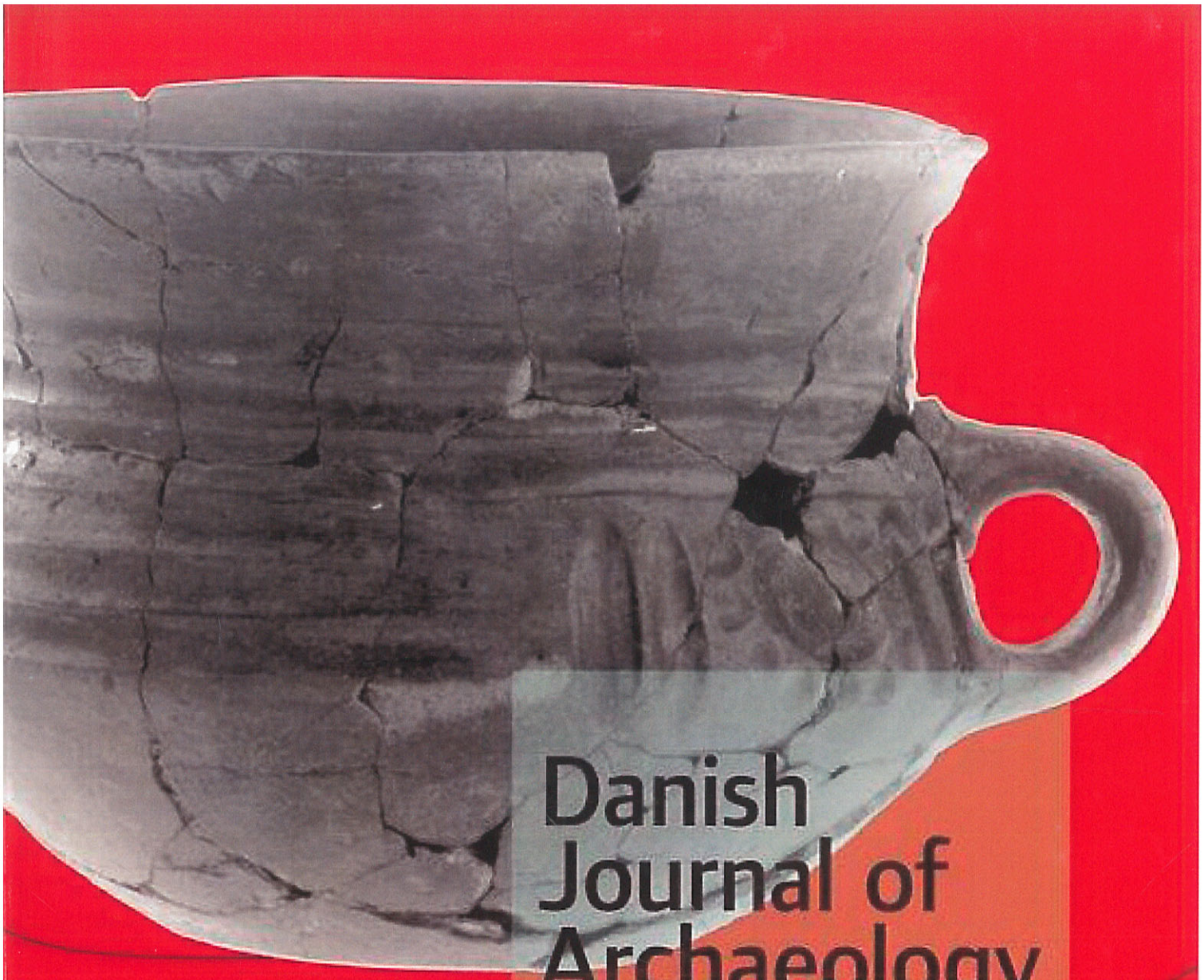

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Editorial

Revitalising a renowned journal can be hard work, but once in a while hard work pays off. We are therefore very happy, and equally proud, to have been promoted to Level 2 of the Danish bibliometric research indicator, the highest possible (see http://ufm.dk/forskning-og-innovation/statistik-og-analyser/den-bibliometriske-forskningsindikator/autoritetslister). As of now we are the only archaeological journal of this ranking in Denmark, and appear amongst a select handful in Scandinavia. The reasoning behind this nomination has been both the diverse range of nationalities represented by the authors of *DJA* and the varied subject matters, which can be found in the three volumes. Furthermore, the high standard of the individual articles have undoubtedly supported the positive outcome of the evaluation, and we are very grateful for the authors to have invested the extra work needed to finalise their contributions with what can now officially be called an international standard. An often-overlooked means to this end is the large group of 'invisible' reviewers, who have put in considerable time and energy to make sure each article carries a solid and serious argumentation, and presents an updated and detailed understanding of the subject matter at hand. There has been much debate and critique of the peer-review system lately (e.g. Bohannon 2013). Despite its flaws, it remains the gold standard of scientific publishing (Smith 2006). Occasionally, journals might take for granted that the reviewers involve themselves in the peer-reviewing process, but we surely are very grateful for your support and willingness to accept the at times tedious labour this process involves. You know who you are and we much appreciate your sharp pen and incisive comments.

What has volume 4 to offer? Chronology and chorology are the cornerstones of classic archaeological research, and the current issue includes several articles, which debate precisely these concepts. Furthermore, they do so in such diverse periods and topics as the dating of the west Swedish Hensbacka culture, the distribution of horse-riding technology as witnessed in Bronze Age hoards, the chronology of large Iron Age cemeteries and even the spread of fashion into the material culture repertoire of medieval Greenlanders. These articles also illustrate *DJA*'s eagerness to cater for shorter and longer articles, which is a configuration with which we try to accommodate the request from several authors to adopt the former journal's willingness to publish longer and more encompassing articles. Evidently, when it comes to publication channels, one of the basic requirements for many of the museum-based authors have been the possibility of publishing in-depth and site-specific articles. These are a type of space-demanding articles we have hitherto overlooked, but now confidently incorporate into the *DJA* portfolio.

In the line of a more interpretive archaeology, we see a novel explanation of the possible use of the enigmatic gold foil figurines as they appear in the Germanic Iron Age. This article and its original take on the period's use of emblems and identification markers have already seen a great deal of circulation on different online platforms (e.g. http://videnskab.dk/kultur-samfund/guldfigurer-var-jernalderens-roskilde-armband-0) and have spawned a renewed debate on the use of these figures. Also, a critical discussion of the concept of the Vikings, often placed awkwardly between resolutely popular 'rape'n'pillage' caricatures and more level-headed studies characterised by a pan-European and diversified understanding of the Viking phenomenon, can likewise be found in volume 4. As we currently witness massive investments in both heritage management and research into the Viking period, the timing of this article can hardly be more appropriate.

Another new article format we have chosen to introduce in the current issue is the *Invited Review*s. With this type of reviews, we hope to present readers with a more comprehensive overview of the methods and theories presented in the books under review. As a start we focus on the larger, well-known *Opera Magna* often characterized by several volumes and of almost encyclopaedic character, whereby 'hidden research trends' can often be illustrated and made explicit. But these are just some of the highlights from *DJA*'s volume 4, a volume that once again

reflects the vigour of archaeological research in Denmark and on Danish archaeological material, as well as reflecting our diverse and international contingent of authors, reviewers and readers.

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RESEARCH ARTICLE

The Late Bronze Age hoard from Bækkedal, Denmark – new evidence for the use of two-horse teams and bridles

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ABSTRACT

In late summer 2014, two metal detectorists located 40 bronze objects on a small hillock west of Gammel Skørping in Himmerland. Eastern Himmerland in particular is renowned for its many Late Bronze Age hoards and the Bækkedal hoard, as the discovery is now known, underlines this trend as it represents a multi-type hoard from Late Bronze Age period V. The hoard, which was undergoing progressive plough disturbance, contains both male and female items and, astonishingly, also several metres of well-preserved leather straps that had once formed parts of bridles and harness. Moreover, several bronze fittings, including cheek pieces and phalerae, were in situ on the leather straps, thereby enabling parts of the bridles to be reconstructed. The many bronze harness-related objects show that the hoard represents the components of bridles for a two-horse team. This article gives a preliminary presentation of the hoard, with a particular focus on the metal objects and horse harness, which are then placed in a broader northwest European context.

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Horse harness; bridle; Nordic Bronze Age period V; hoard; cheek pieces; four-wheeled wagon

Introduction

Archaeological investigations of new Bronze Age hoards are a rarity, as most of the known hoards in southern Scandinavia were discovered between the late nineteenth century and the mid-twentieth century, in connection with peat cutting, draining and so on (Kristiansen 1978, pp. 126–148, 1985). It therefore came as a considerable surprise when two metal detectorists discovered about 40 bronze objects on a sandy hillock west of Gammel Skørping in Himmerland (Figure 1). The area had apparently not been subjected to metal-detector survey previously and the nearest recorded ancient monument is a barrow located c. 500 m to the northwest. A systematic detector survey of the plough soil over subsequent days revealed further 170 objects and fragments. Their number increased drastically towards what proved to be the deposition site. The surface finds comprised in particular fragments of female ornaments, together with a few male items, but several fittings from a bridle, including a cheek piece, were also located. The bronze objects date from Late Bronze Age period V, c. 900–700 BC.

The subsequent archaeological excavation revealed that the bronzes had apparently been contained in a pottery vessel, of which only the lower third remained (Figure 2). The damaged vessel was taken up in a plaster-cast block so it could be excavated under more satisfactory conditions in the conservation lab at Bevaringscenter Nordjylland. In addition to computed tomography (CT) scanning, the contents of the block and the relative positions of the objects were recorded with the aid of a 3D model (Jensen 2012). This subsequently proved to be very useful in the interpretation and reconstruction of the horse harness.

The archaeological investigations showed that the pot had stood in the top of the subsoil and in the plough soil. No traces of an obvious cut feature were apparent around the pot and a network of trial trenches across the hilltop revealed only five cooking pits and two postholes. There were no traces of a grave or other feature that could provide an indication of the area's function in the Late Bronze Age.

The actual find site is located c. 38.5 m above sea level on an elongated sandy hillock. This hillock, which measures 65 × 100 m, lies to the east of Bækkedal, which is a small gully associated with

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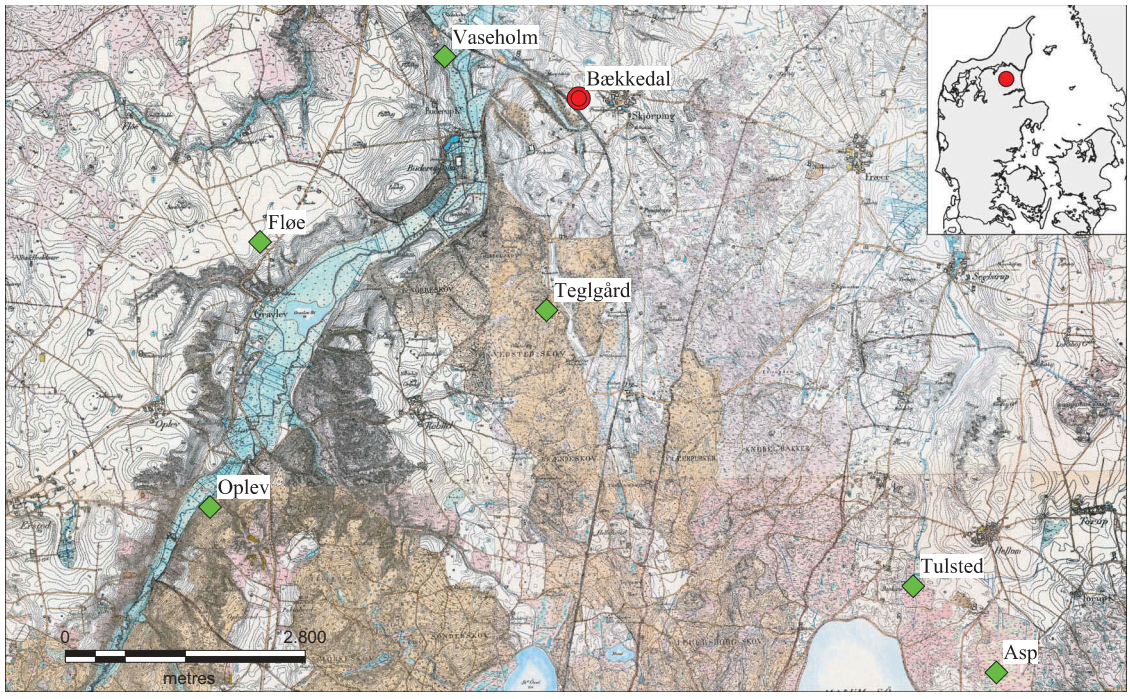

Figure 1. The find spots for the Bækkedal hoard and other multi-type hoards from the Late Bronze Age. The river valley Lindenborg Ådal can be seen to the west. Only the Vaseholm hoard was definitely found in a bog. The hoards at Teglgård, Fløe and Oplev were discovered on heathland in association with large stones (Frost 2008, pp. 132–142). The Asp hoard was found during ditch digging, while that at Tulsted was discovered on heathland during tree planting. The background is an ordnance map from the 1880s.

Figure 2. The lower third of the slip-covered pottery vessel in which the bronze objects lay. Its maximum diameter is *c.* 31 cm.

the distinctive river valley Lindenborg Ådal. In prehistory, it was possible to sail from here out to the Limfjord, which lies c. 20 km away as the crow flies, by way of two river routes, following either Østerå or Lindenborg Å. The Kattegat is 23.5 km to the east. The surrounding moraine landscape, which was formed during the last ice age c. 12–16,000 years ago, is sharply undulating (Münier 2009, p. 33). Immediately to the south lies Rold Skov, which is one of Denmark's largest forests and, as demonstrated by pollen data from Store Økssø (Odgaard and Nielsen 2009, p. 49, Nielsen and Odgaard 2010, p. 381), was also a forest back in the Bronze Age. In the Late Bronze Age, the area was also characterised by grass-dominated commons and heath. The importance of the Skørping area at this time is underlined by records of a further six multi-type hoards found within a c. 8 km radius of the Bækkedal hoard (Figure 1) (Frost 2003, 2008). None of these, however, contains horse harness.

A closer examination of the distribution of the metal finds located by metal detector reveals that they mostly lie within a c. 10 × 45 m area, oriented in the direction of ploughing (Figure 3). A few large objects were found as far as 88 m from the actual deposition site. An analysis of the distribution of 200 bronze objects and fragments, in relation to their weight, shows that the numerous very light items lie relatively close to the site of deposition while there is a tendency for the slightly heavier objects (>25 g) to be found in the marginal zone. The average weight of the 200 bronze objects that were surveyed and plotted is 9.88 g, which reveals something of the degree of their fragmentation.

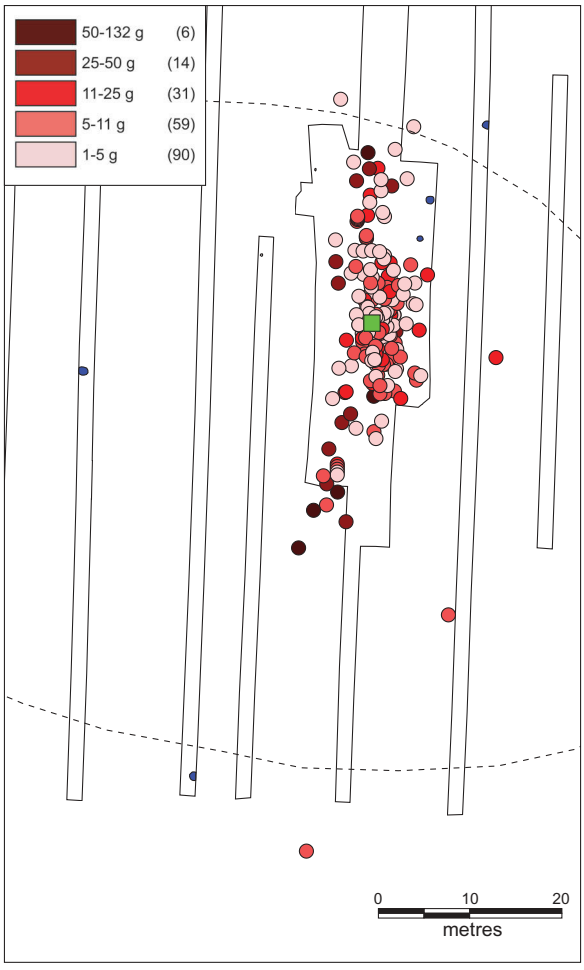

Figure 3. Distribution of the 200 metal-detector finds in the plough soil. The numbers in the various weight categories are shown in brackets. The green square marks the deposition site of the hoard. Trial trenches and the excavation trench are also shown. Cooking pits are marked in blue and the broken line follows the 37.5 m contour above sea level. (for colour image please see online article).

Examination of several series of orthophotos, taken between 1954 and the present day, shows that the ploughing direction has apparently remained unchanged over the last 60 years.[1] This explains why the finds are mainly distributed in the N–S direction. However, the limited degree of corrosion suggests that the bronze objects had probably only been exposed in the plough soil for a few years. Several are heavily fragmented, including one of the suspension vessels, which is represented by at least 87 pieces. Analysis of the ornamented part, which consists of 68 fragments, shows that c. 65% of this vessel was found during the detector survey. The degree of fragmentation of the other types of finds, including neck rings and a razor, follows a similar trend. Fragmentation aside, the surface of both the intact bronze objects and the fragments is generally well-preserved with a homogeneous verdigris patina.

The finds

The finds comprise c. 145 bronze objects, depending on how they are counted, representing horse harness, male- and female-related objects and some other artefacts; a gold oath ring was also found (Table 1). The combined total weight of the metal artefacts is c. 4.9 kg. Of this, 2.8 kg was recovered from the plaster-cast block and 2.1 kg from the plough soil: this should be seen in relation to an average weight for period V hoards of c. 1 kg (Verlaeckt 2000, p. 201). It was mainly the male and female objects that were recovered from the plough soil, while the harness and associated bronzes were apparently located lowermost in the pottery vessel, which explains why the leather straps are preserved.

Table 1. Numbers of metal objects of the various types found in the bronze hoard from Bækkedal. Question marks denote uncertainty about the numbers, given that many of the objects are heavily fragmented. In the case of rings, examples that form parts of sets of jingle plates or which were found associated with ornamental buttons are not included.

Type of object	Number
Horse harness	
Cheek pieces	4
Terret fittings	2
Phalerae	10
Sets of jingle plates	8
Ornamental buttons	14
Ribbed bronze cuffs	26?
Female objects	
Tutulus	1
Suspension vessels	2
Cuff arm rings	2
Bundles of thin spiral neck rings	2
Narrow band-like arm ring	1?
Spirals	2
Twisted neck rings with oval terminals	2
Male objects	
Gold oath ring	1
Celt	1
Razor	1
Lancet	1
Other	
Rings	28?
Bar buttons	14
Zoomorphic protoma	1
Bronze-working waste	1
Sickles	7
Bronze terminal from leather belt	2
Triangular jingle plates	10
Terminal knob	1
Other	1
Total	145

In the following, the most important finds groups will be presented, with a special focus on the metal objects. The leather straps and other organic material are not yet fully conserved and scientific analyses remain to be carried out. A summary of the numbers of finds is given in Table 1.

Horse harness

The Bækkedal hoard contains a number of bronze harness-related artefacts of types that tend particularly to be found in hoards within the sphere of the Nordic Bronze Age (von Brunn 1981, Pare 1989, p. 86; Verlaeckt 2000, p. 196). Common types are phalerae and jingle plates, although bits, cheek pieces and other items also feature in these hoards. Many of the less frequently occurring types, such as cheek pieces, tend to have a very individual character. This is also true of the Bækkedal hoard, which contains four sturdy cheek pieces of a type for which there are no recorded parallels (Figures 4 and 5) (e.g. Thrane 1965; Hüttel 1981; Metzner-Nebelsick 1994; Dietz 1998). The cheek pieces are virtually symmetrical about a circular aperture that accommodated the bit. The cheek straps were attached to the rectangular terminals, which are open, with the aid of thin sinews threaded through two holes. At one end of each cheek piece is an eye in which a set of jingle plates is mounted. The cheek pieces, like the two terret fittings, are decorated with bands of plastic ornamentation. This shows that the horse harness was manufactured as a set and not assembled from random bronze components.

Figure 4. Part of a bridle in situ in the plaster-cast block. The same part is shown exposed and recovered in Figure 5. The length of the cheek piece is *c.* 13.8 cm.

Figure 5. Well-preserved part of the bridle with cheek piece, jingle plates, ornamental buttons, cross-ribbed bronze cuffs and phalera.

All the visible cheek straps are fitted with and covered by cross-ribbed bronze cuffs, made of thin sheet metal and open to the rear. As a consequence, they are in many cases poorly preserved and their number is based on an estimate. These cuffs are up to 6.5 cm in length and several have small attachment holes on the reverse. Similar cuffs feature in hoards found along the southern Baltic coast, for example at Ückeritz, but also occur in Danish hoards, such as Fangel Torp and in the Lusehøj burial (Sprockhoff 1956, p. 270; Lampe 1982, p. 36; Thrane 1983, p. 5, 1984, p. 142). In many places on the reverse of the cheek straps there are rows of light rhombuses (Figure 6),[2] which apparently occur where the leather was woven together in connection with the attachment of ornamental buttons and rings of bronze.

The 14 ornamental buttons are circular and domed, with a flat area bearing the ornamentation. The latter consists of four encircling lines. On the reverse is a perforated shank for attachment. In five cases, small rings with a diameter of c. 2 cm were found associated with the ornamental buttons, but in only one instance could the position of an ornamental button with a ring be established more precisely

Figure 6. Close-up of the reverse of one of the cheek straps with the rhombic inlays. Also visible are a selection of the many leather straps, the reverse of a phalera and several cross-ribbed bronze cuffs.

in relation to the bridle (Figure 5). We are unable to explain the function of this ring, apart from serving for the attachment of something or other. A similar ornamental button was found in the Fangel Torp hoard, which also contained parts of two sets of jingle plates (Thrane 1983, p. 11). The diameter of the Fangel Torp button is c. 4.2 cm, while that of the ornamental buttons in the Bækkedal hoard is 3–3.2 cm.

The phalerae are another type of harness fitting that can be equated in function with the ornamental buttons. The hoard contains ten examples, of which eight are virtually intact or represented by larger fragments, while two are merely represented by their bosses. Some fragments were found in the plough soil and several more may well have been present originally. The four presumed to be associated with the bridles have diameters of 11–12 cm, while the diameter of the four others is c. 15 cm. In several cases there are U-shaped shanks on the reverse, and in a few instances the phalerae still sat on the leather straps. They were attached by the shank being pressed through a small slit in the leather strap and then secured on the reverse by a smaller leather strap threaded through an aperture in the shank (Figure 7). The phalerae from Bækkedal appear to be related to many other Danish examples (e.g. Larsson 1974, pp. 201–202).

Returning to the sets of jingle plates, there appear to be several different types, depending on their

Figure 7. Reverse of a phalera mounted on cheek strap.

position on the harness. The four sets of jingle plates mounted directly on the cheek pieces are of types that consist exclusively of two or three circular plates with a thickened beaded margin. The four other sets, which probably sat further back on the horse's head, were mounted directly on the bridle with the aid of a bronze ring and a loop in the leather strap (Figure 8). A second bronze ring optimised their jingle function. Each set consisted of two cones and two or three round or broadly-oval plates; in two of them the hanging plates have a hole at their centre. The various types perhaps represented an affiliation to a particular horse in the team. Common to all of them is the presence of a suspension eye. In the case of the circular plates, the eyes are linked by a short bar. There are no similar examples in the south Scandinavian or north German records (Sprockhoff 1956, pp. 258–259; Thrane 1975, pp. 122–124).

Figure 8. Example of jingle plates mounted on a leather strap with the aid of a loop (red arrow). These were probably located on the horse's cheek. Also visible are some of the many well-preserved straps. (for color image please see online article).

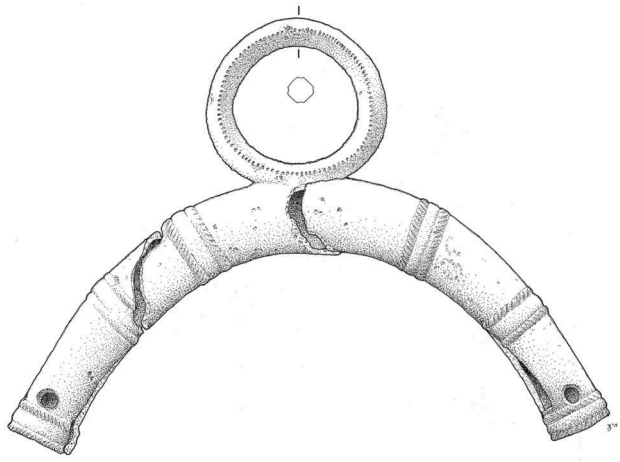

Figure 9. Terret fitting. Note that it is decorated in the same way as the cheek pieces. Its internal diameter is c. 9.8 cm.

Finally, there are the two terret fittings (Figure 9), which are rather reminiscent of the examples found in such as the Turup and Fogdarp hoards, being hollow and spur-shaped with triangular perforations on the reverse (Larsson 1974, pp. 176–178, 188). The terret fittings from Bækkedal also have holes at the sides, near the base of the tube. They also differ in having either a large eye uppermost, while the other examples have either human-like heads or circular bronze tubes in this position (e.g. Broholm 1953, no. 211; Larsson 1974, p. 192). Their function was, however, the same – the device uppermost on the tube had the role of controlling the reins. Consequently, the harness fitting sat lowermost, by the mane, as underlined by its curvature. One of the fittings from Bækkedal had thin leather straps preserved which presumably were used for mounting on to a collar or directly on to the harness, for example with the aid of rings or bar buttons.

If we summarise the above, the presence of two terret fittings, four cheek pieces and eight sets of jingle plates, suggests that the bronzes represent the components of bridles for a two-horse team (Figure 10). In one instance, the cheek strap was found in situ on the cheek piece, together with ornamental buttons and a phalera. We do not know how the two cheek straps were attached to the other side of the phalera, but one suggestion is that there was an ornamental button here which had a connecting function. This concurs with the fact that the number of ornamental buttons in the hoard exceeds the 12 required to secure the cheek straps at the cheek pieces. Other preserved straps show, moreover, that the cross-ribbed bronze cuffs continue on the other side of the phalera. This suggests that there was some form of complex arrangement which joined the two cheek straps. It has not proved possible to see remains of a noseband. Other unresolved questions relate to the set of jingle plates that, in the reconstruction, are placed on

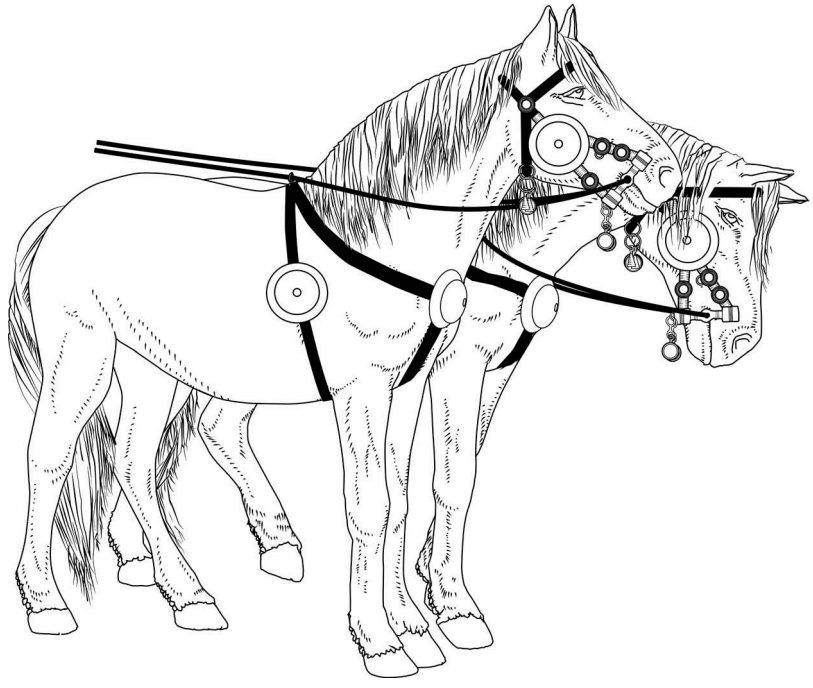

Figure 10. Reconstruction of the bridles from Bækkedal. Drawing: Jeppe Boel Jepsen.

Figure 11. Close-up of whipped rope bit.

the horse's cheek. Their exact position is unknown – only their method of attachment and the fact that they were affixed to a 1.4 cm wide strap which was probably part of the bridle.

Finally, the bit should also be touched upon. This is made of organic material – sturdy, almost whipped cord, giving a certain thickness (Figure 11). Rope appears to have been chosen despite the fact that several bronze bit types are known from the Late Bronze Age, for example the Høve type with a bipartite mouthpiece (Thrane 1975, p. 122; Hüttel 1981). The simple, several metre long leather straps found in the hoard are presumed to represent the reins. However, there is nothing in the hoard to indicate how and where the reins were attached in relation to the cheek piece. One possibility is that they were attached directly to a loop or similar arrangement on the bit. Otherwise they must have been attached to the lower part of the cheek pieces. A more detailed comparison between the horse harness from Bækkedal and other finds is given below in the final section.

Female objects

The female objects comprise a number of items that are characteristic of hoards; some can be seen as sets of ornaments, while others presumably represent similar objects belonging to several different individuals (e.g. Kristiansen 1974, p. 23, Thrane 1975, p. 170). The possible ornamental sets consist of a suspension vessel, a tutulus and two cuff arm rings, whereas two twisted neck rings, two small spirals and two bundles of spiral neck rings cannot be interpreted in the same way (Figure 12). The Bækkedal hoard also contains a second suspension vessel and parts of a narrow band-like spiral arm ring, which are similarly considered to be the female objects.

The two suspension vessels are of different sizes and shapes. The smaller of the two has a maximum diameter of 16 cm (Figure 13) and is c. 6.8 cm tall, excluding the eyes. The vessel is almost intact, but five fragments were also found in the plough soil. In the plaster-cast block taken up for excavation the suspension vessel lay vertically alongside the pottery vessel, showing that it has been struck by the plough. The base is decorated with punched ornamentation, divided up by furrows into several zones. The decoration could not be cleaned as it was decided to preserve some of the organic material found in the

Figure 12. Examples of female objects: Tutulus, cuff arm ring, spirals and parts of the twisted neck rings.

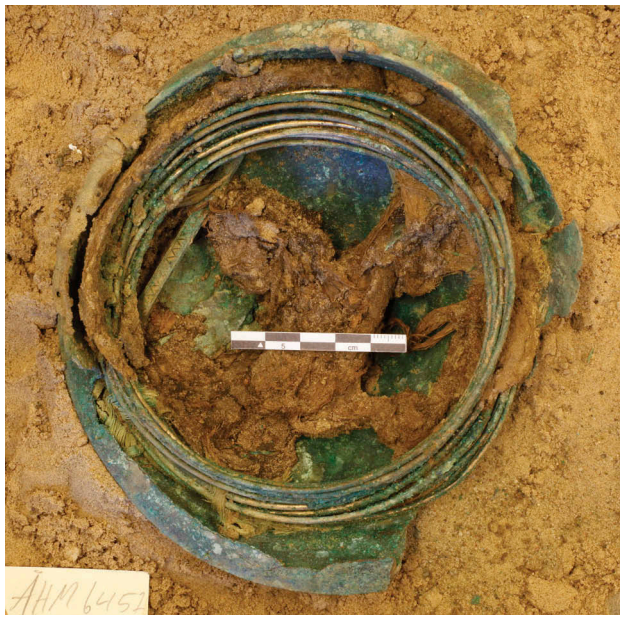

Figure 13. The inner part of the small suspension vessel. The dark areas are bast, while leather remains can just be perceived on the edge of the vessel. Also visible are bundles of neck rings, lashed together with light-coloured plant fibres.

suspension vessel in situ. The latter includes leather items and bast that were used as a kind of lining, perhaps to reduce rattling of the contents and make the vessel more comfortable to wear. The vessel also contained the two bundles of thin spiral neck rings which are held together by light-coloured fibrous material (Figures 14 and 15). Similar spiral neck rings are known from several other hoards, including that from Voldtofte on Funen (Thrane 1971). The suspension vessel also contained a golden oath ring, a fragmented lancet and parts of two sickles. These finds are dealt with in more detail below in connection with the male equipment and other artefacts.

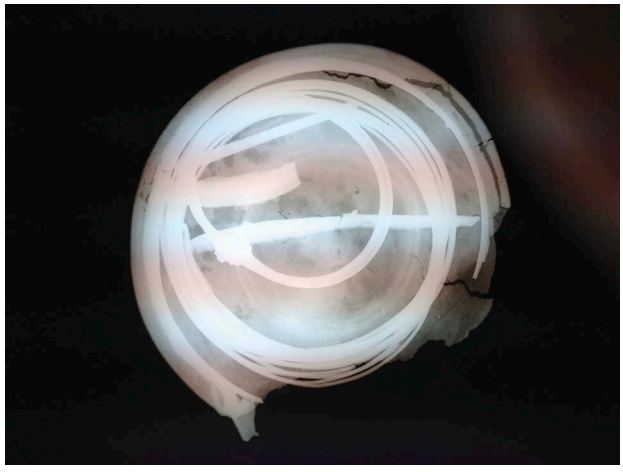

Figure 14. Radiograph of suspension vessel prior to excavation. In addition to bundles of neck rings, the oath ring, lancet (tang) and parts of two sickles can also be seen.

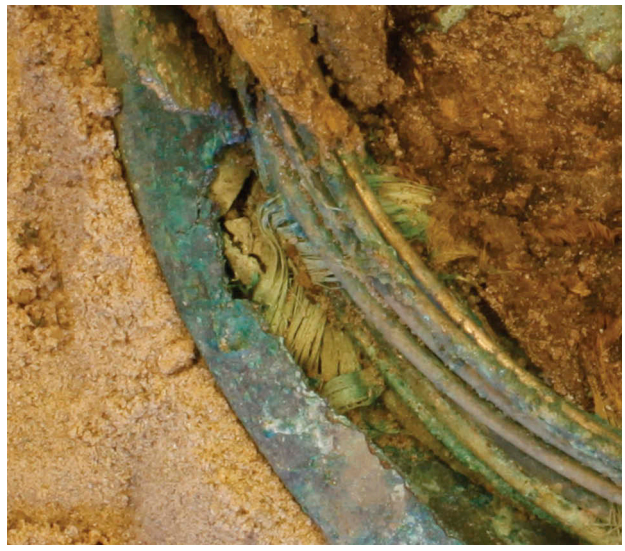

Figure 15. Close-up of plant fibres and neck rings.

The second suspension vessel is, as mentioned above, heavily damaged (Figure 16). It lay scattered over an area of c. 9 × 42 m and the ornamented part, the base, comprises 72 fragments, while the sides are represented by 20 fragments. The base of the vessel had a diameter of c. 29 cm, while the height of the sides was 3.5 cm.[3] The base is divided up into five

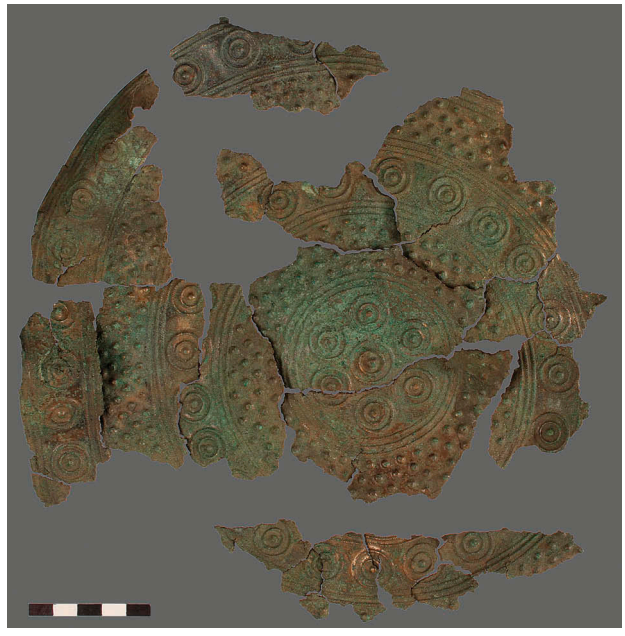

Figure 16. The ornamental plate from the suspension vessel found in the plough soil.

zones by three encircling mouldings, which imitate cord. The individual zones are ornamented alternately with cast bosses and circles. There is also plastic, cord-like ornamentation on the sides, at the transitions between the shoulder, neck and base. At the mouth of the vessel there are remnants of an internal ledge, at least 1 cm in width, perforated by opposing triangles. One fragment shows that this ledge has had a small eye for attaching the vessel to a belt. An almost identical suspension vessel has been recorded from Vester Doense near Hobro, where it was found together with the remains of a cord skirt (Brøndsted 1958, p. 203; Sprockhoff and Höckmann 1979, p. 88).

The Bækkedal hoard also contains a tutulus bearing exactly the same type of ornamentation as seen on the large suspension vessel, suggesting that they formed part of the same belt set (Friis 1968). The tutulus had lain in the upper part of the pot and had therefore suffered plough damage. It was originally hemispherical with a cylindrical tip on which there is a decorative disc. Its height is c. 10.5 cm and its surface is covered with zones filled out with bosses and circles, separated by plastic ornamentation. On the reverse of the tutulus is a slit and something that resembles a bar button for attachment to a belt.

The hoard includes seven fragments of one or more band-like spiral arm rings with a central rib (see for example Ørsnes 1959, pp. 22–25; Kristiansen 1974, p. 20). Further to these are two almost identical cuff arm rings. The 18 fragments that constituted one of these were found exclusively in the plough soil, while one was found in the pot. The arm rings are decorated with six moulded ribs on which there were two or three eyes for the attachment of jingle plates in the form of rings or similar (e.g. Baudou 1960, p. 62). The width of one arm ring is 7.4 cm, while that of the damaged example cannot be measured. At the ends of the arm rings there are two triangular holes which are fastening devices of some kind. Cuff arm rings have been found in a number of hoards where they often appear as a set, for example in the Fårdal hoard found near Viborg (Kjær 1927, p. 248).

Finally, nine fragments making up two twisted neck rings with oval terminals should be mentioned. One of the rings is slender with narrow, almost pointed-oval terminals and hooks for fastening; its terminals are decorated with finely incised lines and zigzag patterns. The other ring is more robust and only one broad terminal, ending in a spiral, is preserved; this is decorated with bows and narrow, diagonally hatched bands. It is of a type known from most of Denmark, Scania and northern Germany (Baudou, 1956, p. 29, Sprockhoff 1956, p. 154, Karte 29).

Male objects

A feature of hoards containing horse harness found in southern Scandinavia and the southern Baltic area is that the harness fittings are often accompanied by ornaments and other female objects, while male equipment occurs less frequently (von Brunn 1981, p. 115; Varberg 2013, p. 148). This situation is clearly reflected in the Bækkedal hoard, which contains about three times as many female items as male items. On the other hand, the male items constitute an exclusive group, comprising a bronze celt of Seddiner type, a gold oath ring, a razor and a lancet. Their special status is demonstrated by several of these artefact types having been found in particularly rich burials, such as the princely grave at Seddin in Brandenburg (Thrane 1984, p. 168 with references). It is true in particular of the 8 cm long bronze celt, which differs from the eponymous axe from Seddin in that it is ornamented (Figure 17). It therefore belongs to a small group of ornamented axes found

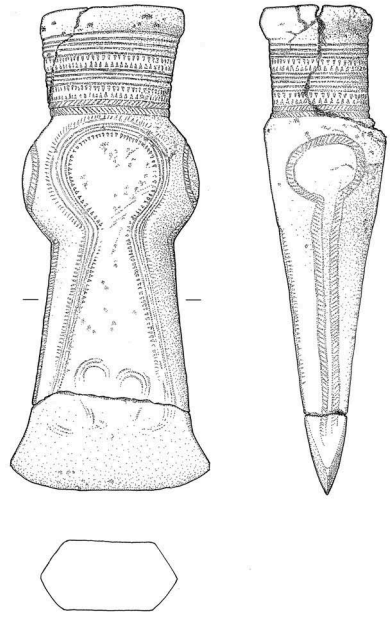

Figure 17. Axe of Seddin type. Note that the narrow face is also ornamented.

especially on Funen and in Scania (Thrane 2014), but the type has also been recorded across an area extending from the southern Baltic to the Netherlands (Sprockhoff 1956, Karte 9).

The socket is ornamented with lines, oblique strokes and small punched triangles, while the same ornamentation is repeated on both the narrow and broad sides in the form of a linear band. On the broad faces, near the edge, there are coiled spirals which almost resemble ship's prows (Kaul 1998, p. 163). This cannot be considered as a working axe, more as a weapon or prestige object.

As mentioned above, the hoard includes a gold oath ring and a lancet contained in a small suspension vessel. Only the tang and a little of the blade are preserved from the lancet and it must have been broken in antiquity as it lay wedged in beneath the neck rings. The tang is ornamented with a zigzag pattern flanked by strokes, while the small part of the blade still attached is decorated with a bow pattern. It is not known precisely what lancets were used for, but in several cases they have been found in male graves together with other male items such as razors and tweezers (Broholm 1953, no. 144; Sprockhoff 1956, p. 86). The oath ring, which only weighs 41 g, belongs to a small group of narrow band-like oath rings that are made of folded sheet gold and are therefore hollow (Figure 18) (Baudou 1960, p. 67; Knoll, Meller & Filipp 2014, p. 819). Oath rings are known primarily from hoards but have in a few cases also been found in graves, for example in the Voldtofte area (Thrane 1984, p. 163).

The hoard also includes a fragmentary razor, found in three pieces in the plough soil. It had a spiral- or S-shaped handle, but this is not preserved. The razor bears images of two almost identical ships with S-shaped prows. By the prow of one of the ships are several centre-pointed double circles that probably represent suns.

Figure 18. Slender gold oath ring with round decorated terminal knobs.

Other finds

As can be seen from Table 1, the hoard contains a number of other finds that cannot be assigned to gender. These include 14 bar buttons/bars that, with two exceptions, were found in the plough soil (Figure 19). The bar buttons are of slightly different types: All have straight, grooved bars, but the eyes differ (Baudou 1960, p. 90). Seven have grooves and six do not. On 11 of them, the eye is oriented parallel to the bar, while two have transverse eyes and the orientation could not be determined on one. The two with transverse eyes, which turned up in the plaster-cast block a few centimetres apart, still had leather remnants in the eyes. This indicates that the bar buttons should be seen being related to the horse harness, perhaps being used for the attachment of straps and the like. A similar interpretation applies

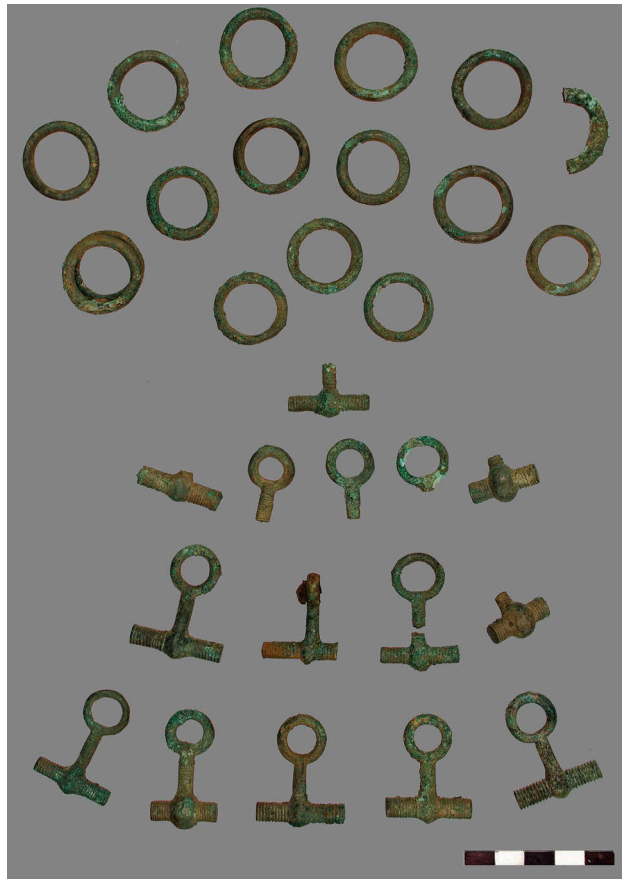

Figure 19. A selection of bar buttons and rings.

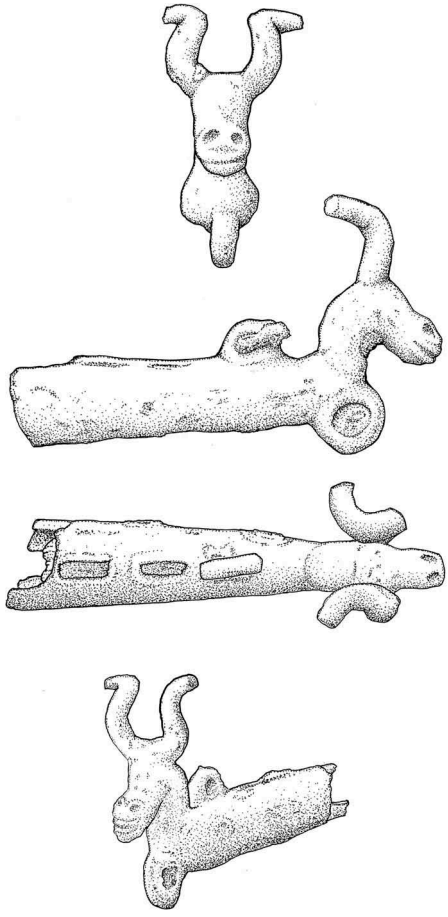

Figure 20. Zoomorphic bronze protoma.

to some of the numerous loose rings in the hoard (Figure 19). These can be divided up into two groups: 17 have a diameter of 2.5–3 cm, while ten smaller rings have a diameter of only c. 1.7 cm. In several cases, the smaller rings were found linked together in twos or threes.

The Bækkedal hoard also includes a curious small bronze figure that possibly represents a bull (Figure 20). It is only 5 cm in length and near the head are two eyelets for the attachment of something – jingle plates perhaps. At the opposite end is a socket containing wooden remnants, indicating that the piece could have functioned as some kind of fitting. Its diameter is c. 1.1 cm. Similar, but longer, figures are recorded from Egemose in southwest Funen and Skjerne on Falster, where they are interpreted as furniture for ceremonial wagons (Broholm 1949, p. 266; Jacob-Friesen 1969, p. 156). This tradition apparently continued into the Pre-Roman Iron Age, when small bull figures are found associated with the Fredbjerg

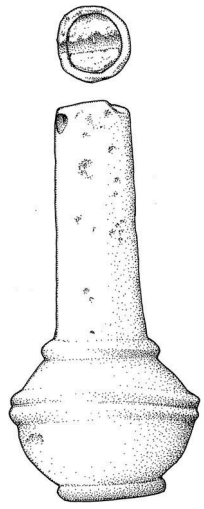

Figure 21. Tubular bronze object with rounded terminal knob.

wagon (Schovsbo 2007, p. 96). Another object that cannot be identified more closely is a tubular piece of bronze with a rounded terminal knob (Figure 21). Its socket also contains wooden remnants and it probably sat at the end of a wooden shaft or similar.

The more curious department also includes two cast bronze fittings probably representing the terminals of a leather belt and ten c. 10 cm long triangular jingle plates (Figure 22). These artefacts are not joined together but their ornamentation, which consists of parallel rows of strokes, bows and cross-hatching, suggests that they should be seen as a set. They also have a few parallels elsewhere, for example in the Faardal hoard and in a richly-furnished grave in Albersdorf in the Ditmarshes in Schleswig (Kjær 1927, pp. 250–253; Sprockhoff 1956, Tafel 71; Menke 1972, Tafel 59). These latter finds show that the jingle plates hung in chains beneath the fittings, which explains the presence of some of the linked rings of small diameter. The fittings are just less than 8 cm in width and therefore slightly wider than those from Fårdal. As was the case with the examples from Fårdal and Albersdorf, the jingle plates appear only to have hung from one of the fittings, as indicated by the remains of suspensions.

Finally, fragments of seven sickles should be mentioned. Several of these have one or two dorsal pegs or studs. Sickles feature commonly in period V hoards and in both male and female graves across a large geographic area (Baudou 1960, p. 45).

Figure 22. Triangular jingle plates and belt fitting.

Horse harness in the Late Bronze Age – conclusions

Horse harness is found particularly in the Late Bronze Age hoards of southern Scandinavia and the southwestern Baltic area: In southern Scandinavia alone there are 33 examples, while in the southwestern Baltic area there are 60 (von Brunn 1981; Varberg 2013) (Figure 23).[4] These hoards comprise a mixture of horse harness and, especially, female objects, although male items and non-gender specific artefacts also occur. It is, however, rare for a complete set of harness, as evident in the Bækkedal hoard in the form of cheek pieces, bits, phalerae, jingle plates and terret fittings, to be present. In only a few cases do the

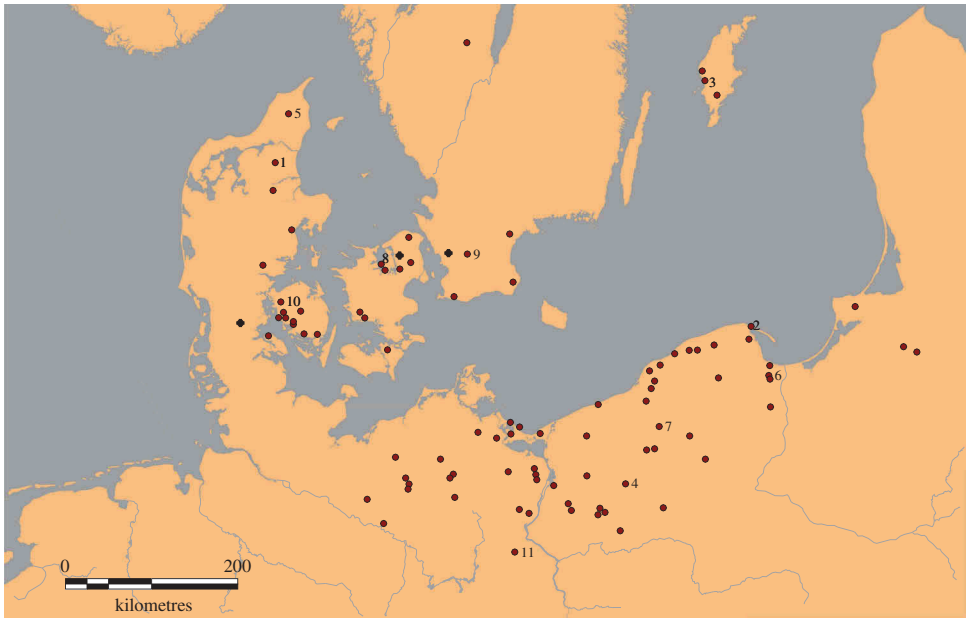

Figure 23. Distribution of finds of Late Bronze Age horse harness in southern Scandinavia and the southern Baltic area. Circles mark hoards and crosses mark graves. Selected finds refer to Table 2. 1. Bækkedal, 2. Rekau, 3. Eskelhem, 4. Karbow, 5. Sæsing, 6. Pyritz, 7. Ückeritz, 8. Løvbjerggård, 9. Fogdarp, 10. Turup, 11. Stolzenberg. Data from Varberg (2013), von Brunn (1981) and Larsson (1974). Two find sites are situated outside the map section.

Table 2. Selected finds of horse harness for two-horse teams in the Nordic Bronze Age sphere together with finds combinations. The find sites refer to the distribution map shown in Figure 23.

Find-place	Cheek pieces	Terret fittings	Horse bits	Jingle plates	Phalerae
Bækkedal	4	2	2?	8	10
Rekau	3			3	2
Eskelhem	4		2	4	12
Karbow	4		2		14
Sæsing	4			x?	
Pyritz	4			3 + 1	5
Ückeritz	7 + 4	2		13	54
Løvbjerggård		2	1	2	11?
Fogdarp		2		4	4
Turup		2			2
Stolzenberg		2		4	12

hoard contents provide a fuller picture of how the horses in a team were equipped with bridles and harness and how these were decorated. The type of wagon drawn by these horses, and how the pole was mounted, are further questions to which these hoards provide very few answers (e.g. Schovsbo 2007, pp. 100–101, 2010, p. 18).

A small group of hoards stands out from the rest in that they either contain two bits, two terret fittings or four cheek pieces (Table 2), thereby giving a clear indication of the use of a two-horse team. But in general the hoards convey a rather more mixed impression. Do they, through the presence of a few individual components, perhaps represent the presence of a two-horse team, saddle horses or something else on a different and more symbolic level? Closer examination of the individual components of the various richly-furnished hoards reinforces the impression that some of these depositions represent complete sets of horse harness. The period VI Eskelhem hoard from Gotland, the contents of which include four identical cheek pieces, four sets of jingle plates, 12 phalerae and two bits of central European origin, is therefore a good example of what can be taken to represent the bridles of a two-horse team (Jensen 1997, p. 180). Similarly, the four cheek pieces in the hoards from Karbow in northern Germany and Pyritz in Pomerania are also identical and the Karbow hoard includes a mould for an axe of Seddin type, 14 phalerae and two bits (Sprockhoff 1956, p. 34; Thrane 1965, p. 70). The Pyritz hoard includes seven twisted neck rings, five phalerae or decorative discs and three sets of jingle plates (Sprockhoff 1956, p. 52; von Brunn 1981, Tafel 49), as well as a ring with three jingle rings. In the hoard from Rekau in Pomerania there were only three cheek pieces and three sets of jingle plates – thereby suggesting a two-horse team, even though the equipment is incomplete (Sprockhoff 1956, p. 54). Finally, the hoard from Sæsing in northern Jutland should be highlighted, not only due to the slightly unusual horse harness it contains, but also because the four cheek pieces are not a complete match: three of them are identical, while the fourth differs somewhat in size and form. A further unusual aspect of this hoard is its four oval decorative plates and five disc/wheel-shaped suspension plates, which possibly represent jingle plates (Friis 1961, p. 43; Thrane 1965, p. 50). Similar oval ornamental plates are evident in a hoard containing horse harness from Nymö in Scania and in hoards from northern Germany, where the plates are, however, pinched in at each end (Thrane 1965, p. 57).

The hoard from Ückeritz stands out by containing a very large number of objects that can be related to horse harness (Lampe 1982). Aside from two terret fittings, there are 54 phalerae and a number of other bridle and harness ornaments (Lampe 1982). Further to these are four cheek pieces of antler and seven of bronze: The latter are, though, of two different types (Lampe 1982, pp. 38–40). The number of cheek pieces suggests that parts of three sets of bridles for two-horse teams are included in the hoard. The 13 sets of jingle plates give a more mixed expression, as there appear to be four different sets represented, but these are also incomplete, as shown by their odd number. Judging from the number of sets of jingle plates seen in other hoards, four sets appear to be the norm. This is true of the Fogdarp, Eskelhem, Stolzenburg and probably also the Pyritz hoards, where one set is incomplete (von Brunn 1981, Tafel 49). There are other hoards that give no definite indications of a two-horse team, for example Alt Ristow, Kallies and Schwachenwalde, or where only three sets of jingle plates are present, for example Klein Butzig, Rekau and Holsteinborg (Thrane 1975, p. 277; von Brunn 1981). It is apparent from the above that four sets of jingle plates per two-horse team, or two per horse, were apparently usual. The Bækkedal hoard, and perhaps also that from Ückeritz, is therefore atypical. As well as being evident from the Bækkedal hoard, the position of the jingle plates can be seen on a bit from Høve, which has a set of these plates at each end (Broholm 1953,

no. 216); this is further confirmed by the figure in the Svartarp hoard from Västergötland (Oldeberg 1939).

Remarkably, bits only feature very rarely in the many hoards containing horse harness. Apart from the Bækkedal hoard, bits have only been found together with cheek pieces on two occasions: in the Eskelhem hoard from Gotland, mentioned above, and in the Karbow hoard, which has bits with twisted mouthpieces (Sprockhoff 1956, p. 34, pl. 58). Bipartite bits of Høve type, with attached jingle plates, were found at Løvebjerggård on Orø in Roskilde Fjord. There were also bits in a hoard found in eastern Jutland (uncertain find spot) and two examples in an urn burial dating from period VI or the very beginning of the Iron Age at Annelöv in Scania (Varberg 2013, 149). The interesting aspect here is the general absence of bits from hoards that otherwise contain large quantities of horse harness components, together with the very diverse and non-standardised appearance of those bits that are present. One explanation could be that many of the bits were made of organic material, as was the case in the Bækkedal hoard: A horse's mouth has a toothless area, the bars, where a bit must be held for it not to be chewed to pieces. A find that appears to support the above conclusion with respect to non-metal bits is the hoard from Ückeritz, where leather remains not representing reins were found in the symmetrical cheek pieces (Lampe 1982, p. 28).

The position and attachment of the phalerae are also much-discussed subjects (Larsson 1974, pp. 211–215; Thrane 1975, p. 128). From later illustrations on for example the Gundestrup cauldron, it has been assumed that they formed part of the decoration of the bridle and harness (e.g. Brøndsted 1934, p. 165, 1958, p. 81). Based on the evidence from northern Germany and Pomerania, von Brunn remarks that the number of phalerae is often divisible by two and therefore reflects two-horse teams (von Brunn 1981, p. 116). Other studies show that phalerae of the same size are often represented by an even number (Larsson 1974, p. 214; Thrane 1975, p. 128). This is true in the case of the Bækkedal hoard, where four phalerae from the bridles have a diameter of 11–12 cm, while four others have a diameter of c. 15 cm. If the number of phalerae in other hoards is examined, a large group becomes evident in which there are only one or two examples and where the horse harness consequently only constitutes a symbolic part of the overall hoard content. The situation is markedly different in the hoards where the harness present represents a two-horse team or teams (Table 2). In these cases there appears to be some form of standardisation in the number of phalerae, as most of these hoards contain between ten and 14 examples. This applies for example to the hoards from Eskelhem (12), Stolzenberg (12) and Karbow (14). In the Løvebjerggård hoard, where the absolute total is not known, there were about 11 phalerae. This picture is further reinforced when other hoards are considered: The hoards from Villingrød Mose and Hanemose, which contain no other artefact types, have 14 and 12 phalerae, respectively (Thrane 1983). In the north German and Pomeranian hoards from Morgenitz, Alt Ristow, Biesenbrow and Prausterkrug, the number of phalerae present is 10, 11, 12 and 14, respectively (von Brunn 1981, pp. 115–116). The hoard from Stevneskoven on Funen (Brøndsted 1934), which contains 23 phalerae together with a suspension vessel, is an exception in that factors other than the number of horses involved perhaps determined the items selected for offering.

A partial conclusion from the above is that, within the large geographic area corresponding to the Nordic Bronze Age sphere, there seem to have been established norms and conventions with respect to the appearance of bridles and harness for two-horse teams. The harness sets typically consisted of four cheek pieces with bits, four sets of jingle plates, two terret fittings and 10–14 phalerae. There are of course exceptions to this, not least in the case of the Bækkedal hoard, which contains eight sets of jingle plates, as well as more rarely occurring artefacts types such as ornamental buttons and cross-ribbed cuffs. The individual sets of harness components show general similarities, but most of the hoards have some special features, bearing witness to the fact the bronze casters had the freedom, and the desire, to give their products an individual character. This is especially true of the jingle plates, which appear quite uniform at first glance but which, on closer examination, prove to vary considerably (e.g. Thrane 1975, Fig. 73; Lampe 1982, Tafel 28, Fig. 5). The form of the jingle plates and the shape of any perforations in them, as well as the composition of the individual sets, therefore often

differ and special regional characteristics are also evident. For example, hourglass-shaped jingle plates are only found in the southern Baltic area (Sprockhoff 1956, p. 259). A further example of variation is provided by the sets of terret fittings, which have the coiled tubes and, in part, triangular apertures on the reverse in common, while their decoration and upper termination differ (e.g. Larsson 1974, pp. 188–192). The most pronounced example of the latter is provided by the terret fittings from Fogdarp, which terminate in human heads, while other examples have either a moulded or cylindrical tube uppermost or a peg in the form of the head of a vase-headed pin surrounded by a ring. Bits and cheek pieces also vary greatly in form in period V, showing that bronze craftsmen continued to experiment and develop the various types.

The form and quantity of the bronzes making up the individual sets shows that these must have been associated with equally superior vehicles. Rougher four-wheeled carts, probably drawn by both oxen and horses, would have been used, as clearly shown by finds of disc wheels dated to the Early Bronze Age (Pare 1992, p. 42; Johannsen 2010, p. 156). However, Denmark also has several hoards containing wagon components that demonstrate the existence of vehicles of a completely different calibre, i.e. low-slung, metal-furnished ceremonial wagons (Schovsbo 2010, p. 18). The best known of these is the hoard from Egemose in southwest Funen, where c. 7 kg of bronze, in the form of c. 1000 rivets and various decorative fittings, was deposited in a pot in a bog (Jacob-Friesen 1969, pp. 125–130). Included in these were several bronze horned fittings and the well-known zoomorphic protoma, which all formed part of the wagon's furniture. These objects, which reveal that the vehicle had been burnt, represent the fittings from a wagon body and a pole. The wagon is thought to have been made in central Europe, perhaps in Switzerland, and, interestingly, parts of bridles are also symbolically represented in the form of two cheek pieces of types that are similarly thought to have been manufactured within the southwestern Urnfield culture (Thrane 1975, p. 122). There is therefore a great deal to suggest that an entire wagon, complete with equipment and perhaps horses, was imported to southwest Funen (Jacob-Friesen 1969, p. 155).

Another hoard, which turned up as early as 1817 at Skjerne on Falster, comprises only three objects: A horned animal figure with jingle plates, a conical bronze tube and an axle cap, which leaves its interpretation in no doubt (Jacob-Friesen 1969, p. 125). Both the Skjerne and Egemose hoards therefore belong to a small exclusive group of hoards containing wagon furnishings that have a particular association with the western Swiss lake site villages (Pare 1992, p. 28). The cremation grave in the barrow Lusehøj, dated to period V, also contained rivets of the same kind as those found in the Egemose hoard (Thrane 1984, p. 143). Thrane concludes that parts of a central European wagon, in the form of a wagon body or wagon seat, were placed on the deceased's funeral pyre together with rich grave furnishings. Given that Egemose lies only 6 km away from Lusehøj, it is suggested that the two finds perhaps represent the same wagon. A fragment of a possible cheek piece with ribbed ornamentation is also present in the Lusehøj burial, as are fragments of cross-ribbed bronze cuffs (Thrane 1984, p. 142), which are possibly associated with the bridles.

Rock carvings apparently depicting the vehicles that existed in the Bronze Age and Pre-Roman Iron Age are another important source of information (Johannsen 2010, p. 181). This is due to their very realistic execution and the fact that wagon components have been found elsewhere in Europe which correspond to those shown in the carvings. Two-wheeled chariots are the most commonly depicted vehicles and these are thought to date broadly to the Bronze Age (Johannsen 2010, p. 178). The image of the chariot from the Kivik grave, the only well-dated example of this type from Scandinavia, is however dated to the transition between periods II and III (Randsborg 1993, p. 133). If we compare this image with illustrations from Egypt and Greece, where this type of vehicle appears to have a similar or earlier date, the indication is that, in a Scandinavian context, these chariots date from the Early Bronze Age (e.g. Pare 1989, p. 81; Crouwel 2004; Randsborg, 2010, p. 251). A few finds confirm that people in Denmark have used horses as draught animals since the beginning of the Bronze Age or perhaps even the end of the Late Neolithic (Randsborg 2010). The most famous find in this respect is the Sun Chariot from Trundholm Mose

or 'The Chariot of the Sun', dated to period II of the Bronze Age, which depicts a hoarse pulling the sun (Aner and Kersten 1976, no. 867). Both the horse and the sun in the shape of a bronze disc are placed on a wagon frame. On the horse there is the suggestion of a very simple bridle and holes where the bit has been. The Sun Chariot shows that four-spoked wheels, wagon constructions and the use of horses as draught animals were all known in the Early Bronze Age. Another type of bridle is depicted on a razor from Daugård, which similarly dates from the Early Bronze Age (Varberg 2009, p. 24): In this case, two straps cross the bridge of the horse's nose; this form of bridle is still in use today. Finally, mention should be made of the two antler cheek pieces from Østrup Bymark on Zealand. These date from period II and probably originate from central or southeastern Europe (Hüttel 1981, p. 103; Thrane 1999, p. 12).

Four-wheeled wagons with four-spoked wheels also feature in rock art and wheels of this particular type have actually been found at Stade, west of Hamburg (Jacob-Friesen 1927). The four bronze wheels were each cast in one piece, but with a hollow rim in which wood could be inlaid. They measure c. 57 cm in diameter. The wheels have been radiocarbon dated to period V (Deichmüller 1974). If the Stade wheels were the type generally used for ceremonial wagons at the end of the Late Bronze Age, as suggested by other finds, this indicates that the wagons were relatively low-slung with small, but richly furnished wagon bodies (Pare 1989, p. 80, 1992, pp. 28–30). An indication of the richness of the decoration on these wagons, and their appearance, is provided by the contents of the Egemose hoard, and also by the Dejbjerg wagons from the Pre-Roman and Roman Iron Age (Schovsbo 2010). These wagons were not built for speed but to serve other purposes. Pare concludes that these were ceremonial vehicles which, due to their small wagon bodies, were not suited to the transport of large, heavy things (Pare 1989, p. 80). He suggests that they were used in connection with ritual processions, funerals and religious ceremonies. Wagons of this type, which have roots at the beginning of the Urnfield culture when they were involved in funerals, appear to have played a role over a c. 800 year period that extended up into Hallstatt times, when there are also records of wagon burials (Pare 1989, p. 82). In Scandinavia and along the German-Polish Baltic coast, the numerous hoards containing elements of horse harness that probably derive from two-horse teams, show that four-wheeled ceremonial wagons were more common than the few preserved wagon components might suggest.

The Bækkedal hoard was, as outlined above, found on a small sandy hillock and this raises a number of questions about the actual deposition itself: Why and how did this take place? Was the deposition site in impenetrable forest, on cultivated land or in some other kind of landscape? The fact that the reins, bridles and perhaps other parts of the harness were deposited in the pot, together with all the metal objects, adds a new dimension to the interpretation of hoards deposited on dry land. The Bækkedal hoard can therefore not be perceived as buried treasure, a scrap-metal hoard or trader's goods (e.g. Levy 1981, pp. 17–25), but shows that there were also sacred places on dry land and that many terrestrial hoards must be equated with those deposited in wetlands.

Notes

1. Orthophotos from the following years were examined: 1954, 1975, 1979, 1982, 1985–1987, 1992, 1999, 2002, 2004, 2006, 2008, 2010–2012 and 2014.
2. Analysis of this material, which could be horn, is presently being undertaken by Enrico Appellini and Ulla Mannering, National Museum of Denmark.
3. The base was, however, domed such that the diameter was somewhat less.
4. Hoards only containing possible wagon components are not included in this statistic. Conversely, hoards are defined as containing horse harness that includes one or more of the following artefact types: Cheek pieces, bits, phalerae/decorative discs and jingle plates.

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RESEARCH ARTICLE

The 'Burgundian' hat from Herjolfsnes, Greenland: new discoveries, new dates

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In 1921, during Poul Nørlund's excavation at the Norse farm Herjolfsnes, Greenland, a tall hat was recovered from the burial grounds surrounding the farm's church, where a substantial collection of medieval garments had been recovered. This unusual hat came to symbolize not only the end of the Greenland Norse colony but also its enduring cultural links with continental European fashions, following a comment to this effect published by Nørlund himself. In 1996, the hat was dated to the early fourteenth century by Arneborg, a century earlier than Nørlund's dating, based on stylistic comparisons with European examples. Recent research on North Atlantic textiles led to a reexamination of the hat, with different sections sampled and resubmitted for accelerated mass spectrometry dating. The results suggest that the body of the hat and its crown are of different periods with *c.* 100 years between them. This reanalysis of the Herjolfsnes 'tall brimless hat' or 'Burgundian' hat suggests that a considerable amount of cloth recycling took place in these North Atlantic colonies, that cloth was a valued and cherished commodity, and raises questions about the role this item of material culture role should play in discussions of identity and enduring links between Greenland and the continent.

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1. The site, the history of the hat and the demise of the Greenland Norse

In 1921, a major excavation was undertaken at Ikigaat (Herjolfsnes), near the southern tip of Greenland, by Poul Nørlund in order to recover and establish the nature of the Norse farm and church within the confines of the Eastern settlement of Greenland (Figure 1). Constant erosion was occurring on the site, and over the course of approximately 100 years prior to Nørlund's excavations, items of clothing, coffins, and skeletal remains had been recovered, as well as a funeral stone with runic inscriptions (Nørlund 2010, p. 194; Lynnerup 1998, p. 19). Nørlund was able to excavate 110–120 burials, despite there being more identified in the surveyed area, although preservation and the way the burials were closely 'packed' together rendered much of the material unrecoverable (Lynnerup 1998, p. 20; Nørlund 2010, p. 59).

The textile remains are the most unique finds from the site and constitute among the finest and most complete garments in existence for the late medieval period, having been preserved for 600 years in permafrost. Else Østergård carried out an in-depth reanalysis of textile finds from Greenland, (Østergård, 1998, 2004, 2005) with a focus on the Herjolfsnes material. Within this corpus was the famous 'Burgundian' hat (Figure 2). This item of personal adornment was considered unusual within the corpus of Greenlandic textiles and received its designation not only because of the particular shape of the hat (item DNM D10608) but also from the custom of wearing a hood over a cap that Nørlund noted in another of the Herjolfsnes burials. Nørlund drew specific parallels between the Herjolfsnes hat (DNM D10608) and 'weepers' on the sarcophagus of the Duke of Burgundy (1425) where one character is depicted wearing a small cap and another is shown with a hood over the cap (Østergård 2004, p. 134).

Over time, this hat has come to be considered an icon of the demise of the Greenland Norse. Nørlund's statement in 1924 that 'it will then be one of the specimens serving to give the latest date for the find and the interruption of the intercourse with Europe' (Nørlund 2010, p. 182) was generally accepted and the hat came to symbolize the end of the Greenland colony, the end of contact with the European mainland, and the latest date for the burials in the churchyard (Arneborg 1996; Østergård 2004).

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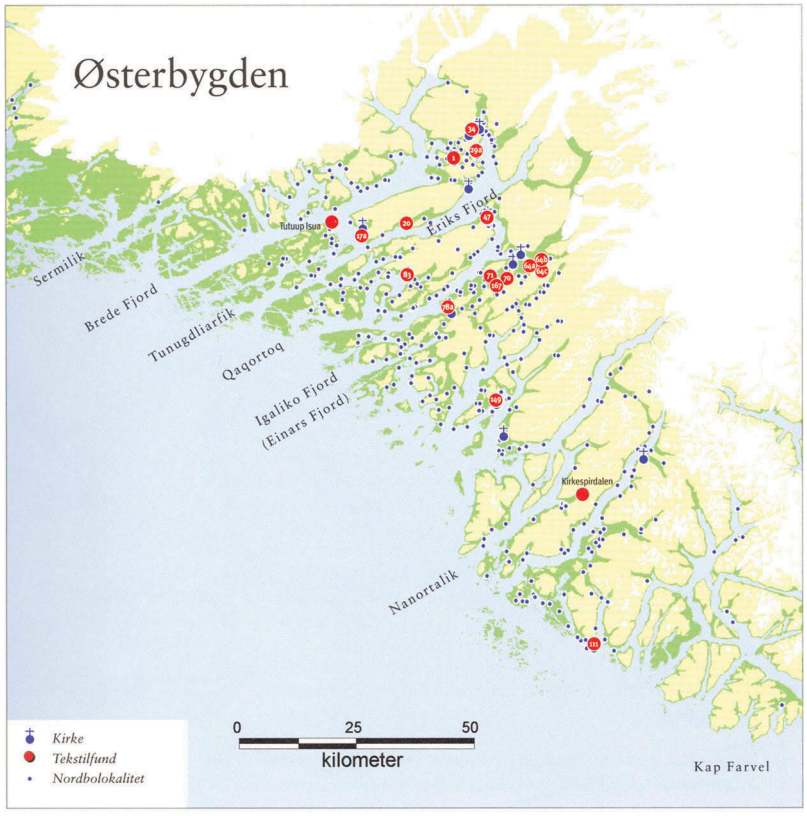


Figure 1. Map of the eastern settlement of Greenland (courtesy of the National Museum of Denmark). Red dots identify Norse sites from which textiles have been recovered. The southernmost of these red textile-producing sites, closest to Kap Farvel, is Herjolfsnes. (for colour image please see online article).

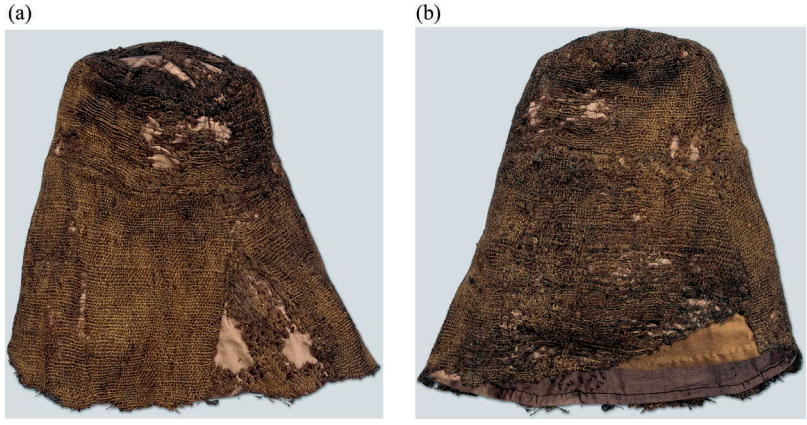


Figure 2. (a and b) The 'Burgundian' tall hat from Herjolfsnes (National Museum of Denmark).

For 70 years, a major implication of this attribution lay in its suggestion that the Greenlanders, despite their marginality, continued to be tightly connected to continental European culture and constructed their identities in reference to the latest trends in western European fashion, right up to point at which the Greenland colony disappeared.

As Gwyn Jones wrote (1986, p. 110):

> Poul Nørlund found dead Greenlanders buried in exactly such costumes as were current in continental Europe throughout the fourteenth century, and even a few examples of the latest fashions of the second half of the fifteenth. . .Now if any doubts should be entertained that these small caps can be given a fairly exact dating, there remains one about which there cannot be much discussion. It is 25-30 cm high, rather conical, standing steeply up from the forehead but widening out at the

> back of the neck. It is one of the high caps shown us on the paintings of Dirk Bout, Memling, and other Flemish painters, worn in the time of Louis XI and Charles the Bold, in the latter half of the fifteenth century.

After Nørlund's thorough analysis, the hat took on a life of its own and came to be known in the literature as the 'Burgundian' tall hat. It was described as such by Krogh (1982, pp. 166), McGovern (1985), Martensen-Larsen (1987), McGhee (2003) and used by them to reference contacts with the external world. In 1996, Seaver mentioned the 'Burgundian' hat, specifically in reference to merchants traveling to Greenland to sell their wares, arguing that such a hat would have been impractical at sea but that its height might have served to impress local inhabitants (Seaver 1996, p. 230–31). Fagan (2006) mentions the hat in *Fish on Friday: Fasting and the Discovery of the New World*, inferring that the Burgundian style of tall hat was worn by the Norse as a symbol of sporadic contact after Norwegian trade with Greenland faltered (Fagan 2006, p. 213). However, despite such long-lasting academic interest in this hat and its meanings, there was no certainty that the hat was actually made to reflect Burgundian influence, since the hat itself had never been directly dated, nor evidence to demonstrate whether it was an element of a man's or a woman's attire, since Nørlund was unable to associate it with a specific skeleton.

This idea that this hat could be used as a symbol of the end of the Greenland colony was challenged in 1996 when Arneborg (1996, p. 83) published a suite of C^{14} dates from Herjolfsnes including one on the hat. This date suggested that the hat was made at least a century earlier than assumed and probably had no correlation with southern Europe but shared more in common with Icelandic and Nordic clothing traditions. Recent reanalyses of the hat, as part of a long-term project on textile production in the North Atlantic,[1] led the authors to resample and verify whether all sections were contemporary with the 1996 date. These most recent radiocarbon dates on the Herjolfsnes hat confirm that the body of the hat is contemporary with the earliest end of Arneborg's date and suggest a late-thirteenth century date for the hat's construction. However, the textiles used for the crown of the hat are earlier than this, by approximately 100 years, suggesting that the Greenland Norse were involved in significant textile recycling as has been observed in other Norse colonies of the North Atlantic, such as Iceland.

This paper presents these new dates and uses their distribution to examine the reuse, or recycling, of basic resources in the construction and maintenance of material culture within these far-flung North Atlantic Norse colonies. It also reconsiders whether Herjolfsnes's so-called 'Burgundian' hat provides evidence for the close integration of the Norse colony of Greenland into contemporary continental European culture, whether it reinforces suggestions of the colony's marginality, or, alternatively, whether it speaks to Greenland's involvement within a specifically North Atlantic medieval European culture area that developed through interaction and adaptation as the colonies established during the ninth–tenth century westward Norse expansion grew and adapted to local conditions.

2. Archaeological context of the 'Burgundian' hat and description

Five caps were recovered from the Herjolfsnes site during Nørlund's excavations, not including other hoods and headdresses, and while most of these are similar in shape – cylindrical with a round crown – the 'Burgundian' or 'tall brimless hat' stands out, being double the height of the others (Østergård 2004, p. 221; Nørlund 2010, p. 12). It was found in the southwestern part of the churchyard resting upon a piece of cloth that Nørlund thought was another part of the same headdress. Inside this second piece were teeth that disintegrated during conservation (Østergård 2004, p. 133; Nørlund 2010, p. 180). Compared to all of the other caps from Herjolfsnes, the tall hat was the only one lacking in clues about its absolute age (Nørlund 2010, p. 182), presumably because Nørlund had difficulties identifying parallels in Europe. A second tall hat was found on the site, but was in such a poor state of preservation that it was discarded (Nørlund 1923).

Construction of the hat

The hat (Nørlund no. 87, DNM D10612) was made using both a tabby weave and a 2/2 twill (Østergård 2004, p. 221). Its body was constructed with a wide lower portion, measuring 190 mm, having an additional gusset of 130 mm × 130 mm that gave a flare to the bottom half (p. 221). A separate 70 mm wide band of tabby was sewn to the top of the main

portion, and the crown was added to this by sewing two pieces together–a piece of tabby and a 2/2 twill (Østergård 2004, p. 221) (Figure 2).

Østergård remarked that the hat originally had a particular color arrangement with black and dark brown warp threads crossed by white or light tan wefts. Furthermore, the warps on the main body of the hat ran crosswise and were spun with possible goat hair, while the wefts were made from the undercoat of the northern short-tailed sheep (Østergård 2004, p. 221). This would have produced an interesting striped effect that Østergård noted in three places: on the bottom portion of the main section, on the top narrow band, and on the crown of the hat. The hat today is very worn and decayed but beyond that its textiles were unevenly woven, in areas displaying warp threads in pairs. The thread count obtained on different parts of the hat range from 6 warp yarns per centimeter to 9 - 13 weft yarns per centimeter the tabby weave sections, while the 2/2 twill found on half of the crown piece was 8/9 suggesting that the cloth was slightly weft-dominant.

3. Dating the Herjolfsnes hat

Stylistic analyses

Following the discovery of the tall hat, Nørlund tried to date it on the basis of typological similarities with headdresses documented from other parts of Western Europe. His main impression was that this hat, like the other caps recovered at Herjolfsnes, belonged to male attire. To support this assertion, he provided examples from European art of the fifteenth and sixteenth century, such as Hans Memlin's *Portrait of a Man* (1480) and details taken from the altarpiece of the Broby church (*c.* 1500) in Funen, where a man is depicted wearing a similar hat to the Greenlandic examples. He stated:

> Its impressive height and broad back part point to the middle and the latter half of the 15th century and most probably it is a man's though the women of that period wore similar erections usually covered with a veil of lawn. (Nørlund 2010, p. 182).

Østergård (2004) also thought that the Herjolfsnes hat bore a significant resemblance to small portraits created by local Inuit people that have been interpreted as representations of Norse Greenlanders, whom Thule Inuit pioneers had seen in the thirteenth or fourteenth centuries, and in part based on these images, she thought the hat was worn with the rim folded over the forehead (Østergård 2004, p. 135).

However, Nørlund also mentioned its potential similarity to Icelandic woman's headdresses of the sixteenth century, the *faldur* – tall conical headdresses that underwent a series of transformations and variations and are today worn as part of the National costume of Iceland (Guðjónsson 1978; Østergård 2004, p. 133, Helgadóttir 2013). Based on Falk's (1919) review of Nordic dress, Arneborg (1996, p. 79–83) argued that the Icelandic women's tall hats were also mentioned in the sagas of the thirteenth and fourteenth centuries, although no images of these exist.

Two Icelandic hats relevant to this discussion were discovered within the context of research for this paper at the Skógar museum in southern Iceland. Both of these hats (F1 and F2) were recovered from the same site, Fornusandur, on the southern Icelandic coast, and both were sampled and dated for this project. F2 (Figure 3) is the closer match to the Greenlandic tall hat, while the former, with a more peaked appearance, has equivalents in Icelandic medieval and post-medieval illustrations; however, both are dated later than our hat and also postdate Memlin's and Nørlund's 'Burgundian' models. Two identical accelerated mass spectrometry (AMS) dates on these hats, calAD 1530–1795 (one-sigma calibration, with highest probabilities at 1619–1670 [53.1%]) are consistent with historical documentation for this farm's occupation and, together with Falk's interpretation of the sagas' references to tall hats, suggest such items of dress remained 'in style' for many centuries in the North Atlantic.

AMS dating, 1996–present[2]

Most of Nørlund's dating of the clothing from Herjolfsnes was done on the basis of style and typology, and despite not having access to absolute methods he was relatively accurate for several pieces but off by more than a century for the tall hat. Nørlund thought it belonged to the late 1400s, while Arneborg's AMS dating (AAR-2201; 685 ± 50 bp) produced a two-sigma calibrated age of calAD 1250–1410. Based on the calibration curve used at the time of her publication, this date was reported with a nearly even bimodal probability distribution. At one standard deviation, there was a 37.3% internal probability that its actual age was calAD 1270–1320 and a 30.9% probability that the wool was

Figure 3. Hat from Fornusandur, Iceland, stored at the Skógar museum in southern Iceland (Courtesy of Skógarsafn Museum, photograph by G. A. Gisladóttir).

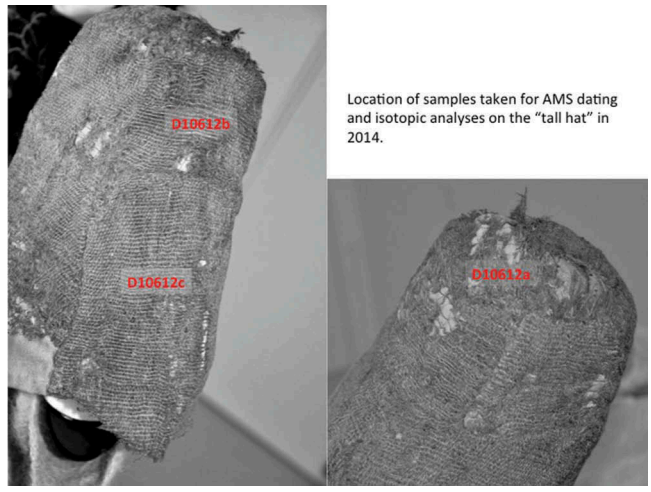


Figure 4. Locations where samples were taken for AMS dating (photograph by Hayeur Smith 2014).

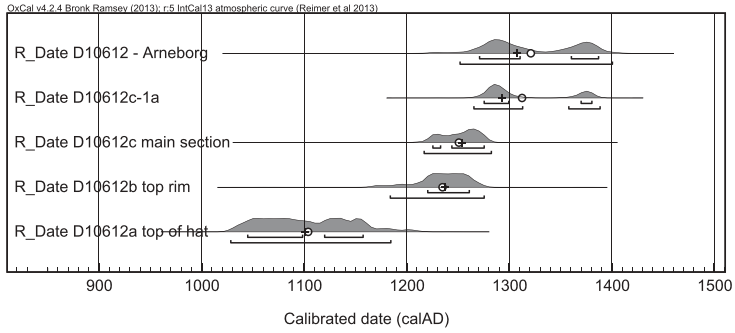
sheared somewhat later, calAD 1350–1390. Favoring the two-sigma range, Arneborg and Østergård placed its age generally between 1300 and 1400 (Arneborg 1996, p. 81; Østergård 2004, p. 133)[3]. The sample that was dated came from the main body of the hat, and while both authors mentioned the possibility of recycling in its construction (Arneborg 1996, p. 79 and 81; Østergård 2004, p. 135), the possibility that different sections of the hat might produce different dates was not explored at that time (Figure 4).

In 2014, as part of a larger project on textiles and gender it was determined by the authors that the hat in question might benefit from further analysis and, specifically, dating of different sections. A sample was collected from the larger lower portion of the hat, a second was obtained from the narrower top band portion, and a third sample was taken from the most worn part of the crown – the tabby weave section (Figure 4). These samples consisted of small fragments of cloth, each with 3–5 warp and weft threads. These were removed under the supervision of curatorial staff from the National Museum of Denmark; loose fragments that were, nonetheless, still physically attached by at least one thread to the adjacent body of the hat were prioritized for sampling. This selection process minimized damage to the hat itself while assuring that the samples selected were actually from the hat's woven structure. All three samples were submitted to Beta Analytic in Miami, Florida for AMS dating.

The dates received from separate parts of the hat are considerably different from one another. Two are essentially contemporary with the earlier end of the date previously reported by Arneborg (1996), and one is considerably earlier than any of these. Importantly, however, all were earlier by at least 200 years than Nørlund's estimated age for the hat. Figure 5 shows the four new AMS dates, as well as the earlier one published by Arneborg (1996). All are now calibrated using OxCal v4.2.3 (Bronk Ramsey *et al.* 2013) and the r:5 IntCal13 atmospheric curve (Reimer *et al.* 2013), under the assumption that the sheep from which the wool was gathered had a primarily terrestrial diet.

The sample from the crown of the hat (DNM D16012a; Beta-383360: 920 ± 30 bp) provided a calibrated two-sigma AMS age range of calAD 1028–1184. This date's probability distribution is relatively continuous; yet at one-sigma there is a slightly higher probability (41.9%) that the wool's true age is calAD 1045–1098 and a slightly lower probability (26.3%) that it actually fits into the interval calAD 1120–1157. The sample from the upper rim (DNM D16012b; Beta-383361: 800 ± 30 bp) provided a calibrated age at two standard deviations of calAD 1184–1275, with a unimodal probability peak and a one-sigma range of calAD 1220–1261. The AMS date from the lower section (DNM D16012c; Beta-383362: 770 ± 30 bp) provided a calibrated two-sigma age of calAD 1217–1282. At one-sigma this date's probability distribution was slightly bimodal, with a higher probability peak (57.8%) spanning the range calAD 1244–1275, and a lower probability peak (10.4%) in the early thirteenth century, calAD 1225–1233.

(a)



(b)

	Crown DNM D16012a	Upper body DNM D16012b	Lower body DNM D16012c	Lower body, re-run* DNM D16012c-1	Hat, body DNM D16012
	Beta-383360	Beta-383361	Beta-383362	Beta-426839	AAR-2201
Standard Radiocarbon Age	920±30 bp	800±30 bp	770±30 bp	690±30	685±50 bp
2σ calibration internal probabilities	1028-1184	1184-1275	1217-1282	1265-1388 1265-1313 (p=0.689) 1358-1388 (p=0.265)	1252-1400
1σ calibration internal probabilities	1045-1157 1045-1098 (p=0.419) 1120-1157 (p=0.263)	1220-1261	1225-1275 1225-1233 (p=0.104) 1244-1275 (p=0.578)	1275-1380 1275-1299 (p=0.542) 1370-1380 (p=0.140)	1271-1387 1271-1310 (p=0.429) 1360-1387 (p=0.253)
Median *Adjusted median*	1101 *1139*	1237 *1275*	1254 *1292*	1292	1307
$^{13}C/^{12}C$	-23.1 ‰	-22.7 ‰	-24.2 ‰	-23.9 ‰	-22.6 ‰
$^{15}N/^{14}N$	+3.1 ‰	+3.5 ‰	+3.7 ‰	--	--

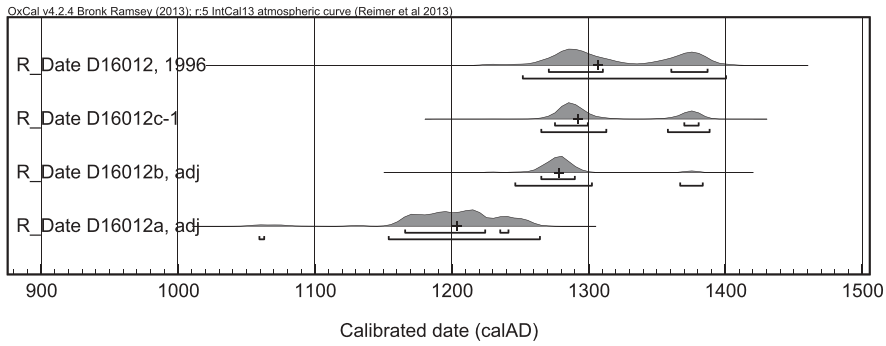
Figure 5. (a [chart], b [table]): New AMS dates combined with Arneborg's (1996) date; all have been calibrated using OxCal v4.2.4 (Bronk Ramsey *et al.* 2013).

Testing for contamination from past conservation practices

To assess whether conservation treatments done in the 1980s and earlier at the National Museum of Denmark could have contaminated the samples, leading to erroneous ages, one sample (DNM D16012c) was rerun with a separate solvent extraction pretreatment process at Beta Analytic's laboratories.[4] This pretreatment was designed to remove residual chemicals containing either modern or 'fossil' hydrocarbons that could have swayed the samples' dates to appear younger or older, respectively, than their true ages. The date received for this split sample (DNM D16012c-1), following the additional pretreatment cycle, was 80 radiocarbon years younger than the pre-calibrated age received from the portion of the sample that had not received the additional solvent extraction pretreatment. At one standard deviation, DNM D16012c-1's calibrated age is calAD 1275–1380, with a 54.2% probability that the true age falls in the range calAD 1275–1299 (and a 14% probability that its age could be calAD 1370–1380). At two standard deviations, calAD 1265–1388 (with a 68.9% probability that its age is calAD 1265–1313), D16012c-1 just barely overlaps the youngest part of the date range for the sample that had not received the solvent extraction pretreatment. However, this is virtually identical to Arneborg's earlier date (AAR-2201).

Adding the solvent extraction pretreatment routine shifted the standard radiocarbon age for sample DNM D16012c by 80 years. Given that all of the new samples collected for this study came from locations no more than 25 cm apart, we feel that it is reasonable to assume that all were similarly affected by past conservation practices. Applying this idea heuristically, the standard radiocarbon dates received for the two remaining samples were shifted by 80 years to account for similar effects of past solvent contamination and these adjusted dates were then recalibrated. Figure 6 presents the results of this exercise,

(a)



(b)

	Crown DNM D16012a	Upper body DNM D16012b	Lower body DNM D16012c-1	Hat, body (1996) DNM D16012
	Beta-383360	Beta-383361	Beta-426839	AAR-2201
Standard Radiocarbon Age	840±30 bp	720±30 bp	690±30	685±50 bp
2σ calibration internal probabilities	1059-1264 1059-1063 (p=0.004) 1154-1264 (p=0.950)	1246-1383 1246-1302 (p=0.905) 1367-1383 (p=0.049)	1265-1388 1265-1313 (p=0.689) 1358-1388 (p=0.265)	1252-1400 (median: 1307)
1σ calibration internal probabilities	1166-1241 1166-1224 (p=0.635) 1235-1241 (p=0.047)	1265-1290	1275-1380 1275-1299 (p=0.542) 1370-1380 (p=0.140)	1271-1387 1271-1310 (p=0.429) 1360-1387 (p=0.253)
Median	1204	1278	1292	1307
$^{13}C/^{12}C$	-23.1 ‰	-22.7 ‰	-23.9 ‰	-22.6 ‰
$^{15}N/^{14}N$	+3.1 ‰	+3.5 ‰	--	--

Figure 6. (a [chart], b [table]): AMS dates from the Herjolfsnes hat, adjusted heuristically for conservation contamination, and re-calibrated with OxCal v4.2.4. Arneborg's (1996) date (AAR-2201) has not been adjusted for conservation effects, as it went through different pretreatment processes than those initially undertaken at Beta Analytic. DNM D16012c-1 is the redated split sample from the upper rim of the hat, with additional solvent-extraction pretreatment.

which tightens the correspondence of dates from the body of the hat. With this adjustment, the two new dates from the body of the hat clearly overlap and are consistent with Arneborg's previously run date. Together, these suggest that the main body of the hat was made from wool shorn and spun in the last half, and most likely the last quarter, of the thirteenth century. The age estimate obtained for the crown of the hat, however, is clearly much different, suggesting that this wool was gathered in the early thirteenth century.

Testing for marine-carbon contamination

Radiocarbon ages can also be affected by marine-carbon effects. Due to the long periods of time during which C^{14} absorbed into seawater circulates and mixes through the water column, near-surface marine plants and animals can produce radiocarbon dates apparently hundreds of years older than the organism's known age (Bowman 1995, pp. 24–27; Cronin 2010, p. 35). Terrestrial animals, such as sheep, when grazed or foddered seasonally on seaweed, can also absorb limited amounts of this 'old' marine carbon, resulting in artificially old radiocarbon dates for these animals. Assessing the degree to which wool was gathered from sheep that had a partially marine diet or were fed a fully terrestrial diet can be estimated by plotting the ratios of two nitrogen isotopes (N^{15}/N^{14}) and two carbon isotopes (C^{13}/C^{12}) in the dated samples and comparing these to reported values for these ratios from living animals and archaeological recovered

faunal remains. Nelson *et al.* (2012) have recently published such nitrogen and carbon isotope ratios for Greenlandic fauna, including sheep. Given that the site of Herjolfsnes is located on the coast, the C^{13}/C^{12} ($\Delta^{13}C$) and N^{15}/N^{14} ($\Delta^{15}N$) ratios of these samples were calculated as part of the AMS dating routine in order to determine whether the sheep whose wool was spun to make the Herjolfsnes hat might have grazed, or been foddered on, seaweed.

Figure 7 plots the carbon and nitrogen isotope values for the samples from the Herjolfsnes hat against known values for the $\Delta^{13}C$ and $\Delta^{15}N$ values of Greenlandic terrestrial and marine animals and plants. Arneborg obtained a 'terrestrial' $\Delta^{13}C$ value of −22.6‰ for the sample of the hat dated in 1996 (AAR-2201); however, no nitrogen isotope analyses were run then. The newly dated samples from the upper rim and the lower body of the hat provided fully terrestrial $\Delta^{13}C$ values of −22.7‰ and −24.2‰, and $\Delta^{15}N$ values of +3.5‰ and +3.7‰, respectively. The sample from the hat's crown provided comparable isotopic ratios of −23.1‰ ($\Delta^{13}C$) and +3.1‰ ($\Delta^{15}N$), ruling out a marine-carbon effect as the reason for its earlier radiocarbon age.

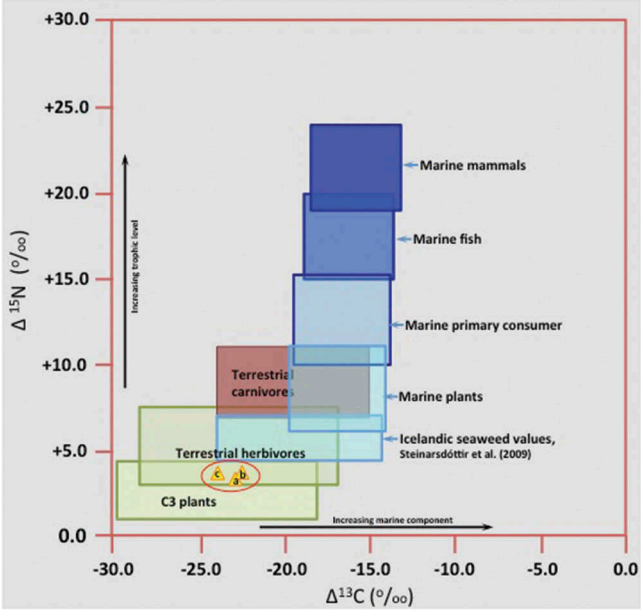


Figure 7. Carbon and nitrogen isotope ratios for samples from the Herjolfsnes tall hat: DNM 16012a (a), DNM 16012b (b), and DNM 16012c (c).

These new $\Delta^{15}N$ values on archaeological sampled wool are fully consistent with recently published baselines of +4.1±1.1 for archaeologically recovered Greenlandic Norse sheep/goat faunal remains (Nelson *et al.* 2012, p. 82). The $\Delta^{13}C$ values (−22.6 to −24.2‰) are also fully consistent with a terrestrial diet. However, it is interesting that they are considerably lower than $\Delta^{13}C$ values reported for sheep and goat remains from Greenland's Eastern (ave.: −19.8±0.5, sheep; −19.0±0.2, goat) and Western Norse Settlements (−19.8±0.3, sheep; −19.7±0.3, goat). Whether this difference reflects regional variance (e.g. Herjolfsnes was not included in the samples analyzed by Nelson *et al.* 2012), differential isotopic fractionation within bone and wool, or the acquisition of the wool from which this hat was made from some location other than Greenland is currently uncertain.

Regardless, all of these samples' isotopic compositions indicate that the wool from which the Herjolfsnes hat was made was shorn from sheep that fed on a fully terrestrial diet of grasses, sedges, and other C3 plants. There is, thus, no evidence for any marine component, such as seaweed fodder, in their diet. This allows marine-carbon reservoir effects to ruled out as an explanation for the 'older' ages of all these dates, whether compared to Nørlund's expectations for the hat's age or to the older age of the cloth used on the crown, relative to the rest of the hat.

4. Discussion

While the overall shape of this hat is similar to hat styles worn by both males and females in Flemish paintings, those hats are too late to be its inspiration, since the Flemish painting tradition flourished between the fifteenth and seventeenth centuries. The hat also resembles Icelandic counterparts of the sixteenth and seventeenth centuries, such as those reported here from Fornusandur. However, by dating the textiles directly, rather than assuming the validity of stylistic cross-dating, we have demonstrated that this is a thirteenth century hat, at least 150 years older than the 'Burgundian' style, known from continental European imagery, and cannot have been influenced by the emergence of that style. The Herjolfsnes hat cannot, therefore, be used to represent close cultural connections between

continental Europe and Greenland in the last generations of that colony's existence.

Similarly, past attempts to date the hat's style based on Thule Inuit carvings of presumed Norse individuals, or to date the age of those carvings based on the presumed stylistic age of the 'Burgundian' hat cannot be easily assumed without directly dating the carvings themselves. Although recent dates from the site of Sandhavn raise the possibility that early Thule Inuit pioneers may have penetrated nearly as far south as Herjolfsnes by the thirteenth century (Golding *et al.* 2011), the vast majority of archaeological evidence for early Norse/Inuit contact supports limited written sources indicating that Norse hunters first encountered Inuit in the Disko Bay region and further north during the mid-thirteenth century (Arneborg 1993). If such hats are, indeed, represented on Inuit carvings from Sermermiut and Inussuk (Østergård 2004), they may imply that hats, such as the Herjolfsnes tall hat, were relatively common in Greenland, or at least were of interest to the Inuit. However, the dates of these carvings and the accuracy of their representations of headgear remain unresolved issues that cannot provide independent support for dating this example.

In addition, the different dates obtained from separate sections of the hat suggest culturally specific textile uses in Greenland that have previously been noted in Iceland. Given that the crown of the hat dates to the early thirteenth century and is much earlier than the other samples from the hat's body, it is possible that cloth was a sufficiently important commodity that it could be preserved for generations and reused in garment construction over and over again. This suggests that the frequently deteriorated conditions of these textiles may not be solely post-depositional, or the result of decay over time, but may rather be related to intense recycling. This also raises interesting questions about how long the hat could have been in use after its thirteenth century creation.

Similar degrees of cloth recycling are common in the Icelandic corpus, where approximately 70% of textiles show some kind of cloth reuse.[5] Analyses of textiles by Hayeur Smith from the site of Bergþórshvoll in southern Iceland resulted in the discovery of a box of previously unknown textiles that had escaped conservation since their archaeological recovery some 90 years ago. After the textiles were cleaned, it was found that the box included many heavily patched garments and fragments, including a footless stocking or garter of a type worn over trousers and shoes and said to be common among fishermen, along with a possible hood.

The hood, currently under analysis, resembles several of the Herjolfsnes hoods, such as D10604 (Nørlund, No. 74). The Bergþórshvoll example appears to lack the long liripipe, familiar from the Herjolfsnes example, but does have a very short one at the back of the head (Østergård 2004). It has not yet been dated but is similarly made up of 12 patches. The stocking was a nearly complete piece put together from many patches that included different types of vaðmál and knits. Like the Herjolfsnes tall hat, the stocking was sampled and dated on two different locations; in this case both produced calibrated dates in the range calAD 1451–1513. A knitted patch was also present on the stocking. While this piece was not dated, it is well documented that knitting first appeared in Iceland during the 1500s (Robertsdóttir 2008).

A funerary shirt from a dated grave of 1783–1845 at Búland, Eastern Iceland (Gestsdóttir and Gisladóttir 2006), was similarly constructed from both knits and woven cloth. This type of shirt was common in Icelandic burials of the late-eighteenth century and similar examples have been identified at the sites of Bessastaðir and Reykholt. The Búland shirt was patched and mended with 17 different pieces of knitted or woven cloth. While this degree of cloth reuse seems to be more intense in Iceland – and sewn scraps from domestic middens similarly testify to the habitual reuse of cloth – recycling appears, nonetheless, to have been a common cultural practice across these North Atlantic islands, despite the seeming abundance of wool produced on Norse pastoral farmsteads.

These examples demonstrate that attempting to date a piece stylistically on the basis of a single C14 date may in some cases provide false information since the date will reflect the age of the piece of cloth sampled, rather than date when the garment was made. If we had only one AMS date drawn from the crown of the Herjolfsnes hat, for example, we might have assumed it was from the late-twelfth century rather than the late thirteenth. Having four

dates of the thirteenth century, on the other hand, allows us to suggest that the older cloth used for this hat's crown reflects the use of recycled cloth. If all four dates had been randomly distributed, and of different ages, we might have argued that this hat *could have* been made in the fifteenth century from a group of swatches of extremely old cloth, thus preserving Nørlund's view. However, the consistent agreement of three dates from the hat's body argues more clearly for the late-thirteenth century being the age when the hat was made, while the difference in age for the fourth sample points methodologically to the need for dating multiple samples from objects that were patched together in order to understand their stories.

By the same token, dating on the basis of style clearly presents its own problems. The 'Burgundian' hat surely does resemble hats depicted in fifteenth century Flemish paintings. However, now with four thirteenth-century dates from different parts of the same object, and with seventeenth century dates on similar Icelandic hats from Fornusandur, we believe the Herjolfsnes tall hat may simply be a Greenlandic creation, not necessarily attached to any continental European cultural tradition but perhaps loosely inspired by Greenland's closest neighbors, the Icelanders, and having more to do with female Icelandic *faldur* or similar hats worn by men. In this case, the Herjolfsnes 'hat', as an item of material culture, may simply be a 'North Atlantic hat' of a type fashionable there – with variations – for several centuries, not 'Burgundian' at all, and the product of a marginalized but culturally coherent society at the end of the western hemisphere with roots in a local, North Atlantic textile and dress tradition.

If this is, in fact, a 'North Atlantic' or 'Greenlandic' hat, then trying to identify external origins for its style or to determine what gender its wearer was may be pointless exercises and a more profitable one may be to focus on the cultural uses of textiles and what these can inform us of wool and resource management in the North Atlantic colonies. Farms in Iceland recycled cloth and bestowed upon it multiple existences, with examples making many transitions – from currency to clothing and ending up incorporated into household furnishings or put to other domestic uses (packing material, saddle cushions, etc.) – before finding their ways into the midden (Hayeur Smith 2014a, 2014b). It suggests that textiles, despite their abundance, were greatly valued and never wasted. In Greenland, the integration of fibers other than sheep's wool in textiles may document people's attempts to survive the harsh Greenlandic environment by selecting species, such as goats, that may have been more adapted to the climate (Østergård 1998, p. 64).

Similarly, the intensive cloth recycling noted on the tall hat from Herjolfsnes suggests concerns for managing and curating resources by reusing and preserving textiles as long as possible, perhaps 100–150 years or longer. What is certain is that the hat and its style do not reflect the date of Greenland's depopulation, which 21 AMS dates suggest took place around AD 1450 (Arneborg *et al.* 2012a, 2012b), and it is not 'one of the specimens serving to give the latest date for the find and the interruption of the intercourse with Europe', as Nørlund hoped. Rather, the hat and the different-aged textiles from which it was made reflect desires, aspirations, and hurdles encountered by these people living marginally at the end of the medieval European world.

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Notes

1. 'Weaving Islands of Cloth, Gender, Textiles and Trade Across the North Atlantic from the Viking Age to the Early Modern Period' National Science Foundation funded project (Polar Programs, Arctic Social Science Award no. 1303898).
2. Libby (1952), Suess (1970), Mook and Waterbolk (1985), Taylor (1987), Aitken (1990), Bowman (1995), Eriksson Stenström *et al.* (2011), and Taylor and Bar-Yosef (2014), among many others, provide excellent reviews of the fundamentals and history of radiocarbon dating,

calibration, and the statistical analysis and interpretation of standard and AMS dates. Readers unfamiliar with these subjects are referred to these and to the journal *Radiocarbon*. For those unfamiliar with statistical terminology used in reporting and discussing radiocarbon dates, the one-sigma range represents the statistical spread of possible ages at one standard deviation around the mathematical mean date reported by the laboratory. The one-sigma range has a 68.2% probability of containing the actual date of the material analyzed; while the two-sigma range (two standard deviations around the mean), has a 95.4% probability of containing the actual age of the sample. Radiocarbon dates calibrated against standards of known age, using programs such as Oxford University's OxCal, are conventionally reported as calAD or calBC. See Taylor and Bar-Yosef (2014) for additional information on calibration and Bronk Ramsey *et al.* (2013) and Reimer *et al.* (2013) for discussion of the calibration program and curves used in this analysis.

3. Østergård (2004) dates were based on Arneborg's (1996) dates. No additional dates were run in 2004.
4. All of the new dates reported here were run after Beta Analytic's standard acid/alkali/acid pretreatment process. Subsequently, conservation records were located at the Danish National Museum that indicated the Herjolfnes hat may have been treated between the 1920s and 1980s with lanolin and a hydrocarbon solvent to remove glue that had been used to adhere the textiles to a fabric or paper backing. The solvent extraction pretreatment process undertaken at Beta Analytic on sample DNM D16012c-1 was configured to remove both the modern lanolin and possible old carbon from the hydrocarbon-based solvent.
5. Research currently being carried out by Hayeur Smith on Icelandic textiles as part of the 'Weaving Islands of Cloth' project suggests intense recycling of textiles identified by seams, stitching, patching, and partially assembled fragments of textiles.

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RESEARCH ARTICLE

The chronology and structure of the Sejlflod cemetery, Northern Jutland, Denmark

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ABSTRACT

The Sejlflod cemetery in Northern Jutland, containing almost 300 graves from the Late Roman and Early Germanic Iron Age, occupies a central position in a North European perspective. This arises in particular from the fact that the graves are inhumation burials furnished with a relative abundance of grave goods and that the cemetery represents the entire adult population of a village through time. An understanding of the Sejlflod cemetery is important for investigations of other similar cemeteries and burial grounds, for studies of a range of period-defining artefacts and for analyses of the social circumstances of the time. It is, however, heavily dependent on knowledge of the cemetery's chronological structure.

On the basis of the pottery, it has proved possible to divide the cemetery up into four chronological phases. This division is supported by stylistic and chronological analyses of the fibulas and a few other artefact types from the graves.

Surprisingly, the chronological analysis does not reveal a horizontal stratigraphical development. On the contrary, it provides a basis for a new interpretation of the cemetery as a progressive fusion of independent family grave clusters.

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Iron Age; Cemetery; Chronology; Graves; Pottery; Late Roman Period; South Scandinavia

The Sejlflod cemetery

The cemetery is located in the eastern part of the Limfjord area, on a conspicuous *bakkeø* (hill island) surrounded by wetland areas (Figure 1). The site was excavated between 1979 and 1985 in advance of the expansion of a gravel quarry and the excavations covered an area of 11 ha. In addition to the graves, an Iron Age settlement with remains of more than 120 house sites – mostly dating from the Late Iron Age – was also investigated. Part of this settlement is coeval with the cemetery, which lies to the south. The cemetery comprises a northern group (grave group 1), containing 105 graves, and a southern group (grave group 2), containing 202 graves (Figure 2). Both grave groups were excavated in full.

The groups include two graves from the Neolithic (AS and PY), and six graves from the Early Roman Iron Age (DF, DM, EE, QS, QT and UG) are located peripherally. Rather more than 50 graves or grave-like features occur outside the two grave groups – some on the settlement, others to the east of the cemetery. These include three adult graves (AEQ, AER and AQY), which are coeval with grave groups 1 and 2, child graves located within or close to house sites and graves dating from other periods.

This paper deals with the remaining 299 graves in grave groups 1 and 2, which can, with reasonable certainty, be assigned to the Late Roman and Early Germanic Iron Age (Nielsen 2000).

Pottery analysis

Pottery vessels comprise the largest group of finds in the graves and it was decided to base the chronological studies on this material. The actual analysis is based on profile drawings of the vessels produced by Ringtved, Aarhus University, together with photos of the vessels and drawings of their ornamentation in the catalogue published from the site (Nielsen 2000). Furthermore, an unpublished classification of the ornamentation, carried out by J.N. Nielsen, was used as a basis for studies of the pottery chronology.

Potsherds or complete vessels were found in 263 of the 299 graves and a total of 500 pottery vessels were included in the analyses. The variable conditions for

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Supplemental data for this article can be accessed here.

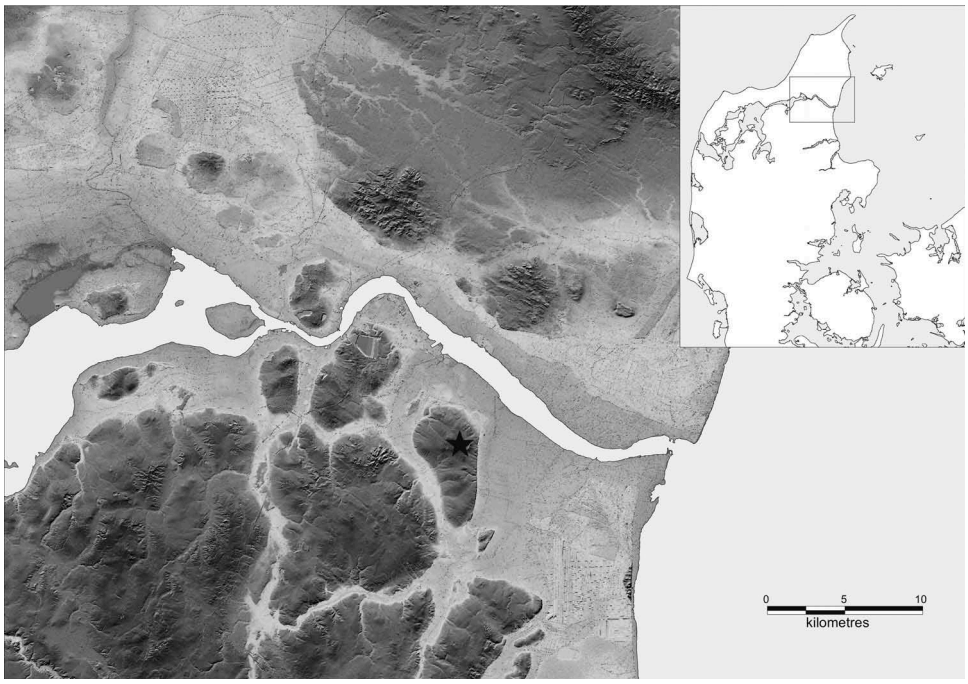

Figure 1. Relief map of the eastern part of the Limfjord area, showing the location of the Sejlflod site. © The Danish Agency for Culture and COWI.

Figure 2. The excavated area at Sejlflod. Settlement traces are shown in light grey and graves in black. Several sunken-floored houses from the Early Iron Age have only been recorded as crop marks on aerial photos and by trial trenching. The houses are located to the south and east of the scheduled burial mound Tofthøj (shown with a grey circle).

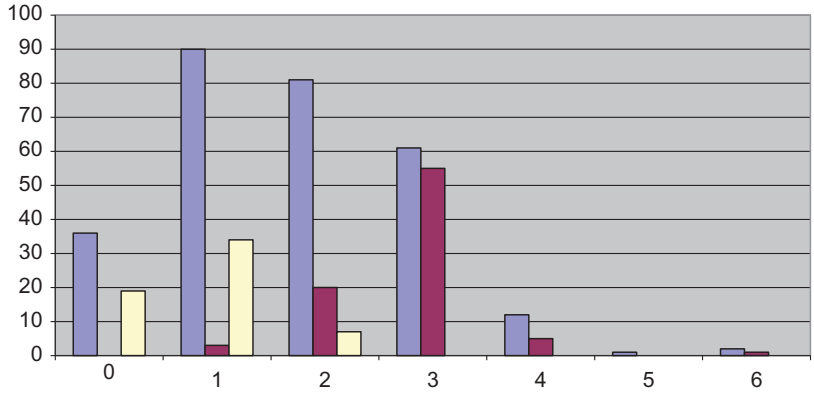

Figure 3. Number of pottery vessels in, respectively, adult graves (red) and child graves (yellow) and all graves (blue) (for colour image please see online article). *N*: 283 graves, of which 84 are adult graves and 38 are child graves. In 16 graves, the number of vessels could not be determined.

preservation made it difficult in several cases to estimate the number and types of vessels present and their position in the graves, but a general set of burial practices could be clearly identified.

The graves only exceptionally contained more than three vessels, and only three graves contained more than four vessels (Figure 3): grave IN with five vessels and graves ZF and ZL each with six vessels. The number of vessels in each grave is highly dependent on the age of the deceased. Of the 84 definite adult graves, 55 contained three vessels. Child graves, on the other hand, are characterised by only one or two vessels.

Total 90% of the pots fall into one of three trisegmented types: coarsely tempered, unornamented handled vessels, burnished and ornamented handled vessels and jars (Table 1). The vessels are equivalent to Ringtved's types H, G and C (Ringtved 1988, p. 113f). The remaining vessels can be classified as miniature vessels, dishes, bowls, beakers and a left-over group termed 'other'.

As can be seen from the abundance diagram presented in Figure 4, the three most frequent vessel types are distributed equally across the graves. Fifty-eight graves contain an ornamented handled vessel, an unornamented handled vessel and an ornamented jar. In the following, this combination will be referred to as a complete vessel set (Figure 5). Grave ZF contains two complete vessel sets and probably represents a double grave (Nielsen 1991, p. 121f, Figure 8(a) and 8(b). A further 18 graves contain at least three vessels. In three of these, the pottery is so fragmented that the vessels cannot be identified to type (AG, IM and TQ). It is therefore conceivable that these graves contained a complete (albeit now fragmented) set of pottery vessels. In two cases, an ornamented handled vessel was replaced by an unornamented handled vessel (CT and HY), and in another two instances, the opposite situation is apparent (AQ and AAH). In five graves, one of the vessels in the complete set was replaced by a miniature vessel (C, U, IO, QP and ZT). In graves TD and VQ the ornamented jar was replaced with an unornamented handled vessel, and in graves A and UC, the unornamented handled vessel was replaced by, respectively, a handled bowl and a jar with a lug, that is, a small vertical protrusion, sometimes with a small horizontal perforation.

Some graves contain special vessels (e.g. AE, IN). Despite the presence of four vessels, AE does not contain a complete set, as both the jar and the ornamented handled vessel are absent. Instead, the grave has a jug and an ornamented handled bowl. Close parallels to the jug have been found on Bornholm, and it is assumed that both the jug and the woman buried in the grave came to Sejlflod in connection with some marriage arrangement. Grave FL also contains an atypical vessel that apparently originated in northwestern

Table 1. Distribution of vessel types and proportion of ornamented vessels within each type. N: 500 vessels. (*) Ten lugged jars are recorded under 'unornamented jars'.

Vessel type	Ornamented	Unornamented	Total
Jar	138	15*	153
Handled vessel	156	145	301
Miniature vessel	5	9	14
Other types	5	8	13
Unknown type	-	-	19

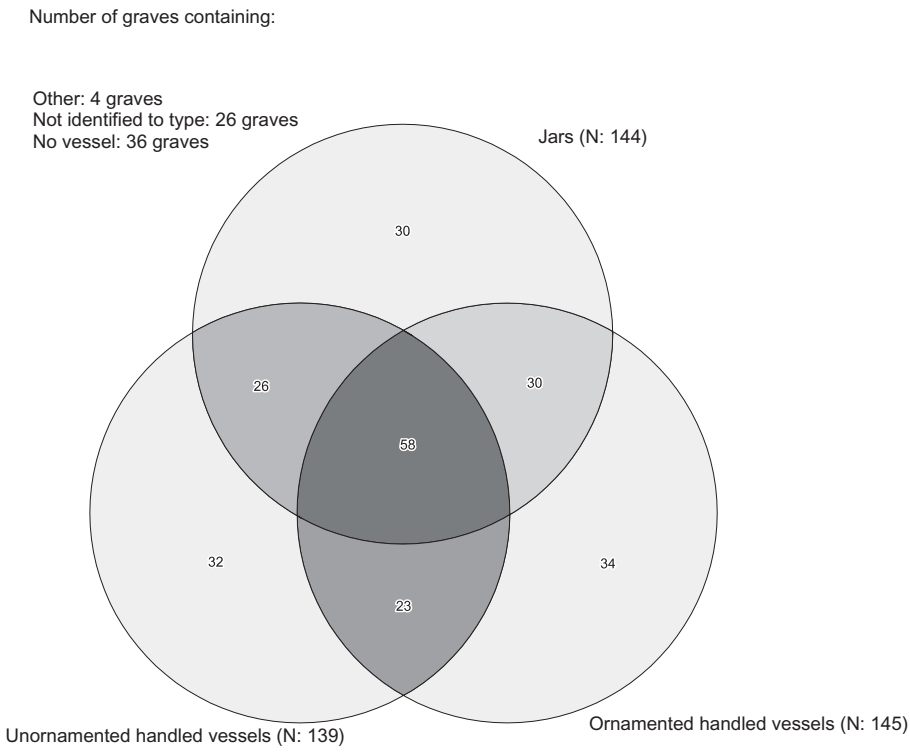

Figure 4. Venn diagram showing the number of graves-containing jars, ornamented and unornamented vessels. A total of 36 graves contain no pottery vessels, while 26 graves contain vessels that cannot be identified to type; 58 graves contain a complete set of pottery vessels (unornamented handled vessel, ornamented handled vessel and jar). *N*: 299 graves.

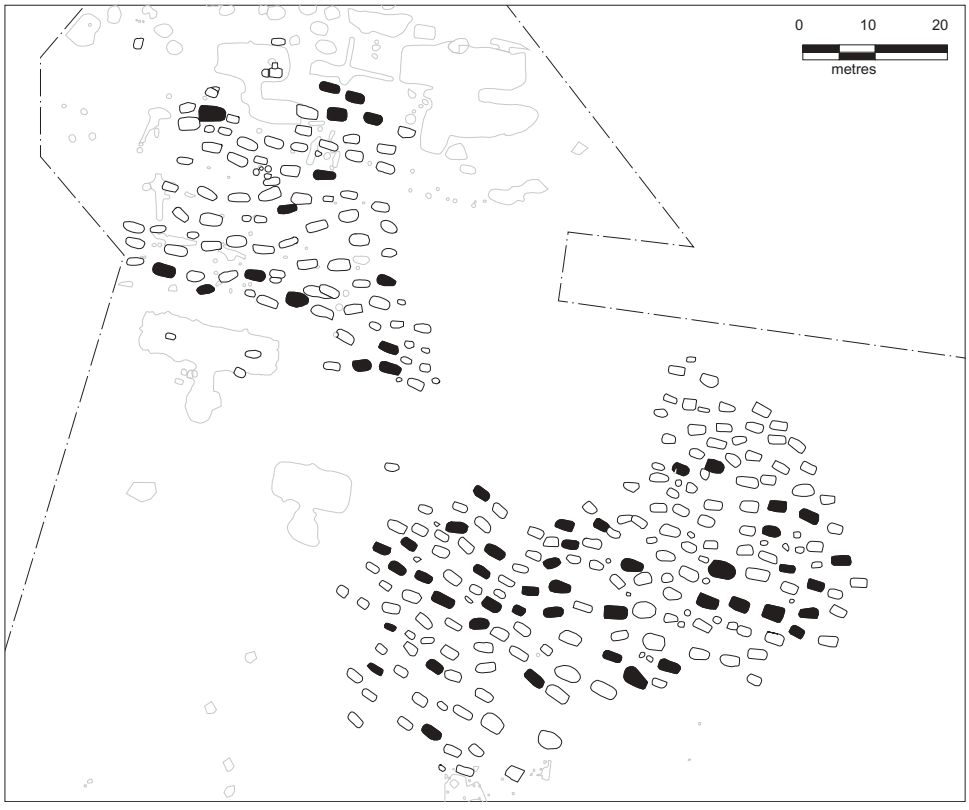

Figure 5. Distribution of graves containing a complete set of pottery vessels. *N*: 58 graves. Grave AQY on the settlement also contains a complete set.

Germany (Ringtved 1991, p. 54). In other instances, the jars were probably made locally, but were modelled on metal vessels. The jar in PH is clearly an imitation of a *Vestlandskedel*, a large metal cauldron, and IN contains an ornamented vessel with two ceramic suspension rings (see Mackeprang 1943, p. 46f; Ringtved 1991, p. 54ff; Lund Hansen 1995, p. 154f). Other graves contain pottery beakers that are imitations of glass beakers (e.g. A, O).

In the following analyses, the three most frequent vessel types will be dealt with independently. The ornamented vessels constitute the foundation for the chronological analyses. These analyses comprise a number of quantitative studies, including correspondence analysis (CA) of the ornamentation and principal components analysis (PCA) of various measurements made on the vessels. In recent decades, these techniques have often been applied to chronological studies of material culture. For more detailed practical information, reference is made to Madsen (1988) and Jensen and Høilund Nielsen (1997).

Unornamented handled vessels

The 145 unornamented handled vessels (UHV) are distributed across 139 graves. In addition to their lack of ornamentation, they differ in several other ways from the ornamented handled vessels. Ware thickness, tempering and firing are significantly different in the two vessel types, which can also be distinguished on the basis of their form. The latter has been demonstrated by a PCA of the dimensions of the handled vessels. As it was the form and not the actual size of the vessels that was in focus, all the measurements were standardised on the basis of the vessel volume. In order to simplify the calculations, and ensure that as many vessels as possible could be included in the study, the truncated cone volume was employed. This is based on the vessel height (H) and the radius of, respectively, the rim (r) and belly (R) (Figure 6). The volume is calculated by the following formula:

$$V = 1/3H\pi\ (R^2 + r^2 + Rr).$$

The measurements included in the PCA were diameters of the rim, neck and belly, vessel height and the position of the belly transition, measured from the base of the vessel. The analysis also included the

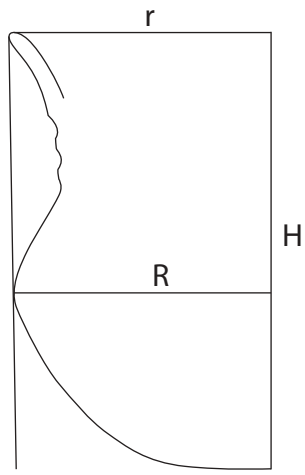

Figure 6. Handled vessels showing the measurements used in the principal components analysis (PCA) of the pottery vessels.

15 unornamented jars (cf. Table 1). The unornamented vessels can be divided into two types, one of which has a lug. The 10 graves containing vessels with lugs are all in grave group 2. The combination with other vessel types in the graves provides no clear indication of the degree to which this vessel type should be seen as a jar or a handled vessel. In three cases, a vessel with a lug is combined with a jar (FM, HL and UC) and in three other cases with either ornamented (EM) or unornamented handled vessels (DZ and, FR). Four graves contain no other types of vessel (HT, OT, RI and ACY). UC is the only grave at Sejlflod in which a vessel with a lug is combined with both a jar and an ornamented handled vessel. In so far as the grave contents reflect a complete vessel set, the lugged vessels must be perceived as a variant of the unornamented handled vessels.

Figure 7 shows the separation of the handled vessels in the PCA. The grouping is not unequivocal, but the unornamented and the ornamented vessels do appear to be mutually exclusive. Lugged vessels are clearly positioned marginally in the group of unornamented handled vessels.

Ornamentation

The ornamentation on both handled vessels and jars shows great variation but also has the common feature of being primarily limited to an encircling band on the belly and/or upper part of the vessel. In several cases, this band can be seen to be divided up

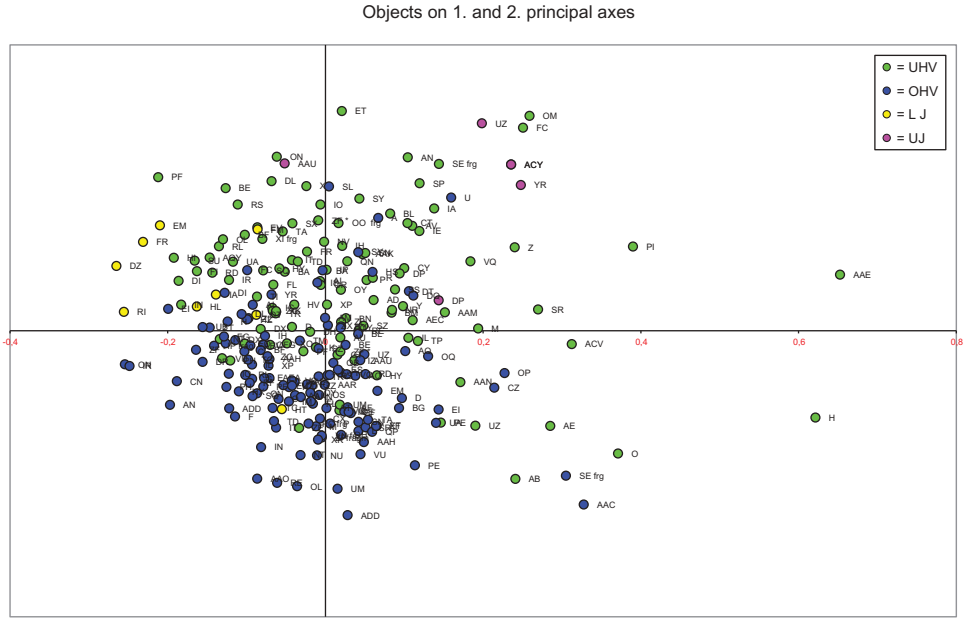

Figure 7. Plot of the first and second principal axes of the PCA of measurements on the handled vessels, adjusted according to the volume of the vessels. UHV = unornamented handled vessel, OHV = ornamented handled vessel, LJ = lugged jar, UJ = unornamented jar. *N*: 258.

into a number of ornamented zones or bundles, often with a symmetrical expression in the application of the latter. The bundles can be vertical, horizontal or oblique. For example, this can take the form of two bundles of horizontal furrows, separated by three bundles of vertical furrows and rosettes, as seen on EUx3011 (Figure 8).

The composition of ornamentation can also be perceived as a whole, that is, a complete entity involving several elements. It may take the form of two complete encircling horizontal furrows, as seen on ITx4185, or a continual sequence of broad, vertical furrows, as evident on DLx925. In addition to lines and furrows, pits of various sizes may also be included. The latter can be assigned to one of three size categories: small (Ps), medium (Pm) and large (Pl). Like the lines and furrows, the pits can also be grouped according to their orientation (horizontal,

Figure 8. Ornamented handled vessel from grave EU with ornamentation drawn in (Nielsen 2000, p. 71).

Table 2. Presence of the various forms of pits on, respectively, handled vessels and jars. N: 65.

	Small pits			Medium pits			Large pits	
Description	Type	Handled vessels	Jars	Type	Handled vessels	jars	Type	Handled vessels
Horizontal main composition with	Ps1	0	2	Pm1	2	4	Pl1	6
Vertical main composition with	Ps2	3	0	Pm2	2	2	Pl2	0
Vertical bundle of	Ps4	0	1	Pm4	0	0	Pl4	8
Oblique bundle of	Ps5	2	2	Pm5	0	1	Pl5	0
Occasional, evenly spaced vertical	Ps6	0	4	Pm6	0	4	Pl6	1
Fill of	Ps10	2	5	Pm10	5	2	Pl10	0
Total		7	14		9	13		15

vertical or oblique). However, a number of pits function more as fill between the other elements of composition and are therefore given the suffix 10 in the analysis: Scattered small pits used as fill are therefore termed Ps10 (e.g. on IGx3517, which has three small pits surrounded by oblique furrows). Several of the identified pit ornaments occur infrequently in the assemblage and cannot therefore be included in the chronological studies (Table 2). It should be noted that Ps, the group of small pits, is found twice as frequently on the jars as on the handled vessels. Conversely, large pits are twice as common on the handled vessels as on the jars. Even though the overall assemblage is of limited size, this difference represents a chronologically determined division, as will be made clear below.

A number of other characteristic ornamental elements are included in the analysis: rosettes, horizontal bands with oblique notches, lugs, knobs, etc.

The pottery analysis is based on the ornamentation represented by the individual bundles. Consequently, no attempt has been made to identify or distinguish vessel groups possessing uniform ornamentation. Instead, each vessel is characterised by a combination of decorative elements in the form of various bundles, rows and stamps. On the vessel from grave EU mentioned above, the ornamentation can therefore be described by the presence of the following variables: horizontal and vertical bundles of furrows together with rosettes. The vessel also has three fully encircling horizontal furrows placed above the aforementioned bundles. This decorative element can thereby be considered as a fourth variable. It should be pointed out that a bundle consists of at least two furrows or similar. In addition to its orientation (vertical, horizontal or oblique), the ornamentation can be classified according to the technique employed. There are lines and furrows of various widths. In this study, the furrows are classified as narrow (at least 2 mm wide) and broad (more than 8 mm wide) (Nielsen 2000, p. 23). The combinations of techniques and orientations are illustrated in Table 3.

Table 3. Combination of technique and orientation with respect to the ornamented handled vessels and jars. The predominant composition implies that other ornamentation is limited to a few pits, furrows and so on. In both the main composition and the bundles, there must be a minimum of two lines or furrows.

Description	Lines	Narrow furrows	Broad furrows
Horizontal main composition with	S1	Sf1	Bf1
Vertical main composition with	S2	Sf2	Bf2
Horizontal bundle of	S3	Sf3	Bf3
Vertical bundle of	S4	Sf4	Bf4
Oblique bundle of	S5	Sf5	Bf5
Occasional, evenly spaced vertical	S6	Sf6	Bf6
Several vertical upper bands of	S7	Sf7	Bf7
Curves with	S8	Sf8	Bf8
Crosses with	S9	Sf9	Bf9

Rosettes constitute a widespread decorative element in the Sejlflod cemetery and occur most frequently on the jars. The rosettes can be divided into two groups: Rosette group A is characterised by a concentric sequence of stick stabs/impressions surrounding a slight circular depression or impression (e.g. ZZx2684). Rosette group B is characterised by a distinct circular depression surrounded by small- or medium-sized finger pits (e.g. EUx3011) (Figure 8).

A horizontal band of closely spaced oblique notches is evident on 10 of the handled vessels. On half of these, this band is positioned on a beaded moulding, giving the vessel a plastic expression. A few vessels have a horizontal, fully encircling band containing small closely spaced pits that can possibly

be considered as a variation of the aforementioned oblique-notch pattern.

Yet another characteristic decorative element should be highlighted, that is, the so-called ring pits. These occur only rarely on the handled vessels (four examples), but are more common on the jars. Other elements comprise bulges, knobs and lugs, but these will be dealt with in more detail in the section on the jars. The distribution of these characteristic decorative elements is far from randomly distributed between the handled vessels and jars: 60% of the jars are characterised by at least one of them, while the corresponding proportion for handled vessels is only 20% (Table 4).

On several of the handled vessels, the handle is flanked by a decorative element and the handle itself may also be ornamented. In other cases, a field of ornamentation is evident on the side of the vessel directly opposite the handle such that it is divided up into two symmetrical semicircles. This is the case for EUx3011, where a rosette flanked by two small vertical furrows is evident on the opposite side to the handle (Figure 8).

The selected decorative elements are all weighted equally in the analyses. This means, for example, that the presence of several bundles of horizontal furrows is ascribed the same significance as an element that only occurs infrequently on the vessel. In theory, there is, therefore, a risk that a vessel on which the ornamentation has an unequivocal 'horizontal expression' will be characterised in the analysis by several vertical elements. In order to avoid this situation, the overall ornamental impression of each vessel has been studied. On the basis of a general and subjective examination, the vessels have been divided up into those with, respectively, a horizontal, a vertical and an oblique composition, as well as examples with an alternating vertical/horizontal pattern. A residual group decorated with complex patterns that cannot be assigned within this system have been grouped under the category 'abstract composition' (e.g. Cx133).

It is evident from this examination of the selected decorative elements that individual vessels can be described on the basis of the presence and combination of one or more elements. The previously mentioned handled vessel EUx3011 can, therefore, be described by the following six variables: Sf3, Sf4, Sf7, rosette B, horizontal/vertical composition with opposing handle ornamentation. The splitting up of the vessel's components into variables means that similarities and differences between the various vessels can be demonstrated using multivariate analysis. As the presence of several of the decorative elements is dependent on vessel type, handled vessels and jars must be analysed separately.

Table 4. Distribution of ornament types on the various vessel types.

Total vessels	135	156	19	310
Ornamentation	Jars	Handled vessels	Other/ unknown	Total
S1	0	0	0	0
S2	0	0	0	0
S3	10	19	2	31
S4	1	8	1	10
S5	18	12	2	32
S6	2	0	0	2
S7	7	4	1	12
S8	0	1	0	1
S9	0	1	0	1
Line ornamentation	21	24	4	49
Percentage	15.6%	15.4%	21.1%	15.8%
Sf1	2	6	2	10
Sf2	7	7	1	15
Sf3	36	41	4	81
Sf4	73	82	6	161
Sf5	29	26	3	58
Sf6	7	5	1	13
Sf7	51	37	3	91
Sf8	9	1	0	10
Sf9	0	1	0	1
Narrow furrows	113	131	14	258
Percentage	83.7%	84.0%	73.7%	83.2%
Bf1	2	0	1	3
Bf2	11	8	1	20
Bf3	3	4	0	7
Bf4	40	34	5	79
Bf5	3	1	0	4
Bf6	7	8	1	16
Bf7	5	0	1	6
Bf8	1	0	0	1
Bf9	0	0	0	0
Broad furrows	67	55	8	130
Percentage	49.6%	35.3%	42.1%	41.9%
Band of oblique notches (moulded)	11	5	2	18
Band of oblique notches	10	5	1	16
Ring pits	11	4	1	16
Rosette A	7	3	0	10
Rosette B	12	7	0	19
Bulges	10	2	1	13
Vertical moulding	25	8	4	37
Lugs	5	0	1	6
Decorative elements	81	32	10	123
Percentage	60.0%	20.5%	52.6%	39.7%

Ornamented handled vessels

In the detailed analyses use was made of CA, employing the computer programme CAPCA version 3.0, which was developed by Torsten Madsen for Excel (see www.archaeoinfo.dk). Insofar as the material can be arranged in a chronologically determined seriation, the plot of the results of the analysis will have the form of a parabola. A number of requirements with respect to the analytical method must, however, be met. A seriation is based on the combination of several elements. Consequently, a vessel on which only a single ornamental element is present, or a variable that only occurs in a single case, does not contribute to the analysis. Only decorative elements/variables that appear on more than one handled vessel can be included in the analysis. Correspondingly, vessels possessing less than two variables are similarly excluded. This means that eight handled vessels had to be omitted from the CA. Four vessels are not included because their description, photo and drawing do not match up in the catalogue (HSx3124, IPx3505, ZEx5692 and ZGx2792).

A few variables have similarly been omitted from the analysis as they appear to skew the plot resulting from the CA. This could be due to the decorative element not fulfilling the requirement for continuity, whereby an element is introduced, becomes common and then is ultimately phased out from the assemblage. This is seen, for example, in the case of ornamented handles, a variable that is evident on one in three handles and appears to be predominantly associated with the later handled vessels. This element is not, however, limited to a narrow time frame. Accordingly, variable Sf1, and bands with oblique notches, have been excluded from the analysis. Horizontal furrows occur as the main composition (Sf1) on only six handled vessels and this element does not appear to be chronologically determined. A horizontal band with oblique notches is evident on 10 handled vessels and is similarly impossible to link to a particular period. A series of variables had also to be omitted from the analysis as they only occur infrequently on the handled vessels (fewer than two occurrences): S8, S9, Sf8, Sf9, Bf5.

Ultimately, the CA of the ornamented handled vessels comprised 143 vessels and 32 variables, and the resulting plot is shown in Figure 9 (see also the sorted matrix in Appendix A). Both the objects (graves) and the variables (decorative elements) form a relatively convincing parabola, indicating that the composition of the decorative elements is chronologically determined and that the material can be seriated. Close to the zero point on the plot is handled vessel x387 from grave Y. This vessel is

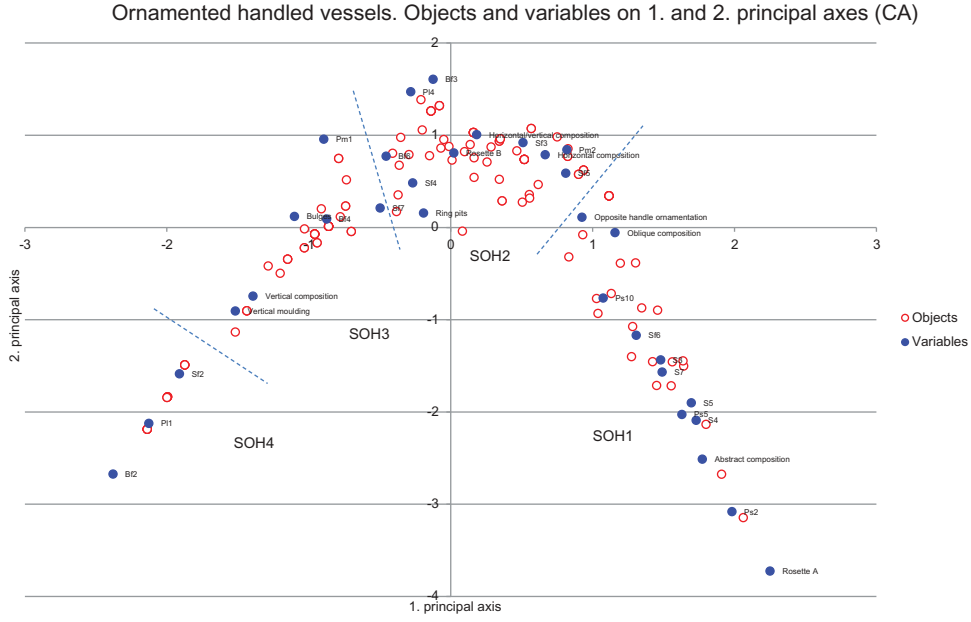

Figure 9. The chronological division of the ornamented handled vessels based on a plot of the first and second principal axes of the correspondence analysis. *N*: 143 vessels and 32 variables. The phases are shown separated by dotted lines. The sorted matrix is represented in Appendix A.

positioned between the two limbs of the parabola because its combination of decorative elements is unique and does not concur with that of the other vessels in the assemblage. Vessel x387 is characterised accordingly by bundles of horizontal lines (S3) and bundles of broad vertical furrows (Bf4), that is, elements that are characteristic of, respectively, the right and left limbs of the parabola.

On the basis of the CA, the handled vessels can be assigned to one of four phases, which in the following will be termed SOH1-4 (i.e. Sejlflod, ornamented handled vessels phases 1–4).

Jars

Unlike the ornamented handled vessels, the jars can be divided up into two clearly distinct form groups. A diagram showing the height and neck diameter of the jars (Figure 10) clearly demonstrates that the material can be divided, respectively, into narrow- and wide-necked jars. The narrow-necked jars (NNJ) have a neck diameter of c. 8–9 cm, irrespective of vessel height, while the wide-necked jars (WNJ) are characterised by a proportional relationship between vessel height and neck diameter. This bipartite division of the form of the jars was also highlighted in Ringtved's studies of the Sejlflod cemetery, with the NNJ being assigned to the Late Roman Iron Age and the WNJ to the Early Germanic Iron Age (1988, p. 119ff).

As already stated, the degree of ornamentation and, in particular, the variation in the decorative elements is greatest on the jars. As a starting point, the chronological analysis of the jars was based on a CA of the aforementioned decorative elements, with the exception of the elements that can exclusively be linked to the handled vessels (e.g. handle ornamentation). The analysis also included the variable WNJ. In a few cases, the jars are unornamented (DP, IA and AAU), or have very unusual ornamentation (U and PC). A total of 131 jars and 38 variables were included in the analysis.

A plot of the first and second axes of the CA is shown in Figure 11. On the basis of this, the jars can be assigned to one of six phases (see also the sorted matrix in Appendix B). With a small number of exceptions, all the jars assigned to the three earliest phases are narrow-necked, while wide-necked examples appear in the three latest phases. This does not represent a replacement of one form by the other, as NNJ continued in use throughout the entire lifetime of the cemetery. A further common factor evident in the earliest three jar phases is the use of line ornamentation.

Phasing of the Sejlflod cemetery

In the above analyses, the ornamented handled vessels were assigned to four phases (SOH1-4), while the jars were assigned six phases (SJ1-6). In order to

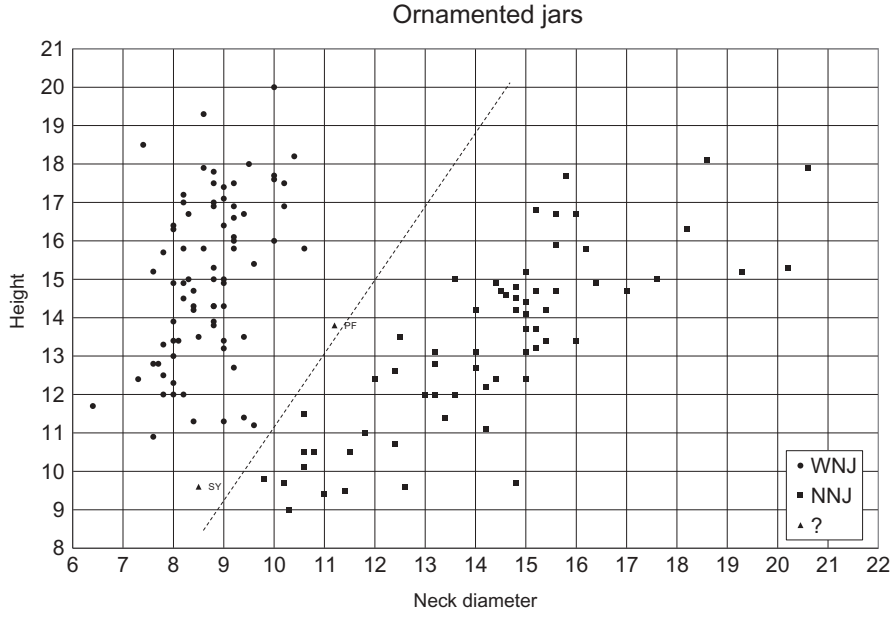

Figure 10. Division of jars into, respectively, narrow-necked (NNJ) and wide-necked (WNJ) examples. *N*: 143 jars, on which both the height and neck diameter can be measured.

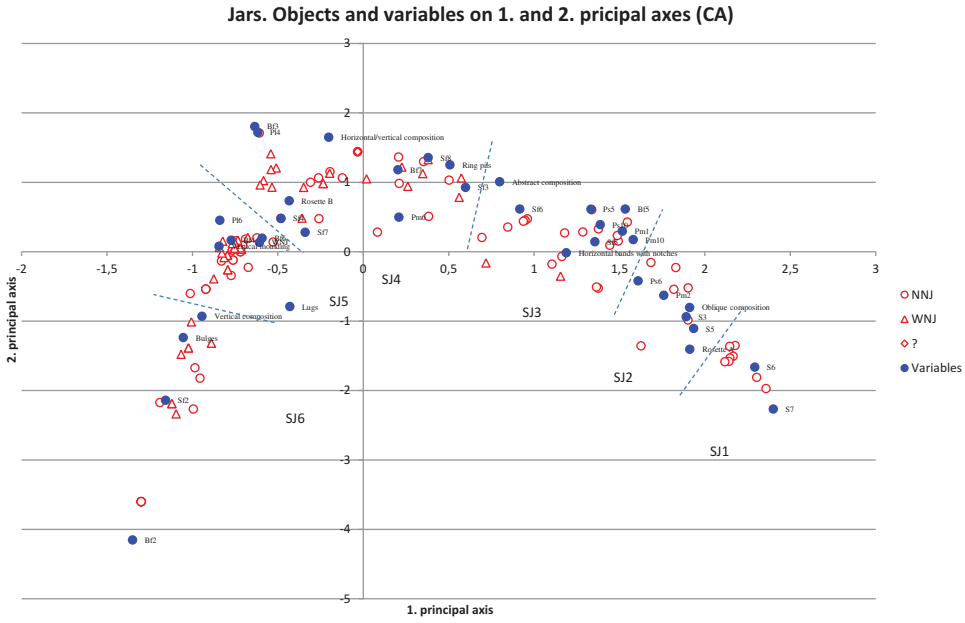

Figure 11. The chronological division of the jars from the Sejlflod cemetery based on a plot of the first and second principal axes of the correspondence analysis. The dotted line shows the chosen phasing for the material. *N*: 131 vessels and 37 variables. The sorted matrix is presented in Appendix B.

juxtapose these various phases, all the vessels that can be ascribed to the same phase will, in the following analysis, be considered as a single object. This object will thereby contain all the variables present and phase SJ1 will, accordingly, contain four occurrences of rosette type A, four occurrences of horizontal bunches of stripes (S3) etc. (see Table 5). It is then possible to carry out a CA of all the variables and the 10 pottery phases. This method means that variables such as WNJ and opposing handle ornamentation can be included in the final analysis, despite the fact that they are form specific. The analysis was based on 289 vessels, and the plot of the first and second axes of the CA is shown in Figure 12. As can be seen from the plot and the associated sums of the variable numbers (Table 6), the material can be grouped into four phases, with a further division perhaps being possible within phase 1.

Phase 1 is characterised by variables on the right limb of the parabola and contains pottery phases SJ1, SJ2, SJ3 and SOH1. Among the variables, line ornamentation in particular should be highlighted. Virtually, all the pottery vessels from Sejlflod with line ornamentation can be assigned to this phase. Another characteristic comprises rosettes with stick stabs/impressions (rosette type A) as well as an oblique main composition. The latter composition does, however, also appear in the subsequent phase. As for pits, mostly small pits are present on the vessels. Narrow furrows are not uncommon and occur most frequently in the form of oblique bundles. Based on the jars, a subdivision into, respectively, early, middle and late phase 1 may be possible. Horizontal bundles of narrow furrows (Sf3), in particular, appear to be a late feature. With the exception of those from graves K and ZZ, all the jars are narrow-necked. Opposing handle ornamentation occurs on about one in four ornamented handled vessels. A total of 33 jars and 26 ornamented handled vessels can be assigned to phase 1.

Phase 2 is made up of SJ4 and SOH2 at the middle of the parabola. Narrow furrows in particular characterise this phase, in the form of oblique, horizontal and vertical bundles. The predominant composition consists of horizontal bundles interrupted by vertical bundles. Of 58 vessels with this horizontal/vertical composition, 55 can be assigned to phase 2. A horizontal composition is similarly common. Broad furrows are not absent from phase 2 pottery vessels, but they always occur in combination with narrow furrows. Rosette type A is replaced by rosette type B, which then continues into phase 3. The majority of vessels with ring pits can be ascribed to phase 2. In the jars, an equal distribution is seen between narrow- and wide-necked examples. A total of 35 jars

Table 5. Relation between the identified pottery phases (SJ1-6) and (SOH1-4), cf. Figure 12.

	S7	S6	Rosette A	S5	Ps2	S4	S3	Oblique composition	Ps6	Ps5	Pm10	Sf6	Pm2	Sf5	Bf5	Ps10	Horizontal band with notches	Abstract composition	Opposite handle ornamentation	Horizontal composition	Sf3	Horizontal/ vertical composition
SJ1	6	1	4	6	0	0	3	7	1	0	0	0	1	3	0	0	1	0	0	0	0	0
SJ2	1	1	0	5	0	0	3	4	0	1	1	0	0	3	0	2	1	0	0	0	2	0
SOH1	3	0	2	12	3	7	16	13	0	2	3	4	0	9	0	1	0	4	9	2	3	3
SJ3	0	0	3	6	0	1	5	10	3	1	1	5	1	17	3	1	3	4	0	3	13	0
SOH2	0	0	0	0	0	0	2	7	0	0	2	1	2	17	1	1	0	0	16	20	39	32
SJ4	0	0	0	0	0	0	0	0	0	1	0	2	0	6	0	2	3	5	0	1	20	24
SJ5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SOH3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SJ6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SOH4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	10	2	9	29	3	8	29	41	4	5	7	12	4	55	4	7	8	13	25	26	77	59
1. axis	2.16	2.15	1.87	1.82	1.79	1.72	1.68	1.54	1.52	1.35	1.34	1.15	1.12	1.04	1.04	1.04	1.00	0.93	0.92	0.61	0.55	0.32
2. axis	−2.55	−2.54	−1.86	−1.66	−1.46	−1.32	−1.29	−1.03	−1.05	−0.75	−0.53	−0.28	−0.17	−0.03	0.11	−0.20	−0.25	−0.03	0.38	1.00	0.91	1.24

	Bf3	Bf7	Pl4	Sf8	Ring pits	Pm6	Rosette B	Sf4	Sf7	Bf6	WNJ	Bf4	Pl6	Vertical moulding	Bulges	Vertical composition	Sf2	Pl1	Bf2	Vessels		1. axis	2. axis
SJ1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8		2.01	−2.16
SJ2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6	59	1.63	−1.25
SOH1	0	0	0	0	0	0	0	6	1	0	0	0	0	0	0	0	0	0	0	26		1.52	−0.98
SJ3	0	1	0	1	2	1	1	4	8	0	2	0	0	0	0	0	0	0	0	19		1.04	−0.22
SOH2	4	0	7	1	2	0	6	41	16	5	0	7	0	0	0	2	0	0	0	63	98	0.37	0.95
SJ4	3	4	3	8	8	2	5	24	12	2	18	7	1	4	1	4	0	0	0	35		0.00	0.90
SJ5	0	0	0	0	0	1	6	42	28	5	27	33	3	20	7	44	0	0	0	45	85	−0.88	0.17
SOH3	0	0	1	0	2	0	1	32	20	3	0	25	1	6	2	38	3	1	0	40		−0.91	0.02
SJ6	0	0	0	0	0	0	0	0	2	0	8	0	0	2	3	18	7	0	11	18	32	−1.63	−2.07
SOH4	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	14	4	3	7	14		−1.85	−2.74
Total	7	5	11	10	14	4	19	150	87	15	55	72	5	34	13	120	14	4	18	274			
1. axis	0.25	0.24	0.18	0.16	0.08	0.05	−0.19	−0.29	−0.41	−0.42	−0.75	−0.81	−0.84	−1.05	−1.17	−1.26	−1.82	−1.91	−2.03				
2. axis	1.39	1.01	1.27	1.18	0.93	0.65	0.86	0.60	0.42	0.74	0.10	0.40	0.42	−0.11	−0.47	−0.77	−2.70	−3.05	−3.47				

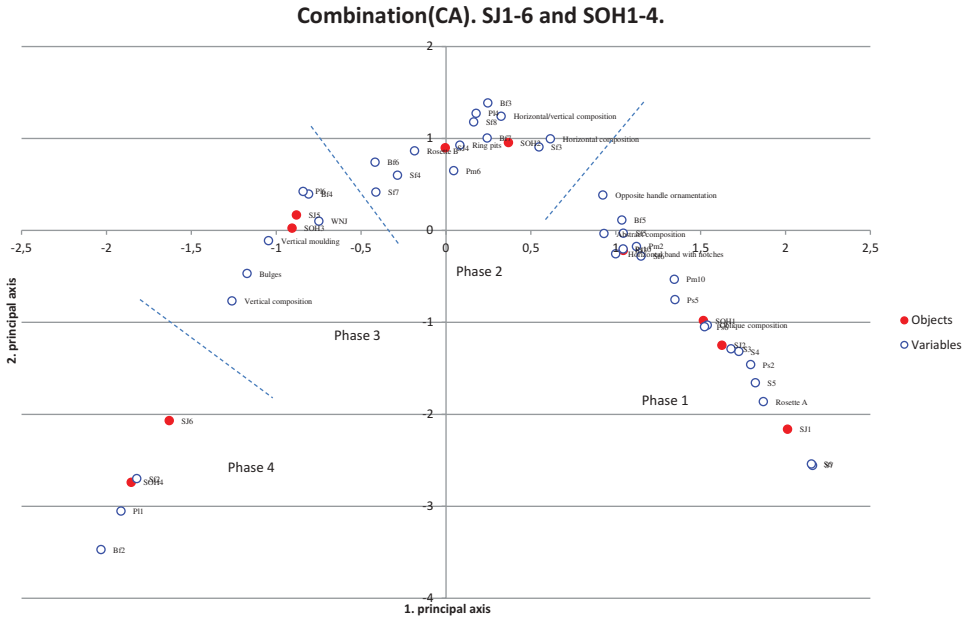

Figure 12. Plot of the correspondence analysis for the 10 identified pottery phases, SJ1-6 and SOH1-4, and division into four phases marked with dotted lines.

and 63 ornamented handled vessels can be ascribed to this phase.

Phase 3 is clearly distinct from phase 2 on the plot and comprises SJ5 and SOH3, with a total of 81 vessels. In phase 3, a marked shift is seen in the orientation of the ornamentation. Where this was previously oblique, horizontal or combined with vertical bundles, it is now exclusively vertical. The ornamentation consists of bundles of narrow and broad furrows, often in combination. A number of vessels from phase 3 are characterised by lugs or bulges which, together with the furrows, give the vessel a plastic expression. One in three vessels is narrow-necked, while the remainder are wide-necked. A total of 45 jars and 40 ornamented handled vessels can be assigned to phase 3.

Phase 4 comprises SJ6 and SOH4. All vessels have a general vertical composition and are characterised by the decorative elements only occasionally being combined with other elements on the same vessel. As a consequence, a main composition in the form of vertical narrow or broad furrows is characteristic of this phase. The vertical ornamentation is only rarely supplemented by lugs, bulges or large pits. In the jars, an equal distribution of narrow- and wide-necked vessels is evident. A total of 18 jars and 14 ornamented handled vessels can be assigned to phase 4.

Synchronisation of the phases

The analyses presented above have dated the individual vessels. However, the graves often contain more than one vessel, and in order to arrive at a date for an individual grave, it is necessary to synchronise the phasing of the jars and handled vessels. The analyses have resulted in 271 vessels from 186 graves being related to a phase. A third of all the graves at Sejlflod cannot be related to a phase on the basis of the elements identified in the pottery. A total of 107 graves contain only one phase-related vessel, while 79 contain at least two. Graves AQ, EK, SY and AAH each contain three phase-related vessels, while double grave ZF contains four.

More than half of the graves containing at least two vessels are characterised by these vessels not having the same dating frame, that is, they are not assigned to the same phase. For example, a typologically early jar may occur in combination with a typologically late handled vessel. In the great majority of cases, the inconsistency is slight, in the sense that the vessels belong to two contiguous phases, that is, one directly follows the other. Accordingly, 12 graves are characterised by containing vessels ascribed to, respectively, phases 1 and 2. Of these, nine have a combination of a handled vessel from phase 2 with a jar assigned to SJ3, that is, the latest part of phase 1. Included in these is one of the sets in

Table 6. The general phasing of the pottery at the Sejlflod cemetery, cf. Figure 12.

	Rosette							Oblique composition												Horizontal band with notches			Abstract composition	Opposite handle ornamentation	Horizontal composition			
	S7	S6	A	S5	Ps2	S4	S3		Bf3	Bf7	Pl4	Sf8	Ring pits	Ps6	Ps5	Pm6	Pm10	Sf6	Rosette B	Pm2	Sf4	Sf5	Bf5	Ps10	Bf6	WNJ	Bf4	Pl6	Vertical moulding	Bulges	Vertical composition	Sf2	Pl1	Bf2	Vessels	Sf3
Phase 1	10	2	9	29	3	8	27	34	0	1	0	1	2	4	4	1	5	9	1	2	11	32	3	4	0	2	0	0	0	0	0	0	0	0	59	18
Phase 2	0	0	0	0	0	0	1	7	7	4	10	9	9	0	1	1	2	11		2	66	27	1	3	6	18	14	1	4	1	6	0	0	0	98	59
Phase 3	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	1	0	7		0	70	47	1	0	7	27	56	4	26	8	78	3	1	0	85	0
Phase 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	2	0	0	0	8	0	0	4	3	32	11	3	18	32	0
Total	10	2	9	29	3	8	28	41	7	5	11	10	13	4	5	3	7	19		4	147	85	4	7	13	55	70	5	34	12	116	14	4	18		

	Horizontal/ vertical composition	Bf3	Bf7	Pl4	Sf8	Ring pits	Ps6	Ps5	Pm6	Pm10	Rosette B	Sf6	Pm2	Sf4	Sf5	Bf5	Ps10	Bf6	WNJ	Bf4	Pl6	Vertical moulding	Bulges	Vertical composition	Sf2	Pl1	Bf2	Vessels
Phase 1	3	0	1	0	1	2	4	4	1	5	1	9	2	11	32	3	4	0	2	0	0	0	0	0	0	0	0	59
Phase 2	55	7	4	10	9	9	0	1	1	2	11	3	2	66	23	1	3	6	18	14	1	4	1	6	0	0	0	98
Phase 3	0	0	0	1	0	2	0	0	1	0	7	0	0	70	47	7	0	7	27	56	4	26	8	78	3	1	0	85
Phase 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	8	0	0	4	3	32	11	3	18	32
Total	58	7	5	11	10	13	4	5	3	7	19	12	4	147	85	13	7	13	55	70	5	34	12	116	14	4	18	

double grave ZF; the other set is assigned to phase 4. The nine graves can possibly be ascribed to a chronological transitional phase between phases 1 and 2 (C, O, AF, IK, NT, UZ, ZL, AEA and one of the burials in ZF). Similarly, 13 graves, which contain both phase 2 and phase 3 vessels, can possibly be interpreted as representing a chronological interim phase (Figure 13 and 14).

However, there are 13 graves in which the combination of vessels does not support the phasing presented above. This is true in particular of grave P, where a jar from phase 1 occurs with a handled vessel from phase 4. Eight graves combine vessels from phase 2 with vessels from phase 4 (DE, DY, EU, HK, IN, IS, OY and ZF) and four graves contain vessels from both phase 1 and phase 3 (Q, BE, SQ and SR).

Graves Q, SQ, SR and ZF very probably represent the burials of two individuals who ended up in the same grave, but not at the same time, that is, there was a temporal displacement. Grave Q was found to contain two combs and two knives, and the positions of these suggest a double grave, even though its two vessels stand close together at the eastern end. It has already been suggested that grave ZF is a double grave, and the six vessels at the grave's eastern end can immediately be interpreted as two complete vessel sets. However, the relative positions of the vessels apparently reflect a more complicated pattern: The handled vessel from phase 2 is placed beside the jar from phase 4, while the jar from transitional phase 1/2 is located beside the late handled vessel. This must mean that the vessels became mixed up in connection with the later second burial. The fibulas in the grave were found together and correspond to the burial in pottery phase 1/2. Grave SQ contains skeletal remains from two individuals, and the early handled vessel is located in the southwest corner, while the later jar and an associated unornamented handled vessel are located in the northeast corner of the grave. In the southwest corner of nearby grave SR, there is a jar with ornamentation identical to that on the jar in grave SQ, while an early handled vessel is placed at the opposite end of the grave. The two ornamented handled vessels in SQ and SR are remarkably similar, and the graves can be interpreted as two burials in pottery phase 2 that were augmented by two

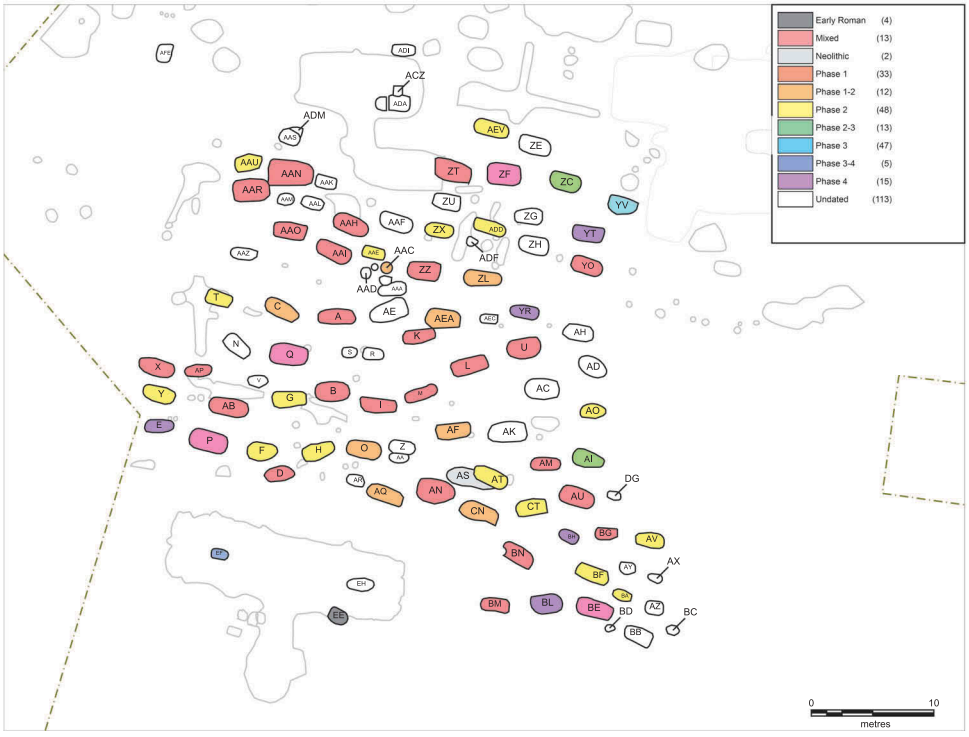

Figure 13. Dating of the graves in grave group 1 (for colour image please see online article).

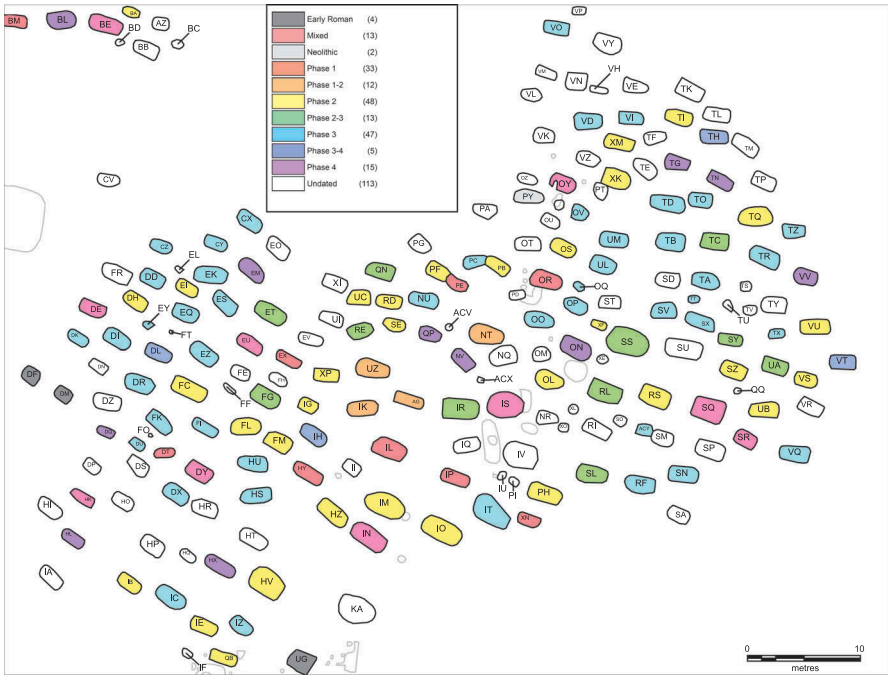

Figure 14. Dating of the graves in grave group 2 (for colour image please see online article).

burials in pottery phase 4. In both cases, the later second burial is characterised by a jar, and it is striking that the two earlier burials do not include a vessel of this type (i.e. a jar). It is first as a result of the later second burial that the vessel sets in the two graves become complete.

A characteristic of the graves outlined here is that the ornamented handled vessels are earlier than the associated jars. Only in graves P and Q, and the disturbed grave IS, is the opposite true. In graves DY, HK and OY, the handled vessels show clear evidence of wear and should perhaps be considered as heirlooms. In graves DY and HK, the later jar is placed in the west end of the grave, while the ornamented handled vessel is placed in the east end, that is, the same pattern as seen in graves SQ and SR. The chronological discrepancy between ornamented handled vessels and jars in graves P, BE, DE and IN cannot be immediately explained. As is apparent from the above, the integrity of graves is, in several cases, either open to discussion or can be directly refuted. Other finds from the Sejlflod cemetery also bear witness to complex burial rituals, which complicate chronological studies. For example, sherds originating from the same vessel were found in both graves EI/EK and graves FI/FK. Whereas graves FI and FK are both assigned to phase 3, grave EI dates to phase 2 and grave EK to phase 3. The probable explanation is that the graves have been disturbed (see below).

The limited synchronisation of the phases probably reflects actual temporal distance between the individual vessels in the graves. The vessels used as grave goods were not specifically manufactured for the purpose, but were for everyday use. This is evident, for example, from the burnt food crust seen adhering to some unornamented handled vessels, for example, BMx572 and SXx26698; the latter shows furthermore heavy wear on its base. An unornamented handled vessel, SYx2347, lacks its handle and the break has been smoothed and polished. This shows that the handle had broken off before the vessel was placed in the grave. Two handled vessels, HIx3108 and VQx2445, originally had two handles but in each case one of them is missing. It was perhaps broken off before the vessel was placed in the grave in order for it to conform to the usual type for this purpose. On other vessels the rim has been smoothed and polished, possibly following a break (EX, OV and QN). This feature should probably be interpreted as showing that personal association played a far greater role than, for example, the vessel's appearance. A very striking demonstration of the fact that these were vessels, which had been used is that several of them have been repaired. Flaking or actual minor breaks at the rim that have been repaired with clay or, more frequently, a mixture of animal and vegetable fat, are yet another feature reflecting personal affiliation (Jysk Teknologisk Institut 1983–1986).

Dating of the pottery phases

In the following, other date-conferring artefacts, primarily fibulas, will be related to the pottery phases and viewed in the light of Ringtved (1988) and Rau's (2010) chronological analyses. In his chronological analysis, Rau divides the costume components into four costume component zones (*trachtbestandteilzonen*) (Rau 2010, p. 78, 104; Figures. 38.1and 38.2). These zones are then related to the established chronological phasing of the Late Roman Iron Age and Early Germanic Iron Age presented by U. Lund Hansen (1987). All the phases have graves in which only fragments of fibulas, often knobs, are preserved. In these cases, identification to type is not possible.

Pottery phase 1

In fibula phase 1, the following fibula types are present: bronze fibulas of types Almgren group VII series 2 and 3, Gudumholm fibulas, Haraldsted fibulas and sheet silver fibulas. Six graves contain fibulas and fibula fragments. In grave U, fibulas x2003 and x2006 are identified typologically as Almgren group VII series 2 or 3 or as Gudumholm fibulas. There is a striking similarity to x355 from grave AB. There are also two sheet bronze fibulas in grave U. These have a rhombic foot and, respectively, a rectangular and a semicircular head plate. Grave AB was found to contain two crossbow fibulas (x355 and x448). Ringtved identifies x448 as being an Almgren group VII series 3 tending towards a Gudumholm fibula and she does not attempt to identify x355 (1988, p. 136). Rau defines x355 as a Haraldsted fibula A and x448 as a Mackeprang III 3 (possibly 2) (2010, p. 48). Even though they are identified to different types, the two fibulas are very similar to one another in type and form. As they were found in the same grave, they must in principle also be considered to be coeval. Grave AE contained three bronze fibulas: x2012 is an Almgren group VII series 2 and the same could be true of x481, but in typological terms, the latter should perhaps be termed a

Gudumholm fibula. The third bronze fibula, x480, cannot be identified to type due to its poor state of preservation. The grave also contained two sheet silver fibulas, both with a rhombic foot and a semi-circular head plate. As previously stated, the pottery vessels in AE are rather special and are therefore not included in the vessel analyses. The oblique line ornamentation on handled bowl x476 does, however, point unequivocally towards pottery phase 1.

Grave A contains a glass that has been identified as E. Straume's type IA (1987, p. 28). The glass is dated by both Rau and Straume to TZ1 (*Trachtbestandteilzone 1*) or the end of C2b and the beginning of C3a (Rau 2010, p. 73).

On the basis of the pottery vessels, Ringtved dates two of the graves in pottery phase 1 to phase b while 17 graves are assigned to phase c (1988, p. 210). Rau dates the following graves from pottery phase 1 to TZ1: A, I, K, AB and AE (2010, p. 73).

To sum up, there are a few graves from the end of C2b, but most of the graves from pottery phase 1 must be dated to C3a.

The nine graves from a possible 'transitional phase' between pottery phases 1 and 2 contain a small number of fragmented, date-conferring artefacts, but grave C is different. It contains at least two fibulas, found at opposite ends of the grave. One is a rosette fibula, which is so fragmented that its form cannot be determined, but it has decorative knobs of a kind that are also seen on a rosette fibula from Gammel Hasseris (Ringtved 1988, Figure 39a; Skjødt 2009). The other cannot be identified to type. There is possibly a silver-sheet fibula in grave NT, but its form and type cannot be determined.

Ringtved has dated the vessels in six graves from pottery phases 1/2 to her phase c (1988, p. 210). On the basis of a ceramic imitation of a glass beaker, Rau dates grave O to TZ1 or the end of C2b and some way into C3a (2010, p. 73). The same date applies to the belt buckle found in grave AF (Rau 2010, p. 73). A belt buckle in grave UZ is dated by Rau to TZ2, that is, C3b (2010, p. 75).

Pottery phase 2

Seventeen graves in pottery phase 2 contain fibulas, with Haraldsted, Nydam, sheet silver and cruciform types being represented. Grave H contained a fragmented Gudumholm fibula (cf. Ringtved 1988, p. 188, Figure 34). Bronze fibula x2991 from grave ZX is also related to the Gudumholm fibulas, for example, x445 in grave AK or the Haraldsted fibula x2050 in grave FC, and should be considered as an interim form between these two types. It is, however, most closely related to bronze fibula x2605 in grave AAE. A further bronze fibula, x2604, was found in grave AAE, but this is too poorly preserved for it to be identified to type. The Haraldsted fibula x2050 found in grave FC was identified to type by Ringtved (1988, p. 138, Figure 34). This grave also contained silver knobs from a possible sheet silver fibula. In grave FL, Haraldsted fibula x1276 was found together with three Nydam fibulas, x1273, x1278 and x2160. These were identified to type by Ringtved (1988, p. 138, Figure 34). Grave XF contained an exquisite Haraldsted fibula, x2527. In addition to Nydam fibulas in grave FL, this type also occurs in grave FM, where it must be ascribed to the Funen variants (Jensen 1980, p. 192).

Possible cruciform fibulas were found in six graves, but only three are well enough preserved to permit further analysis. The fibula from grave FM is linked stylistically and functionally to the Nydam fibulas and other early cruciform fibulas due to its round knobs and spiral construction. The two cruciform fibulas from graves DH and XM are, on the other hand, later in form, being characterised by flat knobs on the head plate and lugs mounted below the bow.

Ringtved dates 24 graves from pottery phase 2 to her phase c, a further seven graves to phase d and three graves to phase c/d (1988, p. 210). Rau dates two of the graves from pottery phase 2 (ZX and AAE) to TZ1, that is, the end of C2b and C3a (2010, p. 74), six graves to TZ2, that is, C3b (H, AT, FC, FL, IM and XF) and three graves to TZ3, that is, D1 (DH, FM and XM) (2010, p. 74f).

Pottery phase 2 must be dated to C3a/C3b, as there are both earlier fibula types and a few graves containing cruciform fibulas that are probably later than the remainder of the group.

Thirteen graves are either from pottery phase 2 or 3. Ringtved has identified x3852 from grave IR as a Gudumholm fibula (1988, p. 136, Figure 32f.). This fibula is of silver and is related to the Haraldsted fibulas. A difference is though evident in the metal, as well as the form of the bow and the spiral construction. The profiled silver knobs from grave IR

could derive from one or more silver fibulas. The grave also contains a glass which has been identified by Straume to type IV, giving a dating to TZ2 (Ringtved 1991, p. 51; Rau 2010, p. 76). Grave SS contains a belt buckle with an animal head that can be compared stylistically to the foot seen on cruciform fibulas, for example, those in graves TO and AER. Rau dates three graves on the basis of a glass, fibula and belt buckle to C3b (FG, IR and QN) and one grave on the basis of the animal head to D1 (SS) (2010, p. 74f.).

Pottery phase 3

Ten graves from phase 3 contain fibulas. These predominantly comprise cruciform fibulas – 15 examples from seven graves – but there are also Nydam and sheet silver examples. The cruciform fibulas show great variation.

The latest dated fibulas at Sejlflod, x1409 and x1412, are from grave OO. Two sheet silver fibulas are unusual in form: x1413 has a rectangular head plate, a short bow with possible indications of an animal border below the bow and a slightly elongated and weakly trilobate foot. It also has stamped geometric ornamentation; x1411 is an equal-armed sheet silver fibula with stamped ornamentation and gilding. This fibula is an intermediary between *Stützarmfibeln mit Trapezfuss* (*Niedersächsischer Typ*) and *Gleicharmige Kerbscnittfibeln* and is slightly earlier than a *vorform* for the latter from Seraing. It must be dated somewhere in the close vicinity of AD 400 (Böhme 1974, p. 10ff, 299, and pers. comm.).

This fibula type is known primarily from the Elbe-Weser area, and this was presumably the original home of the woman buried in the grave. A similar fibula was found in a grave at Præstestien, Esbjerg.[1] The glass beads suspended on small rings of silver wire, found in grave OO, also show features characteristic of Northwest Europe (Ringtved 1991, p. 57).

The earliest cruciform fibula in this phase is x4581 from grave OP because it has round knobs on its, not particularly, large head plate. Stylistically and chronologically, the fibula is close to the Nydam and Haraldsted fibulas, as well as the cruciform fibula found in grave FM. The next developmental step in the cruciform fibulas is represented by x4434 in grave OP, x1058, x1070 and x1071 in grave DI, x1293 in grave IZ, x2313 in grave TO and x871 in grave DD. The similarity between them lies in the knobs, which are most often polygonal or flat. Several of them have an ornamented field on the bow and/or a degenerate animal border directly beneath the bow. The foot ends in a very marked animal head. Other members of this group include two fibulas from grave IZ (x1282 and x3601). They can be assigned typologically to the group of cruciform fibulas due to the end and side knobs on the head plate, but their technical execution, ornamentation on the head plate, the form of the bow, the animal border and the characteristic trilobate foot link them to the sheet metal fibulas. They are, therefore, interesting in that they link together fibula types that are otherwise perceived as being separate. This middle group of cruciform fibulas covers a long-time span and must be compared in style and execution to the Sösdala and Nydam styles. Pottery phase 3 has some of the latest cruciform fibulas: x1457, x1458 and x7759 from grave TR. Common to all of these is a hollow foot, which is either flared or spade shaped. The latest fibula group must be assigned to early style I.

Grave DI was found to contain a beautiful sheet silver fibula, x1065, with a rectangular head plate, short bow, trilobate foot and with an animal border below the bow. The head plate has two four-legged animals which turn their heads towards each another. They are bearded and on their backs saddles can be seen indicated by triangular ornamentation. Dotted edge ornamentation can be perceived around the two animal figures. The ornamentation of the sheet silver fibula is assigned to the Sösdala style and the grave is dated to the earliest part of the Migration period (Nielsen *et al.* 1985) and thereby to phase D1.

Ringtved has dated 23 graves from pottery phase 3. Of these, 18 are assigned to phase d on the basis of the vessels and/or the fibulas (1988, p. 210). Two graves are placed in phase c, while three are assigned to her phase c/d. Six graves from pottery phase 3 are, based on his dating of fibulas and belt fittings, assigned to Rau's TZ3, that is, D1 (graves CX, CY, DD, ES, OP and TO), while three graves are dated to TZ4, that is, D2a, on the basis of the fibulas (graves DI, IZ and TR) (2010, p. 74f).

The predominance of cruciform fibulas, the few Nydam fibulas, the imported equal-armed sheet

silver fibula and the sheet silver fibula in Sösdala style indicate a dating for pottery phase 3 to C3b and D1 – the earliest part of the Early Germanic Iron Age.

Pottery phase 4

In pottery phase 4 there are fragments of fibulas in only four graves (BL, HX, NV and ON). In the case of two graves (HX and OM), these probably represent knobs from cruciform fibulas and, in grave NV, the silver knobs from a sheet silver fibula. Ringtved has dated seven graves from this group: four to phase c and three to phase d (1988, p. 210). There is, therefore, some uncertainty about the absolute dating of pottery phase 4, but a presumed relative dating to D1, extending into the subsequent D2, seems likely.

Conclusion

The phasing based on the pottery vessels concurs well with developments seen in fibulas in the Late Roman and Early Germanic Iron Age. In relation to Ringtved's work, this paper represents an expansion of her findings in that many more graves in the cemetery can now be dated. There are, however, small chronological inconsistencies between the pottery phases presented here and Rau's results. This could in part be due to the fact that Rau analysed a smaller number of graves than examined in this analysis and that a few graves must be considered as being mixed and, consequently, they lack an unequivocal date.

It is important that a typological–chronological development can now be seen in the cruciform fibulas – this was previously difficult – and that this type apparently occurs as early as the Late Roman Iron Age (Brinch Madsen 1975, Reichstein 1975) (Figure 15).

The structure of the cemetery

There is a widespread perception that the cemeteries of the Iron Age developed stratigraphically in a horizontal direction (e.g. Hjemsted, Enderupskov – see below). This situation was also expected at Sejlflod (Ringtved 1988, p. 121, 158, 165, 1991, p. 59, Nielsen 1991, p. 117). However, the distribution of graves from the four phases demonstrates that this was clearly not the case. On the contrary, the cemetery almost has the form of a chronological patchwork.

Some general trends are, however, evident in the distribution of the phases:

Grave group 1: Graves from phase 1 (25 graves) and phase 2 (16 graves), which lie, respectively, centrally and to the north and south of the centre, are predominant. There is a slight tendency towards the formation of small groups. There is only one grave from phase 3, but five peripherally located graves from phase 4. The 'missing' graves from phase 3 are perhaps due to some of the undated graves actually belonging to this phase or the fact that graves were primarily located in grave group 2 during this phase.

Grave group 2: There are eight graves from phase 1 in the central part. Graves from phase 2 are more

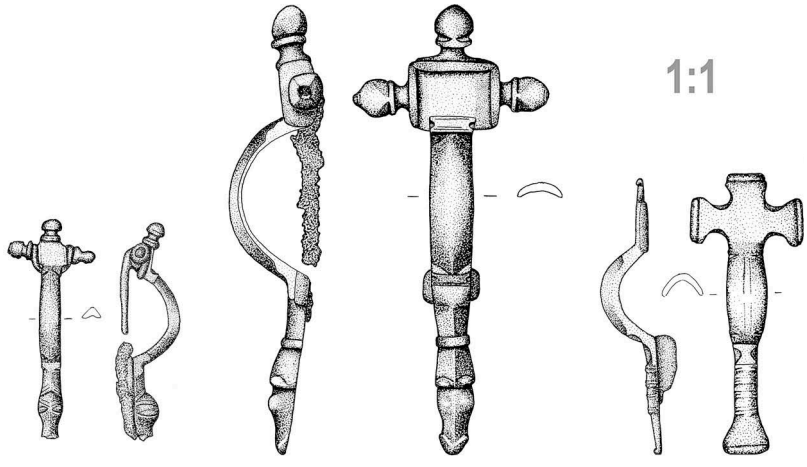

Figure 15. The typological development of the cruciform fibulas at Sejlflod. From the left, x1248 (FM), x2313 (TO) and x1458 (TR).

Table 7. Dating of pottery phases 1–4 in relation to fibula types.

Pottery phase 1 C2b-C3a	Pottery phase 2 C3a-C3b	Pottery phase 3 C3b-D1	Pottery phase 4 D1-D2?
Almgren gr. VII ser. 2–3			
Gudumholm fibula	Gudumholm fibula		
Haraldsted fibula	Haraldsted fibula		
Sheet silver fibula	Sheet silver fibula	Sheet silver fibula	Sheet silver fibula
	Nydam fibula	Nydam fibula	
	Cruciform fibula	Cruciform fibula	Cruciform fibula

frequent (32 graves), and most of these are located centrally, together with the graves from phase 1. The 46 graves from phase 3 and 10 graves from phase 4 lie primarily to the east and west of the central part: Graves from phases 2 and 3 show a tendency to form small groups.

The occurrence of phase 1 graves in grave group 2 shows that this group was established while grave group 1 was still in use. This could, as previously suggested, be due to a lack of space in grave group 1. However, as there are also graves from phases 2, 3 and 4 present, this cannot be the case (Nielsen 1982, 1991, p. 117). The two grave groups were, therefore, in use at the same time, although differences are evident in their centres of gravity.

The first graves lie centrally in grave group 1, midway between three sunken-floored longhouses from the Early Roman Iron Age. They include graves A and I, which Ringtved dates to the end of phase b (Ringtved 1988, p. 139, 158). It is, therefore, likely that the cemetery was founded at the end of the third century AD, corresponding to C2b (see Table 7).

In both grave groups, the earliest graves lie in association with one or two other graves, with a grave-free zone around them (graves R, S and IL).

The distribution of graves from the four phases, and the presence of graves from both phase 1 and phase 4 in the same area, suggest that the cemetery developed concurrently in several areas.

General guidelines

Developments in the various areas of the cemetery took place, to a great degree, according to some general overarching guidelines. They respected house sites and graves from the Early Roman Iron Age and wells from the Early Iron Age, as well as geological phenomena (Nielsen and Rasmussen 1986, p. 20; Nielsen 2000, p. 13). The burial practices are characterised by uniformity, for example, marker stones/stone grave markers, respect for earlier graves, use of oak for wooden coffins, charring of the planks, marking of demographic and social equality and differences (Malmros 1989–1991). The extensive evidence of care for the dead should also be mentioned: Hay has been found on the floor of coffins as well as skin/hide and cloth/textile (a blanket?) under and over the deceased. Grave DY, in particular, showed a clear stratigraphy, with hay at the base, followed by skin/hide with the hair-side uppermost, textile, body traces and then textile again. A similar situation was observed in other graves, including DZ, HS and DI. Skin/hide was recognised in 19 graves. A wooden bucket in grave AT was found to contain woollen threads (x567). This, and the impressions of textiles found on artefacts not generally associated with clothing (e.g. scissors and knife (x3144, x3148) in grave HS, a spear (x2261) in grave TK and an arrowhead (x2359) in grave TZ), suggest that a blanket or similar was laid over the deceased. Skin/hide on artefacts in graves AT, IM and HS indicate that this was used to cover the deceased in these graves.

This systematic approach is also pronounced in the case of the pottery vessels, for example, the types involved and the frequent present of a complete set of vessels, which almost always stands in the eastern end of the grave.

These general guidelines are highlighted by the fact that, in the case of 196 graves, a disturbance was recorded – as a rule at the western end of the grave (cf. Lind 1991, p. 203ff). The presence of artefacts in these disturbances suggests that robbery was not the intention. As these disturbed graves are also found evenly distributed across the cemetery, they are interpreted as an indication of a symbolic act connected with abandonment of the cemetery. Evidence suggesting similar collective, symbolic

closure is also seen at other cemeteries: At Øster Tørslev, 12 graves were covered by a continuous layer of flint blocks,[2] and the small cemetery at Nørreknold was sealed by a layer of clay.[3] The disturbances left the graves with open pits, a conclusion supported by the discovery of ground beetles in a soil sample (Noe-Nygaard 1981). In the deepest part of the disturbance in 33 of the graves, alternating water-lain layers of fine sand/soil and gravel, 1–2 cm in thickness and with a total depth of up to 35 cm, were observed. With the exception of ZF and AEV, these graves are located in the southeastern part of grave group 2, where the ground surface had a slight slope. The graves also show a large chronological spread, so the phenomenon did not result from a special burial custom practised during a particular period.

These water-lain layers support the conclusion that all the disturbances took place at the same time. The layers are probably the result of water flowing down the slope during heavy rainfall, where it was caught by the open pits (Figure 16).

These general guidelines could, however, be deviated from. For example, a number of children and three adults, including a male–female pair, were buried in the settlement area (graves AEQ, AER and AQY) (Nielsen 1991, p. 116ff, 2000, p. 6, 13f). Separate male–female burials also occur elsewhere and do not appear to be conditioned by low social status (Brinch Madsen 1975, Ethelberg 1990, p.104). They probably reveal that these relationships had a special status in society. The complete set of pottery vessels in grave AQY demonstrates that, apart from the location, the general guidelines for burials were followed here.

Clusters

It seemed that, given the great degree of uniformity evident in the burial practices, there must be a structure inherent in the burials. The key to the cemetery's structure, and thereby an understanding of its development, appears to be differences in the relative position and orientation of the graves. Largely on this basis, a number of clusters were identified that are presumed to have developed concurrently (Figure 17).

Grave group 1 (Figure 18) is divided into six clusters: Cluster 12 on the basis of graves with an unusually high density and cluster 13 to some degree because it makes use of the space between two house sites from the Early Roman Iron Age. Both clusters are separated from centrally located cluster 14 by grave-free areas to the east and west. Grave-free zones perhaps reflect the existence of paths between the graves, something that must be considered as almost essential if the cemetery consisted of independent clusters. The lack of overlaps, marker stones and so on, also shows that existing graves were respected, and it seems unlikely that people walked in over the graves. The other clusters were also identified on the basis of grave-free areas running east–west, although these are narrower than the northernmost examples and, therefore, less certain. Grave group 2 (Figure 19) also has grave-free areas. Some of these take the form of tongues that extend in between the graves from the periphery, or of actual discrete areas within the site (e.g. at EO and PA). Finally, there are – often leading off from the aforementioned areas with no graves – in several places narrow belts indicating the existence of paths, as was the case in grave group 1. A total of 11 clusters have been identified in grave group 2. With respect to clusters 6 and 11, account has been taken of the fact that these comprise relatively large, deep and well-furnished graves. Exceptionally, there is thought to be a path here within the clusters.

It is striking that in the clusters in both grave groups there is often a single grave, usually located

Figure 16. Grave NT showing disturbance and possible marker stones. Photo: Jens N. Nielsen.

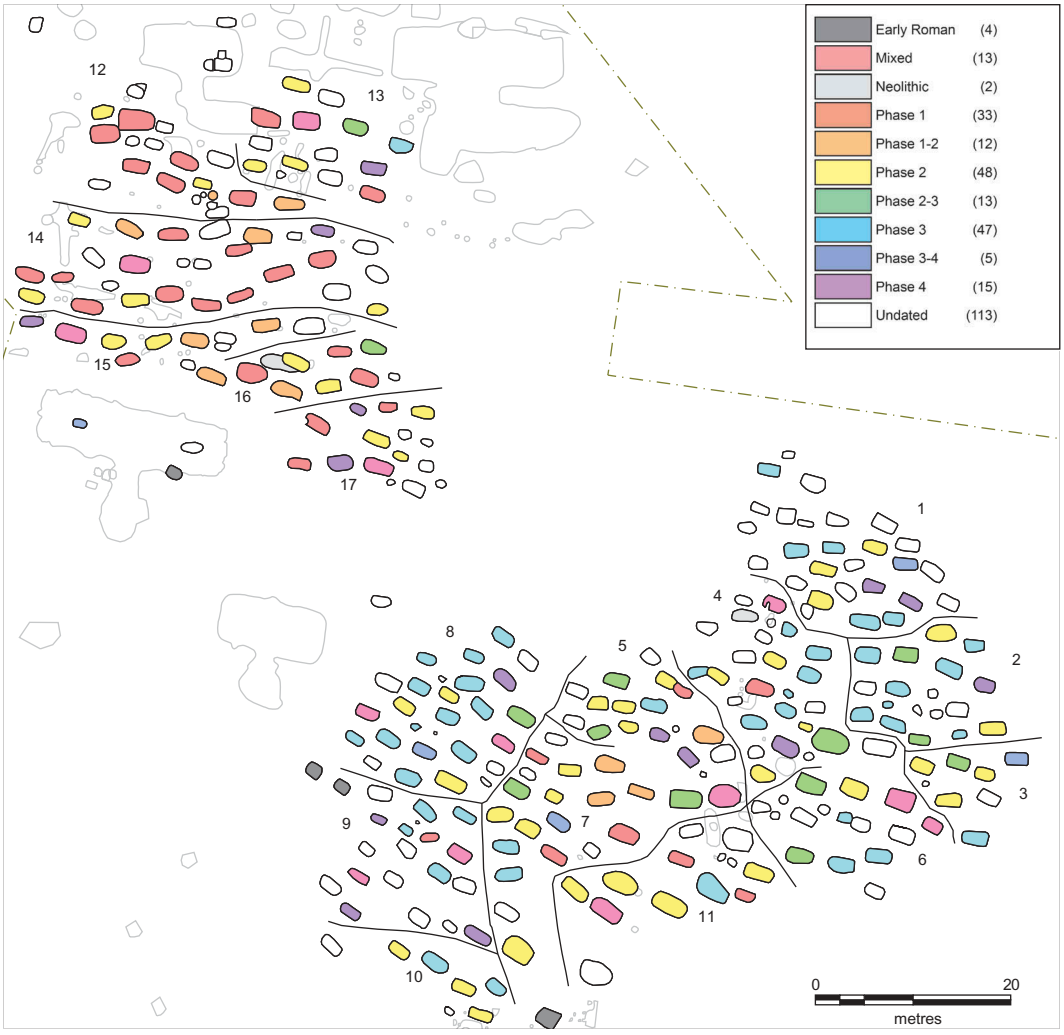

Figure 17. Plan of the cemetery at Sejlflod with dated graves and marking of clusters (for color image please see online article).

peripherally, with a grave-free area around it (e.g. graves S/R, T, BM, DP(?), IA, IK, KA, PA, SA, UM (?), VK, VO, VQ, ZL, AAZ; S/R are child graves, while the others are all graves of adults). This situation does not appear to be determined by gender or social class. Could it be the founder of the cluster who is marked in this way (Ethelberg 1990, p. 111)?

The graves are largely oriented east–west, but a closer analysis reveals the existence of some distinct groups (Figure 20). This analysis is based primarily on the orientation of the coffin, which sometimes deviates significantly from that of the actual grave (e.g. graves AI, FM, HP, HX, IG, PH). Due to considerable uncertainty with respect to their orientation, some graves have been omitted from the analysis (e.g. AT, DY, ET, IR, TK).

Graves oriented directly east–west are few in number and are evenly distributed, though with only a single example in the westernmost part of grave group 2. Graves in which the western end deviates to the south are found in particular in the central part of grave group 1, but are otherwise distributed across the cemetery. There is a certain coincidence with the earliest graves in grave group 1. It is also worthy of note that there are two graves in the central, and early, part of grave group 2, including grave IK. Most of the graves with a deviation to the south are of early date, but there are some exceptions (e.g. E, HS, PC).

Graves in which the western end deviates to the north are gathered together in groups. Deviations of 0–10° are found primarily in grave group 1 and in the eastern part of grave group 2. Deviations of 10–20 and 20–30° are fairly evenly distributed across the entire cemetery. Graves with a deviation of 30–45° are found in particular in the western part

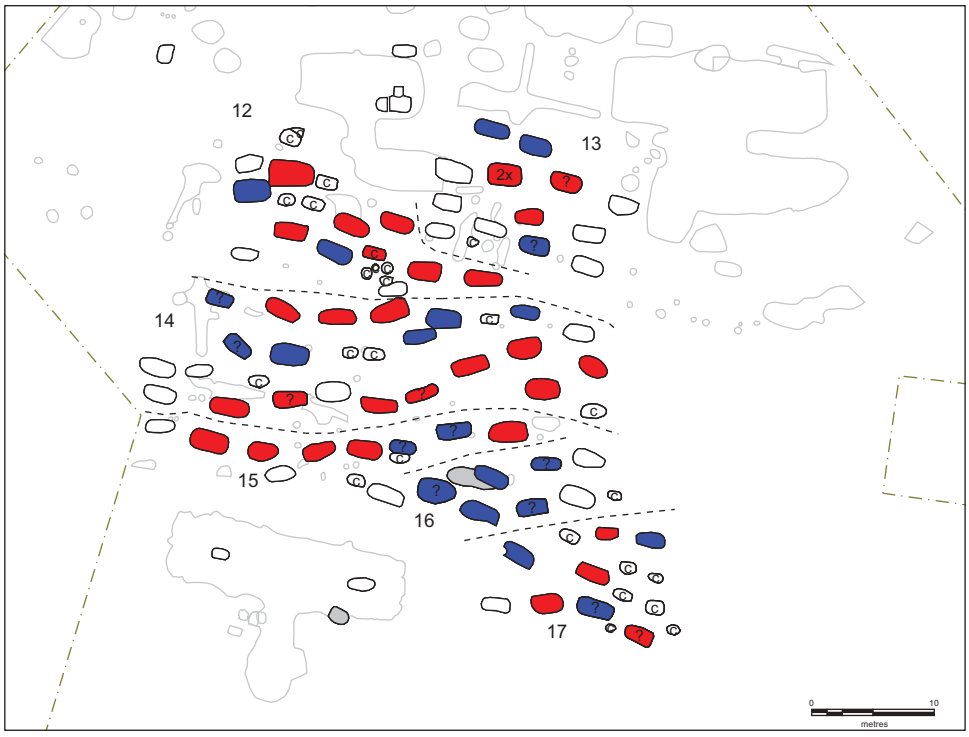

Figure 18. Plan of grave group 1 showing gender, child graves and marking of clusters. Red = female, blue = male, c = child, ? = uncertain identification (for color image please see online article). Earlier graves are shown in grey.

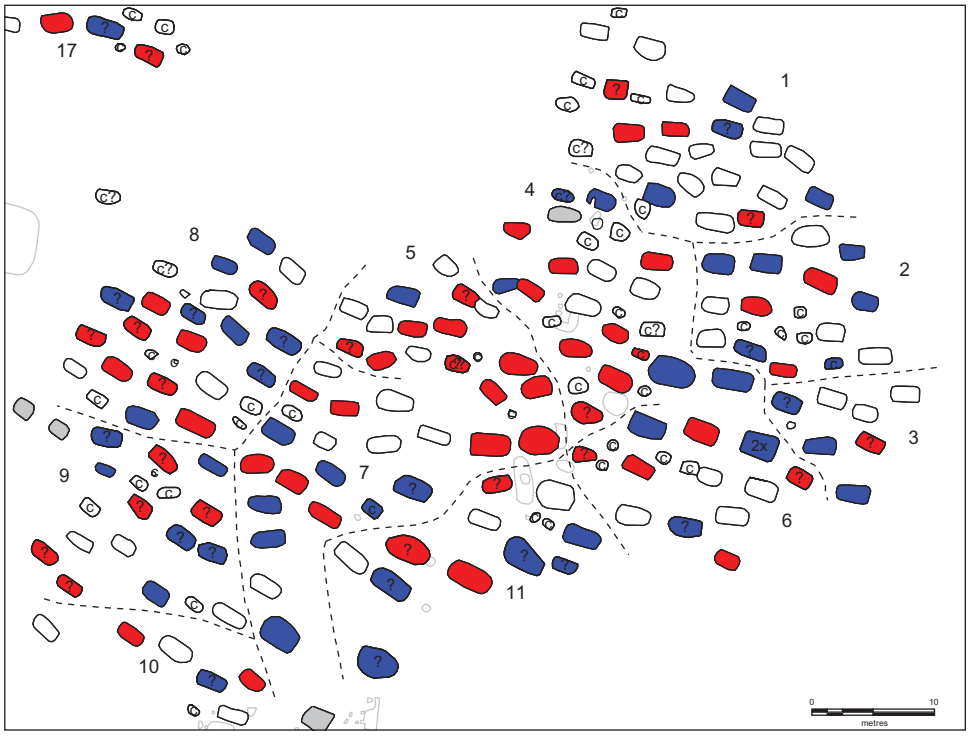

Figure 19. Plan of grave group 2 showing gender, child graves and marking of clusters. Red = female, blue = male, c = child, ? = uncertain identification (for color image please see online article). Earlier graves are shown in grey.

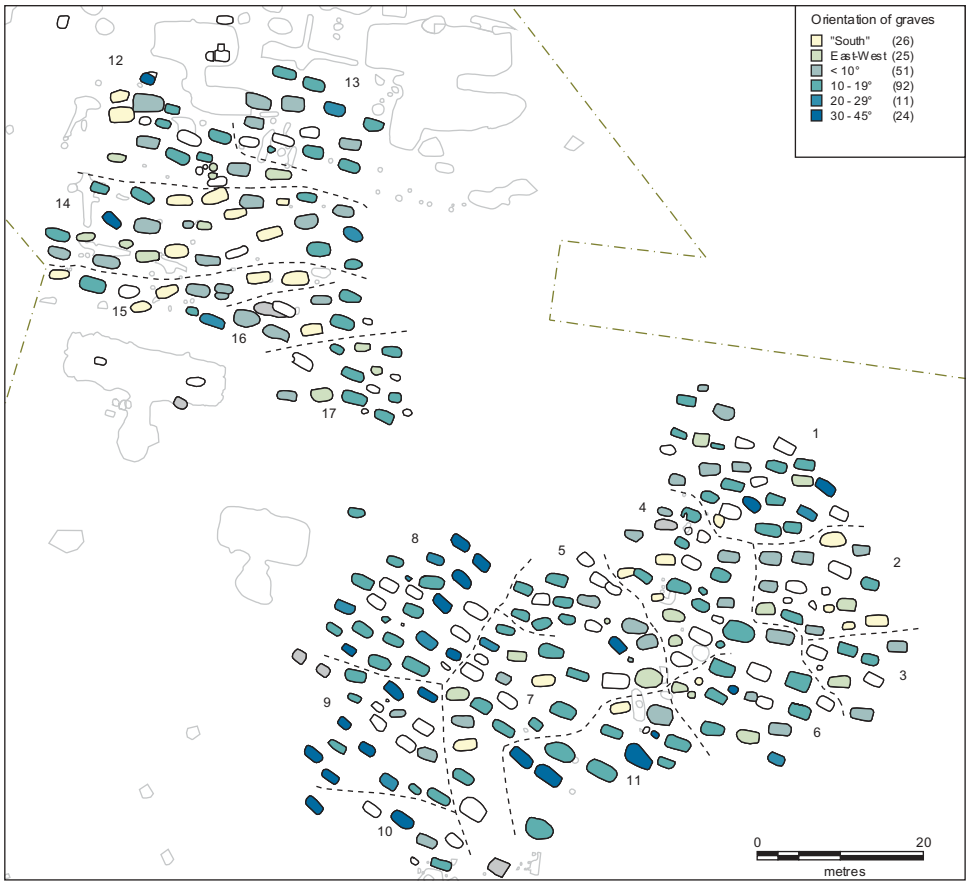

Figure 20. Plan of the cemetery showing the orientation of graves (coffin). Graves where the orientation is uncertain are not included (for colour image please see online article). Earlier graves are shown in grey.

of grave group 2. With one single exception, they occur only in phase 3 and 4 (grave HZ in phase 2; CX, ES, FK, IC in phase 3; EM, HC, NV in phase 4).

The graves are more or less evenly distributed by orientation across the entire cemetery which, together with a tendency for graves of the same orientation to be grouped together, tends to some degree to confirm the clusters that have been recognised. Herschend has pointed out that the orientation of the graves is probably chronologically determined (2009, p. 121).

Seen in relation to the number of graves, the cemetery's period of use and the structure of Iron Age society, it is assumed that the clusters represent the burial areas of specific families or farms. But is this conclusion consistent with the demographic and social structure of the cemetery?

In grave group 1, there are no female graves in cluster 16. Therefore, unless the non-gender-determined graves are those of women, this cluster should perhaps be amalgamated with cluster 15. All other clusters in the cemetery include the graves of men, women and children.

The distribution of the graves according to gender and age does not, therefore, contradict the identified clusters and their interpretation as family burial grounds.

An analysis of the size of the graves can give an indication of the social status of those interred. In this analysis, the depth of the graves is used rather than their length, because the depth was not – like length – dependent on the age of the deceased, but primarily on other factors (Figure 21).

The majority of graves are 10-–69 cm deep, while 46 graves exceed 70 cm in depth. Graves of different depths occur across the entire cemetery, but reasonably clear groups are evident, especially in grave group 2. This is also true of the deep graves which are, as a rule, well furnished (Ringtved 1988, p. 153ff, 1991, p. 59ff; Nielsen 2000).

Graves greater than 90 cm in depth form a small group around grave G in grave group 1. Other

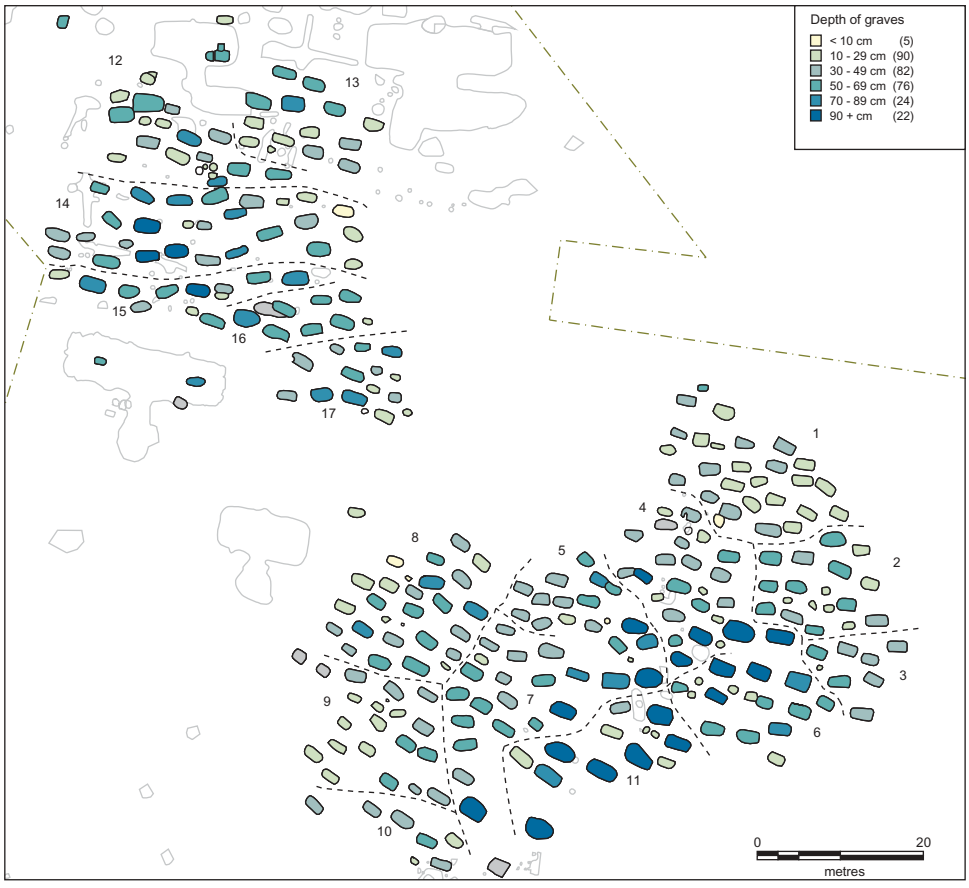

Figure 21. Plan of the cemetery showing the depth of graves (for colour image please see online article). Earlier graves are shown in grey.

graves in this area are also relatively deep (70–90 cm: graves A, C, K, M). A striking feature of grave group 2 is a zone of large, deep graves in its southern part (clusters 6 and 11). Their high social status is also apparent from the glass they contain (otherwise only found in grave A).

The presence of graves of different depths and small groups of the same depth within the identified clusters can, with some degree of reservation, be taken as indicating a hierarchical range among the deceased in most of the clusters. The depth and the various grave goods included also show that there are well-furnished graves in all clusters. There is also a tendency towards social differences between clusters, with relatively well-furnished graves being evident in clusters 6, 11 and 14. This perhaps shows that particularly affluent families were buried here, who possibly were the founders of the two grave groups, representing two lineages. The spread and distribution of graves according to social criteria does, to a certain extent, support the conclusion that the cemetery consists of clusters representing individual families.

The grave goods relate to gender, age and social status, but their distribution suggests that probably other factors also played a role. Axes only occur in grave group 1. The westernmost graves in grave group 2 contain only very few distaff whorls/hooks and no miniature pots. Conversely, clasps are relatively abundant here. Clasps of form 1 (with spiral wire) occur particularly in grave group 2, where there are no clasps of form 2 (small, with a rivet). These are, on the contrary, frequent in the northwest part of grave group 2. Finally, mention should be made of the fact that clasps located at the waist and ankles only occur in cluster 10, and cluster 1 has no graves that contain a complete set of pottery vessels.

These distributions perhaps provide an indication that traditions, occupational/economic circumstances, etc. associated with the individual families

were reflected in burial practices and can, therefore, be seen as evidence in support of the identified clusters.

Summary

A number of circumstances demonstrate that the graves were established and positioned according to some general, overarching guidelines, but also that these guidelines were, in some cases, deviated from. A horizontal stratigraphic development of the cemetery is not evident. Perhaps the two grave groups represent two lineages, as possibly expressed by the clusters of particularly well-furnished graves. On the basis of the structure of the cemetery and the orientation of the graves, a number of coeval clusters can be identified. These are assumed to represent families, and social differences can be traced between them. The identified clusters should not be considered as an absolute and certain result. The essential point is that the two grave groups are made of clusters of graves. To some degree, demographic and social circumstances support the definition of these clusters. There is a suggestion of paths running between and within the clusters, and isolated graves perhaps represent a founder – the first person interred in a cluster. The first graves occupy a central position in grave group 1, and shortly afterwards, early graves are established (phase 1) in both grave groups, around one or two graves surrounded by a grave-free zone. The abolition of the cemetery was probably marked by symbolic 'destruction' of all the graves.

From Early to Late Roman Iron Age

About 20 graves were found dating from the Early Roman Iron Age. These were found in two elongated areas: area A to the northwest and area B to the southeast. Undated graves could also date from the Early Roman Iron Age, for example, a small group of cremation graves to the east.

The graves of this period are clearly dissociated spatially from the settlement of the time. The graves lie scattered within areas A and B – either singly or in small groups (Figure 22).

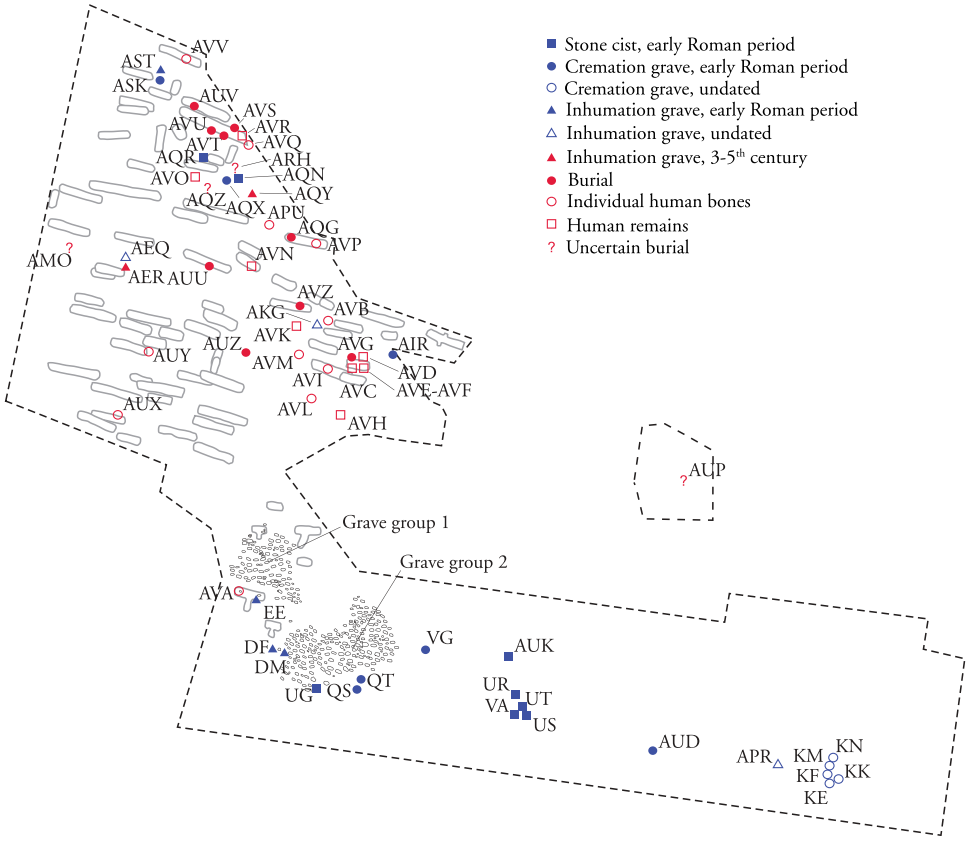

Figure 22. Plan of graves from the Early Roman Iron Age.

Burial practices were markedly different in the Early Roman Iron Age. The graves here comprise eight stone cist graves, four inhumation graves and seven cremation graves.

The stone cist graves show internal differences with respect to size and construction. Anthropological analyses of the bones and gender-specific artefacts show that men, women and children were interred here. Social differences are also apparent.

Scattered bones from several individuals in the grave fill and outside the graves bear witness to the fact that these graves were reused several times. This is true, for example, of graves UR and AST, which are special in having a small pit at their base containing the bones of several individuals: Uppermost stands a pottery vessel. These pits are interpreted as showing that a small number of bones from corpses removed from the grave were reburied. So there was still care of the dead, presumably because it was the same family that reused the grave.

The graves were – given the markers, obvious reuse, pits, etc. – probably an integrated part of village life. The two grave areas (A and B) were perhaps established next to two access roads leading into the village in order to signal that here lay the boundary to the actual village area. Or were they perhaps a consequence of two lineages marking their rights to land? The link between roads and graves has been seen in several other instances, for example, at Hjemsted (Ethelberg 1990, p. 10, 23, 99f; Thrane 2013).

The number of single graves and graves forming small groups corresponds approximately to the number of farmsteads in the village. It, therefore, seems likely that they represent burials of people from the individual farms. Perhaps they are the graves of the farms' leading figures who, in this way, marked their membership of the community. The well-furnished grave UR could represent the leader of the village.

With the establishment of grave groups 1 and 2 in the Late Roman Iron Age, both burial and building practices changed significantly. This could be due to other people taking over the area, but it seems more likely that the descendants of the inhabitants in the Early Roman Iron Age continued to use the area, possibly in combination with newcomers. There is, for example, a suggestion that some of the six to nine villages on the hill dating from the Early Roman Iron Age were abandoned (Nielsen 2000, p. 18f). There are also some aspects of the burial practices that continued:

There are two grave areas in both periods. Grave area B and grave group 2 even occupy the same area, and the respecting of graves from the Early Roman Iron Age suggests that grave group 2 is a continuation of grave area B. The graves in grave group 1 also respect earlier features and structures, such as house sites from the Pre-Roman Iron Age.

Perhaps the grave groups in the two areas in the Early Roman Iron Age correspond to the clusters in grave groups 1 and 2, but with the marked difference that now all the farmstead's adult inhabitants were buried in the clusters and not, as previously, only a few representatives of the family.

Comparative analysis

Are the chronological and structural circumstances at Sejlflod a special case or do they exist at other contemporaneous cemeteries? This question is extremely difficult to answer because the conditions and premises at other cemeteries are different: It is very rare that all the graves have been excavated (e.g. Lundegårde, see Johansen 2002, p. 186). Most cemeteries comprise fewer than 20 graves and even though some, such as Hjemsted, Enderupskov and Stenderup, have significantly larger numbers, the total is still less than a hundred (Ethelberg 1986, p. 13, 62 note 2, 1990, p. 95ff; Ringtved 1988, p. 181ff). Analyses are also made difficult by the fact that almost all the other cemeteries contain several types of graves (Øster Tørslev is an exception in that its 12 graves are all inhumation graves). A diversity of grave types is seen, for example, at three cemeteries located only 6 km from Sejlflod: Lundegårde, Sønder Tranders and Postgården (Ringtved 1988, p. 151ff; Johansen 2002; Nielsen 2008). Cremation graves often dominate and they are not especially suited to the analyses employed here. Finally, it should be mentioned that earlier investigations in particular can be of inferior quality and inadequate (e.g. Donbæk[4]).

The difficulties inherent in carrying out chronological and structural analyses like those undertaken at Sejlflod will be exemplified using one of the cemeteries located in the near vicinity (Sønder

Tranders) and two of the larger cemeteries in southern Jutland.

Sønder tranders

The cemetery, which has been delimited in all directions, contains 23 inhumation graves, one urn cremation grave and four mixed graves from the Early Germanic Iron Age that contain elements of both cremation and inhumation (Christiansen 2005). The graves appear to respect earlier house sites. The pits dug to accommodate the inhumation graves differ slightly in form. One inhumation grave is oriented north–south; the others, and the mixed graves, are oriented east–west or show minor deviations from this. Anthropological analyses, gender-specific artefacts and the size of the graves show the presence of female graves, a male grave and one or two child graves. Even though only one grave has been identified as that of a man, it can be assumed that the adult graves reflect the demographic situation in the settlement.

Several, albeit uncertain, groups emerge from an examination of the relative location and orientation of the graves. These comprise seven graves to the north, aligned approximately in a row, and spaced far apart with more or less the same orientation. To the southeast are five or six graves in a row, of which at least two are female burials. In the central part, there is a group of 9 or 10 closely spaced graves and to the east and west, respectively, are two isolated graves. Those to the west are a male grave and probably a child grave. The urn cremation grave also lies in isolation (Figure 23).

The mixed graves occur in particular in the group to the north, but are also present in the group of closely spaced graves.

There are no indications that particular sections of the population lie buried in the various areas. It is possible that, as at Sejlflod, there are family burial areas. Neither the individual groups, nor the site as a whole, display the same degree of systematic burial practices as is evident at Sejlflod, and the site must represent a significantly smaller settlement and/or a shorter period of use.

Hjemsted

Ethelberg believes that small burial grounds in Ringtved's southern group represent families or lineages and larger cemeteries, for example, Enderupskov, are viewed by him as a single unit or a conglomerate of family/lineage units, that is, the same in principle as at Sejlflod.

He believes that this is particularly evident at Hjemsted, where he interprets three cemeteries from the Late Roman Iron Age (I, II and IV) as family burial grounds (1990, p. 14, 95).

Using these as a model, he identifies two further cemeteries (V and VI) in a large group of graves. These are characterised by tending towards the formation of rows running east–west. Cemeteries II, I and V continue on from one another. The same is true of cemeteries IV and VI, which are contemporaneous with cemeteries II, I and V. The cemeteries are presumed to represent two families or lineages, a conclusion that, in the case of IV and VI, is supported by grave goods showing the same social stratum. At the transition to the Early Germanic Iron Age (AD 350–400), there was a reorganisation into larger common cemeteries in which the graves lie in north-south-oriented rows (III and IV). There were, however, still family/lineage cemeteries at the beginning of the Early Germanic Iron Age, as exemplified by V and graves 9713, 9733, 9737 (Ethelberg 1990, p. 89, 108). The two cemeteries are interpreted as being independent burial grounds, representing the two lineages or families from the earlier cemeteries. It is later pointed out that the major difference between the two cemeteries could be due to the presence of burial mounds from the Early Roman Iron Age, so that this actually represents the same common cemetery, but where two families each have their own department (Ethelberg 1990, p. 95ff).

Ethelberg presumes that when the graves lie in rows, as seen in I, II, IV, V and VI, it must be possible to some extent to observe a horizontal stratigraphy, given that the cemeteries are divided up into a male and a female section. He believes that there is a clear horizontal stratigraphy at cemeteries V and VI, a less well-defined one, one at I and II and an even more diffuse example at cemetery IV. No horizontal stratigraphy is evident at cemeteries III and VII (Ethelberg 1990, p. 95f, 99, 103, 108), and this appears to conflict with the fact that Ethelberg does not believe the cemeteries were segregated according to gender.

Ringtved does not consider V and VI to be independent cemeteries, but views these grave areas as concentrations to the west and east, as well as a few

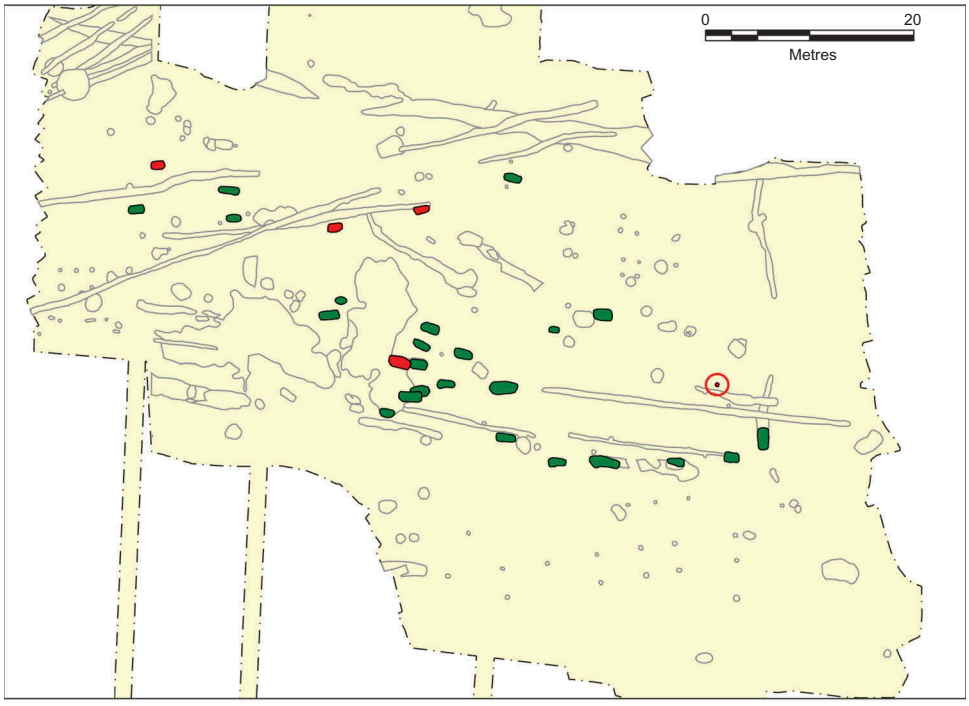

Figure 23. Plan of the cemetery at Sønder Tranders. Red = cremation burials, green = inhumation graves (for color image please see online article). Graphics: Torben Trier Christiansen.

scattered graves. She believes that the earliest graves (phase b and c) were established to the west according to gender and social status. In the Early Germanic Iron Age, when the graves were apparently more randomly positioned, graves were established towards the south and subsequently, or partly at the same time, the eastern concentration was established (Ringtved 1988, p. 189ff).

Ethelberg's identification of cemeteries V and VI, based on the arrangement of the graves in rows, as seen in I, II and IV, is problematic. It is self-contradictory to interpret III and IV as a common cemetery in which each family had its own section.

Perhaps, the rather more than 80 graves in III, V, VI and VII should be viewed as a cemetery that developed from west to east. Another possibility is that the graves to the west and east represent two family burial grounds, as possibly indicated by the orientation and spacing of the graves. Moreover, two graves to the east (118 and 295) are, according to Ringtved, from the Late Roman Iron Age, while Ethelberg dates grave 118 to the Early Germanic Iron Age (Ringtved 1988, p. 189; Ethelberg 1990, p. 88). This latter view is consistent with Ringtved's analysis.

Ethelberg's horizontal stratigraphy is often based on one or two of graves from each of the individual phases (e.g. II and VI) and must, therefore, be perceived as uncertain.

If there is a horizontal stratigraphy at (small) cemeteries, it is doubtful that the available chronological tools are sufficiently fine meshed and secure for this to be reliably demonstrated.

I consider it likely that more significant criteria operated with respect to the relative positioning of the graves, for example, male–female relationships, age, social status, status in the family/lineage and a chronological sequence.

Cemeteries I, II and IV must be seen as family burial grounds and III, V, VI and VII presumably comprise one or two of the same.

Enderupskov

Ringtved dates rather more than 60 inhumation graves to the Late Roman and Early Germanic Iron Age, and draws attention to the fact that the cemetery was probably not excavated in full (Ringtved 1988, p. 183). In the Late Roman Iron Age, she identifies a female section and a couple of male

graves to the north, as well as both a male and a female section to the south. Ethelberg does not believe this division to be real: When men and women were, as a rule, buried beside one another at Hjemsted IV, this was due to a marital relationship (Ethelberg 1990, p. 95f, 103). Ringtved believes there are some chronological tendencies, but states that the positioning of the graves appears disorganised and that it is difficult to speak of a horizontal stratigraphy. She sees no system in the location of the six graves from the Early Germanic Iron Age (Ringtved 1988, p. 183ff, 188).

Ethelberg highlights a tendency towards a clustering of the female graves. He does not believe this to be due to the cemetery being segregated according to gender, but that women of child-bearing age constituted a particularly vulnerable group. Ethelberg writes that clarification of the cemetery's structure requires more detailed analysis (1990, p. 14, 95f).

In addition to scattered single graves, there appear to be two grave clusters at Enderupskov. In both of these are graves dating from the Late Roman and Early Germanic Iron Age, containing the remains of both men and women and representing various social categories. There is, therefore, a certain similarity to the situations seen at Sejlflod and Hjemsted III and VII. Perhaps, these clusters represent two families, but the evidence base for this conclusion is fragile, not least because the site has not been excavated in full.

Conclusion

The lack of a general, overarching horizontal stratigraphy at Sejlflod is probably due to the fact that the cemetery consists of a number of contemporaneous clusters that relate to the families living in the village. Grave groups 1 and 2 possibly represent two lineages.

The graves were, to a very great extent, laid out according to a universal strategy which was, however, in some instances deviated from. The structure of the individual clusters was determined by for example male-female relationships, gender, age, social status and occupational/economic circumstances.

Even though grave and burial practices in the Early Roman Iron Age were markedly different from subsequent periods, it is considered likely that fundamentally there was continuation of the grave structure of this period.

The family unit probably also played a central role at other cemeteries, but this is as a rule difficult to demonstrate because a number of factors complicate the required analyses, as illustrated by the cemetery at Sønder Tranders.

It is thought unlikely that a horizontal stratigraphy exists at other contemporaneous cemeteries and that, even if this were the case, demonstrating this securely would be extremely problematic.

The chronology and structure of the Sejlflod cemetery reveal an exceptionally complex picture of the burials at the site. For example, the integrity of the individual grave can, in several cases, be contested or refuted. The same degree of complexity presumably also applies to other cemeteries but, as the above examples show, this is very difficult to resolve because virtually no other cemeteries have stringent, systematic burial practices or are of a size corresponding to that of Sejlflod.

Notes

1. Esbjerg Museum, archive no. 1421, grave GBS, (P. Siemen pers. comm)
2. NM protocol C 10062-80
3. ÅHM 2645
4. NM C 13705-29, C 14107-33, C 14466-503

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DISCUSSION ARTICLE

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Invitation systems and identification in Late Iron Age southern Scandinavia? The gold foil figures from a new perspective

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ABSTRACT

The ability to identify oneself has always been important, because people in all periods entered into relationships in which their role depended upon their identity. This must have been of great importance to long-distance connections in prehistory, in cases where people did not know the appearance of the foreign individuals they were to connect with. The aim of this article is to present an idea of how a system of identification may have been established. It is intended as 'food for thought' on the subject. Gold foil figures could have played a role in prehistoric invitation systems, the identification of a person's true identity and in the dependency upon magnates in southern Scandinavia during the 6th–8th centuries AD. The gold foil figures may have been tokens issued by the magnate and served as invitations to special events, at a time when there was apparently a preoccupation with organising cult activities at the elite residences and restricting places at and admission to such events. The figures did not guarantee that it was the right guests who arrived on these occasions, but presenting this type of token may have minimised the risk of allowing in impostors.

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In today's society, it is very important that people can identify themselves. This is achieved using passports, identification documents and databases, through large quantities of personal data stored in loyalty schemes in local supermarkets or criminal records, and not least via use of a person's own network, involving friends and family, who are familiar with their appearance, voice and behaviour. But our friends' friends can also identify us as individuals from photos, comments and conduct in various social media. People, who we do not actually know, can easily obtain photos and information about us online. It seems more important than ever to be able to prove who you are and what rights you have. Who are you, are you entitled to participate in referendums, receive medical assistance or be buried as a member of the state church?

This fundamental need for people to be able to identify themselves must also have been important in all periods, because during these periods, people entered into relationships in which their role depended upon their identity. This must have been of even greater importance to long-distance connections. The division between the terms local and non-local can always be debated, but here 'long-distance connections' are defined as those in which people have difficulties identifying individuals based upon their appearance, because they see them rarely or have never seen them before.

For some groups of people, connections between Jutland, Funen and Zealand in Denmark may have been regarded as 'long-distance connections'. Meanwhile, other well-travelled, or internationally oriented, groups may have had to have participated in international relations before they considered them to be 'long distance'. No matter which group a person belonged to, the 'long-distance connections' included contact with other people that they did not have the opportunity to see regularly. These were people that they were not able to identify or recognise based upon their physical characteristics, as appearance changes over time. In addition, a memory or image of a person was difficult to record in a prehistoric society.

A person's reputation, character and identity might easily have been documented in the local or regional relationships of local people, but this did not apply to long-distance relationships, where local

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people did not know the appearance of the foreign person they were going to communicate with. A magnate in the Iron Age needed confirmation of his adversary's personal identity when entering into an alliance with him, undertaking political negotiations or agreeing to a marriage involving his daughter. How did this work in prehistory? How could people at all social levels be certain that other individuals really were who they claimed to be, when dealing with strangers they had never met before?

The aim of this article is to suggest an idea of how such a system of identification may have been established using material culture. It will focus upon gold foil figures as a specific object type that may have played a role in prehistoric invitation systems, the identification of a person's true identity and not least in the dependency upon magnates. Gold foil figures are cited as an example here as these objects exhibit an appearance, distribution and function that indicate they played an important role in Late Iron Age cult activities.

Gold foil figures – a short introduction

Gold foil figures are small gold sheets featuring cut-out or stamped images (Watt 1999a, 2004, 2008; Helmbrecht 2013, p. 9). These images often depict men and women, but a few images of animals have also been identified. They are not found outside Scandinavia (Watt 1999c, p. 174; Mannering 2006). The dating of these figures is still a subject of debate, but most scholars believe that they were in use from the middle of the 6th century AD and production ceased in the 8th century (Figures 1–2) (Watt 1999a, p. 138; Axboe 2005, p. 51, Helmbrecht 2013).

It is hard to imagine that the fragile gold foil figures, with an average weight of 0.1 grams (Watt 1999b, p. 188), played an important role as a means of payment or exchange, or had any other practical function. Watt (2008, p. 52f) argues that their pictorial content involves a high degree of symbolism and that they were specially made for cult activities. At the site of Sorte Muld on Bornholm, Denmark, they are concentrated in the central part of the settlement area. Over 2480 figures were found at this site (Watt 2008, p. 43), which is the largest known concentration from any location.

A possible link between gold bracteates and the gold foil figures should be mentioned, in which the gold bracteates are regarded as the temporal and cultic predecessors of the foil figures (Axboe 2007, p. 155f). There is also no doubt that the gold foil figures emerged from the same environment and cult system as the bracteates, and the two object types have much in common. But in functional terms, there are many differences between the two groups: they are two very different artefact types with differing distribution, contexts, use and slightly different dating. The most important difference in this discussion is perhaps the 'longer life' of the bracteates and their function as pendants. Several bracteates have been repeatedly reused, as displayed by severely worn suspension loops (Axboe 2001, p. 120), in contrast with the

Figure 1. Gold foil figures from Ved Sylten and Smørenge on Bornholm. Photo: Lennart Larsen.

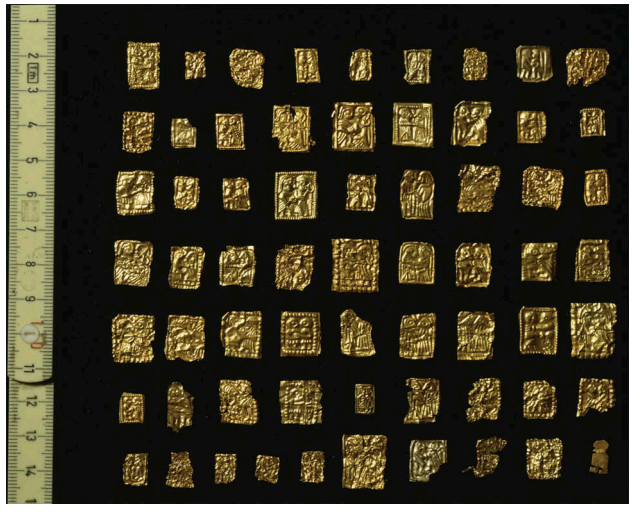

Figure 2. Gold foil figures from Lundeborg, near Gudme on Funen. Photo: Lennart Larsen.

gold foil figures, which do not show traces of wear (Helmbrecht 2013, p. 12). It has been extensively debated as to whether some of the bracteates, with their formulaic runic inscriptions, can be interpreted as loyalty gifts from kings, that enabled the issuing of invitations, the holding of feasts in honour of the gods and the establishment of friendships and alliances (see Andrén 1991; regarding this debate, see Axboe 2001, p. 123ff). This subject is far too multifaceted and complex, however, to go into detail with here. If some of the bracteates do highlight the ability of the magnates to invite people to, and to hold, religious and political feasts, it might also be tempting to view the gold foil figures as 'the successors' of the bracteates, as this would suggest a genuine Late Iron Age preoccupation with invitations (and invitation systems?) over a longer time span. It would demonstrate an interest in possessing the power or position to invite people to different feasts. It is to be hoped that future research will illuminate this area further, whilst at present, it remains the subject of interesting and intriguing speculation.

There appears to be a very clear connection between the gold foil figures and cultic activities at a number of the major Iron Age sites in southern Scandinavia. At Uppåkra in Sweden, more than 100 gold foil figures (122 in 2004) and 5 dies were recovered. Several of these were associated with a 'ceremonial building' (Helmbrecht 2013, p. 9ff). At Helgö, Sweden, 26 gold foil figures were found in the central part of the settlement (in building group 2, foundation I, which includes a building dating to the 6th–8th centuries AD). The gold foil figures were found together with two gold bracteates, a silver bowl with a Christian cross motif and a Mediterranean (possibly Coptic) bronze ladle (Lamm 2004; Jørgensen 2009, p. 334f). Building group 2 is also interpreted as having been where special or cult activities were undertaken (Jørgensen 2009, p. 335). A similar pattern is associated with some of the major sites in Denmark that have produced gold foil figures, particularly Sorte Muld on Bornholm, Gudme on Funen, where a few gold foil figures have been found, the nearby harbour area of Lundeborg, where 102 have been recovered (Michaelsen 2015, p. 175), and Toftegård on Zealand with its total of eight gold foil figures (Tornbjerg 1998, p. 227; Baastrup in prep.).

Several studies of gold foil figures have focused upon their iconographic content. Some interpretations have highlighted the gold foil figures as representing individual gods, whose names are known from later written sources (Hauck 1992, 1993, 1998), and some have also suggested that the gold foil figures depict shamans performing rituals (Back Danielsson 1999, 2007). Other researchers are more reluctant to identify the gold foil figures as representing specific gods or people (Helmbrecht 2011, p. 112ff, 2013, p. 11). The figures have also been analysed to enhance our knowledge of Iron Age clothes and gender (Watt 2003; Mannering 2004, 2006, 2008, 2012, 2013; Mannering and Andersson Strand 2008). Watt regards the figures as tangible evidence of communication between humans and gods. She states that what most religious ceremonies have in common is the desire to come into contact with the gods – perhaps to deal with an emergency, to get help or to ask for advice about the future. The 'payment' for these services could be made using the gold foil figures. Watt emphasises that the cult activities at Sorte Muld were most likely to have been controlled and performed by the local magnate (Watt 2008, p. 53).

There are many ways in which the figures can be interpreted, but whether or not they represent gods, payment or something completely different, there is little doubt that they should be seen as an important element in aspects of the cultic or ritual sphere of the Late Iron Age. They are primarily found at locations where pre-Christian cultic and ceremonial activities were performed. This is significant when discussing their role in the invitation systems of the Iron Age and their possible function as a means of identifying selected individuals.

Invitation systems in the Iron Age?

In the last decade, archaeological investigations have revealed significant evidence of social activities undertaken at so-called central places or elite residences in southern Scandinavia. People interacted in various ways at assembly sites, such as Tissø, Uppåkra and Toftegård, their activities including trade, diplomacy and cultic activities (Jørgensen 2002, 2003; Larsson 2004). Such locations were used for assemblies at a local, regional, interregional and international level. These sites and their related

functions were the backbone of a society in transition from a tribal system to a realm. The precondition for these activities, however, was that people really were who they said they were. It had to be the right people who attended the various events. It was crucial for the magnate that he was negotiating with the right person and not an imposter. In a similar way, it was vital that the right people participated in the cult or ceremonial activities. We do not know the circumstances of these activities, but there are numerous indications they were undertaken by the magnates. Rituals took place at their settlements and the rituals were most likely controlled by the elite (Jørgensen 2002, p. 215ff, 2009). The gold foil figures can be seen in this context as a means of ensuring the identities of the invited and participating persons. Today, various invitation systems exist. An invitation system is a method of encouraging people to join an organisation – it may be a website, a club or the intranet for parents of children at a local school. It is often a system in which new members are chosen, they cannot just apply. Sometimes existing members can receive a number of invitations, perhaps in the form of tokens, to enable others to join the service. In a similar way, some objects from the past can be seen as a type of 'token' – an invitation to attend a specific event, which was also evidence that the invited person really was the correct individual. This may have been the case with the gold foil figures.

The gold foil figures can be interpreted as invitations or rather 'tokens' from the magnate. The token would allow access to rituals or ceremonies. If a person received this golden token from the magnate, he or she was selected to be a part of the event. These 'gold tokens', if brought to the site of the event, for instance the magnate's hall, would be the proof that allowed access. In this way, the gold foil objects could emphasise the individual's social importance and position. In addition, the token could play an active part in the ritual as a votive gift. These two functions are not mutually exclusive.

A comparable example of tokens used in association with rituals is known from the Temple of Bel (dedicated on April 6, AD 32), in Palmyra, Syria. At this site, the Palmyranians performed annual rituals. During these rituals, priests and participants walked in a procession, carrying statues of the gods. Animal sacrifices and ritual banquets connected with these processions were held within the temple complex. Participation in events such as the banquets was strictly controlled through the use of terracotta tokens (*tesserae*), which were only issued to the priests who served in the temple and a few selected citizens. The Temple of Bel had a dining room in which the invited participants ate sacrificial meats (Figure 3) (Colledge 1976, p. 11, 29, 54f; Al-As'ad *et al.* 2005; Raja 2015).

It is possible that the Nordic gold foil figures, despite the differences in terms of geography and dating, can be seen in the same way as at the tokens used at Palmyra; they were part of a strictly controlled invitation system, granting the right people access to various ceremonial events. The requirement for invitation systems has apparently existed

Figure 3. a–b Terracotta tokens from Palmyra (now in the collection of Ny Carlsberg Glyptotek); they functioned as invitations and could grant people access to rituals and feasts at the Temple of Bel. Photo: Rubina Raja.

in every period and in all geographical regions of the world. There is no doubt there are significant differences between southern Scandinavia and Syria in terms of dating, cultural contexts and religious systems. However, some features are recognisable in both places. The Temple of Bel contained restricted areas, where only certain people were allowed in, ritual feasts were held and animal sacrifices were made. These are elements that we can also identify at southern Scandinavian sites. In addition, it is worth noting that food, presumably including ritual meals, was also part of the Scandinavian elite's ceremonial sphere. At the magnate's halls at Gudme, Tissø and Lejre on Zealand, for instance, a number of deposits of bones and burnt stones can be interpreted as the remains of ritual meals and sacrifices (Jørgensen 2009, p. 334, 343ff; Christensen 2015, p. 173ff.). Furthermore, as will be emphasised later, it was of great importance at the South Scandinavian elite residences to organise space and control the movement of people in the central and cult areas. Different people had access to different parts of the cult areas at the residences. This is a pattern that can be identified at numerous religious sites from various periods and geographical areas, including Palmyra.

The argument is not that Syria and South Scandinavia are alike – they clearly are not. But this example has been chosen to emphasise the possibility of certain elements from different environments appearing in various different geographical locations. Religious elements that are found all over the world include the sacrificing of animals, processions, religious tokens and control of the movement of people.

The use of religious tokens for different purposes appears to be one of these elements found in various temporal and geographical contexts. Another well-known example of this is the pilgrim badge (Andersson 1989). These medieval artefacts, which are commonly found throughout Europe, are often made of pewter or other lead alloys. The badge's main purpose was to certify that the owner had travelled to a specific place on a ritual journey. The badge could document that an individual had visited a particular location for a specific religious purpose. Thus, they apparently differ from the gold foil figures in that the badges document participation in religious activities that have already been completed. Similar to the terracotta tokens, the pilgrim badges belong to another religious system, time and cultural context than the gold foil figures. But they are nevertheless examples of artefacts with no practical purpose, which could be easily broken, and which were associated with a cultic context and were exclusively associated with documenting the individual's participation in cult activities, either before or after these occurred.

The mentioning of terracotta tokens and pilgrim badges is not intended to enable close comparisons to be drawn between these objects and the gold foil figures, but instead it is meant to emphasise that religious tokens linking a person's identity with certain cultic events are a universal phenomenon. There are many differences in the form, function and dating of the various types of tokens. But what they have in common is that that they did not have a practical function, their production was controlled and they have been found at sites with documented cultic contexts and activity.

In debt to the magnate?

If the gold foil figures functioned as invitations from the magnate to a selected few to join certain events and the objects played a part in votive offerings, this would mean that the receivers became indebted to the magnate. The magnate would finance the receiver's votive offering to the gods and the receiver would then be under the magnate's influence when establishing alliances, undertaking political activity and negotiating social relations. Both parties could benefit from this relationship. This appears to display some similarities with the contemporary system associated with the so-called ring-swords. These swords had a ring attached to the pommel, which could symbolise a connection and commitment to a local ruler amongst the military elite of Europe (Figure 4) (Steuer 1987, p. 206ff.; Nørgård Jørgensen 1999, p. 197ff).

We cannot be sure how prehistoric invitation systems worked. What enabled access to various activities? What factors could result in an invitation? Was it a person's status, kinship, or physical or psychological traits? Or was it completely different factors? One thing is certain though: identifying yourself and your privileges was a challenge in

Figure 4. Ring-sword from Kyndby, Zealand. This type of sword, with its prominent ring on the pommel, could signal connection and commitment to the local ruler. Photo: Lennart Larsen.

prehistory. There were no lifelike images that could easily be transmitted and no databases to browse. Perhaps gold foil figures were used as tokens in such an invitation system, if only as the 'final document' proving upon arrival at the cult area that the person was actually part of the invited network and should be allowed to come in.

Amongst the gold foil figures, male figures are numerically dominant (Mannering and Andersson Strand, 2008, p. 55). However, this probably does not reflect the actual representation of the sexes at special activities during the Late Iron Age. We have no completely convincing interpretation models for the figures' iconographic content and meaning. Therefore, it is unwise to draw too many conclusions on this basis as to whether the gender composition of the gold foil figures is accurate and represents that which existed in the cult activities of the Late Iron Age.

An intellectual network?

Gold foil figures were not well suited to circulation in large networks and to passing through many pairs of hands as they were too fragile. These objects were intended for quick transactions from one person to another. They were taken out of circulation as soon as they were deposited, often in a cultic context, after their possessor had arrived at a certain event and deposited the figure.

The production and use of the gold foil figures must have been controlled by the elite. Producing gold foil figures required both access to gold and the expertise of skilled goldsmiths. But it depended, in particular, upon knowledge, of how to use and understand them, and of how to decode their symbolic meaning. From this perspective, the gold foil figures are a powerful indicator that network relations were developed to a high social and intellectual level. To be able to use gold foil figures correctly, an individual had to be a member of a network, whose members were familiar with, understood and accepted the use of such objects. The members of this network included some of the most important actors of the period: the elite represented at Sorte Muld, Gudme, Uppåkra and Toftegård. These network relations are emphasised even further by the fact that dies for foil figures have been found at Lundeborg, Uppåkra, Toftegård and Sorte Muld, indicating the existence of a die network in Scandinavia (Watt 2004, p. 215).

Minimising the risk?

The gold foil figures could not guarantee that the right people arrived at the events. They were not an absolute assurance of the holder's identity. But presentation of a 'golden token' from the magnate might minimise the risk of letting in an unwanted guest or impostor. By presenting a gold figure at the entrance to an important event, it could not only signal that a person was, to some degree, part of a network, but also that they were connected with the magnate and possessed the privilege to participate. The same mechanism can be observed in modern life, in which access to different groups via 'electronic tokens' is offered in advance. This can take the form of a Facebook invitation, a login to your child's school intranet or a membership card for a frequent

flyer programme. Tokens such as these – made of gold, plastic or electronic impulses – do not eliminate the risk of the wrong person gaining access, but they reduce it. Tokens make it more difficult for *personae non gratae* to enter. This may have applied in Iron Age society too. At a time when society depended upon people really being who they said they were, gold foil figures can be seen as part of an established invitation system to verify a person's identity, or at least to minimise the threat from tricksters. Gold foil figures display very distinctive characteristics: they were often associated with elite and cultic contexts, and apparently had no practical function. However, they may have been just one of several object types which played a role in prehistoric invitation systems or in systems aimed at identifying people.

Organising space

In summary, certain pieces of evidence may point towards a role for the gold foil figures in an invitation system. A substantial proportion of the figures ended up at sites containing clear indications of cultic activities. They have been found exactly in the places where the archaeological evidence for cult activities is very convincing – in association with the 'ceremonial buildings' at Uppåkra (Larsson and Lenntorp 2004) and Helgö (Jørgensen 2009, p. 334f), and within the central area at Gudme (Thrane 1998, p. 253ff), for instance.

Lars Jørgensen demonstrates (2009, p.329ff, 349: ff), on the basis of a number of examples from southern Scandinavia, how elite residences follow a distinct pattern when it comes to the organisation of the central areas of the large settlements and the pre-Christian cult. The magnate's main building is located here at all the complexes he describes (e.g. Gudme, Tissø, Lejre, Toftegård, Lisbjerg and Sorte Muld in Denmark, and Järrestad, Uppåkra and Helgö in Sweden). He argues that more or less all of the sites display a pattern in which this central building, the actual residence, is associated with a smaller building. In the case of Tissø, Järrestad, Toftegård, Lisbjerg and probably Sorte Muld, this smaller building is surrounded by fencing often joining the central building. He also argues that the main residences at Uppåkra, Helgö, Gudme and Lejre were accompanied by smaller buildings too (see also Andrén, 2002, p. 315ff), but at these sites, no traces of fences were found. Such traces may have been destroyed by ploughing, or else the fences may never have existed. At the older complexes, such as Gudme, Jørgensen has suggested functional differences, in which the hall was for profane activities and the smaller building was preserved for sacral activities. He identifies a change in the general pattern of the complexes occurring around 6th–7th centuries, when some of the sacral functions moved into the halls.

The whole issue of spatial organisation and movement of cultic activities at the elite sites is far too complex to go into detail with here. But it is nevertheless important to keep these patterns in mind when discussing cultic activities and the related artefacts. This is because this strict organisation of the space, using fences and architecture, in the central parts of the elite residences reveals a very rigid way of organising the cult, the cultic areas and not least access to these sacral areas. There seems to have been a genuine preoccupation with controlling people's behaviour and patterns of movement. Areas were fenced in and cultic activities were allocated to special buildings. These places were deliberately isolated from their surroundings, and it does not seem plausible that all people were allowed into the restricted areas. Interestingly, it is particularly in these places, where strict spatial control was exercised, that the majority of the gold foil figures have been found. This type of organisation and mentality required an efficient way of controlling people and their access to certain areas. Therefore, an invitation system could have been very useful.

The gold foil figures are usually found at these elite residences and only rarely occur in other types of contexts, such as graves (Watt 1999c, p. 174). It is noteworthy that an artefact type, of which thousands of examples are known, displays such a uniform contextual pattern. This may indicate that their value was connected with the event they represented – either as an invitation or a votive gift. If they had functioned as invitations, their value would probably have been reduced after the gathering was over. The gold foil figures are made of microscopic amounts of gold and do not constitute 'treasure' in an economic sense, and even though they could have still represented a connection to the elite, such lavish invitations would have been most valuable when they

could be used as planned. A ticket to a performance is usually worth more before the event than afterwards. This might explain why we see such a distinct contextual pattern – the figures are found at places where they had value. Their value may have been based on the fact that they provided access to an intense event, or that they represented a votive gift, which could only be handed over to the gods on this occasion. This may be the reason why they are not found in graves and other contexts in which they could not fulfil these functions.

Control of production and movement of the foil figures

The production of gold foil figures must have been controlled. It is not a common type of artefact that would have been produced in many workshops. The access to gold, the specialised technique, integrated intellectual content, the understanding and acceptance of the use of the foil figures, as well as the contexts they have been recovered from, indicate that they were controlled by the elite in an organised network.

Upon initial examination, the gold foil figures exhibit visual consistency – they are all made of the same material, are small in size and generally depict people. Even though the iconographic content is rich and varied, their layout is standardised like other groups of mass-produced religious tokens. Watt has noted that on the basis of the products of at least 550–600 different dies, which are known of, the general impression is that the majority of foil figures belong to surprisingly stereotypical groups (Watt 1999c, p. 177).

If the gold foil figures played a role as tokens for personal identification in connection with participation in certain events, this could to a certain extent explain why they are often found at different places to the dies (Figure 5). The production occurred at a different location to the use and deposition. An element of an invitation system is that the tokens travel – their usage, significance and interpretation are associated with a network away from their original starting point.

The National Museum's collection contains eight dies which are registered as having been found in Denmark.[1] The majority of these were found in areas where no gold foil figures have been recovered.

Figure 5. A recently found die, from Neble, Zealand. It is stored in the National Museum's collection (Inv. no. C 39604). It was found using a metal detector in 2012 in an area where no gold foil figures have been found. Another die (Inv. no. C 32546) was found in the same area in the 1990s. Photo: the National Museum.

Two are from Neble, one is from Vester Egesborg and another from Flakkebjerg, which are all located in South and West Zealand. But the only recorded gold foil figures from Zealand, as previously mentioned, are from Toftegård in South-East Zealand. In addition, there is a die from Øster Vandet in North Jutland, but this is also an area without any known gold foil figures. According to Watt (2008, p. 44), the closest known gold foil figure is from the eastern part of the Limfjord region and not the western area, where Øster Vandet is located. Two of the three dies from Bornholm (Møllegård and Smørenge) were found at locations with known gold foil figures and the third one came from Sylten II, which is located close to the Sorte Muld site. It is interesting, however, that only one die has been found close to Sorte Muld – a site which holds 2480 of the approximately 3000 Scandinavian gold foil figures that are known of (Figure 6). The usage of figures at this site was very significant. The site has been intensively surveyed with metal detectors, so the chances of finding

Figure 6. A selection of gold foil figures from Sorte Muld. Photo: the National Museum.

dies here ought to be good, but still only one neighbouring example of a die has been recorded. The second largest find spot for gold foil figures, Uppåkra, has produced five dies (Helmbrecht 2013, p. 9), which shows a better balance between dies and gold foil figures. But from a Danish perspective, five out of the eight known dies have been found in areas with no gold foil figures whatsoever, and only three dies have been found on Bornholm, where 85% of all the known gold foil figures in Scandinavia have been found (Watt 2008, p. 45). This could reflect a 'dynamic function' – the figures acting as 'messengers' in an elite-controlled network to a final place of deposition at a cultic event. This would explain why at least five of the known dies from Denmark were found in areas lacking gold foil figures; they had been transported after production, and strict control of the artefact type ensured that scraps were not left behind, which is also a characteristic of tokens travelling in an invitation system. Tokens designed to function as messages in an invitation system do not need to be particularly durable and withstand the ravages of time. They are designed for only a few transactions and are subsequently deposited at a given event or place. But the hypothetical role of the gold foil figures as tokens does not rule out other interpretations, as mentioned above – the figures may have played both a role as votive gifts and invitations.

The gold foil figures are not found outside Scandinavia and are associated with a Nordic tradition. This part of the world was a non-literate society in the Late Iron Age. In a society where agreements were probably verbal, and not written down, one can imagine the importance of meeting up from time to time, to revive and revitalise contracts and participate in special social and cult events. In an arrangement where people from distant places and from certain families met on a regular basis, it was of great importance to be able to identify people. Who would the various families send along? Had the person been seen before, or could a person be recognised if they had not been seen for 10 years? Late Iron Age society prioritised spatial organisation and was preoccupied with granting the right people access to specific places. This concern and mentality is reflected in the layout of all the central and cultic areas of the magnates' residences of the period in South Scandinavia. Controlling and managing this required invitation systems, and the gold foil figures may have been one of the elements of such systems. In sum, the gold foil figures could have been an element of the invitation systems of the Late Iron Age and thus have had an actual and rather important function after all.

This is by no means a definitive interpretation of the function of the gold foil figures. At present, we cannot convincingly determine their function. This article instead offers 'food for thought' and is a contribution to the debate.

Note

1. The eight dies from the National Museum's collections: (1) Møllegård, Klemensker Parish, Bornholm Nørre District, Bornholm County, C 31846, (2) Sylten 2, Ibsker Parish, Bornholm Øster District, Bornholm County, Inv. no. C 34255, (3) Smørenge, Vestermarie Parish, Bornholm Vester District, Bornholm County, Inv. no. C 35638, (4) Neble, Boeslunde Parish, Slagelse District, Sorø County, Inv. no. C 32546, (5) Neble,

Boeslunde Parish, Slagelse District, Sorø County, Inv. no. C 39604, (6) Vester Egesborg, Vester Egesborg Parish, Hammer District, Præstø County, Inv. no. C 34094, (7) Flakkebjerg, Flakkebjerg Parish, Vester Flakkebjerg District, Sorø County, Inv. no. C 37469 and (8) Øster Vandet, Øster Vandet Parish, Hillerslev District, Thisted County, Inv. no. C 40131.

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BRIEF COMMUNICATION

Chronological aspects of the Hensbacka – a group of hunter-gatherers/fishers on the west coast of Sweden during the Pleistocene/Holocene transition: an example of early coastal colonization

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ABSTRACT

In this short article, we take a brief but concise look at chronological, and to a limited extent environmental and typological, aspects of the Hensbacka culture group in Bohuslän. Due to the extensive nature of the group in time and space, it is reasonable to refer to members of this group as colonizers – even if other groups may have visited western Sweden prior to the Hensbacka. Granted, the title is provocative but it should be made clear that we are addressing the Hensbacka group as we know it today, and not in the mid-1950s. In addition, and fairly obvious, it is only the Swedish west coast that is taken into consideration, since this particular area had an extensive seasonal population during the close of the Late Pleistocene and beginning of early Holocene; one that is difficult to find elsewhere in Scandinavia.

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Introduction

As discussed in previous papers (Schmitt 1994, Schmitt *et al.* 2006, 2009), the C-14 dating of Hensbacka sites on raised beaches has proven to be a problem. In addition to the obvious problem of well-aerated sandy contexts in which organic material has not been preserved, we could also have had a problem with acidic rain along the coast of Bohuslän (for additional insights, see Schmitt *et al.* 2006, p. 18). It was for this reason that an early marine transgression on SW Orust was investigated and, in the long term, could possibly serve as a chronological 'time marker' in other northern coastal areas with this transgressional phase. In that which follows, we first take into account our concept of regional colonization and then continue with when this episode most likely took place. In closing, a brief discussion concludes that three phases of the Hensbacka group might very well be present in Bohuslän.

As mentioned and before we proceed, it should be made perfectly clear that our use of the term 'colonization' should be taken to mean repeated seasonal visits to a specific, but limited, geographical region on the Swedish west coast by one and the same culture group from, as we see it, the North Central European Plain. Accordingly, these visits are witnessed by an archaeological record containing similar artifact inventories within a given chronological zone; in this case the late Younger Dryas and early Preboreal. This does not mean that other regional 'colonization' processes of a later date are not significant; only that they do not represent the first 'Continental Connection' (Schmitt 2015a).

Chronology – and how we got there

In the early 1990s, an excavation at Nösund on SW Orust (Figure 1) revealed a minor transgression (Schmitt 1999b, p. 8, Figure 3) that took place shortly after 12,000 cal BP (ibid. NHR, ST13752, p. 111; see also Schmitt 2013b). Accordingly, our original shore displacement curve (Figure 2) has been constructed from this information in conjunction with data from a previously known small transgression of c. 5 m, and duration of c. 100 years, from Kolamossen (Figure 1) in Risveden (Svedhage 1985, p. 7). A few words concerning shore displacement dating is in order. A shore line curve incorporates at least four parameters; the rate of sea level rise in relation to the rate of isostatic rebound in coastal

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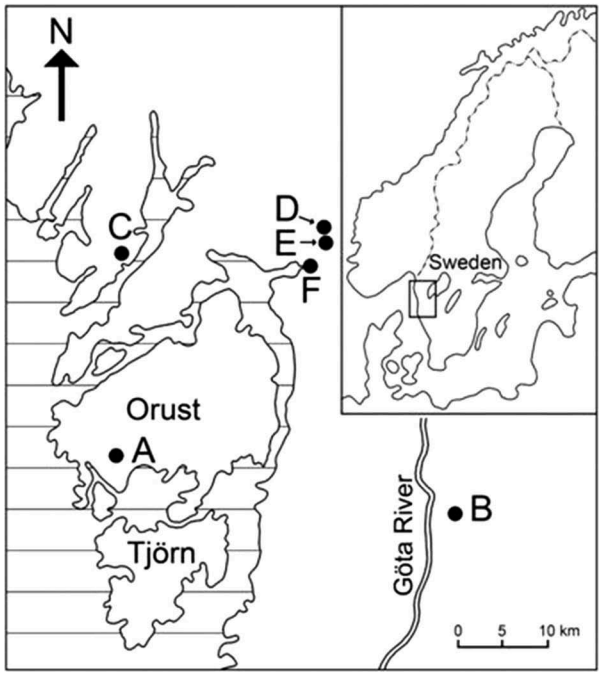

Figure 1. Generalized map showing the location of archaeological sites, areas of geological investigations and present-day cities mentioned in the text. (A) Nösund. (B) Kolamossen in Risveden. (C) Gullmarsskogen/Lassehaga. (D) Ramsedalen. (E) U-157. (F) The city of Uddevalla.

areas after deglaciation, known regional palynological studies, geological features seen in the terrain, and radiometric dates when available. In consequence, archaeological sites situated on these curves are referred to as raised beach sites and, at times, water rolled flint artifacts and/or a sorted matrix containing the artifacts, disclose that the actual site was situated within the local tidal range. Interestingly, this has been the case in the three sites seen on our curve in Figure 2. The advantage of shore displacement dating is twofold: the curves are regional and there is no risk of dating 'old drift wood' that is a common problem with radiometric dating. The disadvantage is that it is not *always* certain that the sites were situated within the tidal zone and, therefore, radiometric dating in this case is more exact.

How can these observations be used to date our site in Nösund? Providing that the rate of regression was 2.5 m/100 year (Schmitt *et al.* 2009, p. 18), one can count downwards along the slope of the site in Nösund from an erosion notch, in the underlying moraine, that represents a transgressional maximum at 60.0 masl; this becomes our chronological 'fix point' at 12,000 cal BP. The first (YD) regression minimum, or minorant, is represented by a distinct notch in an underlying layer of compact diamicton at the 55-m level of the site. Based on these features, the area with wide-edged flake axes/knives can be dated to between 11,700/600 and 11,200/100 cal BP. In order to corroborate our findings, a second displacement curve, based on GIA modelling (glacial

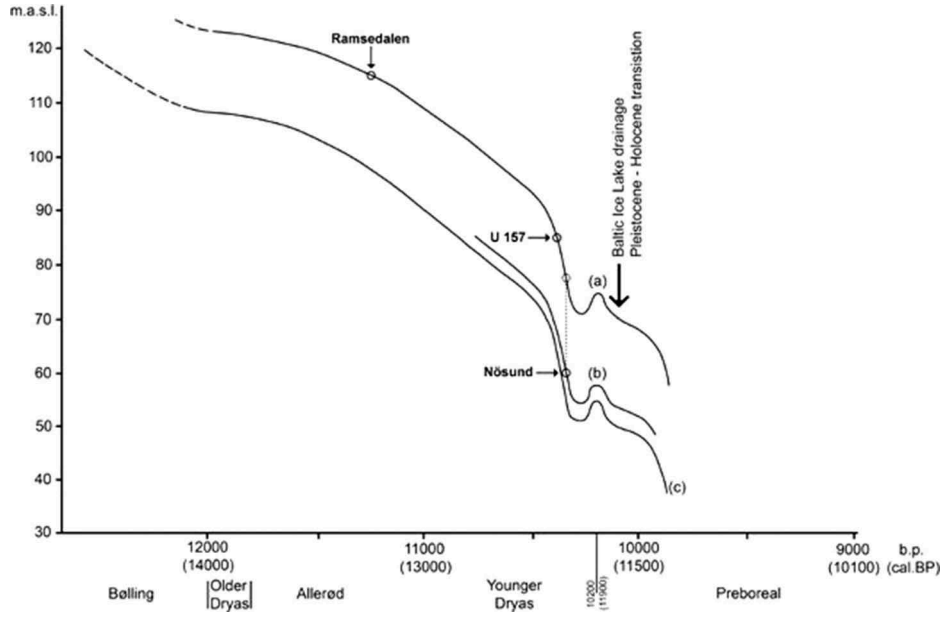

Figure 2. Shore displacement curves for the Uddevalla area (a), Nösund on SW Orust (b) and Kolamossen in Risveden (c). Note the difference between Nösund on SW Orust and its relationship to U-157 in the Uddevalla area.

isostatic adjustment) was presented in 2009 (Schmitt *et al.* 2009, p. 5, Figure 3). Our curve, as well as a third- and independent displacement curve (Påsse and Andersson 2005), indicates a period of isostatic subsidence at about 12,000 cal BP. From our point of view, this resulted in the minor transgression we see on SW Orust in Bohuslän, and in Risveden.

Naturally, it goes without saying that the material recovered from the site in Nösund was not *in situ*. Clearly, all flint material that has been subjected to tidal movements on an inclined beach must, to a certain extent, have been moved downhill. However, since we could co-join a blade and a burin to the core they were removed from – and found in the same meter square but in different fractions and intervals (see Schmitt 1999b, p. 62, M238 area 'B'); it is safe to assume that this downhill movement was rather limited. The aforementioned tidal movement in the archaeological recorded is witnessed by a sorted matrix containing aggregates of gravel with chipped flint material, and areas of homogeneous sand lenses with no flint at all (ibid. pp. 36–37). This feature has been referred to as 'islands of gravel and rivers of sand' (ibid. p. 10; Schmitt 2013b, pp. 436–437) and is easy to identify in the field.

Elsewhere

It is not without interest that a similar transgression, but larger (~10 m), also occurred along the Norwegian west coast in the Bergen (Krzywinski and Stabell 1984; Anundsen 1985) and Stavanger (Thomsen 1982) areas at about 12,000 cal BP. In addition, it is noteworthy that a small (1 m) transgression also occurred during the Younger Dryas near Tromsø (Munch-Ellingsen 1984) – as well as a minor transgression, ending at about 12,000 cal BP, which has been observed in the Kroppefjäll area of western Sweden (Björck and Digerfeldt 1991, pp. 128–129, Figure 17). In western Norway the transgression was caused by a major ice sheet re-advance that halted the isostatic uplift (Lohne *et al.* 2007) and raised the geoid (Fjeldskaar and Kanestrøm 1981). Far more distant examples of this Younger Dryas transgression can be found on Svalbard, where a phase of equilibrium between isostatic rebound and eustatic sea level rise has been noted between 12,500 and 11,500 cal BP (Landvik *et al.* 1987, pp. 39–41), as well as on Iceland were a transgression culminated at c. 12,100 cal BP (Rundgren *et al.* 1997, p. 210; Wohlfarth *et al.* 2008, p. 75). In brief, regional features such as an ice front re-advance, in conjunction with a rising eustatic (global) sea level in general, can have had far reaching effects in Nordic coastal areas. Consequently, there is no reason to doubt the Younger Dryas transgression observed at Nösund on the Swedish west coast, in that the event has been documented in numerous northern coastal areas. See also Schmitt (2013b) for additional insights concerning dating on raised beaches.

Implementation – in theory

If we integrate the aforementioned shore displacement curves with where Hensbacka sites are found in the terrain of central Bohuslän, many of the sites can be dated to an interval between c. 11,700/600 and 11,200/100 cal BP. Thereafter, this early phase is replaced by a latter phase of the Hensbacka that continues until c. 10,700 cal BP. However, and as Fredsjö pointed out, there exists a series of high lying sites that represent a *very* early phase of the Hensbacka group (see Fredsjö 1953, p. 131, Figure 34, sites marked 'V') without flake axes (ibid. pp. 85–86) that, as we see it, are earlier than 11,700 cal BP (compare Fredsjö 1953, p. 131, Figure 34 and Schmitt *et al.* 2009, p. 5, Figure 3; p. 18, Figure 8); that is to say – prior to the drainage of the Baltic Ice Lake at 11,700 cal BP (Jakobsson *et al.* 2007, p. 367). One of these early 'V' sites (U-157) in the Uddevalla area (see Figure 1) has been excavated; no flake axes were found, but rolled chipped flint was observed and collected along with other typical Hensbacka artifacts (Cullberg and Kindgren 1999). If we extrapolate from our chronology in Nösund by adding 18.2 m to our 'fix point' (60.0 masl), in that the site in Uddevalla (U-157) is about 26 km to the north (+0.7 m/km, towards the north, Svedhage 1985, p. 4), we arrive at 78.2 m at U-157 in Uddevalla. This indicates that the 60-m level in Nösund or 12,000 cal BP is, in chronological terms, younger than the 85-m level of U-157 in Uddevalla. In consequence, U-157 in Uddevalla is older than 12,000 cal BP. As mentioned previously, the early phase with wide-edged flake axes referred to as the 'Hogen phase' by Fredsjö (Fredsjö 1953, pp. 73–75 and 144), follows directly after these very high

lying 'V' sites and can be dated to a chronozone that runs between c. 11,700/600 and 11,200/100 cal BP.

It should also be mentioned that a second, very high lying site (115 masl) referred to as Ramsedalen 579 by Fredsjö (1953, pp. 82, 83, and site catalogue p. 184) (see also Schmitt 2015b) can be dated to c.13000 cal BP when plotted on our shore displacement curve (Figure 2; see also Schmitt *et al.* 2009, p. 5, Figure 3b). Had it not been for the occurrence of very early Ahrensburgian sites on the Continent, e.g. Alt Duvenstedt LA 121 at 11,060 ± 110 uncal C-14 (c. 13000 cal BP) (Kaiser and Clausen 2005, pp. 456–457; Weber *et al.* 2011, p. 291) and Hintersee 24 OSL dated to an early segment of the Younger Dryas (Bogen *et al.* 2003), one could not believe that this early HK/Ahrensburgian dating in Bohuslän was possible. Clearly, these very high-lying sites in central Bohuslän require additional investigation. Nevertheless, the material that had been collected at the Ramsedalen site included: one tanged point, five convex end scrapers on blades and a large microburin and lastly, but by far not least, water rolled flint. Fredsjö refers to the tanged point as having its parallel in the Ahrensburgian material from Stellmoor (Fredsjö 1953, p. 83). As to the microburin, it seems as if this item has been a stigma for Late Palaeolithic Stone Age research from a Nordic point of view. As was demonstrated in a recent paper (Schmitt *et al.* 2009), microburin technique has been well known during most of the Upper Palaeolithic (see also Bo Madsen (1996, p. 69) for additional insights concerning microburins in a Hamburgian context). We find it most probable that this microburin in the material from Ramsedalen deterred further investigation of the site in that a Mesolithic context was obvious – or was it? (see also Schmitt 2015b, Figure 2).

Implications

For the time being, and *generally* speaking, the Hensbacka group existed during a 1300-year period between 12,000 and 10,700 cal BP. At the end of this 1300-year long period – a palaeogeographic change took place that seems to have had a profound effect on the Hensbacka culture group; the Otteid and Uddevalla straits dried up at about 10,500 cal BP (Fredén 1988, p. 70). In brief, large quantities of fresh melt water no longer emptied into the archipelago of central Bohuslän. An earlier and non-local change that might also have had an environmental impact on the Hensbacka (Ahrensburgian) was the drainage of the Baltic Ice Lake at about 11700 cal BP (Jakobsson *et al.* 2007, p. 367) in that this resulted in the closing of the Fehmarn Belt (see Jensen *et al.* 2005, Figure 2). Prior to the drainage event, a connection with the Kattegatt, over Fehmarn Belt and Great Belt, is probable (ibid. p. 45) and is supported by C-14 dates (c. 12,000 cal BP) that derive from organic material recovered in sediment samples from the Great Belt (Bennike *et al.* 2004, p. 22, Table 1). In addition, recent tidal modelling suggests that, prior to the drainage of the Baltic Ice Lake; the northern end of the Great Belt was effected by a tidal amplitude (M2) of c.1.2 m in the southern end of the Kattegatt (Schmitt 2015b, pp. 110–111). This means that the difference between low and high tide was about 2.4 m. Nevertheless, the implication here is that it became impractical, but not impossible, to travel by boat between the Continent and Bohuslän shortly after c. 11,700 cal BP. This in turn can have resulted in shorter seasonal rounds within a more restricted regional area; *perhaps* from coastal areas of eastern Denmark. That is to say, from the land area that existed between Læsø and Anholt and, on the eastern side of the Kattegatt, the Swedish west coast (see Schmitt 2015a, Figure 2). In this regard, it is interesting to note armatures types that resemble those found in south eastern Norway and Bohuslän have been found on Anholt (Sørensen 1996, p. 121). Recent investigations, however, suggest a Neolithic dating and not, as could be expected, Mesolithic (see Petersen 2004), although an early Maglemosian site is known from the southern side of Anholt (personal communication, Petersen P.V. 2015/12/19). Moreover, it should be kept in mind that a Late Palaeolithic Bromme point has been found on Anholt (Fischer 1985, Figure 4, p. 84).

Indeed, from an archaeological point of view, perhaps one can define the difference between a Late Palaeolithic lifestyle and an Early Mesolithic lifestyle, as the distance travelled on a seasonal round – and not only because of environmental circumstances, as we have been doing? Indeed, the latter option resulted in the colonization of western

Sweden in the form of a culture group we refer to as the Hensbacka. It should be noted that the drainage of the Baltic Ice Lake at c. 11,700 cal BP did not change the coastline of Bohuslän since it was only the surface of the lake (BIL) that was lowered via an outlet at Närke in central Sweden.

Three phases of colonization

This short article is not a report; it is an enticement. That is to say, it is an attempt to interest future archaeological researchers to put additional 'meat on the bone'. In short, confirm that which has been suggested using empirical data.

Accordingly, and from a generalized point of view, variations in the tool-kit reflect different activities. If true, this suggests that three chronological phases of the Hensbacka group should be taken into consideration. Firstly, a very early phase (HK-1) from *before* 11,700 cal BP without flake axes; a second phase (HK-2) between 11,700/600 and 11,200/100 cal BP with wide edged flake axes that display concave lateral sides (Figure 3a), and thirdly, a final phase (HK-3) between 11,200/100 and 10,700 cal BP with surface trimmed flake axes that usually display diverging lateral sides when viewed from a proximal butt-end position towards a distal cutting edge (Figure 3b), concave lateral sides are no longer seen. In addition, core axes in the form of Lerbergs axes (Figure 3c), and flake chisels, make an appearance in this third and final phase. It should be noted that the wide edged flake axe mentioned above is a 'key artifact' for the HK-2 phase; however, this does not exclude the presence of other morphological types of flake axe in the same (HK-2) phase.

In summary, and as a plausible scenario, we have three phases within the Hensbacka group: *exploratory, extraction*, and finally – regional *habitation* at about 11,000 cal. BP. The first and earliest phase is witnessed by the absence of flake axes in the tool-kit and this might mean that they were not needed and or another tool, such as a blade, was employed for an eventual job at hand. These sites can be seen as being *exploratory* in nature. In a somewhat latter phase of the Hensbacka, the large numbers of wide-edged flake axes might express the regional *extraction* of rendered seal oil from blubber that, in part at least, could have

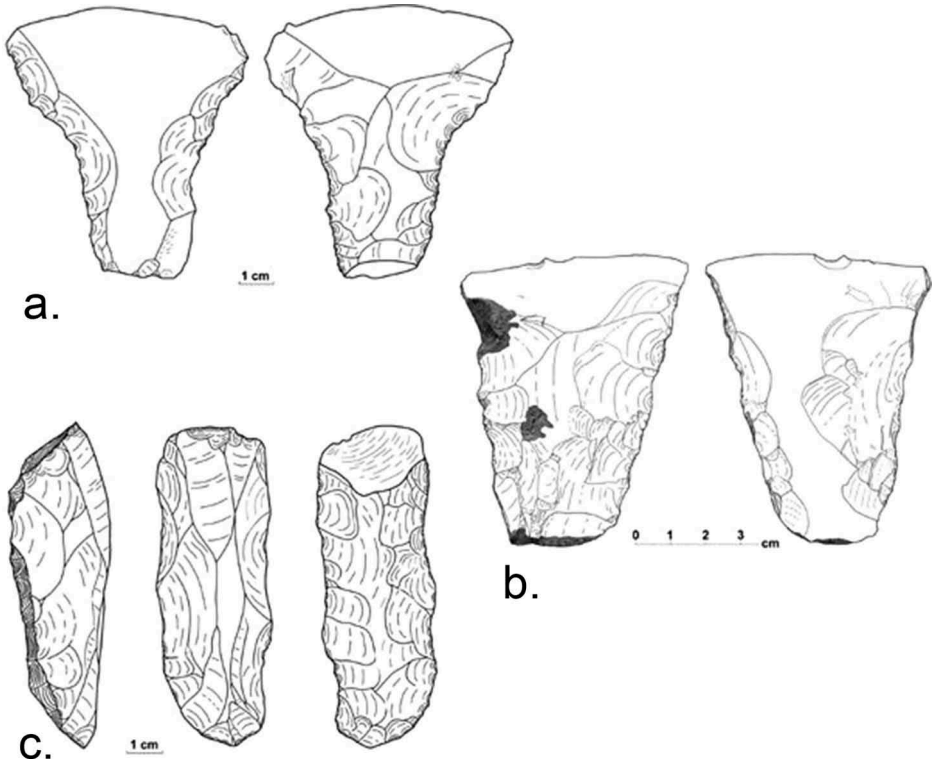

Figure 3. Chronological differences of 'type' within the axe/knife populations mentioned in the text. (a) Represents the late phase of the early Hensbacka while (b) and (c) are found in the in the last, or youngest phase, of the Hensbacka. The total absence of these axes/knives indicates the earliest phase of the Hensbacka/Ahrensburgian group.

been transported back to the Continent (for more detail see Schmitt 2013a & Schmitt 2015a). Last but by all means not least, the final form of flake axes, in conjunction with flake chisels and Lerbergs axes, suggests a possible wood working tradition – that was not seen earlier; as such, a phase of regional *habitation* has become a reality. Indeed, this might also mark the close of Ahrensburgian traditions as we know them today.

A concluding reflection

Although we do not wish to debunk what we have suggested here, it should be kept in mind that things are not always what they seem to be. Nevertheless, and until a reliable C-14 dating from a Hensbacka site in Bohuslän becomes available, it is reasonable to assume that our shore displacement curve has a considerable amount of utility in the field during the excavation of Hensbacka sites in western Sweden. As such, it is noteworthy that the method also incorporates a standard ±100 year deviation.

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INVITED REVIEW

The Vikings, victims of their own success? A selective view on Viking research and its dissemination

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The Viking age as a time of adventures and violence never ceases to fascinate the public. Both aspects remain central to the definitions of the period which can be found in recent introductions to the topic. Those definitions, developed in Western Europe and applied to the events taking place in this region, are currently being challenged by scholars arguing for the greater significance of economic, political and social developments on a broader scale, beyond the strict agency of individuals of Scandinavian origin. This discussion raises the question of the participation of different regions in the Viking phenomenon and their visibility in the research history. While Viking studies can benefit from this debate thanks to new perspectives on the cross-cultural dynamics of the Viking world, generalizations and excessive broadening may potentially lead the concept to lose its meaning. Therefore, we need to retain the focus on the specificities of the Viking age as a particular set of phenomena under the broader scope of contemporary pan-European historical processes and to pursue our research objectives independently from the desires and pre-conceptions of the public.

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Introduction

This essay proposes a review of recent syntheses about the Viking age and its definition in various regions of modern-day Europe. The question of which regions can claim to have had a Viking age is deeply entangled with recurrent academic debates about the themes, events and peoples which characterize the period. Indeed, the Viking Age is not only defined as a historical frame, that is, what happened between *c*. 800 and 1050, but also as a set of phenomena generated through particular activities and contacts. The extent of the involvement of ethnic Scandinavians in these phenomena is variously assessed, leading to alternative definitions of the Viking age. A strict definition of the period as that of raids, trade and colonization conducted by Scandinavian Vikings (the 'ethnic' model) is now challenged by more inclusive assessments focusing on cultural, social and economic processes broadly relating to maritime expansion in Northern Europe (the 'processual' model). By considering the scientific reasons for the inclusion and exclusion of various regions in the general picture of the Viking world, as well as the role of popular interest and political tensions inherited from the nineteenth and twentieth centuries, it appears that the current discussions about which regions had a Viking age – and of what kind – is often more about why these regions want to have a Viking age. This approach might, in many instances, over-emphasize mistakenly the particularity of the period within the frame of early medieval European history, the Viking age thus appearing as victim of its own success.

The Viking world today, its definition and geography: a selective overview

The most common definition of the Viking age is the time of the maritime expansion of peoples of predominantly Scandinavian (i.e. modern-day Danish, Swedish and Norwegian) origin. This expansion was motivated by trade, colonization and raiding involving the eponymous sea-borne raiders, and had a deep impact on the involved populations, both in the lands of the expansion and in the Scandinavian homelands. At the time, these activities were recorded in annals and chronicles and described in letters and poems, most famously by Anglo-Saxon and Frankish clerics, but also by

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merchants and travellers from the Muslim world. On this basis, the commonly used chronological frame of the Viking age has been set by modern historical scholarship to 793–1066, the dates of two attacks lead by Northmen, who reached the shores of England by ship. Alternatives to these dates, which are mostly relevant from a West-Scandinavian perspective, have been proposed in several instances, but adjustments have essentially consisted of a 'smoothening' of the absolute historical definition to a vaguer *c*. 800–1050 (or *c*. 700–1100), more suitable to the more transient archaeological chronologies.

The research history of the concept and its relation to and basis in the nineteenth century national-romanticism in the Scandinavian countries has been discussed in various instances (e.g. Lönnroth 1997, pp. 236–244; Svanberg 2003). The Viking age was then coined as the heydays of the Scandinavian past, according to the political needs of the time, but also based on the sources available at the time: essentially the records from England and France testifying of the Northmen's fierceness and grandeur. The development of archaeology as an independent discipline throughout the twentieth century both supported and nuanced this view: objects in or inspired by Scandinavian styles have since shed further light onto the Viking settlement in England, for example (Kershaw 2013), while the 'Viking achievement' in terms of culture and society in the homelands has been stressed (Foote and Wilson 1970). The usual triad of trading, plundering and colonizing thus gave birth to expansion, cultural exchange and diaspora (e.g. Abrams 2012).

Previous research has unanimously acclaimed the skills at ship-building and navigation mastered by the Scandinavians during the Viking age (e.g. Crumlin-Pedersen and Olsen 2002), postulating that these technological improvements enabled the Viking age – rather than caused it (Barrett 2008, p. 673). It is certain that maritime expansion shaped the Viking world and made possible the multifarious contacts between individuals of Scandinavian origin and others in the territories of modern-day Europe, North Africa, the Levant and the North Atlantic. Viking studies are also conducted in equally many regions, each contributing with a particular view on the period. Therefore, in order to understand how the Viking age is currently approached and defined, attention needs to be directed at the recent works which claim to offer a holistic overview, namely handbooks and introductions on the one hand and museum exhibitions and their catalogues on the other. A great amount of literature dealing with the Viking age as a whole has been produced for the past century (e.g. Almgren 1967, Brøndsted 1979, Graham-Campbell 1980, Richards 2005, Hall 2007), and it is not the aim of this article to provide a systematic assessment. Instead, a small selection of handbooks published since the 1990s are considered a valuable source, as their purpose is to provide students and the interested popular readership with a synthetic historical view established by previous research which should be, at least in theory, updated with the most recent results and discoveries.

A notable introduction to the period was offered by an English historian, Peter Sawyer (1997a). Starting his *Oxford Illustrated History of the Vikings*, Sawyer gives us, in one page, the most standard definition of the period:

> From the eighth century to the eleventh, Scandinavians, mostly Danes and Norwegians, figure prominently in the history of western Europe as raiders, conquerors, and colonists. […] Other Scandinavians, mainly Svear from what is now east Sweden, were active in eastern Europe in ways that were very similar to those of their contemporaries in western Europe, despite the great differences between the two regions (Sawyer, 1997b, p. 1).

The stage is set: the Viking age is about the Scandinavians starting to play a significant part in European history. Accordingly, the Viking world here presented is composed (each with their individual chapter) of the Frankish Empire; England; Ireland, Wales, Man and the Hebrides; the Atlantic Islands; European Russia with few mentions, in relation with trade, of Finns, Saami and the West Slavs (Noonan 1997, pp. 150–153), whose role is here deemed 'relatively unexplored' (1997, p. 152). The Mediterranean is mentioned in the introduction (Sawyer, 1997b, p. 10), but is not treated further.

Ten years later what has probably become the most used teaching material by students of Viking studies was produced, Brink and Price's *The Viking world* (Brink and Price, 2008a). Not a popular introduction as such, the book was thought as a synthesis for an academic audience. It introduces the Viking age in much a similar way as that of Peter Sawyer's:

> The Viking Age was the period when the Scandinavians made themselves known […]. Norwegians in particular controlled and colonised the whole of the North Atlantic, from Norway, to the Faroes, Iceland, Shetland, the Scottish islands, parts of Ireland, Greenland and all the way to the eastern brim of North America. Especially Danes, but also Norwegians and Swedes, ravaged and had an impact on the political and social development of England and parts of France. Swedes travelled eastward, traded along the Russian rivers, and down to the Byzantine and Islamic world.

As for Peter Sawyer, the Viking phenomenon is described as the activities of ethnically (nationally?) defined Scandinavians abroad. The violent aspect of the phenomenon has, according to Brink, been neglected in the second half of the twentieth century to the benefit of the 'peaceful, industrious, trading Viking' because of the trauma of WWII – by aspiring to peace today, Europe found peace in its past (Brink 2008, pp. 4–5).

Although the editors regret in their preface that 'most overviews of the Viking period have also been produced very much from a British perspective' (Brink and Price, 2008b, p. xix) part II of the volume, 'The Viking expansion', dedicates over a third of the total pages and nearly half the number of chapters to one region: the British Isles. Certainly the British Isles were marked by contrasting landscapes, cultures, languages and political structures when Scandinavians entered the scene, and they deserve a nuanced approach, but the same can be said for the Continent, under which two regions are briefly distinguished in sub-chapters (Normandy, 5 pages; Brittany, 4 pages). The same stands for the one chapter about the 'East' which covers everything from the Southern Baltic, the Ladoga region, the Dniepr and Volga axes down to the Black Sea with, here again, a multitude of languages, ethnicities, social structures, religions and resources. The more specific relationship between the Rus', Byzantium and Islam receive more attention.

In a recent *Reader* for the study of the Viking Age, the editors Russell A. McDonald and Angus A. Somerville offer a slightly more nuanced view, even though their angle is strictly textual (McDonald and Somerville 2014). In the introduction, the aspiring Viking scholar is reminded that 'while a very small minority of early medieval Viking Age Scandinavians might well have resembled the warriors and bandits of the stereotype, their fellow Norsemen were also renowned merchants, seamen, explorers, mercenaries, and poets, who contributed much to early medieval European civilization' (2014, p. xv). Four chapters of little over 200 pages in total relate directly to the Viking expansion. The Viking attacks occupy over half that space and are presented through 14 sources: seven for the British Isles, four for the Frankish areas and two for Spain. The rest of the phenomenon is treated in three equal chapters about colonization (essentially in England with seven texts, Normandy only appearing as one source), the Eastern route (focusing on the Rus and Varangians) and the North Atlantic (mostly Iceland). Again, the British Isles are the main region of interest in discussing the phenomenon, but the editors do manage to cover a fairly large ground by giving attention to each region proportionally to the existence of written documentation.

Enthusiasm for the 'traditional' Viking Age is met in Anders Winroth's introduction to *The Age of the Vikings* (Winroth 2014), which compiles the knowledge established by a long recent tradition more than it includes the results of recent research. His premise is that 'the Vikings pique our imagination', as 'ferocious barbarians' and 'super-masculine heroes' addicted to 'slaughter, raid, rape' (2014, p. 8), but also as 'accomplished and fearless discoverers' thanks to their mastering of ship-building and seafaring. In other words, we love the 'barbarians', but we comply with the 'civilizators'. Winroth follows the rule of the genre and compensates for the troublesome first (Chap. 2, 'Violence in a Violent Time'; Chap. 3, 'Röriks at Home and Away: Viking Age Emigration') with an overview of their 'great cultural, religious, and political achievement' (2014, p. 10–11) (Chap. 4, 'Ships, Boats and Ferries to the Afterworld', Chap. 5, 'Coins, Silk, and Herring: Viking Age Trade in Northern Europe', Chap. 6, 'From Chieftains to Kings', Chap. 7, 'At Home on the Farm', Chap. 8, 'The Religions of the North', Chap. 9, 'Arts and Letters').

In the introduction to the volume, Winroth first sketches an impressive Viking world spanning from Al-Khwarezm in Central Asia, to Newfoundland in America, Seville in Southwestern Spain and the White Sea (Winroth 2014, p. 8). Later, this area is drastically reduced in the chapter on the Viking expansion (Chap. 3, pp. 45–70). While Iceland,

Newfoundland, Russia, France and England, Ireland and the Low Countries are mentioned, the chapter offers a more general discussion of the Viking phenomenon mostly based on Frisia/the Northern Frankish areas, the British Isles and Ireland, as well as Greenland. The Baltic Sea region is treated in another context as sea-faring route and crossing point towards the East (2014, p. 84) and for the market towns of Truso and Wolin, visited by Scandinavians (Chap. 5, p. 111–112). Finland is treated once in a chapter on state formation ('From Chieftains to Kings', p. 155) – but in a twelfth century context. Russia receives more attention in relation to the navigation on rivers (Chap. 4, p. 80ff), the most famous account of the funeral of a Rus' chieftain in a boat by Ibn Fadlan (Chap. 4, p. 96), and for the trade centres and routes between the North and the Middle East (Chap. 5 Arabic coins, and foundation of Staraya Ladoga, p. 114).

Let us now turn to museum exhibitions and their catalogues. Many national museums across North-Western Europe feature a Viking section in their permanent exhibitions, but a closer look at some of the larger temporary exhibitions opened since the 1990s also gives an impression of how the academic knowledge about the Viking age is being presented to the public.

Les Vikings… Les Scandinaves et l'Europe 800–1200 (catalogue: Roesdahl *et al.* 1992) was the first large-scale exhibition after the fall of the Wall. Its ambition was not just to present the Scandinavian warriors and their dramatic actions abroad, but also the developments these international contacts triggered in their homelands – political, economic, religious and artistic (Roesdahl and Wilson 1992, p. 24). This massive project presented a large Viking world including equally the North Atlantic, Finland, the Saami, the Eastern route, the Slavs of the Southern Baltic, the Continent (essentially Frankish areas and Normandy) and the British Isles. This inclusive approach is a characteristic of Else Roesdahl's work; one can find an equally broad scope in her successful introduction *Vikings* (Roesdahl 2012, p. 198–300). This Post-Cold-War interest can also be seen in another exhibition dealing with contacts between East Scandinavia and the territories of Ancient Russia in the long Viking age presented at the State Museums of the Moscow Kremlin (Jansson 1996b). While not aiming at offering a total view of the period, this exhibition was part of a cultural exchange program between Russia and Sweden and aimed at 'bringing together' the material evidence attesting of close contacts in the past.

A radically different take was adopted for the production of the catalogue of the latest large-scale international Viking exhibition, *Viking* (Williams *et al.* 2013). The volume offers an image of the Viking world *a minima* through an unapologetic focus on the good-ol' Vikings, those who fought and robbed. The Viking age is defined as the unprecedented expansion of Scandinavians. The nineteenth century scholars acclaimed the pirates among them, when the twentieth century scholarship, thanks to the development of archaeology, added merchants, colonists, crafts, poets, discoverers, ship-builders and sea-farers to the list of the Viking job description. But the reader is reminded that it is a history of violence, and is warned against the misguided, peaceful depiction of the past half a century (Williams 2013, p. 16). Accordingly, the catalogue is structured around four thematic axes: contact and cultural exchange; warfare and military expansion; power and aristocracy; belief and rituals. The Viking ship, presented separately, is the element that binds them all. The curators explain that it was not their aim to cover every aspect of the period, but only those which could be shed light upon via new, spectacular archaeological finds, or new research (Williams 2013, p. 17). This argument is a little difficult to accept, considering that many of the finds presented in the catalogue are not exactly recent, and that Viking research is continuously producing new knowledge on many more of the period's dimensions (e.g. urbanization). Furthermore, it so happens that these 'freshest' themes are also the public's most cherished ones: the obscure cult and the unbound violence, the rich and famous, are much sexier than the craftsman's skills, the landowner's recent conversion to Christianity and the – female – weaver's sail. While the exciting chapter on contacts and cultural exchanges sketches a rich and broad Viking world, stretching from Iceland to Byzantium (Kleingärtner and Williams 2013), the thematic choices imply that only particular regions outside of Scandinavia are treated in further details. Relations with the Continent, England and Ireland are considered for their military

character ('Continental defenses against the Vikings'; 'Viking camps in England and Ireland'), while the 'East' appears under friendlier, more pacific headings (e.g. 'Neighbours along the Southern Baltic coast'). The North Atlantic is absent.

A concurrent large-scale exhibition, however, presents a diametrically different view. *We Call Them Vikings* was shaped as two touring exhibitions by the Swedish History Museum and has been displayed at the Field Museum in Chicago and opened in November 2015 at the Schloss Schallburg in Austria. Its focus is to call our 'traditional view of the Vikings as brutal, bloodthirsty barbarians […] into question' by focusing on the people, their society and culture, and their roles and relationships in everyday life (We Call Them Vikings 2015). The contribution of recent archaeological discoveries is highlighted as challenging pre-conceived ideas – a most reassuring approach for other fields of Viking scholarship not dealing with politico-military history.

Based on this overview, several co-existing trends appear: the Viking age and the Vikings are often described in a stereotypical manner by reproducing well-established clichés, formulated almost identically from one volume to the next and creating a schizophrenic image of the Viking as both bringer and destroyer of civilization; alternative views, generated by a large body of research on social, cultural and economic aspects (e.g. a number of now unavoidable volumes about urbanization and trade, e.g. Clarke and Ambrosiani 1991, or about women, e.g. Jesch 1991), have made the Vikings 'soft', and their brutality needs to be re-established; some aspects of the Viking period are better illustrated by events taking place in a selection of usual – regional – suspects grouped in an East/West dichotomy and very unevenly treated. Thus, we are currently witnessing a remarkable, though far from universal, development in the dissemination of knowledge about the Viking age, where a lot of the research conducted in the past 30 years does not seem to be part of 'what you need to know', and where the complexity of the period and its geographical span are being simplified and narrowed down to what is relevant to an Anglo-Scandinavian sphere, hereby catering to the public's expectations about the supremacy of the Scandinavian Vikings.

The Anglo-Scandinavian bias: a tentative explanation

While scholars often highlight the extent of the Vikings' achievement by drawing the distant borders of the ground they covered, the Viking world has a remarkably variable geometry when it comes to considering the period in detail. While the world in the Viking age never ceases to expand (Sindbæk and Trakadas 2014; Sindbæk 2015), how are we then to understand the current reduction in scope of the Vikings' world and the increasing Anglo-Scandinavian focus? One can find an explanation on three levels: cultural (what the public wants), scientific (the state of research and the available sources) and political (that of academia and of the rest of the world).

Indeed, the Vikings could not be more *dans l'air du temps*: they are commonly used in commercial branding (e.g. Winroth 2014, p. 9) and cultural branding (Pries 2014), leading some historians to fear for possible misuses and misrepresentations of national history for the sake of entertainment rather than knowledge dissemination (Stockmann 2015). They have also become a useful tool for European construction as they suggest a shared – though not necessarily mutually appreciated – European past (Sindbæk 2013, pp. 81–82). The whole world is being inspired by the Vikings. Through their hyperactive exploitation of trade routes they appear as paragons of an early medieval spirit of enterprise and the instigators of the liberal and entrepreneur ideal in today's Anglo-Saxon world – and beyond! (2013, p. 84). In its acclamation of the Nordic welfare state and economic dynamism as a model for reforming the public sector, the American Journal *The Economist* used the name Vikings to refer to the modern inhabitants of the Scandinavian countries as a convenient point of reference for an American audience: 'If you had to be reborn anywhere in the world as a person with average talents and income, you would want to be a Viking.' (The Nordic countries 2013). Admittedly, modern Scandinavians have not inherited this model from the Vikings, and no line of continuity seems implied. Instead, it is significant that the 'smallish countries' of Scandinavia become easier to situate and to relate to when they are incarnated by a hairy man wearing a horned helmet.

In the Vikings' taste for blood and for fearless adventures overseas, one may find ideals of masculinity, free-spirit and independence from the conformist rules of society. Winroth reminds us that 'while we may sympathize with and grieve for their helpless victims and feel put off by all the mindless slaying, we can scarcely help admiring the strength, courage, and virility of the Vikings' (Winroth 2014, p. 8). The success of re-enactment groups of Viking warriors, of HBO television series *Vikings* and of the latest exhibition *Viking* in Copenhagen, Berlin and London, leaves no doubt as to the appeal of this aspect of the Viking age among the public. The idea of independence even inspires political claims, for example in Scotland, where the Scottish National Party (SNP) wished in its campaign towards the referendum on 18 September 2014 to establish closer relations with Scandinavia, based on historical (i.e. Viking) and current affinities with Norway in particular (Kelly 2011).

The public's fascination with this aspect of the Viking age can possibly explain the current Anglo-Scandinavian focus in some curatorial and editorial choices. Indeed, politics, raids and military campaigns are traditionally seen as a trademark of the events in this part of the Viking world in opposition with the trade-oriented Eastern expansion, although there is abundant and long-known evidence for both aspects in both regions. A look-back at the research history may explain this unbalance. The Viking age as a historical period was created at a time when archaeology was in its infancy. Its definition thus relied essentially on written sources, mostly available in large numbers, compiled, edited and translated for the early medieval Anglo-Saxon and Frankish areas. Therefore, lands and phenomena not fitting the accepted definition and with few or no contemporary written testimony for having experienced the Viking phenomenon have since the beginning of scholarship received less attention, a trend which has largely been reproduced by later research.

Admittedly, the amount of evidence for Scandinavian activities and contacts in the favoured regions of the British Isles and the North Atlantic, both textual and archaeological, is extensive, much more than in Finland, for example, where evidence for traditional Viking activities – raiding, plundering and settling – is virtually inexistent, may it be written (Ahola and Frog 2014b, p. 30) or material (Raninen *et al.* 2014, p. 339). Scandinavian contacts also appear in the linguistic and toponymical records (Schalin and Frog 2014), but the scarcity of examples indicates minor Scandinavian impact in comparison with their abundance in England and Normandy (Fellows-Jensen 2008, Ridel 2014). Changes in the source situation, namely with new archaeological discoveries, are constantly challenging our definition of the Viking world (e.g. the discovery of the settlement at L'Anse aux Meadows in Newfoundland in the 1960s, Ingstad 1977), although the extent to which they effectively achieve a paradigm shift seems rather limited. This is visible, for example, in the *Viking world* which, although very inclusive towards archaeology, remains very close to the Anglo-centrist tradition. Written sources documenting Viking activities, both trade and raids, are no longer considered sufficient, and having an archaeological confirmation of 'what we know already' (Sawyer cited by Rahtz 1983, p. 15) has become paramount. The lack of archaeological finds in Normandy, for example, never ceases to puzzle in light of the wealth of evidence provided by written sources (for a summary of the discussion, Moesgaard 2011). Current projects are also aiming at gathering new material, for example in Galicia where archaeological structures revealed after a storm in 2014 may be comparable to constructions of documented camps in Ireland and England (Digging up the 'Spanish Vikings' 2014), or in Turkey, where objects of Scandinavian types identified at a recently excavated Byzantine settlement on the shore of Lake Kucukcekmece near Istanbul may indicate a port-of-trade visited by the Rus', as mentioned in the written sources (Stambuł/Konstantynopol-Kucukcekmece 2015).

However, a lack of sources cannot explain the relative neglect towards the Western and Eastern Baltic. Evidence for some of the phenomena characteristics of the Viking Age have long been known there: traces of early sea-borne urbanization in the eighth and ninth centuries with the today Polish market-places of Wolin and Truso/Janow Pomorski (Jagodzinski and Kasprzycka 1991, Bogucki and Jurkiewicz 2012) and, earlier on, at the settlement and attached burial ground at Grobina in Latvia, already excavated before WWII (Nerman 1958); the burial ground and trading site at Wiskiauten, now in the Kaliningrad region, already investigated in the

mid-nineteenth century (Ibsen and Frenzel 2010), and of Staraya Ladoga in the territories of Karelia, ceded by Finland to Russia in 1940 (e.g. Sedov 1985). Rich evidence for trade does not imply that the Viking age in the Baltic was a peaceful era. Although the written evidence is more or less inexistent, the single, contemporary mention in the *Vita Anskarii* (Rimbert (1884), chap. XXX, pp. 60–61) of a military attack may be attested in the archaeological record from the site of Apuolé (Lamm 2009, p. 133–137). More recently, the ship burials from Salme on the island of Saaremaa in Estonia can be counted as one of the most spectacular archaeological discoveries of the past decade for the Viking age (Konsa *et al.* 2009). If one interprets the find as the remains of a typical Viking attack, this implies that the Viking age did not start at Lindisfarne in 793 but about half of century earlier, in another sea. One might wonder, then, how the Viking age as a whole would have been defined if the Baltic region had had clerics to record their bloody encounters with seafaring people from the North.

Thus, the existence of sources, textual or material, does not guarantee inclusion in the Viking sphere; these sources also need to be accessible to the international research community. Linguistic and political issues have hindered to some extent the spreading of information. There is no need arguing about the absolute domination of English as academic language, a development which is obviously not unique to Viking studies. The Viking world is studied in many countries and equally numerous languages. It so happens that the British Isles and Ireland are not only one of the best documented areas of the Viking expansion; their scholarship is also composed of English speakers, communicating and publishing in their own language. As research in English is today more read and cited than in other languages, it results, rather simply, that research produced in other languages has a lesser impact and is less integrated in the general rendering of the great outlines of Viking history. This is arguably the case for Polish research (Gardeła 2015, p. 214).

Besides the linguistic aspect, communication between international scholars has to some extent been conditioned by twentieth century geopolitics. One of the most venerable institutions in Viking studies, the Viking Congress, illustrates perfectly the heritage of WWII in the constellation of the delegate countries (Sindbæk 2013, p. 84–85). Russia and other continental European countries were not invited; neither was Germany, who had made abundant use of the Viking imagery in the Nazi period. Sixty years later, the situation has little evolved. East European scholars have been invited as special guests sporadically, and the – very few – German delegates are attending as representatives of Schleswig-Holstein (e.g. 17th Viking Congress, Participants 2013). The core group of the Viking Congress, the British Isles and Scandinavia with its former commonwealth (i.e. the Faroe Islands, Iceland and Greenland), were the winners of the post-WWII alliance. Scandinavia especially would rather look towards its Anglo-Saxon connections than its Germanic affinities (Sindbæk 2013, p. 84). The Cold War comforted the North-Western European isolation – and self-perceived domination – by making scientific collaboration between East and West difficult and by reducing, at least in appearances, the contribution of Russia and the Baltic to the study of the Viking age to the limits of the Normanist controversy (e.g. Hannestad 1970, Klejn 2014). The most inclusive endeavour of public dissemination in terms of geographical span to date, the exhibition *Les Vikings*, was achieved because of the recent fall of the Eastern bloc which enabled access to museum collections all over Europe. It should also be underlined that the exhibition was supported by the European Council as an initiative promoting European integration (Mohen *et al.* 1992).

Challenges from the East: towards a new definition?

The vision of the Viking world *a minima* offered by some recent publications and exhibitions is not the only new trajectory taken by Viking scholars. Others are promoting a definition of the period not centred on the politico-military role played by ethnic Scandinavians in a small number of regions of Western Europe, but on the many processes ongoing across the continent at the time corresponding to the Viking age, focusing for example on the more theoretical question of identities on a larger scale (e.g. Jesch 2015). A particular approach, particularly critical to the established Anglo-Scandinavian scholarship, has also emerged in the regions which have

been somewhat neglected in the recent overviews, namely the Western and Eastern Baltic.

In the light of the abundance of sources, contacts with Scandinavians and the impact of these contacts on the local culture appear 'largely understudied' in Poland. Finding Scandinavians in the archaeological record is indeed not new (cf. Żak 1963, 1967) and continues to attract interest (e.g. Stanislawski 2013). This enthusiasm has been criticized by Leszek Gardeła, who has judged often too simplistic the ethnic identification of archaeological remains, chiefly of burials containing Scandinavian objects or features interpreted as belonging to migrants from Scandinavia – anything exotic being seen as 'Scandinavian' or 'Viking' (Gardeła 2015, p. 216). This is for example the case with chamber graves, which have sometimes been interpreted as potentially Scandinavian (Buko 2008, p. 404–414), whereas Gardeła would rather understand the non-local traits in the light of supra-regional identities (Gardeła 2015, p. 227). Gardeła's work on Scandinavian amulets and cultic objects is also showing the importance of the exchange of ideas between North and South of the Baltic Sea (Gardeła 2014) rather than on their mere transfer from North to South; an idea which has also been stressed by scholars studying Slavic material culture in South Scandinavia (Roslund 2001, Naum 2008).

The same line of thoughts, though in more provocative terms, can be found on the Finnish side in a recently published anthology, *Fibula, Fabula, Fact. The Viking Age in Finland* (Ahola *et al.* 2014). The volume presents in English the results of a series of seminars held in the frame of the project *The Viking Age in Finland*. Showing ambitions of breaking with tradition by 're-conceptualizing' and 'reframing', an objective visible in the relatively sparse references to international Viking research (Scandinavia, Western Europe and the Southern Baltic), the book seeks to frame events and cultural practices in Finland during the Viking period, to assess the possible impact of the Scandinavian expansion, and 'to negotiate a definition of the Viking Age as a historical period in the cultural areas associated with modern-day Finland' (Ahola and Frog 2014a, p. 8). As in Poland, interest for the Viking age in Finland is not new, although it has been more often rejected than integrated as a result of the problematic political situation with Sweden and the Swedish-speaking minority in Finland, the Viking age being seen as Scandinavian, thus not Finnish, heritage (Aalto 2014, p. 140–147). But, in comparison with Poland, the source material attesting contacts with Scandinavians or their presence is very limited, and has sometimes been interpreted in a way which is now, as in Poland, deemed over-enthusiastic. Raninen and Wessman are critical, as well as Laakso, of previous attempts at finding Vikings in the archaeological material, for example at Luistari (Laakso 2014, p. 140–147) or in the Åland islands where the Scandinavian material has, in their opinion, been over-interpreted in regards to the finds relating to the Finnish mainland and the Baltic region (Raninen *et al.* 2014, p. 329–330).

Finland experienced the Viking age *stricto sensu* as a 'contact zone' for different groups of Scandinavian, but mostly Baltic and Finno-Ugric traders, who would pass by for collecting certain products such as furs (Heininen *et al.* 2014, p. 304) on the way towards lake Ladoga, lake Ilmen and the fluvial transport system of Ancient Rus'. The Ålanders may have facilitated trade, and some Finnish coastal communities would have linked the 'Germanic Scandinavian' travelling merchants and the inland Saami (Heininen *et al.* 2014, p. 307; Raninen *et al.* 2014, p. 334). The 'Viking effect' was thus limited to coastal areas, and most territories of modern-day Finland seem to have been exempt from the 'silver fever' (Raninen *et al.* 2014, p. 335; Talvio, 2014, p. 134), one of the most common explanations for the Viking expansion to the East. Identity-wise, the presence of swords and Scandinavian artefacts attest the valorization of some aspects of foreign culture among the North Finnic populations 'in relation to perception of power' (Heininen *et al.* 2014, p. 308). The many communities of these vast territories thus saw or heard very little of this foreign Viking age.

The editors of *Fibula* admit to have 'wrestled' with their effort at combining Viking Age and Finland (Ahola *et al.* 2014, p. 485). This led them to formulate an alternative to the traditional definition of the period, which they only find relevant for the events and scholarship in the Anglo-Scandinavian sphere (Ahola and Frog 2014b, p. 23) and more of a technical expression than an adequate tool for Finnish archaeology (Raninen *et al.* 2014, p. 327). As what was happening in Finland in the Viking age does not seem to have been 'triggered' by

contacts with 'ethnic' Scandinavians (Ahola *et al.* 2014, p. 488), the significance of these contacts as criteria for the Viking age is deemed overemphasized in international research and even as a hindrance for studying the period in Finland (Raninen *et al.* 2014, pp. 329–330). While Gardeła advocated the importance of exchanges and cultural processes between populations of various regions, involving Scandinavians but not determined by them, *Fibula* promotes the Viking age in Finland as an 'era of historical development impacted by Scandinavian contacts, but also paralleled to them (…) in culturally distinct ways' (Ahola *et al.* 2014, p. 489). Instead of being characterized by the maritime expansion of 'ethnic' Scandinavians, the Viking age as a whole is seen as a time of 'inter-regional developments and their influence on various societies of the period' (Raninen *et al.* 2014, p. 327).

The Scandinavian hegemony over Northern Europe in the period *c.* 800–1100 has also been attacked by Przemysław Urbańczyk, who critically assesses the roots of the idea of a Nordic civilization embedded in that of the Viking period (Urbańczyk 2009). Urbańczyk finds the idea of 'civilization' highly connoted and problematic – those who are civilized (here, the Scandinavians) can only spread their superior culture among the barbarians (here, the Slavs) in a top-down process (2009, p. 156–157). While these ideas are not supported in current Viking research, they are an underlining part of its history. To mention one example, the work of one of the greatest names in Danish archaeology, Johannes Brøndsted, deserves a closer look. The Viking world presented by Brøndsted in his introduction (Brøndsted 1979 – first published in 1960) is geographically remarkably broad, especially in the light of current developments. While this large scope has perfectly valid scientific reasons, it might also reflect a certain view on the grandeur of Northern civilization – the more those subjected to it, the greater its glory. When asking 'why was the North strong and the rest of Europe weak?'('hvorfor var Norden stærkt og det øvrige Europa svagt?', 1979, p. 7), Brøndsted postulates that the Vikings' success laid in their strength, which enabled them to take control over most parts of Europe. Brøndsted was certainly writing a national (in the sense of the Scandinavian family) history, praising the Vikings for having 'made their era the greatest of the North' ('som gjorde deres tid til Nordens største', 1979, p. 24).

If this was indeed Brøndsted's agenda, and if Urbańczyk is correct in his assessment of the dangers of the nationalist and isolationist approach to the Nordic civilization (Urbańczyk 2009, p. 137; pp. 146–147), we must conclude that finding Vikings abroad is about affirming the superiority of ethnic Scandinavians over other populations – an obviously criticizable, nearly racist approach. Instead, Urbańczyk promotes a more processual approach to the Viking age as a period marked by reciprocal relations in which various ethnic groups were involved (2009, pp. 157–158), underlining at the same time that the Scandinavian populations themselves were not ethnically 'pure' and uniform (2009, pp. 139–143). This definition of the Viking age, although not explicitly advertised as being so, seems particularly adequate for the tenth–eleventh century Baltic region including the Slavic areas (2009, p. 158), which have, as also stressed by Gardeła, been largely ignored in a Viking world looking straight West or straight East.

Vikings at the crossroads: splendid isolation or total integration?

This Baltic, 'processual' trend is obviously rather new, but the ambition of challenging the traditional definition of the Viking age through an emphasis on the importance of specific historical processes over that of the agency of actors defined in terms of the modern nation-states will need to be followed. While these propositions concern mostly the regions which have not received much attention in mainstream, Anglo-centrist research recently, there is certainly more to the claim of these Polish and Finnish scholars than correcting an unbalance. Thus, is the international Viking research community to take up their critique and redefine the Viking age altogether?

It is true that Viking research in its traditional sense has been and is still biased towards the West, and does not include the Baltic sufficiently. While language and political antagonisms were a limitation for including the Baltic region and Eastern Europe during the Cold War, these can no longer be taken as an excuse. The fruitful Scandinavian-Baltic collaboration which immediately followed the fall of the Eastern Block resulted in a number of joint ventures:

the exhibitions already mentioned but also conferences and anthologies (e.g. Jansson 1996a, Jansson and Fransson 2007, Bjerg *et al.* 2013). New finds and, not least, the dynamism and desire of Baltic scholars to present their research to the international research community will presumably lead to a greater inclusion of the Baltic region in the general lines of Viking studies. Hopefully this will break the false dichotomy which still opposes the West and the East as separate scenes for politico-military expansion and for trade.

It is also certainly a sign of intellectual dynamism within a research field when knowledge established in former research is being challenged and when scientific 'truths' are deconstructed. The issues raised by the 'ethnic' definition need to be addressed by the international research community to a greater extent, not only because of the connoted idea of a superior Nordic culture and its political misuse in the past, of which most scholars are well aware, but also because of current trends in humanist research. Contacts, networks and interactions are central contemporary issues of debate on the global plan, but also echo with some of the most fascinating aspects of the Viking age, thus offering an amazing intellectual playground for investigating the processes engaged at cross-cultural encounters. The multiple identities formed hitherto are an interesting contextual product of a much broader interconnectedness. Taking into account these aspects may lead to consider a more dynamic Viking age, where identities all over Europe were negotiated, and where political, economic and cultural developments fed one another.

However, a clear balance between the defining role of these developments and that of the Scandinavians needs to be found. Indeed, a lot of the characteristics of the alternative Viking age seem rather unspecific and more generally applicable to the Early Middle Ages on a European scale. The proposal made by the authors of the chapter on geopolitics in *Fibula* illustrates well the matter at stake. They see the Viking age as a time when Northern Europe was 'reconstructed' as a 'coherent' area (Heininen *et al.* 2014, p. 296) and 'Europeanized'. The combination of kingdom formation and of the Church as an increasingly important geopolitical actor (2014, p. 307) 'restructured peer-polity interactions' (2014, p. 309). The Europeanization happened when Europe (i.e. Western Europe) became aware of Scandinavians. By 'maintaining routes from the north to the Mediterranean […], the Scandinavians "drew up" the borders of Europe as they are understood in the twenty-first century (referring to Käkönen 1998). Thus, the Vikings did nothing more nor less than redefine Europe' (Heininen *et al.* 2014, p. 307). Through Christianization, the Northerners became integrated in a shared European identity (2014, p. 306; p. 315). The Christian kingdoms of Scandinavia believed in the 'valorization of Continental court practices' (2014, p. 308), while the elite abandoned its models of identity based on courage, endurance, curiosity and 'adventurousness' to the profit of those of Continental Europe (the authors do not let us know which ones; 2014, p. 310). The Viking age thus becomes the time of the simplification of identities, which reduced in number to be replaced by larger, shared identities (2014, p. 310).

This Europeanization seems a dodgy process. While the efforts of the Scandinavians in gathering Europe may please the European Council, there was no such idea of 'Europe' at the time, and their networks did not assemble the continent in any political or cultural entity which would have a direct continuity with today. Before the Vikings, Bronze Age people have also been given the title of first Europeans (cf. Graves-Brown *et al.* 1996, p. 14–17; now relayed by genetic studies in the popular scientific medias, Jakobsen 2015). The role of conquest, colonization and associated cultural change has also been underlined as part of the construction of a European, homogenous society in the following centuries (Bartlett 1993), but it does not imply that the involved actors thought of themselves as participants in a coherent European culture. Europeanization connotes some form of adoption of a superior – Western European – culture in a top-down process, in a much similar way as the spread of Nordic civilization described by Urbańczyk; a belief in the splendid isolation of Nordic culture before the Viking age; and an evolutionist view on history, with becoming European as a progress towards civilization (the Viking age is even described as a period 'oriented towards progress'; Heininen *et al.* 2014, p. 311). Instead, it is clear that polities across the continent became increasingly connected in the

period corresponding to the Viking age, involving a multiplication of ethnicities (Garipzanov *et al.* 2008), constructed and expressed through intensive cross-cultural contacts. Even after the year 1000, a shared Christian belief cannot be assumed to have erased all differences, and that it was spread across the continent does not make it a marker of European identity.

While describing the Viking age in terms of Europeanization presents a number of problems, the factors selected to define the period (technology and knowledge; mobility; networks; identities and adaptation) appear, although established on the basis of the Scandinavian expansion, relatively unspecific. Technology, mobility, networks and identities are buzzwords of the post-modern world, and of any 'globalized' system, also in the past: the age of discovery in the fifteenth–sixteenth centuries, of the Greek expansion in the Mediterranean from 10th to 9th century BC onwards, etc. This lack of historicity is problematic when one attempts at writing history for such a clearly delimited period as the Viking age, but it is perhaps not a problem for the authors, who seem to believe in the very *longue-dur ée* (Heininen *et al.* 2014, p. 297): everything is always the same, but takes different forms as the frame is changing. Therefore, one can read Iron Age mentalities in nineteenth and twentieth century oral tradition (Ahola 2014, Frog and Frog 2014), for example. Furthermore, these factors are not specific for Viking age Scandinavia or even Northern Europe. Maritime expansion was not just the fact of Scandinavians (Sindbæk and Trakadas 2014). Social, cultural and political developments, settlement increase as well as the emergence of royal and ecclesiastical powers are not exclusive to Viking age Scandinavia either, and similar processes took place in other European territories in the period *c.* 700–1000 (or even up to *c.* 1250 according to *Fibula*), though at different paces and taking different forms according to pre-existing conditions.

With a Viking age broadly defined as 'a time of change', of 'economical, technical, cultural and political exchange and interrelations between peoples, settlements and powers' (Heininen *et al.* 2014, p. 298), it seems that any region of the world at any time of history could have had a Viking age. Also, if the traditional definition of the Viking age, however imperfect it may be, cannot be bowed to the reality of Finland in the generously defined period *c.* 750–1250, so that Scandinavians need to be removed from the picture, why call it a 'Viking age'? Is there such thing as the Viking age at all? Or are we over-emphasizing its importance, 'vikingizing' about and constantly pushing further the geographical and chronological borders of the period?

The proposal of the authors of *Fibula* invites, at the very least, to reflect upon the current definition of the period and its relation to the European early Middle Ages, as the Viking age is beginning to be used to describe what in many ways should be seen as symptomatic of the European early Middle Ages: a time of re-definition of the spheres of power and influence, of cross-cultural contacts, of new settlement patterns, economic strategies, and social and religious ideas. While this is all true, it is not because they occurred – partly – within the chronological frame *c.* 800–1050 (or even *c.* 750–1250) that they belonged specifically to and should define the Viking age. Pan-European contacts and phenomena do not need to be labelled 'Viking' to become more interesting. Urbańczyk describes some of these processes as participating in an 'Europeanization', a term which I have critically discussed earlier. Contrary to Heininen, Ahola and Frog, however, Urbańczyk does not wish to see Europeanization as the spreading of one particular culture, from the West towards the 'rest', but as a whole continent interacting and shaping together a shared culture (Urbańczyk 2009, p. 137). Seeing Northern culture in a European perspective is not new for the Viking age: from the perspective of the populations of Scandinavia who lived at the time, their 'age' must have appeared very European indeed (Brøndsted 1979, p. 279–280), and several of the works reviewed earlier agree on the Viking age being the time when Scandinavians become Europeans, however anachronistic the term may be. Throughout Europe, scholars have established different regional chronologies, some regions being in the Late Iron Age (with a number of more contextual, regional terms) while others were in the early Middle Ages. The lack of a coherent, interregional system may hinder comparison and correlation of contemporary situations. As similar developments seem to have taken place all over Europe at more or less the same time, we may be better off getting rid of the evolutionist distinction that some parts of the continent were still in prehistory while others had already jumped into history.

Furthermore, one cannot remove the Vikings from the Viking age, which is and will remain a term related to Scandinavia, both in scholarship and among the public. The Viking phenomenon involved mostly Scandinavians, whose identities were not uniform and fixed – especially not in terms of the modern national states, and what their interactions abroad did to the situation in their homelands. The Viking age is thus one of the many strange things which happened in the European early Middle Ages, and however industrious they may have been, many phenomena could occur simultaneously and in relation with one another without the Vikings' intervention.

While both former neglect and current academic debates appear as perfectly legitimate grounds for reshaping the Viking age in the Baltic regions, it is hard not to see in the flourishing of new research and the application of 'Viking' as a label a desire to be affiliated to an extremely popular topic. Indeed, everyone seems to want to have a Viking age, both among the public and among scholars. Modern academia aims at producing independent research defined after strategic and innovative scientific agendas. Yet academics are people too, and their interests cannot be separated from current social trends. Besides perfectly legitimate passion for the period, there might be more prosaic motives in choosing – or at least, for having the chance and support – to conduct research on the Viking age. University-based researchers are expected to finance their own research to a large extent thanks to public but also private grants. While it cannot be concluded that scholars choose to work with the Viking age for financial reasons, the requirement of disseminating the results of research projects to the public may be more easily met if those are dealing with popular topics such as the 'traditional' Vikings, their kings, their adventures and their gruesomeness, which incessantly attract media coverage. Gardeła observed that the sudden burning interest among Polish scholars for the Viking age was 'not only fueled by the current research trends in international academia, but also largely influenced by the great popularity of the Vikings in mass media' (Gardeła 2015, p. 215). One is left to wonder to which extent scholars – as well as their publishers and funding providers – are using Vikings as a brand. While it certainly is easier to sell a book if it includes in the title the word 'Viking' instead of 'Late Iron Age' or 'early medieval' (Christiansen 2006, p. 1) – does not the same apply to receiving research funding? The eagerness of some neglected regions to be re-integrated into the Viking world is thus reminding us of the power of fascination of the period and of the many motives being its promotion, not all of which being solidly grounded scientifically.

Conclusion

We can only be pleased by current attempts at addressing the definition of the Viking age. This might be what keeps Viking studies from being a romantic story-telling, only offering to the public what it expects and repeating itself within a simplified and ever more narrowing frame. A number of scholars, most notably from the Baltic regions which have been neglected in recent Anglo-Scandinavian research, are seeking to nuance ethnic definitions and to see the Viking phenomenon not just from the angle of the expansion of individuals of Scandinavian origin but as cultural exchanges and new identities emerging through various contacts involving – or not – said Scandinavians. The provocation of the dominant Anglo-centrist research, both in form and content, is stimulating regardless of the strength of the 'claim' to a Viking heritage they might have – the past is, after all, not owned by anyone. Discussing whether there was a Viking age and of what kind in various regions certainly gives a more nuanced view of the phenomenon: it underlines that Viking activities were highly adaptive to the peoples they involved and the conditions they met, and reminds us that what happened in the British Isles and the North Atlantic is not representative of the entire phenomenon. To reuse a term cherished by the authors of *Fibula*, it is now the time of negotiation and 'reconceptualization' of our definitions and of our field of research, and certainly the Baltic regions will increasingly contribute to this.

At the same time, the Viking age appears victim of its own success and its popularity is at the centre of an identity struggle for both scholars, actors of the tourist industry and enthusiasts. Those who feel entitled to it, based on tradition and national history, are currently emphasizing certain aspects, in a process which resembles a

claim to ownership; those who have not been part of the game are seeking to reinvent it, so there would also be room for them in the exciting Viking community. The Viking age is being twisted in all sorts of direction to match all sorts of purposes, and is starting to remind of a cheap piece of clothing tagged 'One size fits all': it is large, elastic and convenient, but does not actually really fit anyone. The attraction exercised by the period is still not entirely freed from national-romantic ideals. At the meeting point between the too distant, voiceless pre-history and of the supposedly alien Christian, European Middle Ages, the Viking age represents the last echo of an 'Ur'-Scandinavian past, before it was perverted and integrated into a multi-ethnic, foreign community. In Denmark, where this article has been written, the current debates surrounding cultural canons, 'Danishness' and border issues makes of this question a highly political one. As citizens we are free to engage or not in this debate, but as scholars we have as a mission to disseminate the results of our research as they are, and not in a diluted manner in order to gather more visitors, readers or research grants. While studying the Viking age as an independent historical period is scientifically well founded, it will certainly benefit from more fluid views about ethnicities and cultural dynamics, and allow including other voices in the discourse about the past that those who dictated it over a hundred years ago.

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INVITED REVIEW

Reflections on Jørgen Jensen: *The Prehistory of Denmark; from the Stone Age to the Vikings* – Gyldendal, Copenhagen, 2013

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ABSTRACT

In the Danish version, Jørgen Jensen's *Prehistory of Denmark* is presented as the continuation of an archaeological tradition going back to 1843. Jensen's work is the fourth, and what is common to these archaeological descriptions of our past is that they discuss our Danish origin and identity, related to the worldview of Romanticism, and reflect the most important issues at the time of their publication. The background is that Denmark was reduced to a very small state during this period, that Danes migrated to the area after the Ice Age, and that we have lived on the periphery of cultural evolution and civilisation. By presenting his predecessors' reflections on such issues, I analyse aspects of Jensen's work from this perspective.

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In his introduction to the Danish edition of *The Prehistory of Denmark; from the Stone Age to the Vikings*, Jørgen Jensen (1936–2008) positions his book as a historical continuation of an old tradition in Danish archaeology, a tradition with three predecessors. The first is Jens Jacob Asmussen Worsaae (1821–85): *Danmarks Oldtid – oplyst ved Oldsager og Gravhöie*, of 1843, translated into English in 1849 as *Primeval Antiquities of Denmark*. According to Jensen, this book presents Danish prehistory as a Golden Age painting, and was written in a time when the old landscape as it was formed in the Iron Age was disappearing because of the relocation of the farmhouses from the villages to the fields. The second book in this tradition is Sophus Otto Müller's (1846–1934) *Vor Oldtid. Danmarks forhistoriske Archæologi – almenfattelig fremstillet* (*Our prehistory. Denmark's prehistoric archaeology – presented in a general understandable way*), of 1897, which Jensen characterises as showing the proud, national archaeological science, after the defeat by the Germans in 1864. This book reflects the national regeneration during this period. The third work within this tradition is Johannes Brøndsted's (1890–1965) *Danmarks Oldtid* (*The Prehistory of Denmark*) in three volumes, published between 1938 and 1940, which, according to Jensen, reflects the time just before the Second World War. Finally, there is Jørgen Jensen's own *Danmarks oldtid – The Prehistory of Denmark* in four volumes, published between 2001 and 2004. As I will show, this work may be characterised as reflecting a globalised Denmark in a combination of a 1960s anthropological perspective and the ideology of postmodernism.

Comparing these four works shows an enormous development in the knowledge of Danish prehistory, from Worsaae's 123 pages to Jensen's 2560 pages. In addition, the duration of our prehistory, that is, the time between the first known human presence within what is today Danish territory, and the end of the Viking Age, with the arrival of Christianity, is extended during the four presentations of our prehistory by 12,000 years, from a beginning in 1000 BC in Worsaae's book, to a beginning in 13,000 BC in Jensen's. In spite of this extension of prehistory, it did not change Christian Jürgensen Thomsen (1788–1865) famous division into a Stone Age, a Bronze Age and an Iron

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All quotations except Jensen 2013 are translated by the author.

Age, a tripartition that more or less structures the two first works, and gives titles to the volumes of the two latest. It looks as though this tripartition of Danish prehistory has itself become a national monument.

Because Jørgen Jensen regards his books as a continuation of a tradition this paper presents some of those traditions, in order to situate Jensen's contributions in the perspective of his predecessors. The framework for this is the national romanticism that has been very significant in the construction of the Danish self-image, and in Danish prehistoric archaeology during the whole period. I want to show how Jørgen Jensen manages this tradition in his construction of a Danish twenty-first century prehistory, with consequences for his idea of a twenty-first century Danish identity.

All four works refer to archaeological artefacts exhibited in what was in Worsaae's time 'The Museum of Northern Antiquities', and in 1892 became the National Museum. Here in the country's main museum, located in the capital, chosen archaeologically-educated employees, often with our four authors in executive positions, have been authorised to choose those artefacts they decide are representative of the national history, no matter where in the country they are found, and no matter where in the world they were produced. The less spectacular artefacts are returned to the museums in the provinces, where they are exhibited as representing the local, and thus much less sophisticated or developed culture, compared with the national level, and the level in the capital. In connection with the prehistoric exhibitions in the National Museum, a history of Denmark from the earliest times is constructed, a history that, with all the finest artefacts, is meant to give Danes a historical identity as national (but not nationalistic) citizens, in accordance with central issues at the times of the publication of the prehistories, and openings of the exhibitions. These prehistories have always been confined to the geographical borders at the time of publication, and because during the whole period discussed here, Denmark was a small state with a past as a leading European state, our grandeur and pride lay in the past, and not in the losses of land. With selected artefacts, the National Museum constructs a common Danish historical and original identity, and the books discussed here – and many other more specialised books – communicate the results to primarily the whole country but also to the World.

It was a given that the people living in what is today Denmark had migrated to this area from elsewhere. This was consistent with both the Christian worldview and the descent from Noah and the repopulation of the earth from Mount Ararat, and with the scientific worldview following the discovery of the existence and extent of the Ice Age, in 1837 and after. Because of this descent from immigrants, Danish prehistory had to construct a national culture in a global context, given that both the people and the culture or elements of culture came from outside. The challenge and task was to combine this with the construction of autonomous Danish activity and creativity, that is, to avoid making Danish culture the product of solely foreign – and especially German – impact. Danish culture had to be primarily a product of Danish natural or human creativity, to make it a common past to be proud of, and a contemporary tradition to unite the people.

The contemporary relevance of prehistory

According to Worsaae, an awakening of the Danish people happened around the beginning of the nineteenth century, and a part of this awakening was the inclusion of prehistoric monuments as part of the national tradition and identity. Worsaae notes that this reflects and is consistent with Romanticism's idea of the importance of a national history in the construction of a national identity. One result of this awakening was a fine collection of ancient artefacts from all over the country, made available to the people, free of charge. However, Worsaae also recognised that this served people from Copenhagen only, and this was the reason he wrote his book. In this way, people from the provinces who had patriotically collected and delivered many fine artefacts to the museum could see their beneficial use.

The 1840s were a time when the last elements of the earlier Danish status as a major Nordic power had disappeared, both at sea, with the British destruction of the Danish navy in 1807, and in land, with the loss of Norway in 1814. In addition, it was a period when ideas of regional separatism threatened to divide the country further (Frandsen 1996). That was the reason it was so important to

also address the burghers and farmers in the provinces, to remind them of their Danish nationality, or make them national-minded. This may also explain why the book was published at the request of the king, after Worsaae had lectured on prehistory. In accordance with this, Worsaae describes the roots of the Danish people and its relations to neighbouring peoples:

> A people with self-esteem and esteem for its independence … must necessarily look back on the past to inform itself of the tribe or nation it belongs to, and which kind of kinship relates it to other peoples, and whether, from the beginning of time, it lived in its present country, or migrated to this area later, and its fate over time; in short, to learn how it has become what it is today. The reason is that only when a people is aware of this will it achieve full awareness of its uniqueness, and only then will it be able to forcibly protect its independence, and eagerly work for greater future development, and thus promote the fortunes and esteem of the fatherland. … It is obvious that it is very important for us Danes to obtain the most exact knowledge possible concerning our ancestors' immigration, origin, customs, traditions and achievements. (Worsaae 1843, p. 1–2)

According to Worsaae, the Danes are the descendants of a proud Gothic tribe that immigrated to the country with a Bronze-Age culture, and later incorporated iron into the culture without letting the weaker Goths, who came with the iron, take control of our country. The weaker Goths with iron became Norwegians and Swedes. This reduction of especially the Swedes might be a reaction to the traditional Swedish identity as the real and finest Goths (Jensen 2002). It is more interesting that here, Worsaae demonstrates that culture can diffuse from one people to another, something that was generally accepted by cultural historians only 50 years later. It was important to Worsaae to make Danes descendants of people we could admire and be proud of.

Sophus Müller wrote his book at a time when the territory of Denmark had been further reduced since Worsaae's book was published, with the loss of Schleswig and Holstein, following the war of 1864. This was also the period when, after a showdown between the bourgeoisie and the farmers on the one side, and the land-owning aristocracy on the other, a parliamentary democracy was on the agenda. The aristocracy had been in power since 1875, supported by the king, and without constitutional legitimacy. Moreover, it was a time when the labouring classes began to be a force in the parliament. Thus, it is not a regional or national split that Müller confronts, but the struggle between classes, primarily the struggle and triumph of the bourgeoisie over the aristocracy. Müller expresses this by pointing out that archaeology will be the archaeology of the people:

> Rather than aristocratically counting the ancestors back to the Middle Ages, the study of prehistory regards itself as a child of the new époque, born on the morning of the century of freedom. Proud to have grown from the bosom of the people, it maintains its free and peculiarly exceptional position. It will continually attract both commoners and scholars, and those words that were once written on the flag will not disappear: equally popularly and scientifically. (Müller 1897, p. 702)

By exposing the past, the people's science will tell the Danish people who it is.

It was up to Johannes Brøndsted to formulate the national heathen past of the interwar period. His *Danmarks Oldtid – Danish Prehistory* was published in three volumes, *The Stone Age* in 1938, *The Bronze Age* in 1939, and *The Iron Age* in late 1940, the last published after the German occupation of Denmark, in April 1940. His presentation of the Danish past was characterised by a new and, for the interwar period, typical self-image: that Denmark was just a small and rather insignificant country on the periphery of Europe, a Europe governed by superpowers such as Germany, France and Great Britain. This identity had its famous popular expression in a poem from the Danish workers' party poet, Jeppe Aakjær (1866–1930). With reference to the Great War, when Denmark was neutral, he in 1916 described Denmark as a tiny country, clandestinely enjoying its cosiness in a remote corner of the world while the whole world is burning around its cradle (Aakjær 2006, no. 468). This poem described Brøndsted's opinion very precisely. This already appears in his introduction to the Old Stone Age or Palaeolithic period, of which Brøndsted writes: '… against the background of World History, the 10–20,000 years of life on this spot on the earth is a late and limited part of an enormous totality' (Brønsted 1938, p. 13). However, what we no longer are we once were; from our prehistory, we can feel

pride for our people's earlier importance in world history. Twice we have been a superpower. The first time was in the Early Bronze Age, and the second was the Viking Age, when the Nordic countries were very powerful, and operated far from their home countries. (Brøndsted 1940, p. 308).

In the 1970s, Jørgen Jensen published a shorter Danish prehistory as the first volume of a Danish social history. The title of Jørgen Jensen's contribution was *Oldtidens samfund. Tiden indtil år 800* (*The prehistoric societies. The period until AD 800*). This book, published in 1979, reflected the contradictions in Danish society at the time of publication, only 6 years after we had joined the EEC (now EU), and with an economy in crisis. Here, Jensen very strongly rejected cultural changes as the result of the immigration of foreign peoples. Instead, he argued that Danish prehistory was the result of a dynamic between different crises and Danish self-sufficiency. Here, in the aftermath of our inclusion or integration into the EEC, there was a fear among leftists and nationalists that, economically, Denmark would become a remote German province. In this situation, it was important to Jensen to demonstrate that we were in no danger of being overpowered physically or culturally from the outside, and that we were in full control of the impact or import of cultural elements from the continent.

The 1970s were also a time when theories of social systems were central to sociocultural analysis in the understanding of societies, cultures and humans. This is reflected in Jensen's construction of a tight, systemic relation among population density, occupations, social patterns, and settlement, as mutually conditioning one another. The dynamic of the system was presented as a kind of a crisis cycle, where a renewal of technology, most often actively chosen and imported from the outside, made possible a greater population density, thus solving the crisis for the moment. Nevertheless, by and by, a new overpopulation develops, resulting once more in a shortage of food. Again, new technology is developed or imported, which again leads a growth of the population and to a food crisis, which again causes the import or development of new technology, and so forth. Within this dynamic, the population density determines the social system. The essence of this prehistoric experience is that we ourselves determined what was imported from outside, and that we have always been able to manage the crises we have been confronted with.

Jørgen Jensen published the Danish version of *The Prehistory of Denmark* at the turn of the millennium, when nationalism was eagerly debated in Denmark, and when a book with a national perspective was easily misunderstood as nationalistic. A rather right wing party, The Danish People's Party, promoted nationalism as its central political topic and was strongly critical of Muslim immigrants who did not integrate into Danish society. The supporters of this party were primarily less-educated people from the provinces, and their opponents were primarily those who considered themselves the intellectual, cultural and creative elite. This creative elite lived in the capital, and with their favourite newspaper, *Politiken*, they distanced themselves from, and were hostile to The Danish People's Party and its supporters. A Danish prehistory with a strong nationalistic perspective in the style of its predecessors would easily expose its author as a suspect supporter or sympathiser with The Danish People's Party, and the book might possibly be part of the political propaganda of this party. If this happened, it would politically and intellectually discredit any intellectual and humanistic author, in the eyes of the cultural elite. In addition, there were also other themes of great importance to this elite group, such as biodiversity, cultural relativism, globalisation, environmental and/or climatic awareness, and the idea of extreme individualism. As an example, the climate debate is commented on in Jensen's description of the rising sea during the Palaeolithic. Referring to the period of 7000–6000 BC, he continues:

> The perspective is thought-provoking at a time when we discuss the future effects of the so-called greenhouse effect. It can create a new melting of the ice masses at the Poles. Climate scientists consider this to cause a rise of the oceans in the order of ½–1 metre. In 50–100 years, we contemporary humans may also have to move our settlements further into the country. (Jensen 2001, vol. 1, p. 136, not included in the English edition p. 74).

In comparison to the three earlier books on Danish prehistory, globalisation is evident in the very structure of Jensen's prehistory. He does not start with the first immigration into the area of our country after the Ice Age, nor with the first signs of humans in this area. His introductory chapter begins with human origins in Africa, and presents this in accordance with the so-called 'Out-of-Africa' hypothesis,

which had been the dominant theory since 1987, although contested by the so-called 'multiregional' theory (Høiris 2016 – forthcoming). After this, Jensen restricts his perspective to the earliest cultures in Europe, and finally, he further reduces his focus to what he calls the 'North European' or the 'South Scandinavian' area, denoting the area as 'Danish' only very seldom. He presents the culture of this area as partly the object of, or adapted to the northern nature, partly the result of various impacts from Central and South European imperial cultures. In this dialectic between cultural impacts from the South and contemporary existing culture, that is, cultural contact on the one side, and the adjustment of the new to the Nordic nature in securing existence and development on the other, Jensen constructs a space that allows him to present the Nordic people as active subjects in their own history. After his four volumes, Jensen finishes both the publications, the Danish as well as the English, with a national but not nationalistic morale:

> Trying to recall the history of human existence in what we have called Denmark for the last thousand years means recalling the diversity of both nature and mankind. For as has been said at the beginning of this book, one of the greatest challenges of our time is the battle against the impoverishment of biological diversity that is expressed by the extinction of species. It is an equally great challenge to preserve – through the study of human history – an understanding of the diversity of culture. If we connect the two, we understand that the eternal Denmark is to be found precisely where one encounters the fine interaction between the culture of bygone times and the freshness of nature. A glorious land of sun, rain, of weather fair and rough, with fog and wind, and with windswept beaches where the waves eat up the shore, and the seabirds fly off in screaming flocks. (Jensen 2013, p. 1093)

That was as far as you could go with nationalism as a member of the Danish creative elite in Copenhagen. The interplay between culture and nature was the kind of patriotism to which Jensen, with his four-volume Danish, and posthumous 1093-page English *Danish Prehistory*, relates. This is a very different form of patriotism, compared to that of the three earlier authors, for Jensen also appeals to the European part of our nation and national identity. In the chapters on the Viking Age, he argues a couple of times that history is made in Europe, and, that it is from this part of the world we got the inspiration to develop ourselves: 'During the ninth century, and until after the year 1000, craftsmen made artistic works, and always as a result of impact from either the continent, in the South, or from the British Isles, in the West, but always modified to retain the special Nordic Tone …', and 'Many of the Danish chieftains seem to have been of the opinion that it was time to seek inclusion in the European community'. This happened with King Harald Bluetooth accepting Christianity (Jensen 2006, vol. 4, p. 471, not included in the English edition before p. 1039; see also 2013 p. 1061). And, Jensen goes on to say that we ought not to isolate ourselves from globalisation: 'Strong foreign movements were what, in a short period of time, transformed Denmark into a mediaeval European society'. (Jensen 2006, vol. 4, p. 558, not included in the English edition before p. 1089)

Related to the debates in Denmark at the time of publication, the message is clear. History has taught us to not isolate our country, but that it is better to join Europe, as we did when we became Christians in the Viking Age, the apex of Danish historical, ideological identity. The obvious interpretation of this is that it marks Denmark as a part of a common European culture, a part of the EU, and a society open to foreigners who might seek our country and inspire us.

The dynamics of history

Worsaae did not discuss the dynamics behind development, evolution or history. This was not an issue during the romantic period, given the particularistic conception of history. National histories were not determined by external forces, but by internal ones, perhaps innate in the people itself, and the present was seen as the product of history, which in turn was the result of many coincidences. Worsaae notes only that history has been formed as a succession of 'ages', and that the first or oldest, characterised by stone tools, was the product of universal human nature, and thus identical all over the world (Worsaae 1843, p. 20). This also meant that humans in Denmark had started from scratch, that is, a beginning at the level of the original primitive human. In a way, we were part of the world since the beginning, which for Denmark was *c.* 1000 years after the deluge, when 'Denmark, because of a dramatic natural upheaval, emerged

from the sea' (Worsaae 1843, p. 8). Worsaae presented this beginning as a primitive Stone Age, something that was eagerly discussed and created major problems in Europe, because according to *Genesis*, iron was invented only seven generations after Adam. Maybe Worsaae knew geologist John Woodward's (1665–1728) 1728 publication, *Fossils of All Kinds, Digested into a Method, Suitable to Their Mutual Relation and Affinity*, where Woodward made it clear that metal was known to man up to and including the time of Noah. But for humans, the catastrophic conditions after the deluge made the struggle for existence so difficult that man could only just manage to scratch out a living, with the result that all knowledge of metallurgy totally disappeared. In addition, all metal tools from before the deluge had been destroyed by the deluge, and were thus unavailable. According to Woodward, that was the reason people began with stone tools immediately after the deluge, and only later developed the use of metal once again, something that must have happened after the spread from the Tower of Babel, since the American Indians had no knowledge of metallurgy.

Müller, too, formulated his prehistory in accordance with the ideas of the culture and history of Romanticism. Like many of the linguistic and cultural scholars of his time, and the period of Romanticism in general, he supported the idea of the Orient as the creative region of the world, the area in which most culture originated – 'ex oriente lux'. This narrative combined the 1786 discovery of Sanskrit as the root of all Indo-European languages with Romanticism's integration of Christianity in scholarly reflection supporting the idea of the origin of man in the East. Müller writes:

> During the Stone Age, the impetus for new developments often seems to have come from Western Europe, and from here the new ideas may be traced in the areas further South, over the Mediterranean, … and back to their place of origin, the cradle of culture in the East. (Müller 1897, p. 190)

One example of history of origin is presented in Müller's analysis of the dolmens. Because man originally lived in caves, the dolmens are most numerous in regions with no caves – for example in Southern Scandinavia. It is difficult for Müller to determine where the development of the dolmens took place: '… but everything is in favour of this having taken place in the Orient, within those countries where the great ancient cultures developed, and man for the first time was led to a higher form of civilisation' (Müller 1897, p. 70). From here, civilisation spread to the neighbouring peoples in India, the Caucasus, Crimea, Northern Africa and so on, and from here came improvements and refinements in tomb building, something we can observe in the increasing artistry, the more we are near the Southern European classic countries. Thus, development was caused by man's attempts to maintain the same culture or life under changed conditions. That was the reason caves in mountains became dolmens. With this argumentation, Müller also showed his adherence to another of the dogmas of Romanticism, that cultural elements were discovered or invented only once, and often by chance. Afterwards, they spread throughout the world, and the uniqueness of each culture or people was a consequence of receiving cultural elements from without, and then adapting them to the national culture and nature. That was the reasoning behind adhering to the idea of culture as a cohesive unit, combined with the idea of cultural diffusion.

According to Müller, Danish prehistory was the result of cultural impact from without, but he also made room for our own initiative. It was characteristic of the Danes that they made independent developments or improvements on received cultural elements. As an example, the Roman and the Nordic melded, and formed the basis for independent Nordic styles in crafts. Among other things, our independent development of different cultural elements was made possible by the special situation of being located on the periphery of the world. We were far from the origin and centre of the different movements, and only later did what was created in other areas reach us. We were spared the use of time and work of the first trials and defects. When a cultural phenomenon arrived here, it had stood the tests of use and function, and shown its vitality and worth. Thus, we might well receive culture from others, but we ourselves developed it into our own culture. Müller regarded the dynamic interaction between cultures or cultural elements as the dynamic cause of development in Denmark.

For Johannes Brøndsted, the dynamic factor was the interaction with, or adaptation to natural

conditions, in addition to cultural loans coming to the North from the South. Brøndsted was inspired by German anthropogeography and cultural history. The natural conditions changed slowly from arctic tundra to woodland, and the humans slowly changed by adapting to this change.

> The way of life … and hence all the available tools were changed and reshaped by nature. The crucial, common stamp for all human life in the Old Stone Age (Palaeolithic) was exactly the unconditional and total dependence on the natural surroundings. A small measure of independence, and thus the conditions for real cultural development, would arise only with the Younger Stone Age (Neolithic) and its peasant culture. (Brøndsted 1938, p. 13)

Here, Brøndsted concurs with the idea that in the earliest times, man and culture were totally determined by natural conditions. With development or evolution, and man's transformation of nature, man becomes more and more free. In this process, both Müller and Brøndsted regarded man as a conservative being, and maybe lazy, too. To them, only changes of climate and of the conditions of life, or being forced to accept a foreign culture, could do away with the power of habit and create change.

Brøndsted notes that in general, 'everything of importance that happened in the Palaeolithic was due to climate change' (Brøndsted 1938, p. 121) and he proceeds to state that it is most likely that several times, new groups of people immigrated into the country during the Palaeolithic. Combining cultures is now unproblematic, and so is blending peoples. This refers to the idea of migrations, which, since the second half of the nineteenth century, had been central to understanding the arrival in Europe of the Aryans from the East, and their subsequent dominance of the area. In a period with a massive and catastrophic focus on race and pure races, Brøndsted presents the Danish descent in the British way, as a mixture of many (of the best) creative forces.

With the end of the Palaeolithic hunter-gatherer existence, the direct dependence of cultural change on natural change and on immigration also ceased. Now, new laws of culture made their appearance. They were determined by human nature:

> A form or a type grows from a primitive point of origin within the limits marked out by practical demands, to a full unfolding or blooming, and afterwards it becomes callous, degenerates, and finally disappears. Here, we see a law that scholars, especially under the influence of the Darwinian theories, detected early, and used in schemes of development, showing the forms of tools in primitive cultures. This 'typology' is useable with care, and if possible, always controlled by other time determining factors. (Brøndsted 1938, p. 156)

Even if form and function have obtained their apogee, man cannot refrain from making changes, and thus the form is forced into degeneration and negative development. 'Thus, anything has only a limited lifetime' (Brøndsted 1938, p. 158). That is why types of material culture disappear, which Brøndsted later shows is also the case with clay pots. They are also subject to the law of constant change, resulting in a decline in quality and decay following the culmination of a style (Brøndsted 1938, p. 245).

Summarising the Neolithic, Brøndsted notes that during this period there were strong influences from the outside, and a substantial development of its own conditions:

> This culture, which, with contributions and impulses from several sides, unfolds itself in Denmark during those centuries, is characterised by the blooming of a strong and vigorous race with favourable living conditions, and under the influence of considerable skills for agriculture as well as commerce. (Brøndsted 1938, p. 214).

So, immediately after nature released the Danes, the calibre of the Danish people appeared.

During the Bronze Age, classes formed, and development became related to those classes. The new upper class 'understood in an outstanding way how to maintain contact with Central Europe, and, by an excellent and active commercial system spanning centuries, to create the basis for a rich, extended cultural life' (Brøndsted 1939, p. 10). What really impresses Brøndsted is the ability of this upper class to secure so much metal in a country without metal of its own. Moreover, he – and his readers – are further impressed by the 'spiritual energy' that is demonstrated by the processing of bronze. Only very few findings originate directly from foreign areas. This impressive independent processing 'is the reason the Nordic culture has been able to assert itself gloriously in these material fields in the European context, not only in its initial

greatness, but throughout the Bronze Age' (Brøndsted 1939, p. 93).

The Bronze Age was the culmination of an independent Nordic cultural development, and the end was characterised by a strong foreign impact, which arose at the same time as a certain decrease in production at home sets in. This is not a real breach in history, 'but they are whirls in the cultural reproduction, which until now was a continuous course. They are ripples that warn of great changes to come. Iron will replace bronze …' (Brøndsted 1939, p. 228). Decline is on its way, in accordance with the previously mentioned law. What is now received from the outside is no longer incorporated into the local culture as critically and independently as it was before. This is Brøndsted's rise and fall of an early Nordic empire, and in his text you feel the threat from the 3rd Empire in 1939, when Brøndsted writes: 'A great period was ending, new and difficult times were soon to come' (Brøndsted 1939, p. 253).

In the Iron Age, European cultures determined what happened in the North. The history of Celts, Germans and Romans formed the perspective in which the Danish or Nordic Iron Age is to be understood. The first part of this period was characterised by 'scarcity, decrease, and thrift' (Brøndsted 1940, p. 37), and the reason was that the Celts blocked the supply of iron from the South. Nevertheless, this also had a positive effect; we had to mine iron ourselves. In addition, the climate changed, and 'in all matters of human life, the climate has a decisive influence on the development of material culture' (Brøndsted 1940, p. 69). The climate change between the Bronze Age and the Iron Age resulted in a colder and more humid climate, but this also had its positive aspects, effecting a change in agriculture and livestock farming. The challenges of historical and climatic changes resulted in important cultural improvements, for example, the plough. Nevertheless, this transition was still difficult, with widespread poverty. Wealth gives rise to independent development, whereas poverty makes development dependent on nature and foreigners.

When Jørgen Jensen published his work, cultural studies theories had shifted from ideas of cultural processes controlled by laws, to ideas of man as an independent agent. Jensen introduces his chapter on the early prehistory with a statement in accordance with this theoretical change. This does not show how man adapted to the environment, but how man overcame the limitations imposed by nature in its dynamic fluctuations. Now man is subject in his own story, an actor and not a product of natural or cultural conditions. The concept of society of late modernism, with its focus on the individual, is projected on the past, and Jensen structures each of the central chapters in the same way. First, he describes the climate changes, and then changes in the natural conditions, which are again presented as challenges that man has to overcome on his way forward and upwards. This forms the point of departure for his description of the culture and history. This understanding of development is especially important to Jensen in his descriptions of the earliest periods of prehistory. However, in his detailed descriptions of specific cultures, for example, the Maglemosian culture, he describes 3000 years of development as an adaptation to the development of the big forests. This is modified in the following period, when the dynamic processes include both adaptation and the inventive utilisation of the shifting possibilities offered by the ever-changing natural conditions. Only now, in Jørgen Jensen's view, man seems to move slowly from being an object, subject to natural conditions, to becoming an agent or subject in its own history, which matches Jensen's programmatic statement. And, if you relate this to neo-evolutionary theory, a kind of modern romanticist theory that is still stands behind Jensen's concept of development, it may be seen as a rephrasing and personification of what the neo-evolutionists termed 'evolutionary potential'.

In making man a creator of history, Jensen establishes possibilities for the involvement of new forms of forces in behind the further development. He now includes anthropology, and finds gift exchange one of the most common modes of human communication, which, together with kinship relations and entering alliances of many different kinds, plays an important role in the interaction between societies. Central to his argument is Marcel Mauss's (1872–1950) *Essai sur le don. Forme et raison de l'échange dans les sociétés archaïques*, of 1923–24, with Mauss's identification of the laws of gift exchange, the obligation to give, receive and give again as the central factors creating and maintaining social relations, and thus, communities (Mauss, 1993/1925). Inspired by the French anthropological structuralist, Claude Lévi-Strauss (1969, 1949), Jensen

adds the exchange of women as the most important form of gift exchange for establishing alliances. And inspired by the French Marxist anthropologist Claude Meillassoux the system of exchange of women is presented as a result of the contradiction between the old men and the young (Meillassoux 1975, 1978). In Jensen's prehistoric universe, alliances are created by the exchange of women, with bride prices in the shape of material artefacts, in a system controlled by the old men. Meillassoux needed this contradiction to establish class struggle in primitive society, which to him, inspired by Trotskyism, was the dynamic evolutionary force. Jensen is not so much of a Trotskyite. He just registers that this idea of exchange in the Palaeolithic era does not conflict with known findings, especially in graves, and this may explain the arrival of foreign artefacts in Denmark during this period (Jensen 2013, p. 125). After this, Jensen suggests his version of the introduction of agriculture after 4000 BC, which, according to Jensen, has something to do with social competition in the hunting-fishing society. Thus, the dynamic forces of development or evolution are adaptations to, and the triumph over nature in competition among groups, groups that in this context make use of the logic of gift exchange, especially the exchange of women, to form alliances.

The origin and global development of agriculture brought agriculture to Northern Europe, and in his discussion of the reason for introducing agriculture in the North, Jensen rejects population pressure and other similar theories. Instead, he seeks the cause in the socioeconomic sphere, in the competition for power and prestige, and categorises the products of agriculture as luxury and prestige goods in a sphere-economy, i.e. an economy where different values circulate within different spheres and where exchange between the spheres is impossible (in principle). Jensen imagines that in tribal societies, man competed in potlatch-like exchanges – that is, the one who offers the finest gifts would earn both power and prestige. From then on, competition characterised man, and this competition is used by Jensen to explain both the import and development of new phenomena. Cultural elements no longer just arrived in the country, but are expressly imported as items in the social game or competition. In the beginning, the competition unfolded as described by Claude Meillassoux within both the contradiction between the old men and the young, and within the internal competition among the old men for power and prestige. These contradictions are related to the finds of artefacts, especially axes that do not seem to have any practical function, and thus were ceremonial artefacts only. The idea is that the old men controlled the exchange of valuables, resulting in the young men's dependence and obedience. Investments were in feasts where men fought for positions as Big Men. Jensen does add that we do not know whether this was the situation in Denmark, but we know that the number of big and very fine polished flint axes far exceeded the number needed in agricultural practice, therefore they must have played a role in 'the social competition that exists in all human societies' (Jensen 2013, p. 171). Here too, Jensen is inspired by anthropology, and although Meillassoux's inspiration came from his research in West African societies, Jensen refers especially to the conditions in New Guinea: 'But it is only by taking such an anthropological view that we can have any hope of understanding even a fraction of the way prehistoric man acted' (Jensen 2013, p. 216). In addition, New Guinea is an obvious example, because the people here still have extensive exchanges, and the Big Man system in segmented and egalitarian tribal societies you find in New Guinea seems to fit very well with the development in the older part of the Bronze Age.

With the Corded Ware Culture of the beginning of the third millennium, a certain kind of individualism seems to arise, especially in Jutland, and this caused Jensen to reflect on the earlier collectivism:

> When one lives in a modern society with its great emphasis on the individual, it is difficult to form a picture of a society where the group was the indivisible whole. Here, we must once more look at the accounts of the anthropologists, for example of social forms of the kind found on the North American Pacific coast until as late as the twentieth century. Among the North West Coast Indians society was organized in kinship groups who lived and worked together. Within the kinship groups there could be people of either high or low rank. But the community was permeated by ideas that kin and group were an indivisible unity, and that the group was the highest authority. (Jensen 2013, p. 261–262)

The anthropological accounts of the American North West Coast also seem to give a deeper understanding of what happened: 'One purpose of the

wealth was that it had to demonstrate lavish consumption. This was how one showed one's prosperity and power over others, and this gave the kinship group respect. The extreme expression of this was to give away or destroy quantities of valuables. This phenomenon is called *potlatch*'; but 'There is no guarantee that this is how it happened in Neolithic Denmark' (Jensen 2013, p. 262). Thus, the use of the anthropological analogy seems only to show possible conditions that must not be factually negated by the material artefacts. At the same time, it forms a very fine skeleton for the construction of Danish history as a nice, neo-evolutionist history.

With the Bronze Age came the chiefdom organisation, as this organisational form is described in neo-evolutionism. The metal became a form of accelerator, initiating this social development. Gold, bronze, amber and other valuables circulated among the societies, and the control over these resources was the basis for prestige and the exercise of power, which in turn created a totally new social system. Differences in wealth created individuals, something that is evident in the graves, given the significant differences in the grave goods. Based on this, and with reference to New Guinea (again) and anthropological observations, Jørgen Jensen establishes that artefacts, for example, axes, were assigned different forms of value, such as use value, prestige value and labour value. In addition, in his interpretation of petroglyphs illustrating processions with axes, Jensen notes that: 'Here too, you can refer to the anthropologists' observations in New Guinea, where axes belong to the male domain only. Only men did work requiring the use of axes' (Jensen 2006, bd. 2, p. 45; not included in the English edition p. 305). The result of the analysis of the axe suggests that the struggle for power and prestige was a struggle solely among men.

At the beginning of the second millennium BC, Denmark was locked in a European exchange network system, with the consequence that changes anywhere in the network resulted in changes in the whole system. What tied the exchange system together was bronze. Here, Jensen includes globalisation in his prehistory, and makes global exchange a more important historical factor than the subjugation of the challenges of nature. Danish society was dependent upon an outside supply of bronze, which presupposed alliances, which in turn were based on the exchange of women. The challenges of nature diminished, because during the Bronze Age, the land had been cultivated to such a degree that, at the beginning of the Iron Age, the nature that man related to was itself a product of human activity. A third determining factor was the Celtic blockade of the Northern European lowlands, including Denmark, from the developments in the South. The militarisation that explains the major weapon sacrifices is a part of the adaptation to this situation in the North.

The next crucial event determining the history of Northwest Europe is the rise and expansion of the Roman Empire, which is thoroughly described by Jensen. The contrast between the civilisation with its big cities and highly developed handicrafts in the South, and the chiefdoms with their incipient development of villages in the North, was huge. The raids on the South in the 2nd century BC by the Cimbri and the Teutons created connections with the South, and artefacts from the Mediterranean civilisations begin once again to emerge in the findings. At the same time, up to the birth of Christ, a chief and warlord aristocracy developed, after a period that seems to have been characterised by greater equality, at least in the graves.

The development towards the primitive kingdoms of the Viking Age is regarded as a result of the competition and games within the North, on the one side, and the impact from the South, on the other. Starting in the Iron Age, development is regarded solely as an effect of social forces, in the form of competition between leaders, and involving valuable artefacts from the high civilisations of the South as the dynamic force. Now, man is the subject in his history or social development, although it might be that only the upper classes had the opportunity for such agency.

In the period following the birth of Christ, Jensen finds the old kinship society replaced by other kinds of solidarity, something evidently experienced in the emergence of the hird, a military unit used by Nordic chiefs as a bodyguard and followers. Regarding some grave findings, he notes that they 'testify to the existence of local leaders who were connected through mutual alliances covering long distances, and who had contact with the international exchange system' (Jensen 2006, vol. 3 p. 289–290, not included in the English edition p. 686–687). From the grave goods, he notes that

women were exchanged over long distances, and that this in turn shows marriage alliances between leading families. Referring to the grave goods, Jensen finds that there were four classes or strata in the society, the highest being an elite with supra regional powers, these being princes and major chiefs. Under each of these were several chiefs, and under the chiefs were warriors and local leaders. At the bottom were the peasants. Within the military there was a hierarchy, with the riding chiefs at the top, the infantry at the bottom, and a group of riding warriors in the middle. This is confirmed by Tacitus's description of the Germans. However, this did not mean that Jensen included class struggle as a dynamic factor. Instead, he took these class conditions as the basis for identifying the dynamics as being the existence of channels for distribution of Roman prestige goods through alliances, the exchange of women, and redistribution of valuable goods from the leaders to the sworn vassals in the new hierarchical system. This formed the basis for the creation of the feudal system that lasted until 160 years ago.

The encounters between the Germans and the Romans meant that Roman goods became much easier to acquire, and Roman goods and systems rolled into the North. The cultural impact was massive, and became the most important dynamic factor. During the third and fourth centuries, prehistoric society collapsed, and a new militarised society replaced it: 'We can now begin to vaguely see the contours of a military aristocracy and a peasantry, both of which were to have important roles in the formation of what, in the final period of the Iron Age, became the Danish Kingdom' (Jensen 2006, vol. 3 p. 555; not included in the English edition between p. 806 and 807). According to Jensen, this kind of society was 'a societal type that social anthropology describes as consisting of two social classes: a military aristocracy and a peasant population. And, it is a societal type that constitutes the beginning of a state' (Jensen 2013, p. 823). This development was to take place in the time that followed the fall of the Roman Empire, which shook all Europe. Frankish sources mention kings in what was to become the Danish region during this period, and in the eighth century there followed the beginning of the establishment of cities, with Ribe and Hedeby as the first. These cities were constructed after Frankish designs, so once again, according to Jensen, the imitation of civilised elements from the South directed developments in the North. This development, together with some major constructions, such as Dannevirke, shows that royal power had become strong, because it demanded extensive resources, and power over many people.

Jensen's view of the development in the North-Western Europe relates closely to the developments in Asia, and Southern and South-Eastern Europe. In light of globalisation, the North European or South Scandinavian area developed because of the impact of sociocultural elements arriving in random order, and often, long after their origins in the South and East. However, in spite of this, Jensen presents the development in the North as progressing in a strict order, thus following the idea of a general evolution described by the neo-evolutionists, and developed in American cultural anthropology as in the 1960s. In this connection, it is worth noting that these anthropologists regarded their idea as an abstract scheme, and that they denied that any society would develop strictly in accordance with this abstraction. This general evolution was only an abstraction of the many and varied cultural histories of individual societies, and not itself a history. Nevertheless, according to Jensen, Northern Europe followed this scheme, with the hunters first, then agricultural and tribal societies that developed into a Big-Man system, which developed into chiefdoms, the basis for the development of the primitive kingdoms or states. Within the classical Danish three-phase system, our history is now constructed within a new, universal American-construct of social evolution, without relinquishing Thomsen's system, which is observed and respected in the titles of the volumes of the Danish version, and in the major chapters in the English one. And, this is in spite of Thomsen's system being based on the materiality of tools, which does not give any meaning in relation to the development of the social system, unless you are an old-fashioned technological determinist, which Jørgen Jensen certainly is not. So here, at least, nationalism has crept into his history of South Scandinavia or Northern Europe.

At first, the dynamics moving evolution forward were human subjugation to and the triumph over nature. By and by, central aspects of nature became the products of human activity, and the dynamics moved to the social sphere, in terms of competition

and alliances. These caused the individual to emerge, and what look like classes to crystallise. Now, as agents in their own lives and in the history of the North, these men imitated what they saw in the much more advanced South. The history of the area within the present Danish borders may be understood only as a part of, and a product of global events. Even though our ancestors were actors or agents in their own lives and history, they lived in a peripheral part of the world, where the major powers and far more advanced societies to the South and East were the real agents and determinants of history and development. All the Danish grandeur of the past had vanished. Now, it was the diversity of culture and nature we should appreciate, for as quoted before:

> If we connect the two, we understand that the eternal Denmark is to be found precisely where one encounters the fine interaction between the culture of bygone times and the freshness of nature. A glorious land of sun, rain, of weather fair and rough, with fog and wind, and with windswept beaches where the waves eat up the shore, and the seabirds fly off in screaming flocks. (Jensen 2013, p. 1093)

Since the publication of Worsaae's book, prehistory has formed an important part of the Danish historical identity. For the entire time since Worsaae, this has been the epos that, with Thomsen's three periods as a fixed framework, has described our history as a genealogical or cultural investigation into our origins, and understood it as our common roots, after the fashion of Romanticism. This history has been remarkably unaggressive, separating our ancestors from all other peoples, and presenting them as having always lived within the present borders. In times when archaeology in other nations, especially to the South, underlined and legitimated the political demands of areas outside the nation referring to distant ancestors having lived here, Danish prehistory never expressed any wish or legitimate reason to demand the return of lost areas of Norway, Sweden, Germany or England. We have had our Golden Age(s), but in none of our prehistories did Danes really live in those areas now lost. And, when Jensen argues for a much broader origin of the Danes as a North-Western European people, the framework is one of peaceful coexistence and mutual exchange in a globalised world. Even though he thus includes areas outside our present borders, it is not nationalism to which he refers, but the love of one's country that he makes the central image, where forces are turned inwards, and not outwards. Jensen's Danes have their roots in a multicultural world, with competition and with humans who, through their creativity, overcome climatic challenges, recognising that, from a historical perspective, the exchange of culture and interaction with foreigners is progressive. This means that the identity expressed in his prehistory is a multicultural life in a cooperative Europe, wherein we can probably keep our national identity, but only as an element of a global interaction. Now we have had confirmed that our real identity is as creative humans, and as a small part of the cultural diversity of North-West Europe, the Continent and the world.

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RESEARCH ARTICLE

A new time: Bayesian models of an Early Neolithic enclosure in North-Western Denmark

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ABSTRACT

The article presents the results of the first Bayesian model of a causewayed enclosure from Denmark. 21 samples were dated, some with multiple dates, giving a total of 41 dates. These dates are built into a model which includes archaeological priors in the form of stratigraphy. It is demonstrated that this enclosure can be dated to the same time as the majority of enclosures on the British Isles: the 37th century BC. Together with other early dates for enclosures, it illustrates that enclosure construction was introduced in South Scandinavia as part of a large European expansion of enclosures. With Bayesian modelling, we can provide better answers to more questions, both regarding intrasite chronologies and a wide range of chronological issues.

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Introduction

The Neolithisation of South Scandinavia clearly marks a great shift in society, but the following centuries offer additional great changes. One of these is related to the construction of monuments in the form of non-megalithic long barrows and causewayed enclosures. The start of a new time: The time of monuments. This article will focus on the introduction of causewayed enclosures into South Scandinavia, especially the date of this event. It has been convincingly demonstrated by the Gathering Time project that by using Bayesian modelling, we can get within generations of these shifts (Bayliss *et al.* 2011). This is a drastic improvement of previous methods. What is of further interest here is that the project revealed that the enclosures of the British Isles were built during a short period, starting in the later 38th century BC and booming in the 37th century BC (Whittle *et al.* 2011). This seems to be part of a European expansion of enclosure construction in the period (Klassen 2014, pp. 206–219). This begs the question: Did the South Scandinavian enclosures follow this trend, or were they several centuries younger? Traditionally, the enclosures in South Scandinavia have been seen as a phenomenon dating to the EN II, starting roughly at 3.500BC, but as suggested by Klassen, the majority of enclosures are poorly dated or not dated at all (Klassen 2014, pp. 199–206). Together with new results from northern Germany and southern Jutland, it will be argued that at least the Jutland peninsula experiences a more widespread construction of enclosures in the 37th century BC.

An important part of the argument made in this article relies on Bayesian modelling, thus this approach deserves a few words. This approach is named after Thomas Bayes' theorem (Bayes 1763). In archaeology, Bayesian modelling refers to an approach where our established knowledge, such as stratigraphy and typology or any other information available to us (called prior beliefs), are integrated with our knowledge provided by dates with probability estimates (such as radiocarbon dates) in a common model. Good introductions to the use of Bayes' theorem in this way can be found in Bayliss *et al.* (2007, 2011) and Bronk Ramsey (2009a). Today, Bayesian modelling is becoming standard within archaeology, with a high increase in the number of papers in the last years (Bayliss 2015). This is, however, not so within Scandinavian Neolithic research. Note that calibration of radiocarbon dates in some

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programs, such as OxCal, are Bayesian in nature (Bronk Ramsey 2009a), so all calibration using these programs is Bayesian. More complex models in addition to simple dating are rarely, if ever, applied in Scandinavian Neolithic research, and the Bayesian approach is limited to the use of OxCal and similar programs.

The use of Bayesian models in archaeology is not without problems. Several factors can lead to the models being inaccurate, such as problems with the samples (reservoir-effects, residual samples, etc.), but also with the defined prior information (e.g. the archaeology) and the understanding of the radiocarbon dates. Especially lack of information and/or poor implementation of these factors have been criticised (Bayliss 2015, Pettitt and Zilhão 2015). It must be noted that the issues raised in these papers apply to all use of radiocarbon dates, whether they are within a formal model or not (and several of the issues apply to all use of any sort of dating, whether typological or by other means). However, the more the dates are used in the argumentation and interpretation, the more important these issues become. Additionally, the more constraining priors of more complex models allow more erroneous answers, or false positive answers, if the models are not critically evaluated.

A more fundamental discussion of issues related to the Bayesian calibration is presented by Weninger *et al.*, where they demonstrate serious issues in the way the tree ring wiggle curve can interact with the calibration, producing problematic results (Weninger *et al.* 2015). Counter-intuitively, these problems are greater for very precise dates, which tend to produce erroneous peaks in large datasets (see also Contreras and Meadows 2014, Brown 2015). This calls for some caution in interpreting the results of the models. However, the strength of the models is the addition of archaeological priors (or other dating priors if such are available), which should mitigate the problems rather than enlarge them, as they are not dependent on the calibration curve.

If applied correctly, Bayesian models offer a powerful tool to build very precise chronologies, which in accuracy and precision go beyond what we can expect of the dates by themselves. However, the approach is fundamentally subjective as it, just as any other archaeological chronological approach, relies on our choices of elements to be analysed and an evaluation of these elements' relation to the events, features or artefacts we wish to date (Buck and Meson 2015). In this article, I have focused on clarifying my choices and discussing why these were made. The certainty of our archaeological interpretation is difficult to quantify, and the results of a Bayesian model is never more certain than the interpretation it relies on.

The site: Liselund

Liselund is located on the present day peninsula Thy in North Western Jutland (Figure 1). In the Neolithic, Thy would have been an island off the coast of Jutland. When built, the enclosure would have been located 4 km from the coast, but near where a small river runs into the now drained Sjørring Sø (Sjørring Lake). It is located on a small plateau, and in the Neolithic a small stream likely ran west of the enclosure, and possibly another south of the enclosure. The location at a place where two rivers/streams met is a typical one of South Scandinavian enclosures (Klassen 2014, p. 43, Table 2). The site is interesting in relation to Bayesian modelling of enclosures, as organic material has been retrieved from multiple layers in the ditches. This organic material was found in close relation to clear phases of the ditch cutting process, and in many cases in relation to datable artefacts. Such information has generally not been systemically selected for in Scandinavian excavations of enclosures. New excavations of other enclosures should focus on achieving this by careful retrieval of soil samples and radiocarbon dating of relevant contexts.

Several factors are included in the models: the overall layout of the enclosure, individual ditch-stratigraphy, as well as the pottery chronology. The site is known through several small-scale excavations: the first in 1989–1990 (Mikkelsen 1989), a small excavation focussed on an Iron Age settlement in 1993 (A. L. H. Olsen 1993), and excavations in 1996 and 1997 (Westphal 1996, 1997) with mainly Neolithic finds. These excavations uncovered several ditches in different parts of the enclosure, as well as pits, postholes, and cultural layers inside the enclosure related to a Neolithic settlement phase. As the excavations are small, orthophotography has been

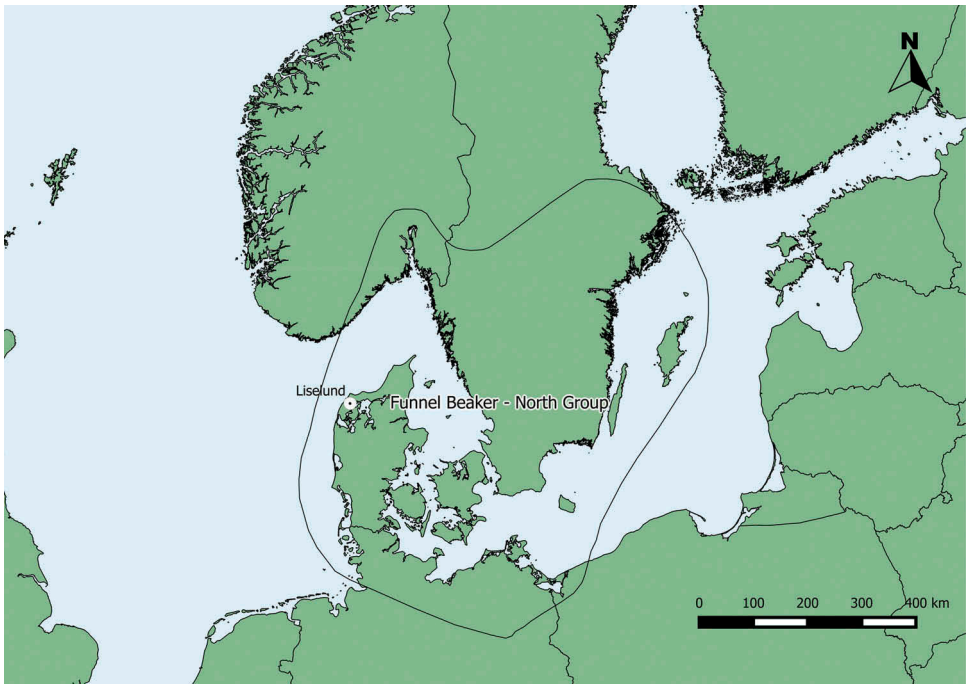

Figure 1. Geographical location of Liselund

used to improve the understanding of the enclosure (Westphal 2000), and in 2014 a geomagnetic survey was conducted on part of the area, only part of which gave a successful result, as the readings from the southern part was blurred by natural phenomena and Iron Age/Bronze Age activity.

Layout of the site

The enclosure is slightly triangular (Figure 2). The outer perimeter of the enclosure is marked by two rows of ditches and possibly a palisade. Internally, there are two rows of ditches that divide the area.

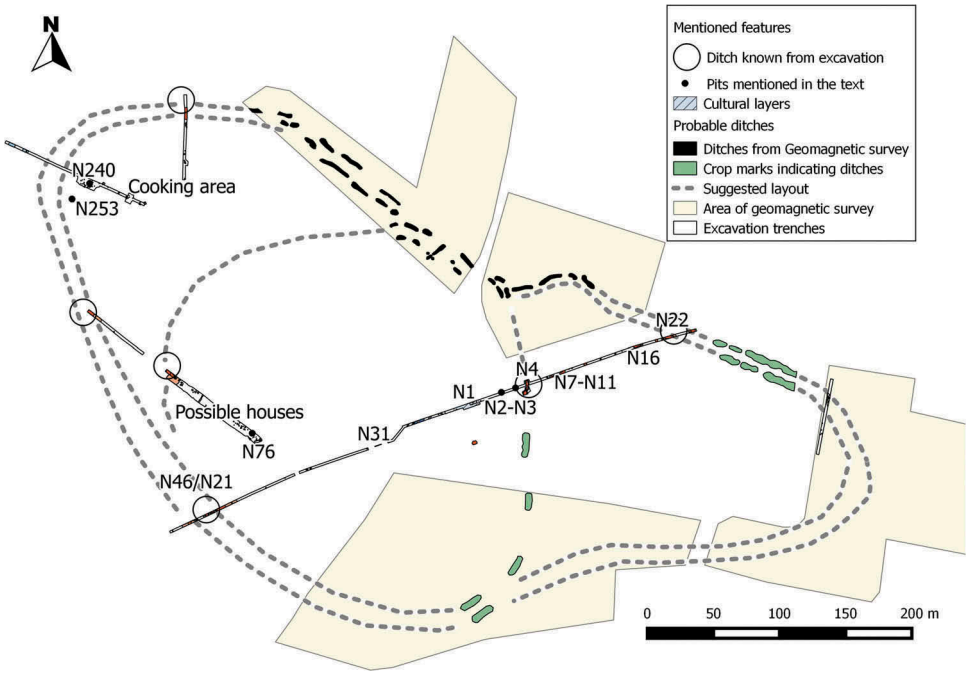

Figure 2. Reconstructed layout of the site

The ditches recorded in the geomagnetic survey and the outer ditch circuit recorded on photos indicate that the causeways between the ditches are between 2 m and 6 m wide, while the 'causeways' in the internal row are 25–35 m. As the inner rows connect to the outer circuit near a possible entrance to the enclosure to the north-east, it is likely that the inner rows have the purpose of separating the space of the inner surface in different compartments. The inner rows connect to the outer circuit, suggesting that the entire enclosure is one system and is made as one mental whole. It is, however, important to note that there are no excavations from where the ditches join but only a geomagnetic survey.

The clearest indications for settlement were found in the central part of the enclosure, in the form of a thick cultural layer and possible houses. The uneven distribution is possibly due to the small scale investigation, as less than 2% of the area has been excavated. Most artefacts come from a 20 cm thick cultural layer 35–50 m west of ditch N4. Several pits were found in relation to this layer, and two of these, N2 and N3, were dated (see Table 1). Around 65 m north east of N46/N24, at least 15 post holes, several pits, and two hearths were found, likely the remains of houses. From this concentration, pit N76 was dated. Both of these areas were within the two internal rows of ditches. The traces of settlement were fewer outside this central area, but a series of thin cultural layers (N7-N11 and N16) and a few pits were found in the eastern part between N4 and N22. South-east of N22, an Iron Age settlement was present. In the northern part many scattered pits, especially cooking pits, and a few post holes can be dated to the Neolithic, most importantly two pits containing cereal: N240 with around 800 cereal grains and N253 with estimated (on the basis of a 10% sample) 42.000–44.000 cereal grains (Westphal 2005). N253 has previously been dated and has been included in the models.

Stratigraphy

Three ditches have been included in the dating scheme, N4, N22 and N46/N24. N22 and N24/N46 are both from the outer circuit, while N4 is from the inner row. Only a 1.6–1.7 m wide cut across the ditches was excavated, but the ditches were excavated to the subsoil. Clear profiles were drawn and

Table 1. List of replica dates on single samples. Problematic T' values in bold

Context	Material	Lab number	Radiocarbon age (BP)	X^2 test	Replicate group
N2, pit	Hazelnut- shell	AAR21905	4643 ± 29	T' = 0.3; T' (5%) = 3.8	1
		KIA51018	4674 ± 45		
N3, pit	Hazelnut- shell	AAR22904 (ext)	4681 ± 29	**T' = 187**; T'(5%) = 11.1	2
		AAR22904	4689 ± 32		
		KIA50122a	5079 ± 26		
		KIA50122b	5082 ± 29		
		KIA50122c	4935 ± 22		
		KIA50122d	4923 ± 22		
N3, pit	Corylus	AAR21907	4761 ± 30	**T' = 4.5**; T' (5%) = 3.8	3
		KIA51020	4661 ± 36		
N4, layer c	Corylus	AAR21903	4562 ± 26	T' = 2.1; T' (5%) = 3.8	4
		KIA51017	4625 ± 26		
N4, layer c	Corylus	KIA50594a	4905 ± 35	**T' = 10.4**; T' (5%) = 3.8	5
		KIA50594a	4745 ± 35		
N4, Layer d	Corylus	AAR22905 (ext)	4677 ± 29	**T' = 56.4**; T' (5%) = 11.1	6
		AAR22905	4713 ± 31		
		KIA50123a	4859 ± 26		
		KIA50123b	4891 ± 23		
		KIA50123c	4864 ± 27		
		KIA50123d	4891 ± 27		
N4, layer d	Corylus	KIA50124a	4826 ± 22	**T' = 7.9**; T' (5%) = 7.8	7
		KIA50124b	4865 ± 22		
		KIA50124c	4875 ± 38		
		KIA50124d	4930 ± 30		
N22, layer k	Corylus	AAR21908	4711 ± 28	T' = 1.1; T' (5%) = 3.8	8
		KIA51020	4657 ± 42		
N22, layer k	Corylus	KIA50125a	4853 ± 27	T' = 0.5; T' (5%) = 6.0	9
		KIA50125b	4848 ± 32		
		KIA50125c	4874 ± 26		
N22, layer l	Corylus	KIA50126a	4935 ± 22	**T' = 4.7; T'** (5%) = 3.8	10
		KIA50126b	4866 ± 23		
N22, Layer l	Betula	KIA50127a	4840 ± 22	T' = 1.0; T' (5%) = 3.8	11
		KIA50127b	4774 ± 27		

soil samples and pollen samples taken from each layer. In most cases, the dated samples were found in connection with pottery, but in some cases no artefacts were found and the samples come from soil-samples taken during the excavation.

The ditch N4

The primary layer is layer e, which is formed of quickly backfilled material, with no growth layer at the bottom and no silting layers. On the bottom of this layer, two funnel beakers as well as sherds from a third vessel were found. Between the sherds of one of the vessels some charcoal fragments were found, which constitute the sample for dating from this layer. A large part of the vessel was recovered, and it seems to have been placed on the bottom of the ditch purposefully (Figure 3).

Layer d constitutes a re-cut of the ditch. As with layer e, the finds are from the bottom of the layer, which seems to have been re-filled quickly. Several large fragments of vessels were found as well as smaller sherds. Sherds from around 12 vessels and additionally 7–9 clay disks were present in the excavated part of the layer. The dated sample comes from charcoal at the bottom of the layer.

The final re-cut in the ditch is marked by layer c. At the bottom of the layer, a whole vessel was found, placed between some stones (Figure 4). This indicates continued ritual use at the time of layer c, but in contrast to layers e and d, more refuse material was present in the layer, indicating both flint and amber production. Parts of more than 20 different vessels were present, as well as at least 10 clay disks. It is doubtful whether the material was deposited due to normal settlement activity, as several large sherd fragments were found, which is not typical of the settlement debris at the nearby cultural layer.

Figure 4. Deposited vessel at the bottom of layer c in N4

The debris could be material created elsewhere and discarded at the ditch after the deposition of the whole vessels. Some sherds were in very bad preservation state, and some seemed very weathered, while the whole vessels were in a better state of preservation. Layer c is covered by layer b, which contained only a few sherds and a little flint, and layer a, which had almost no finds. Layer a consisted of clayish sand with small charcoal particles, making the layer almost black. A similar almost black top layer is known from the other excavated ditches at Liselund.

The ditch N22

The primary phase is layer l, which contained few artefacts and no pottery. A small sample of charcoal from the bottom of layer l was available for dating (Figure 5).

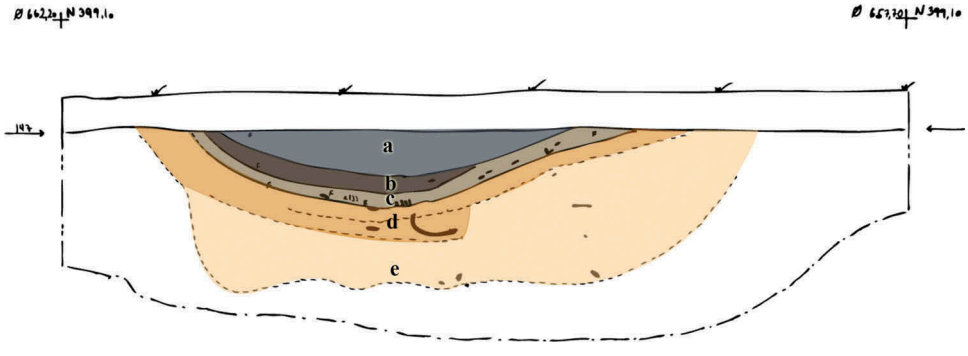

Figure 3. Profile of ditch N4

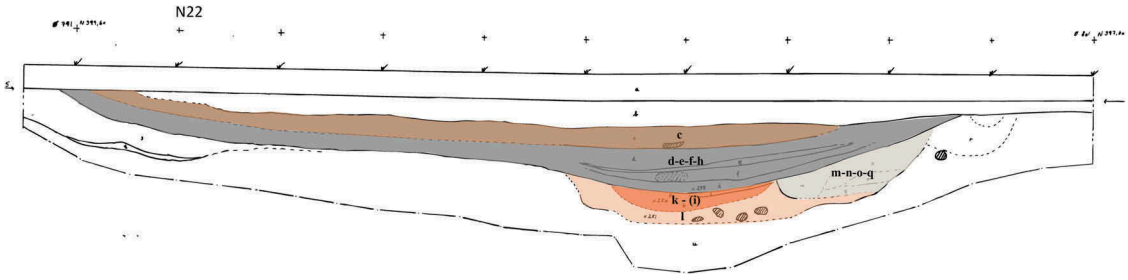

Figure 5. Profile of ditch N22

Layer k is a re-cut containing pottery, including several almost complete vessels. From this layer, another charcoal sample was available. To the east of layer k, another series of layers is present, likely another re-cut, which is later than layer l, but impossible to relate to layer k. No artefacts or charcoal was retrieved from these layers.

Above these re-cuts was a series of thin layers containing varied degrees of gravel and larger rocks. One of the layers, layer e, was almost black from charcoal particles, resembling layer a in N4. Above these layers, layer c is a homogeneous brown mix of sand and clay. In contrast to N4 and N46/N24, there is no large deposition layer near the top.

To the west of N22, another feature is also partly covered by layers d and c. This feature also ran across the excavation trench and could be part of another enclosure ditch or more likely a trench for supporting a palisade, see below for N46/N24.

The ditches N46 and N24

The ditch N46 is cut by N24. Layer p near the bottom is interpreted as the primary deposition layer. The primary cut is a few centimetres deeper, but the soil below layer p is likely to derive from loose soil deposited during digging of the ditch. There were no finds in layer p, and a few undiagnostic sherds higher in layer n makes up all the finds from N46. Layer p contained charcoal particles, and a few pieces were large enough to determine and date (Figure 6).

A re-cut of the ditch is moved slightly to the east, layer m, covered by refill in the form of layer l. No finds and no datable material.

The bottom of N24 is marked layer k, which contained no artefacts. Sherds and the butt end of a polished axe was found at the bottom of the superseding layer h. A soil sample from layer k contained charcoal, but the pieces were too small to identify and date.

The fill of layer h is slightly stratified, and several distinct layers could be observed. At least layer f, but likely also layer i and g are re-cuts of the ditch. This suggests a total of 4–6 re-cuttings happen after the first construction of N46. To these can be added layer d, which marks a deposition horizon with many artefacts, including large pottery fragments. Layer d is dated and included in the models.

Layer d is covered by the layer c, which contains charcoal particles and is likely related to layer b from N 4 and layer e from N22. Layer c also covers two features to the east of the ditches, both trenches running parallel to the ditches across the excavation trench. With the limited extent of the excavation, it

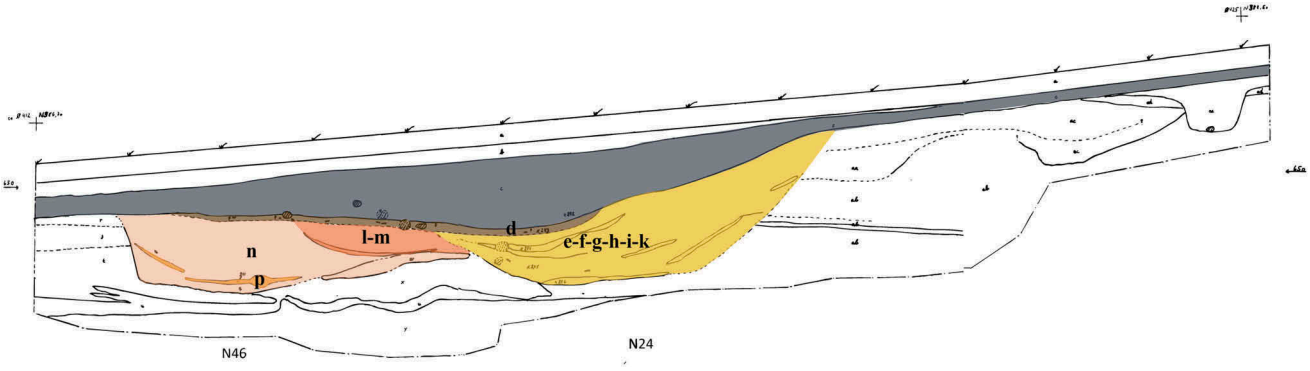

Figure 6. Profile of ditch N46 and ditch N24

is impossible to ascertain, but these features likely mark palisade trenches as at Sarup I (Andersen 1997, pp. 29–34). The double trench indicates that the palisade was renewed/replaced, perhaps at the same time as the digging of N24.

Relation between enclosure and settlement

No clear stratigraphic evidence is present. It is noteworthy that several culture layers (N1, N7-N11 and N31) and some settlement pits have the same black character as the thick sealing layer of the enclosure. Thus, it is likely that these charcoal layers are formed in relation to the settlement activity. This indicates that the settlement is later than the final depositions in the enclosure, which lie below these layers. Alternatively, the final layers of the ditches belong to the settlement phase, as indicated by the amount of waste.

Pottery

There is a difference in the pottery style between the lower layers, and the upper layers of the enclosure. The difference is especially clear on the lugged beakers: Lugged beakers with whipped cord occur in the final layers, while unornamented ceramics or ceramics ornamented with a toothed tool occur in the lower layers. Sherds with stab-and-drag are present at the lower layers at both N4 and N22. Stab-and-drag rarely occurs in the final layers, in spite of much larger pottery depositions in these layers. Stab-and-drag is common within the EN I (3950–3500calBC) Volling style, while whipped cord appears regularly in the EN II styles (3500–3350calBC) (Madsen and Petersen 1984), however the exact introduction is poorly dated. The observed change of deposition practice between the primary phases, with few but complete pots, and the final deposition, with both complete pots, single sherds, flint and amber waste, is together with the difference in style used to define the upper layers as one horizon.

Samples and dating

The first step was to select suitable samples. As there were no existing samples from the enclosure, the strategy was to date the primary phase of the three ditches. In addition to this, it was attempted to date as many subsequent layers of these ditches as possible. One date existed for the settlement from pit N253. In addition to this date, a series of new dates reflect the settlement activity of the site.

Selecting samples

In the second chapter of Gathering Time, Bayliss *et al.* discuss the taphonomic considerations of samples and order different sample types according to reliability (Bayliss *et al.* 2011, pp. 38–42). At Liselund, no bone or antler is preserved, and the only possible datable material was charcoal and carbonised residue, 'food crusts', on pottery. Carbonised residue on refitted pieces of pottery rank high (4 out of 12) in the reliability suggested by Bayliss *et al.*, however later they note some observed issues with the dating of carbonised residues (Bayliss *et al.* 2011, pp. 56–57). For this reason and due to the issue with freshwater reservoir effect, it was chosen not to date carbonised food residue (Fischer and Heinemeier 2003, J. Olsen *et al.* 2010, Philippsen *et al.* 2010, Philippsen 2013, Fernandes *et al.* 2013).

The dating thus relies on single entity plant remains, primarily charcoal from short-lived trees, in addition to dates on a few charred hazelnut shells and the existing date on cereal from a pit. Radiocarbon dates of small pieces of charred material are usually not considered very reliable, as they can be residual. There are good arguments against this being the case in the present project. Samples from three categories of contexts can be considered: pits, primary layers of the enclosure and secondary layers of the enclosure. The majority of samples from pits come from charred layers at the bottom of the pits, and thus likely relate to the primary function. Similarly, the cereal sample must be considered an intended deposition due to the amount of cereal. The primary layers of the ditches are all deliberately refilled within a short time. As there is no indication of any activity on the site prior to the enclosure, any material from the primary layer of the enclosure ditches must be considered as belonging to the primary phase. More problematic are dates from secondary layers. These can either be related to the re-cutting event, be residual from the first enclosure phase, or relate to activities in the central part of the enclosure. As the re-cuts in most cases respect the lower layers (with exception of N46/N24), the

chance of residual material should be low. If the settlement is later, the chance of material from this entering the ditches should not be a major concern.

However, loose samples will never be as certain as samples functionally related to an event such as articulated bones in primary position, tools for digging found at the bottom of ditches or charcoal related to function. To establish the reliability of the dates, it was attempted to date multiple samples from each context. In some cases, the same species was used, and it is uncertain whether they are two separate entities or two pieces from the same tree found apart. In other cases, separate species were dated and they are thus definitely separate entities.

Another possible issue is the old wood effect, where the organic material has grown over a long time-frame and thus contains carbon that already has a significant age at the time of burning and deposition. In the primary layers, charcoal from acer (maple) and betula (birch) were common, with minor inclusions of corylus (hazel). In the secondary layers, only corylus and a few cases of prunus (cherry-family) and alnus (alder) is recorded, though not all charcoal pieces were analysed. From the pits corylus, betula, and quercus (oak) are determined and only corylus dated. As charcoal from corylus was common, and it can be considered short-lived, it was generally preferred. In the primary layers, hazel was not as dominant as in the secondary layers, and the amount of charcoal pieces large enough for determination generally low. Therefore, betula and acer were also frequently dated. Both trees as well as the dated alnus can be older than corylus, so some consideration must be given to this. The only acer native to the area around the enclosure is acer platanoides, both this tree, alnus and betula can be considered trees with a lifetime of middle length.

Dating

Overall, 21 samples were selected and dated. Some samples have been dated more than once, thus the number of dates/measurements is 41. Seven samples are from pits located in the interior, while 14 are from the enclosure ditches.

In the dating scheme, two laboratories were used. A series of dates were dated in the Leibniz-Labor in Kiel (code KIA). The remainder were dated in the Aarhus AMS Centre (code AAR). During this period, the dates from Aarhus were dated in Seattle, but the samples were extracted in Aarhus. All new dates were dated in the period 2014–2015. The single previous date, AAR-7205, was dated in 2001. All calibration and modelling has been done in OXCal 4.2, using IntCal13 curve (Bronk Ramsey 1995, 2009a, Reimer *et al.* 2013).

Testing replicate radiocarbon measurements

To investigate reliability of the measurements, multiple measurements were done on individual dates. The samples dated at different labs were selected from large pieces of charcoal or nutshell, which were broken into pieces and pre-treated separately. Multiple dates from KIA, marked with a, b, c, d, are multiple measurements, sometimes on the same pre-treated sample and sometimes dates on new extractions of the same sample to test reliability of previous dates. All dates were combined before calibration using the R_combine function in OxCal (Bronk Ramsey 2009a, 2009b).

Six out of 11 samples fail at the 5% level, thus much above the expected (Table 1). A clear explanation is not easy. Replicate groups 3, 7 and 10 are only slightly above the threshold that 95% of samples should be below. The T'-value (the chi-squared value calculated by OxCal) of these groups fall within the 1% level. The error of these groups could relate to the reported uncertainty of the samples. An increase of the uncertainties of the measurements with additional 5 years give T' values below the threshold. Thus these dates can perhaps be considered correct. Replicate groups 2, 5 and 6 are more problematic, as all dates from these cannot be correct.

In two cases (group 2 and 6), there is a difference between laboratories, in both cases with KIA dates significantly older. The Kiel dates are from a group of dates (KIA50122-KIA50129) measured in February 2014 with additional dates on new extractions of the samples done in June 2014. The multiple measurements from Kiel are consistent for each sample, and this suggests the Kiel results are accurate. This is contradicted by other dates from N3: replicate group 3 is also from this pit, both KIA and AAR dates from this group are consistent with the AAR date from group 2. Another date from N3, AAR21906 is also consistent with the younger date

(see full list of dates). These dates were all measured in 2015. We could then expect that KIA50122 is erroneous, or the sample residual *and* the AAR-measurement wrong. The chance of a residual sample is unlikely, as it comes from a layer of charcoal and charred nuts at the bottom of the pit. This leads to considerations regarding the accuracy of the KIA dates, since the Kiel lab experienced issues in the period 2009–2012 (Meadows *et al.* 2015). In four cases, the dates from Kiel and Aarhus fit well (group 1, 3, 4 and 8), in some cases the Aarhus date is even slightly older (group 3 and 8). The Kiel dates consistent with AAR dates are all from 2015, while the dates not consistent with AAR are from the measurements in 2014. Replicate group 5 is likewise dated in 2014. It is difficult to explain how the dates from the series KIA50122-KIA50129 could be wrong, but so consistently so, even when two extractions were taken separately and measured in February and June, respectively, the last dates according to the new stricter procedure introduced at this time and together with material with a known age which didn't show any issues. To test the significance on the results, a model where all Kiel dates from 2014 have been removed is presented alongside a model where they are included (see Figure 11 below). In the model without KIA 2014 dates, an AAR date is the oldest and any issue from the Kiel lab does not determine the start date. Both models show the same pattern, and it is thus possible that the Kiel dates from 2014 are correct (except KIA50122, which was still excluded, and KIA50594, which is considered an outlier). If this is true, it is difficult to determine the reason for the high rate of inconsistent replicate groups (6 out of 11, with 3 being very divergent), at least without further analysis of the dates, including new samples.

Evaluation of the effect of the old wood effect

As discussed, some considerations are needed in relation to the possibility of old wood effect. Since betula and acer are only dated in the primary layers, and since there were few corylus dates from these layers, the old wood effect could push the start date of the enclosure too far back in time. Three methods were considered to counter this possible old wood age.

The first method is using the charcoal dates only as a *terminus post quem* (TPQ) by using the *After* function in OxCal. This method is useful in many situations, but it is questionable if it adds any value to this question, since it is doubtful whether the *After* function puts enough weight on the possibility that the dates could in fact be contemporary with the event they should date. Testing has shown that the result is often imprecise when dealing with datasets consisting only or mainly of charcoal dates (Dee and Bronk Ramsey 2014).

The second method is running a charcoal outlier model (Bronk Ramsey 2009b, Dee and Bronk Ramsey 2014). Such a model can allow for outliers due to old wood effect, but still allow the dates to be included in the analysis. The drawback is that the model considers all charcoal samples equally.

The third option is adding a uniform distribution as an extra uncertainty (Valzolgher *et al.* 2012, p. 492). It adds a probability that the wood is between 0 and a fixed number of years old, depending of the expected maximum age of the tree. It has the advantage over the *After* function that it includes our knowledge of how much older the wood is likely to be. In the models, the hazel has been assumed to be 20 years or less, while acer, betula and alnus have been assumed to be 100 years or less.

The difference of assumption between the outlier model and the approach of adding a uniform distribution is that the outlier model expects the dates to be exponentially distributed with most of the charcoal samples only slightly older than the event, but with a long tail of older dates (Bronk Ramsey 2009b). Which assumption is correct will vary according to the situation. In hearths and fire-pits, we might assume that many branches and young trees are burnt along with fewer larger pieces, favouring a dominance of short-lived samples. When dealing with wood used in constructions, less short-lived material is included, and a more uniform distribution can perhaps be assumed, even though the volume of the outer tree rings (youngest) is larger than that of the inner tree rings (oldest), favouring a non-uniform distribution of charcoal ages. If the last few years are lost due to dressing the wood for use, we would see a non-uniform distribution starting at the outermost preserved tree ring. The charcoal outlier analysis suggested by Bronk Ramsey also assumes that dates can be very much older (1.000 years). This is especially true for very old trees, but it also accounts for residual

samples. The uniform distribution model is the one favoured here, since it adjusts for our prior beliefs about the maximum age of the individual trees and since residual samples are considered unlikely, at least in the primary phases of the enclosure. The final end of the entire sequence is also supported by dates on hazelnut shells and cereal, which is generally of the same age as the charcoal from the same layers. Again, some caution of using charcoal is warranted, but with multiple samples of relatively short-lived material in clear stratigraphic position the results are relatively robust.

Models

The model includes the prior beliefs from archaeology, in this case both the layout of the enclosure, the stratigraphy of the ditches and the pottery chronology. Above, it was argued that the enclosure forms one system. This leads to the belief that a common start boundary for the enclosure can be assumed. The start boundary is followed by a phase including dates from the ditches with individual stratigraphic sequences of re-cuts. Before the last use of the enclosure, there is a shift in the style of the lugged beakers and a change in the deposition behaviour. This is seen in N4, layer c and in N24, layer d. These two layers are believed to represent the same horizon. To estimate the time of this shift, a cross-referenced date is inserted, with the *Date* function in OxCal, just before layer d from N4 and layer d from N24, and after layer k in ditch N22. The inclusion of the date in the sequence of N22 is due to considerations of the stratigraphy and the pottery chronology. There are undated layers stratigraphically above layer k, and the pottery of layer k is older than that of the final layers of the other ditches. It is further suggested that the enclosure predates the settlement, thus a boundary marks this transition (start settlement). Finally, the settlement phase ends in a final end boundary. (Figures 7 and 8).

An alternative interpretation, where the settlement is contemporary with the final phase of the enclosure, is also presented (Figures 9 and 10). N4 layer c and N24 layer d have been included in the settlement phase. The alternative model offers a slightly different chronological interpretation. It would mean that depositions of pottery in the ditches (see Figure 4) occurred at the time of the settlement. It also means that we have fewer discrete events dated, allowing the start date of the settlement to move back in time. It is important to point out

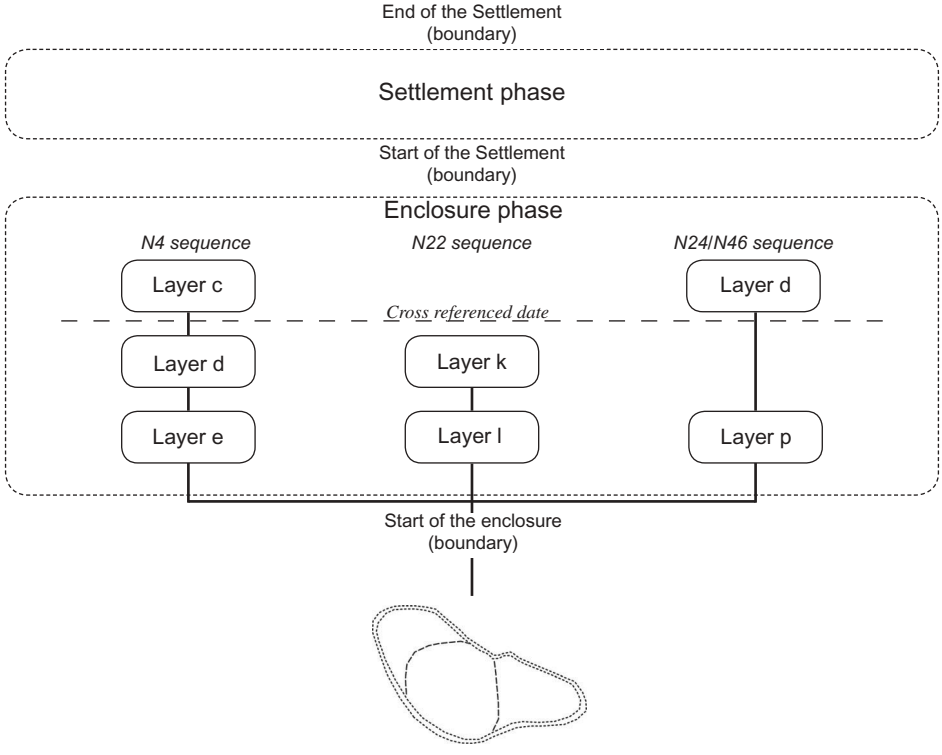

Figure 7. Schematic model of Liselund where the settlement is later than the enclosure (model 1 and 2)

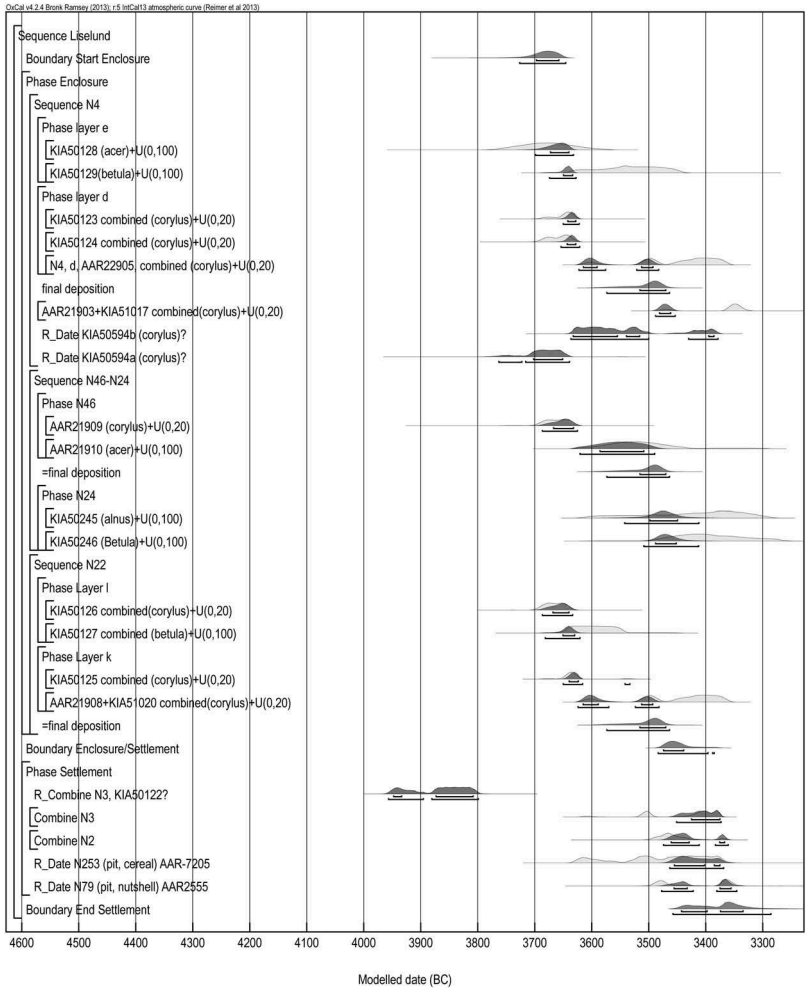

Figure 8. The OxCal implementation of model 2, presented in Figure 7

that the N46/N24 has at least four undated re-cuts between N46 layer p phase and N24 layer d. N22 has at least one undated re-cut before the undated sealing layers.

Results and discussion

In all models, the enclosure is most likely to start in the early 37th century (Figure 11). The models where Kiel 2014 dates are included produce results comparable to those without (with the exception of a bimodal start boundary on model 1, and a more undefined start boundary in model 1 and 3). This could be taken as an indication that the results including the Kiel 2014 dates are correct. In the further discussion, this is taken to be the case. The main conclusion that Liselund was built in the EN I period (e.g. before 3500calBC) is true in all four models (see Figure 11).

The favoured model suggests a start of enclosure activity between 3700–3660BC at 68.2% (3730–3645BC at 95.4%). After a final deposition, the site becomes a settlement around 3475–3445BC 68.2% (3485–3405BC at 95.4%). The settlement is abandoned before 3460–3275BC at 95.4%. This shows that the enclosure is contemporary with the EN Ib phase (3700–3500BC) and the settlement with the EN II phase (3500–3350BC). The model in which the last layers of the ditches belong to the settlement have comparable start and end boundaries, but have an earlier and slightly bimodal boundary between the enclosure and the settlement (see Figure 11, in dates 3615–3485BC at 68.2% or 3620–3470BC at 95.4%).

OxCal allows for estimating the probable duration of defined 'boxes' such as phases, using the *Span* command. When applied to Liselund (Figure 12),

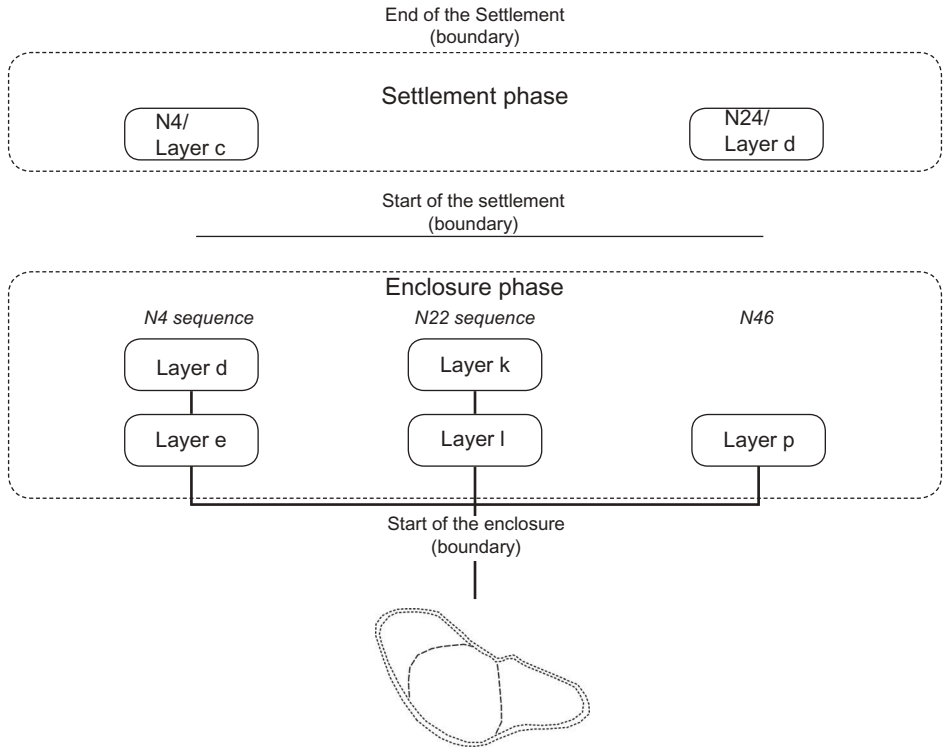

Figure 9. Schematic model of Liselund where the settlement is contemporary with the final layers in the enclosure (model 3 and 4)

the enclosure phase is between 166–253 years (95.4%), and the settlement between 0–98 (95.4%) years in model 2. In the alternative model (model 4), the enclosure is in use for 23–198 years (95.4%), and the settlement for 14–230 years (95.4%). In N46/N24, the layers p, m, k and f are certain 'enclosure events', with possibly also g, i and d, indicating at least four uses in the maximum 166–253 years of the enclosure. If equally distributed in time, it would result in one re-cut every 40–60 years, or approximately every generation to every other generation.

The start date of the enclosure in the 37th century BC is earlier than the traditional expectations of enclosures, but is comparable to new dates from enclosures in Southern Jutland and North Germany (Lützau Pedersen 2010, Lützau Pedersen and Witte 2012, Hage 2015). It could be pointed out that some enclosures or enclosure related sites could be added to these (Skousen 2008, p. 169; Madsen 2009, Klassen 2014, pp. 182–188). In addition, there is the Hamremoen site in Southern Norway (Glørstad and Sundström 2014, Glørstad and Solheim 2015). This site is atypical and has a very early start date, modelled to be between 3990–3820, and a long use time of 200–370 years, both estimates at 68.2% (Glørstad and Solheim 2015). The dated material is from a cultural layer inside the ditch, and the exact date of the ditch remains unknown. It is worth noting that Büdelsdorf in Northern Germany has a similarly early date (Hage 2015).

Little work has been done so far to precisely date the more than 40 enclosures from South Scandinavia (Klassen 2014, pp. 199–204), but when new dating schemes are implemented, it can be demonstrated that the enclosure phenomenon starts with a few very early sites such as Büdelsdorf and perhaps Hamremoen, but with the major construction phase of new enclosures after 3700BC. Interestingly, the start dates of the enclosures follow the pattern gained from England (Whittle *et al.* 2011). Here enclosures began in the end of the 38th century BC, and in many regions had its height in the 37th century BC. This indicates that the British explosion in enclosure construction is mirrored in South Scandinavia and Northern Germany, at least on the Jutland peninsula.

Recently, a population boom has been suggested at this time (Collard *et al.* 2010, Hinz *et al.* 2012, Shennan *et al.* 2013, Timpson *et al.* 2014). This can be explained as either a population explosion or migration from older farming communities, and it could be considered as an underlying reason for the

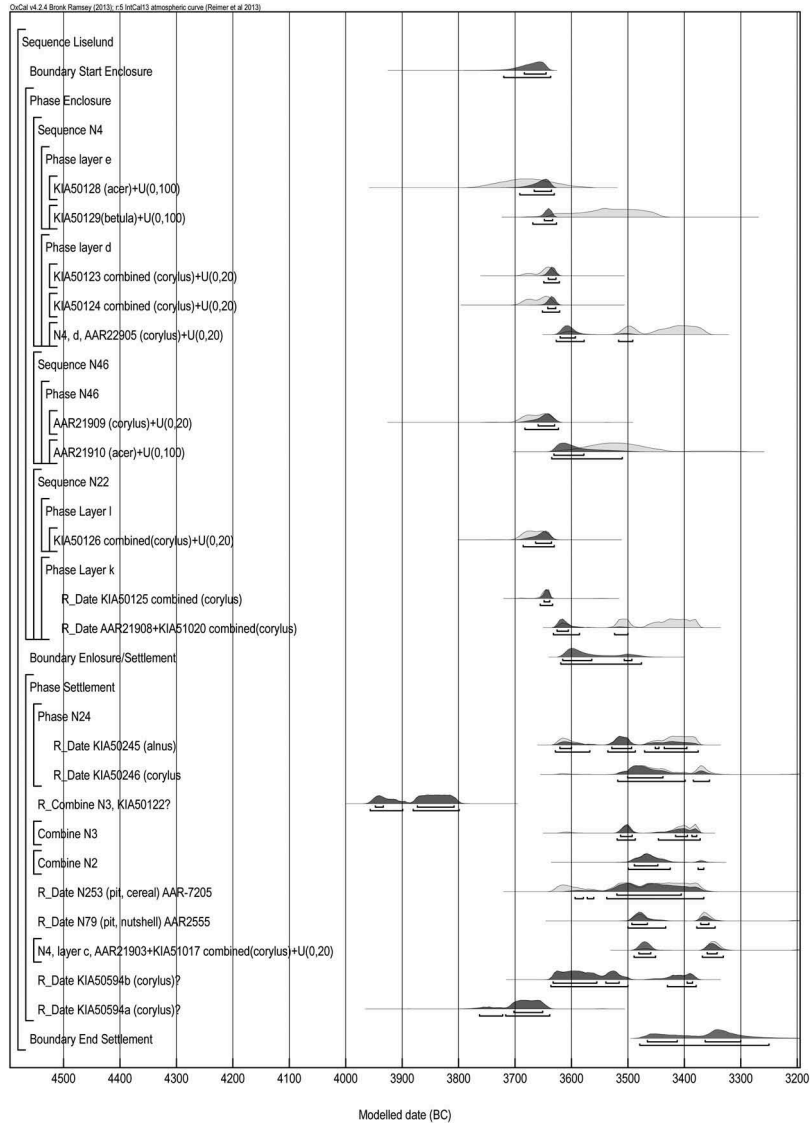

Figure 10. The OxCal implementation of model 4, presented in Figure 9

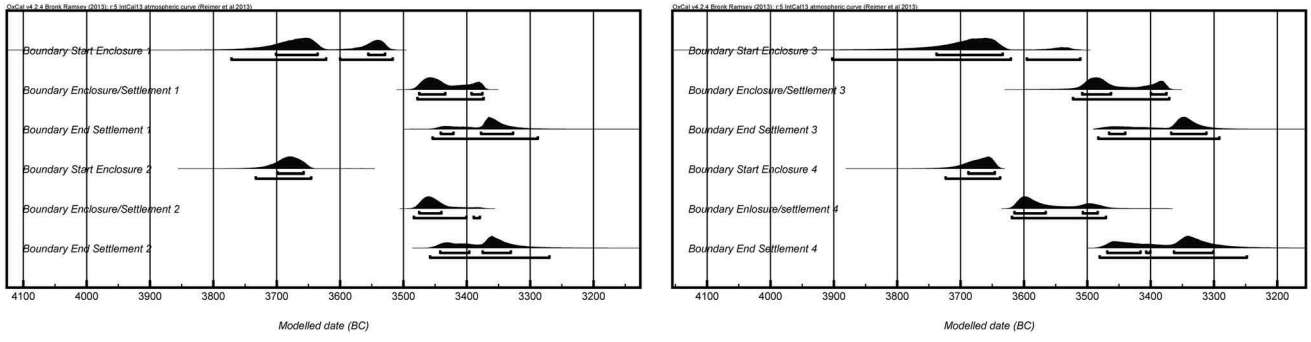

Figure 11. Left: the boundaries arrived at with the primary suggested model with the settlement later than the enclosure. Above model 1 (Amodel 64.7) without dates from Kiel 2014, and below model 2 (Amodel 67.1) including them. Right: a model where the settlement is contemporary with the last layer in the ditches. Above model 3 (Amodel 98.5) without KIA 2014 dates, and below model 4 (Amodel 78.4), which included them

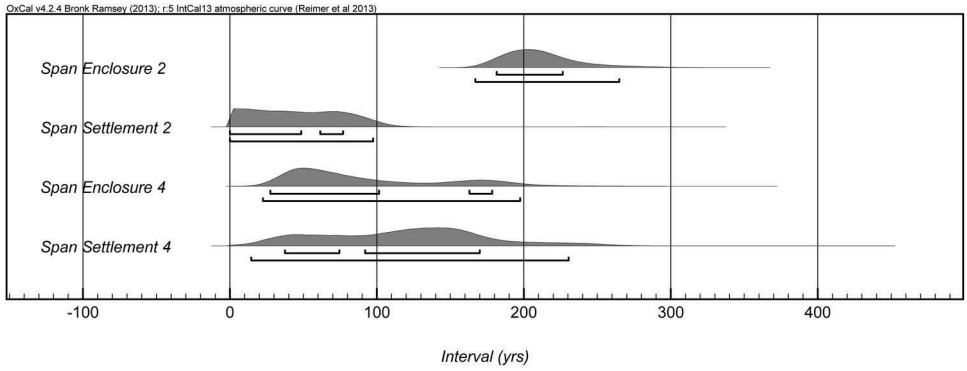

Figure 12. Comparison of the estimated span (use time) of the enclosure and settlement in model 2 and 4

boom in enclosure construction. However, not only are the population booms problematic from a modelling perspective (Contreras and Meadows 2014, Brown 2015, Weninger *et al.* 2015), it can also be demonstrated that the majority of dates forming these peaks are from continued use of Mesolithic shell midden sites and related to differences in research activity and preservation (Torfing 2015a, 2015b). The settlement record of this time is one of small scattered settlements, and the population have a continued use of wild resources. In the archaeological record, there is a lack of evidence for a population boom at this time. Population pressure would be more in line with the traditional date of the enclosures to the EN II-MN I (3.500–3200calBC), where an expansion of the settled area takes place (Madsen 1982, Andersen 1999, pp. 296–302; Klassen 2014, pp. 135–146). Instead, the enclosure construction in South Scandinavia is probably better understood as a step towards an increasingly Neolithic self-identification and increased contact with other societies due to wider exchange networks.

Conclusion

With the aid of Bayesian modelling, it can be shown that the enclosure at Liselund was in all likelihood constructed in the very late 38th century, or more likely the 37th century. Along with other early dates for enclosures, the result forces us to re-evaluate the introduction of enclosures in South Scandinavia. It can no longer be regarded as a phenomenon of the EN II, but must be something that already starts in the middle of the EN I. It requires us to rethink the development of society in the course of the Early Neolithic, and the way enclosures were introduced and why. With the new dates, the Scandinavian and North German enclosures become an integrated part of a larger explosion of enclosures from the 38th century BC to the 36th century BC. This could be the result of changes in the underlying social construction of the newly neolithizised communities and/or changes in the wider networks of contact. However, most Scandinavian enclosures remain poorly dated, and a new effort to date them will likely prove useful in discussing the development and changes during the Early Neolithic of Northern Europe. Radiocarbon dates revolutionised archaeology when first discovered. Bayesian models can take us a step further, as they integrate the dates further in our archaeological processes and data and so offer better answers for more questions.

Acknowledgements

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RESEARCH ARTICLE

Typifying scientific output: a bibliometric analysis of archaeological publishing across the science/humanities spectrum (2009–2013)

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ABSTRACT

This article presents the results of a bibliometric analysis conducted on all original research papers published in six high-ranking archaeological journals between 2009 and 2013, consisting of 926 papers. The purpose is to identify the general features characterizing the output of archaeological publishing within the given time frame and to discuss the results in light of the science/humanities divide of archaeology. It expands previous work, covering not just scientific *or* humanistic parts of archaeology, but sub-disciplinary niches *across* the science/humanities-spectrum. Significant differences are identified amongst the journals on an array of parameters, including journal statistics, citation network, thematic distribution, the application of methods and the direction of relevance to other sub-fields. Most significantly, established correlations of academic publishing are for the first time identified in archaeology, regarding the structure of citation networks, the connectedness of high-ranking journals and how specific affiliations to either side of the science/humanities divide affect publishing. In the end, these results are taken to represent a sub-optimal division of labor between archaeological sub-fields, tentatively explained by the continued relevance of the science/humanities divide in archaeology, by providing diverse epistemic underpinnings.

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Archaeology; bibliometrics; citation analysis; division of labor; epistemology; science/humanities divide

1. Introduction

What characterizes the current state of archaeological publishing? In trying to answer this general question, this article presents a bibliometric analysis of established correlations regarding the connectedness of high-ranking journals, the relation between types of papers and methods used, and how different affiliations to the science/humanities divide affect archaeological publishing. Bibliometrics – the application of quantitative methods to analyze academic literature and publishing (Bellis 2009, p. xi, 417) – is next to non-existent within archaeology, and is utilized here with the aim of better understanding archaeological publishing, confirming for the first time correlations observable in other parts of academic publishing.

Bibliometric studies of specific sections of the archaeological discipline have already been attempted (Marriner 2009, Palomar *et al.* 2009, Leydesdorff *et al.* 2011). On the occasion of the *Journal of Archaeological Science´s* 35th anniversary, a bibliometric assessment was made of publishing trends amongst the archaeological sciences (Marriner 2009). The current article aims at expanding such previous works by assessing what characterizes both scientifically and humanistic oriented archaeological publications during the past 5 years. The data set comprises all the 926 original research papers published between 2009 and 2013 by six top-ranking archaeological journals, which cover sub-disciplinary niches across the science/humanities spectrum. This data is submitted to a set of bibliometric analyses – covering journal statistics, citation network, thematic distribution, the application of methods and the direction of relevance to other sub-fields.

Aiming for the bigger picture by including different sub-fields of archaeology might be fruitful, taking into account the general diversification of archaeological conduct since the 1960s and the theoretical diversification especially since the 1990s (Trigger 2006, p. 484, 497, Webmoor 2007, p. 568, Fahlander 2012, pp. 122–123, Hodder 2012, Kristiansen 2014, p. 15). Both methodological and theoretical diversity is illustrated by an ever-

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expanding panoply of archaeological journals. There is also a shared perception of archaeology as being a multifaceted discipline, operating at the intersection between historical and social sciences, utilizing methods corresponding to the whole range of natural sciences to the aesthetics (Jones 2004). This goes for the application of theory as well. Though social and anthropological theory have received most attention, natural scientific theorizing is of fundamental importance to questions of dating, site formation, taphonomy, ecology, climate reconstruction etc. Archaeological diversity is also mirrored by the various ways in which the discipline has been institutionalized around the globe. By a rough typology, archaeology has been the smaller sister of history in Northern Europe (Trigger 2006, p. 164), as part of the anthropological project in North America (cf. Binford 1962, Trigger 2006, p. 410), and as one of many humanistic disciplines within classical studies (cf. Whitley 2001, p. 3), especially for the Mediterranean region. The unequal weighting of the empirical record and prioritization of prehistoric periods, has led archaeologists to internalize a variety of academic profiles as a response to a multitude of educational and institutional affiliations (a point made early on by Polanyi (1958, p. 151)). The prominence of such differences have a long history of being debated, yet they may today be expressed on a different arena and scale – namely in the world of digital academic publishing. Through quantitative analyses, this article finds that archaeological publishing is significantly affected by the affiliation of sub-disciplines with specific epistemic outlooks on science. Based on the results a short argument is presented for the continued relevance of the science/humanities divide in archaeology, claiming that the observable differences in publishing practices may point to a sub-optimal division of labor within archaeology.

2. Bibliometrics

Bibliometrics is essentially a set of methods to investigate quantitative properties of academic literature (De Bellis 2009. p. xi, 417), applying 'mathematics and statistical methods to books and other media of communication' (Pritchard 1969, p. 348). The most common and well-known application of bibliometrics is through the analysis of cites, their frequencies, patterns and relation to other variables (see Rubin 2010, Garfield 1983) – a method widely used for ranking journals, institutions and scholars on impact-indexes. The common goal of bibliometric methods is to 'investigate the formal properties of the scholarly publication system', and thereby making science itself the subject of inquiry (Bellis 2009, p. xi; for an excellent example, see Fanelli and Glänzel 2013). Bibliometrics came into being during the 1920s but was not consolidated until the 1960s. Its development and dissemination has since evolved in accordance with advances of information technology (Glänzel 2002; for the development and history of bibliometrics, see Broadus 1987, Brookes 1990, Gross and Gross 1927, Lotka 1926, Nalimov and Mulchenko 1971, Price 1961, 1963, Ravichandra 1983). Today bibliometrics constitutes its own field of study, mainly directed at methodological development, providing numeric and evaluative input to scientific disciplines, as well as to policy-making, and to grant and application management. Although an established tool in informatics, mathematics, quantitative science studies and library science, bibliometrics has seen almost no application in archaeology (for exceptions, see Mallía and Vidal 2009, Mays 2010). As such, there is an untapped potential in applying bibliometrics to archaeology.

3. Procedure

The selection of data for this study has been made on the basis of its representativeness, thereby facilitating the identification of general features in archaeological publishing. The data set consists of 926 papers, covering the five-year period of 2009–2013. The specified time slot is of interest both in presenting recent data points, as well as in covering the marked upswing of publishing during this period (compared to preceding years). Furthermore, bibliometric studies exist only prior to this period and the signified period allows the inclusion of some archaeometric journals that came into being just in advance.

This article exclusively presents data from 'regular' journals. That is, journals with less than 15 articles per issue, and 2–4 issues a year, published on paper (in contrast to exclusively online and open source publishing). Given these criteria, I have avoided some of the biggest and top-rated journals.

These being primarily digital, with a much higher number of articles per issue and with up to four times the number of issues per year. When mapping trends in archaeological publishing, this omission is an unfortunate but necessary measure taken to control the volume of data. Only original research papers are included, thereby excluding editorials, reviews, discussions, book reviews, errata and otherwise non-original studies. The main directive for selecting journals is their ability to be representative of archaeological sub-fields such as historical, anthropological, social, scientific, environmental and general archaeology. It might be helpful to review the statement of purpose as presented by the respective journals.

- *Antiquity ([A])*: 'a quarterly review of World Archaeology interested in all research questions, in all periods and all parts of the world'.
- *Archaeological and Anthropological Sciences (AAS)*: 'covers the full spectrum of natural scientific methods with an emphasis on the archaeological contexts and the questions being studied. It bridges the gap between archaeologists and natural scientists providing a forum to encourage the continued integration of scientific methodologies in archaeological research'.
- *Journal of Anthropological Archaeology (JAA)*: 'devoted to the development of theory and, in a broad sense, methodology for the systematic and rigorous understanding of the organization, operation, and evolution of human societies'.
- *Journal of Social Archaeology (JSA)*: 'promotes interdisciplinary research, focused on social approaches in archaeology, it champions innovative social interpretations of the past and encourages exploration of contemporary politics and heritage issues'.
- *Environmental Archaeology (EA)*: 'consider the interaction between humans and their environment in the archaeological and historical past'.
- *International Journal of Historical Archaeology (IJHA)*: 'focuses on the post-1492 period and includes studies reaching into the Late Medieval period … [and] present the latest theoretical, methodological, and site-specific research'.

One could just as well have included journals representing classical, heritage, computational, evolutionary or any other archaeological sub-field. These have been omitted only for the sake of feasibility. Though taken to represent some general attributes of archaeological publishing, the data reflect (some might say suffer) from a geographic dislocation as only journals based in Britain and the United States are included, respectively three American and three British journals (meaning those published *in* the given regions).

Even so, the most important criterion for selection has been the journals´ iconic status vis-a-vis given sub-specialities.. As the data selection is based on topic instead of geographical affiliation, no region-specific journals are included. The lack of geographically diverse journals should not be impairing as the included journals publish research from all over the world, and are all high- to top-ranking amongst specialized *archaeological* journals. The quantity of articles and metrics of the journals included in this study are summarized in Table 1.

The information value of such metrics is disputed. They are nonetheless listed here to provide a basic overview of the included journals. The dispute concerns whether such metrics present a fruitful way of evaluating the output of scientific research. Critical voices claim that particularly the impact factor (originally a device for helping libraries select the most important journals for their collections) does not function properly as an indicator of the importance of individual papers, but rather represents a mix-up of a scientist's reputation with the ranking of a journal (cf. The San Francisco Declaration on Research Assessment; Batista *et al.* 2006, Penfield *et al.* 2014; explicating the connections to open access publishing, see Norris *et al.* 2008, Solomon *et al.* 2013).

3.1. Source critical factors

It has been necessary to quantify *qualitative* variables as no existing database contains the data needed for this study. A problem connected to this line of work is the unfortunate result of having to catalog each paper manually. Looking at already quantified parameters would enable the use of preexisting, bibliometric analyzers such as *Web of Science, Publish or Perish* and *Scopus*. These ready-made bibliometric

Table 1. Summarized metrics for the journals included in the bibliometric analyses.

Journal	Papers (n)	Cites	*AM* cites, Pr paper	% of n With 0 cites	Max cites, Total amount of years	h5-index	h5-median	SJR	5 year Impact factor
Journal of Social Archaeology	82	241 (550)	3,05 (6,11)	44.46%	23 (65)	7	-	0.688	1
Journal of Anthropological Archaeology	181	1044 (1680)	5,77 (8,65)	17.79%	29 (43)	19	25	1.333	2.453
International Journal of Historical Archaeology	164	186 (399)	1,15 (2,33)	68.19%	12 (22)	8	10	0.264	(0,44)* -
Archaeological and Anthropological Sciences	112	492 (913)	4,47 (5,67)	43.65%	52 (73)	14	25	0.649	1.06
Environmental Archaeology	70	182 (357)	2,53 (2,36)	49.39%	16 (16)	9	14	0.588	0.974
Antiquity	317	1421 (2554)	4,41 (8,05)	46.13%	53 (76)	21	29	0.873	1.43

The differing values presented under cites, average cites (AM) per paper and max cites correspond to the values provided by Web of Science above and Publish or Perish below, in brackets (). The h5- index and- median are procured from Google Scholars ranking metrics, while the 5-year impact factor is provided by the journals themselves. The SJR is Scopus'' take on the impact factor, calculated using the same algorithm, but over a shorter time span. *The h5-median of JSA, and the 5-year impact factor for IJHA could not be obtained. I have calculated an estimated value for the latter, using a scatter plot and best-fit-to-curve function, which seems reasonable when correcting it with a ration of 2:3 between SJR and the 5-year impact factor. This value is therefore unofficial, and has been included in order to give the reader a relative sense of the journal's impact factor in order to make comparison easier.

programs allow for direct statistical queries of a given data set. Even so, there are problems related to the interpretation of such queries, if used uncritically. For instance, it would be possible (yet misleading) to catalog a paper under a given subject, based solely on the occurrence of a corresponding word in the paper's title, abstract or the main text. Instead it is necessary to evaluate each paper individually when identifying the main purpose of research.

The thematic data were collected directly from the online homepage of each journal and then plotted into an Excel sheet. Citation data and journal metrics (the analyses of which are presented in Table 1) were collected using two sources: *ISI Web of Science* (WoS) and *Publish or Perish* (PoP). The metrics were then calculated manually, correcting the values provided by the WoS and PoP databases. It was necessary to combine and correct the two manually, as they provided quite diverging results. WoS produces overly conservative estimates, while the opposite is true for PoP. In short, the reason for this is unequal access to appropriate databases and different ways of calculating the metrics. At the time of writing, a whole range of journals are not included in the WoS catalog. PoP on the other hand, collects data from Google Scholar, which in itself provides some issues for the analysis presented below, that needs mentioning: PoP provides a much wider array of sources for citation analysis, by collecting data from journals, books, internet journals and other digitized (or otherwise online registered) media, in all languages. The downside is the inclusion of 'unofficial' cites, such as non-peer-reviewed blog entries. In order to balance this, I have listed the metrics collected from both WoS and PoP in Table 1. Despite my best effort to remove false and unofficial cites, there is still going to be a certain margin of error in the numbers presented here. Even so, the extent of such erroneous cites constitute a very small fraction of the data set (in the range of ≤1%).

Timing is another important factor that needs mentioning as metrics are dynamic values. The metrics presented here are but a snapshot of archaeological publishing and discourse, representing the very period for which the data was collected. Also, no age-weighted metrics are included, as the aim of this analysis is to compare results *within* the given time frame (2009–2013).

3.2. Classification

A database was built be codifying the (1) topic being examined, (2) application of methods and (3) citation network for every single paper published by the six journals over the 5-year period. The thematic considerations of each paper were classified into a manageable number of categories, thereby reducing the vast variation of topics. The classification was made with some initial categories thought to be prevalent in the data set. Over time, the growing number of categories was integrated in the further

Table 2. The 29 thematic categories employed in the bibliometric analysis.

Class 1: Phenomena	Class 2: Environment	Class 3: Meta
Art/Symbolism	*Agriculture/Husbandry*	*Conceptual*
Civilization/Culture history (urbanism)	*Dating/Age/Chronology*	*Heritage*
Class/Inequality	*Diet/Subsistence*	*Method*
Colonialism/Indigenous	*Ecology/Climate*	*Research history/Critique*
Cosmology/Identity/Ritual	*Evolution*	*Theory/Interpretation*
Death/Burial	*Formation/Taphonomy/Preservation*	
Economy/Exchange/Production	*Health*	
Gender	*Human impact*	
Infrastructure/Monuments	*Hunter-gatherers*	
Population/Mobility	*Provenience*	
Power/Politics/Conflict	*Settlement/Land use*	
Technology/Function	*Zooarch/Animal*	

description of papers, before a full correction of the data set was made, employing the entire set of categories to the complete database. I have complied with the guidelines provided by the international classification of academic literature used in libraries, the Dewey system, and used the classification of *EBSCO Anthropology Plus* for calibration (see http://www.ebsco.com/about). Table 2 illustrates the analytic schema applied in the analysis.

The categories have been divided into a primary and a secondary level. The primary level consists of three major groups of categorical classes, each containing a number of secondary level categories. *Phenomena* includes the most recurring research on past phenomena. This class represents topics researched in 'traditional' archaeology, that is, papers presenting new findings on the assorted topic. *Meta* on the other hand, encompasses those papers somehow reflecting on archaeology itself, either through the development of new methods and theories, or through critique. *Environmental* refers to categories that in some way are oriented toward natural processes, for instance matters of ecology, evolution, biology and dating. Though also presenting 'immediate' results on past phenomena (thereby overlapping with *Phenomena*), these categories are oriented toward the interplay between culture and nature/habitat/landscape.

Representing a more fine grained classification, the secondary level contains a total of 29 categories. The function of this division is to counteract any subjective bias that might affect the classification itself, as there may occur significant overlap between the categories. It thereby secures the correct weighting of variables in the analysis presented below, as any incorrect classification on the secondary level should be counteracted by the classification on the primary level. The allocation of categorical membership has been made according to a set of rules:

- Categorization is based on a combination of the information provided by title, abstract and keywords. If difficult to ascribe a category, introduction and conclusion are read. If still unclear, a skimming of the main text is done. The reason for not basing the analysis entirely on the keywords provided by the authors themselves is the need to compress the thematic variation to a manageable number. Heavy emphasis has still been put on the keywords providing vital information regarding the main topic of the papers.
- Papers are categorized by the area of knowledge the papers aim at.
- If an article incorporates elements attributed to two distinct categories (according to the above schema), it is assigned to the category most dominantly present.
- Papers on contemporary issues concerning archaeology and society, such as power, politics and policy, are classified as *Heritage*, not *Power/Politics*, as the latter is reserved for papers focusing on power and politics as a prehistoric phenomenon.
- *Antiquity* has its own specific section on 'method'. These articles are also included here, and are classified as *Method*.
- It will always be possible to question the categorizations made here, if emphasizing other aspects. This is an unavoidable weakness of quantifying essentially qualitative variables. Despite the risk of categorical overlap and errors of codification on my part, the two-leveled classification should counteract possible incorrect categorizing.

4. Results

4.1. Thematic distribution

Table 3 shows the full data range of thematic distribution. Only highlights relevant to the further analysis will be discussed here.

The journals publish papers very much in accordance with their stated purposes. An example is *EA*'s almost exclusive appearance under the (first-level) class *Environment*, by nearly 80%. *JSA* provides the direct opposite – 0% of its papers belonging to the environmental class. Instead, *JSA* has the highest values for the *Meta*-class (60%), and its most numerous themes are *Theory/Interpretation* = 23.17%, *Cosmology/Identity/Ritual* = 20.73% and *Heritage* = 15.86%

Method constitutes *AAS*'s most prominent theme, which amounts to 23.21% of its papers. *[A]* also present a high amount of papers belonging to *Method*, 20.18% of its total. Even so, there are significant differences in the qualitative aspects of the papers concerning method in these two journals. Whereas *AAS* presents papers on the technical development and improvement on scientific methods, *[A]* mainly presents the results of scientific methods applied to archaeology.

[A] stands out with a general culture-historical profile. Interestingly, articles belonging to the category *Civilization/Culture history* exclusively come from *[A]* and, even more specific, the studies are mainly conducted in China. What causes this is not clear. It might point at some national differences and the continued relevance of methodological nationalism, or more interestingly, an effect of the need for basic research in an otherwise under-explored area – what earlier was also the case for the Indus valley. This pattern is also supported by *[A]* being alone in presenting papers on *Infrastructure/Monuments*, in the sense of describing roads, ditches, earthworks, standing monuments etc. in themselves.

4.2. Methods used

The ways in which the research has been conducted might be as informative as the thematic distribution.

Table 3. Metrics for the distribution of primary and secondary category levels.

	Journal of Social Archaeology		Journal of Anthropological Archaeology		International Journal of Historical Archaeology		Archaeological and Anthropological Sciences		Environmental Archaeology		Antiquity	
	%	n	%	n	%	n	%	n	%	n	%	n
Class 1: Phenomena Total	40,24%%	33	51.93%	93	57.24%	94	25.00%	28	7.14	5	48.89%	155
Art/Symbolism	2.43%	2	1.10%	2	0.60%	1	3.57%	4	1.42%	1	8.20%	26
Civilization/Culture history	-	-	-	-	-		-	-	-		4.73%	15
Class/Inequality	-	-	0.55%	1	15.24%	25	-	-	-	-	-	-
Colonialism/Indigenous	6.09%	5	1.10%	2	12.19%	20	-	-	-	-	0.94%	3
Cosmology/Identity/Ritual	20.73%	17	3.31%	6	8.53%	14	0.89%	1	1.42%	1	4.10%	13
Death/Burial	2.43%	2	3.86%	7	6.09%	10	2.67%	3	-	-	6.30%	20
Economy/Exchange/Production	-	-	4.41%	8	5.48%	9	-	-	-	-	5.04%	16
Gender	1.21%	1	0.55%	1	0.60%	1	-	-	-	-	-	-
Infrastructure/Monuments	-	-	1.10%	2	-	-	-	-	-	-	3.78%	12
Population/Mobility	-	-	8.28%	15	1.21%	2	3.57%	4	1.42%	1	4.41%	14
Power/Politics/Conflict	4.87%	4	12.70%	23	3.65%	6	-	-	-	-	3.15%	10
Technology/Function	2.43%	2	14.36%	26	3.65%	6	14.28%	16	2.85%	2	8.20%	26
Class 2: Environment Total	0.00%	0	40.33%	73	10.97%	18	49.10%	55	78.57%	55	24.92%	79
Agriculture/Husbandry	-	-	4.97%	9	-	-	8.92%	10	21.42%	15	5.67%	18
Dating/Age/Chronology	-	-	-	-	-	-	4.46%	5	2.85%	2	9.46%	30
Diet/Subsistence	-	-	6.62%	12	1.21%	2	10.17%	12	11.42%	8	1.26%	4
Ecology/Climate (environ. Recon)	-	-	3.86%	7	-	-	2.67%	3	10.00%	7	-	-
Evolution	-	-	2.76%	5	-	-	0.89%	1	-	-	1.57%	5
Formation/Taphonomy/Preservation	-	-	1.10%	2	0.60%	1	5.35%	6	2.85%	2	-	-
Health	-	-	1.10%	2	0.60%	1	-	-	-	-	-	-
Human impact	-	-	-	-	-	-	0.89%	1	5.71%	4	-	-
Hunter-gatherers	-	-	6.07%	11	-	-	-	-	-	-	1.26%	4
Provenience	-	-	-	-	-	-	9.82%	11	-	-	-	-
Settlement/Land use	-	-	12.70%	23	8.53%	14	2.67%	3	12.85%	9	5.04%	16
Zooarch/Animal	-	-	1.10%	2	-	-	2.67%	3	11.42%	8	0.63%	2
Class 3: Meta Total	59.76%	49	8.28%	15	31.70%	52	25.89%	29	14.28%	10	26.18%	83
Conceptual	6.09%	5	1.10%	2	7.31%	12	-	-	-	-	0.31%	1
Heritage	15.85%	13	-	-	10.36%	17	-	-	-	-	0.31%	1
Method	6.09%	5	6.07%	11	5.48%	9	23.21%	26	11.42%	8	20.18%	64
Research history/Critique	8.53%	7	-	-	3.65%	6	-	-	1.42%	1	1.26%	4
Theory/Interpretation	23.17%	19	1.10%	2	5.48%	8	2.67%	3	1.42%	1	4.10%	13
Total:	*100.00%*	*82*	*100.00%*	*181*	*100.00%*	*164*	*100.00%*	*112*	*100.00%*	*70*	*100.00%*	*317*

A marker for this parameter is signified by [Method used], classified per paper. This might indicate the most significant difference between the journals, as there seems to be clear-cut and distinctive boundaries between them. As shown by Table 4 and Figure 1, the number of theoretical and discussion papers form an almost perfect fall-off curve, corresponding to a descending number of archaeometric methods – an inversely proportional relation.

It is interesting to note that this pattern quite resembles the hierarchy of sciences (Fanelli and Glänzel 2013). This is evident from the 'concentric' pyramid-like shapes in Figure 1, the first corresponding to the methods used by *JSA*, restricted to the methods of the lower half of Table 4. Next, *IJHA* has a somewhat bigger scope, while *A* and *JAA* utilize the whole range of methods (included in this typology). These two are the most comprehensive and highest ranked journals in this analysis, which is also reflected in the broader scope of interests and methods used. It therefore seems like we can introduce the following rule of thumb: a broader scope of interest of a journal results in a wider application of methods.

4.3. Citation analysis: cross-references

It is possible to map the connections between variables at both the level of papers and the level of journals. This can be done by identifying the patterns of citing amongst papers and between journals, thus allowing the citation-network to be studied (cf. Brughmans 2013). As shown in Table 1, and graphically reproduced in Figures 2 and 3, the journals exhibit large differences in their number of papers, number of cites per paper and the percentage of papers with zero cites.

Reviewing the percentage of cites coming from the other journals within the given time frame, may indicate to what extent occurs across sub-disciplinary units. As illustrated by Table 5, there are no large differences in the sum of cross-references, that is, cites coming from the other journals included here. The one exception is *IJHA*, which has less than half of its cites coming from the five other journals. This is probably due to its multidisciplinary profile, producing a citation network overlapping with historical journals. Once again *JAA* and *A* stand out, in this case with high degrees of self-citing. There are several potential explanations for

Table 4. Bibliometric data for the methods used in the 926 papers.

	Social	Historical	Antiquity	Anthropological	Environmental	Sciences
Physical Archaeometry	-	-	11.35%	3.31%	5.71%	50.89%
Bioarchaeology	-	3.00%	9.46%	27.61%	75.71%	25.00%
Computer modeling	-	1.83%	2.52%	11.60%	0.89%	
Excavation/Survey	2.43%	8.00%	14.82%	10.49%	-	1.78%
Material Study	11.00%	16.46%	10.00%	18.23%	1.43%	-
Discussion/Theoretical	79.26%	65.00%	38.00%	22.65%	5.73%	11.60%
Experimental	-	-	2.83%	0.55%	8.57%	1.78%
Other	-	5.00%	10.41%	5.52%	2.85%	9.00%

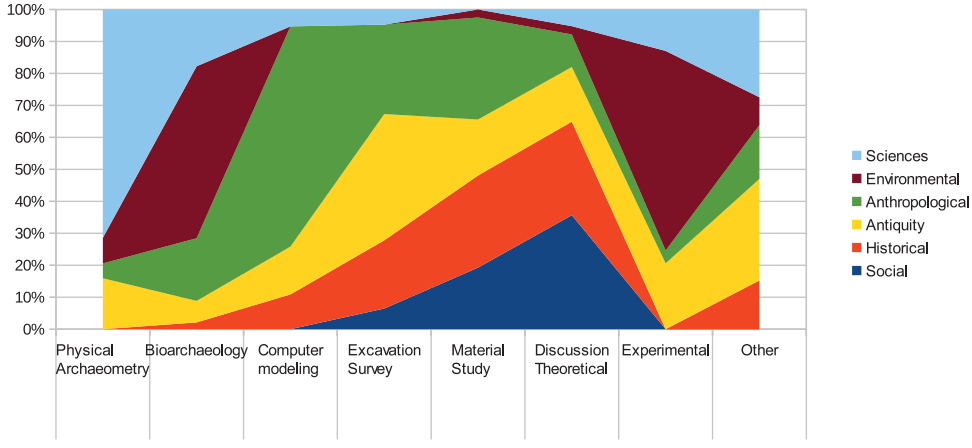

Figure 1. Graphical representation of Table 4, in a 'stacked percentage' diagram.

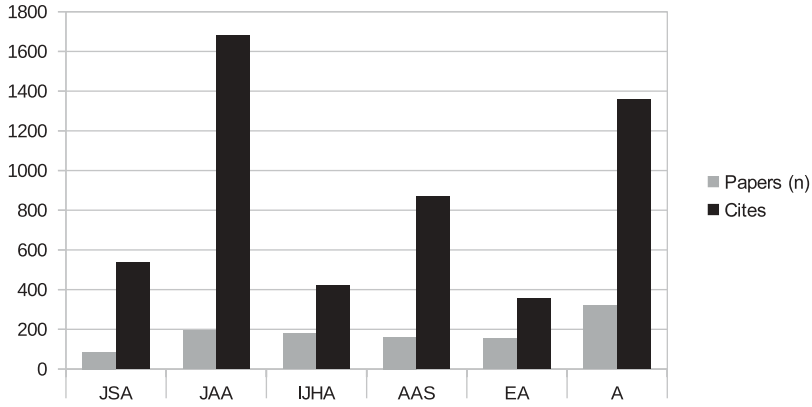

Figure 2. Relation between total number of papers and cites.

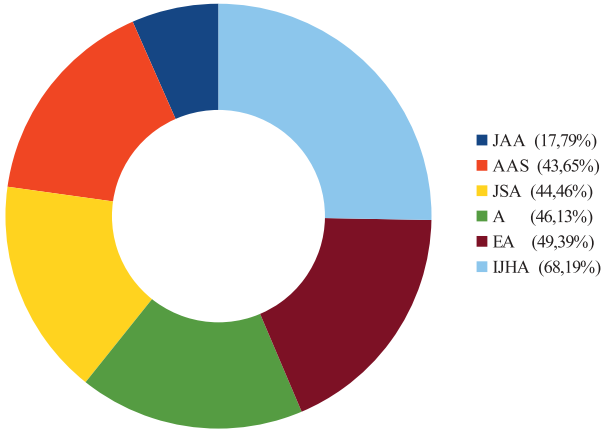

Figure 3. Percentage (%) of papers (n = 926) that have been cited zero times, covering only 2009–2012. The values for this particular diagram were collected from *SCImago Journal & Country Rank (SJR)*, as no reliable data was otherwise available.

this, but it might be attributed to the all-round function of these journals (as witnessed by their broad-scoped statement of purpose – cf. Section 3), constituting a lively community for debate.

When the results in Table 5 are transformed into graphical expressions of the citation network, some points of interest appear (see Figure 4). As illustrated by the figure, the journals form connections of

Table 5. The extent of cross-referencing between the included journals.

Social	Times cited	% of n (82)	Environmental	Times cited	% of n (70)	Antiqiuty	Times cited	% of n (317)
Antiqiuty	2	2.43%	Antiqiuty	1	1.42%	Antiqiuty (self)	92	29.00%
Environ.	0	0.00%	Environ.(self)	11	15.71%	Environ.	6	1.89%
Historical	7	8.53%	Historical	1	1.42%	Historical	4	1.26%
Anthro arc	3	3.65%	Anthro arc	4	5.71%	Anthro arc	25	7.88%
Social (self)	15	18.29%	Social	0	0.00%	Social	5	1.57%
Sciences	0	0.00%	Sciences	3	4.28%	Sciences	13	4.10%
Sum total		*33.00%*	*Sum total*		*28.50%*	*Sum total*		*45.70%*
Sum of others		*14.61%*	*Sum of others*		*12.83%*	*Sum of others*		*16.70%*
Historical	Times cited	% of n (164)	Anthro. Arc.	Times cited	% of n (181)	A. A. Sciences	Times cited	% of n (112)
Antiqiuty	2	1.21%	Antiqiuty	16	8.83%	Antiqiuty	10	8.92%
Environ.	0	0.00%	Environ.	1	0.55%	Environ.	2	1.78%
Historical (self)	16	9.75%	Historical	1	0.55%	Historical	1	0.89%
Anthro arc	0	0.00%	Anthro arc (self)	50	27.62%	Anthro arc	6	5.35%
Social	7	4.26%	Social	4	2.20%	Social	0	0.00%
Sciences	1	0.60%	Sciences	6	3.30%	Sciences (self)	17	15.17%
Sum total		*16.00%*	*Sum total*		*43.00%*	*Sum total*		*32.00%*
Sum of others		*6.07%*	*Sum of others*		*15.43%*	*Sum of others*		*16.94%*

Highest external cites (blue), and self-cites (red). These numbers should be reliable, as the WoS databases include all the journals analyzed in this article. As such, the number of cites amongst the respective six journals should therefore amount to the actual coverage made up of cross-citation (given in %). Color representation is only available in the online version. Please consult the according version.

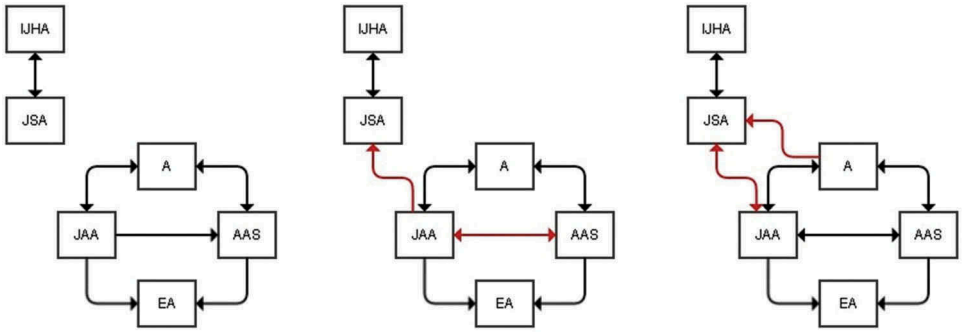

Figure 4. Citation networks according to the confidence interval of >4% (left), >3% (middle) and >2% (right). The direction of arrows denotes the directionality of citing. Double-headed arrows indicate cross-referencing, according to the given confidence interval. Red arrows mark new nodes in the network compared to the former interval.

different kinds depending on what confidence interval (percentage of cites explained by a journal *X*) is applied. Even though the interval of >4% is not too significant, the bar could be raised to 8% and a simplified (less connected) version of the central cluster would still remain, thereby being the most stable and significant network.

What is most profound is the central cluster, as it prevails different levels of testing – which underpins the representativeness of the observable patterns (at least for *JAA-A-AAS*). If we extrapolate the position of these results into the network that would arise from a complete analysis of all archaeological journals, I find it reasonable to assume that the central cluster of Figure 4 would still represent a vital part of the actual central cluster, if all relevant journals were included. Some common denominators for the central cluster are *Journal of Archaeological Science, Archaeometry, World Archaeology, Current Anthropology* – in short, topmost ranked journals. This means that proximity to the center (in terms of cross-referencing) seems to correspond to the ranking of journals. Thus, the higher the rank of a journal, the more connected through cites. This is a confirmed correlation (described by Bradford's law and Zipf's law), though subjected to a recent weakening whereby highly cited research no longer is reserved for a handful of top journals (Lozano *et al.* 2012, Larivière *et al.* 2014, cf. Weale *et al.* 2004).

5. Discussion

What might be expected of the bibliometric results if they were to indicate an optimal and efficient division of labor within archaeology, unaffected by the science/humanities divide? First of all, a very low number of papers would be left without making any contribution to the professional discourse, by way of not receiving any cites. Second, there would be a high degree of cross-referencing between journals. If the division of labor functions smoothly, one sub-field would build on the work being done in other sub-fields (Weisberg and Muldoon 2009), evident by an extensive citing between sub-disciplinary journals. As a result, all parts of the citation-network would become interconnected, and the degree of integration would increase with thematic proximity. Third, the thematic distribution of subjects per journal should take the form of a spectrum of relevance by which a topic of high relevance to a specific journal, is of decreasing relevance to the adjacent journal in the spectrum, until we arrive at the journal where the topic is not relevant. What is relevant to any particular journal would be proscribed by their statement of purpose, and importantly, the very purpose of every single journal would be attuned to the division of labor between archaeological journals. In this way a discipline may foster the most effective allocation of resources, as specific research areas strictly correspond to an associated journal. Fourth, there would be a substantial overlap between journals in what methods are being used. Despite the various goals of journals, given by their statement of purpose, they all have in common the ambition of explaining/interpreting the past. The main differences should not be in the utilization of methods, but in how they are put to use (corresponding to the journal-specific focus on periodic or geographical area). Notwithstanding, the results of the current analysis point to some deviation from this idealized condition.

5.1. Zero-cites

The number of papers that received zero cites in this time period ranges between 17.79% and 68.19%, with an average of 44.94%. This seems to be within normal range of zero-cites amongst the highest ranked archaeological journals (Scopus). The number of zero-cites therefore support the centrality of the journals in the citation network described above, as the highest ranked journals also tend to receive the most cites. Still, almost half of the papers presented are not cited at all. A large review showed that levels of zero-cites correspond to different branches of science, placing these results closer to the social (32%) and natural sciences (27%), than the humanities (82%), for this parameter (Larivière *et al.* 2009). A spectrum appears when dissecting the results: Whereas *JAA* has very few zero-cites (17.19% – close to the ultimate low of 12% set by medical journals, thus falling below the average for natural science journals), *IJHA* stands out with a particularly high amount (68.19%), closer to the humanistic average.

The rate of zero-cites must be kept in mind when reviewing a journal's impact factor, as it is based on the average number of cites per paper, not the median. Therefore, a journal with a high percentage of zero-cites and some highly cited papers, can give the impression of most papers being well cited. In regard to the journals included for analysis in this article, about half of the papers have not been cited – a fact which affect the journals' impact factor/SJR as presented in Table 1. When coupled with the values for zero-cites, there is a strong inverse correlation with the impact factor, making high ranking correspond with low number of zero-cites. This is confirmed by the highest ranked journal *JAA*, having the lowest percentage of zero-cites. Conversely the lowest ranked journal *IJHA*, has the highest percentage of zero-cites.

5.2. Cross-references

The citation network (cf. Figure 4) provides an illustration of what we may call *the direction of relevance*. It describes the general direction most of the cites are oriented toward – that is, in what journals the papers (from the original set) are considered relevant. When checking for external citing (cites coming from journals not included here) *JSA* predominately gets cited by anthropological journals, but also some heritage and literary reviews. *IJHA*, naturally gets cited by other historical and contemporary archaeology journals to a high degree, but also social matters such as by slavery, theater and art reviews. Both diverge from the other four, in being more specifically oriented toward humanistic journals. A massive study of citing amongst specifically humanistic journals has identified archaeology as highly connected to classics and religion studies, and secondarily to history (Leydesdorff *et al.* 2011, pp. 2420–2421).

The situation is a bit different when it comes to *EA, JAA* and *AAS*, as they are all directed toward scientific journals such as *Archaeometry* and *Journal of Archaeological Science*. The bulk of all their cites comes from these two, together with journals of physical, chemical and biological science. Internally, both *JAA* and *AAS* cite *EA*. The relation does not work the other way around, *EA* being a link toward the environmental sciences. Being a specialist journal, these factors may explain *EA´*s low rate of cites (both absolute and amongst the included journals), its modest metrics (cf. Table 1) and ranking (SJR). In sum, there are weak ties between the two clusters (as shown in Figure 4), and some one-way connections amongst the archaeometric journals. Ideally this would not happen, as a fully integrated discipline with a well-functioning division of labor amongst its sub-fields, relies on a steady exchange of information between its sub-fields. This would have become visible in the network analysis as regular cross-referencing amongst the journals.

Another factor that seems to influence the distribution of cites is geography: the main bulk of cites to a specific journal are given by journals that originate in the same country. As such, the majority of American journals' citation network stems from other American journals. The same pattern goes for British journals.

It might seem unfair comparing such recent cites as of the previous five years, due to the distribution of cites being time dependent. One might therefore claim that journals exhibit unequal 'output profiles', that is, accumulating cites at different rates. Some journals receive a steady number of cites between year *x* and *y*, while others might have a decreasing or increasing output profile over time. If so, a journal with an increasing output profile will be underrepresented in

this analysis due to the lack of time to accumulate cites. Even so, different output profiles pose no challenge to this article. Rather it's the opposite: the differences in the time it takes to manifest the direction of relevance to other journals only demonstrate the different characteristics of the journals.

5.3. Thematic and methodical distribution

The thematic distribution exhibits large differences (cf. Table 2). *JAA* and *[A]* seems most all-round with a general coverage of most categories, with main emphasis on past phenomena. *EA* and *AAS* clearly discriminate against the [Environment]-class, while *JSA* and *IJHA* are the only journals with significant emphasis on [Meta]-class (when not counting technical, methodological development).

Some topics come out as exclusive to particular journals. Even though this may follow naturally from the journals representing specialized sub-fields within archaeology (such as *EA*'s correspondence with environmental topics), it is still noteworthy that some topics that by no means are necessarily bound up with the program statements of a specific journal, only occur in some journals and not in others. For instance, a singular treatment of topics arises from *IJHA*'s take on *Class/Inequality* = 15.24% and *Colonialism/Indigenous* = 12.19%. Despite some occurrence in *JSA*, I can see no apparent reason for the very small portion of total coverage of such topics, as they are very much in accordance with the stated purpose of *JSA*. The same sort of monopolizing of topics has already been mentioned regarding the exclusive occurrence of *Infrastructure/Monuments* and *Civilization/Culture history* in *[A]*. Furthermore, *AAS* is the sole journal with papers on provenience, e.g. identifying the point of origin of raw materials. There is nothing in the stated purpose hindering the publication of provenience studies in any of the journals. This absence is particularly striking for *[A]* and *JAA*. Such singularities may only point to the limited scope of this analysis, restricted to a five year period. Still, the total absence of a topic over five years (i.e. a substantial number of issues and papers) might be telling for the general practice of that journal.

A distinct distribution of traits amongst the six journals also goes for the application of methods. Contrary to the thought-experiment that predicted a substantial overlap in methodological applications, there are distinct connections between type of journal and the utilization of methods.

5.4. What's at stake? The epistemic viewpoint

In sum, when a constellation of the above four parameters form separate and unconnected clusters, it might result in 'islands' in the sea of knowledge. These are characterized by several factors, such as very low cross-referencing, treatment of unique topics and a narrow scope of utilized methods. There seems to occur some form of island formation, particularly amongst *JSA* (and to some degree) *IJHA*. Without any evaluative statement intended, it is safe to say that *JSA* and *IJHA* form one end of a hypothetical continuum ranging from basic science to externally oriented, socially engaged research. This is evident from their main reliance upon discussion as a favored method, that these two journals are the only ones dealing with heritage, making policy papers, raising normative research-questions, and they have the fewest connections to archaeometric journals – less than 1% of their cites comes from *AAS* and *EA*.

As discussed earlier, disciplinary fragmentation is bibliometrically indicated by a singular focus on research topics, a singular reliance on methods and by the abrupt transition between journals in regard to thematic and methodological scope. What is more, the direction of relevance of each journal may belong to general areas of similar research interests. Such connections often transcend disciplinary boundaries, and may therefore form clusters of interdisciplinary bonds that are more closely epistemically related *across* disciplines than between archaeological sub-fields.

Taken together, the findings presented above hint at some differences in conduct, and it is my claim that they result from differing orientations toward explanatory ideals facilitated by the science/humanities divide. The affiliation of different branches of science with specific modes of explanation is well established, and was described early on by Whewell (1840). In its basic form, the argument states that as disciplines study different phenomena, and different phenomena may best be described by specific types of explanations, different disciplines will adhere to different explanatory ideals. The most common distinction is made between nomothetic and ideographic explanations.

This dichotomy concerns the degree to which a statement has general validity, ranging on a continuum between specificity and generality (Windelband 1921, 1998, Lyman and O'Brien 2004). *Ideography*, representing an ideal of specificity in explanations, seeks to describe what is distinct, unique, particular, local in space and time. On the other end of the analytic continuum, we find the *nomothetic* ideal, seeking general and possibly law-like descriptions of materials, events and phenomena, which has a large distribution across time and space. A typical example of the former is humanistic research. The physical sciences may stand for the latter. As different parts of the archaeological enterprise trace their purpose and origin back to multiple traditions, as well as the engagement with other disciplines vary, it is reasonable to assume that it does affect the outlook on archaeology as a scientific or a humanistic endeavor.

The important point I wish to emphasize is that differing explanatory ideals are generally proscribed by specific epistemological outlooks. As such, opposing directions of relevance might be the best practical indicator of diversification, potential fragmentation and incompatibility in archaeology. At this point it is necessary to briefly touch upon the fundamental evaluative question motivating this inquiry: is the ideal of a unified archaeology worth striving for? Though clearly a topic lacking consensus in archaeology (and arguably also lacking in interest since the 1980s), it is my strong belief that all knowledge production necessitates a common epistemological footing – which is exactly what might be provided by a well-integrated discipline. I take diverging orientations toward scientific and humanistic ideals to represent different and opposing epistemologies, that is – different ways of knowing, which proscribe different ways of procuring and evaluating knowledge. Though practices may fruitfully vary and methods may be differently applied, this is of less importance as they can be compared and it is therefore possible to integrate the results of slightly variable practices. On the other hand, differing epistemologies proscribe different worldviews and scientific outlooks that can be more or less in accordance with the aims of archaeology as an enterprise procuring knowledge of the past.

If granting archaeology the objective of procuring knowledge of the past, it becomes vital that the archaeological community reflects upon the impact of multiple and opposing epistemologies underpinning the everyday practice of archaeology around the globe – be it lab-based archaeometry, postmodernist discourse analysis or culture historical deliberations. Clearing out such epistemic inconsistencies is important because stronger integration provides more efficient communication amongst archaeologists of different epistemological positions, as well as in the cooperation with practitioners of external disciplines. Second, integration provides a more effective framework for comparing results, which is the precondition for knowledge accumulation. Furthermore, the comparison of results constitutes the very backbone of scientific quality assessment and the peer review process, by which scientific progress is made possible and reliable.

Some attempts have been made at analyzing the epistemic divide of archaeological traditions (Kristiansen 2004, 2014, Trigger 1998, 2006, p. 485, 2008, cf. O'Brien *et al.* 1998). In a Scandinavian context, maybe the most significant attempt was made by Kristian Kristiansen (2004, p. 77) in his plea for archaeologists to rally behind a common understanding of archaeology as a historical discipline. This idea might be taken a step further by suggesting an inclusion of archaeology under the umbrella of the historical sciences (Davidson 2010). This is taking up the established notion that historical phenomena share some vital properties that transcend the disciplinary boundaries traditionally separating the sciences and humanities, and that such phenomena require special measures (Clarke 1968, p. 20, Shennan 2004, p. 5). Historical phenomena have in common being fundamentally transformative and in being spatio-temporally particularistic, be they geophysical, biochemical or cultural, on a small or big scale. By this conception, archaeology fits together with geology, paleontology, astronomy, evolutionary biology and historical linguistics (Cleland 2001, 2002, 2011, Cleland and Brindell 2013). To me this is what seems to be the most coherent and promising approach to handling the epistemic discrepancy of scientific and humanistic archaeology. Despite Kristiansen's program presenting a somewhat weaker claim, I fully support his ambition in reviving the debate on the epistemic underpinnings of archaeology. I think a public and broadly inclusive debate is the only way to first reveal, then improve

and finally agree on matters of disciplinary epistemology. Though inherently controversial subjects, the alternative (insularity) seems far less appealing.

6. Conclusion

The bibliometric data presented in this article point to some significant differences in the practical conduct of archaeological sub-fields, identified as variations in:

- the number of zero-cites (pointing in the direction of a science/humanities-spectrum)
- directions of relevance
- citation-networks (cross-referencing)
- thematic distributions
- unequal application of methods
- scope of journals dictated by the respective statements of purpose

Furthermore, the established relation that proximity to the center cluster (in terms of cross-referencing) corresponds to the ranking of journals, was confirmed by the citation-analysis. Thus, the correlation of 'the higher the rank of a journal, the more connected' (through cites), also has its bearing in archaeology. In concluding this article, I wish to remark that the direct accumulation and comparison of research results in archaeology might be hindered by the variability in practical conduct. A result of special interest corroborating this, is the inversely proportional relation between increasing numbers of theoretical and discussion papers in a journal correlating with a descending utilization of archaeometric methods. In other words, the more papers a journal publishes on theoretical discussions, the fewer the connections made to archaeometric papers. This points to a discontinuity in the intercommunication between different archaeological sub-fields, and I have argued that this lack of integration might be the result of various archaeological sub-field relying on diverse epistemic positions. As this pattern is what would be expected of a somewhat fragmented discipline, I have claimed that the cause of such a potential fragmentation could be ascribed to the continued relevance of the science/humanities divide in providing sub-fields with opposing explanatory ideals (e.g. nomothetic/ideographic). Despite the many factors influencing the outcome of academic publishing, such as editorial priorities, competition between journals, the selective pressure of authors in choosing where to publish and financial restraints, the results of the analyzed sub-field journals may point to a sub-optimal division of labor in archaeological publishing. This, diverse archaeological practice resembles a double-edged sword: At once stimulating creativity and innovation, while at the same time hindering the effectiveness of a normal science to solve problems. Further research is needed in order to evaluate the consequences of such a disciplinary situation.

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