1940, 64), measures 51.6cm in length, but this seems unusual, and most are around 30cm in overall length.

conservation. **8** Harrison and Ó Floinn point out that this type of spearhead is largely confined to Dublin. The only exception is an example from a burial at Larne (Harrison and Ó Floinn forthcoming). Interestingly, the Larne burial also contained a ringed pin, a rare grave-find in the corpus of Viking graves outside of Dublin also. **9** NMI Wk4. This was incorrectly provenanced to the River Shannon by Bøe (Ó Floinn 1998, 148).

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THE 2008 EXCAVATION

Electricity Supply Board (ESB) maps of the location of the electrical cable showed that the trench had been dug across the front lawn of the lodge, dipped to go under the concrete wall bounding the property and came out the other side. An area measuring *c*.4m by *c*.1.8m was opened around this trench.

The ESB trench had cut through redeposited garden soil, which contained large quantities ceramic sherds, glass sherds, modern iron nails, modern plastic wrappings, painted wood and animal bone at all levels. The fill of the trench consisted of tarmac and modern debris. Disarticulated human and animal bone was also found scattered throughout the fill of the trench. All of the human bone found in the fill was disturbed and most showed evidence of recent breaks suggesting that portions of a skeleton had been disturbed during the excavation of the trench.

In situ human remains (08E0693:001) were discovered at a depth of 80–90cm below ground level in a triangle of undisturbed ground between the ESB cable trench and the boundary wall. Portions of the right scapula and clavicle, fragments of seven right ribs, unsided fragments of radius and ulna, and fragments of vertebra remains were found and have been identified by Ó Donnabháin as those of a young adult male. The burial extended *c*.20cm underneath the wall foundation, and some portions of ribs had adhered to the base of the concrete foundation, which had been placed directly on the bones.[10] These remains were lying on gravel and exposed bedrock.[11] The bones were in poor condition, exhibited recent breaks and were probably disturbed by at least two separate events: the construction of the wall and the digging of the cable trench. Two fragments of a right mandible were also found underneath the wall foundation, in a disturbed context.

It appears that the individual was lying in a supine position and, based on the position of the *in situ* vertebrae, was oriented approximately north–south, with the head at the north. The legs appear to have been flexed, as indicated by the portion of the left femur, which was *in situ*. The upper and lower sections of the body had been disturbed and removed or displaced when the wall was constructed.

As was probably the case with the other graves discovered here (Wilde 1866), there was no evidence for stone protection around the grave, but the burial respected a small rock outcrop to the south.

10 All visible bone was excavated. The left side of the body and the skull were probably disturbed and displaced during previous groundworks. **11** There is some damage to the edge where one perforation may have been, but the lack of perforations around the remainder of the circumference would seem to indicate that this pan was not perforated.

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ARTEFACTS FROM THE 2008 EXCAVATION

Teeth were recovered in the area of the ribs, indicating that the human remains were badly disturbed, and the associated grave-goods may have been slightly displaced, although organics were fortuitously preserved on some of the copper-alloy objects. Copper staining on some rib bones suggests that the artefacts were originally lying on the torso.

A copper-alloy ringed pin was found lying in the area of the rib bones, and portions of a copper-alloy dish, perhaps a pan for a balance scales, were also found in this area. All of these artefacts were lying underneath the wall foundation and were therefore excavated in section. The ringed pin was parallel to the long axis of the burial, with the ring of the pin at the north. A third object, a flat piece of copper-alloy, was also found in this area.

Copper-alloy ringed pin (08E0693:002): The ringed pin is of Fanning's plain-ringed loop-headed variety. The shank of the pin measures 11.6cm in length and it is decorated with incised parallel and crossed lines on the lower shank of the pin. The lower portion of the shank is bent, indicating that it had been used prior to its deposition. The ring is circular with narrowed terminals which meet under the loop on the pin. The pin is rectangular in cross-section, while the ring has a round section. Fanning describes this type of ringed pin as the simplest of all, and the most popular type in the Viking period. It is also the most common type outside of Ireland, in the Scottish Isles and the Isle of Man. A small number of pins of probable Irish manufacture are known from Norway, but the majority found in Scandinavia were probably made locally (Fanning 1994, 21–3).

Most ringed pins found in Viking graves in Ireland have been found in Dublin (Wilde 1866, 20; Coffey and Armstrong 1910, 121; Bøe 1940, 88; Harrison and Ó Floinn, forthcoming). Outside Dublin, ringed pins are known from a Viking grave at Larne, Co. Antrim (Bøe 1940; Ó Floinn 1998, Fanning 1970), and from Woodstown, Co. Waterford (O'Brien et al. 2005, 35). Both of these were male interments accompanied by weapons.

Copper-alloy scale pan (?) (08E0693:003): This object is similar in form and size to a scale pan, but is unusual in that the edge of the pan does not appear to be perforated as would be expected if it were to function as part of a balance scales.[12] It is a dished circular object made of copper-alloy and measuring 4.3cm in diameter, somewhat smaller than the other scale pans found at Islandbridge (see Bøe 1940, 49–50). It was originally convex but was dented in

12 There is some damage to the edge where one perforation may have been, but the lack of perforations around the remainder of the circumference would seem to indicate that this pan was not perforated.

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antiquity, apparently by force applied to the convex side. Traces of possible fur have been noted on the inside of the bowl while traces of other organics – leather or wood – have been identified on the outside.[13]

The convex face is decorated with faintly incised compass-drawn concentric rings and arcs, forming a marigold pattern. This decoration has been noted on other scale pans, such as a pair from Fishamble Street, Dublin (NMI E190:7673), although in this case the decoration is on the inside of the pan. There is no evidence for tinning on this pan, unlike some of the others from Kilmainham/Islandbridge (Bøe 1940, 50).

If the pan is to be interpreted as part of a balance, it was either unfinished or was never intended to be used. Traces of textile indicate that it was either placed near clothing on the body of the interred, or perhaps wrapped in textile.

Fragment of a copper-alloy object (08E0693:004): This object is also of copper-alloy. It is a flat strip of copper-alloy tapering at one end to a rounded point, and broken at the wide end. It was found directly underneath the wall foundation. Its function is not clear, but it was part of a larger object, the remainder of which may have been removed or disturbed when the wall foundation was laid. Given the presence of a possible scale pan, it is tempting to consider this to be part of a balance, such as a pointer; however, it is much broader and the point is less tapered than most similar examples (see Bøe 1940, 51; Shetelig 1940, 155–66). It measures 55.87mm in length and is 8.5mm wide at the wide end. An incised longitudinal line is visible on one face. If this object was intended to be part of a balance, it was not likely to be the same object to which the pan was intended to belong, as it is proportionally larger than other pointers known, while the pan is relatively small.

Bøe (1940, 50) lists four separate finds of scales from the Kilmainham/Islandbridge complex and Harrison and Ó Floinn have been able to ascribe some of these finds to more exact acquisition groups, and, consequently, locations (Harrison and Ó Floinn forthcoming). One balance from an 1866 acquisition group comprises a beam and pans, which have a diameter of 6.5cm (R2402). Another fine example comes from the third acquisition group, R2395, which Harrison and Ó Floinn state were almost certainly found with the six weights having a diameter of 7.9cm (Harrison and Ó Floinn forthcoming; see also Bøe 1940, 49–50). Bøe compares all these scales to Rygh's R476, the only type of balance illustrated in his text.

These do not appear to have find associations and so it is not possible to speculate on whether they come from female or from male interments. In

13 If the damage to the pan occurred recently, one would expect the organics to have disintegrated and the pan to fracture completely. We are grateful to Carol Smith, Conservation Department, National Museum of Ireland, for identification of the fur and leather on the surface of the pan.

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Scandinavia, weights and scales are found in both male and female interments, though they are mainly associated with males. In his 1940 survey of Insular material found in Norway, Shetelig lists forty-four examples of sets of scales, the vast majority of which come from male graves (Shetelig 1940, 155–66; Harrison 2001, 71). Graham-Campbell disputed the idea that all of these scales are Insular in origin, indicating that there is little evidence to support or deny this (Graham-Campbell 1980). Wamers has pointed out that only a few found in Scandinavia can be definitively said to be Insular in origin (Wamers 1998, 41). Scales remain a rare find in Insular Viking graves and, significantly, are not found in a burial context outside of Dublin, again reinforcing the importance of Dublin even in this early period.[14]

THE GRAVE IN ITS CONTEXT

Although it will never be possible to definitively associate the sword and spearhead found in 2004 with the human remains, copper-alloy objects and ringed pin excavated in 2007, it seems likely that these objects represent one and the same grave. The collection appears to represent the grave of a young male warrior of high social status.

The main body of comparable material for this grave is that found in the Islandbridge/Kilmainham/Inchicore area (Wilde 1866; Coffey and Armstrong 1910; Bøe 1940). Graves from this area, the largest cemetery in the Viking west, have produced a rich array of artefacts with an impressive collection of weapons and trading material, among other objects.[15] Finds are recorded as early as the eighteenth century, and during the nineteenth-century construction of the railway, and gravel extraction uncovered further burials. More recently, in the 1930s, a group of burials was found during the laying out of the War Memorial Park at Islandbridge (Wilde 1866; Coffey and Armstrong 1910; Bøe 1940; O'Brien 1998; Ó Floinn 1998; Harrison and Ó Floinn forthcoming).

The burial discussed here is in Harrison and Ó Floinn's western zone of the burial complex, which has so far produced fifteen burials (Harrison and Ó Floinn forthcoming).[16] The majority of these came from the 'great gravel pit' already mentioned, and were published by Wilde in 1866. The 2004 and 2008 material which is discussed here is thought to represent another burial in this grave-field.

14 One pair of similar scales (1989:22A-B) and three decorated weights (2003:35–7) were found at a crannog at Coolure Demesne in Lough Derravarragh, Co. Westmeath (O'Sullivan et al. 2007, 34). **15** Confusion has arisen as to the provenance of many artefacts, and there has been much discussion of how the grave-fields at Kilmainham and Islandbridge should be understood spatially (see O'Brien 1998; Ó Floinn 1998). The author follows Harrison and Ó Floinn's model of a Kilmainham/Islandbridge complex divided into various zones (Harrison and Ó Floinn forthcoming). **16** It should be noted that this

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Although disturbed, the grave and grave-goods reinforce the existing evidence of the social make-up of Scandinavian colonists in early Viking Age Dublin. It has already been noted that Viking graves from various locations in Dublin speak of a substantial population of warrior elite engaged in commercial activity, with a male:female ratio of about 10:1 (Ó Floinn 1998, 142). Weapons are the commonest artefact from male graves (the combination of sword and spearhead being most frequent), while a very significant amount of trading equipment has also been found (Bøe 1940; Ó Floinn 1998, 138; Harrison and Ó Floinn forthcoming). The results of isotope analysis on teeth discovered during the excavation suggest that this individual is non-local, and spent his early years in the Scandinavian region.[17]

Bent or mutilated weapons have traditionally been considered to represent cremation burial, with good reason, like the burial from Hesket-in-the Forest in Cumbria, for example (Graham-Campbell 1998, 113), but there is no evidence to support a cremation burial in this case. There may be some other evidence for non-cremation related weapon mutilation – such as at Woodstown, Co. Waterford, where the sword had been broken and the broken pieces were subsequently wrapped in cloth, and deposited in the burial (O'Brien et al. 2005, 35; Harrison and Ó Floinn forthcoming). An example is also known from a grave discovered in 1934 during the laying out of the War Memorial Park, where the sword was broken and replaced in position (see Bøe 1940, 60, fig. 39). Again, assuming that the sword and spearhead were associated with the inhumation burial discovered here, it suggests that some ritual activity was carried out before interment, which involved making the spearhead effectively useless. It may also be significant that the copper-alloy dish, if it is a scale pan, was not functional either, and in fact seems to have been damaged in antiquity.

CONCLUSIONS

Altogether, this can be considered to be a well-furnished grave, and corresponds with the rich character of Viking graves previously found in this area. The early type of sword also fits with others known from this burial complex, and corroborates the ninth-century date that others have suggested for this complex as a whole.[18]

does not include the five burials found in the 1930s in the War Memorial Park. **17** Because the teeth were disturbed, it is not possible to definitively associate them with the sword and spearhead, or with the *in situ* remains, though the authors suggest that these are likely to represent the same burial. **18** In the course of the excavation in 2008, Mr John Connolly of South Circular Road informed us that as a child, some thirty years ago, he had discovered an iron sword while digging for worms to the west of the gate lodge. His description of the sword suggests that it was a large iron Viking-type sword. Unfortunately, Mr Connolly discarded the sword soon after discovery. This probably represents a further warrior burial.

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APPENDIX 4.1: THE HUMAN REMAINS FROM THE VIKING AGE BURIAL RECOVERED FROM ISLANDBRIDGE, DUBLIN (08E693)

Barra Ó Donnabháin

Introduction: An articulated skeleton was found in the grounds of the lodge at the entrance to the War Memorial Park, Islandbridge, Dublin. The skeleton had been cut in recent years by an Electricity Supply Board (ESB) service trench and by the digging of a wall foundation. A number of artefacts were recovered by the workmen who dug the service trench and it was the notification of these finds that brought the burial to the attention of the National Museum of Ireland (NMI). The articulated remains were found in a small triangle of undisturbed soil between the service trench and the wall foundation. The *in situ* remains extended under the concrete that had been poured into the trench dug for the wall foundation. Some of the bones were practically touching the base of the concrete and must have been exposed when the foundation was dug. Most of the remaining human bones were recovered from the backfill of the ESB trench and one of these fragments could be matched with the undisturbed bones. Many animal bones were recovered from the upper levels at the site. Some were also found at the level of the burial but none was directly related to the burial. While the skull of this individual was not found, a fragment of mandible was discovered in the disturbed material immediately adjacent to the burial and may be derived from this individual. The bones were in a fragmentary state but were moderately well preserved.

The *in situ* remains: The following remains were found in articulation: fragments of the right scapula and clavicle; fragments of seven right ribs; unsided fragments of the midshafts of a radius and an ulna; the left capitate and lunate; fragments of the sacrum and lumbar vertebrae; the left hip bone; and the proximal end of the left femur. One rib fragment has evidence of copper staining. The body was placed in the grave on its back with the head to the north. The left hip was slightly flexed. It was not possible to determine the positions of the hands.

Age-at-death: The morphology of the pubic symphysis suggests that this individual was in late adolescence or in young adulthood. The epiphysis of the left ischial tuberosity had fused not long before death. This normally fuses between the ages of 16 and 18 years. The epiphyseal plates of the vertebrae were also in the process of fusing at the time of death. This normally occurs between the ages of 20 and 25 (Albert et al. 2010). There is a pronounced epiphyseal line on the left femur, indicating that the head of the femur had fused to the shaft not long before death. Based on these factors, an age-at-death estimate of 18 to 20 years seems most likely.

Sex: The morphology of the sciatic notch of the left hip bone suggests that this was a male. This is also indicated by the maximum diameter of the head of the left femur. It was not possible to estimate the living stature of this individual.

The *ex situ* remains: Some human bones were also found in disturbed contexts, mostly to the south-west of the ESB service trench. The break on one fragment of the

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femur shaft matches with the *in situ* fragment of that bone. The human remains that had been disturbed have an MNI of one and it seems likely that they are all from the individual represented by the articulated remains. The bones that had been disturbed include: the right hip bone; the right second, third and fourth metatarsals; the left second or third metatarsal; one foot phalanx; and one hand phalanx.

Two fragments of a right mandible were recovered from the area under the wall foundation. One of these is a fragment of a right ramus, while the other is a portion of alveolar bone, also from a right mandible. The following teeth were present in this fragment (the teeth in italics were missing post-mortem):

48 47 46 45 *44*

There was minimal wear on the premolar and second molar, while attrition was more marked on the first molar, where patches of secondary dentine had been exposed. The socket for the third molar suggests that the roots of this tooth were complete. The third molar usually erupts between 17 and 21 years, while the roots are usually complete between 18 and 25, so it is possible that this fragment of mandible was from the same individual as the articulated remains. One loose tooth was also recovered: this was an upper right central incisor.

Pathology: There is what appears to be a small cut-mark on the portion of mandible. The cut area is just 6mm long and is located on the buccal surface of the bone. It is at an oblique angle and is obscured at both ends by postmortem breakage. It has the appearance of perimortem sharp-force trauma, but given that the fragment is small and the cut surface even smaller, damage incurred when the remains were disturbed in recent years cannot be ruled out.

Other than the possible cut-mark described above, the only pathological change noted in the remains occurs in one of the lumbar vertebrae, L5, that was found *in situ*. This has a crescent-shaped lesion at the right anterior superior margin of the centrum, which has an irregular surface and protrudes anteriorly. This type of lesion has received little attention from clinical medicine but has been noted in the palaeopathological literature. It may be an early manifestation of an intervertebral osteochondrosis (Kelly 1982), a degenerative change in the bone that, if the individual had lived, would have been superseded by more typical and symptomatic lesions. More recently, Maat and Mastwijk (2000) have described similar lesions and suggested that they represent avulsion injuries to the vertebral endplate. An avulsion injury occurs when a piece of bone is torn from the main mass of the bone as a result of trauma. Each of these interpretations of the lesions is compatible with the other in that both suggest that physical stress of some kind as the cause of the lesions. It seems likely that apart from minor backache, these lesions are relatively asymptomatic, which is why they have received little attention in the clinical literature. Mays (2007) has recently reported that similar lesions can occur in the vertebrae of people infected with brucellosis. This is a zoonosis that can pass to humans as a result of ingesting the milk or meat of infected animals. The disease will persist for months if untreated but is rarely fatal. However, Mays has further argued that these lesions are more likely to be traumatic in origin unless other skeletal lesions are also present or the remains have been tested for the

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presence of brucella bacteria DNA. Given the absence of other lesions in this case (though it should be remembered that little of the skeleton has been recovered), it is safer to suggest that the lesion is related to physical stress to the lower back in the form of a traumatic incident or to strenuous physical activity.

APPENDIX 4.2: ISOTOPE RESULTS

Niamh Daly

The isotopic and elemental data from the archaeological human remains from Islandbridge, Co. Dublin are presented in Table 4.1 and Table 4.2. In this study, we observe from the major, minor and trace element concentrations of the elements calcium (C), phosphorous (P), strontium (Sr) and barium (Ba) that little diagenetic contamination was observed in either the bone or tooth enamel samples analyzed. Therefore, we can suggest that little diagenetic activity is observable in this burial. Thus, these elemental results are crucial with regard to establishing a unique parameter on which to base all the isotopic results.

Palaeodietary analysis

This study produced isotopic values of $\delta^{13}C_{carbonate\ (V\text{-}PDB)} = -25.4‰$ in relation to the tooth enamel sample and $\delta^{13}C_{carbonate\ (V\text{-}PDB)} = -24.2‰$ for the bone sample respectively. In addition, the mean $\delta^{13}C_{collagen\ (V\text{-}PDB)} = -20.2‰ \pm 0.0‰$ and mean $\delta^{15}N_{collagen\ (AIR)} = +11.6‰ \pm 0.2‰$. The $\delta^{13}C$ data for both the apatite and collagen analysis would be consistent with the consumption of a diet rich in C^3 plants. As C^3 plants demonstrate $\delta^{13}C$ values that range from –20 to –35‰, we can suggest that this individual consumed a diet rich in plants that photosynthesized using a C^3 pathway; for example, wheat (*Triticum*), barley (*Hordeum*), and oats (*Avena sativa*). Therefore, this information would correlate perfectly with the fact that Northern Europe is located in a temperate region where the majority of plants are photosynthesized using a C^3 pathway.

Furthermore, terrestrial mammals and birds have a mean bone collagen $\delta^{15}N$ value of +5.9‰, whereas marine mammals have an average value of +15.6‰ (Schoeninger et al. 1983). In relation to the mean $\delta^{15}N$ values from the collagen analysis, we can suggest that this individual consumed a diet rich in terrestrial mammals. This information correlates with the dietary information documented in the early historical sources from Scandinavia and Ireland as well as the environmental archaeological evidence from previously excavated Viking sites in Dublin. In general, the relatively recent social perception of the Vikings is one of a seafaring people relying on marine sources for both subsistence and trade; however, this assumption was not traceable in the dietary intake of this individual. Therefore, based on this dietary analysis, we can suggest that there appears to be no homogeneous 'Viking diet' recorded from this individual.

Paleomobility

In relation to the received oxygen isotopic data from the Dublin sample, the data from the tooth enamel provides a value of $\delta^{18}O_{\ carbonate\ (V\text{-}PDB)} = -8.9$ and a value of

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$\delta^{18}O_{\text{carbonate (V-PDB)}} = -8.4$ for the rib bone sample. In order to convert the observed oxygen isotope values into drinking water values, the oxygen isotope data referenced above were converted to a common scale. In this regard, the tooth enamel and bone $\delta^{18}O_{\text{carbonate (V-PDB)}}$ values (Vienna Pee Dee Belemnite Formation) were re-referenced to the V-SMOW (Vienna Standard Mean Ocean Water) standard according to Coplen et al. (1983). Therefore, by converting the data via a series of formulas, the tooth enamel sample (-8.9) converts to a value of $\delta^{18}O_{\text{dw ‰ VSMOW}} = -14.96 \pm 0.01$ and the bone sample (-8.4) converts to a value of $\delta^{18}O_{\text{dw ‰ VSMOW}} = -14.164 \pm 0.04$.

According to the International Atomic Energy Agency (IAEA), the oxygen isotope signatures from Ireland range from (-5 to -8‰), and the Scandinavian oxygen isotopic signatures range from (–8 to –11‰). We observe from the stable oxygen isotope analysis that the drinking water levels both in the tooth enamel and bone samples from this Early Viking Age individual are significantly higher than the expected oxygen isotope signatures or values in relation to Ireland (–5 to –8‰), as stated by the IAEA. Furthermore, we can observe that the drinking water levels in both the tooth enamel and the bone samples from this Early Viking Age individual are significantly closer to the Scandinavian oxygen isotopic signatures. However, although the stable oxygen isotope values from the Early Viking Age individual are slightly higher, we suggest that this difference in values can be noted from different contributing factors, such as the possibility that the water may have been derived from numerous sources. Climatic variation or the storage and heating of water may also affect isotopic signatures that may affect the results (Knudson 2009). Therefore, these factors must be taken into account when analyzing the oxygen isotope data from this particular individual.

Ultimately, although the oxygen isotope signatures display slightly higher values as stated by the IAEA Scandinavian levels, we suggest that this individual may have originated from a geographic region similar to the Scandinavia oxygen isotope values. We propose that the Early Viking Age individual central to this study is non-local to Dublin and spent most of his early life in some region of Scandinavia before coming to Ireland.

Finally, in relation to the radiogenic strontium isotopic ratios, the enamel strontium isotope values are $87Sr/86Sr = 0.71882$ and the rib bone strontium isotope values are $87Sr/86Sr = 0.71043$. Based on these observations, we suggest that the Early Viking Age individual central to this study originated from an area with older bedrock; that is, different in composition to the available recorded strontium values known for Irish bedrock. Notably, there are differences in radiogenic strontium isotope values of both the tooth enamel and bone samples from this individual. In this regard, the radiogenic strontium isotope value for the tooth enamel is higher than the radiogenic isotope value from both the rib sample and the local signature derived from the Dublin faunal sample. As tooth enamel undergoes little change after it is formed in childhood, we propose that this individual may have moved residence in the later years of his life. In addition, the radiogenic isotope value from the rib sample falls just outside the local signature derived from the Dublin faunal sample. Thus, we suggest that based on this information, this individual moved to Ireland in the period leading up to his death. Therefore, based on the radiogenic strontium isotope values, we can deduce that this individual represents a non-indigenous population in the context of medieval Dublin.

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Table 4.1: Summary of elemental and isotopic analysis, Early Viking Age burial, Islandbridge, Dublin.

Lab Number	Specimen Number	Material	Ca/P	Ba/Sr	$^{87}Sr/^{86}Sr$	Standard deviation	$\delta^{13}C_{c(V\text{-}PDB)}$	Standard deviation	$\delta^{8}O_{c(V\text{-}PDB)}$	Standard deviation
ACL-2791	DUBL-08E693	LRM2	2.1	0.09	0.71882	0.00667	–25.4	0.04	–8.9	0.01
ACL-2792	DUBL-08E693	rib	2.2	0.11	0.71043	0.00343	–24.2	0.05	–8.4	0.04

Table 4.2: Carbon and nitrogen isotopic data, Early Viking Age burial, Islandbridge, Dublin.

Lab Number	Specimen Number	Material	Mean $\delta^{13}C_{collagen}$ (V-PDB) (‰)	SD	Mean $\delta^{15}N_{collagen}$ (AIR) (‰)	SD	C:N	% C	% N	% collagen
ISB1	DUBL-08E693	Mandible/ Rib	–20.2	0.0	11.6	0.1	3.2	27.6	9.9	3.7

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