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Johannes Müller Martin Hinz Maria Wunderlich Megaliths — Societies — Landscapes Early Monumentality and Social Differentiation in Neolithic Europe



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Institut für Ur- und Frühgeschichte der CAU Kiel

# Megaliths – Societies – Landscapes Early Monumentality and Social Differentiation in Neolithic Europe

## Volume 2

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## **Preface of the Series Editor**

The DFG Priority Program 1400 »Early Monumentality and Social Differentiation: On the origin and development of Neolithic large-scale buildings and the emergence of early complex societies in Northern and Central Europe« started its work in 2009. Its research agenda focused on the investigation of the phenomenon of monumental structures, in particular on megalithic constructions and their social and economic backgrounds during the Neolithic with a focus on Northern Central Europe. Already in May 2010 a workshop on the topic »Megaliths and Identities« took place in Kiel. The vivid dialogue that had started on

this early workshop continued throughout the years after. In consequence the International conference »Megaliths, Societies, Landscapes« was organized five years after on a broader scale. Many experts gathered to discuss research on megalithic and monumental structures and the societies that built them on not only a European scale.

The three volumes, which you hold in your hands, may inspire again new ideas and perhaps new insides for future research on the development of these early monumental landscapes!

Johannes Müller





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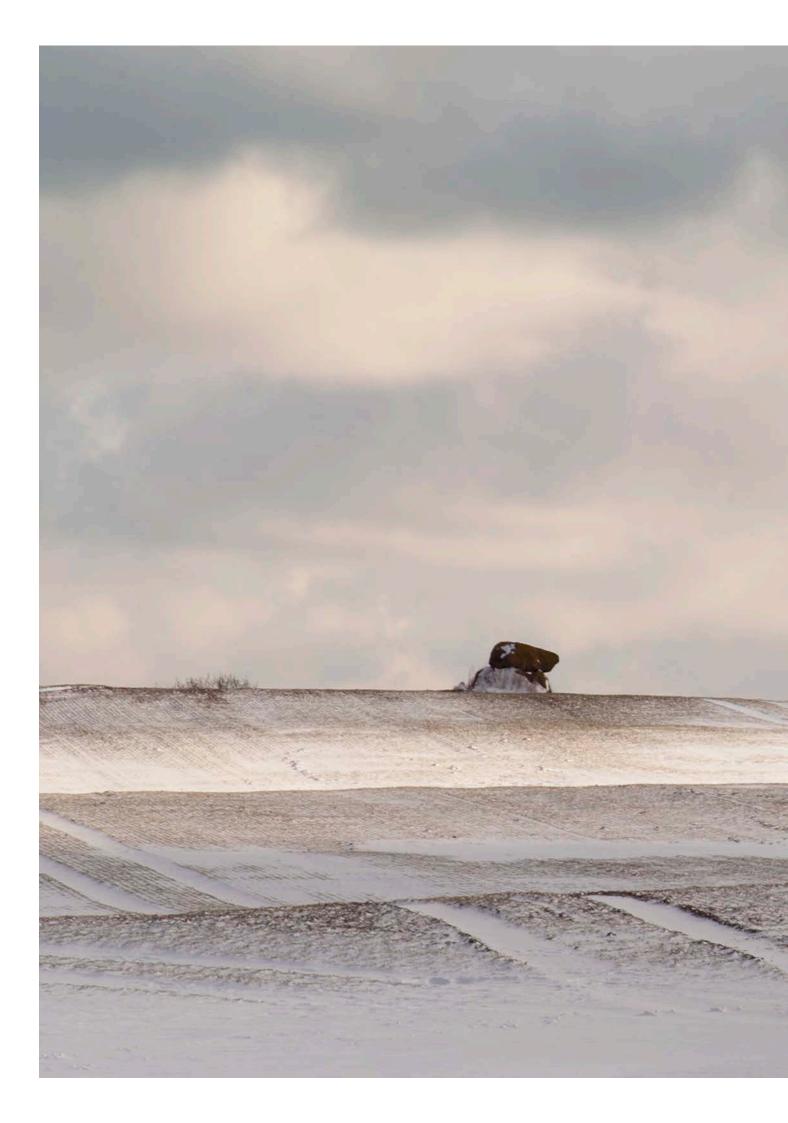
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# On the edge of the Neolithic world — But not on the periphery. Perspectives from an enclosure on Thy, North-Western Denmark

**Tobias Torfing** 

#### **ABSTRACT**

The enclosure at Liselund was almost on the edge of the Neolithic world when it was built. Located on Thy, a small piece of land in North-Western Denmark, it bordered the North Sea and the Mesolithic Norway beyond. In this article, I will discuss the local, regional, and super-regional context of the enclosure, and connect it to the development of a new group structure.

It will be argued that the enclosure was a central part of networks of exchange of physical products and a place where ideas formed the society around it. On the edge of the world, the enclosure was in many ways central to both local and regional networks, a channel for international trends to spread into Scandinavia and a factor in creating a local identity.

#### INTRODUCTION

Liselund was excavated more than twenty years ago, but has only gotten small references in the literature connected with the excavations (MIKKELSEN 1989; OLSEN 1993; WESTPHAL 1996; WESTPHAL 1997; WESTPHAL 2000). The site deserves more attention, not only because it with its 13-15 hectar is one of the largest enclosures in Scandinavia, but also because it is an early enclosure, and one that lies in a region in which our knowledge about the Early Neolithic is scarce. The location at the edge of the Neolithic core area makes it an important site for investigating the introduction of enclosures and the interconnections between this phenomenon and the surrounding society. The site offered a way for a dispersed population living in small household settlements to expand the network of interaction (MARTÍN/MURILLO HERRERA 2014).

The site of Liselund is located in Thy, the northwesternmost part of Denmark (Fig. 1), close to the North Sea to the north and west. Across the sea is Norway, and while the southern coast and especially the Oslo Fjord area can be regarded as part of the Funnel Beaker Culture, it is also clear that the finds in Norway are scarce and evidence of agriculture even scarcer (GLØRSTAD/SOLHEIM 2015, 140–143). So while Southern Norway is the final frontier, Thy is the outermost part of the heartland of the Neolithic in the period the article is concerned with (4,000–3,300 BC). The site itself consists of a causewayed enclosure phase and a slightly later settlement phase. The enclosure is among the oldest known enclosures in Denmark, with a probable start

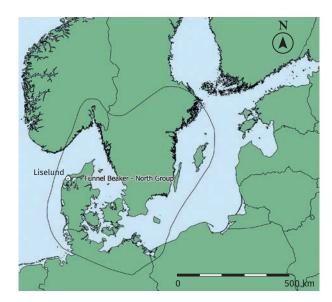


Fig. 1. Location of the site Liseland within the Funnel Beaker North Group (modified after BAKKER 1979).

date in the beginning of the 37<sup>th</sup> century BC. It had several reuses before a time around 3.500 BC, where it changes to a settlement (TORFING 2015).

Some of the key characteristics of the enclosure will be presented, and there will be a discussion of the enclosure as a nodal point in networks of various sizes. The term network is in this article not understood as a passive channel for transmission of objects and ideas, but as the result of a dynamic

interaction between people and objects in complex constellations, which have left physical traces in the material record. The network is not something that is or was, but something that was continuously created through interactions, and which we attempt to re-create through archaeological research. At any time multiple networks might have been in existence,

created through different interactions and between different actors, creating multiple communities of practise, interconnected by yet other networks. Thus, this article cannot describe all of these networks, but I hope it will bring to the foreground how some of these networks are part of the enclosure's role as a centre of ritual and mundane practices.

## THE SITE

Only small excavations have been carried out, but additional evidence of the layout of the cause-wayed enclosure is available in the form of orthophotos and a geomagnetic survey on a part of the site (Fig. 2; WESTPHAL, 2000). The site is between 13 and 15 hectares large, and thus among the larger enclosures in South Scandinavia, where enclosures smaller than 10 hectares are the norm (KLASSEN 2014, 195 fig. 118). The site has two rows of outer ditches, which form a slightly triangular enclosure. The space inside is then divided into three by rows of ditches. The orthophotos suggest that these internal rows have much wider causeways than the outer ditches.

Part of the geomagnetic survey revealed two lines of ditch sized positive anomalies in prolongations of the ditches known from excavations, these are interpreted as enclosure ditches. Interestingly, at one point there is a break, and in this break are two post hole sized anomalies with an oblong feature running between them (Fig. 3). These signals could be an entrance structure with double posts; similar features are known from other enclosures (Klassen 2014, 179-182). West of the enclosure there would have been a small stream. A digital elevation model suggests this is also the case to the south (Fig. 4). In the north-western corner the stream met another stream and turned west into the now drained Sjørring Sø. North of the enclosure the landscape slopes slightly. At the north end, the outer lines of ditches were found. The innermost of these was covered by 40-70 cm of later eroded soil, but the outer ditch by 2-3 m of eroded soil, suggesting that the slope would have been more marked in prehistory. The shape of the enclosure closely matches that of the landscape, following the slightly triangular plateau where it is located. The southern part of the enclosed area is marked by low hills, while the northern part is more flat.

Most of the ditches are around 0.8–1.0 m deep and show complex processes of digging, re-filling and re-cutting. At the bottom of the ditch and in the recuts, whole or almost whole vessels are occasionally found, indicating deliberate depositions of pottery.

The initial phases only include small amounts of pottery, ranging from zero to three or four vessels, while the later layers can include more than 10 vessels, though other re-cuts are almost devoid of finds. The flint gives a similar result; few pieces in the primary layer, with later layers containing either nothing or many finds. As only small excavation trenches have been cut into the ditches, and none have been completely excavated, it is likely that some of the recuts would yield finds in other parts of the ditch. Some of the enclosure ditches have only three phases of activity, while others show evidence of five to seven phases. The maximum use time of the enclosure was from around 3,700 to around 3,500 BC, thus around 200 years of enclosure activity. The many re-cutting events and depositions suggest a continuous awareness and reuse of the enclosure roughly every generation, until the site transforms into a settlement around 3,500 BC or slightly later (TORFING 2015). The activity history show that this pattern is followed in both the inner row and the outer rows, and that there seem not to be a great time-difference between the two.

The settlement traces are all located within the enclosure. The excavation trenches reveal scattered signs of activity in all excavated parts, but the clearest evidence of settlement activity is in the central part. A thick cultural layer containing many artefacts and waste products was found west of N4. The cultural layer measured at least 20 m in length along the trench, with an unknown width. In connection to the layer, several pits and a possible post hole were excavated. At least two pits, N2 and N3, can be interpreted as related to nut roasting due to layers of charcoal and charred nutshells at the bottom (Fig. 5). The finds from the cultural layer include pottery, as well as flint tools and flint waste, and small fragments of amber indicating amber bead production.

Around 150 m from the cultural layer, in the other end of the central part of the enclosure, a group of post holes and pits were found, as well as two possible hearths. One of the hearths, many of the post holes and all the related pits include Neolithic finds in the form of flint flakes and potsherds.

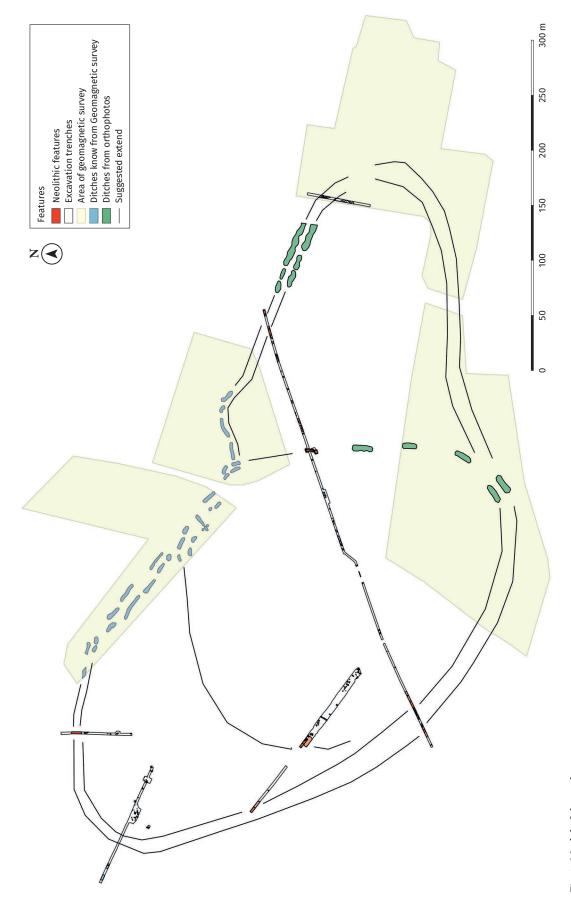


Fig. 2. Model of the enclosure.

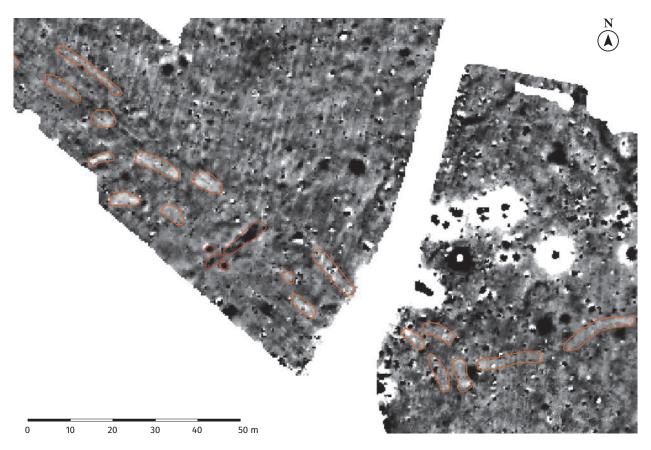


Fig. 3. Close-up of the magnetic survey. Orange lines mark the enclosure ditches, while red indicates the possible entrance.

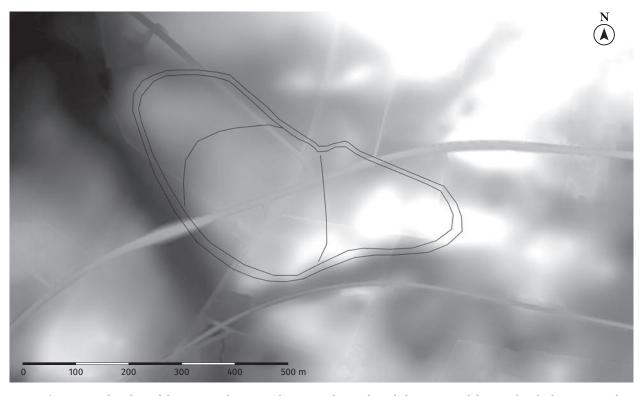


Fig. 4. The suggested outline of the inner and outer enclosure overlain a digital elevation model. Irregular darker areas to the south, west and north indicate lower lying areas.

Both hearths lie on the central axis of lines of post holes (Fig. 6). The dimension of the houses would fit the known examples of contemporary houses (ERIKsen/andersen 2014, 98-104, 265-271; sørensen 2014, 177–212). In the eastern and northern parts of the enclosure there were additional traces of activity, mostly small and thin cultural layers, as well as various pits and single post holes with Neolithic finds. Most of these features contain typical settlement material, rather than select material typically associated with an enclosure. Most remarkable is pit N 253, which contained around 42-44,000 cereal grains, mostly emmer. As less than 2% of the area is excavated, it is questionable if the finds are representative for the extend of the settlement activity. The existing traces suggest a series of activities, including living, cooking, flint knapping, and amber bead production. The settlement most likely postdates the enclosure or is alternatively contemporary with the

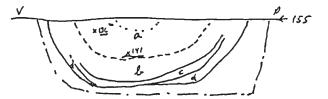


Fig. 5. Drawing of pit N3. Layer c and the bottom of layer a consist of charcoal, sooth, burned clay fragments and charred hazelnut shells, indicating two horizons of use, likely roasting of nuts. Layer d and b contained very few artefacts, with the exception of an amber bead. Pottery fragments were found in layer a.

final phase of this (TORFING 2015). The interpretation of the finds as a settlement is based on the character of the material, as there are no indication of deliberate deposits, but instead traces of cooking, general refuse (a cultural layer), and possibly houses.

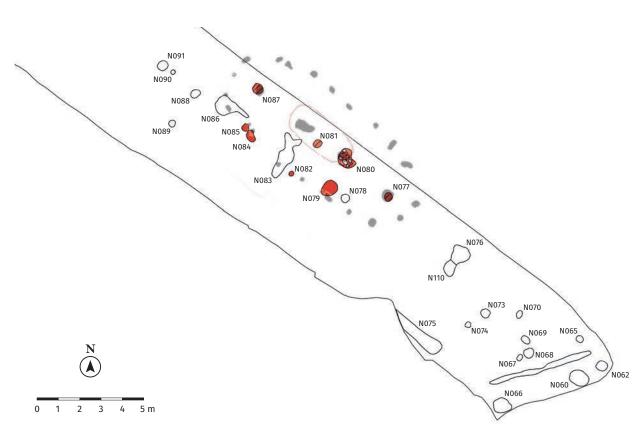


Fig. 6. Possible house at Liselund. Post holes belonging to the house marked marked in red. The house would have consisted of three central posts, a hearth in the south-east end, and a series of stakes along the wall. Possibly four of these were preserved, disturbance was present along wall in the form of post holes and another hearth (feature N086), perhaps marking a second phase of the house. Grey features are the layout from the house at Bygholm Nørremark (orientation rotated) (Rønne 1979). The house at Liselund would have had almost the exact same proportions as the Bygholm Nørremark house, as the outermost posts in the central axis overlap.

## THE LOCAL CONNECTIONS

With the basic chronological aspects of the site established, I will turn to a discussion of the role of Liselund in the local network. The understanding of local in this context is the area where the people lived who took immediate part in the activities at the site: the people building it and participating in the rituals connected to it, whose descendants made later re-use of the site for ritual and/or practical purposes. As is often the case in archaeology, we still have gaps in our knowledge of the past distribution of sites, and thus the interpretation offered here must be based on the evidence which can be assembled.

Some central questions for understanding the role of the enclosure in relation to surrounding society is:

- Who built it?
- How many people were involved?
- How were they organised?

Below there will be a discussion of these questions.

#### Labour investment

Andersen has calculated the work force involved in Sarup I to 170 persons for three months (ANDERSEN 1988, 26–27). Both the combined length of ditches and the palisade are significantly longer at Liselund. The outer perimeter at Liselund is 1,500 m containing two lines of ditches. From the orthophotos and geomagnetic surveys it can be estimated that approximately 20% of the perimeter are un-dug parts (causeways). Thus a combined length of the two rows of ditches is around 2,300 m-2,500 m, in comparison there were around 600 m of ditches at Sarup I. The ditches at Sarup I and Liselund have comparable depths and widths, thus volume of running meters are the same. Very little information has been recovered regarding the palisade at Liselund, thus it could be much smaller than at Sarup, and no external fences are recorded. This is a large dark number, since much of the workforce at Sarup was focussed on the palisade. At Sarup, the soil is very sandy, while at Liselund there is a clay subsoil. This would increase the labour investment of Liselund in comparison to Sarup as digging in the clay would be a much harder and more time demanding task. Thus, we can propose that the ditches at Liselund required more labour than at Sarup, while we cannot properly estimate the work force required for the palisade. Many assumptions can be differentiated in order to calculate the work force required. An important one is that of time: Andersen proposes three months in 1988, but today suggests a much shorter period of construction is probable, as the primary layers contain no silting lines at Sarup, which would occur if they were open for a longer period (pers. communication). Some of the ditches at Liselund are backfilled very quickly with no layers at the bottom, indicating that they could not have been open for months. Other ditches contained indications of layers of water at the bottom, which could indicate longer periods of openness, however the time period is probably still less than three months. An estimate must remain rather loose, but if the same values as used by Andersen are applied, the two outer ditch circuits would require above 130 people for three months. Any labour investment required for the palisade and internal rows of ditches should be added, as well as the increased time required to dig in the clay soil. More people would obviously have been needed if the construction time was shorter. Approximately 150-400 people is a conservative estimate for the people involved, a large palisade and shorter construction time would easily double this number.

As EN settlements are small one house settlements, it is clear that we are dealing with multiple settlements cooperating in the construction (ANDERSEN 1999, 296–302). Even extended family groups consisting of multiple single households would be insufficient to make out the required work force, thus a larger clanor tribe-based system for organizing the effort can be proposed. Other models can also be proposed, but certainly, the construction of monuments is part of shaping larger social networks (ADAMS 2007; DEHN 2016; GUNAWAN 2000).

This gives us important information about the structure of the network: it should be able to facilitate that kind of labour investment, and be stable enough to re-construct the enclosure, even though these secondary events could be much smaller than the initial construction event. Dynamics within the network should provide the scattered and small settlements with a way and a reason to construct a single large monument. This suggests that the enclosure was one part of a larger effort to create extended social ties, and that it changed the way the socially defined kinship was perceived and organised (WIESSNER 1998).

## Settlements and graves

An important part of the local network is the relation of the enclosure to settlements and burial sites. As discussed above, the enclosure is not the investment of a single settlement, but of a larger area. The next step is to explore what this larger area is, and how

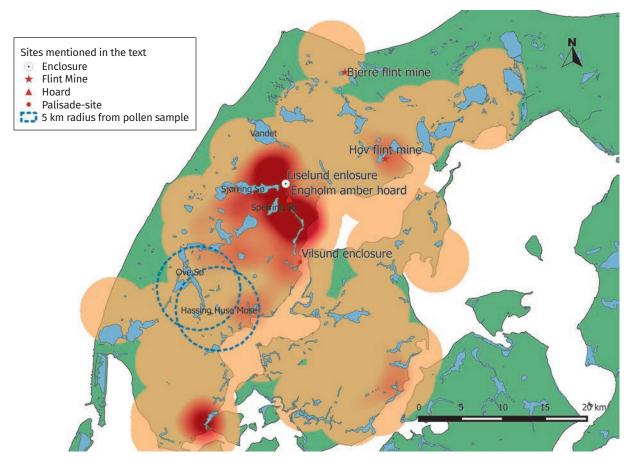


Fig. 7. Density map of Funnel Beaker graves, ranging from light orange (low density) to red (high density). Within 3 km of Sjørring Sø more than 30 graves were located, while 3 km around Ove Sø only 5 graves are known.

it was organised. Are we dealing with clusters of different areas, equally scattered traces, or a skewed pattern in relation to resources?

Few Funnel Beaker settlements have been recorded in Thy, and fewer excavated. A series of surface finds were recorded in relation to the Thy project, but as only selected areas were surveyed, they might present a skewed picture of the settlement for the region (BECH 2003; BECH 1993). One of the results was that at some sites, the majority of finds are located in the plough zone. A site which through sampling of the top soil can be estimated to have contained 4 tonnes of flint in the plough zone, only yielded a few pits with a few finds when excavated (STEINBERG 1996). The picture gained from the survey is that of smaller settlements, often found within a kilometre of a megalith. This is supported by on-site pollen studies from megaliths in Denmark, which demonstrate that they were located either directly on or close to contemporary agricultural lands (WESTPHAL 2009). As there is no major variation in research activity or destruction rate of megaliths within the area, and later Single Grave and Bronze Age barrows do not show the same skewed

picture, it can be assumed that the grave structures are a rough proxy for settled areas. Fig. 7 shows a heat map of graves registered as belonging to the Funnel Beaker period in the Danish national heritage homepage as of early 2015 (KULTURSTYRELSEN – FUND OG FORTIDSMINDER 2015), in relation to the sites mentioned in the text. Most noticeable is the lack of graves at the west coast. The sea level has been higher in prehistory, with a maximum of 4-6 m above present day levels in the region. The coast would have been further east, perhaps 4–5km with many fjords (JENSEN 1920, 48). There are no indications of marine layers in Sjørring Sø, and newer research suggests it might have been cut off from the sea by a small strip of land (ANdersen/sjørring 1992, 109; petersen 1992; jensen 1920; LIVERSAGE/ROBINSON 1995). In addition to the sea level, two other explanations can be proposed:

1. A general preference in the Funnel Beaker period for inland fjords. Like the late Mesolithic, the EN population preferred settlements close to inland lake/river systems or fjords, and not directly on the coast.

 Dune systems formed by drifting sands cover prehistoric traces along the coast of Thy. The first indication of large scale drifting sands come from the Single Grave period, but with larger episodes after the Middle Ages onwards (LIVERSAGE/ROBINSON 1995).

Apart from this lack of sites at the west coast, it can be observed that the burials are scattered across the region, but with a marked concentration in the area around Liselund. This identifies the area as a core area of funnel beaker activity in Thy. The cluster of graves stretches from a part of the Limfjord area around the villages of Sjoldborg and Ås along a stream, which might partly have been a salt water fjord in the Neolithic, to Liseland (JENSEN 1920, 46). The area of intensive use stretched further north along another stream and to the area north of the lake of Sjørring Sø and south of another lake, Vandet (possibly a Neolithic fjord). Also the area immediately south of Sjørring Sø has an above average density of Funnel Beaker graves. The same is true along the Limfjord coast to the south, with a marked concentration in the southern end. There is also a possible small cluster of graves close to the flint mine at Hov. The field surveys undertaken in connection with the Thy project give a similar picture: Intensive fieldwork was done in the Sønderhå district near the former fjord at Ove Sø, but only a few Funnel Beaker sites was found, while more Funnel Beaker sites were found in the surveyed areas along the Limfjord coast (BECH 2003, 50-51 fig. 6; JENSEN 1920, 46-60; LIVERSAGE/ROBINSON 1995, 42).

There are no features in the landscape that offer an immediate explanation for the higher density around Liselund. The landscape was marked by streams and inland lakes and saltwater fjords, and part of the area is close to the east coast at the Limfjord, a fjord cutting Thy from the remainder of Jutland to the southeast. However, this description fits almost all of Thy. Neither do soil components explain the distribution. As shown by Tab. 1, the grave monuments are roughly equally distributed on sand mixed with clay, clay mixed with sand, and clay soils. Grave monuments are rare on the very sandy soils, but as mentioned above that is probably due to later sand dunes covering large areas, hiding both the original soil and any prehistoric features along the western coast, as well as changes in the coastline.

One important factor is perhaps the close proximity to the island of Mors at Vilsund, a site containing what is interpreted as a special enclosed site (Klassen 2014, 182–192). The location is a central travelling corridor southwards. Another important reason is the physical centrality of the site, located in the central part of Thy. Along Sjørring Sø there would have been

easy access to the western coast. The enclosure also lies on a north/south travelling corridor between Sjørring Sø and the dried out fjord to the south, and it is close to the mentioned crossing to the island of Mors, and further away from the mainland of Jutland. Thus the enclosure lies centrally within the travel network of Thy. The concentration of burial monuments could be a consequence of the status and wealth accumulated through the activities at the enclosure, rather than specific landscape features.

There have been different suggestions regarding the size and organisation of the settlement territories in the Funnel Beaker period (MADSEN 1982; madsen/jensen 1982; madsen 1988; klassen 2014, 134–158; ANDERSEN 1981; ANDERSEN 1997, 89–100). The suggestion by Klassen of areas of roughly 4–5 km in diameter seems well founded. However, both the models by Madsen and by Klassen are formed on the basis of areas along fjords in Eastern Jutland, which represent densely settled areas in the Funnel Beaker period. Similarly, the model by Andersen is developed on the background of a small, densely settled area near a large enclosure. In Thy, territories of approximately 4-5km in diameter are suggested for the area around Liselund and along the Limfjord coast, but as other parts of Thy were loosely settled, I would argue that these areas did not follow this pattern. Based on the graves, the concentration could represent two territories north of Sjørring Sø and towards the Limfjord, possibly another one or two could exist south of Sjørring Sø, while a few more clusters of graves lie along the Limfjord coast, at Hov and at the south end of Thy and on the south-east end of Mors. The rest of the area was sparsely populated in this period, probably with smaller settlements scattered in mixed forests, a notion also supported in the pollen diagrams.

Two pollen diagrams exist from Thy, one comes from a lake, Ove Sø (BECH 2003 fig. 2), the other a bog/ small lake, Hassing Huse Mose (ANDERSEN 1992; AN-DERSEN/RASMUSSEN 1993; ANDERSEN 1995). These show little human impact in the EN I-phase, with only slight indications of forest clearing. In the EN II and MN, there is an increase in hazel as well as grasses and herbs, indicating a small opening of the landscape. A major opening of the landscape did not occur until the Single Grave period. Ove Sø lies 15-16km south of Liselund, and Hassing Huse Mose 16-17 km, thus both lakes are located outside the area with the Funnel Beaker grave concentration (Fig. 7). With a prevailing western wind in the area, it is doubtful if these pollen diagrams fully represent the landscape use around the grave concentration near Sjørring Sø or the landscape at the Limfjord coast to the east. However, they are a good indication of the vegetation for the central and western part of Thy. At Liselund, there

SOIL TYPE	AREA (HECTARE / 10,000M²)	NUMBER OF GRAVES	AREA PER GRAVE (HECTARE)
Clay soil	8,371	8	1,046
Sand mixed clay	29,890	37	808
Clay mixed sand	44,332	50	887
Sandy soil	37,343	11	3,394
Other/unclassified	21,525	27	797

Tab. 1. The distribution of Funnel Beaker graves on the different soil types.

are indications of mixed exploitation of wild resources (pits with charred hazelnuts) and agricultural production (pits with charred cereal). The combination of evidence for resource use at sites, on site pollen analysis from Danish dolmens, and the regional pollen diagrams from lakes suggest that a majority of the landscape would still be forested, with smaller areas of open agricultural land around settlements.

In the Early Neolithic the settlement pattern is likely to have been that of small settlements existing one generation or less, before moving to a new location (MADSEN/JENSEN 1982; MADSEN 1982). The questions of how many people lived at each Early Neolithic site, and how many sites were in use at same time, are difficult to answer. Some sources can be used to support an estimate: The houses found are often very small and they likely represent single family households. In the EN II and MN I phases, when the megaliths were being built, it is clear that each area has multiple small clusters of megaliths (ANDERSEN 1997, 91; ANDERSEN 2009), and we can thus suggest that each territory was inhabited by multiple single households, perhaps 3-8 families in an extended family/ clan. Thus we would get no more than 10-20 adults per territory (2–3 adults per family household). With perhaps 8-10 densely settled »territories« on Thy/ Mors, as well as smaller settlements scattered across the region this would amount to 80-200 adults in the densely populated part plus perhaps 20-50 additional adults from other areas of Thy and Mors (based on the number of graves in these areas compared to the clusters). It is clear that the entire region of Thy and Mors would have had to be involved in the construction of the site, if not people from an even larger region. This suggests that the enclosure construction required a set of social institutions spanning multiple small clans. By gathering the dispersed population, each household has its network of exchange and interaction expanded (MARTÍN/MURILLO HERRERA 2014). The social institutions and the construction of the enclosure then become integrated in the same sphere of understanding. I would argue that the enclosure becomes not just the result of the social institution, but part of how it is constructed and maintained.

A preliminary description of the situation in Thy at the time: People primarily lived in small secluded single house settlements within small openings of the forest, in some regions small clusters of these settlements might exist close together forming a more domesticated land in the area around Sjørring Sø and along the Limfjord coast, while most of the area was sparsely populated and dominated by mixed forests. In the 37<sup>th</sup> century this scattered population met to construct a 13–15 hectare large enclosure, deposit pottery and other artefacts just to cover it all up again.

By connecting the physical evidence from the enclosure, the graves, the sites and landscape proxies, part of the prehistoric society can be described, but the means and the reasons for the construction of the enclosure remain elusive: What triggered this single monumental effort from a scattered population? To understand this, it is important to understand that this event does not exist in a vacuum, but was part of networks of relations that possessed a regional character. These networks will be explored further below.

## REGIONAL IMPORTANCE AND GLOBAL PHENOMENA

Above the local settlement pattern and its connection to the enclosure was discussed, but explanations concerning the how and the why of enclosure building was left unanswered. In this part I will argue answers to both questions are to be found in the confluence of two divergent aspects of prehistoric

societies: the sense of and strive for community, and continuous controversies over the control of resources. Both aspects supported by the involvement of objects and sites. The following will analyse the interaction between people and objects in the network at and around the enclosure.

## The enclosure explosion in the 38th – 37th century BC

The start of enclosure construction within the Funnel Beaker Culture of northern Europe is not an isolated phenomenon, but part of a larger European trend (KLASSEN 2014, 214-238). That this is a very narrow event horizon has been well documented for the British Islands (WHITTLE et al. 2011). Previously many Scandinavian enclosures have been connected to the EN II-MN Ib phases 3,500 BC-3,100 BC (MADSEN 1988; Andersen 1997; Andersen 1999; Nielsen 2004). However, a series of new dates indicate an earlier start of the enclosure construction (LÜTZAU PED-ERSEN/WITTE 2012; DIBBERN 2012; MÜLLER et al. 2013; HAGE 2016). Klassen has pointed out that some of the existing dates for EN II are not from the primary layers (KLASSEN 2014, 202–204). However, a site such as Sarup II is definitely an enclosure built in the MN I phase, 3,350-3,100 cal BC (Andersen 1999; Andersen 1997) and thus indicates a prolonged period of enclosure construction within the Funnel Beaker Culture.

The date of the Liseland enclosure, and other equally early enclosures, corresponds well to the dates from the British isles, suggesting a larger global phenomenon. This does not invalidate the need for exploring local factors involved in the process, as the reasons for participating in and sharing this larger phenomenon need to be explained. Local variations are also an example of how the global is translated into specific local events. The global background of enclosure construction is tapped into by local actors, and offers these a way to display foreign connections. By constructing the enclosure at Liselund, the local population manifests its current network of contacts, allude to shared ideas, and participates in a second wave of Neolithisation. The first was the inclusion of neolithic pottery and some neolithic diet, the second the beginning of large communal and monumental constructions such as enclosures, the wooden and earthen long barrows, and later megalithic tombs, as well as an increased focus on agriculture. The creation of the enclosure is thus a step in creating a more fixed Neolithic identity.

### Resources, production, and exchange networks

Located on the edge of the Neolithic world, with the North Sea as a neighbour and only a thin strip of partly Neolithic land further away in Southern Norway, it is easy to imagine Thy as a wood covered periphery in the Early and Middle Neolithic periods, in contrast to booms in the later periods of the Late Neolithic and Bronze Age. However, we have evidence to the contrary, namely the access to and exploitation of two of the most prestigious resources of the time: flint

and amber. There are around 12 km to the nearest flint quarry at Hov, and 15 km to another quarry at Bjerre. Both sites can by pottery and axe preforms be dated to EN I, at Hov this is supported by <sup>14</sup>C-dates (BECKER 1993; SØRENSEN 2014, 170).

Amber bead production is observed in the settlement layers at Liselund, as small fragments of amber and a few finished or half finished beads were found during the limited excavation of these parts. The extend of amber bead production cannot be estimated, but less than 2 km south of Liselund a dry-land deposit of around 10,000 amber beads was found at a site called Engholm (BECH 2008). A nearby pit contained pottery identical to that at Liselund and, along with the typology of the beads, dates the Engholm deposit to the same time as Liselund. Large depositions of amber beads are not unknown from the Neolithic. These are concentrated to the northern part of Jutland (EBBESEN 1995). In the case of Liselund, the amber for the production would have been gathered at the west coast, today 13 km away, in the Neolithic perhaps only 8-9 km away. Amber bead production could have been undertaken on multiple sites, though a specialized production site from the coast is only known from the later MN I period (LIVERSAGE/SINGH 1985). That amber beads were produced on site during the settlement phase at Liseland is well documented by finished and half-finished beads and amber waste, and it demonstrates that the inhabitants had either direct or indirect access to the raw material from the coast. As amber is only found at the coast, and mainly the west coast of Jutland and in the Limfjord region, the amber deposits found further inland must thus logically have travelled there as part of exchange networks.

Thy might be at the edge of the Neolithic world, but not at the periphery. Within half a days travel from the area around Liselund, there would be access to two flint quarries as well as amber along the coast, and close proximity to the calm protected waters of the Limfjord 4km to the east and exchange partners here and further south in Jutland. This double access to two of the most important prestige goods of the EN would have made Thy a centre of the regional exchange network. In the centre of Thy, there was a more densely settled area, and in the centre of this cluster one of the largest enclosures in South Scandinavia was constructed by a workforce that would include almost the entire population of Thy and Mors. It was re-used numerous time within its lifetime of about two centuries, and after the abandonment of the enclosure a settlement was established.

A connection between enclosures and control over flint resources has previously been suggested (see SØRENSEN 2014, pp. 169–174 for a discussion). Similar control over amber resources would have been

important: both the ability to make large sacrifices of amber such as the Engholm site, and the prestige gathered within larger exchange network would add to the status of the groups with amber access. However, the character of the use of the enclosure as a series of short events on a generational time frame, demonstrates that they could not originally have been centres from where the resources could be controlled. Instead the construction of the enclosure is in itself the primary function. The construction-process can in this light be seen as a way of constructing a social system by participation. By mobilizing the work force required and distribution of the necessary tasks, a set of relations is created within the population. It should be considered whether the internal division of the enclosure in three parts is related to this, and whether the central part was meant to distinguish one subset of the population. The group creation is re-performed several times within the following centuries by new re-cuts in the ditches and perhaps re-establishing the palisade at least once. The re-creations of the original event confirm the original social contract. Thus the enclosure fossilised and maintained a specific set of relations. This way, the construction of the enclosure is part of an ongoing negotiation of social prestige within the community.

In the early 35th century, the site is transformed into a settlement, and it is clear that the population at Liselund at this time had access to the amber resources 8–9km away, and that bead production happened at the site. As only a very small part of the site is excavated and the flint remains understudied, it is difficult to establish whether large scale axe production happened at the site, but some axe production can be observed. It is difficult to ascertain whether access to resources was direct, or if access was gained as part of a local exchange network, where the prestige gained by constructing the enclosure had secured the group a status and continuous inflow of resources. In support of the latter, it can be argued that the lack of re-establishment of the enclosure, and thus the social prestige in relation to this, after the shift to a settlement would lead to a gradual deterioration of the social position of the group, as this was dependent on the physical participation of the other groups in the construction-process. This would explain why the settlement was so short lived, less than a hundred years according to the 14C-dates.

## Communities of practice and pottery networks

The construction of the monument did not just rely on and grant access to resources, it is also interlinked with the creation of larger communities, creating extended social relations through a process of homogenisation (WIESSNER 1998). The first argument in favour of

this also relies on the size of the enclosure: Large scale work would require some common group identity, but the common project would also facilitate interaction between the groups and offer opportunities to negotiate appropriate behaviour and rituals within the group. In relation to the enclosure, a series of activities of ritual or ceremonial character were performed. At Liselund the best evidence concerns the placement of complete or almost complete vessels at the bottom of the ditches, but at other enclosures additional activities are observed, both fireplaces at the bottom, and deposition of axes as well as animal and human bones (ANDERSEN 1997, 267–276). At both Lokes Hede and Store Brokhøj, remains of meals in the form of shells were associated with fireplaces. Thus, a variety of actions are associated with the ditches. The impact of these is in some cases difficult to detect, but in the case of pottery we can observe the development and relations in the technique and ornamentation.

A concept which has recently been applied to Funnel Beaker pottery is that of communities of practice (HALLGREN 2008), which is focused on how learning and re-production of actions and interactions are embedded in the social structure and culture. Hallgren discusses the theory and connects it to the idea of culture within Ethnography and Archaeology and demonstrates how the concept is a useful way of understanding the development of local differences in the pottery expression and how it relates to group identity (HALLGREN 2008, 17-33, 189-197). These ideas complement ideas about stylistic behaviour within pottery producing communities within what have previously been termed networks of style (TORFING 2013). When producing new pots, the potter does not work within a vacuum, but refers to existing ideas about how a pot should be formed and ornamented. The potter wishes for the pot to be accepted as appealing and fitting within the cultural context by other members of the community, but at the same time the decorations can be an arena for promoting a positive self identification (ROE 1980; Wiessner 1983; Wiessner 1984).

Regional stylistic groups have been identified within the EN Funnel Beaker culture of South Scandinavia (MADSEN/PETERSEN 1984), however it can be questioned if these style-groups are valid for all vessel types, as some of the groups are identified by the richly decorated lugged beakers and bowls (MADSEN/ANDERSEN 1978; EBBESEN/MAHLER 1980). These style-groups can be described as an east-west difference between the Jutish mainland on the one hand (the Volling and later Fuchsberg groups), and Zealand and Scania on the other (the Svaleklint and Virum groups). If other vessel-types were taken as a starting point, other groups would emerge. Especially noteworthy is the Scandinavian-wide distribution of small and medium sized

vessels with cord ornamentation near the rim and at the neck of the vessels, which connects Jutland, Southern Norway, Eastern and Western Sweden, as well as Bornholm, while Zealand and northern Germany are not included (TORFING 2017). Yet another picture emerges if the basic funnel beakers are examined, were the variation in ornamentation within the north group of the Funnel Beaker Culture is negligible, and we are dealing with a »global« common style. This combination of different styles within the same ceramic assembly and the deduced negotiation between local group-identification and a global homogeneous expression continues into the MN I-period (TORFING 2013), after which local variation declines. The potter can thus be said to have multiple interests when decorating a ceramic vessel, identification with different communities of practice, as well as a strive for positive self identification. These diverse interests can be used to discuss strategies of the potters and developments of communities of practise.

The continuous meetings at the enclosure where a large group of people, who are otherwise dispersed over a large area, shares multiple activities offers the possibility for them to interact, change ideas and compare against each other. This puts stress on the system described above: More people imply more people to compare against, both in terms of fitting within the same ornamental schema, and in regards to the possibility to express individuality within the common expression (for an example of the latter see WIESSNER 1984, 218). The large gatherings also offer a transitional route for new ideas to enter a community, which can be accepted or rejected, translated and transformed collectively.

Within the ceramic material from Liselund, three main categories of vessels can be identified and in addition to these numerous clays disks were found. The disks differs so much from the vessels in form that it will not be used for comparison here. The three vessel categories have different ornamentation and shape variations and are in general easy to distinguish.

- Group one: medium to large funnel beakers, with flat bases and no handles/lugs, and simple ornamentation in the form of a narrow band below the rim, unornamented neck, and vertical furrows on the body.
- Group two: small to medium beakers, with round or rounded bases, and diverse ornamentation at rim and often the neck executed in twisted cord. Several vessels within this category have handles suggesting a use as cups.
- Group three: lugged beakers. Mainly belong to the larger beakers. In the lowest layers, examples are unornamented or in one case ornamented with

a tooth stamp. In the secondary layers and in connection with the settlement, 5 of 6 certain lugged beakers and the only lugged bowl from Liselund have a complex ornamentation, including rim, neck and body ornamentation, with hanging triangles in twisted or whipped cord on the neck and an incised field or band of vertical/horizontal pattern at the body. Smaller fragments from an additional 3-4 possible lugged beakers have this combination. The hanging triangles and the band pattern are always combined, and there are no documented cases outside the lugged beakers and lugged bowls. Similarly, the technique of whipped cord occurs at 3 certain lugged vessels and two possible, and does not occur once on other vessels. A single lugged beaker is ornamented as group 1. Thus the lugged beakers are clearly ornamented differently from the remaining beakers and undergo a development from unornamented or slightly ornamented to having the most complicated ornamentation.

The development of lugged beakers from an unornamented type to a type carrying a rich decoration is noted as a general phenomenon, and it is suggested that the type developed into a ritual type in the MN (KOCH 1998, 111). As noted above the regional style groups are best detected within the lugged beakers, and in the EN II onwards the open bowls which always have parallel decoration.

The morphological differences of the three groups suggest a functional difference, such as flat or rounded bases, handles for holding in the hand or lugs for hanging. Koch has demonstrated that it was mainly the medium and large beakers that were used for cooking (KOCH 1998, 115-119). The ornamentation thus follows the function/use of the vessel and can be related to different activities within the community: The large, flat-based and lightly ornamented beakers are probably connected to storage and cooking, while the smaller round-based beakers decorated with twisted cord, with or without handles, are used in drinking or other consumption activity, while the lugged beakers in the beginning were used for mundane purposes, but develop into a ritual type during the EN and become the richly decorated Prachtbechers of the MN, which likely had a special position in pottery depositions in front of the megaliths (KAUL 1995). The first group of everyday vessels were ornamented similarly within the entire Funnel Beaker Culture north group, changing with international fashion rather than due to local developments. The uniformity of the decoration indicates frequent contact with neighbouring groups, where comparison between different groups avoids alterations of the style through continuous changes (WIESSNER 1998;

WIESSNER 1984). Such comparisons also allow new trends to spread through the network of interaction. The second group of vessels is related to other activities, maybe of a more personal nature, indicated by the inclusion of small vessels with twisted cord and sometimes handles in graves and at the palisades of earthen long mounds (THORVILDSEN 1941, nr. 3, nr. 58, nr. 59, nr. 82; knöll 1978, 37, Plate 5,1b; liversage 1980, 31). The ornamentation with twisted cord mainly belongs to vessels found along the fringe of the Neolithic world, from Northern Jutland and Southern Norway to Eastern Sweden. It reflects part of a network of contacts quite different from that of the basic funnel beakers. That different parts of material culture are affected by stylistic behaviour in different ways is shown convincingly by Wiessner in the difference between the projectiles (group belonging and boundary) and bead ornamentation (kinship relationships and personal prestige) (WIESSNER 1983; WIESSNER 1984). Examining published vessels from the period, it has not been possible to find a single lugged beaker matching the schema of ornamentation from the later phases at Liseland, thus it must be considered a local variance. Hanging triangles occur at some Fuchsberg sites, within the Virum style, and they are common on the Djursland peninsula, both at the enclosures at St. Brokhøj and Blakbjerg as well as in grave contexts such as a lugged beaker in a dolmen at Løvenholm Skov. However, these vessels do not combine the triangles with the distinct body pattern of Liselund, but with vertical fringes in the whipped cord technique on Djursland and Zealand/Scania, a combination not seen on any vessel at Liselund. The Fuchsberg lugged beakers and bowls are ornamented with large

angled bands running all around the vessel. Thus by comparing the ornamental schema of the lugged beakers, distinct regional groups are easily identified. The development from the unornamented lugged beakers in the primary layers to the later ornamented vessels in a distinct local style, suggests that this development happened within the use-time of the enclosure, and that it is related to the »ritualisation« of the function of the vessel. During the lifetime of the enclosure, the lugged beakers changed connotation from a simple cooking or storage vessel to a vessel which signified aspects of group identification. The growing connection of the lugged vessels to ritual sites could indicate that they were used to cook or serve a specific course or used at specific events, and by sharing in such activities the community would define themselves as belonging to a certain group.

Different origins of pottery influences have been proposed for the Funnel Beaker pottery, both from a south-western and a south-eastern direction (MAD-SEN/PETERSEN 1984; KLASSEN 2004; SØRENSEN 2014, 227-269). However, from the early phase, local and regional expressions developed alongside the international influences, for instance the Scandinavian cord-ornamented beakers. Tracing communities of practice and their diverse expressions at Liselund reveal that the pottery refers to different networks of interaction, one global and the other with the northern edge of the Funnel Beaker Culture. A synchronous development of a distinct local ornamentation schema for the lugged beakers indicates changes in the strategies and structures of the network, delimiting the community from other communities within the larger networks.

#### CONCLUSIONS

On the edge of the world an enclosure was built. It was the 37<sup>th</sup> century BC, a time when enclosure construction boomed across Europe. The location was Thy, North-Western Denmark. Farming had been introduced just a few centuries earlier, and it was a time of change: New impulses spread across Europe, axes of flint, jade, stone and copper were exchanged, new ideas about houses and pottery had been introduced, and grave monuments in the form of long barrows were created. The background was international, the manifestation a result of local factors.

I have tried to gather the diverse traces of the past networks of action surrounding the site: The labour intensive work of building the enclosure, the activities at the enclosure, the deposition of pottery, the surrounding landscape as seen through grave clusters and pollen diagrams, nearby resources such as flint and amber. The changes within the pottery style can be added to these traces of activity. Together they offer an account on how and why the enclosure was built and built the way and the place it was.

The enclosure at Liselund was one of the largest in Denmark, the area rich on then prestige resources such as good flint and amber, so while it was on the edge of the world, it was far from a periphery. The area around the enclosure developed into a local centre that participated in far reaching exchange networks. The site itself was built centrally within the area with easy travel access in all directions: the amber rich west coast, the flint mines to the north, and exchange networks to the south, both along the coast and inland, and north to Norway. I have argued that the population was caught in a difficult negotiation between different strategies, that of access to resources and exchange partners and

that of different regional networks and ideas related to these, as well as a growing local identity shown in the pottery style. This was managed by using different ornamental schemas for different pots, related to different aspects of life: vessels related to wide ranging networks to the south, other vessels relating to a northern network, as well as lugged beakers used to reinforce a local sense of community. Interconnected with this development is the construction of the enclosure: at the same time distinguishing one area as central, but also creating a common point of referral. It is impossible to untangle the construction from this process: It was both created as an idea from abroad and was based on negotiations of local relations. It also shaped the background for further interaction and formed local

relations for the future. Within its 200 years of existence the enclosure was re-created multiple times, and through its construction and re-construction and the activities related to it, the ideas of community grew and an exchange of artefacts and ideas was conveyed.

Following the enclosure phase, a short lived settlement was founded at the site, but in contrast to other South Scandinavian enclosures, there is no great MN activity at the site, suggesting that the status of the site failed. The exact reasons are unknown; perhaps the stop in recreation of the enclosure by new re-cuts had a part in this, reducing the importance of the site, or perhaps some common cause, such as a breakdown in exchange relations, explains both the end of enclosure activities and the shift towards settlement.

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# Megalithic tombs and wetland depositions as markers of old and new places in the Early Neolithic: Break or inversion of ritualized practices?

Almut Schülke

#### **ABSTRACT**

This article investigates >monumental landscapes< by comparing two different expressions of ritual that can be observed in the same Neolithic landscapes and are seen as typical traits of the Funnel Beaker Culture (TRB): megalithic tombs and wetland depositions. The rich archaeological evidence from an area on the Danish islands, north-west Zealand with a special focus on the area around Lille Åmose will serve as background for discussing the complex ritual use of space in the earlier part of the Southern Scandinavian Neolithic (TRB). The different chronological development of ritualised practices is shown, with the wetland depositions starting already in EN I and the megalithic tombs later in EN II. Beside these chronological differences, the different material character of the two groups of finds, their

distribution and their spatial relation to each other are discussed. For the case study area, it can be shown that the wetland deposits mark settlement areas that date back at least to the EN I – if not to the Late Mesolithic – located at lake sides. The megalithic tombs are placed differently, witnessing a broadened use of the inland from the late EN I and EN II onwards, indirectly indicating agrarian economy. They are often placed close to communication routes. These results are discussed regarding the neolithisation process. The question of whether wetland depositions and megalithic tombs witness a break in ritual expression or a change or inversion of ritual opens up new perspectives of understanding social, ritual and economic changes in the 4th millennium BC.

## INTRODUCTION

This contribution aims to explore the topic of >monumental landscapes by studying different expressions of ritual that can be observed in the same Neolithic landscapes. The rich archaeological evidence on megalithic tombs from an area on the Danish islands will serve as a starting point for discussing the complex ritual use of space in the Southern Scandinavian Neolithic. They will be contrasted with depositions in wetlands (also termed bog-offerings), a find category that – as well as the stone tombs – is often ascribed the ritual sphere. Both groups of finds are typical for the Early Neolithic and Middle Neolithic A in southern Scandinavia (EN and MNA; ca. 3950-2800 BC), in the so-called north group of the Funnel Beaker Culture (TRB) (MIDGLEY 1992; KOCH 1998; ANDERSEN 2000). Both have been studied in their own right, although only a few studies have more closely compared the megalithic tombs and the depositions in wetlands (ebbesen 1982; koch 1998, 139-143; sparrevohn 2009). Aspects of their chronological relation to each other, their different qualities and topographies as well as their possible meanings to each other have merely been discussed.

The density of known megalithic tombs is very high in southern Scandinavia and especially on the Danish islands (FRITSCH et al. 2010). From here, a high number of contemporaneous wetland and bog finds are also known (BECKER 1947; KOCH 1998). Particularly the northwest part of the Danish island of Zealand – with an exceptionally high number of finds – is well suited for a closer analysis of the complex ritual use of space. In this article, the megalithic tombs and the wetland depositions from this region will be compared regarding their chronology, their respective ritual expression, their possible functions and meanings, choices of place and the different material elements involved. The Lille Amose bog, a locus classicus of Danish wetlands sites and its surroundings will serve as a case study to show that there are continuities and discontinuities in the marking of space, with old and new places gradually being used at the same time. The last section of the article discusses these results regarding the development of ritual and social life from the EN to the MNA, thus contributing to the debate on the neolithisation process on the Danish islands.

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## THE NOTION OF > RITUAL < IN THIS STUDY

Using the term >ritual< in a study on the TRB requires an introductory explanation. The term is generally discussed in archaeology. One of the points of critique is that >ritual< has often been used to describe aspects of a >sacred< sphere, versus aspects of a >profane (sphere (Brück 2005; Berggren 2010, 99-103). This is also the case in studies on the TRB, where a distinction has been made between profane settlement sites, and all other ritual sites like depositions, graves, cult houses and Sarup enclosures (ANDERSEN 2000), or more specifically, where there have been discussions that define criteria for deposits (flint and stone axes, ceramics) as ritual finds and as such belonging to the religious sphere (RECH 1979, 72-92; KARSTEN 1994, 24–31). Such rather fixed categories of ritual finds can complicate the understanding of prehistoric realities and block possibilities of interpretation (NYLAND 2003).

In the last two decades, the discussion on >ritual< in archaeology has developed into another direction, inspired by C. Bell's work (1992; 1997). By applying a practice theory perspective, Bell prefers to understand »ritual« as »ritualization«, as being carried by repetitive, formalised practices, which stand in contrast to other activities. In this context, practice is defined as actions with societal and strategic qualities (agency) (bourdieu 1992 [1977]; 1980; ballmer 2010, 123-124). Patterns in the archaeological record that might be called ritualised have been discussed regarding the question of whether they represent repetitive everyday routines or religious ritual practice (BRÜCK 2005, 324-328). For her study on the wetland depositions in the pond Hindbygården in Scania, Å. BERGGREN (2010, 113) applies a practice theory perspective in which ritual is understood as ritualised practice, which has to be seen in the context of the differing environmental, social and material conditions for each deposition and whose meaning is always relational.

BELL (1992) and HUMPHREY/LAIDLAW (1994). Damm follows the idea that ritual is characterised by repetitions and routines, which cannot easily be distinguished into religious or secular. Rituals follow certain rules concerning how an action has to be conducted or performed, and their meaning lies in the experiencing of them and not so much in their symbolic representation of religion. Rituals structure people's lives. Rituals can both be liturgical and performative, and are thus not only part of the religious sphere but also of everyday life. The range of performing rituals is broad, and there are possibilities to change parts of a ritual without changing its meaning. Rules that are part of ritual practice are open for variations and improvisations and thus can lead to a change in ritual. Here, I will therefore understand >ritual< primarily as the ritualised patterns of practice that can be observed in the archaeological record, as in megalithic tombs and wetlands depositions. The fact that these can be seen as typical find categories implies that their material remains witness of repetitive practices, which leave behind distinguishable – and not least comparable – traces. Having stated this, megalithic tombs and wetland depositions can in principle be discussed against an interpretative background that ascribe them or some of their aspects both profane and religious explanation. However, this needs thorough reflection as not only the character of the two find categories is very different, but also their coming into being as well as their background and context. Moreover, differences can be observed within these discernible groups of finds. The following paragraphs will try to understand the >ritual < character of the megalithic tombs and wetland depositions by comparing them, placing a special emphasis on their spatial setting.

In this study, I will apply an approach outlined by

CHARLOTTE DAMM (1998), who draws on the work of

## THE CASE STUDY

Northwest Zealand belongs to the regions with the highest density of finds that can be ascribed to the northern group of the TRB. Within my earlier post-doc study, an extensive database on these finds was compiled, based on the central register for archaeological finds (DKC: Det Kulturhistoriske Centralregister), archive studies and literature (SCHÜLKE 2007; 2009a; 2009b; 2010). The megalithic tombs and their spatial distribution was discussed regarding types of graves, concepts of burying the dead and the possible implications of social structure (SCHÜLKE 2009a; 2009b;

2014; 2015; 2016). More than 400 megalithic tombs are known, of which more than 360 are dolmens (335 certain and 29 questionable) and about 50 of them passage graves and double passage graves (45 certain and 6 questionable). They are erected in the phases EN II to MNA I/II, which roughly corresponds to the time span between ca. 3500–3000 BC. Furthermore, almost 200 wetland locations with depositions that can be ascribed to the TRB are known. They have not yet been presented in a wider spatial discussion context. In the following, I will present the data from the study area.

### THE MEGALITHIC TOMBS

Their high number and the existence of clearly discernible types underline the fact that the megalithic chambers were erected according to a special, repetitive pattern. The practices of building and to some extent using the chambers can be called »ritualized«. They were built to contain the mortal remains of human beings. This makes them a topic for discussing the burial and death ritual as tombs. However, they were also embedded and used in a world in which they also had other meanings.

The megalithic tombs were constructed of stone and earth. The chambers, and in many cases their passages, are erected of large boulders, which naturally occur in this moraine landscape. Many of the dolmens and all of the passage graves were covered by earthen mounds, often delimited by kerbstones. The stone architecture indirectly indicates that some architectural parts might have been constructed of wood, such as entrance areas in the case of the dolmens, and wooden doors in the case of the passage graves.

The tombs differ in architecture. Their different forms represent different chronological stages. However, they also display different possibilities of use, which again can point to varied ritual functions and use. Figure 1 offers an overview over the different types of megalithic tombs, the three main types of dolmen chambers, and the passage and double passage graves.

In the study area about ten dolmen chambers are recorded to have been excavated, almost all of them in the second part of the 19<sup>th</sup> century by the amateur-archaeologist Ludvig Zinck; all of the others are recorded by above ground survey. The dolmens can be divided into three types (SCHÜLKE 2014):

- rectangular closed chambers, in most cases embedded in a mound (usually a long mound, sometimes a round mound),
- 2. rectangular open chambers, often embedded in either a long- or a round mound, and as
- polygonal, open chambers, in some cases embedded in a round mound.

Due to very few excavations of dolmens and the lack of dateable material in general their chronological classification has to be based on observation from other areas as well: Based upon typological observations and some <sup>14</sup>C-dates the dolmens are traditionally dated to the EN II between ca. 3500 and 3300 cal BC (ANER 1963; NIELSEN 1984; KOCH 1998, 190). However, their more exact dates – based on collections of <sup>14</sup>C-dates – are discussed. While B. SCHULZ PAULSSON (2010) argues for a building of the dolmens within

a short time period in the first half of the 35th century BC and before the passage graves, P. ERIKSEN/ N.H.ANDERSEN (2014, 50-53) date the dolmens to the time around 3350 +/- 100 BC, the latest types being contemporary with the early passage graves. The finds from the few excavated dolmen chambers from Denmark, mostly ceramic vessels (lugged flasks), typologically date the first burials in the dolmens to the phase EN II (NIELSEN 1984). From an over-regional perspective, the closed rectangular dolmen chambers usually are regarded as being the oldest types of megalithic graves, followed by the rectangular open chambers (NIELSEN 1984; EBBESEN 2011, 248-249; ERIKSEN/ANDERSEN 2014, 39-45). The chronology of the polygonal chambers is as well as their relation to the passage graves not fully understood. In Denmark they are usually seen as the latest types (EBBESEN 2011, 248-249; ERIKSEN/ANDERSEN 2014, 45), while they in other areas seem to occur as earliest types (MISCHKA 2013; KAELAS 1958). The uncertainty regarding the dating of the polygonal chambers has consequences for the understanding of social and ritual behaviour in the periods EN II and MNA I/II (SCHÜLKE 2014).

Studying the different types of dolmen chambers two main ways of burying the dead can be discerned: the burial in closed stone chambers (rectangular stone chambers/cists with capstone) and the burial in openable graves (rectangular or polygonal open chambers with capstone) (SCHÜLKE 2014). In the chambers either single individuals or several individuals were interred. Sometimes, defleshed human remains were deposited in the dolmen chambers (ERIKSEN/ANDER-SEN 2014, 290-291). From the study area the number of individuals found in the dolmen chambers differs from one to three. These excavations were undertaken at the end of the 19th century and were not documented properly. It is therefore difficult to say whether these inhumations were undertaken within one act of burial, or whether the chamber was re-opened for consecutive burials, as observed in Klokkehøj on the island of Fyn (see THORSEN 1981).

There are several structural parallels between the megalithic tombs and the earthen long barrows (MADSEN 1979, 315–317), which are the first monumental graves of the TRB period, starting up in EN I from about 3700 BC to 3500 BC and thus earlier than the megalithic tombs (SCHULZ PAULSSON 2010; ERIKSEN/ANDERSEN 2014, 50). One of them is the occurrence of both closed and openable chambers (MADSEN 1979, 308–311). These can point to parallels in burial ritual for the earthen long barrows and the megalithic tombs. However, there are differences in the sheer number of earthen long barrows and dolmens: from the study area

of north-west Zealand, only two earthen long mounds – Lindebjerg and Asnæs – are known, both of which have yielded wooden chambers. They stand in contrast to the hundreds of dolmens in the area that roughly date to EN II. While the earthen long mound at Lindebjerg, has been <sup>14</sup>C-dated to around 3700 cal BC and thus belongs to the preceding »non-megalithic phase« EN I (LIVER-SAGE 1981; SCHULZ PAULSSON 2010), the burial and the wooden chamber in the long mound at Asnæs is dated to EN II or latest at the very beginning of MN, due to the type of the clay flasks found in the burial chamber (GEBAUER 1988).

The passage graves and double passage graves were used as collective graves, and differ from the rather >single grave< character of the dolmens (SCHÜLKE 2014, 118–121). The number of buried individuals per

passage grave chamber reported from the study area is between four and fifty. Most of these sites are excavated and recorded in the last part of the 19<sup>th</sup> century. However, these numbers must be interpreted with caution and might have been higher, as it is by no means certain that the graves were completely excavated. Other factors also have to be taken into account, such as the question whether whole bodies or only parts of bodies were deposited, as well as the extent to which the burials relate to each other chronologically. Furthermore, most of the skeletal deposits in the passage graves also contain material from the Late Neolithic and Early Bronze Age.

The passage graves and double passage graves were built in the time between ca. 3300 and 3000 BC (Dehn/Hansen 2006a; NISSEN 2009; SCHULZ PAULSSON 2010).

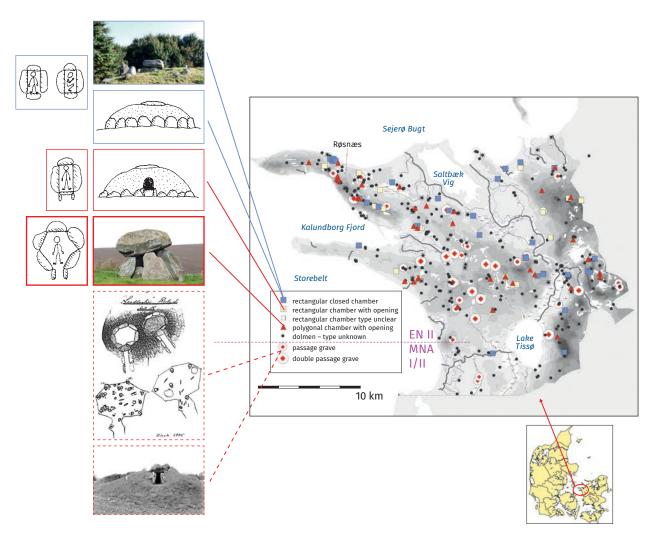


Fig. 1. Megalithic tombs in the study area of north-west Zealand, Denmark. Map: Almut Schülke. The elevation in the study areas is between 0–100 m a.s.l., the highest lying areas marked with dark grey. Sources: Lakes and wetlands: Danmarks jordarter 1999 – © GEUS: Digitalt kort over Danmarks jordarter 1:200,000 (1999); watercourses: AIS – Miljø- og Energiministeriet, Areal Information System (1996–2000); elevation/contour: © Kort&Matrikelstyrelsen (Målestok 1:25,000) (2004) (map: Almut Schülke).

They are architectonically advanced and are built with care and expertise (HANSEN 1993; DEHN/HANSEN 2006b; DEHN 2009; DEHN 2015).

There are 364 dolmens and 61 passage graves (among them 16 double passage graves) recorded from the study area. Calculating the average number of the graves in relation to the length of the period in which they were in built (EN II with a length of 200 years), it can be seen that there on average were erected about two dolmens per year (1.82 per year) in the study area, while only 0.17 passage graves (including double passage graves) were built per year (MNA I/II with a length of 300 years) – one circa each sixth year on average (SCHÜLKE 2015, 193-197). However, such numbers can only illustrate the average impact that these tombs had in different time spans, and do not take account the consideration that most of the passage graves supposedly erected in the beginning of the time span MNA I/II (schülke 2015, 193).

Both the dolmens and the passage graves are distributed across the study area and in different topographical settings: Close to the coast as well as further inland and in deeper and higher lying areas (Fig. 1). While the dolmens occur as well in clusters as in lines, single passage graves are distributed more evenly, but there are also quite a few areas with passage graves placed close

to each other in groups (SCHÜLKE 2015). There are also areas from where only few single megalithic tombs are recorded, like west or south of Lake Tissø and in the area of *Bregninge å* in the north of the study area.

The megalithic tombs have had a complex function in TRB-society. They were built as burial spaces, but were in their function as burial place also social and spatial markers. They might also have been places that had a special religious significance as places where the living world and the >other< world could meet (HOLTEN 2009). The openings of the open dolmen chambers and the entrances of the passage graves, and the area around these openings, were used as places of offering, were pots, both whole and destroyed, were deposited (only few excavated examples from the study area; otherwise HOLTEN 1997; MIDG-LEY 2008, 148-154). The tombs were places that attracted activity, and their distribution indicate that at least some of them were built along communication corridors/routes - or vice versa, that their erection in lines led to the establishments of »roads« in the landscape (schülke 2009a). They are also important for a discussion of the (changing?) social structure of the TRB, including the discussion of possible population densities (SCHÜLKE 2015; for other areas, for example SCHIESBERG 2012; MÜLLER 2010).

#### THE WETLAND DEPOSITIONS

The wetland depositions are characterised by portable objects – often »everyday objects« that are found either singularly or in groups in wetland areas. The frequent constellation of the object – non-destructed, usable items – with the place where they were found – wetlands – makes it possible to address these types of finds as »ritualized«, following a special pattern of activity, namely laying down and leaving objects. This constellation – albeit with different types of items – is known from many prehistoric periods, and has especially been discussed in connection with the Bronze Age.

Depositions in wetlands occur in all phases of the TRB of the northern group. At least in some parts of southern Scandinavia this practice goes back to the Late Mesolithic as locations with place continuities show (Karsten 1994, 166–170; Berggren 2010, 187–206; Berggren 2014, 230; Sørensen 2015). From all over Denmark Neolithic wetland deposits are known, primarily consisting of the so-called "bog-pots", flint and stone axes and other stone and wooden tools, amber beads and animal bones (Koch 1998, 148–155; Koch 1999). At some of the sites with wetland depositions stone pavements or wooden platforms have been found (Koch 1998, 143–146).

Furthermore, human bones that date to the TRB have been found in bogs (KOCH 1998, 155–157; KOCH 1999, 128–130; BENNIKE 1999), although none of the dateable finds stem from the study area. Depositions with large numbers of amber beads mainly occur in northern Jutland (EBBESEN 1995).

On the Danish islands, the phenomenon of wetland depositions and especially of the bog pots has been distinct, due to extensive peat-extraction in the bogs reinforced during the years of World War II (BECKER 1947, 6, 11 fig. 1; KOCH 1998, 58–62).

In 1947, Carl J. Becker built his discussion on the chronology of the Early Neolithic on the Danish bog pots, which mainly comprised the finds from the Danish islands (BECKER 1947, 11 fig. 1 offers an overview over the sites), with the complex of finds from the *Lille Åmose* as one of the largest. Eva Koch's comprehensive study on the Neolithic bog pots from Zealand, Lolland, Falster and Møn discusses the vessels found in bogs regarding their material, landscape, chronological and societal context (KOCH 1998), although the finds were not mapped diachronically. Koch re-evaluated Becker's chronology based upon a typological study of vessel shape in combination with <sup>14</sup>C-datings of food crusts found in the pots (but see FISCHER 2002).

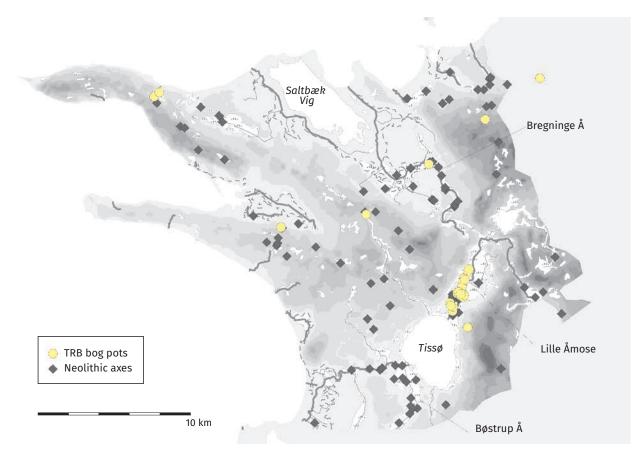


Fig. 2. Overview over depositions in the wetlands of the study area; the deposition with ceramic vessels are emphasised. Sources: see fig. 1. (map: Almut Schülke).

For the Danish islands, rather few finds have hitherto indicated a wetland >offering< tradition that dates back to the Mesolithic. However, finds from settlement sites are difficult to distinguish from possible deposits for this period (κοch 1998, 157–158). New evidence from the island of Lolland shows a ritual continuity from the Late Ertebølle to at least EN II (SØRENSEN 2015).

For the Southern Scandinavian Neolithic wetland finds different interpretations have been forwarded, which are closely connected to the discussion on "sacrifice" and "hoard" in archaeology in general. Both P. Karsten (1994) and E. Koch (1998) interpret these depositions as "sacrifices", regarding them as intentionally placed at locations where they were difficult to collect again. Karsten (1994, 126–128) distinguishes between "sacrificial sites" (offerplats), religious offering places, with single deposits and those with accumulated sacrifices.

Koch interprets the bog pots generally as offerings, having »ritual origin« (косн 1998, 132, 134). However, she discusses possible other interpretations. For example, vessels placed in wetlands directly at the margins of settlements could have been put into the water to keep their contents cool, they could

have been fallen into the water while dish-washing, or they even could have been placed into the water to soften the food-crust in the pot, and later not been taken up (KOCH 1998, 132-134). Koch later discussed the bog pots' possible function as fish-traps or traps for crayfish, and forwards the idea that the pots in some cases might have been used for catching crayfish (косн 2003; 2004). However, regarding the finds' context, she still addresses them as being offerings. Koch stresses that sacred sites rarely are »narrowly-defined locations« (KOCH 1998, 171) and avoids denoting places for offerings as sacrificial sites. In her opinion, only stone pavements or wooden platforms connected to wetland offering might be denoted as »regular sacred places« (косн 1998, 171). However, she states that Neolithic bog pots often were deposited at »old sacred places« that go back to the Mesolithіс (косн 1998, 139).

In her study of the numerous and diachronic depositions from the little wetland Hindbygården in Scania, Å.BERGGREN (2010) aims to interpret wetland deposition from an »outside« and »inside« perspective. Applying a practice theory perspective, she interprets these bog finds as »ritual depositions«. Berggren

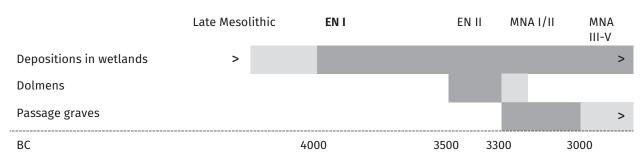


Fig. 3. The chronology of the megalithic tombs and the wetland deposits in the study area (graphics: Almut Schülke).

argues that the changing character of the wetland — with altering vegetation and the different objects deposited through time — played an important role in terms of how the participants in the rituals perceived and embodied the situation of depositing (BERGGREN 2010; 2014). The experiences at the pond contributed to the participants' ordering of the world. BERGGREN (2010) avoids dealing with the motives behind the acts as beliefs and religion. Thus, for her Hindbygården is »the pond« at which many different experiences and memories meet.

The wetland finds from north-west Zealand were recorded in my database of the region. Items which were either found as »single finds« and »groups of finds« in a wetland and which could not directly be connected to finds from a settlement were classified as »wetland finds«. For the following discussion of the ritual use of space it is focused on the ceramic vessels (»bog pots«), but it will also be touched upon flint axes found in wetlands. Other types of materials like amber beads or animal bones are not included, firstly due to the few finds, and secondly due to problems of dating. The ceramic vessels are particularly suited for chronological studies. Their spatial distribution through time can give valuable insight into the development of ritualised practice in the first part of the Neolithic. For the chronological classification косн's (1998) comprehensive catalogue and her typological classifications are used. It has to be mentioned that fischer (2002) has revised Koch's chronology for the four early vessel types 0-III (all EN I), criticising Koch's use of food crusts as material for dating. This does not affect the chronological division in the present article, which distinguishes between the three

phases EN I, EN II to MNA II and MN A III–V (for this division see SCHÜLKE 2009b, 218). The spatial distribution of the items through time – which will be presented in the following – can offer valuable insight into the development of ritualised practice in the earlier part of the Neolithic.

Altogether, 192 find spots can be classified as wetland deposits in the study area. They are found all over the area and in different natural settings: in today's wetlands along riverbeds like the *Bregninge å* and the Bøstrup å, in the wetland Lille Åmose as well as in minor wetlands (Fig. 2). The bog pots are primarily and in large numbers known from the Lille Åmose, and here in large concentrations (see below; Fig. 6). Furthermore, thirteen locations in other wetlands have yielded ceramic vessels (list 1). The wetland deposits occur in different types of water: in small ponds/wetlands, lakes, today's wetlands (partly representing former lakes) along rivers, in fjords and freshwater areas at the base of fjords (косн 1998, 135). In the study area, we deal almost exclusively with depositions in freshwater. While the single finds from smaller wetlands in almost all of the cases are due to accidental finds, which in none of the cases were followed by archaeological investigation, especially the concentrations in the *Lille Amose* witness the extensive peat-cutting in the second quarter of the 20th century. Minor wetlands have also been excavated and analysed more closely from other Southern Scandinavian areas for example, at Saxtorp (NILSSON/NILSSON 2003) or Hindbygården (BERGGREN 2010; 2014) – showing that minor bogs have also yielded huge amounts of deposited items. This might indicate that the distribution picture that we know from north-west Zealand is biased.

#### MEGALITHIC TOMBS AND WETLAND DEPOSITIONS IN THE STUDY AREA — A BRIEF SUMMARY OF THE GENERAL PICTURE

The two ritualised practices described above, deposition in wetlands and the erection and use of megalithic tombs, have one thing in common: Both of them materially mark space. However they mark different spaces in very different manners. On the one hand, portable

everyday objects like pots and axes were laid down into waterscapes, and it is difficult to tell whether (and how?) these places were recognisable if not through oral tradition. On the other hand, solid and partly enormous stone-earth-wood constructions mark places on dry

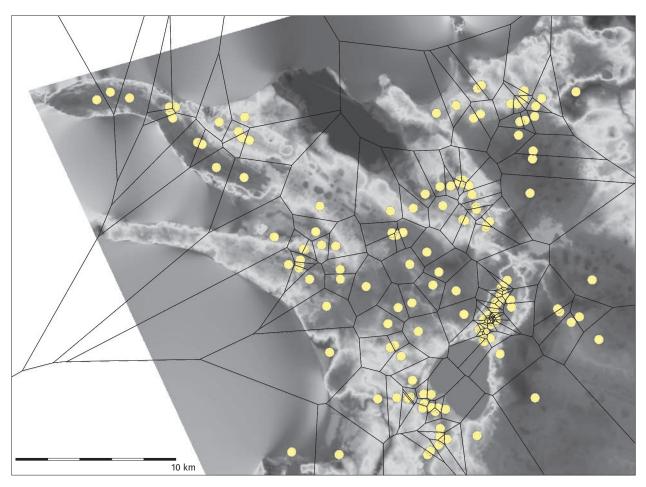


Fig. 4. A Voronoi map of all of the Neolithic wetland deposits (yellow dots) from the study area. Source: Højdemodel (DHM), 25 m net © Kort&Matrikelstyrelsen (map: Almut Schülke).

land, which could be seen, sensed and experienced by trespassers. While in the first case items are laid down to be – either immediately or gradually – enclosed by water or sediments, in the second case containers are built to house items and human remains. However, a common feature is that in both of the cases different types of wetlands or topographical settings are marked. While the megalithic tombs are more easily grasped as burial places, places of memory and worship at which items are laid down, as social markers and markers (or establishers) of lines of movement, the wetland depositions are more difficult to understand from our modern Western perspective.

Looking at their chronology there are clear differences (Fig. 3). The practice of depositing items in wetlands is at least as old as the EN I (ca. 3950–3000 BC), and might even go back to the Mesolithic. It continues throughout all of the TRB. The megalithic tombs were the first monumental tombs in the study area, built and used from around 3500 BC until ca. 3300 BC, only preceded by the earthen long barrow at Lindebjerg (around

3700 BC). The passage graves were built from around 3300 BC until about 3000 BC, but were used for depositing items and possibly also for burials throughout the whole of the Neolithic and sometimes later.

косн (1998, 139-143; 1999, 127) maintained that wetland deposits and megalithic tombs are placed in close vicinity to each other and close to contemporary settlements. This statement is solely based on Koch's calculation of the average distance of megalithic tombs to wetland depositions and not on the mapping of these locations. However, taking the factual distribution of the finds into account, the picture looks somewhat different. A comparison of voronoi-maps shows that the wetland finds (Fig. 4) often are clustered in areas were the density of megalithic tombs is low (Fig. 5). Considering the fact that north-western Zealand was archaeologically surveyed and recorded thoroughly (MATHIASSEN 1959) this picture can be seen as somehow representative. The mapping of the tombs and the wetland depositions thus indicates a different spatial relation between megalithic tombs and the

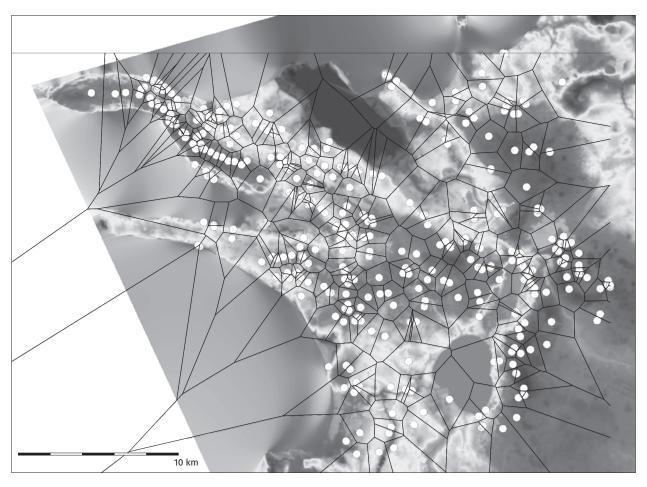


Fig. 5. A Voronoi map of all of the megalithic tombs (white dots: dolmens, passage graves and double passage graves) from the study area. Source: see fig. 4. (map: Almut Schülke).

wetland deposits as the one outlined by Koch. A similar observation can be made for the area around the river Verebro  $\mathring{a}$  in northern Zealand (SPARREVOHN 2009). Here the four areas along the river which have yielded depositions from the Neolithic have quite different character with different topographic and cultural contexts. In most of the cases the depositions are not placed; in direct vicinity to the megalithic tombs. The same can be said for the bog with the highest amounts

of ceramic vessels on the eastern Danish islands, the *Store Åmose*some kilometres to the east of the study area, where bog pots were deposited throughout the whole TRB. Here the megalithic tombs are in most of the cases not placed in direct vicinity to the bog finds (compare MATHIASSEN 1959, pl. XVI).

In the next paragraph, this observation will be further investigated by looking at a case study, the Lille Åmose bog and its surroundings.

#### UNTANGLING THE COMPLEX RITUAL USE OF THE LILLE ÅMOSE AREA

Lille Åmose is placed in the Eastern part of the study area (see Fig. 2). Through the river Halleby å it is connected to the same water system as the extensive Store Åmose, a former inland lake located some kilometres further to the east outside the study area (FISCHER 1999). While KOCH (1998, 354) described the Lille Åmose as a lake connected to Lake Tissø in the Stone Age, geological investigations later have shown

that today's wetland in times of the Holocene was a kind of river delta with smaller lakes and riverbeds, which was transgressed at times with high ground-water level (NOE-NYGAARD/HEDE 2004, 136–144). Between Lille Åmose and Lake Tissø a sand bar has been deposited by freshwater sediments (Fig. 6). *Lille Åmose* was earlier exposed to extensive peat digging (BECKER 1947, 29), but is a protected landscape today (FISCHER/

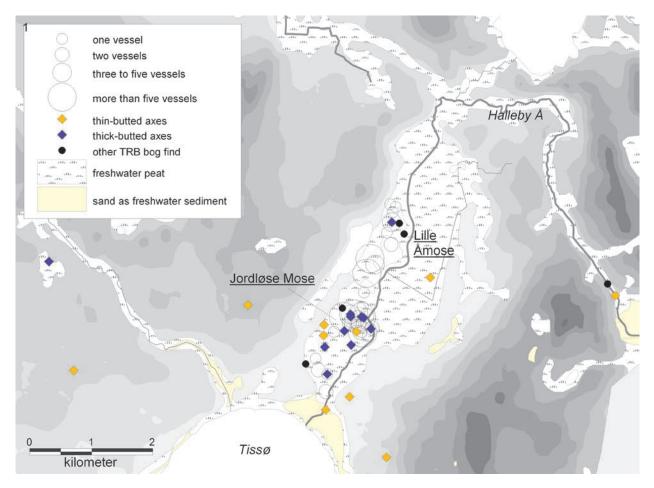


Fig. 6. Overview over bog finds in the Lille Åmose: Concentrations of bog pots and finds of flint and stone axes in the part of the bog called »Jordløse Mose«. Sources: see fig. 1. (map: Almut Schülke).

PEDERSEN 2005). Many of the archaeological finds that were made during peat digging could be saved by archaeological excavation (FISCHER 1999, 86-87). Most of them were found in an area west of the Halleby å, the so-called *Jordløse Mose*, in depths between one and two metres in the bog (BECKER 1947, 29–38. KOCH 1998, 354). From this area 37 locations with ceramic pots are known, 35 of these can be located more closely (list 1; Fig. 6). In most of the cases one or two pots are reported from one find spot, either preserved as whole vessels, or - as in many cases - in sherds. However, there are also locations that have yielded pots in large numbers, with the highest amount recorded being »circa 50« vessels. For several cases it is reported that many pots were found at one find spot, but only some of them were rescued. The reconstruction of the original number of vessels thus is difficult. Altogether, the remains of at least 135 pots from different phases of the TRB are recorded, described in further detail and classified according to types (KOCH 1998, 354–366).

The depositions in *Jordløse Mose* are well-marked from the beginning of the EN. As many as 17 find

spots (see fig. 7; list 2) have yielded vessels that can be ascribed to Koch's types 0, I, II and III can be dated to EN I (3950–3500 BC) (κοch 1998, 63–121; see fig. 8; see fig. 7; list 2; and fig. 8). Most of them are placed close to each other in the southern part of the bog, stretching out in an area of about 500 m, located quite centrally between a land-tongue to the east (in the extension of which some activity areas/settlement sites are recorded) and the hill »Egebjerg« to the west. Some of the pots have rests of food crusts and were obviously used for cooking of fish soup before they were deposited (косн 1998, 150–151; 2003).

In the cases where they are recorded the find circumstances substantiate that the pots were placed into open water. They were found in layers with gyttja under peat which contained shells of freshwater molluscs (JORDLØSE SD. 59; KOCH 1998, 357) or in gyttja with freshwater molluscs (JORDLØSE SD. 68, KOCH 1998, 362). Two ways of depositing the pots are thinkable. They imply two fundamentally different experiences for the depositor(s): either with or without getting wet. From other wetland sites wooden

platforms are known which are interpreted as places from where items were deposited (KOCH 1998, 146; 1999, 127). Such structures are not known from the *Lille Åmose*. People might therefore have been wading into the water when depositing the pots. In single cases, upright standing sticks that encircled the pots are recorded (KOCH 1998, 358). This likewise could speak for people being in the water while depositing the pots; otherwise it might have been difficult to bring on the sticks. To keep the pots in position (which at humid times would mean to sink them into the water) they must have either been filled (with food?) and/or being filled by the surrounding water. Together with the pots other items like animal bones and stone and sometimes wooden tools were found.

Concentrations of lithic finds (surface-finds or recovered by peat digging) in its southern and western part

indicate that the edges of the former wetland were used for settlement purposes in the EN I, although they are not easily understood, both chronologically and structurally. These activity areas are either placed on dry ground close to the wetland, such as at "Sandhuse" on the sand bar in the south, or in swampy areas along the edge of the wetland. Many of the locations were visited from the Late Mesolithic and throughout the TRB, and often they were exposed to turbation due to water level changes (FISCHER 2004, 27). The Lille Åmose area reflects a general pattern of land-use and settlement in the EN I in this region with people predominantly settling at the coast, at lakes and along valleys of streams (SCHÜLKE 2009b).

If the pots were deposited from the settlement/ places lying directly to the east (Fig. 7), the depositors would have faced the marked hill *Egebjerg* to the

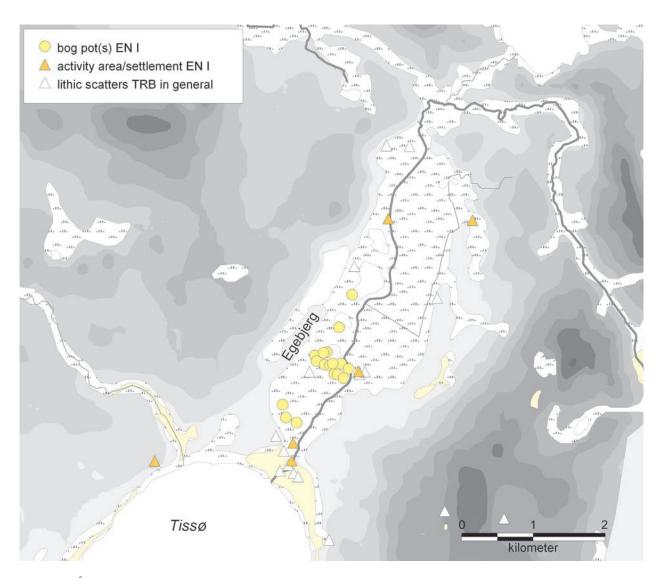


Fig. 7. Lille Åmose: Bog pots dating to EN I, lithic scatters, and settlements/activity areas that can be dated to EN I. Sources: see fig. 1. (map: Almut Schülke).

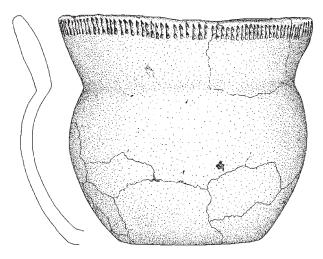


Fig. 8. Example of a bog pot dating to EN I, found in Jorløse Mose (FIND 177.1; Jordløse (30606) sb. nr. 45; from Koch 1998, 358 plate 114; copyright: The National Museum of Danmark).

west. Koch (1998, 135; 354) assumed that this hill might have had a special significance, which could have been the reason for the offerings near by. However, the items might also have been deposited from the area around the Egebjerg, with the depositors facing the east. While the direction of deposition hardly can be inferred, it is a fact that the pots never were recollected; instead, they were abandoned.

In the subsequent megalithic phase (EN II to MNA II, from 3500-3000 BC) a continuation of depositing practice can be observed. Two locations have yielded pots that can be ascribed the EN II, while vessels belonging to types that occur in MNA I and MNA II have been found at eight locations (list 2). Figure 9 shows that more or less the same areas in the bog are marked by pots, with concentration in front of *Egebjerg* and about 1 km to the north. In four cases pots dating to MNA I are found at locations which were used for depositions in EN I (see list 2). Additionally, finds of thin-butted flint axes were made in the area east of *Egebjerg*. However, they are difficult to date, as some of them could belong to EN I (NIELSEN 1978, 72-75). Only in one incident is a pot placed in another area (JORLØSE sb. 31), while the area with three EN I vessel-deposits to the south of the wetland is no longer marked. It can be summarised that almost all of the depositions from the megalithic phase are found in the same areas of or even at the same places in the bog as the earlier depositions from EN I. This continuity of place with an >unbroken < practice of depositing items indicates that people in the megalithic period had knowledge of the »old places« and the ritual traditions connected to it. These traditions were obviously repeated and thus lived on.

This continuity of place is especially interesting seen in the light of the distribution of the dolmens that were first erected at that time (EN II) (Fig. 9). Many dolmens are recorded on the slopes of the hills surrounding *Lille Amose*, on its eastern side with heights up to around 80 m a.s.l (list 3; compare also Fig. 1). A number of these megalithic tombs are only known from old records, and are today partly or fully destroyed, and thus only some of them can be specified more closely. All of them are within easy walking distance to the wetland, which is unsurprising looking at the general >overall< distribution of the megalithic tombs in the study area. However, when looking more closely at the quality of their spatial distribution, on the background of the tombs' general spreading, an interesting picture emerges. Only a few dolmens line today's bog, three of them placed to the west on the east-oriented slopes with distances of 200 to 400 metres to the wetland. The only passage grave known from the slopes close to Lille Amose, is situated directly at the edge of the wetland, just across the middle concentration of depositions, but at least 1 km away from it. The passage grave is situated in a cluster of dolmens. However, most of the dolmens are situated on the western slopes of the north-south ridge, which demarcates the wetland to the east. A cluster of dolmens was built at and around the northern end of the wetland and in the vicinity of recorded settlement sites, which have yielded material from EN II. Quite a few are concentrated in the area, where the outflow of the small lake Skarridsø joins the Halleby Å and where a small strip of land makes it possible to move between the two water systems of the *Halleby å* and the *Bregninge Å* (compare Fig. 2). On historic maps like the *Høje Målebordsblade* produced between 1842 and 1899 and the Videnskabernes Selskabskort produced between 1768 and 1772, cross-over-points across these watercourses are recorded here, following pre-industrial roads. It is very well thinkable that these pre-industrial cross-over points at the northern end of the wetland -and perhaps Stone Age-lake – were also important passages in the Neolithic. Furthermore, a comparison of the roads that are recorded on these two historic maps shows that the megalithic tombs in this area often lie close to pre-industrial communication corridors, or mark areas that due to preferable (=dry) topographic conditions easily could be used as such, like the west-oriented slope east of the *Lille Amose*. The connection of megalithic tombs to old communication lines (or vice versa!) is well known (MÜLLER 1904; SPARREVOHN 2009, 55-56; SCHÜLKE 2009a; ANDERSSON/WALLEBOM 2013). For the Lille Amose area, it can be said that many of the megalithic tombs mark communication lines and nodal points of communication, like cross-over points. Considering the overall picture of the distribution of settlements and dolmens in the EN II, which shows an increasing and marked use of the inland (SCHÜLKE 2009b), it is very likely that such routes were becoming important at that time. This is most likely connected to the breakthrough of the new Neolithic economy, with agrarian practices like the growing of crops, which went hand in hand with a gradual opening of the forest and a clearing of the woodland (WESTPHAL 2009). The establishment of more permanent routes must have been part of this new way of organising the land. Even though single megalithic tombs show a vicinity to the wetland deposition site, the overall picture suggests that the tombs were not built in direct connection to it. Pollenanalytical investigations indicate that the landscape in the first part of the megalithic phase – when the dolmens were built - was still covered with forest

to a large extent, and clearings occurred in more isolated patches (WESTPHAL 2009; RASMUSSEN et al. 2002). Thus, woodlands might have been (mental) borders between the tombs and the wetlands.

In the final phase of the Funnel Beaker Culture – phase MNA III–V (3000–2800 BC) – depositions continue in the south-western part of *Lille Åmose* (Fig. 10). There are only two locations with ceramic vessels (JORDLØSE sb. 52 and sb. 58; see list 2). They both lie areas with former depositions. Furthermore, thick-butted axes are recorded as wetland finds. They might belong to this phase or the later MNB. Thus, phase MNA III-V depositions also continue at the old places in *Jordløse Mose*: in the area west of Egebjerg and at the locations furthest to the north, which was first marked by vessels in the megalithic phase.

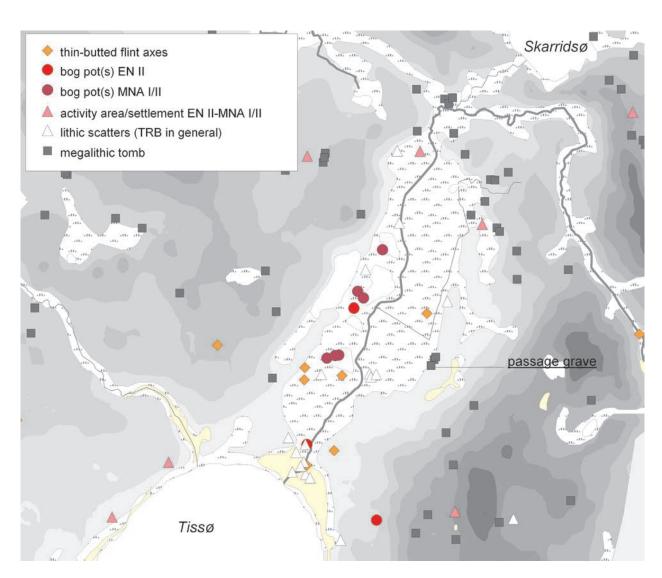


Fig. 9. Lille Åmose: Bog pots dating to the megalithic phase EN II to MNA I/II, finds of thin-butted flint axes, megalithic tombs, lithic scatters, and settlements/activity areas dating to EN II/MNA I/II. Sources: see fig. 1. (map: Almut Schülke).

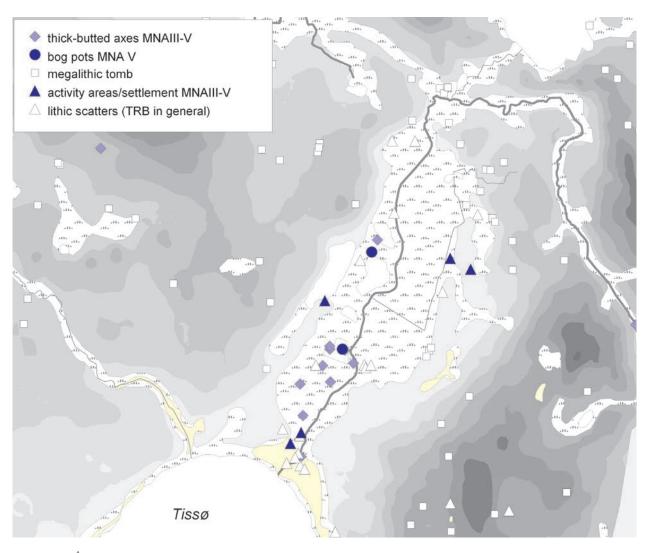


Fig. 10. Lille Åmose: Bog pots dating to the phase MNA III-V, and thick-butted flint axes. Sources: see fig. 1. (map: Almut Schülke).

# MEGALITHIC TOMBS AND WETLAND DEPOSITIONS IN THE CHANGING WORLD OF THE EARLY NEOLITHIC: INVERSION OR BREAK OF RITUALISED PRACTICES?

The megalithic tombs and the ritual depositions (often called »offerings«) at the graves, in wetlands and on dry land, are seen as typical traits of the TRB-complex. Even though the chronological difference between the early ›offerings« from EN I onwards and the later megalithic tombs have been observed (KOCH 1998, 179–194; KOCH 1999), their relation to each other has hardly been studied. Thus, the study of the qualitative, chronological and spatial relation of the wetland deposits and the megalithic tombs in the *Lille Åmose* area, showing both differences and similarities, can contribute to a more refined understanding of the first part of the Neolithic and of the neolithisation process.

It can be concluded that there is a place continuity of wetland depositions in the south-western part of the

*Lille Åmose* – which lasts throughout the whole of the TRB period – that is about more than a thousand years and even longer into later prehistoric times (косн 1998, 161-164). The ritual of depositing starts from the EN I onwards with the depositions of ceramic vessels and presumably animal bones, and eventually flint axes. Some finds from the Late Mesolithic might witness of earlier deposition practices in the Late Mesolithic, although these finds are difficult to interpret as they also might represent waste from settlement activities (KOCH 1998, 157-158). Depositing in the wetland and almost at the same spot is a practice which is kept up in the following megalithic phase (EN II to MNA I/ II), in a time when new modes of marking the land by building a large number of megalithic tombs can be seen. Older and newer customs were practised parallel from the EN II onwards and throughout the Neolithic. The pots, axes and other items were put down consecutively in the same areas of the bog throughout hundreds of years. However, it is impossible to tell whether single objects or groups of objects dating to one period were deposited consecutively or during one event of deposition. Thus, it is also difficult to tell how much time passed between the different events.

In north-west Zealand – like on the Danish islands in general – the building of the dolmens and thus the principle of building grave chambers for the dead was introduced on a broader scale first with the beginning of EN II at around 3500 BC. Together with the gradual opening of the woodland due to more intensified agricultural activities, this certainly changed the surroundings and people's perception of the landscape. However, it has to be considered that this process of monumentalising the landscape happened gradually throughout a period of 200 years (SCHÜLKE 2015). In all of the study area the megalithic tombs were not erected especially close to the depositions in the wetlands. Instead they are often concentrated in other areas. In the *Lille Åmose* area most of the dolmens are – with the exception of some single lying tombs – placed in a spatial distance to the places of deposition. Many of the megalithic tombs are placed further inland. Often they are located along axes of communication and at important nodal points like possible »fords« or cross-overs. Accumulations of tombs – like at the northeastern side of the wetland - must have represented new ritual centres, which at least through their function as visible and marked burial monuments must have had a special social meaning. However, even if the areas that are marked by many tombs are lying, with several kilometres, rather afar from the places with depositions in *Lille Åmose*, visual contact to the wetland might have been possible from there, if not possible woodlands might have disconnected the two spheres.

Recent studies have shown that the introduction of Neolithic practices like farming and animal husbandry in southern Scandinavia and northern Germany seems to be a process that developed gradually from around 3950 BC onwards. First in the second part of the EN I, from 3700 BC onwards, the new economy can be traced on a broader scale in the archaeological and archaeobotanical record (bones from domesticated animals, direct and indirect traces of cereal and cereal production) and in pollenanalysis (FISCHER 2002; SØRENSEN/ KARG 2012; KIRLEIS/FISCHER 2014). Developing the long debate on the neolithisation process further (FI-SCHER/KRISTIANSEN 2002), the shift to farming and animal husbandry is lately understood as changes within the old hunter-gatherer groups that through long-lasting long-distance contacts with agrarian

populations to the south were ready to adopt the new ideas (FISCHER 2002). These changes are also explained with the gradual change and ultimately splitting up of indigenous groups, with parts of their society taking over the new lifestyle (Andersson 2004, 240–253). Based on large-scale analysis, other theories argue for a quick process with the immigration of task groups with farming knowledge to the fertile inland areas, living side by side with the indigenous hunter-gatherer groups at coast and inland lakes (sørensen/karg 2012; SØRENSEN 2014). It has to be stated that the archaeological picture of the EN I in southern Scandinavia is complex, with different regional characteristics. This complexity is archaeologically challenging and is still not understood. However, the complex archaeological evidence perhaps also illustrates a time of ambiguity and disorder - probably a societal stress - for the beginning of the Neolithic, which is reflected in the ambiguous material and is difficult to grasp.

The development in the *Lille Åmose* area thus is just one mosaic stone in the debate on the neolithisation. To understand the social processes that stood behind the material changes it has to be asked: How is the keeping up of the depositing at old places to be understood in the light of the new modes of marking and using the land through the megalithic grave architecture, which went hand in hand with the settling of the inland, the opening up of the landscape and the introduction of agriculture and animal husbandry? Do we face a discontinuity of ritual practice, which is not only expressed chronologically but also spatially, and which could hint at drastic social changes from EN I to EN II? Or is there a relation between these two modes of marking space, which could speak for a ritual connection - a continuity – between them, reflecting an unbroken social tradition? Or are things even more complex?

To approach these questions, it is necessary to look more closely at these different forms of ritualisation. The wetland depositions that started at the latest in EN I are not easily understood. There can be no doubt that the south-western part of the lake or wetland Lille Åmose was what I would like to call a »marked site« in people's memory: a location that was highlighted by ritualised depositions. The items deposited here were not taken up again and thus surely have to be seen as »given away«. However, whether the ritual practice that led to their alienation should be denoted as profane or religious is, following DAMM (1998), rather difficult to define. One point to consider is the temporal aspect: Even if the site was more or less »continuously« in use, and obviously was remembered, the background for and meaning of depositing there might have changed through time. Closely connected is the question how the site came into being as an important and »marked site«. BERGGREN (2010, 334-335)

assumes that the idea of depositing must have been inspired from depositions at other places, and that a relation was created to the place through the practice of deposition. However the reason for depositing at a spot could also lie in a certain event – e. g. dramatic or/and festive -, which was remembered through later, more ritualised practices, through which the place was re-visited and remembered again and again, being renegotiated and provided with shifting meaning. As for the megalithic tombs it is likely that the marked wetland sites at times were conceived as an important memorial or religious site, while there surely also were moments when they were not important in the same way. The idea that the wetland depositions mark ancient places that go back to Mesolithic times has repeatedly been stressed. KOCH (1998, 138–139) assumed that they were put down close to marked hills, which might have been hunter-gatherer sacred places that go back to the Mesolithic, as in the case of the Egebjerg close to the Lille Åmose. FISCHER (2004, 36-38) by contrast sees in the wetland depositions the marking of mythological places – in wet elements like lakes, wetlands, etc. – to worship hunter-gatherer ancestors. He argues that the change in settlement location away from coasts and lakes and to the inland – which took place in the EN – and the human remains from bogs that are recorded for the Neolithic witnesses of a shift in people's conception of the wetlands at the transition from the Mesolithic to the Neolithic from »the realm of the living to the realm of the dead« (FISCHER 2004, 37; translation by the author). The fact that the areas in the Lille Amose that were settled in the Late Mesolithic (PALUDAN-MÜLLER 1978) also are settled in the EN I (SCHÜLKE 2009) – and that the wetland areas outside these sites are marked in the EN I by depositions – illustrate a continuity of place.

It is difficult to tell whether the places of depositions relate to the contemporary settlements from the EN I or the earlier Mesolithic settlement sites. However, what can be said with certainty is that with the deposition of the ceramic vessels and other items in wetlands new ritualised practices in this area were introduced, while at the same time old – Mesolithic – settlement areas persist.

In the light of the chronology and topography of the wetland depositions the practices that are embedded in and expressed through the megalithic tombs appear as a later and different way of ritualising the land. Together with forest clearance and agricultural cultivation, they witness a marked and clear cultural change. The megalithic tombs – and in the case of the *Lille Åmose* especially the dolmens – have to be seen as places of both life and death: places for the dead to rest, and at the same time as ritual and social focal points for the living. Such focal points would have

different functions: As places of memory, as possible meeting places between the living world and the world of the dead, most likely with a religious dimension, as spatial markers and as representations of social relations. The tombs most likely had several meanings and shifting functions in the world of the living – according to different situations which required more or less ritualised behaviour – spanning from burial ceremony to simply passing by. Most likely, their meaning was also shifting through time, transforming tombs into ancient buildings; for example, in the MN, when burial in dolmens was given up and collective burials rites were practised in the extensive passage graves.

With the megalithic tombs and the wetland depositions we face two very different modes of marking the land. It can be argued that these represent disparate perspectives on how to operate in and perceive land and surroundings, and thus mark a cultural break. On the one hand there are »marked places«, where people return to the same wetland sites to deposit there, focusing continuously on the same cultivated »natural« places. These sites bundle ritualised activity at one and the same spot throughout centuries. On the other hand, there are the megalithic tombs as growing numbers of stone constructions that are erected consecutively throughout the land. Even though each tomb bundles ritualised activity the erection of many such stone tombs carries ritualised practice into the land, segmenting it by transforming a growing number of places into ritual places, often in clusters or in lines. While the »marked place« is characterised by the »natural« site at which artefacts and animal bones are deposited and given away, the stone tombs transform topographic spaces to containers for the memory of people buried/deposited there. Moreover, the placing of items into waterscapes and the practices and actions involved into this – either from a boat or a platform or when in the water – must have been an experience different to the depositing of vessels and other items outside or inside megalithic chambers and on dry ground. Could the different ritual practices reflect the different use of one and the same area by people attached to different cultural and economic practices, with depositing in wetlands representing the hunter-gatherer ritual and early farmers using the megalithic monuments representing the places of ritual of early farmers?

On the other hand, these two modes of marking the land have qualities which let them appear as complementary, and which therefore could indicate a close connection between them, in the sense of an inversion: The wetland deposits are locations where things and animals (and possibly humans) are placed, while the megalithic tombs are containers that can take in things, as well as the remains of animals and humans.

Consequently, the building of an openable stone tomb could also be compared with creating an artificial space that can take in or house items and the remains of dead persons, and thereby as a materialisation of the qualities that natural places like wetlands, bogs or lakes can have. The erection of the stone tombs could thus also be interpreted as a mode of materialising the natural qualities that lie in a wetland deposit. Consequently, the dolmens could also be interpreted as a development of the deposition practice in wetlands, in a world at the wake of EN II which allowed society to split up the land, thus transforming old ritual practice into new modes of being. However, the old, »marked places« would still be marked in the same way as earlier, illustrating the might that the meaning of these places must have had for people. Such an explanation could speak for a more gradual shift of ritual practices, in the course of which parts of the rules belonging to the ritual were changed. This might signify an unbroken but slightly changing ritual tradition through time. The use of the same types of materials (the same types of [ornamented and unornamented] vessels and axes) in the wetland deposits and the tombs could strengthen such an interpretation.

Whether the process of adopting a Neolithic lifestyle was gradual or swift is very much dependent on what scale »gradual« or »swift« is understood, as well as what is seen as the cultural springboard and what as the result of the process. In southern Scandinavia,

the transition process from a Mesolithic to a full Neolithic life style took place in the course of a few if not many hundreds of years. Indeed, what today is observed as a drastic change in the archaeological record was perhaps not experienced as explicitly by the people living in and through these times (SCHÜLKE 2009b). Furthermore, the old question of the extent to which it was an indigenous group that took impulses from outside or whether people from outside were settling the land and how the relation to indigenous groups developed in this case remains a question to be discussed. The changing patterns of ritualisation that can be seen by comparing the wetland depositions and the megalithic tombs, from the EN I to the EN II, can thus be explained in different ways. Further chronological and comparative studies will in future help to refine our understanding of the processes involved. However, one thing however can be stated for certain: the wetland deposits seem to be the continuous element in Neolithic people's ritual praxis, different from – for example – the megalithic tombs, which were built later and throughout a much shorter period. The depositions in wetlands thus witness of the lingering of the living places of the Mesolithic and the EN I in the memory of people and throughout all of the TRB (and even later), and thus reflect strategies of living on with aspects of the past in the present – in a changing world.

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#### **APPENDIX**

List 1: Finds with bog pots in the study area (except *Jordløse Mose*). Ars herred: Årby (sted.-nr. 30110) sb.nr. 232; Røsnæs (30105) sb.nr. 35; Røsnæs (30105) sb.nr. 66; Ubby (30109) sb.nr. 116; Ubby (30109) sb.nr. 66; Løve herred: Buerup (30202) sb.nr. 101;

Skippinge herred: Bregninge (30603) sb. nr. 181; Føllenslev (30604) sb. nr. without no.; Føllenslev (30604) sb. nr. 99; Særslev (30608) sb. nr. 108; Særslev (30608) sb. nr. 116; Værslev (30610) sb. nr. 52; Viskinge (30609) sb. nr. 22.

List 2: Locations with depositions of ceramic vessels dating to the TRB from the Lille Åmose. The dating of the vessels follows KOCH'S (1998) types and their absolute dating, as well as her identification of the type for the different finds (KOCH 1998, 354–368). All of the find spots are located in Jordløse parish, Skippinge herred, Holbæk Amt (sted.-nr. 30606).

PARISH	NUMBER OF LOCATION	POTTERY SHERDS, NUMBER	NUMBER OF VESSELS	_ _ _ _	II N L	MN AI	MN AII	MN A111/1V	MN AV
Jorløse			2	-	-	-	-	-	-
Jorløse		1		Х	-	-	-	-	-
Jorløse	19	many	2	Х	-	-	-	-	-
Jorløse	28		12	Х	-	Х	Х	-	-
Jorløse	29		5	Х	-	Х	-	-	-
Jorløse	31		3	-	-	Х	Х	-	-
Jorløse	32		2	Х	-	-	-	-	-
Jorløse	33		1	Х	-	-	-	-	-
Jorløse	37		1	-	-	-	-	-	-
Jorløse	38		1	-	-	-	-	-	-
Jorløse	42		many	-	Х	Х	Х	-	-
Jorløse	43		1	Х	-	-	-	-	-
Jorløse	45		ca. 50	Х	_	Х	Х	-	-
Jorløse	46	1		Х	-	-	-	-	-
Jorløse	49		1	-	-	-	-	-	-
Jorløse	50	1	1	Х	-	-	-	-	-
Jorløse	52		1	-	-	-	-	-	Х
Jorløse	54		3	Х	-	Х	-	-	-
Jorløse	55		2	-	_	-	-	-	-
Jorløse	58		7	-	-	-	-	-	X
Jorløse	59		1	-	-	-	-	-	-
Jorløse	64		2	Х	_	-	-	-	-
Jorløse	65		1	Х	-	-	-	-	-
Jorløse	68		8	Х	-	-	-	-	-
Jorløse	69		1	-	-	-	-	-	-
Jorløse	70	1	2	Х	-	-	-	-	-
Jorløse	84		1	-	-	-	-	-	-
Jorløse	85		1	Х	-	-	-	-	-
Jorløse	93		1	Х	-	-	-	-	-
Jorløse	97	5		-	-	-	-	-	-
Jorløse	99		2	-	-	-	-	-	-
Jorløse	100		2	Х	-	-	-	-	-
Jorløse	105		2	-	X	Х	_	-	-
Jorløse	116	1	<u> </u>	-	_	-	-	-	
Jorløse	124		1	-	-	-	-	-	-
Jorløse	150		2	-	_	-	-	-	-
Jorløse	178		many	-	_	Х	Х	-	_
	-								

List 3: Megalithic from the area around Lille Åmose (slopes that surround today's bog). They belong to four parishes: Skippinge herred: Jordløse (sted. nr. 30606), Avnsø (30601); Løve herred: Bjergsted (30602), Buerup (30202) (compare fig. 1).

PARISH	NUMBER OF FIND	TYPE OF MEGALITHIC GRAVE	MOUND	PRESERVED	
Avnsø	13	dolmen	questionable	Yes	
Avnsø	10	dolmen	-	Yes	
Avnsø	12	dolmen	-	Yes	
Avnsø	14	dolmen	questionable	Yes	
Avnsø	23	dolmen	long mound	Yes	
Avnsø	16	dolmen	round mound	Yes	
Avnsø	11	dolmen	round mound	Yes	
Bjergsted	36	dolmen	long mound	Yes	
Bjergsted	34	dolmen	long mound	Yes	
Bjergsted	35	dolmen	long mound	Yes	
Bjergsted	16	dolmen?	questionable	-	
Buerup	33	dolmen	questionable	Yes	
Buerup	59	dolmen	-	-	
Buerup	30	dolmen	-	Yes	
Buerup	32	dolmen	questionable	-	
Buerup	31	dolmen	-	Yes	
Buerup	37	dolmen	-	-	
Buerup	23	dolmen	long mound	Yes	
Buerup	22	dolmen	long mound	Yes	
Buerup	34	dolmen	long mound	-	
Buerup	36	dolmen	long mound	-	
Buerup	21	dolmen	long mound	Yes	
Buerup	29	dolmen	long mound	-	
Buerup	38	dolmen	round mound	Yes	
Buerup	27	dolmen	round mound	Yes	
Buerup	35	dolmen	round mound	-	
Buerup	25	dolmen	round mound	-	
Buerup	24	dolmen	round mound	-	
Buerup	26	passage grave	round mound	-	
Buerup	28	double passage grave	long mound	Yes	
Jorløse	7	dolmen	-	-	
Jorløse	184	dolmen	-	-	
Jorløse	4	dolmen	-	-	
Jorløse	9	dolmen	-	-	
Jorløse	10	dolmen	-	-	
Jorløse	5	dolmen	round mound	-	

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# Megalithic and settlement patterns of Funnel Beaker times in Eastern Holstein, Germany

Jan Piet Brozio

#### **ABSTRACT**

The agrarian economy of the Neolithic societies in Northern Europe and Southern Scandinavia is associated with a reshaping of the landscape through settlements and early monuments. As one of the most densely-populated Funnel Beaker Culture (FBC) landscapes sites, the area of Eastern Holstein in Schleswig-Holstein, Germany plays a key role in understanding land-use planning, social development and the function of monuments. Through new excavations in the area of a settlement and a

passage grave, it is possible to reconstruct the development and the absolute chronology of a secular and ritual context for the southern range of the FBC-North group. Thus, the genesis of a burial place used over centuries between 3640 and 1900 cal BC, the reconstruction of changes underlying subsistence-oriented village community between 3270 and 2920 cal BC and an outlook on the settlement landscape of the southern Group of the FBC-North group in Eastern Holstein are the focus of the presented research.

#### INTRODUCTION

The evolution of the mobile hunter and gatherer groups in Northern Germany and Southern Scandinavia to the primary local agrarian societies of the Funnel Beaker societies (FBC) - 4100-2800 cal BC is associated with intense changes: after the outset of human impact and the initiation of cultivated plants in the FBC-North group during the Early Neolithic Ia (ca. 4100-3800 cal BC), major economic and environmental changes can be recognised for the Early Neolithic Ib (ca. 3800–3500 cal BC), including cereal cultivation (KIRLEIS et al. 2012) contemporaneous with the beginning of an opening of the landscape (FEESER et al. 2012). Equally, the number of domestic sites, causewayed enclosures and megalithic tombs increases the quantity of produced items such as ceramics or adzes (MÜLLER 2011). In the following Early Neolithic II period (ca. 3500–3300 cal BC), most of the megaliths were erected and the described developments reach their culmination. Finally, in the Middle Neolithic (ca. 3300-2800 cal BC) an economic and demographic decline of the Funnel Beaker societies is observed (HINZ et al. 2012; FEESER et al. 2012).

This last phase (between 3500–2800 cal BC) of the FBC is the focus of the sub-project »Megaliths and Settlement Structures in Eastern Holstein during 3500–2700 BC: Middle Trave Valley and Western Oldenburger Graben«, conducted in conjunction with the DFG priority programme SPP 1400 »Early

Monumentality and Social Differentiation: On the origin and development of Neolithic large-scale buildings

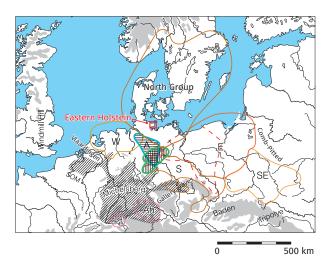


Fig. 1. Location of the micro region Eastern HolsteinGermany), in contrast to regional groups of the TRB societies. W = West Group, E = East Group, S = South Group, S = South East Group, S = South Group, S = So

and the emergence of early complex societies in Northern Central Europe« (MÜLLER 2012).

The initial point of research in the sub-project is represented by two micro regions in different

landscapes of Eastern Holstein in Northern Germany (Fig. 1). Several excavations between 2009–2015 in the area of the settlements of Oldenburg-Dannau LA 77 and Bad Oldesloe-Wolkenwehe LA 154 and at

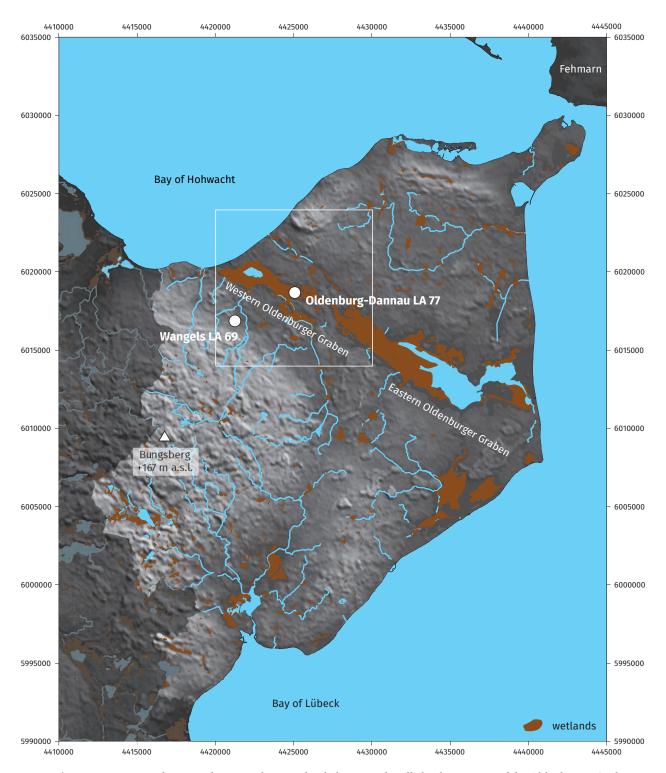


Fig. 2. The Wagrian peninsula in North-East Holstein is divided geomorphically by the wet area of the Oldenburger Graben in a northern and a southern part.

the Wangles LA 69 burial site enable the reconstruction of the settlement and the burial landscape in the small regions of the Western Oldenburger Graben situated at the Hohwacht Bay on the Baltic Sea and within the inland surroundings of the Middle Trave Valley (BROZIO 2016). This article concentrates on the small region of the Western Oldenburger Graben near the town of Oldenburg i. H.

#### THE INVESTIGATION AREA OF THE WESTERN OLDENBURGER GRABEN

The investigation area of the Western Oldenburger Graben is located on the Wagrian Peninsula in Northeast Holstein, whose relief – comprising terrain elevations, depressions, lowlands and wetlands – is the result of glacial-geological processes during the Weichselian glacial period. A division of the area into a northern and a southern part is defined geomorphically by the Oldenburger Graben, a lowland area 23 km long and up to 3 km wide (Fig. 2). This region has been strongly influenced by a rise in sea levels, which led to repeated transformations of the land-scape, whereby numerous islands and peninsulas are

in existence as terrain elevations to the present day. After the formation of two fjords during the Holocene sea-level rise, the latter rise slowed down in the Late Atlantic (Late Mesolithic), whereby the coastline was stabilised by a sequential arrangement of cliffs and beach ridges. The former bays and fjords were cut off from the sea by sand barriers, promoting the development of lagoons (JAKOBSEN 2004). Evidence of Mesolithic and Neolithic settlement activity is concentrated along the periphery of the fjord/lagoons as well as on islands and peninsulas (KARNATZ 1987; HOIKA 1987; MENNENGA 2011).

#### THE SETTLEMENT OF OLDENBURG-DANNAU LA 77

The settlement site Oldenburg-Dannau LA 77 (BROZIO 2010; 2011; 2012; 2016) is located on a WNW-ESE oriented terrain elevation of ca. 3 ha, measuring

approximately  $280 \,\mathrm{m}$  long and  $125 \,\mathrm{m}$  wide. It belongs to a group of sand knolls lying up to  $+0.8 \,\mathrm{m}$  a. s. l. within the wetlands of the Western Oldenburger Graben (Fig. 3).

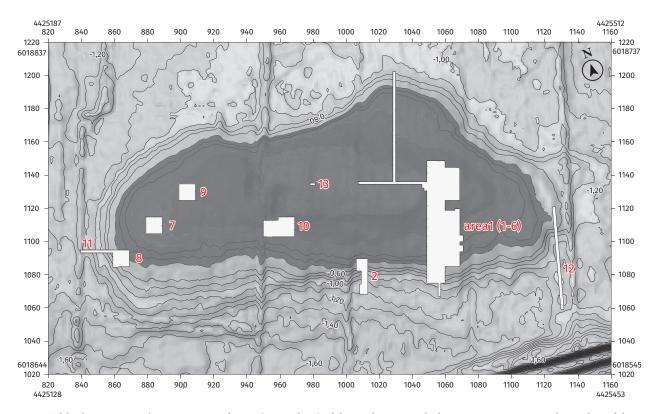


Fig. 3. Oldenburg LA 77: The reconstructed area (grey colour) of the settlement with the excavation areas and trenches of the years 2009-2012. DGM ©LVermGeo SH.

SAMPLE NO. LABORATORY	RADIOCARBON AGE BP	STA N D A R D D E V I A T I O N	FEATURE NO.	FIND ID	KONTEXT	S A M P L E M A T E R I A L	SAMPLE MATERIAL, DETAILS	CALIBRATED DATES (95,4%)	CALIBRATED DATES (68,3%)	Δ13 C
BETA311575	4380	30	1C21	SED267	well	cereal	Triticum dicoccum	3090-2913	3020-2926	-24.3
KIA-40888	4480	25	1B1	F196	sunken-floor	cereal	Hordeum vulgare	3339-3035	3328-3098	-23.68±0.23
Poz-62717	4460	35	5007	F5012	sunken-floor	charcoal	-	3326-3030	3341-3017	-25.7
Poz-62722	4450	40	5007	F5011	sunken-floor	charcoal	-	3324-3024	3339-2933	-23.8
Poz-62783	4560	60	5007	SED5154	sunken-floor	cereal	Triticum dicoccum	3506-3031	3486-3111	-39.3
Poz-62784	4450	40	1C29	SED1C252	pit	cereal	Hordeum vulgare	3339-2933	3324-3024	-28.3
Poz-62785	4480	40	10429	SED10257	pit	pulp of apple	Malus sylvestris	3349-3026	3331-3095	-30.5
Poz-62786	4430	40	6020	SED6001	pit	cereal	Triticum dicoccum	3331-2922	3310-2936	-23.1
Poz-62791	4380	40	5045	SED5155	posthole in sunken-floor	cereal	Triticum dicoccum	3263-2903	3079-2921	-21.3
Poz-62792	4390	40	4037	SED4096	pit	hazelnut	Corylus avellana	3310-2904	3084-2925	-25
Poz-62793	4335	35	4008	SED4114	pit	cereal	Hordeum vulgare	3081-2891	3011-2902	-25.4
Poz-62794	4410	40	4056	SED4122	pit	cereal	Triticum dicoccum	3325-2913	3094-2930	-21.6

With the exception of the western portion, the entire archaeological site is covered with a settlement layer of variable conservation status. Organic materials such as botanical macroremains (KIRLEIS/KLOOSS 2014) and bones were identified on the former prehistoric riparian zone and the terrain elevation. Apart from settlement features in the form of pits and postholes (Fig. 4), two well structures (Fig. 5) between 3100–2960 cal BC and 3316–3013 cal BC¹ were discerned (BROZIO 2012; BROZIO et al. 2013). Rows of stakes, primary ash, lase and hornbeam obviously served to enclose the settlement area between 3087–2927 cal BC.

Burials within the settlement include not only the interment of an individual (3960–3806 cal BC) but also a burial in a deviant position, lying on the stomach with bent arms in front of the chest (3489–3363 cal BC),

which was disturbed in more recent prehistoric times. Several individuals were also recovered from the riparian zone, one of which was dated to the transition from the Middle to the Late Neolithic between 2897–2872 cal BC<sup>2</sup> (BROZIO 2011; 2012).

The find material primarily comprises stone artefacts, especially basic flint objects like flakes, blades and cores and flint tools like scrapers and axes, which were locally produced depending on the situation (*ad hoc*) and for personal use. Sufficient raw material was available for this purpose from the directly-accessible Baltic Sea beaches in the western and eastern area of today's Hohwacht Bay. The ceramic material is mainly composed of highly-fragmented pieces. Overall, only 25% of the vessels exhibit decorations, whereby the ornamented vessels tend to be of a finer design with

<sup>1</sup> Dated by sequential calibration based on Bayesian methods.

<sup>2</sup> The dates correspond to the maximum peaks in sumcalibrated probabilities.

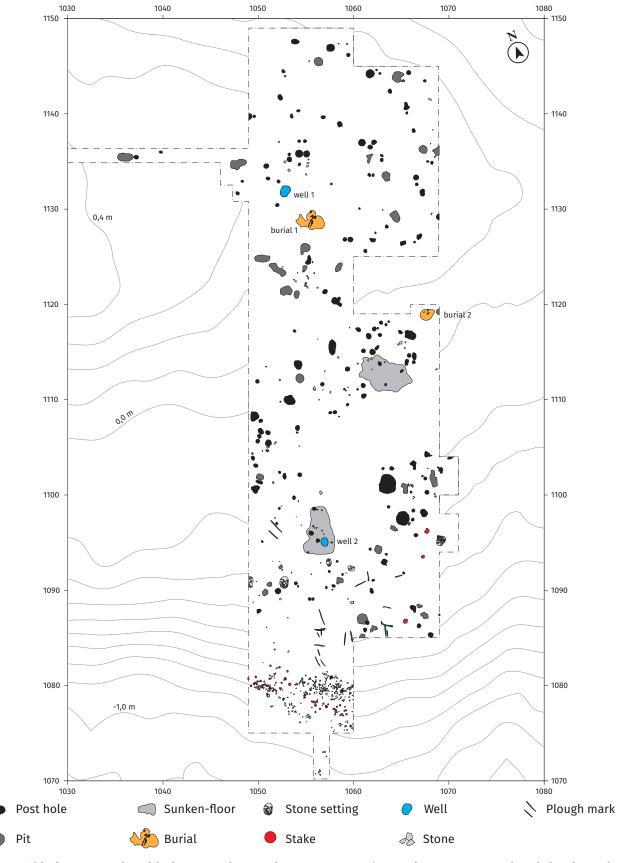


Fig. 4. Oldenburg LA 77: Plan of the features in the central excavation area. The most features are pits and postholes of several houses. Stakes of a fence are located in the southern area. The water supply of the settlement took place by wells.



Fig. 5. Oldenburg LA 77: Well profile showing a concentration of finds like ceramics, flint artefacts, abrader fragments, querns, rubbers, daub fragments, macro remains, animal bones and a human femur.

respect to the amount of temper used and the size of the temper grains. Additional artefacts such as grinding stones, devices made of bone and horn as well as wooden artefacts are attested.

The compilation of the findings makes it possible to identify several huts and five houses of the Funnel Beaker »Mossby« type (ARTURSSON et al. 2003; MÜLLER 2012/13), which are generally 15 m long, 5m wide and display semi-circular ends. Based on <sup>14</sup>C dates (Tab. 1), the associated contexts and the absolute dating of the context of the findings, a fine chronological subdivision has been established 12 AMS datings (Fig. 6) in combination with a seriation of ceramic pattern types. Based on the ceramic from 3270-2920 cal BC, the dating results enable an absolute-chronological model for the settlement Oldenburg LA 77: Oldenburg phase 1, 3270-3110 cal BC; Oldenburg phase 2, 3110-3020 cal BC; Oldenburg phase 3A, 3020–2990 cal BC; and Oldenburg phase 3B, 2990-2920 cal BC (BROZIO 2016)3.

The phase model facilitates a temporally-differentiated reconstruction of a permanent settlement in terms of the number of buildings and population size. Until 3110 cal BC, the settlement comprised

2–3 contemporaneous houses (calculating 25 years per house generation) with up to 20–30 persons. Between 3110–3020 cal BC, a rise in population with 80–110 individuals per house generation can be observed with up to eleven contemporaneous houses and five to six huts. Maximum settlement population is reached between 3020–2990 cal BC, with up to 16 houses, 10–11 huts and 120–160 individuals per house generation. The number of houses decreases until 2920 cal BC to only ca. 4–5 houses with 30–50 inhabitants (Fig. 7). During the Late Neolithic after 2920 cal BC, the terrain elevation was only used with low intensity.

In contrast to the previously-known individual farms such as the Early Neolithic house structures of Rastorf (STEFFENS 2009) or Hemmingstedt (KRAUSE-KYORA 2007), Oldenburg-Dannau is one of the few larger Middle Neolithic settlements of the FBC-North group distribution area that was continuously used over a long period of time. The settlement is integrated into a settlement system characterised by the use of the former islands and peninsulas as settlement areas and the border areas of the Oldenburger Graben as agricultural land. Burial sites are located on the adjacent northern and southern moraine tracts.

<sup>3</sup> The dates correspond to the maximum peaks of probability densities in sequential calibrations based on Bayesian methods.

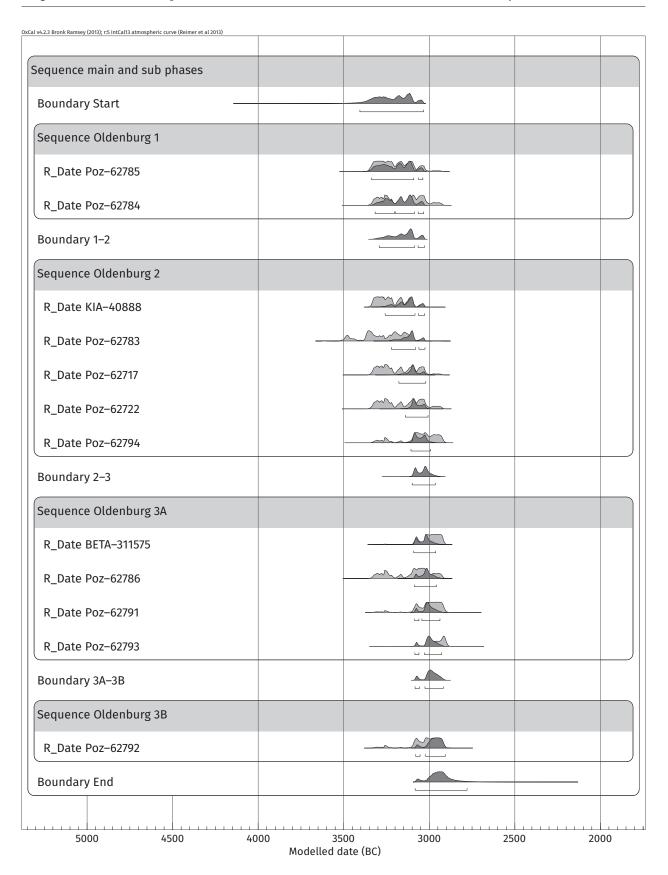


Fig. 6. Oldenburg LA 77: Sequential calibration matching of  $^{14}C$  dates.

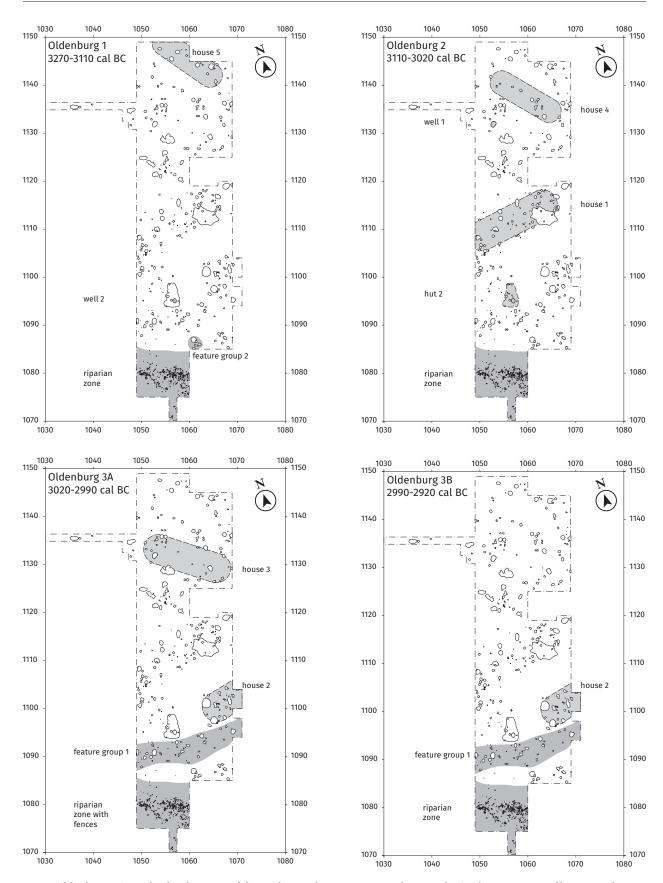


Fig. 7. Oldenburg LA 77: the development of the settlement between 3270 und 2920 cal BC. The maximum of houses and residents are expected between 3110-2990 cal BC.

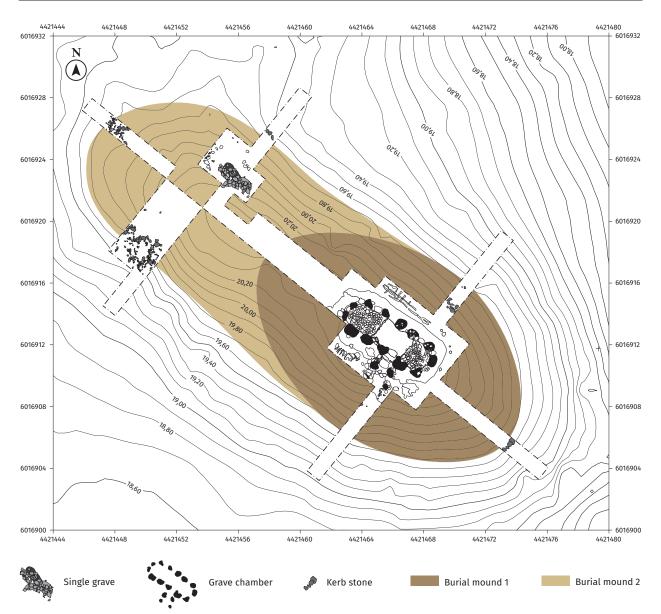


Fig. 8. Wangels LA 69: Plan of the site. In the south-eastern is a passage grave and in the north-western a single grave is located. The long barrow is surrounded by a line of stones.

# THE MEGALITHIC GRAVE WANGELS LA 69

The megalithic grave Wangels LA 69 (Brozio 2012; 2015; 2016) is located in the southern moraine tracts bordering the lowland of the Oldenburger Graben on a natural terrain elevation at ca. +22 m a.s.l. The former ca. 32 m long and up to 12 m wide earthen body of a long barrow was influenced by modern disturbances (Fig. 8). Although all megaliths — except for two orthostats — were removed from a Holstein chamber (Sprockhoff 1958; aner 1968; hoika 1990) in modern times, the funeral horizon is nevertheless preserved *in situ*. The grave chamber is sub-divided into three areas by stone paving, including a

quartier (Fig. 9). The chamber is covered by a mound, which was extended to a tumulus (Fig. 10) in Neolithic time. The latter was hedged by a stone curb. Below the grave site, several Funnel Beaker-time plough tracks were discernible.

In addition to stone artefacts and 69 amber objects such as beads shaped like bobbins or double-edged axes, an extensive ceramic inventory – including 57 vessels of the FBC and the Globular Amphora Culture (GAC) – was recovered (Fig. 11). The inventory mainly comprises intricately-decorated pieces, some of which are preserved in a completely intact and

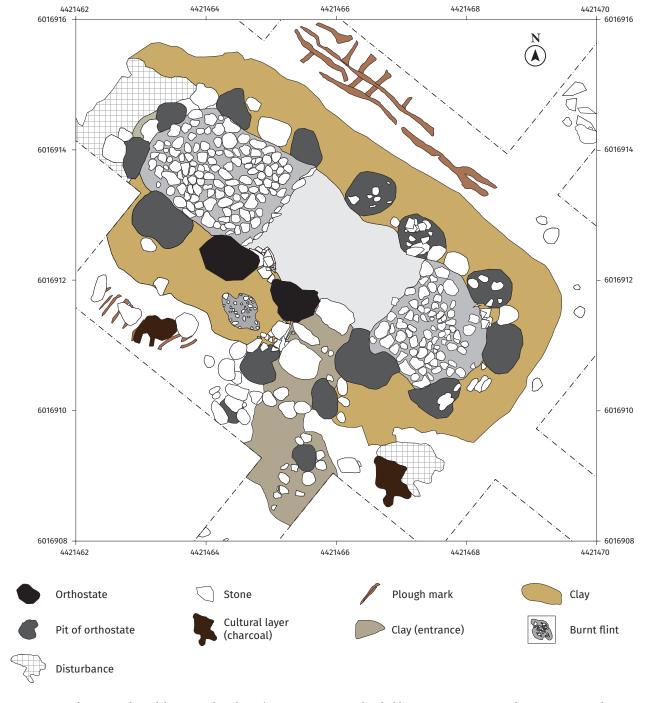


Fig. 9. Wangels LA 69: Plan of the grave chamber. The passage grave is divided by stone pavements in three sections. In the north-west, a line of flagstones separates a quartier. The grave chamber was sealed around with clay.

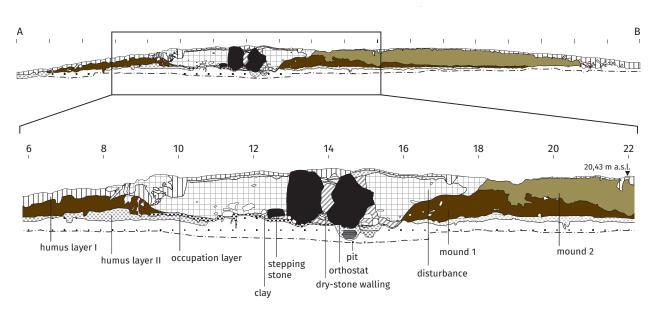


Fig. 10. Wangels LA 69: Profile of the burial mound.



Fig. 11. Wangels LA 69: Funnel beaker ceramic, globular amphoras and stone artefacts like axes and blades were deposited in the grave chamber (photo: A. Heitmann).

Tab. 2. Wangels LA 69: List of  $^{14}C$  dates for sequential calibration matching.

	SAMPLE NO. LABORATORY	RADIOCARBON AGE BP	STANDARD DEVIATION	FEATURE NO.	FIND ID	KONTEXT
	KIA-50238	5205	35	3109	SED3108	entrance
	KIA-50239	4675	35	3144	SED3112	orthostat
	KIA-50242-A	4770	40	3013	F3964	chamber surrounds
	Poz-62684	4750	35	1005	F1142	mound 1
_	Poz-62685	4630	35	3030	F3645	burnt flint
	Poz-62686	4680	35	3231	F30644	floor of the chamber
	Poz-62687	4615	35	3231	F30614	floor of the chamber
	Poz-62688	4550	60	3013	F3980	entrance
	Poz-62689	4550	35	3013	F3976	entrance
	Poz-62690	4695	35	3013	F3969	orthostat
	Poz-62699	4430	35	3030	F3730	burnt flint
	Poz-62700	4395	35	3030	F3650	burnt flint
	Poz-62702	4440	35	2091	F2091	mound 2 (long barrow)
	Poz-62703	4500	80	3025	GE5-P4	ceramic, funnel beaker
_	Poz-62704	4520	40	3030	GE14-P11	ceramic, funnel beaker
	Poz-62705	4455	35	3033	GE12-P4	ceramic, funnel beaker
	Poz-62706	4510	50	3030	GE10-P8	ceramic, funnel beaker
	Poz-62707	3855	35	3030	F3676	ceramic, globular amphora
_	Poz-62708	4425	35	3025	GE6-P11	vessel
	Poz-62709	4450	40	3171	F30606	orthostat
	Poz-62710	4450	35	3025	GE1-P11	ceramic, funnel beaker
_	Poz-62712	4465	35	3030	GE14-P11	ceramic, funnel beaker
_	Poz-62713	4780	40	3030	GE4-P8	ceramic, funnel beaker
	Poz-62715	4710	35	1007	F1155	mound 1
_	Poz-62716	4450	40	3287	SED3333	floor of the chamber
_	Poz-62718	4625	35	3172	SED3288	orthostat
_	Poz-62719	4490	35	2014	F2111	mound 2 (long barrow)
_	Poz-62723	4880	40	3232	SED3059	burnt flint
_	Poz-62724	3600	35	3030	F3659	burnt flint
	Poz-62725	4420	35	3232	SED3054	burnt flint
	Poz-62726	3660	35	3231	SED3062	burnt flint
	Poz-62727	4490	40	3013	F30740	chamber surrounds
	Poz-62729	4500	35	2020	F2297	mound 2 (long barrow)
	Poz-62770	4685	35	3013	F3993	entrance
	Poz-62771	4405	35	3173	F30576	burnt flint
	Poz-62772	4760	40	3210	F30560	layer below mound 1
Ī	Poz-62776	4475	35	1007	F1163	mound 1
Ī	Poz-62778	4450	110	3026	GE13-P12	ceramic, funnel beaker
_	Poz-62780	4550	40	2017	F2280	stone kerb setting
_	Poz-62782	4480	40	7018	SED7005	stone setting, single grave
				-		

S A M P L E M A T E R I A L	SAMPLE MATERIAL, DETAILS	CALIBRATED DATES (95.4%)	CALIBRATED DATES (68.3%)	Δ13 C
charcoal	Corylus avellana	4041–3972	4221–3956	-24.87±0.37
charcoal	Alnus	3516-3374	3625–3366	-24.51±0.29
charcoal	Alnus	3635-3524	3644-3381	-25.79±0.31
charcoal	Alnus, trunk, 2 annual rings	3633-3519	3638-3381	-25.4
charcoal	Fraxinus excelsior, branch, d: 2–3 cm, 7 annual rings	3498-3362	3517–3351	-25.6
charcoal	cf. Corylus avellana/Alnus, 2 annual rings	3517–3375	3627–3367	-23
charcoal	Corylus, branch, d: 2–3 cm	3497–3355	3517-3144	-24.3
charcoal	diffuse porous wood	3368-3107	3499-3030	-31.8
charcoal	diffuse porous wood	3365–3121	3370-3103	-25.3
charcoal	cf. Corylus avellana, 1 annual rings	3619–3377	3630-3370	-23.1
charcoal	cf. Maloideae, branch, d: 2–3 cm, 5 annual rings	3308-2941	3328-2925	-25.1
charcoal	cf. Maloideae, branch, d: 2–3 cm, 7 annual rings	3085–2928	3264–2911	-23.1
charcoal	cf. Tilia, trunk	3321–3018	3332-2929	-26.6
charcoal	diffuse porous wood	3348-3096	3488-2926	-42.5
charcoal	diffuse porous wood, branch, d: < 2 cm, 3 annual rings	3350-3113	3361–3097	-27.9
charcoal	cf. Maloideae, Zweig, d: 2–3 cm, 2 annual rings	3323-3027	3340-2945	-26.9
charcoal	cf. Corylus avellana/Alnus	3345–3106	3364-3029	-36.5
charcoal	cf. Corylus avellana/Alnus, trunk, 2 annual rings	2452-2214	2461–2207	-24.8
charcoal	cf. Corylus avellana, branch, d: 3–5 cm, 2 annual rings	3264-2938	3327–2922	-25.5
charcoal	cf. Corylus avellana	3324-3024	3339–2933	-25.4
charcoal	cf. Maloideae, Zweig, d: 2–3 cm, 4 annual rings	3322–3025	3337–2939	-26
charcoal	diffuse porous wood, branch, d: < 2 cm	3327–3032	3340-3022	-25.4
charcoal	cf. Corylus avellana, trunk, 4 annual rings	3637–3526	3648-3383	-24.8
charcoal	Maloideae, Stamm	3627–3378	3632–3373	-25
charcoal	cf. Corrylus avellana,branch d: 5–10 cm	3324-3024	3339–2933	-22.5
charcoal	cf. Corylus avellana	3498-3360	3517–3348	-25.5
charcoal	cf. Corrylus avellana, 5 annual rings	3333-3101	3349–3033	-27
charcoal	Ranunculus ficaria	3696-3641	3765–3538	-28.8
charcoal	cf. Corylus avellana/Alnus, 2 annual rings	2017–1911	2116–1881	-25.3
charcoal	diffuse porous wood, d: 2–3 cm	3262-2936	3325–2920	-21.3
charcoal	Corylus avellana	2130-1972	2140-1939	-20.4
charcoal	Corylus avellana, branch, d: 3–5 cm, 4 annual rings	3335–3099	3351–3029	-27
charcoal	cf. Corylus avellana/Alnus, trunk, 2 annual rings	3336-3105	3355-3091	-22.2
charcoal	cf. Maloideae	3517-3376	3627-3369	-25.9
charcoal	diffuse porous wood	3090-2933	3314-2912	-25.6
charcoal	cf. Corylus avellana, branch, d: 2–3 cm, 4 annual rings	3634-3521	3641–3380	-28.4
charcoal	cf. Corylus avellana, branch, d: 5–10 cm, 6 annual rings	3331–3093	3341–3027	-31.2
charcoal	diffuse porous wood, branch, 1 year old , d: < 2 cm	3336-2943	3497–2886	-39.8
charcoal	cf. Corylus avellana/Alnus, trunk, 3 annual rings	3366-3118	3485-3100	-28.8
charcoal	cf. Corylus avellana, branch, d: 5–10 cm	3331–3095	3349-3026	-28.5

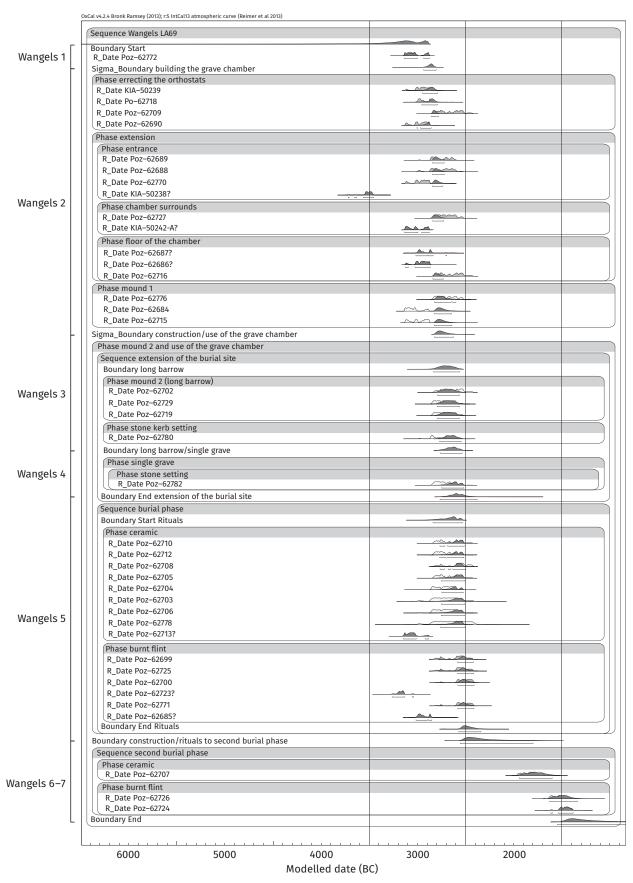


Fig. 12. Wangels LA 69: Sequential calibration of  $^{14}C$  dates.

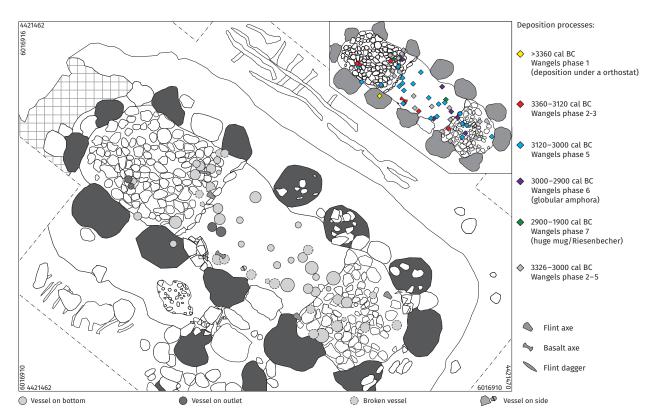


Fig. 13. Wangels LA 69. The position of artefacts in the burial chamber. The size of the plotted vessels is relative to the diameter of the vessels.



Fig. 14. Wangels LA 69: A vessel of the Funnel Beaker Culture was excavated in a pit under an orthostat. The initial deposition took place before the orthostat of the grave chamber was erected (photo: A.S. Jagiolla).

non-fragmented state (BROZIO 2016). The fragment of a huge mug (*Riesenbecher*) and a double axe type DII–4 (ZÁPOTOCKÝ 1992, 124) made of basalt indicate contacts to southern-based Neolithic groups such as that of the Walternienburg Culture (RINNE 2012).

A fine chronological differentiation of the structure is achieved by a  $^{14}\mathrm{C}$  model with 40 out of a total of 51  $^{14}\mathrm{C}$  datings (Tab. 2). As a result, seven individual construction and burial phases can be differentiated

from one another, which can be classified by absolute chronology (Fig. 12) between 3360–1900 cal BC:

- Wangels phase 1: Start of use (3640–3360 cal BC)
- Wangels phase 2: Construction of the grave chamber and the mound; a time span of about 80 years (3360–3280 cal BC)
- Wangels phase 3: Aggradation of the long barrow and the establishment of the stone circle (3280–3120 cal BC)
- Wangels phase 4: Burial of a body (3120–3100 cal BC)
- Wangels phase 5: Burial phase (3120–3000 cal BC)
- Wangels phase 6/7: Secondary burial phase (3000–1900 cal BC)

Additionally, a seriation of the ceramics in combination with scientific dating and stratigraphic information enable the distinction of three ceramic phases that can be integrated in the absolute-chronological phase model. Thus, a differentiation of the burials in two Funnel Beaker utilisation phases and a Globular Amphora secondary burial phase (Wangels phase 7) is feasible. Moreover, a typochronological phase (Wangels phase 7) is possible by means of the huge mug (*Riesenbecher*).

Due to the temporal distribution and the dispersion of the artefacts in the chamber, at least nine

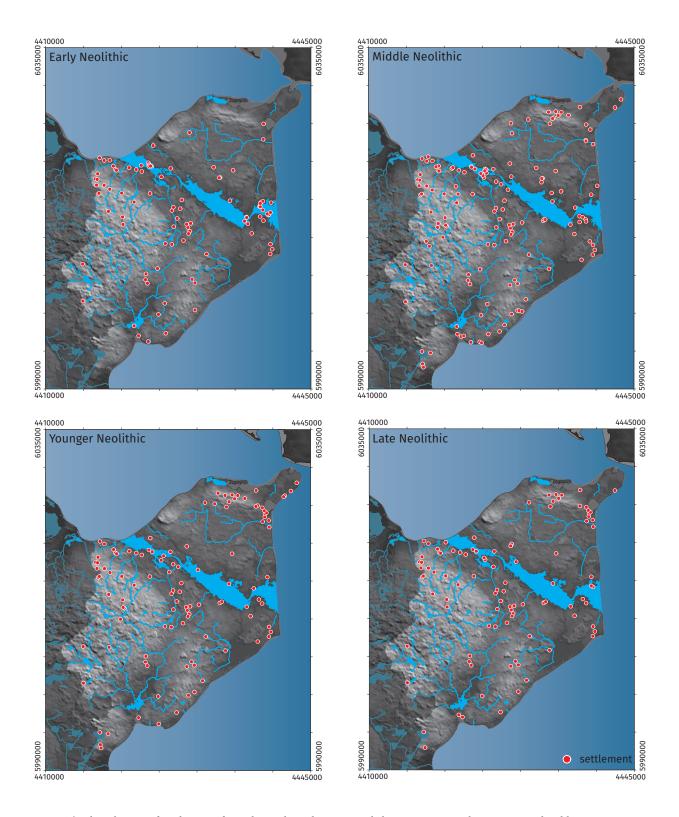


Fig. 15. The distribution of settlements from the Early to the Late Neolithic in Eastern Holstein at a sea-level between -2 m and -1 m a. s. l (after Jakobsen 2004, fig. 2; © Bundesamt für Seeschifffahrt und Hydrographie (BSH)).

depositional categories can be distinguished. These include not only the deposition of individual vessels or groups of artefacts but also a concentration of objects in an area measuring 0.5 m² in the quartier, which was used by members of both the FBC and the GAC over several centuries. Moreover, the central part of the chamber also constitutes a particular deposition zone. Here, fragmented material primarily from repeated frequenting events is to be found (Fig. 13).

Since no artefacts in the form of a clearing space or layer could be observed in front of the entrance, it must be assumed that the chamber was not cleared out in prehistoric times.

A unique phenomenon is the deposition of a vessel under one of the orthostats before the construction of the chamber (Fig. 14). With some certainty, this can be interpreted as a votive or a building sacrifice.

A probably comparable feature is known from the megalithic grave Carlshögen near Hagestad in Sweden. A pit under the floor of the grave contained human bones and flint artefacts (STRÖMERG 1971).

In conclusion, the beginning of the site's use is pinpointed between 3640–3360 cal BC, marked by plough marks under the hill of the tomb. In the period from 3360–3280 cal BC, the construction of the grave chamber and the first mound in the form of a round mound took place. The enlargement of the round mound of the passage grave to a long barrow with a surrounding stone curb dates between 3280–3120 cal BC. A more than 400-year frequentation span of the feature lasting to within the outgoing Late Neolithic around 1900 BC is verified by the <sup>14</sup>C model and the point fragment of a Scandinavian flint dagger.

#### THE SETTLEMENT LANDSCAPE IN EASTERN HOLSTEIN

In addition to Middle Neolithic phases (MÜLLER et al. 2012), a reconstruction of the Neolithic settlement history of Northeast Holstein should include the outgoing Mesolithic (HARTZ/LÜBKE 2006), the Early Neolithic and the first half of the Late Neolithic to make changes visible. The investigated time phases were oriented according to their boundaries to supra-regional, discernible changes in the use of the landscape (FEESER et al. 2012), an established subdivision method in archaeological investigations of settlements in Southern Scandinavia and Northern Germany (MADSEN 1982; ANDERSSON 2004; SCHÜLKE 2008, HINZ 2014).

As a result, it can be stated that the FBC in Northeast Holstein developed from Mesolithic traditions between 4100–3500 BC (Fig. 15). This is expressed in both the material culture as well as the choice of settlement sites. Subsequently, a differentiation in the

forms and patterns of ceramics is identifiable between 3500–3000 BC. The construction of megalithic tombs and the increased adoption of a subsistence economy based on agriculture are also striking (BROZIO 2016).

Regarding a significant population growth, unpopulated areas were sought out to create burial and settlement sites. The last phase of the FBC from ca. 3000 BC is marked by a shift of the sites to higher-lying areas. At the same time, a new archaeological group appears that arranged their burials with Globular Amphora in the grave sites of the FBC. With the beginning of the Late Neolithic and the appearance of the Single Grave Culture around 2800 BC (HÜBNER 2005), the final phase of the FBC comes to an end. Simultaneously, decreasing indicators of agricultural land coupled with increased indicators of open country suggest the increasing importance of livestock in community life.

## CONCLUSIONS

In the present investigation with the implementation of absolute chronology, it is possible for the first time to reconstruct the development of a settlement and burial site of Northeast Holstein and the southern distribution area of the FBC-North group over a time span of several centuries. The fine chronological differentiation of the material culture within a profane and ritual context enables developing a typochronological model (Fig. 16) that can be used to precisely date further sites with ceramic material from the Middle Neolithic (BROZIO 2016).

Since the model's endpoint is found during the Middle Neolithic with the Single Grave Culture, the

latter is particularly significant to comprehend the development of the Neolithic into the Late Neolithic and the older Bronze Age. Evidence of developments can similarly be detected in changes in pollen diagrams of more than regional character for Southeast Schleswig-Holstein as well as activities in Oldenburg-Dannau LA 77 after the colonisation during Funnel Beaker times. Consequently, the Oldenburger Graben continues to be a starting point for research about the Neolithic on the southern Jutland Peninsula.

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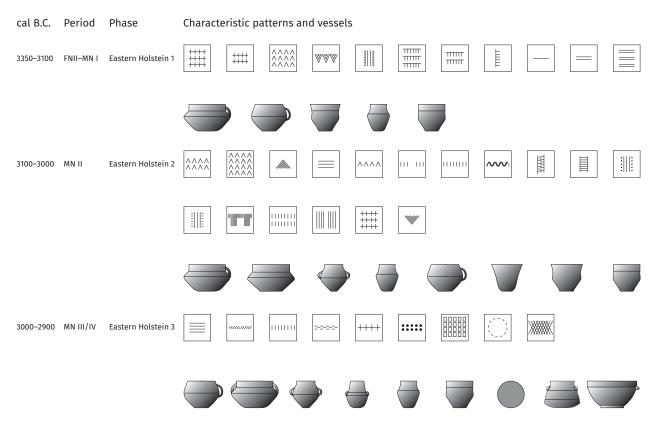


Fig. 16. Characteristic patterns and vessels in Eastern Holstein between 3350-2900 cal BC.

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# Settlements and houses between Elbe and Ems – The Funnel Beaker Culture in North-Western Germany

Moritz Mennenga

#### **ABSTRACT**

Over an extended period of time, the research focus of investigations on the TRB West Group was placed on megalithic graves and some singular house plans. Within the PhD study summarized in this contribution, the results of old and new excavations have been reviewed to compare the structures of the houses and the settlements from different situations. Within the new excavations of Lavenstedt, it was possible to investigate a cultural layer containing finds from the TRB West Group for the first time. These finds could be used to

identify activity areas in the settlement. Through the combination of the ceramic finds of the sites and the results of radiocarbon dating, it was possible to revise the absolute dates of Brindley's chronology and correct the time spans of her horizons. In addition to the identification of internal structures of houses and settlements, another result of the investigation concerned the comparison of house forms, finds, settlements and cultural relations within the European context.

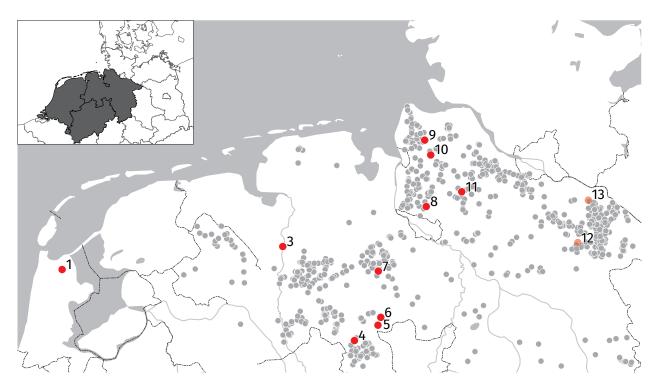
#### INTRODUCTION

Large parts of the north-west European and Scandinavian landscape are still characterized by the monumental collective burials of the Funnel Beaker culture (Trichterbecherkultur - TRB). Even if most of the former graves have been destroyed over the years, about 1,100 of these sites are still visible. This is one of the reasons why archaeological research has focused on the cultural, economic and social aspects of the TRB since the 19th century. Nevertheless, our knowledge – especially of settlements in the distribution area of the TRB – is incomplete. Sites defined as settlements on the evidence of surface finds are common, but there is rarely proof based on structural features. The ground plans of only about 100 houses are known from the Early and Late Neolithic periods in northern Europe (MÜLLER 2012/2013, 262). Most of the known TRB houses were found in southern Sweden (ARTURSSON et al. 2003). These yield information on the structure of the settlements and the different types of houses built by the TRB North Group. Providing an overview of the TRB culture in north-western Germany – with the main emphasis on the settlements and houses – was the aim of the author's doctoral thesis (MENNENGA 2016), which is summarized in this article.

Outside Scandinavia, it has not been possible to identify more than a few unfortified settlements, even when – as mentioned above – surface finds point to potential dwelling places. This is also true of the TRB

West Group in north-western Germany and the TRB West Group sensu BAKKER (1979, 11). Overall, the remains of TRB houses have been found on thirteen sites between the Elbe and Amsterdam (Fig. 1). These were excavated between 1972 and 2012 and can be classified into three different types: the first type was built with single posts, as is typical for this period (SVENSSON 2003); the second type is characteristic of the West Group, namely houses with wall-foundation trenches; and the third type includes special constructions, buildings with a non-domestic function.

Sites with houses of the TRB West Group type have been found at: Bouwlust, Noord-Holland (NL) (RAE-MAEKERS 2013, 121); Engter, district of Osnabrück (ROST/WILBERS-ROST 1992); Flögeln, district of Cuxhaven (ZIMMERMANN 2000); Heek, district of Borken (FINKE 1990), Hunte, district of Diepholz (Kossian 2005); Pennigbüttel, district of Osterholz-Scharmbeck (ASSENDORP 2000); Visbek, district of Vechta (MENNENGA et al. 2013); and finally, Lavenstedt, district of Rotenburg (Wümme) (MEN-NENGA 2015). A similar picture emerges for the neighbouring settlement regions of the TRB Altmark groups in the Elbe-Weser-Triangle, where only isolated house remains have been recorded thus far. These are the sites at Rullstorf, district of Lüneburg (GE-BERS 2004) and Wittenwater, district of Uelzen (voss 1965). As well as publishing house plans, in a few of



 $\textit{Fig. 1. Settlements and megalithic tombs in the TRB-West-Group (after \textit{SChafferer in prep.; base map: natural earth data)}. \\$ 

these articles the authors compare the types of construction, while in other cases they present the finds from the sites (BAKKER unpub; LÜBKE/RICHTER 2000; MOSER 2003; WACHENDORF 2003).

A significant desideratum is a detailed comparison of the houses, finds, settlement structures and cultural affiliations (cf. RAEMAEKERS 2013). Filling these research gaps was one of the aims of the »Settlement and land use in Neolithic north-western Germany« project undertaken by the Lower Saxony Institute for Historical Coastal Research (NIhK) in Wilhelmshaven as part of the German Research Foundation's (DFG) priority programme 1400 »Early Monumentality and Social Differentiation, On the origin and development of

Neolithic large-scale buildings and the emergence of early complex societies in northern central Europe«.

The NIhK project was designed to be interdisciplinary, with an archaeological and a palynological sub-project. Both involved five micro regions in the search for directly detectable remains of the settlers – the finds and features – and indirect indications, namely their influence on the environment, which can be observed in pollen profiles.

This article concentrates on the archaeological results of the settlement-archaeology project, i.e. the author's doctoral thesis (Mennenga 2016) and — to provide a chronological framework — a new arrangement of the pottery typology.

#### CHRONOLOGY OF THE FUNNEL BEAKER WEST GROUP

One of the most important issues in understanding the development of the TRB culture is its chronological framework. Unlike those of the North Group, the West Group's silex artefacts do not permit a detailed typological differentiation. As in the North Group's area, general trends can be seen in the development of arrowheads (BEUKER 2010, 176, 196 and 204–205; NIEKUS 2009, 242), although fine distinctions — as in the case of the flint axes — are not possible in the West Group. For example, approximately 95% of the axes were imported from neighbouring regions to the east

and north because the local raw material was of poor quality (BEUKER 2010, 177), which leads to a fuzzy chronology.

This problem does not exist for the other major find category, the pottery. Since the first intensive archaeological research was carried out at the beginning of the 20<sup>th</sup> century, the highly-decorated pots of the West Group – mainly from tombs – were at the forefront of attention (VAN GIFFEN 1927; KAT-VAN HULTEN 1947; KNÖLL 1959; BAKKER 1979). The last in-depth typological work on the West Group's pottery was done

by Anna Brindley (1986a; 1986b), when she developed the standard chronology that remains in use today. A new analysis of the pottery of the West Group by Lorenz (2015) was on a much smaller scale and revealed that the pottery data set is good for defining smaller typological regions, but the associated <sup>14</sup>C-dates are not sufficient to generate a stable model, e.g. for the Elbe-Weser triangle.

After analysing the material, BRINDLEY (1986a) sub-divided the total time-span of the pottery into seven horizons. Some absolute dating was also possible: BRINDLEY (1986a, 132) used <sup>14</sup>C-dates from various sites to determine the duration of each horizon. Unfortunately, only a few dates were available, and there were none for the horizons Brindley 1–3.

Thus, one of the first objectives was to take a closer look at these horizons. As the typology itself is very

detailed and logical, the aim was to find a more accurate chronological order. Since the end of the 1980s, the number of <sup>14</sup>C-dates associated with typologically identified pots has risen from 15 to 45 (MENNENGA 2016). These dates were used for a recalculation of the typo-chronological model (Fig. 2). OxCal calibration and the trapezoidal model were used for the computation. This model corresponds well to archaeological reality: it assumes that the passage from one horizon to the next was not abrupt but rather an evolving transition (LEE/BRONK RAMSEY 2012, 107). This transition is defined by probabilities for the start, end and actual duration. The mean dates for these transitions were used to build up a new typochronology for the pottery. The first – and most important – point is that Anna Brindley's order of the horizons is correct: the algorithm would signal outliers if that were not the case.

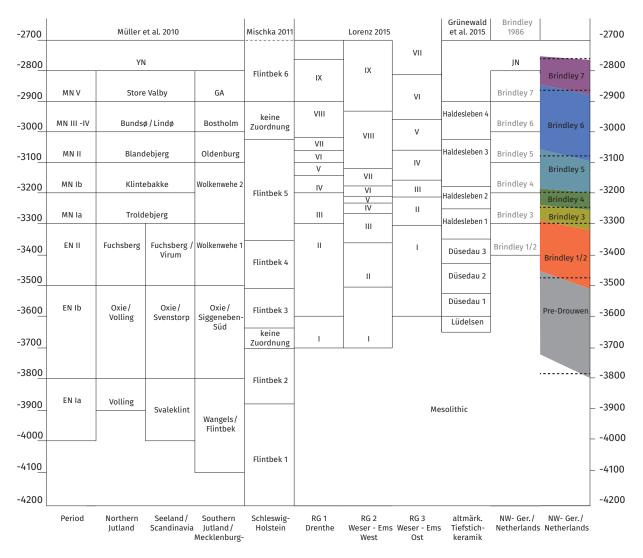


Fig. 2. Overview of the old and new typo-chronologies of the TRB West Group and the adjacent regions.

The second point concerns the duration of the TRB West Group's activities: the first horizon starts between 3510 and 3450 cal BC, i.e. 50–100 years earlier than expected. However, the earliest horizons are still a methodological problem due to the lack of data. There are only two dates for Brindley 1/2 and six (from one site) for Brindley 3. Data from the Pre-Drouwen horizon (TEN ANSCHER 2015) were therefore used to obtain an early demarcation. The transition to the

ensuing Single Grave culture has not changed substantially, although the durations of the horizons have changed (Fig. 2). The new transition dates are certainly much more realistic than the old ones, but a lot more data — especially for the beginning of the TRB — are needed to confirm these results.

This typochronology was also used to date the settlement structures of the TRB West Group.

#### SETTLEMENTS BETWEEN ELBE AND EMS

During the course of the project, it was possible to obtain new insights into the settlements of north-western Germany. On the one hand, excavations were conducted on new sites and the results included in the evaluations. On the other hand, the material and documentation from excavations in the

1970s and 1980s became available thanks to J.J. Assendorp and W.H. Zimmermann. Both paved the way for a joint reflection on the settlements of the TRB culture. Overall, eighteen houses are now known in the area of the TRB West Group and the eastern part of north-western Germany.

#### THE HOUSES

# Houses with foundation trenches — external influence or local development?

The first Funnel Beaker house ever found in the region - house 12100, or house 1 - was documented in 1977 during a research excavation at Flögeln. W.H. Zimmermann conducted the excavation on this mainly Roman Iron Age - settlement site (DÜBNER 2015). While excavating the site in the late-1970s and early-1980s, eight flat graves, two houses with foundation trenches and a pit house (see special buildings) were found. House 12100 is a 13 m long and 4.7 m wide rectangular building (see ZIMMERMANN 2000). The foundation trenches and a few of the posts inside the house were easily visible in the sand. In contrast to the other houses, it was not possible to document posts in the trenches with certainty, although when compared with the other houses it seems likely that there had indeed been posts in the trenches. A great advantage of this type of construction is the simplicity of the internal arrangement of the rooms. For the first time, the concept of a four-part division was visible. However, without finds from a cultural layer it was not possible to determine the functions of the rooms at that time. Bakker (unpub.) worked on the pottery finds from Flögeln, and dated the sherds in the features to Brindley 3-4. <sup>14</sup>C-dates - mostly from grain and undetermined charcoal - date to 3320-2938 cal BC (MEN-NENGA 2015).

The second house - Flögeln 7617 - was built in a similar way: it is 13.5 m long and 5.5 m wide, a rectangle with four rooms. The large room in the middle of

the house was divided into two parts by a shorter wall. A so-called anten section was located at the southern end of the building, the foundation trenches of the lateral walls were not connected by an internal wall, and the house had an opening on one of the narrow sides. Additional phosphate analyses were carried out on this feature, and a concentration in the large middle room indicates - in comparison to other sites (see below) – a possible hearth (see ZIMMERMANN 2008). Close attention should be paid to the smallest room at the northern end of the house, which contained a pit with a diameter of 1.3 m. Based on two intact pots of the Funnel Beaker culture, the pit is assumed to have had a sacral significance. Besides this sacral feature, seven possible flat graves were also found at Flögeln (BAKKER unpub).

Pennigbüttel 12 is also well known from the literature. The site was found in the 1980s, when a gatherer discovered some artefacts in a sand-extraction area. Unfortunately, the extraction had progressed to such an extent that it was impossible to determine the original size of the site. Nevertheless, excavations conducted by the archaeological service of the district revealed two houses with foundation trenches (As-SENDORP 1988; ASSENDORP 2000) and two »stonepaved graves« (KOSSIAN 2005, 54–55). Sand from the nearby dunes had covered the site (ASSENDORP 2000, 116), whereby the features were well protected against soil developments such as podzolization. House A – located a few metres to the west of the graves – was not completely preserved but was helpful in clarifying the use of the rooms. The surviving features covered

an area measuring approximately  $10\,\mathrm{m} \times 4.5\,\mathrm{m}$ : two rooms and a single pit in the eastern part of the building were identified. Above the pit, highly-decorated pottery was found that can be attributed to Brindley 2–3. The pit itself was oval,  $1.25 \,\mathrm{m} \times 0.8 \mathrm{t}$  in size, and upright stones stood on the narrow sides. These construction elements are typical of the »individual graves with larger coping stones on one or both narrow sides« (see Kossian 2005, 51). <sup>14</sup>C-samples were taken on oak (branch) charcoal, giving absolute dates between 3340 and 3100 cal BC. House B at Pennigbüttel was much better but still not completely preserved, at 11.5 m long and 5.5 m wide, with a trapezoidal shape. Pottery and charcoal (oak) found nearby permitted an attribution to Brindley 3–4, i.e. 3350–3030 cal BC. House B is very similar to Flögeln 7617: four to five rooms were separated by inner foundation trenches and the largest room was sub-divided by a smaller trench. Traces of a possible anten section had been destroyed by the sand extraction.

A further site with houses of this type – Heek – was published by finke (1990). The construction of the BAB31 motorway had occasioned extensive preliminary archaeological investigations, which revealed a graveyard with 20 flat graves, dating to Brindley 4–5, and a settlement (finke 1990, 150–151; kossian 2005, 376–377). Heek is the only West Group settlement in Germany outside Lower Saxony. There is still no detailed publication of the finds and features, whereby the general plan (kossian 2005, 249) was used for comparison purposes.

The latest excavated house with foundation trenches was found in 2010 during construction preparations in Visbek. Only a few hundred metres from the megalithic tombs known as »Pastors Kamp« and »Stippers Höhe« (ECKERT 1990; 1992), the archaeological excavation firm Denkmal3D - which kindly provided its documentation for the author's thesis – uncovered a house and three graves of the Funnel Beaker culture (MENNENGA et al. 2013). Two of these burials can also be described as »individual graves with large coping stones on one or both narrow sides« (after ко-SSIAN 2005). The third burial is defined by three intact pots spread over 0.6 m; traces of a pit could not be proven, but these kinds of »graves without complex wood or stone installations« (KOSSIAN 2005, 49) are common in the TRB. The same applies to the two »stone-paved graves« (KOSSIAN 2005, 54–55), 50 m to the south. With a length of 19 m and width of 7 m, the Visbek house is the largest building with foundation trenches in the West Group. It was of a regular rectangular shape, separated into three rooms by internal trenches. The western end was an open *anten* section. As at Flögeln and Pennigbüttel, the smallest room contained a pit with intact, highly-decorated pots. In

this case, the pots can be attributed to Brindley 4. It was not possible to recover material for radiocarbon dating in these features.

The houses on the Hunte 1 site at Lake Dümmer are very similar in their internal structure. This water-logged site was discovered in the 1930s by Hans REINERTH (1939). Given the political situation at the time, the evaluation of the finds and features in the 1930s give cause for justified doubts about Reinerth's interpretation and archaeological correlations (Kos-SIAN 2007, 32). In addition, a large part of the documentation and a manuscript ready for publication was lost during World War II. KOSSIAN (2007) therefore re-examined the remaining excavation records and could identify finds of the Corded Ware culture, the Bell Beaker culture and especially the Funnel Beaker culture, horizons 3–5 and 7 (KOSSIAN 2007). Only one of the houses - no. 15 - has been dated to the Funnel Beaker culture with certainty, based on finds found on the floor. Two further houses also probably date to this period, i.e. houses 21 and 22 (KOSSIAN 2007, 240-242).

To recapitulate, these houses have a (nearly) rectangular shape and the internal structure can be determined from the foundation trenches. The houses can be divided into two groups. On the one hand, there are houses with just one room, albeit which may be this way by design or due to the state of preservation, whereby a differentiation is not possible in all cases. On the other hand, there are houses with more than one room, and these are the ones that present interesting similarities. ASSENDORP (2000, 119) was the first to mention that house 7617 at Flögeln and house B at Pennigbüttel are almost identical. Indeed, independent of scale, most of the houses seem to have the same layout. All of the houses seem to follow a very similar plan, in different sizes. The widths of the rooms are multiples of the width of the smallest room (Fig. 3). The four or five rooms constitute four sections; however, it should be noted that not every house has all four sections. The first section is the smallest room at one of the narrow ends, it seems to be related to sacral practices, judging by the flat graves found there. The function of the second section is impossible to determine. The third - and largest - section was used for domestic activities, as indicated by the hearth in Flögeln 12100 and possible traces of such a feature in Flögeln 7617. Further comparison with the houses at Hunte – where heaths were found in a similar section – confirm this hypothesis. An *anten* section was also found at Hunte. The remains of activity areas and a hearth were identified in the same section, so that a similar function can be assumed.

Finally, it is necessary to clarify the origin of the houses with foundation trenches: is it a local development or an imported style? A look at similar houses

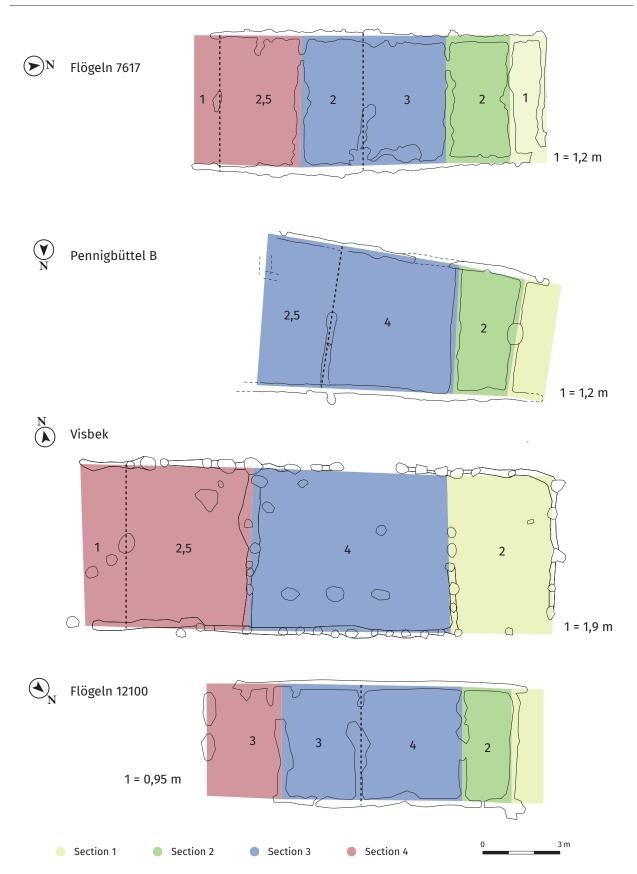


Fig. 3. Sections of the internal subdivision of the houses with foundation trenches and more than one room: Flögeln 7617, Pennigbüttel B, Visbek and Flögeln 12100.

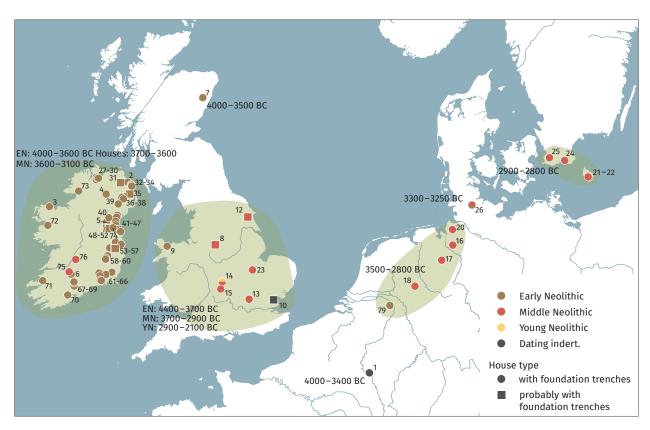


Fig. 4. Houses with foundation trenches but without a primarily cult or sacral function in the 4<sup>th</sup> millennium BC (after MAROLLE 1989, BARCLAY 1996, DARVILL 1996, NIELSEN 1999, ARTURSSON 2003, SMYTH 2014, HAGE 2015, MOOREN et al. 2015).

of this period in northern Europe is therefore necessary. Besides the west-group houses, five other TRB sites with house plans that include foundation trenches are known: Grødbygård and Limensgård, district of Hovedstaden/Bornholm in Denmark (NIELSEN 1999); Heerestad and Skabersjø, district of Skåne län in Sweden (ARTURSSON 2003); and some of the houses at Büdelsdorf, district tof Rendsburg-Eckernförde (HAGE 2015). However, in all of these cases the existence of foundation trenches is the only common detail: the construction method and inner division are different from houses of the West Group, apart from Heek. An overview of the houses with foundation trenches in northern Europe in the 4th millennium BC suggests yet more features from other cultures (Fig. 4). SØRENSEN (2014, 201-211) wrote about the similarities between Flögeln/Pennigbüttel and the Michelsberg house at Mairy (MAROLLE 1989), district of Sedan in France. However, the houses of the Irish and British Neolithic fit much better: they are more variable in shape and size, but their internal structure is very similar to that of the West Group. Especially when Flögeln 7617, Pennigbüttel B, Bellyglass in County Mayo, and Tankardstown in County Limerick both in Ireland – (SMYTH 2014) are compared, their

common features become clearly visible. Not only the construction parameters but also other factors in the settlement structure show parallels between these distribution areas (MENNENGA 2016). After the different features have been compared, in view of the small chronological difference it is uncertain that the concept of these houses was imported from Ireland or the British Isles, although the similarities suggest a strong influence from that region. A relatively new, but poorly preserved feature at Well-Aijen, Province of Limburg, gives a hint of possible earlier buildings on the mainland: the house in the Netherlands is placed in the context of the Rössen or Swifterbant culture (MOOR-EN et al. 2015). New research and careful attention are needed to document these barely visible features to cast light on the origin and development of Middle Neolithic buildings with foundation trenches in the TRB West Group.

#### Post-wall houses

As mentioned above, the second group of buildings are the post-wall houses. Four of these have been found in the distribution area of the West Group. The

difficulties encountered in this case are mostly related to the dating of the houses. House 14 at Engter was discovered during an excavation between 1986 and 1988 on a multi-period site, with remains that can be dated from the Funnel Beaker and Single Grave cultures to the Bronze Age and Roman Iron Age. Since the majority of the finds in the vicinity of the house can be dated to the Funnel Beaker culture, this date is also assumed for its construction (KOSSIAN 2007, 245). One of the largest settlements mentioned in the literature is Heede 5. In order to obtain sand for the construction of the BAB 31 motorway, a colluvium of plaggen soil was removed from the nearby sand-extraction area and prehistoric features were thus exposed. Fröhlich (1985) postulated seventeen houses, but due to the lack of further publications on the finds and features, excavation plans, etc., Heede was not considered further as the facts could not be verified. The only west-group house outside of Germany was found in Slootdorp-Bouwloust in the Netherlands. This is a special case since the Slootdorp site was discovered in the salt marshes, unlike the other sites, except Hunte, which were found on the Pleistocene sandy soil. It was possible to identify the house among a total of 541 post holes, due to the different shapes. Most of the cultural layer had been completely removed, but the salvaged remains revealed a concentration of pottery next to the house, which can thus be dated to the Funnel Beaker culture (HOGES-TIJN/DRENTH 2000; HOGESTIJN/DRENTH 2001). Remains of cultural layers are very rare on west-group settlement sites. Lavenstedt 178 is the only site in the main distribution area of the West Group with a layer containing a large number of archaeological finds, and a house plan. The site was discovered by a gatherer who noticed grinding stones and pottery that fell out of the profile of a small pit dug by a farmer. After reporting this to the archaeological service of the Rotenburg (Wümme) district, it was decided to excavate a test trench (Gerken 2012). A large amount of pottery and flint artefacts of the Funnel Beaker culture were found and the site was therefore included in the project. D. Nösler – who was first in charge of the archaeological sub-project - excavated test trenches in the adjacent field. The first excavation campaign revealed a large number of relatively well-preserved features and a lot of tiefstich (deep incision) pottery. Further investigations on a larger scale – conducted by the author – discovered concentrations of finds and features on the site, including a house plan, a possible house with foundation trenches, a potential granary and a well (see below; MENNENGA 2015). For the sake of completeness, two houses have been found on the border of the West Group: Wittenwater (SCHIR-NIG 1979), which has not been dated with certainty; and Rullstorf, which has only been published in not very detailed short articles, but is – after Lavenstedt – the only site with an intact cultural layer that has been excavated (GEBERS 2003).

#### Supra-regional comparison of the houses

In the distribution area of the TRB culture, five main types of house construction are known (after artursson et al. 2003, 115; MÜLLER 2012/2013, 254–255):

- Two-aisled house with apsidial narrow sides and convex long sides – Type Mossby
- Two-aisled house with straight narrow sides and trapezoidal form – Type Dagstorp I
- Two-aisled house with straight narrow sides and a rectangular form – Type Dagstorp II
- Two-aisled house with straight narrow sides and foundation trenches – Type Limensgård
- One or two-aisled house with straight narrow sides, foundation trenches and an internal room division –Type Flögeln

To determine the degree of correlation between the different houses, a similarity analysis was conducted. The number of aisles, the shape of the narrow sides, the form of the house (rectangular or trapezoidal) and the existence of foundation trenches were evaluated using the Jaccard Coefficient (SHENNAN 2004, 228). In general, these were the factors that were used to classify the houses in the first publications. The results of the evaluation have been mapped as a network with the original classifications indicated by the colour of the dots (Fig. 5). This method helps to classify the houses more objectively. If two or more houses on a site have the same attributes, they are represented by one dot. The degree of correlation is illustrated by the lines between the dots: the darker and thicker the line, the greater the similarity. The size of the dot represents the number of similar houses within the network, but only connections with a factor larger than 0.4 have been displayed. The position of the dots within the network was calculated based on the similarities. The network shows a separation between the houses with and without foundation trenches. Based on their spatial proximity, the network reflects the house types listed above very clearly, but not all the houses fit into a single group. In view of their double row of central posts, Rullstorf and Büdelsdorf in particular are combinations of different house types. However, it is not proposed to define new types based on the singularities. The Lavenstedt house is not identical to the Dagstorp II houses, due to its links with

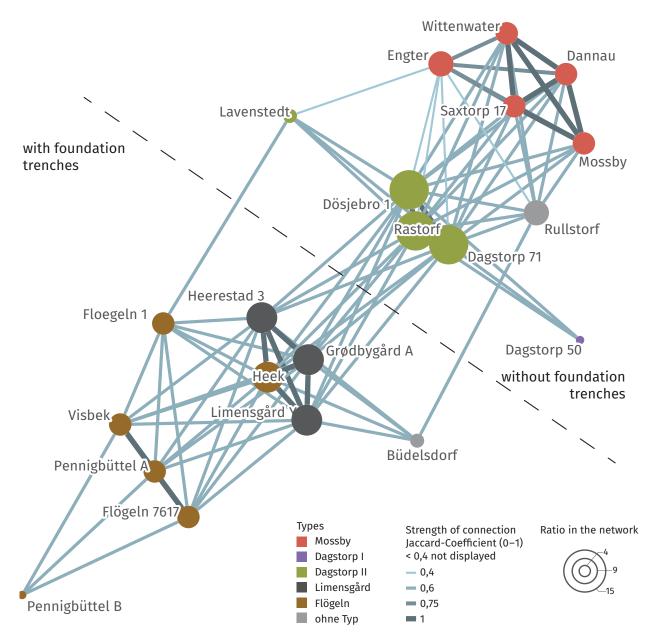


Fig. 5. Network plotted with the Jaccard-Coefficient showing the similarities between selected houses of the TRB North and West Groups. Only one type of construction is mentioned for each site.

Flögeln. It is clearly evident that the construction of the houses without foundation trenches is very similar to houses in the North Group, but in most cases there are no dates for these houses and a well-founded comparison is thus not possible. The similarities between the Flögeln-type houses are not as close as is the case for other types, where small differences in the method of construction have a larger impact. Particularly interesting is the house at Heek, which seems to be much more like the houses of the Limensgård type, but due to the lack of information on Heek this point has to be seen as a provisional conjecture.

### Special buildings

The final point regarding features concerns buildings that are not associated with residential houses. Two such structures are known for the TRB West Group. The first was found in the 1960s in a sand-extraction area. Stones and other material fell out of the side of the pit, so the archaeological service of the district of Cuxhaven decided to excavate the site. Several accumulations of stones were documented: the largest measured  $3 \times 1.3$  m, but it was located on the edge of the sand extraction area. A trench was therefore dug

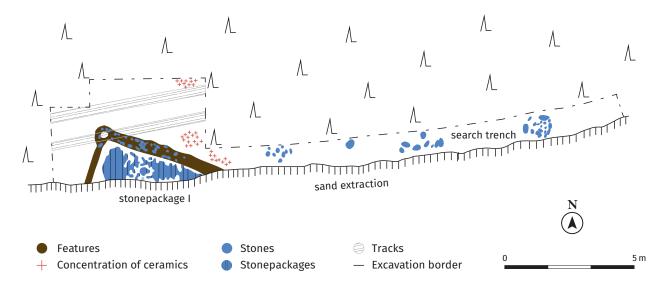


Fig. 6. Plan of the excavation at Hainmühlen (after Aust 1966, 96).

next to this accumulation of stones, which has been interpreted as the corner of a structure (Fig. 6). In this corner, a pedestalled bowl – a so-called *Fruchtschale* – was found in a niche (AUST 1966, 97; BAKKER 1979, 58).

In the 1980s, a similar house was documented at Flögeln (Fig. 7), the cult-house or pit-house 5700. This feature measured 6.3×4.4 m: the pottery could be attributed to Brindley 3 (BAKKER unpub) and <sup>14</sup>C-dates for burned grains indicated 3340–3030 cal BC. The house had been built by digging a shallow rectangular pit in the middle, flanked by two foundation trenches. Traces of posts were found on the outer edge of the red square in Fig.7 and in the trenches. Slightly off centre in the middle of the feature was a hearth, and there was an additional accumulation of stones outside the inner square defined by the posts. Among the finds in the house was highly-decorated pottery, including a pedestalled bowl and a club.

The search for comparable features takes us to the cult houses of Jütland in Denmark (BECKER 1996). The similarities are the rectangular shape and — in the case of Hainmühlen — the compact accumulation of

stones and the filling of the trench (see BECKER 1996, 376-380). However, the documentation for Hainmühlen is not as specific as would be necessary for a detailed evaluation. In the case of Flögeln, an evaluation of the house is possible, but it diverges from the Danish houses from several points of view. First of all, there are depositions of groups of >votive< pottery in the Danish cult houses, while the pottery finds at Flögeln are spread over the whole area of the house. Second, weapons or tools were not found in the Danish cult houses, while a club was found at Flögeln. Third, in contrast to Flögeln, there is evidence in the Danish features that the houses had been burned down and/or - in several cases - covered with stones in a deliberate effort to make them unusable. Finally, the construction itself is different. Consequently, Flögeln 5700 is not a cult house like the Danish parallels and an indisputable interpretation is not possible. There are no additional finds that would suggest its use as a workshop or a place for cultural activities. On the other hand, it seems certain that it was not a residential building.

# THE FINDS

The number of finds differs from site to site. In general, no cultural layers remain so only finds from within the features and stray finds are known. Finds from the TRB West Group sites have been partially analysed. The author worked on the pottery from Lavenstedt, Pennigbüttel and Visbek – the analysis of the Flögeln pottery was carried out by BAKKER (unpub), who kindly provided the data for a detailed comparison – and on

the flint finds from Lavenstedt and Visbek. The stone tools from Lavenstedt have also been analysed.

#### **Pottery**

Unsurprisingly, the settlement pottery is highly fragmented. The largest number of sherds came from



Fig. 7. Rectified photograph of spit D in pit house 5700 at Flögeln. Red: discolouration of features; Blue: hearth; Green: accumulations of stones (Photograph: NIhK).

Lavenstedt, one of only two sites with a cultural layer, i.e. almost 180 kg. A total of 46,302 sherds were recorded during the excavations undertaken by the NIhK. At Pennigbüttel (11 kg, n=3038), Flögeln (14 kg, n=2011) and Visbek (2.5 kg, n=144) the numbers are much lower because in these cases the finds are mainly from the features. In the settlements at Lavenstedt and Pennigbüttel, with almost no sacral features, the average weight per sherd is about 4 g, while at Flögeln and Visbek the weights are 7 g and 18 g, respectively. At Visbek, this is due to the graves with well-preserved pots; at Flögeln, the situation may be similar. In the TRB culture, pots with conical rims and baking plates are indicative of settlements, while funnel-shaped rims are much more common in sacral features and burials (KOCH NIELSEN 1987, 118; MISCHKA 2011, 948-996; brozio 2015, 27-33; hage 2015, 90). Conical rims dominate at Lavenstedt and Pennigbüttel, while at Visbek and Flögeln funnel-shaped rims dominate. At Flögeln, eight flat graves are known, which mostly contained less-fragmented pottery. These can be interpreted as »graves without complex wood or stone installations« (KOSSIAN 2005, 49). A distribution map of the surface finds with the focus on

rim-shapes shows that many of the funnel-shaped rim sherds (Fig. 8) — which Bakker associates with the TRB culture — are stray finds from the entire area (Fig. 8) and are not connected with the features. Due to the intensive use of the site by settlers in the Roman Iron Age and the Migration Period (DÜBNER 2015), it is possible that there once were many more flat graves, which have subsequently been destroyed. This suggestion is supported by the ratio of decorated sherds at Visbek and Flögeln: the ratio is about 64%, as would be expected for sites with graves. At Lavenstedt and Pennigbüttel, only 2–13% of the sherds are decorated.

BAKKER (1979, 15) was the first to state that »settlement pits« are unknown for the West Group and still today there are almost no features filled with settlement waste. Due to the high degree of fragmentation, dating the sherds from settlement sites is very problematic. Flögeln sherds classified as Brindley 1/2 to Brindley 5 have been found, while most of the features seem to be attributable to Brindley 4–5. At Lavenstedt and Pennigbüttel, the range is from Brindley 2/3 to 5. Since the pottery from Visbek is well preserved and highly decorated, it can be attributed to Brindley (3-4). The absence of the final horizon is

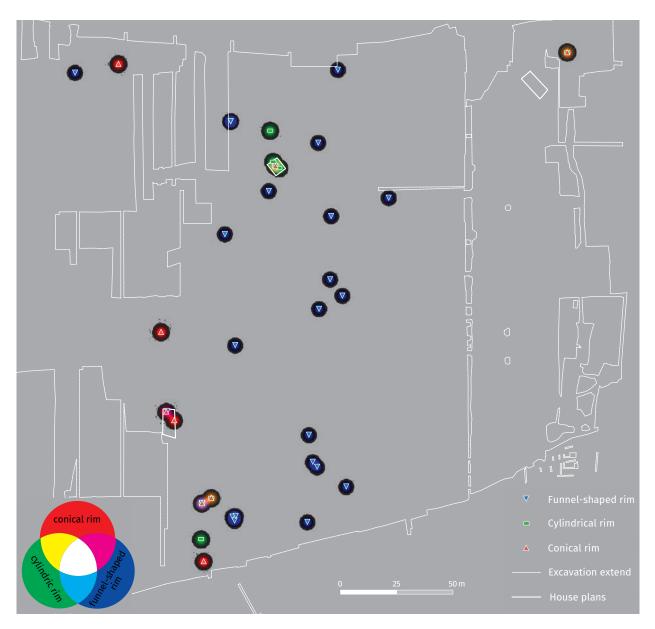


Fig. 8. Distribution of vessel shapes at Flögeln. Mapped by an additive colour mixture of the KDEs (d=5 m) for each rim-shape (see: Nobles 2016).

probably due to less decoration, which is difficult to identify on highly-fragmented material (see Kossian 2007, 239). To sum up, on all of the sites most activities can be dated to between Brindley 3 and 5.

#### Flint

The Pennigbüttel flint was the only category of finds previously published in detail by LÜBKE and RICHTER (2000). The Flögeln finds are the subject of a thesis by A. Drafehn. Consequently, a new study was only necessary for Lavenstedt. This site is located on a

spur of Pleistocene sandy soil containing a large number of glacier-deposited flint stones: some of these had been worked and were found in the cultural layer. Therefore, as a first step, it was important to differentiate between worked and unworked flint. This left about 30,000 objects with a total weight of 156 kg, of which 90% were unmodified pieces. This is a ratio already known from other settlement sites of the Funnel Beaker culture (see LÜBKE/RICHTER 2000, 7; WACHENDORF 2003, 10; HARTZ et al. 2007, 18; BROZIO 2015, 40; HAGE 2015, 75). The overall impression of the flint objects is that they were very opportunistic. Most of the tools were made from flakes and the

retouches were straightforwardly arranged. Many scraper-like tools did not even have preparation retouches, but rather *GSM retouches* (Gebrauchs-, Sediment-, Museumsretusche, i.e. so-called usage, sediment and museum retouches, as described in HAHN 1993, 167), which probably occurred during use without prior preparation. Perhaps the most impressive example of the minimal expenditure of effort is a surface find from the TRB settlement area at Flögeln: a flint axe, made from a naturally box-shaped flint pebble, with a cutting edge that was simply ground without prior preparation.

To recapitulate, most of the tools were scrapers or similar objects (including the GSM retouches), i.e. nearly 2,500 pieces. Further tools include fifteen drills, a burin and a few pointed tools, but also isolated artefacts from the Single Grave culture and the Bronze Age, such as a dagger and a sickle fragment. Most objects had been produced with little effort and could be defined as ad-hoc tools (see GOLDHAMMER 2015, 90).

#### Stone artefacts

Tools made of non-flint stone have only been recorded at Lavenstedt. On all of the other sites, such artefacts are unknown. In some cases, they may have been overlooked or an attribution is no longer possible. Most of the artefacts were associated with settlement activities; only in two cases were small axe fragments

# **ACTIVITIES IN THE SETTLEMENT**

One of the main objectives was to identify the activities carried out in the settlements. Two points of departure proved useful in detecting activity areas: the evidence furnished by the features, and the distribution of the finds. Other than the houses, there were few features. As mentioned above, settlement pits are uncommon in the TRB West Group, although a well was discovered at Lavenstedt: it had been dug in sandy soil, down to a layer of clay on which water flowed from higher lying springs to the Oste River. At the bottom of the well was an organic structure that had disintegrated during the time when the well was in use and was later filled up with settlement waste (MENNENGA 2015). Similar features from the TRB West Group and its adjacent areas are known at Emmerhout in the Netherlands (VAN DER WAALS 1998, 175-176) and

found. One category stands out due to the size of most of the objects: rough grinding stones, probably used to process grain. Overall, 42 handstones, 18 querns and 36 unidentifiable objects were found. The sizes varied greatly, whereby the heaviest weighed 16.7 kg, the lightest fragment 84g (mean 2.7 kg, median 2.1 kg). Of the grinding stone types according to ZIMMERMANN (1988, 725) only type 3 was found at Lavenstedt. Nearly all were made of granite or coarse-grained quartzite sandstone<sup>1</sup>.

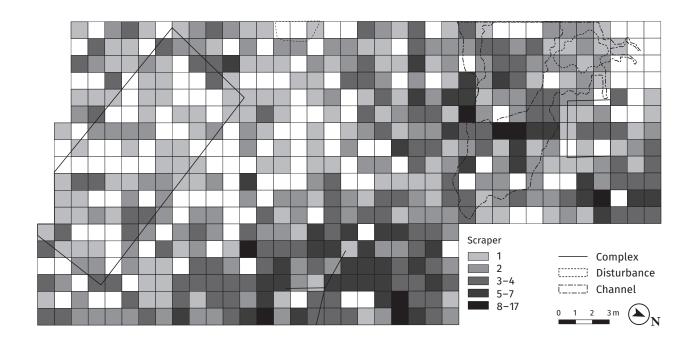
In addition to these coarse-grained grinding stones, there were also 32 very fine-grained artefacts with almost flat surfaces, made of sandstone or very fine granite. These were presumably used to grind mineral or organic substances or to grind other stone tools (HAHN 1993, 298–302).

The largest category of stone artefacts comprised 144 hammerstones. Every type except type A was found (after WILLMS 1980, 110–111). In terms of raw material, it was possible to identify nine different types of stone. A correlation between the type of material and the type of hammerstone could not be detected. Only type B – hammerstones with band-shaped, linear working areas surrounding the stone – was usually made of hard stone. The degree of hardness indicates two groups of hammerstones: those made of hard stone were probably used to work on other stones, e.g. the grinding stones, while those made of softer or brittle stone would have been used on softer materials, such as wood (see Gehlen 2012, 854).

Oldenburg-Dannau in Schleswig-Holstein (BROZIO 2015, 66).

A cultural layer was found only on the sites at Lavenstedt and Rullstorf. Brief preliminary reports on the distribution of the finds on the latter have been published (MOSER 2003; WACHENDORF 2003), identifying several concentrations of finds near the building. Determining concentrations of material was also the aim of the analysis of the finds from Lavenstedt. One of the problems encountered was "settlement's noise" (after BAKKER unpub.), an effect caused by long-time use of a site. In the course of time, objects are deposited around the site randomly, the result of minor activities or by having simply been lost. However, if an area is used more intensively or frequently, the remains of activities accumulate in visibly larger

1 The identification of the raw material was carried out by Dr. Friederike Bungenstock (NIhK).



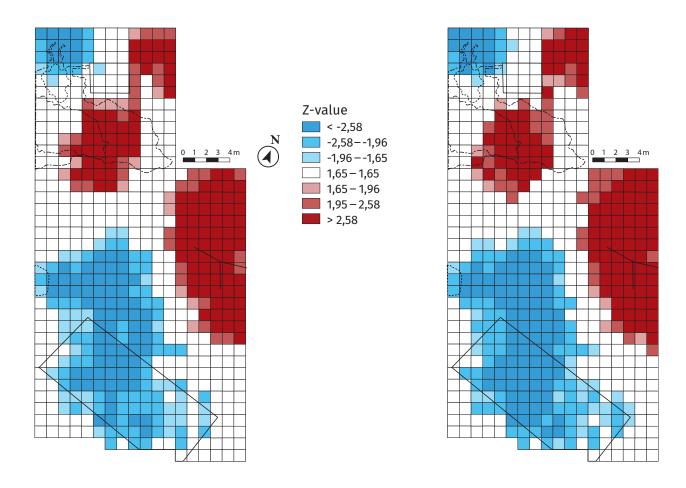


Fig. 9. Distribution of scrapers at Lavenstedt (above), and the results of the hotspot analysis with a search radius of  $2.1\,m$  (left) and  $2.9\,m$  (right).

quantities (see GRØN 2000, 159). To highlight these accumulations and counteract the »settlement's noise«, a hotspot analysis was carried out (GETIS/ORD 1992; Nobles 2012). Using this auto-correlation tool, it was possible to locate different areas based on the presence of flint and stone tools. The distribution of most of the tools indicated concentrations in various areas, e.g. the drills formed a hotspot in the north-western section of the excavation area. This was probably due to a nearby pit where several drills were found in the top cultural layer. A second example is the distribution of the flint scrapers. Fig. 9 shows that scrapers were found in nearly every excavated square, but higher concentrations were visible in three areas, which may indicate working areas. Most of the tools were concentrated in the area to the north of the house. Next to the house was a – not very clear – accumulation of worked flint, a large quantity of flint production waste and highly-fragmented sherds. Of particular note is the fact that the distribution area of the sherds was covered by the remains of the house (Fig. 10), perhaps because the waste was deposited next to the walls of the house.

#### CONCLUSION

The »Settlement and land use in Neolithic northwestern Germany« project was able to shed new light on the settlements of the West Group of the Funnel Beaker culture.

First of all, the typochronology established by Anna BRINDLEY (1986a) was checked with new <sup>14</sup>C-dates and mathematical methods. This showed that the order of the horizons is correct, but the total duration was longer than previously expected. Moreover, the durations of the individual horizons were not as constant as previously postulated. However, there is still a lack of radiocarbon dates, especially for the earliest horizons, which needs to be rectified. This could be achieved by excavating new features with pottery finds and botanical macro-remains that can be dated reliably.

By comparing the results of new excavations – i.e. Lavenstedt and Visbek – and the unpublished and published data from former excavations, it was possible to establish inventories for the settlements and highlight some typical aspects. As on other sites in Schleswig-Holstein, the degree of fragmentation of the pottery and the proportion of undecorated sherds are much higher for settlements than in graves. In the flint inventories, production debris dominates. Among the tools, scrapers and similar objects are most common. A large number of hammerstones and grinding stones complete the range of stone artefacts found on the sites. These objects are a research desideratum in north-western settlement archaeology and should be

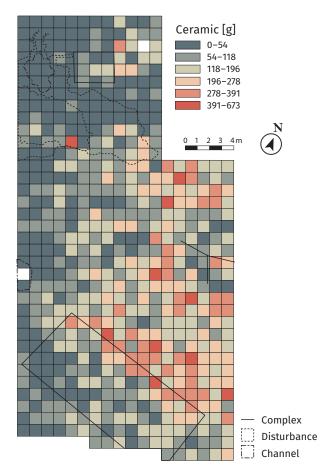


Fig. 10. Distribution of the pottery, weight per square metre (Jenks).

brought more into focus. Given that only two sites have a cultural layer, this is also a point on which to focus. If new sites with such layers are discovered, it is absolutely necessary to excavate them in detail to obtain new and important information about the inner structure of such settlements. At Lavenstedt, it was possible to identify activity areas and spatial relationships between the different groups of tools, waste distribution and the features based on the finds that were excavated in a square-metre grid and wet sieved.

Three main types of house have been determined for the West Group of the Funnel Beaker culture. The first was the post-wall building – as found at Lavenstedt – which has certain similarities with the buildings of the North Group. The second type is a house with foundation trenches: the highlight of its construction is the division into rooms. It is remarkable that these rooms followed a plan that can be found in all the houses of this type. Comparisons of the finds from the different features and the water-logged sites permit an interpretation of their functions, i.e. it is possible to differentiate between areas used for ritual

activities, daily living or various crafts. The construction method was probably influenced by the Early Neolithic house horizon in Ireland and Great Britain. The structural similarities there were the closest parallel at this time in northern Europe. The third type is the special building: at Hainmühlen and Flögeln, these buildings were probably used for sacral activities, but only a few such house plans are known so further intensive and targeted research is necessary.

The best-preserved features and house plans were covered with soil, in most cases subsequent to the use of the site. Different reasons for this process are possible. At Visbek, for example, the site was covered by a thick layer of plaggen soil that had been brought there to make the land more fertile, but it also protected the features against soil developments like podzolization. Unfortunately, the cultural layer was destroyed by this typical medieval process. The second type of soil cover is the accumulation of sandy soil as in the case of Pennigbüttel. ASSENDORP (2000, 116) investigated the slopes around the site, recognizing that they had suffered erosion and that the eroded material had

accumulated on top of the settlement. It was not possible to date this process, but it probably occurred between the Middle Neolithic and the Bronze Age. At Lavenstedt, a similar process underwent pedological investigations by Stephan Schwank, which showed that in the wider area of the settlement up to 1 m had eroded. In a small depression, the eroded podzol had accumulated on top of a Mesolithic hearth and was later covered by a Brindley 4 cultural layer (see REI-MANN 2013). Not only the stratigraphy but also a pollen analysis of the nearby Huvenhopsmoor by Annette Kramer indicated a change in the landscape due to woodland clearance. Taken together, the results of the archaeological, pedological and botanical investigations lead to the conclusion that the first Neolithic settlers - probably of the TRB culture - had an immense impact on the landscape. The processes described here make it difficult to find the sites: surface finds are not available in all cases. However, if the remains of later cultures are found in the region, it is possible that under a layer of soil without any finds - Neolithic features could appear.

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# The Michelsberg Culture of Northern Baden-Württemberg: A case study of a Neolithic landscape with enclosures and open sites

Birgit Regner-Kamlah, Ute Seidel

#### **ABSTRACT**

Supported by the DFG-Project »Settlement structures of the Michelsberg culture (MK) in the Kraichgau region« (ca. 4300–3650 BC), an evaluation and a synthesis of the information about the enclosures as well as the open sites in this region were undertaken and supplemented by information for the adjacent Neckar region. Focusing on Bruchsal >Aue«, as it represents a fully investigated earthwork of the classical MK, an analysis of the ditch features in combination with the allocation of ceramics, animal and human bones, as well as 48 radiometric dates reveals several datable ditch-fill layers and modifications of the earthwork's layout in up to six utilisation phases within 600 years. Thus, the dynamics of a Michelsberg enclosure site can exemplarily be shown at >Aue«.

In Baden-Württemberg, MK enclosures occupy widely visible elevations of topographic importance, but there is neither visual contact between them, nor to the surrounding open sites. MK sites occupy exclusively regions most favourable for agriculture with beneficial climate and soil, and succeed in replacing the former epiroessen occupation. A role of the MK as an intermediary for naked wheat is discussed. The predominance of cattle in the MK economy cannot be verified. MK enclosures likely had a wide range of »functions« for MK society. The authors favour the hypothesis of an interrupted occupation of enclosures and propose a model of shifting occupation between neighbouring enclosures, which is denoted as the »Heilbronn-Kraichgau model«.

### INTRODUCTION

In the south of Germany, in the surroundings of the town of Bruchsal, four enclosures of the Michelsberg Culture are known: Bruchsal »Aue«, Bruchsal »Scheelkopf«, Bruchsal-Heidelsheim »Altenberg« and the eponymous earthwork of Bruchsal-Untergrombach »Michelsberg« (Fig. 14). They are situated above small tributaries to the Rhine, giving access from the Rhine valley to the hilly countryside called »Kraichgau«.

In the adjacent Neckar valley to the east, four enclosures of the Michelsberg Culture (MK) are known: Heilbronn-Klingenberg »Schlossberg«, Neckarsulm-Obereisesheim »Hetzenberg«, Ilsfeld »Ebene« and Leonberg »Silberberg«. These enclosures are also situated on historical routes given by water currents. An analysis of their documentation was recently published (SEIDEL 2008; SCHLENKER et al. 2008; SEIDEL 2009). For

the Kraichgau enclosures, some work has been undertaken (LÜNING 1967; BEHRENDS 1991; 1998; STEP-PAN 2003; REITER 2005; REGNER-KAMLAH 2006), although a synopsis of the state of knowledge was lacking. As the work about the MK in the Neckar valley opened new insights for interpreting the settlement system of the MK – which appears to have been rather mobile – and the ditch systems of the enclosures – which appear to have seen periodic reconstructions – it was a desideratum to conduct an evaluation and synthesis of the known information about the enclosures and open sites of the MK in the Kraichgau. This work was supported by the DFG Project »Settlement structures of Michelsberg Culture in the Kraichgau area« and the Landesamt für Denkmalpflege im Regierungspräsidium Stuttgart (www.denkmalpflege-bw).

#### **PREMISES**

The MK is estimated to have lasted from about 4300 until 3650 cal BC, covering large areas of Central Europe (e.g. höhn 2002, 190–94; Lanting/van der plicht 2000). The five typological ceramic stages

defined by J. LÜNING (1967) still serve as a basis for communication about the MK, as well as the slight alterations made by B. нöhn (2002). An important contribution to the absolute dating of the MK was provided

by I. MATUSCHIK (2011), evaluating dendrodates from layers of prealpine wetland sites containing MK ceramics. For contexts with »Ösenkranzflaschen mit tief sitzenden Ösen« (bottle with low lugs) characterising MK III, dendro dates between 3919–3834 BC are available, whereas contexts with »Ösenleistenflaschen« (bottle with pan pipe lugs) defining MK IV can be fixed between 3869 and 3817 BC (MATUSCHIK 2011, 271 ff.). This leaves only about 100 years for stage MK III, rather

than the previously-estimated 300 years (HÖHN 2002, 190 ff.). The timely overlap of the appearance of the two bottle types underlines the problem of dividing MK III and MK IV by typological means. Therefore, the ceramic ensembles of these two stages are sometimes named MK III/IV (e.g. SEIDEL 2008, 331; 388; Anhang 2; SEIDEL 2011, 145; KNOCHE 2013). The actual dating of the five typologically-defined MK stages (LÜNING 1967) is shown in the chronological table in this volume.

#### THE OPEN SETTLEMENTS OF THE MK: REPEATED EPISODIC USES

The work presented here is based on a completed catalogue of more than 100 sites of the MK in Baden-Württemberg, including all known and suspected enclosures as well as open sites (SEIDEL 2008, 419–425; SEIDEL 2011; with additions: SEIDEL in press).

One assumption is that the MK settlement system was rather mobile. This is based on the observation

that only up to 5–6 (storage?) pits with MK ceramics can be found per occupation phase at an open site. These pits are scattered at distances of about 30 m to each other. A distance of about 30 m was also observed between the MK house places of Echzell »Wannkopf« in Hessen (нöнn 1996). The conclusion is that although a concrete number cannot be given, only few

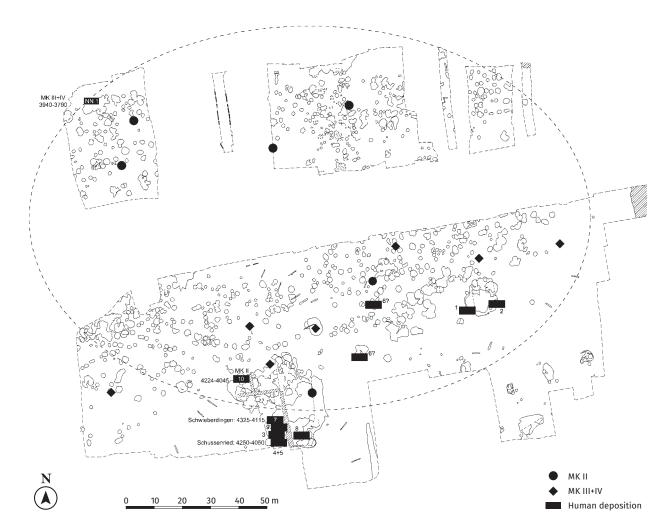


Fig. 1. Leonberg-Höfingen. Plan of the site with all jungneolithic structures. – Epiroessen (Bischheim, Schwieberdingen, Schussenried) – MKII - MKIII/IV – boxes: human deposits. (after Seidel 2004, graphic alterations C. Urbans, LAD, Freiburg).

people of the MK could have stayed together at one place at one time, and apparently they left a place before it was necessary to dig new storage pits (SEIDEL 2008, 385–389; SEIDEL 2011). This is thought to be necessary after 5–7 years. After that time, an experimental storage pit in loess breaks down (KEEFER 1988, 23–29). Some places have repeated occupations.

An example of this pattern is the settlement area of Leonberg-Höfingen, Lkr. Böblingen. At this site, more than 1,000 storage pits were documented on ca. 14,000 m<sup>2</sup> (Fig. 1). Almost all pits can be ascribed to the successive Epiroessen groups Bischheim, Schwieberdingen and Neckar Schussenried (SEIDEL 2004). The presence of these groups at the place spreads over a timespan of about 300 years. Their pits seem to be

arranged along lines, whereby it is highly probable that the pits indicate houses standing in rows, as is known for the few better-preserved sites on dry soil, as well as wetland sites.

Among the more than 1,000 pits of Höfingen, five pits with ceramics of MK II and five pits with ceramics of MK III/IV were identified, placed at ca. 30 m distance to each other. An interruption between the occupation of MK II and MK III/IV is likely, owing to the ceramics and absolute data. Therefore, apparently the MK people stayed – in contrast to the Epiroessen – for only 5–7 years at the place, left before there was a need to dig new pits and returned after an unknown timespan for another 5–7 years. This pattern also seems to be probable for other MK settlement

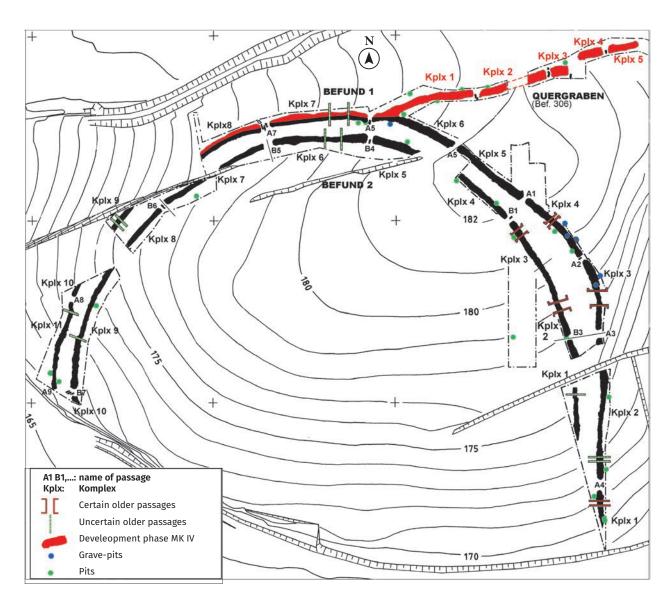


Fig. 2. Bruchsal »Aue«. Plan of the enclosure with positions of some special features. (Landesamt für Denkmalpflege im Regierungspräsidium Stuttgart Dienstsitz Karlsruhe, additions by B. Regner-Kamlah).

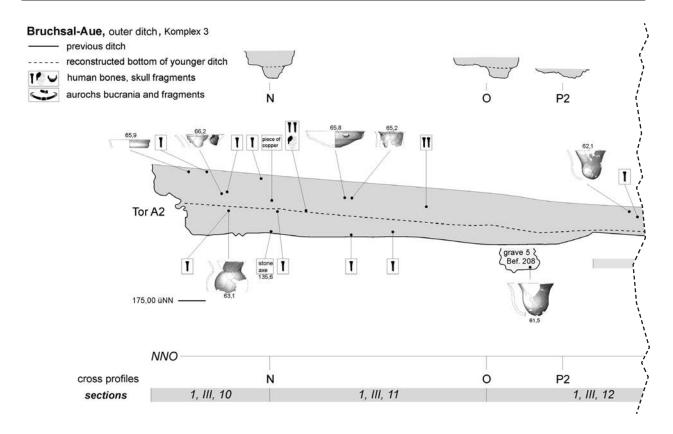


Fig. 3. Bruchsal »Aue«. Feature 1, Komplex 3: longitudinal profile of a whole Komplex with cross profiles above. See older slim ditch below, younger wider ditch above dotted line. Distribution of some finds. See the platform of an older loess bridge and the position of grave 5. (Numbers at ceramics see plates at Reiter 2005, B. Regner-Kamlah, graphic design: C. Nübold).

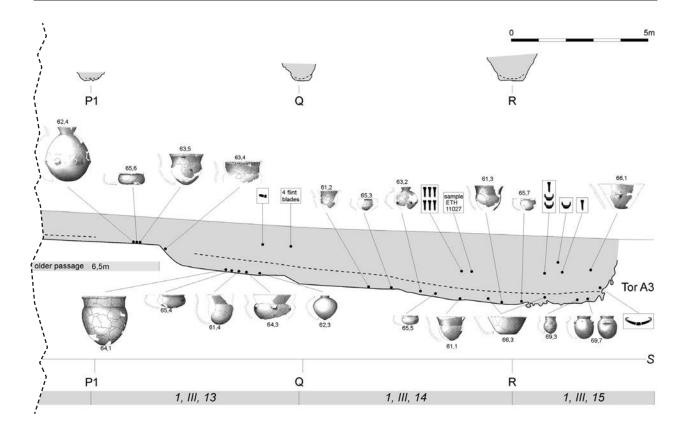
areas (e.g. Seidel 2008, 286–287; BERGMANN 2008; HÖHN 1996, 119–129; LASSERRE et. al. 1999).

In this framework, the deposits of eleven humans of Höfingen also hold interest. They were all placed at the edges of the contemporarily occupied areas. The most probable interpretation is that during every settlement occupation, a most remote place for a human deposit was chosen. Perhaps the settlement place was even left when a person died (SEIDEL 2004, 119–151; SEIDEL/REGNER-KAMLAH 2017).

# THE DITCH SYSTEM OF THE ENCLOSURES: REPEATED USE AND INTERRUPTIONS

Interruptions of use can also be assumed for the enclosures of the MK, at least for their ditches. For MK earthworks, recuttings were first observed by R. Koch, documenting two profiles in the south-west of the inner ditch of Ilsfeld »Ebene« (KOCH 1971, 60 Abb. 6). Here, a younger ditch was built into an older ditch. The younger ditch did not hit the bottom of the 0.3–0.5 m deeper older ditch. Additionally, the axis of the younger ditch showed a deviation of 0.3 m to the east, then to the west in the two different profiles the younger ditch did not hit the axis of the older ditch exactly. Therefore, the older ditch was most probably already filled and no longer clearly visible at the time of the younger ditch's construction. This signifies that the older ditch had not been cleaned for some time before recutting. Koch also

documented a recutting of the inner ditch of Ilsfeld in a lowest planum, where the upper part of the ditch was already removed by clay extraction. Again, the younger ditch segment does not hit the axis of the older ditch. In the older segment, an »Ösenkranzflasche« with high lugs was found, indicating a filling during MK II, as well as an »Ösenleistenflasche« in the younger segment, indicating a filling during MK IV (KOCH 1971, 62 Abb. 7). However, the analysis of the ditch fillings of Ilsfeld in the years after 2000 showed a more complex history from Bischheim, MK I to MK IV, with many hints of ditch recutting, at least for the inner ditch and the ditch in the middle (SEIDEL 2008, 71–90). For instance, in 1974, a recut in an entrance situation was documented in a longitudinal section of the ditch in



the middle of the three ditches. Here, an earth bridge was removed at a later stage. The newly-cut ditch was dug deeper within the area of the former earth bridge. In the middle of the recut, a narrow slot indicates a former »Schlitzgräbchen« in the former gate (SEIDEL 2008, 80 Abb. 70. On this basis, a first stage of the enclosure was proposed, with a single inner ditch with very short segments (SEIDEL 2008, 368–371 Abb. 257). Nevertheless, the conclusions for Ilsfeld had to remain incomplete due to the incomplete excavation and documentation of this enclosure.

More arguments were made that many MK enclosures show reconstructions of their ditches, so-called recuttings (SEIDEL 2008, 367 ff.). However, the question remained open about the exact process or history of these recuttings in the ditch system of a classical enclosure of the MK.

Irregularities were also observed for the ditches of the MK enclosure of Bruchsal »Aue«. The ditch system of »Aue« is the only one for the classical MK that has been completely excavated and documented to date. Therefore, Bruchsal »Aue« became one of the foci of the Kraichgau project. The exact structure of the recuttings held particular interest, as well as the question of the time period between these reconstructions.

An analysis of the ditch features of »Aue« in combination with the allocation of ceramics, animal and human bones as well as 38 radiometric dates enabled identifying different datable ditch-filling layers and several reconstruction works. Remarkable modifications of the earthworks layout during up to six utilisation phases within 600 years show exemplarily the dynamic of a MK enclosure. The question of an uninterrupted or interrupted occupation of the place cannot be answered definitely (REGNER-KAMLAH, in press. b).

In this text, we want to contrast our work at the level of ditch structure with the »Rosheim model« of Jeunesse/Lefranc (1999), and the level of landscape with the »Braunschweig model« of Geschwinde/Raetzel-fabian (2010).

#### THE ENCLOSURE OF BRUCHSAL »AUE« AND THE »ROSHEIM MODEL«

The »Rosheim model« was based on the observation of irregularities in the ditch system of the Linear Pottery enclosure of Rosheim, Alsace. Jeunesse and Lefranc (1999) concluded that only single pits existed at one time – a so-called »Grubenanlage« – and that a

»closed« enclosure with longer ditches never existed. The impression of a ditch system only arises in their eyes after several recuttings of single pits.

The MK ditch system of Bruchsal »Aue« was almost completely archaeologically excavated from 1987

to 1993 (BEHRENDS 1991; 1993). The enclosure is situated 182 m above sea level on a loess hill, which slightly slopes on three sides. On the fourth side in the northeast, a flat, natural loess slope enables entering the enclosure. Two parallel ditches of about 500 m length surround the loess hill like an arch (Fig. 2). In a later stage, a transverse ditch was connected to the outer

arch-shaped ditch in the north. This annex locks the flat loess slope to the north. Southern parts of the ditch system are lost due to recent stone quarries, and the ditches were probably once closed. The interior space of the enclosure was about 5 hectares, with a further 2 hectares in addition with the later transverse ditch.



Fig. 4. Bruchsal »Aue«. Feature 2, Komplex 3: planum of lower parts of the inner ditch with irregularities caused by removal of a former loess bridge. At the top left the angle of an older ditch terminal. (Landesamt für Denkmalpflege im Regierungspräsidium Stuttgart, Dienstsitz Karlsruhe. Photo: S. Reißing).



Fig. 5. Feature 1, Komplex 7: cross profile G1 with expanded step (left), which is caused by the inbuild of the third (= transverse) ditch. (Landesamt für Denkmalpflege im Regierungspräsidium Stuttgart, Dienstsitz Karlsruhe. Photo: S. Reißing)

The outer ditch has nine, the inner six and the transverse ditch four loess bridges, which show at the recent surface of 3 to 5 m width. The loess bridges divide the ditches in 26 sections (called »Komplexe«), which are from 8 m to 70 m in length (Fig. 2). These passages probably could have been closed by wooden and stone structures, because 15 of 19 loess bridges show round and slot-shaped discolorations, which could have been the foundations of trenches. Some ditch terminals contained accumulations of chalkstones, possibly the collapsed rests of former stone installations on the loess bridges.

There is no evidence of a palisade. Former interpretations of large loess fillings in the ditches as eroded rampart material (REGNER-KAMLAH 2009, 77 and 2010, 179) have to be revised and are now seen as collapses of ditch walls. Hence, there are no traces where the dugout of the ditches was placed.

The analysis of the ditch features and the position of the ceramics showed that ceramics of style MK I/ at the beginning of MK II, classical MK II, late MK II, MK III, MK IV and MK IV late/change to MK V were deposited in different layers. On this basis, hypothetically 5 to 6 utilisation phases and intermediate breaks



Fig. 6. Bruchsal »Aue«. Feature 1, Komplex 8, planum of eastern ditch terminal: younger wider ditch (right) was kept shorter than the older slim ditch (left). (Landesamt für Denkmalpflege im Regierungspräsidium Stuttgart, Dienstsitz Karlsruhe. Photo: S. Reißing)

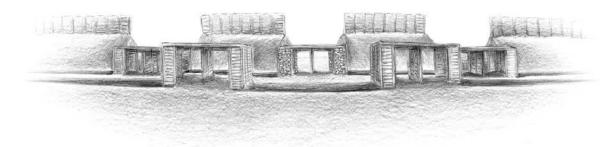


Fig. 7. Hypothetical view towards the façade of the ditch system of Heilbronn-Klingenberg. The imposing effect of the symmetric layout is evident. (Chr. Jacob 2010, 46–47. Drawing by Suse Krisch, Tübingen).

were identified. Carbon dates show a 600-year period between 4250 to 3650 cal BC.

Numerous irregularities observed in plana and profiles could be explained by different construction events:

#### a. Irregularities formed during ditch-building

For the first building of both arch-shaped ditches during stage MK I at the change to MK II, purposeful constructive considerations about their course on a loess hill are discernible, especially concerning the skillful adjustment of the ditch-bottom course to the slopes. Thus, some irregularities of the longitudinal bottom course represent slope-down located steps to level out the latitude, deliberately carried out during ditch construction (REGNER-KAMLAH, in press a). Furthermore, the longitudinal bottom course shows up about ten platforms, ca. 3-6m in length and up to 0.6m in height. They are seen as older loess bridges that were removed during later utilisation phases (see below) (Fig. 3). Concerning the dimensions of the ditches and their passages, some regularity indicates an intentional architectural layout: the outer ditch is narrower (average 1.2 m width on bottom) and shows broader passages (ca. 4m and above). By contrast, the inner ditch is wider (average 1.9 m width on bottom, in the ditch terminals ca. 2.5 m width) with narrower passages. The ditch terminals on both sides of a passage are always identical in width, which leads to the assumption that the builders paid attention to the symmetrical appearance of the ditches in the gate zones. According to the ceramics, especially tulip beaker types 1.1/1.2 and 2.1 (for a definition of the types, see Seidel 2008, 106–112) were lying on the bottom of many complexes of the inner and outer ditch, whereby both ditches were built during MK I or at the beginning of MK II. These early ceramics (for instance, Reiter 2005 table 1,2; 15,2; 25,2.4.5; 32,1.3) were in use for at least some decades, whereby it is not possible to decide whether the ditches were built simultaneously or one ditch (and if so, which one) in a distance of months, years or even decades after the other. The ditch structures provide no information about this.

# b. Irregularities formed during MK II utilisation phase

In the same layers on the bottom of the ditches, there were numerous ceramics of classical MKII, although they are not separable from those with old ceramics of MK I/ at the beginning of MK II neither stratigraphically nor by carbon dating. Such classical MK II ceramics are sometimes located directly on the surfaces of about ten platforms, ca. 3–6m in length and up to 0.6m in height. The platforms are situated in the longitudinal course of

the ditches, representing the remains of primary existent and older passages removed during the MK II phase (Fig. 4). These older gates divided the earlier ditches in sections with highly different lengths: some of them are only  $6\,\mathrm{m}$  and even quite short. However, the other dimensions (width, depth) of these short sections are equal to those of the neighbouring longer sections. Thus, the short sections cannot be seen as single pits in the sense of the Rosheim model.

# c. Irregularities formed by installation of the new outer ditch during MK III

The cross profiles of the outer ditch appeared very variable, whereby narrow box-shaped and broad U-shaped profiles were documented, as well as profiles with steps in the walls (REGNER-KAMLAH 2010, 181–186 fig. 2). During excavation, these divergences of the cross-profile shapes were interpreted as unique local repairs or interventions. However, in course of the analyses they could be identified as one simultaneously- and continuously-realised installation of a new wider ditch into the older, narrower, outer ditch. In some ditch sections, the new ditch was elongated into the areas of the loess bridges, whereby the passages became narrower. Only in one ditch terminal (feature 1, Komplex 8, eastern ditch terminal) was the younger wider ditch kept shorter than the older ditch: both ditch terminals - differing in age and width - can therefore be seen side by side in the planum (Fig. 6). On the new bottom of the integrated ditch, numerous ceramics of MK III were found, dating to the end of this building activity (Fig. 3), which was carried out after a break of utilisation of unknown duration. During this break, both old ditches were refilled to a minimum 0.8 m to 1.0 m in height by natural sedimentation.

# d. Irregularities formed by addition of the transverse ditch during MK IV

After another break of activity, during stage MK IV a transverse ditch was attached to Komplex 6 of the outer ditch, extending about 140 m to the east. Almost certainly linked to this attachment are two anomalies in Komplex 7 and 8 of the outer ditch: they are obviously wider than every other ditch section (up to 4,8 m width) and their cross profiles show expanded steps at the outer ditch wall (Fig. 5). Here, the inbuilt second ditch – already refilled by MK III material and natural sedimentation – was opened again. Shifted somewhat to the outer side, a third ditch was built into the second, as a prolongation of the transverse ditch to the western part of the ditch system. The result was an east-west positioned ditch line of about 220 m length as a façade to the north (Fig. 2, red line).

The irregularities in the features of the plana and profiles gave no hints for »pseudo-ditches«, given that the earthwork did not develop out of successively interleaved long pits. Only few of the irregularities lead back to small and locally-restricted interventions into the already-refilled ditches. Most of the observed

anomalies are the accumulated results of different constructive interventions, which were undertaken during diverse activity phases as major reconstructions or renewals of the whole ditch system (REGNER-KAMLAH, in press b).

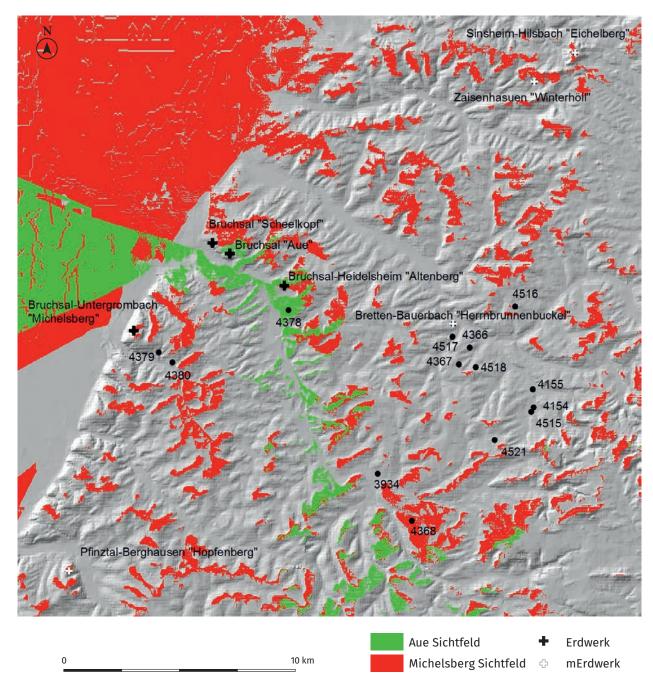


Fig. 8. MK sites in the Kraichgau region: fields of vision for the enclosures of »Michelsberg« and »Aue«. The enclosures of »Scheelkopf« and »Altenberg« in the Kraichgau, and Ilsfeld, Klingenberg and Obereisesheim »Hetzenberg« along the Neckarvalley show comparable fields (T. Baum/U. Seidel in prep.).

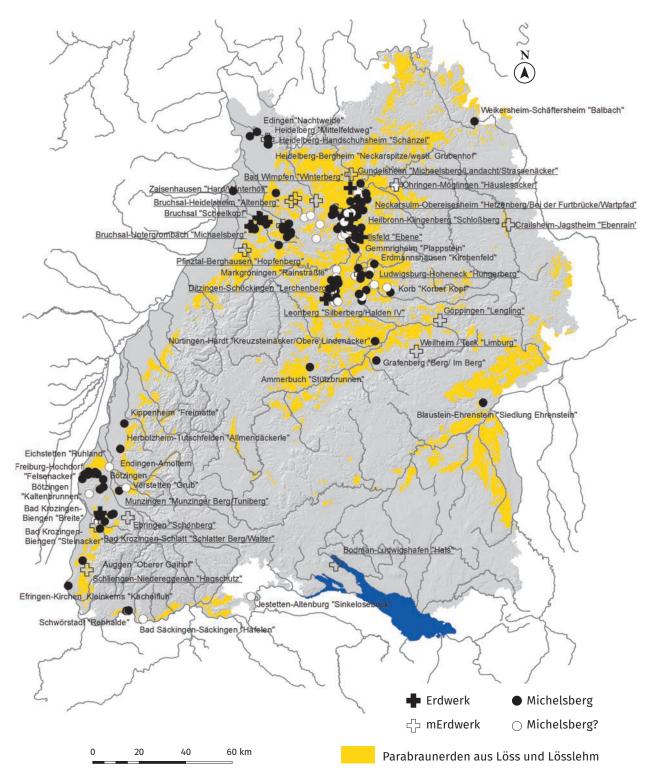


Fig. 9. Distribution map of MK sites and loessic soils (yellow) in Baden-Württemberg (T. BAUM/U. SEIDEL in prep.).

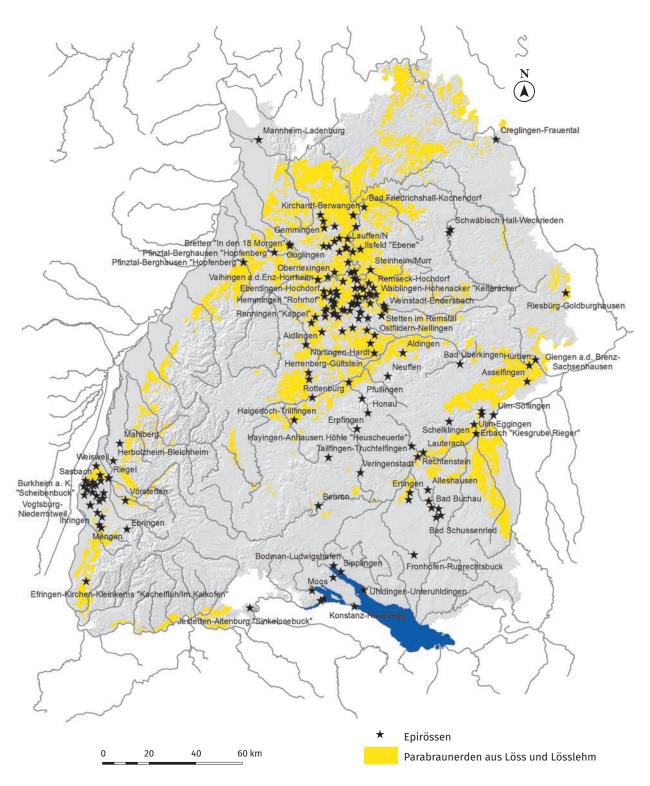


Fig. 10. Distribution map of Epiroessen sites and loessic soils (yellow) in Baden-Württemberg (T. BAUM/U. SEIDEL in prep.).

### **DITCH-FILLING**

The refilling of the ditches happened largely by natural sedimentation and to a lesser degree by the anthropogenic input of objects. Sediments flowed in from the edges and are visible in the cross profiles as bowl-shaped deposition layers. The natural sedimentation layers show that major parts of the ditches stood open for longer periods. There are no hints of distinctive anthropogenic refilling of the dugout.

The finds – a mixture of ceramics and animal bones, stones, charcoal, ashes, daub fragments, some tools of bone, antler and stone as well as several single human bones – could be interpreted as settlement waste. The waste largely entered the ditches by direct anthropogenic input. Ceramics and animal bones were thrown in without being exposed to weathering for much time (STEPPAN 2003, 18; REITER 2005, 23). Completely preserved vessels always show small damages, thus making them unusable, while all animal bones show traces of slaughtering (REITER 2005, 108; STEPPAN 2003, 82f.).

Some ditch terminals contained remarkably large quantities of finds (e.g. the pairs of passages A1/B1 and A7/B5; passage between complex 3 and 4 of the transverse ditch). These accumulations could be the result of the frequent disposal of waste while entering/leaving

the enclosure. However, a few, apparently intentionally placed objects in some ditch terminals point to their special meaning. For instance, there were two remarkable assemblages in the area of the passages A7/B5: five horns of bos primigenius were lying on the bottom of the eastern ditch terminal of Komplex 8 of the outer ditch, of which two times two pieces belonged to respectively one animal. They could have previously been fixed at posts and positioned in the gate areas or intentionally placed on the bottom of the ditch terminal. In the neighbouring ditch terminal of the inner ditch (Komplex 7), a tulip beaker together with a young woman's facial bones - which were probably prepared as a facial mask (WAHL 2010, 97–98) – seemed to have been deposited on the bottom. Perhaps these mainly-used entrances into the settlement were armoured with deposits or locations of unique objects with sacred and ritual relevance, giving protection against the outside world.

The package of finds in the ditches and the few investigated pits result from a combination of profane waste disposal and cultic-ritual activities, expressing the inseparably connected performances of daily and religious life. The function of the site has to be regarded as a settlement with ritual aspects.

#### 14C-DATA

There are 38 instances of carbon data from the inner, the outer and the transverse ditch taken in different times from different layers (e. g. STEPPAN 1994, 251–255; STEPPAN 2003, 51; STEPPAN 2006, 210–220). Eleven data items – mostly from layers on the bottom – indicate classical MK II between 4250 and 3950 cal BC. One data item points to the first phase in MK I (4356–4247 cal BC [1 $\sigma$ ]) and four further data items to another phase in late MK II (4050–3982 cal BC [1 $\sigma$ ]). 14 data items show wide ranges between 3950 and 3800, partly 3700 cal BC, whereby they represent MK III and MK IV. A plateau in the calibration curve does not allow a separation of these two

stages. Five data items from upper layers show evidence of presence in MK IV late and MK V (3750–3521 cal BC [1 $\sigma$ ]). Therefore, six utilisation phases can be assumed (REGNER-KAMLAH, in press b).

With the carbon-dating results in mind, one wants to identify distinct using phases, although the calibration curve does not permit a clear separation, just as it is impossible to estimate the length of the interruptions. Nevertheless, in the light of the given data for MK structures (SEIDEL 2008, 388–89), a 600-year continuity at the place is rather to be excluded and a model of short activity phases with breaks is preferred.

#### THE MK SITES OF BADEN-WÜRTTEMBERG AND THE »BRAUNSCHWEIG MODEL«

At the landscape level, the work of Geschwinde and RAETZEL-FABIAN (2010) provides a basis to compare the results for the MK sites in Baden-Württemberg.

In the »Braunschweiger Harzvorland«, Raetzel-Fabian and Geschwinde detected 26 enclosures, although not all of them are dated at present. As we are at the edge of the MK sphere, a spacial and timely overlap with the TRB is conceivable. The authors

showed that 18 of those enclosures are situated on a historical route system (GESCHWINDE/RAETZEL-FABIAN 2010, 228 Abb. 163). They also state that the enclosures would be situated at the edge of — not on — loessic soils. For this observation, no mapping was published. In the interpretation of Geschwinde and Raetzel-Fabian, MK enclosures are seen as cattle-gathering points on a route system; therefore, the

MK economy would have based on transhumance, especially for cattle breeding.

Moreover, the point was made that building an enclosure would have been an act of foundation in occupying a new territory. One argument was that the largest enclosures of the MK have the earliest datings – as well as the latest – and that they were placed at the edges of the expanding MK area (»Calden model«: Raetzel-Fabian 1999, 93–94). This general outline has subsequently been frequently cited as the »Braunschweig model« (GESCHWINDE/RAETZEL-FABIAN 2010, 241–249 Abb. 168).

For Baden-Württemberg, it is evident that the MK enclosures occupy topographically prominent places (SEIDEL 2008, 11–3.71–3.183–5; SEIDEL 2011). As proposed by RAETZEL-FABIAN (1999, 86.105) for the enclosure of Calden, an imposing architecture also seems to have been intended for the enclosures in Baden-Württemberg (JACOBS 2010, 46–47; for Aue: see above) (Fig. 7). Mappings visualise the wide fields of vision of the enclosures: the wide sight into the Rhine valley for the Kraichgau enclosures (Fig. 8), and into the Neckar valley for the Neckar enclosures. In contrast to the enclosures, open sites are situated in rather hidden places. Remarkably, the open sites have no sight connection to the prominent enclosures. This is valid for both Neckar and Kraichgau regions.

As for the occupied soils, in Baden-Württemberg MK sites were found exclusively on — not at the edge of — loessic soils (Fig. 9). This so-called »Altsiedelland« is most apt for growing cereals and was occupied since the Linear Pottery culture. However, the Epiroessen sites are also situated on less favourable soils, like on the Schwäbische Alb (Swabian Mountains) or morainic soils of the prealpine region; for instance, in Oberschwaben (Upper Swabia) (Fig. 10).

The preference of the MK for the climatically most favourable regions in Baden-Württemberg can be shown by a map showing the moment of the first blossom of snowdrops, indicating short winters. MK sites are restricted to regions with short winters (HEUMÜLLER et al. 2012, 57 Abb. 27), whereas Epiroessen sites can also be found in climatically less favourable regions (ib. Abb. 28). As the regions with the earliest moments of the blossom of snowdrop are in Baden-Württemberg mainly congruent with the loess areas, the expansion of the MK was restricted clearly not only to loessic soils but also to regions with short winters.

Following the interpretation of RAETZEL-FABIAN (1999, 93 f.), building an enclosure was an »act of foundation« when occupying a new territory. Therefore, for Baden-Württemberg, all known sites of the late Neolithic (Jungneolithikum) were mapped, for the first time together MK as well as Epiroessen groups. The mappings were separated according to the stages MK I–III.

On the map for the sites assumed to be contemporary during MK I (Fig. 11), the known MK I/IIa enclosures Aue and Ilsfeld are placed at the edge of the MK area. However, comparing the distribution of the MK sites with the distribution of the Epiroessen sites, no closed »MK area« seems to exist. The sites with MK ceramics appear to be rather dispersed in a generally »cultural mixed area«, as the sites with Epiroessen ceramics (Bischheim, Schwieberdingen, Aichbühl, Merdingen, BBOB) themselves show a highly mixed pattern. Apparently, during this stage the groups practised a certain openness, at least regarding the use of decorated ceramics, whether connected with migration of people or not.

More doubts concerning the pattern of »founding enclosures at the edge of the expansion of the MK area« exist for stage MK II in Baden-Württemberg (Fig. 12). At this time, a separation between an area of sites with MK ceramics and an area of sites with Epiroessen ceramics (Schussenried) takes place. Evidently, the cultural behaviour - expressed by the use of decorated pots - had changed, while at the same time a reduction of applying decorated ceramics can be observed, in so far as quasi exclusively bottle-shaped pots were decorated. Perhaps the decorated ceramics now played a more decisive role in presenting, offering or sharing liquids. Some sites with MK ceramics spread into the »foreign territory« of the Neckar and the Donau Schussenried sites (e.g. Leonberg-Höfingen; Ludwigsburg »Schlösslesfeld«; Siedlung Ehrenstein). However, the enclosures that were newly founded during MK II - id est »Altenberg« and »Hetzenberg« – are not situated at the border between MK and Schussenried area, but rather in »old MK regions« in the »Hinterland«.

From stage MK III onwards, the sites with MK ceramics begin to replace — or displace — the sites with Epiroessen ceramics (Fig. 13). This expansion of the MK area was repeatedly stressed (KEEFER 1988; SCHLICHTHERLE 1991; 1998; LÜNING 1998) and can be observed in the Neckar region in the area south of the Zaber, as well as in Upper Swabia and down to Lake Constance (SCHLICHTHERLE 1998). Until now, no new foundation of an enclosure during MK III can be proven. However, taking into account that the typological stages MK III and MK IV cannot be divided clearly (MATUSCHIK 2011), the enclosure of the »Michelsberg« near Untergrombach could have been founded already during MK III or MK III/IV, instead of MK IV.

Untergrombach »Michelsberg« is an example of a monumental enclosure that was newly founded in the western area of the MK, later than the »horizon MK I—II« (vgl. Geschwinde/Raetzel-Fabian 2010, 186 Abb. 142). Recent geophysics showed that its ditches enclosed an area of 8,5 ha (seidel et al. 2009, 26) and

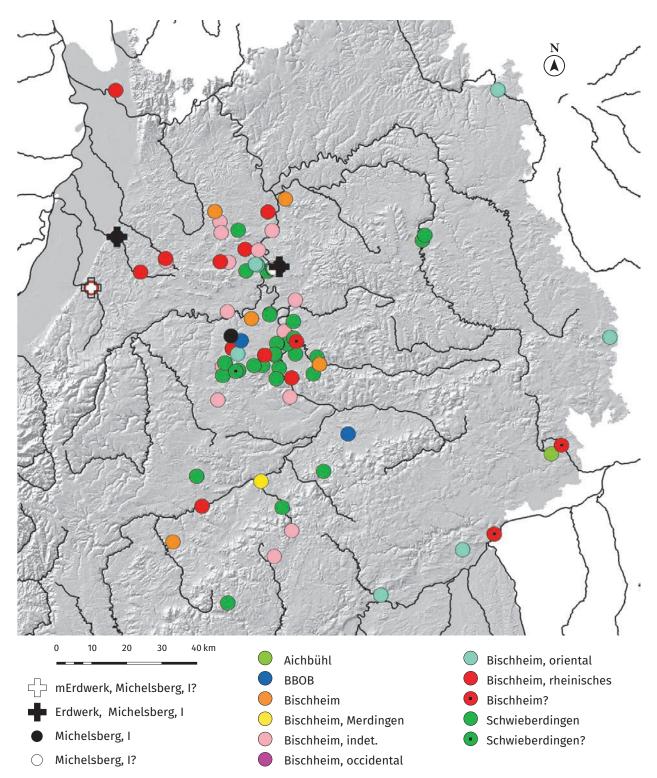
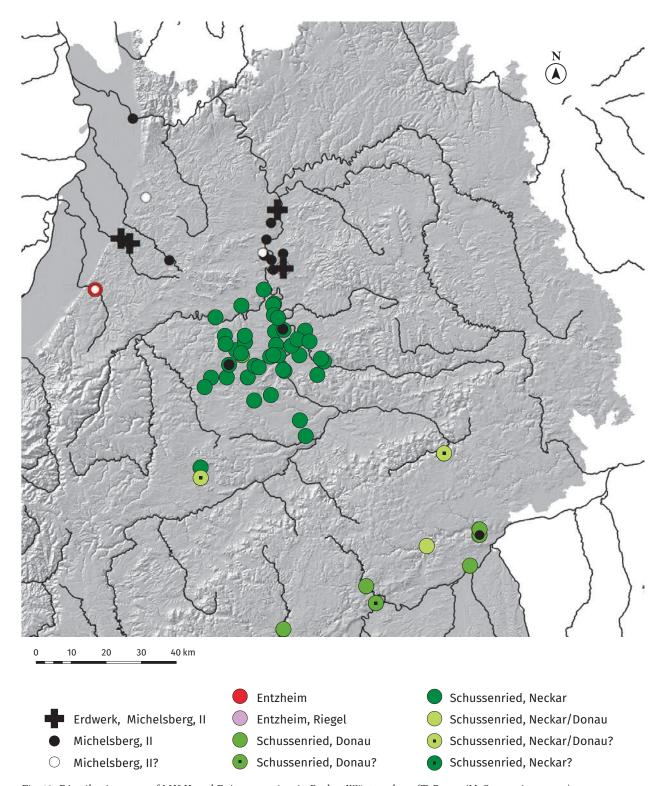


Fig. 11. Distribution map of MK I/IIa and Epiroessen sites in Baden-Württemberg (T. BAUM/U. SEIDEL in prep.).



 $\textit{Fig. 12. Distribution map of MK II and Epiroessen sites in Baden-W\"{u}rt temberg~(\textit{T. Baum/U. Seidel in press~a}). \\$ 

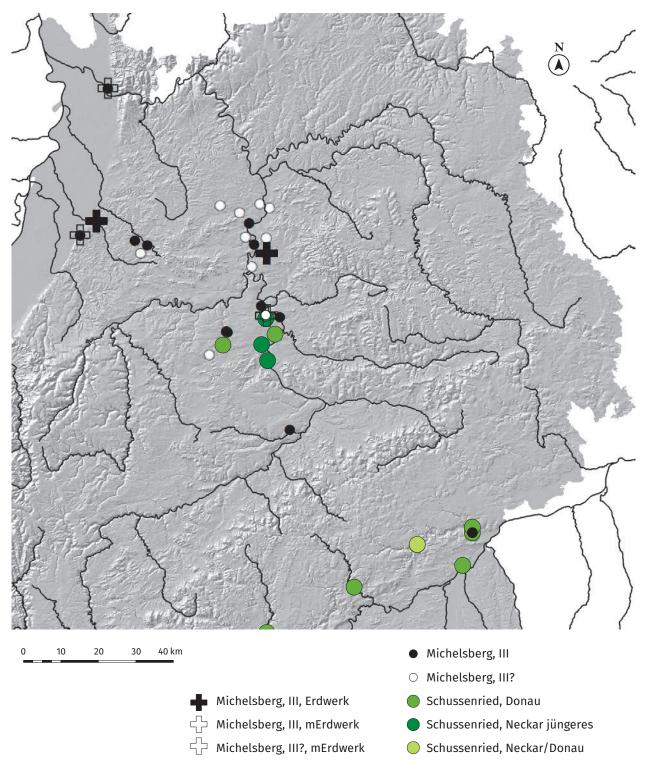


Fig. 13. Distribution map of MK III and Epiroessen sites in Baden-Württemberg (T. BAUM/U. SEIDEL in prep.).

KARSULM- REISESHEIM TZENBERG«	ELD »EBENE«	LBRONN- NGENBERG HLOSSBERG«	NBERG .BERBERG«	CHSAL- ) ELSHEIM 'ENBERG«	CHSAL »AUE«	CHSAL- ERGROMBACH CHELSBERG«	CHSAL HEELKOPF«
NEC OBE »HE	ILSF	HEIL KLIN »SCH	LEOI	BRU( HEID »ALT	BRU	BRU UNT »MIC	BRU »SCF
_	Bischheim	_	Bischheim	_	_	_	_
_	MKI	_	_	_	MK IIa	_	_
MKII	MK II	MK II	_	MK II	MKII	_	_
_	MK III	MK III	_	_	MK III	MK III	_
_	MK IV	MK IV	_	_	MK IV	MK IV	_
_	_	MK V/Mz	MK V/Mz	_	MK V	MK V/Mz	MK V/Mz

Tab. 1. Occupation phases of the eight enclosures of the MK in the north of Baden-Württemberg, as investigated so far. – Fat types: enclosure phase veryfied – Narrow types: occupation phase without verification of an enclosure.

therefore that it ranges among the monumental enclosures (of »Kategorie Bc«: RAETZEL-FABIAN 1999, 90ff.) and not among the smallest ones (GESCHWINDE/RAETZEL-FABIAN 2010, 214 Abb. 158). In any case, Untergrombach was founded in the »MK Hinterland« of the MK area, and the expansion of MK settlements and/or ceramics seems to take place without any foundation of an enclosure in the newly-occupied areas.

Therefore, at least for the case of Baden-Württemberg, there are doubts that building an enclosure formed an indispensable part of occupying a new territory by the MK.

Evidently, the MK was more successful in expanding to and keeping regions most favourable for agriculture in climate and soil. In Baden-Württemberg, this happened at the expense of the Epiroessen groups.

From the beginning of the South-German late Neolithic (Jungneolithikum) – ca. 4300 BC – onwards, an expansion into hitherto-unsettled landscapes took place. However, this foundation of new settlements on less favourable soils and in regions with less favourable climate was undertaken by people living in the Epiroessen tradition, not by the MK.

One interpretation could be that the MK displaced the Epiroessen settlements because the MK tradition obliged the MK to occupy regions favourable for growing their reduced range of cereals. Recent botanical investigations link the MK with the growing of naked wheats, including tetraploid and hexaploid naked wheat (KIRLEIS/FISCHER 2014; KREUZ et al. 2014). Tetraploid-free threshing wheat belongs to the western tradition of neolithisation, based in the Mediterranean region (MAIER 1998) and short winters and dry summers are favourable for its yields (KIRLEIS/FISCHER 2014, 82). By contrast, the Epiroessen groups seem to have grown a wider range of cereals, known

since the Linear Pottery culture. In the investigated cases, spelt cereals were dominant, like Einkorn in the Schwieberdingen and Schussenried site of Leonberg-Höfingen, or Emmer in the Schussenried sites of Ehrenstein and Ludwigsburg »Schlösslesfeld«. A change towards naked wheats only seems to have taken place at the end of Schussenried and transition to the MK (MAIER 2004, 347 f.). Most probably, these naked wheats included hexaploid naked wheat (bread wheat), which has – in contrast to tetraploid wheat – a profit from rain during summer and a more continental climate (KIRLEIS/FISCHER 2014, 82).

It is important to stress that there are far too few botanical investigations for both MK and Epiroessen sites in the south of Germany to compare the plant economy of the respective culture traditions.

Much too little investigation has been conducted for faunal remains. Concerning the question of whether the MK economy was mainly based on cattle breeding, it is important to stress that the few osteological results for the Braunschweig enclosures do not display evidence of a specialisation in cattle breeding in this area (S. Grefen-Peters in GESCHWINDE/RAETZEL-FABIAN 2010). For the MK enclosures of Baden-Württemberg – with the exception of Neckarsulm-Obereisesheim »Hetzenberg« (BEYER 1972; STEPHAN 2008) – a predominance of cattle cannot be shown by the osteological remains throughout the MK (STEPPAN 2003; STEPHAN 2008, 184 with Abb. 42 and 241), nor can a contrasting dominance of cattle in MK contexts regarding the contemporary sites of the Epiroessen, Hornstaad and Pfyn groups be proven. Among the pending questions is to which race the Neolithic cattle belonged and whether they were reliant on pleasant climatic conditions. Regarding the predominance of domesticated animals, cattle and sheep/ goat of »Hetzenberg«, the osteological evidence hints at

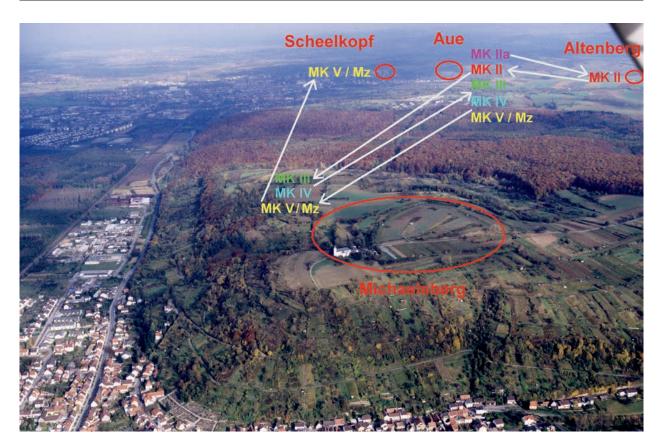


Fig. 14. »The Heilbronn-Kraichgau Model«: The dashes outline how the change of activities between the shown enclosures hypothetically could have taken place. – Arial photography of the »Michelsberg« near Bruchsal-Untergrombach, Lkr. Karlsruhe, which gave its name to the »Michelsberg Culture«. (Landesamt für Denkmalpflege im Regierungspräsidium Stuttgart Arial photography L6916-040-01\_849G-02. Photo: Otto Braasch. – Thematic additions: B. Regner-Kamlah and U. Seidel).

the exchange or barter of already-slaughtered animals rather than animals that were still alive (SCHMID 1958, 52; STEPHAN 2008, 235ff.).

Referring to the Braunschweiger Harzvorland, pollen profiles seem to indicate that from 4000 BC onwards indicators for settlement activities increase after a hiatus since the Linear Pottery culture (GESCHWINDE/RAETZEL-FABIAN 2010, 205f.).

As the enclosures of the Braunschweiger Harzvorland are located at the very edge of the MK sphere, some of them may be Funnel Beaker enclosures, while some of them could also represent the interaction sphere between MK and Baalberge groups (BERAN 1993, 74 Karte 1; GESCHWINDE/RAETZEL-FABIAN 2010, 202ff. Abb. 153). Regional differences between »MK areas« should therefore be taken into account.

#### CONCLUSIONS

In the regions of the Neckar Valley and the Kraichgau, six enclosures of the MK type are investigated and therefore dated. This dating was mainly undertaken by typological investigation of the ceramic finds, supplemented by absolute datings: Bruchsal »Aue« (MK IIa-V), Bruchsal »Scheelkopf« (MK V/Mz), Bruchsal-Heidelsheim »Altenberg« (MK II) and the eponymous earthwork of Bruchsal-Untergrombach »Michaelsberg« (MK III, IV), Leonberg »Silberberg« (MK V/Mz), Heilbronn-Klingenberg »Schlossberg« (MK V/Mz), Neckars-

ulm-Obereisesheim »Hetzenberg« (MK II) and Ilsfeld »Ebene« (MK I–IV) (Tab. 1).

According to the typological stages present in the enclosures in the Neckar and the Kraichgau region, during all stages of the MK more than one enclosure could have been in use at one time. This could be called »Model One«.

Taking into account the pattern of the reconstruction phases and the filling phases – which was shown exemplarily for the ditch system of »Aue« – a second model is favoured here. This model implies a

change of activities between neighboured enclosures. Confirming former modelling for the Neckar region (SEIDEL 2008; JACOBS 2010), here it is called the »Heilbronn-Kraichgau model« (Fig. 14).

Following the »Heilbronn-Kraichgau model«, there was a minimum change by – hypothetically (!) – first activities in the Kraichgau region beginning at »Aue« (MK I/IIa), shifting to »Altenberg« (MK II), coming back to »Aue« (MK II), changing to the »Michelsberg« (MK III/IV), then back to »Aue« (MK III/IV), again to »Michelsberg« (MK V/Mz) and eventually shifting to the »Scheelkopf« (MK V/Mz), *if* there were not more shifts between the enclosures and *if* we know all enclosures in this area of the Kraichgau. This model of shifting activities could also be valid for other regions with MK enclosures and this could explain the very low distances between enclosures in some areas (SEIDEL 2013, 209).

Concerning the interpretation of the functions of the MK enclosures, it seems to be clear that the earthworks had a special function for the MK society, although findings hinting at the social order of a MK society are rare.

The MK enclosures were built in the same way throughout the MK and therefore they are a defining feature of the MK. It can be assumed that comparable reasons led to the construction of an MK enclosure.

Based on recent investigations in the north of Baden-Württemberg, a MK enclosure comprised a system of segmented ditches, rampart and berm. A construction merely out of single pits (»Grubenanlage«/»Rosheim model«) could not be verified.

A ditch system does not seem to have been required for activities at a place at every time. The ditches of the enclosures show hints for interruptions of use and repeated reconstructions (»recuttings«). This led to the »Heilbronn-Kraichgau model«, which is presented here. It proposes a shift of activities between several neighboured enclosures within a region, including the »reuse« of a place with enclosure.

Digging a ditch was not an effort so huge to be a construction for generations and only made once within many generations; on the other hand, it demanded a certain planning and investment of labour, which could not have been an answer to a spontaneous request. The ditch systems of the MK enclosures have defending qualities as well as symbolic and representative qualities. They are appropriate to display power, over land – including agricultural land and

route systems — and people. Moreover, they are suitable to defend »real« wealth like crop or cattle, as well as symbols of wealth or power. A community gathering — even temporarily — within or/and outside an enclosure could have been entered into a space of special laws, whether this community had been composed or not by different social, political or even ethnic groups, or whether a group or a person of political and/or religious importance had been present inside the enclosure, giving importance to it. The site of an enclosure is suitable for repeated social events, like fairs, markets, religious feasts, etc. (SEIDEL 2008, 384).

Enclosures must have been central places in the settlement system of the MK, taking into account the small and short living open sites of the MK.

The difficulty to detect a representative number of open sites contemporary to the estimated occupation phases of the earthworks prohibits statements about »territories«.

The enclosures in Baden-Württemberg occupy protruding elevations, widely visible and topographically important places that dominate a route system given by topography. By contrary, no visual contacts neither between contemporary earthworks nor to surrounding open settlements can be shown for the north of Baden-Württemberg.

In Baden-Württemberg, the classical MK sites are restricted to regions with loessic soils and short winters, id est most favourable for agriculture.

As enclosures were not built by the neighboured Epiroessen groups nor by Hornstaad and Pfyn groups, the enclosures were probably a factor that helped the MK community to stabilise and expand. In Baden-Württemberg, the expansion of the MK sphere took place without the foundation of enclosures at a »frontier« to areas occupied by neighboured culture traditions.

It is remarkable that the expansion of the MK took place in regions that were already occupied, in Baden-Württemberg by the Epiroessen, as well as by the Hornstaad and Pfyn groups. Later, the MK was contacting Altheim in the east, Munzingen and NMB to the west, Baalberge, Wartberg and Funnel Beaker groups to the north. At least in Baden-Württemberg, settlements in previously-unoccupied regions — signifying a real »expansion of settlement area« — were founded by the groups of Epiroessen tradition, not by the MK. In this respect, regional differences for the MK could emerge.

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# Monumental sites in the landscape. World of the dead and living world during the Middle and Late Neolithic in Western-Central France

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#### **ABSTRACT**

On the Atlantic coast of Europe, two forms of monumental architecture appeared during the Neolithic period at the end of the 5th millennium BC: the megalithism of the world of the dead and the causewayed enclosures of the living world. These two architectures are involved in the social and symbolic construction of landscapes and territories. Through a study conducted as part of a collective research project on a portion of the Charente valley located in west-central France, we have sought to link these two worlds

by conducting new fieldworks (excavations, multi-methods surveys) and implementing spatial analysis. Through analysing the distribution of these sites and visibility areas, we have attempted to determine the choice of implantation and the territorial frames between the Middle Neolithic and the Late Neolithic. Aggregation phenomena between domestic and burial sites and visibility boundaries are observed and reveal the evolution of the occupation dynamics during the Middle and Late Neolithic.

#### RÉSUMÉ

Sur la façade atlantique de l'Europe, deux formes d'architectures monumentales apparaissent au cours du Néolithique à la fin du 5° millénaire avant notre ère: le mégalithisme du monde des morts et les enceintes fossoyées du monde des vivants. Ces deux architectures participent à la construction sociale et symbolique des paysages et des territoires. À travers une étude menée dans le cadre d'un projet collectif de recherche, sur une portion de la vallée de la Charente située dans le Centre-Ouest de la France, nous avons cherché à lier ces deux mondes en mettant en œuvre

de nouvelles opérations de fouilles, des prospections multi-méthodes (pédestres, aériennes et géophysiques) et des analyses spatiales. Grâce à l'analyse de la distribution de ces sites et des aires de visibilité nous tentons de déterminer les choix d'implantation des sites et les trames territoriales entre le Néolithique moyen et la fin du Néolithique. Des phénomènes d'agrégation entre sites domestiques et funéraires et des frontières de visibilité sont observés et révèlent des dynamiques d'occupation de l'espace évolutives au cours du Néolithique moyen et récent.

# INTRODUCTION

During the Neolithic of Atlantic Europe, the architectural monumentality takes two main forms: ditched enclosures from the living world and megalithic tombs for the world of the dead. These architectures emerge between the late 5<sup>th</sup> and early 4<sup>th</sup> millennium BC in west-central France and participate in a social and symbolic construction of Neolithic landscapes, like in northern Europe later (MÜLLER 2014). Socially valued and visible from afar in the long term, these two types of sites have clearly played a major role in the construction of Neolithic territories.

However, these sites were studied independently in most cases, mainly due to a supposed shift in their

emergence, without seeking to understand their spatial relationships and their respective roles in the territorial network. Owing to their monumentality and durability, these sites have had a major impact on landscape even after their abandonment, as can be seen by the role of some megaliths as landmarks until now.

In west-central France – like elsewhere in Europe – burial sites were first studied and excavated from the late 19<sup>th</sup> century, enjoying the richness of Atlantic megaliths. The development of extensive surveys – especially by plane – since the 1950s allowed a renewal of the data by the discovery of numerous causewayed enclosures between the Loire and

the Dordogne rivers (e.g. CASSEN 1987; BURNEZ/ LOUBOUTIN 2002). As part of two successive Collective Research Projects (PCRs) between 2013 and 2015 and subsequently between 2016 and 2018 – funded by the French Ministry of Culture and the department of Charente – we hired a research program on one of the richest sectors of west-central France in Neolithic heritage: North Charente. In this area – which covers the »Ruffécois« and the northern »Angoumois« – the Charente river forms a succession of meanders near which many Neolithic sites - enclosures and megaliths – were discovered. Apart from old explorations of megaliths (BURNEZ 1976) and a few more recent excavations (GAURON/MASSAUD 1983; JOUSSAUME/ PAUTREAU 1990), the sites of this region are mostly unexcavated.

In this sector, the research conducted over the past twenty years by Roger Joussaume (Joussaume et al. 1998), Luc Laporte and Elias Lopez-Romero (Lopez-Romero et al. 2010; Laporte et al. 2014) has only concerned a spatial analysis of megalithic monuments, schematically organised around four major necropoles (Luxé/Fontenille, Tusson, the Boixe forest and Chenon). Their works are interested in both the distribution of these monumental barrows in this area as well as the structuration of the landscape that can be inferred. They showed that the long barrows are mainly located on the highlights along the ridge lines. This materialises at Luxé/Fontenille and Tusson necropoles by alignments of long barrows surrounded

by smaller satellites circular barrows. The other two necropoles (Boixe and Chenon) have different configurations: the barrows that compose them – mainly circular – are distributed more randomly. Furthermore, the visibility study by Elias Lopez-Romero and Luc Laporte (Laporte et al. 2014) has also revealed that the monuments of the necropolis of Chenon are excluded from the visibility zone of the other monuments and appear to respond to other norms of visibility.

Our project – which includes the inventory and mapping of all the Neolithic sites as well as geophysical surveys and excavations of some of them – is based on several questions concerning the links between the living world and the world of the dead in the construction of Neolithic landscapes: Are these two worlds entirely independent? What is the distribution of enclosures and barrows structures the Neolithic landscape? Is it arbitrary or does it respond to cultural, economic or symbolic norms? Are everyday objects and funeral deposits the same? What are the environmental impacts of the construction of monumental buildings?

This paper aims to explore one of the questions of this project – namely concerning the territorial organisation of the study area – based on data renewed by new excavations and through spatial analysis tools such as visibility analysis. After presenting the corpus, objectives and methods of the study, the preliminary results of the spatial analysis will be presented following chronological period.

# **OBJECTIVES AND CORPUS**

# Objectives of the study

This study aims to analyse the place of monumental sites in a micro-territory of west-central France – the »Ruffécois« - between 4500 and 2200 cal BC, covering the Middle Neolithic and the Late/Final Neolithic periods. In this sector, the research conducted over the past twenty years by Roger Joussaume (Jous-SAUME et al. 1998), Luc Laporte and Elias Lopez-Romero (LOPEZ-ROMERO et al. 2010; LAPORTE et al. 2014) has only concerned the spatial analysis of megalithic monuments, schematically organised around four major necropoles (Luxé/Fontenille, Tusson, the Boixe forest and Chenon). Their works is interested in both the distribution of these monumental barrows in this area as well as the structuration of the landscape that can be inferred. They showed that the long barrows are mainly located on the highlights along the ridge lines. This materialises at Luxé/Fontenille and Tusson necropoles by alignments of long barrows surrounded by smaller satellites circular barrows. The other two

necropoles (Boixe and Chenon) have different configurations: the barrows that compose them – mainly circular – are distributed more randomly. Furthermore, the visibility study by Elias Lopez-Romero and Luc Laporte (Laporte et al. 2014) has also revealed that the monuments of the necropolis of Chenon are excluded from the visibility zone of the other monuments and appear to respond to other norms of visibility.

As already mentioned, previous spatial studies (LAPORTE et al. 2014) have mainly been interested in funerary sites, not incorporating domestic and/or defensive sites in their corpus due to a lack of usable data at this time. Since 2008, the discovery and excavation of several causewayed enclosures dated from the Middle and Late Neolithic at Chenommet (ARD 2014), Chenon and Charmé (ARD, forthcoming) — associated with the intensification of aerial and geophysical surveys — allow us to integrate the living world into new spatial analyses. For a more comprehensive approach in the context of our project, we considered it important to focus on all known domestic sites, included

stray finds, starting with the most important (enclosures) like in this paper. This first exploratory study focused on two main issues:

- What are the territorial frames for the Middle and Late/Final Neolithic?
- For these two periods, which are structural elements of »territory«? In other words, do enclosures and/or barrows play a role in structuring the occupied landscape?

Through a systematic research of Neolithic enclosures by aerial and geophysical surveys and architectural and technological review of megalithic monuments, we have also sought to understand how the landscape has changed time through these monumental sites, across more than two millennia.

# Corpus of sites

In the current state of research, 89 monumental Neolithic sites – including 65 megaliths and 24 enclosures – have been identified in North Charente. Their spatial distribution within the study area appears to be clearly heterogeneous (Fig. 1). We also map in figure 1 the thirteen sepulchral caves inventoried by B. Boulestin (UMR 5199 Pacea, Bordeaux) used during the Middle and Late/Final Neolithic. Before conducting a precise spatial analysis, it is necessary to question the representativeness of our study sample and the possibility that the heterogeneity of the distribution is related to a documentary bias.

In our case study, this heterogeneous distribution is clearly influenced by the amount of data from pedestrian and aerial surveys, which are themselves biased by the current vegetation cover (Fig. 2). Thus, two areas in the south-west (»Rouillacais«) and the north-east of the study area (»Nanteuil-en-Vallée surroundings«) are not representative due to a vegetation cover that handicaps aerial surveys (vineyards and meadows)

# Archaeological data: BD PCR Nord-Charente Gis data: BD Active denclosures and barred spurs Funeral sites (dolmens, barrows) Menhirs Sepulchrales caves

Fig. 1. Corpus dataset: distribution of various types of sites in the North of the Charente French department (PIL-LOT L. 2016, QGIS 2.10.1, PFT GéoBFC, MSH Dijon, UBFC).

and the scarcity of data on pedestrian surveys. However, the rest of the territory is well documented, including forested areas (Boixe and Braconne forests) that have recently been covered by LIDAR for another project (GEOLAB, Limoges). The spatial analysis presented in this paper is therefore focused on the best-documented sector, namely the edge of the North Charente valley, precisely the »Ruffécois« area.

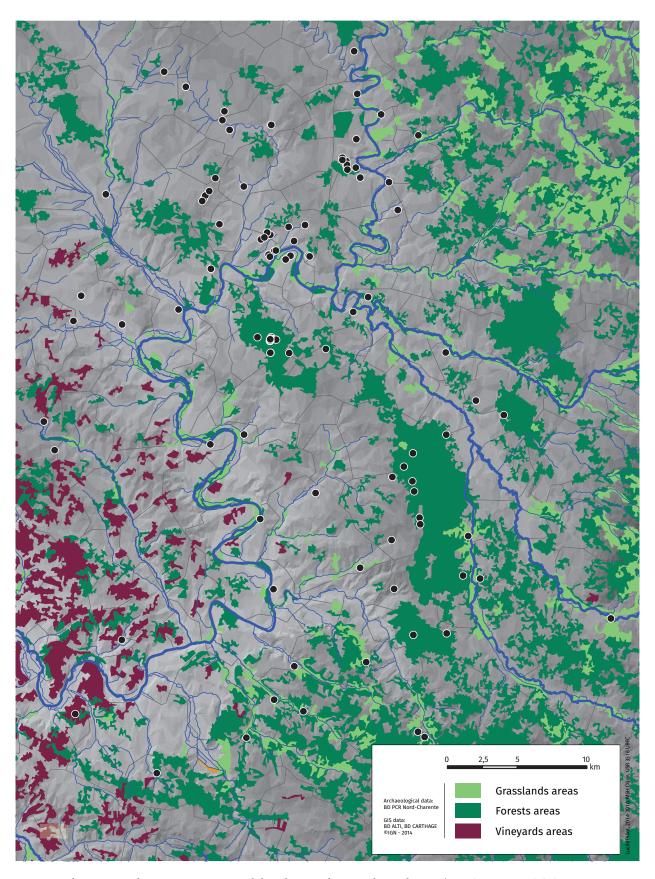
# METHODOLOGY OF SPATIAL ANALYSIS

To conduct this study, a methodology using GIS was implemented to observe the territorial frame of the sites through observation and description of these and the characterisation of their spatial distribution. The next step is to understand whether there is a recognisable territorial model from the distribution of monumental sites, using several methods of analysis such as statistical spatial analyses and distances calculations. Moreover, topographic and visibility analyses are realised.

# Spatial distribution of sites

With the aim of characterising territorial frame, various spatial indexes were computed through geoprocessing, spatial and statistical analyses.

GIS methods based on the distance calculation were used to describe spatial distribution. These measure the trend of the sites to be clustered or dispersed in space.



 $\label{eq:power_problem} \textit{Fig. 2. Landcover map of current vegetation and distribution of sites in the study area (PILLOT L. 2016, QGIS 2.10.1, PFT G\'eoBFC, MSH Dijon, UBFC).}$ 

Euclidean distances between sites were computed (PUMAIN/SAINT-JULIEN 1997). Later, these theoretical distances will be weighted according to the topographical and environmental context. The Average Nearest Neighbour Analysis Index (EBDON 1985; aggregation  $\leq$  NNh index =  $1 \geq$  dispersion) provides a relevant indicator of the spatial distribution, calculating an index of the nearest neighbour based on the average distance of each entity from its nearest neighbourhood. The Poisson index, noted R is computed by GIS methods (PUMAIN/SAINT-JULIEN 1997), testing the hypothesis of a random distribution corresponding to a Poisson process. This is based on the NNh analysis, comparing the studied point pattern with an estimated theoretical homogeneous distribution according to the Poisson process (R = 0: aggregation  $\leq$ R = 1: random  $\ge R = 2$ : dispersion). All of these indicators provide the global trend of the spatial distribution of sites. In order to describe territorial local structures, we use spatial statistical methods, attempting to identify spatial concentrations and distance thresholds at which these aggregates appear and disappear in space (aggregate sizes). We use many functions such as Ripley's K and Besag's L, which are based Monte Carlo iterations (RIPLEY 1976, 1977, BESAG/DIGGLE 1977, DIGGLE 2003). With these MC iterations we estimate simulation envelopes, based on the null hypothesis of the tested process. These MC simulation envelopes are used as a confidence interval in the correlogram, resulting in a »line of demarcation« between aggregate, random or regular distributions (for more information about this method, we refer to the methodological literature: RIPLEY 1976, 1977; BESAG/DIGGLE 1977; DIGGLE 2003). We use an amelioration of these methods, which allows adapting the tested statistical assumptions and calculation routines to the specifics of archaeological data corpus (PILLOT/SALIGNY 2012; PILLOT et al. 2013). Improving the method used mainly relates to the fact that these methods were inappropriate in theory to analyse non-stationary points pattern, or even heterogeneous and incomplete datasets such as the archaeological one. To overcome this, we have drawn on Ecology's methods, computing derivatives functions such as Kinhom and Linhom, which are more suitable for non-homogeneous processes1 (CUZICK/EDWARDS 1990; DIGGLE/CHET-WYND 1991; BADDELEY et al. 2000; PÉLISSIER/GORE-AUD 2001; MARCON/PUECH 2003; PILLOT/SALIGNY 2012; PILLOT et al. 2013). Through implementing these

functions, we were able to describe both the structure and behaviour of the points pattern (aggregation or dispersion in space). It assesses whether site clusters are statistically detectable, as well as clusters' sizes.

Second, the cartography of these clusters is performed, notably the organisation of sites within them. We calculated buffers using the distances thresholds identified by the methods explained above: we could analyse finely the distribution of sites into these buffers. It is noteworthy that this cartography allows determining the role of monumental sites in these clusters of sites (geographical and topographical locations, interactions between Neolithic sites, etc.).

# Visibility approaches

Given that one of the main objectives is to determine the role of enclosures in the Neolithic territorial frame, we have chosen to apply these methods mainly from the corpus of this type of site, unlike previous works based on megaliths, particularly regarding the visibility calculations (WHEATLEY/GILLINGS 2000). Through a visibility analysis, we seek to determine which areas can be viewed from an enclosure, assuming that they played a role in controlling part of the occupied space. By extension, we observe what other sites are in this field of view, particularly the megalithic sites. It is recalled that methodological problems are inherent in this analysis (LLOBERA 2012; WHEATLEY/ GILLINGS 2000), primarily the uncertainty remains about the land cover in the study area. In this preliminary study, we did not consider the environmental impact of land cover given the lack of paleoenvironmental data for this period.

In this study, we consider that the analysis of visibility – on bare land – provides information about a potential maximum visibility. Furthermore, a debate exists in the literature on the limits of perception offered by human capacities compared to numerical analyses of potential visibility. In spatial archaeology studies, this parameter – the human eye's, namely visual field ability—is often ignored (WHEATLEY/GILLINGS 2000; CONOLLY/LAKE 2006). Some landscape works provide classification levels according to the visible perception of the observer as the distance (HIGUCHI 1983). These theories are used in visibility studies applied to archaeological corpus (WHEATLEY/GILLINGS 2000), especially Ruffécois mounds study (LAPORTE et al. 2014). This

1 The intensity of the point process is weighted by the local distances or variations based on a parameter underlying that could influence the spatial distribution of points.

latest study used the indices of visual landscape structure proposed by T. Higuchi for setting its visibility studies. This parameter was taken as part of our study, but adapted to our aims: a long limit has been adopted by considering a radius of 20km of distance around each site as the maximum field of vision2. These visibility studies are based on the confrontation of two factors: the distribution of sites and the topography. A visibility study can be evaluated qualitatively (geographical location in relation to landscape and landforms, etc.) or quantitatively, by using a DTM (Digital Terrain Model), obtained in our case by the BD ALTI° (IGN – 2011). In the case of our study, it is the BD ALTI° in 25 m, which agrees well with a micro-regional type of study. Through visibility calculations computed by GIS methods, we seek to identify which areas are viewed from a point in

space (observation entities). This analysis uses a terrain on which theoretical visibility lines are projected in all directions from an observation entity. For each cell of the terrain (DTM), the visibility calculation verifies the position according to the theoretical line of sight. We resort to the calculation of the Cumulative Viewshed Analysis. It represents the addition of all visibility fields for several entities sightings. As a result, it gives the total area visible from several observation points: the values obtained range from 0 to the maximum number of observations entities (visible from all the observation points of the DTM; WHEATLEY 1995). This analysis provides a synthetic image of the visual exhibition of the landscape. This analysis was used as a synthetic calculation in our stud, to assess the most-viewed areas and those that are excluded from potential visibility.

# PRELIMINARY RESULTS: A DYNAMIC VIEW OF THE LANDSCAPE BASED ON NEW FIELD DATA

# The Middle Neolithic (c. 4500 – 3600 cal BC)

#### Discoveries of Middle Neolithic enclosures

For the Middle Neolithic period, regionally dated between c. 4500 and 3600 cal BC, we have a corpus of 63 sites, including 60 megaliths (dated or supposed to be dated from this period) and 3 enclosures. In North Charente – like throughout west-central France – the number of domestic sites and enclosures dated to this period is very low. Only three enclosures are attributed to this period, thanks to recent excavations: Chante Grolle at Mornac (s. DUCONGÉ, unpublished) and l'Echalette at Chenon and le Peu at Charmé, both excavated during our project in 2013 for the first site and 2014 and 2015 for the second. These last two enclosures present architectural affinities such as the association of a large external ditch associated with an internal palisade and the use of earthen material for the construction.

During the first excavation of the causewayed enclosure of le Peu at Charmé in 2014, we explored a monumental entrance system combining a large external ditch, internal palisades and row of postholes (Fig. 3). This entrance presents an original feature — regionally named »pinces de crabe« (crab claw) (BURNEZ/LOUBOUTIN 2002) — corresponding to a portion of ditch joined to an edge of the external

ditch, which is dated by the material from the Middle Neolithic. The emergence of »crab claw« features was traditionally dated from the Late Neolithic, so this exemplary is the oldest known in Western France.

In 2015 and 2016, new excavations and geophysical surveys of the internal space of this enclosure showed the existence of at least four houses on wooden posts, burning and waste pits and especially contemporary levels of the Middle Neolithic occupation kept in place at a former marsh bank for a probably considerable surface (3 ha?). Original features were discovered at this level, such as double palisades and a possible trap for fish. The site of le Peu at Charmé – occupied around 4400 cal BC – already appears as key to the knowledge of the emergence of domestic monumentality.

# New data on Angoumoisin-type dolmens

By contrast, almost all of the megaliths were erected at that time, around five areas or necropolis (Chenon, Tusson, the Boixe, Luxé/Fontenille, Braconne). As shown by the excavations in the tumulus of the Boixe C (GOMEZ DE SOTO 1998) and la Petite Pérotte at Fontenille (ARD et al. 2016a) as well as the nearby necropolis of Bougon (MOHEN/SCARRE 2002), these monuments were built during the Middle Neolithic

- 2 In the current state, we have not taken into account other indicators that would hold value in the setting, such
- as the potential height of monumental structures present on the sites studied.



Fig. 3. The causewayed enclosure of le Peu at Charmé (Charente, France) dated from the Middle Neolithic, around 4400 cal BC (CAD V.-E. Leroux and V. Ard; geophysical survey V. Mathé, A. Camus and V. Legrand – La Rochelle University/ULR Valor; aerial photography IGN).



Fig. 4. The dolmen of la Grosse Pérotte at Fontenille (Charente, France): well-squared and well-joined orthostats of the funeral chamber (photo: V.-E. Leroux).

and reused until the end of the Neolithic, in the 3<sup>rd</sup> millennium. This area is characterised by an original passage grave type: the Angoumoisin-type dolmens (BURNEZ 1976).

This type of dolmens is the perfect illustration of a highly-refined art of working stone (ARD et al. 2016b). Shaped with a very high level of finish (Fig. 4), the monoliths are likely the result of specialised workshops that were able to successfully transmit this technical tradition for centuries (second half of the 5<sup>th</sup> and first half of the 4<sup>th</sup> millennium).

The Neolithic builders mobilised considerable energy to snatch blocks to the substrate in difficult conditions, like for the capstone of la Petite Pérotte at Fontenille, a 40-ton block originally hung in a 45° slope on the banks of the Charente. More massive still, the capstone of the monument of la Grosse Pérotte at Fontenille weighs about 100 tonnes and comes from an outcrop located approximately 5 km from the place of edification (geological determination D. Poncet).

At the centre of the monument, the burial chamber focuses all the attention of the builders. The contiguous and well-shaped pillars create a perfect interior. On the contrary, the monoliths of the gallery entrance are very irregular and crude of crude shaping. At the dolmens of la Motte de la Jacquille

and la Petite Pérotte at Fontenille, we even observed an increase in the degree of development of the orthostats, approaching the burial chamber. To this monument a door is added that pivots on a tenon in a pivot bearing carved into a sill stone (GAURON/MASSAUD 1987). It is unique in the European megalithism. This door weighs about 300 kg and was probably inspired by a wooden model.

Inside the burial chamber, mineral walls show symbolic encodings built on geology, natural colours, the shape of the visible faces, the shape of the peaks and especially the treatment of surface states. Through effects of »staging«, some walls are intentionally valued by the builders. Finally, on the site of la Motte de la Jacquille (Fig. 5), many anachronisms have been recorded compared to the »standards« of Angoumoisin-type dolmen (ARD et al. 2016b). For example, one orthostat has two interlocking grooves, one active on the main face and one inactive on the small side. This device is quite unusual in Angoumoisin context where the grooves are commonly dug on the small side. Numerous other anomalies have been observed and cannot be attributed to shaping errors. Only reuse orthostats from another burial chamber can explain such anachronisms. All these anomalies show that one or more burial

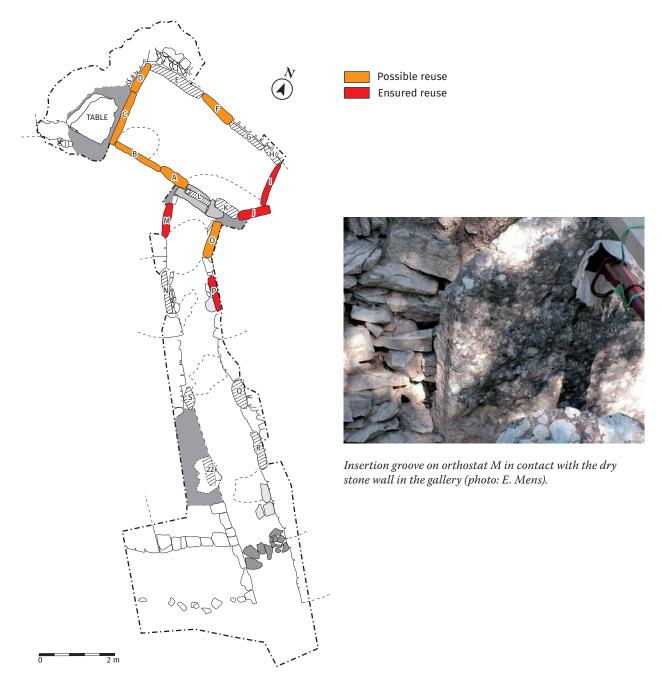


Fig. 5. The dolmen of la Motte de la Jacquille at Fontenille (Charente, France): location of the reused orthostats in the monument according to the degree of reliability (CAD E. Mens, V. Ard and F. Cousseau).

chambers were deconstructed in favour of that of la Motte de la Jacquille, through a pragmatic recycling of megalithic materials.

# A close proximity between enclosures and necropolis

From the two recently-excavated enclosures (le Peu at Charmé and l'Echalette at Chenon), we have conducted some visibility analysis to examine their

relations with surrounding megaliths (Fig. 7). In the state of research, data on the distribution of these first enclosures remain too incomplete to allow a spatial distribution analysis implementation.

The analysis conducted from the top of the enclosure of le Peu at Charmé shows that the theoretical visibility area is mainly oriented to the south including the long barrows of Tusson and the western part of Luxé/Fontenille necropolis but excluding the two other eastern necropolis of Chenon and

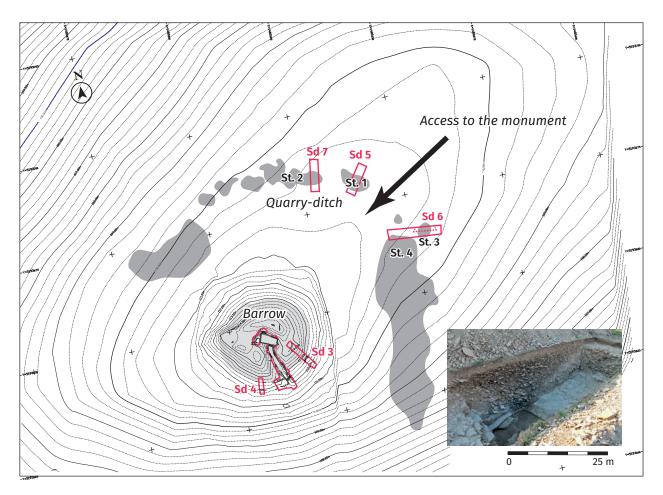


Fig. 6. The dolmen of la Motte de la Jacquille at Fontenille (Charente, France): general sitemap and location of the magnetic anomalies detected by geophysical survey. Three trenches (Sd 5, 6 and 7) dug in these anomalies have shown that it was several portions of quarry for small cairn stones and a Neolithic interrupted ditch dug into the infill during a second stage (topography lycée de Sillac and V.-E. Leroux; geophysical surveys V. Mathé and A. Camus – La Rochelle University/ULR Valor; photo: V. Ard).

the Boixe. The same analysis conducted from the enclosure of l'Echalette at Chenon – dated by the radiocarbon between 3800 and 3600 BC – shows a completely opposite visibility area, mainly oriented towards the east, such as for the nearby necropolis of Chenon (LAPORTE et al. 2014). Moreover, only this necropolis – whose deposits range from the Middle Neolithic to the Chalcolithic (GAURON/MASSAUD 1983) – is included in the vision of the enclosure of the Echalette, located in the immediate vicinity.

Finally, a map of visibility from both these contemporary or sub-contemporary enclosures shows two opposing visibility areas with a NW-SE limit, without overlap. We notice that from each enclosure the calculated potential areas of visibility reveal a visual »domination« on different sectors, sometimes exclusively. Indeed, it is found that the potential visibility zones of each enclosure are very spread out in space and well separated from one another despite a few overlapping

zones. This suggests that visually the enclosures had an attraction on a specific space, which is its own. Despite all of the limitations of this type of analysis (first of all, the ignorance of the forest cover), it seems interesting to question this visual attraction highlighted here. It could reinforce the hypothesis of enclosures with a strong territorial role, as structuring poles that control territorial spaces. The visibility analysis of the Peu enclosure in Charmé shows that the visibility area is essentially turned towards the south. From this enclosure, there is a field of view of nearly 360 degrees. The same analysis carried out on the Echalette in the Chenon enclosure shows a totally opposite visibility area, turned essentially towards the east. From this site, the field of view is smaller, about 180 degrees east and west. In these areas of high visual potential, we note that the three Middle Neolithic enclosures known at this time are located near major megalithic necropolis: Tusson/Bessé/Courcôme for the enclosure

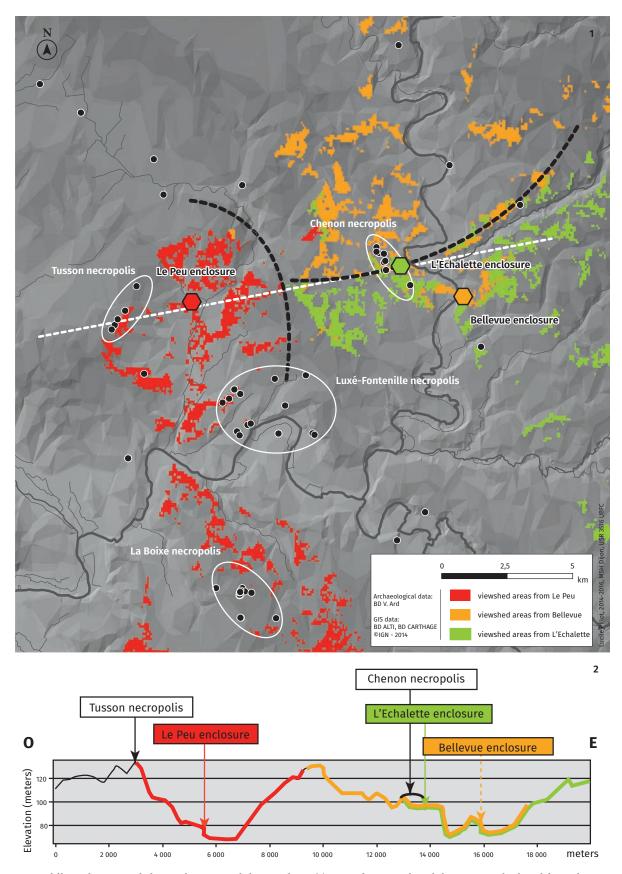


Fig. 7. Middle and Late Neolithic enclosures visibility analysis: (1) map of potential visibility areas calculated from the Peu, l'Echalette and Bellevue enclosures, (2) topographic profile (PILLOT L. 2016, QGIS 2.10.1, PFT GéoBFC, MSH Dijon, UBFC).

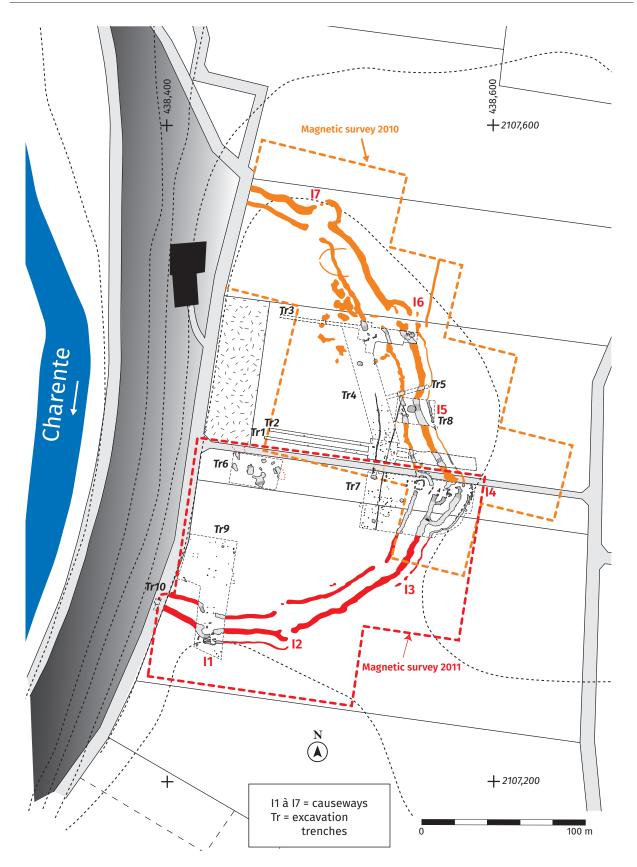


Fig. 8. The causewayed enclosure of Bellevue at Chenommet (Charente, France) dated from the second half of the  $4^{th}$  millennium BC (CAD V. Ard; geophysical survey V. Mathé, A. Camus and M. Druez – La Rochelle University/ULR Valor; aerial photography IGN).

of Charmé, the necropolis of Chenon for the enclosure of Chenon and the barrows of the Braconne forest for the enclosure of Mornac. Therefore, it must consider a very strong relationship between the living world and the world of the dead during the Middle Neolithic, as indicated the enclosure of l'Echalette established in the immediate vicinity of the necropolis of Chenon. This close relationship between enclosures and megalithic monument is particularly notable in the case of the megalithic monument of la Motte de la Jacquille at Fontenille where an interrupted ditch was dig in the carry used for picking the small limestone elements of the cairn in the Middle Neolithic (Fig. 6). This ditch blocks the access to the spur on which the monument is erected and participates in the monumentalisation landscape.

# The Late and Final Neolithic (c. 3600 – 2200 cal BC)

Increasing the number of enclosures: the consequence of rising social tensions?

For the Late and Final Neolithic periods – regionally dated between 3600 and 2200 cal BC – the distribution of sites is more homogeneous with a network of enclosures distributed throughout the study area (44 sites, including 22 enclosures). All enclosures that do not have a similar configuration to those recently excavated at Charmé and Chenon – comprising a wide external causewayed ditch with an internal palisade trench – have been considered as dating within these periods, such as throughout west-central France. These enclosures have one or several parallel causewayed ditches and often complex entrances with architectural features named »crab claw«, like in Bellevue at Chenommet (Fig. 8), mainly occupied between 3650 and 3350 cal BC (ARD 2014).

On the causewayed enclosure of Bellevue – excavated between 2008 and 2011 – the lack of overlap between the many features of the main entrance area should be noted, even if the digging was spread over several centuries. We also observed a perduration in time of five of the seven causeways. These two observations show that the plan of this enclosure changes over time, taking into account previous architecture. Therefore, we must consider a long visibility of past features or regular maintenance of these structures over time.

Moreover, considering the characteristics of the entrance areas — narrow causeways, successive zigzag between ditches, changes in passing axes, a long development of the entrance features in space and the presence of embankment built along ditches on the five studied entrances — it is clear that the nature of this architecture is highly defensive (KEELEY et al. 2007).

The defensive interpretation of the causewayed enclosures of west-central France — mainly based on the recent excavation at Bellevue — initially strongly relied on the hypothesis of rebuilding embankments and »towers« of the enclosures of Champ-Durand at Nieul-sur-l'Autise, in Vendée (Joussaume 1981). It has been virtually abandoned favour of a domestic interpretation. This change is mainly based on the fact that »the many causeways between ditches segments and their consistency are incompatible with a defensive function« (Burnez et al. 2001, 211). If the defensive function is then retained for complex enclosures like Bellevue, the potential range of visibility from this site makes sense because it could correspond to all or the major part of the controlled space.

# Some old megalithic monuments reused

For this period, the burial – megaliths and caves – mainly corresponds to the reuse of sepulchral site previously erected (BAILLOUD et al. 2008), with the exception of single dolmens of the Bois des Chailles at Saint-Ciers-sur-Bonnieure (Charente). Despite being older, it is important to note that the Middle Neolithic burial barrows were still visible at the time of the construction of new enclosures. It should probably consider architectural modification of certain monuments during this period, such as reuse cycles observed in some Angoumoisin-type dolmens. The presence of these older megaliths also raises the question of the role of pre-existing megaliths in the choice of enclosures implantation during the Late and the Final Neolithic.

# What about the spatial distribution of the enclosures?

Knowing the role of enclosures as an important structuring element of the territories, it seemed appropriate to perform this approach on this corpus, which appears much more important than for the previous period. The corpus of sites is also more homogeneous with a network of enclosures spread over the whole studied area. We used very complementary methods that provide analytical keys for understanding the pattern and the territorial organisation. Distance analysis have been conducted to characterise the spatial distribution of these enclosures to determine whether they are uniformly or randomly spatially distributed (Fig. 9). All analyses carried out show that sites' concentrations are statistically detectable within a maximum radius of 4-5 km around the enclosures. A first type of analysis – NNh analysis – shows that the average distance between enclosures is 4 km. Similarly,

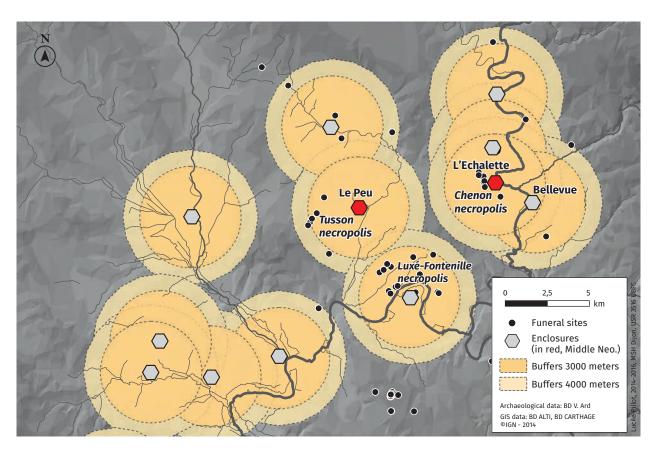


Fig. 9. Middle and Late/Final Neolithic distribution analysis: buffers map calculated around the Peu and l'Echalette enclosures (PILLOT L. 2016, QGIS 2.10.1, PFT GéoBFC, MSH Dijon, UBFC).

the distance between enclosures and the nearest burial site is about 4.1 km away, while another analysis on these enclosures (K Ripley) shows a very slight trend of aggregation with a peak around a similar distance of 4 km.

Therefore, from these distances and distribution analyses, it is possible to draw buffers with a radius of 4km: these schematically materialise these sites' clusters and observe what happens within them.

In the north of the study area – the best documented – we systematically observed funerary monuments in these rays, although it is the richest area in megalithic monuments. However, further south, the enclosures were implanted without necessarily reflecting the existence of megalithic tombs nearby and there seems to be a homogeneous distribution in the territory that was privileged.

To take an interest in the role of enclosures in this territorial frame and the change compared to the previous period, it seemed appropriate to look at the visual attraction of these sites. The spatial proximity between the Late Neolithic enclosure of Bellevue

at Chenommet and the necropolis of Chenon must be raised. The visibility area from this enclosure – interpreted as a domestic site with defensive architecture – covers the space of the necropolis of Chenon. However, this visibility area is totally opposed to that of the neighbouring enclosure of l'Echalette at Chenon, which precedes it in time (Fig. 7). These two enclosures are located on opposite banks of the Charente, one regarding the north (Bellevue), the other the south (the Echalette).

Indeed, the visibility analysis of the Bellevue enclosure shows that the visibility area is essentially turned towards the north space, in the west bank of the Charente, whereas the Echalette enclosure dominate towards the south, in the opposite bank. Like for the Echalette enclosure, Bellevue had a field of view at 180 degrees east and west. These two enclosures seem to succeed one another in time. This last analysis also shows that the configuration and their domination over space seems to evolve and move in time around 3600 cal BC. The visual attraction of these has moved from one bank of the river to the other over time

# CONCLUSIONS

Our first results of spatial analysis are mainly based on visibility analysis at this time, showing a relationship between the location of the first enclosures and the necropolis of the »Ruffécois«. In addition, the excluding areas of visibility between the two Middle Neolithic enclosures (Charmé and Chenon) are broadly in line with what has been observed using the same type of analysis conducted from megaliths by E. Lopez-Romero and L. Laporte (ibid.). Observed in both the living world and the world of the dead, this east/west border could match two living areas - two terroirs - according to the territorial and economic dynamics that remain to be understood. This close connection between settlement sites and burial monuments seems to persist in the early Late Neolithic, as we can see in the Chenon sector, where two successive recently-excavated enclosures of the Echalette (late Middle Neolithique) and Bellevue (early Late Neolithic) - located on both sides of the Charente river - are located in the immediate vicinity of the necropolis of Chenon. By comparing the visibility

areas of these two successive enclosures, a phenomenon of frontier is observed between two opposing visibility areas (oriented to the north for Bellevue and the south for the Echalette), with one overlap area, which corresponds to the necropolis of Chenon used in the two periods. In this case, it seems appropriate to consider a possible change in the occupancy strategies for this area of Chenon, around 3600 cal BC, with a displacement of living space on the opposite bank of the Charente, starting to gradually move away from the space of the dead.

These spatial analyses now need to be refined, taking into account paleoenvironmental analysis – which is currently underway – which will introduce the question of the impact of vegetation cover on observed visibility areas and especially the impact of these major architectural projects on the environment. A second research perspective is to take into account all the Neolithic sites in the analysis, particularly those discovered in pedestrian survey to better perceive the territorial frame.

#### **ACKNOWLEDGEMENTS**

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# Measuring distance in the monumentalities of the Neolithic in Western France

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#### **ABSTRACT**

In an earlier presentation in Kiel in 2011 (Measuring distinction in the megalithic architecture of the Carnac regions), we used the concept of distinction to explore the ways in which identity was expressed in the world of the Neolithic Armorica through materials, object-signs and representations.

For this paper, we shall turn to the notion of distance — whether social or geographic in nature — which is also germane to the question of identity and distinction. We shall start by returning to the extraordinary case of an imported Stichbandkeramik vessel, found in a tomb in the Carnac region. The significance of this find will be re-evaluated in the light of the distribution of the irregularly-shaped bracelets, whose epicentre is located in the Alsace region and with a distribution that extends as far as the Atlantic coast. This

measurement of a geographic distance will then be compared with the overall length – in metres – of the engravings found on a specific orthostat in the megalithic tomb of Gavrinis, on the same Atlantic coast: a cumulative length that defies imagination. We shall then make precise estimates of the distances travelled by the orthogneiss stelae that can be found in the same area of France. The significance of such movements lies not only in the long distances involved, but also the need for some kind of seaborne transportation – other than rafts and longboats – to move monoliths weighing up to 330 tonnes. These three studies – which lead to very different scales of analysis – will ultimately allow us to address the concept of monumentality.

# INTRODUCTION

Our contribution to the last Kiel conference in 2010 – whose main topic was the concept of identity – was focused accordingly on the concept of distinction (« Measuring the distinction in the megalithic architectures »), exploring the ways in which identity was expressed during the Neolithic of Armorica. This approach was conducted through the analysis of materials (sediments and volumes, stones and weights, etc.), object-signs (jade and fibrolite axes, variscite beads and pendants) and through representations (iconographic programs) (CASSEN et al. 2011).

Therefore, we could keep the same theme at the 2015 meeting, albeit with another variation, focusing this time on the notion of distance – either social or

geographic – which is also germane to the question of identity and distinction. We propose testing this notion through three types of objects extracted from the material culture and belonging to the same geographical area as the one addressed in the previous article. The first object is an extraordinary pottery discovered inside a quite ordinary cist, the second an engraved orthostate from the famous Gavrinis passage tomb, and finally a stele described in an island provides us the opportunity to consider the risky field of distance travels by sea. Ultimately, the discussion will bring together these three elements to examine the concept of monumentality.

#### AN EXTRAORDINARY POTTERY IN A QUITE ORDINARY CIST

The site of Er Mané in Kerhuen (Belz, Morbihan), close to Carnac, comprises two passage graves (east: no. 1 and west: no. 2) inside an elongated cairn ( $52 \times 18 \,\mathrm{m}$ ). In 1866, W. C. Lukis recorded different plans of the tombs and identified a cist with a single cover capstone in the

centre of the place (Fig. 1). The cist is no longer accessible nowadays, hidden under the fallen rocks and sediments of the mound.

Ten years after Lukis' survey, G. Chaplain-Duparc explored these monuments, discovering a very singular

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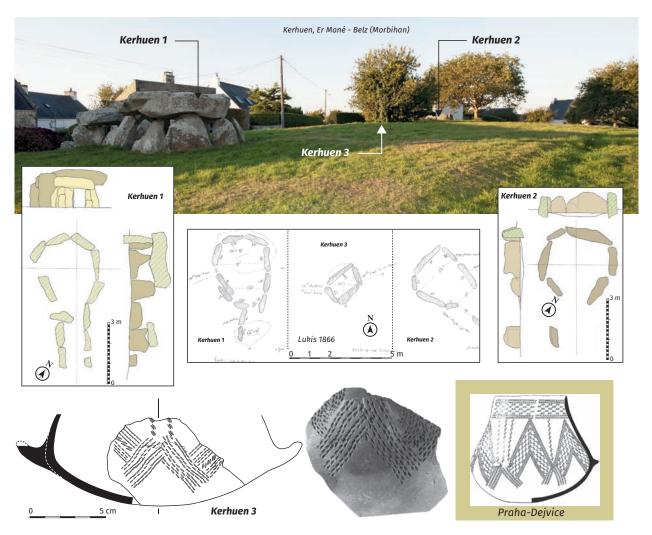


Fig. 1. Er Mané, Kerhuen (Belz, France). View of the mound from the north-east; the cist 3 – located under the mound – is no longer visible between the passage graves 1 and 2; plans of the structures by Lukis 1866 (photos/drawings: after Cassen 2003; SBK ceramic from Praha-Dejvice (Czech Republic) after Zápotocká 1998).

ceramic inside the cist. The collection gathered by Chaplain-Duparc in the Carnac area was examined by P. R. Giot and J. L'Helgouac'h (1965); nevertheless, the Kerhuen vase was considered likely to be non-Neolithic until recently (LE BOULAIRE/CASSEN 2000). Several decades later, we conducted a thorough investigation of the history of this collection (nowadays in the Le Mans Museum): the historiography of Chaplain-Duparc (his campaigns in Morbihan) and the different sherds collected (taphonomic process, marks of restoration) were studied. The analysis of all these aspects concluded that the discovery was relevant and acceptable (CASSEN 2003).

The ceramic was probably intact: the edges of the fractures are sharp and fresh, suggesting the possibility of these being originated during the excavation. This is the only object collected from the grave and no bones were preserved, mainly due to the

acid soils of the region. The internal structure of the tomb comprises four slabs that form a quadrangular plan  $(1.8 \times 1.0 \text{ m})$ . Such a type of cist is documented in the Carnac area from the early moments of the Middle Neolithic - as the eponym Castellic grave, which is covered by a low circular mound of 15 m diameter (BOUJOT/CASSEN 1992) - until the Bronze Age. Of course, the sherd morphology as well as its impressed decoration are completely exotic in Brittany; furthermore, its fine paste is far from the usual aspect of the pottery productions of the Morbihan Castellic and Auzay-Sandun cultures, which are responsible for the aforementioned cists and passage tombs (the Kerhuen tomb 1 contained a late Castellic pottery; LE ROUZIC 1932; HAMON 2003). A quick look at the European corpus allowed us to finally propose the Stichbankeramik reference as the most likely origin of this vase. Such diagnosis was subsequently confirmed

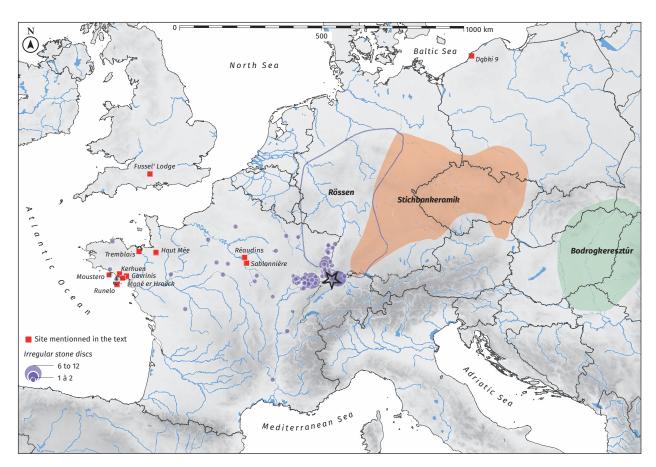


Fig. 2. Map of Europe displaying the sites mentioned in the text. Stichbankeramik (early and late phases) and Bodrogkeresztúr areas, compared with the importer sites of Kerhuen (France) and Dąbki 9 (Poland), located in the two seacoasts (after Czekaj-Zastawny et al. 2011; Eibl 2011; Jeunesse 2004). Distribution of irregular stone rings; the star indicates the main raw material source in Bad Säckingen (after Pétrequin et al. 2015).

thanks to the kind assistance provided by M. Zápotocká. Indeed, it is a Stichbandkeramik specimen (belonging to the early or middle phase of this culture); moreover, the evidence suggests that it is not a local imitation but rather a clear import (Fig. 1 to compare with Praha-Dejvice specimen, Czech Republic; ZÁPOTOCKÁ 1998).

Of course, the SBK chronological spectrum (4900–4300 BC) is coherent with the dates concerning the type of cists in Southern Brittany in which this pottery has been found, although the geographical distance seemed unreasonable given the state of knowledge fifteen years ago (Fig. 2). The closest SBK sites are probably those located in Bavaria (EIBL 2011), at 1,000 km as the crow flies. Therefore, we are dealing with an extraordinary distance between Germany and the Morbihan, albeit not so much in terms of long-distance transfers, since we are used to managing such scales when studying the distribution of alpine jade and Iberian callaïs; rather, it is the nature of the imported object that raises a problem, because pottery

does not reputedly travel across such long routes during the Neolithic of the  $5^{\rm th}$  millennium.

Nonetheless, a similar distance can be traced in the case of several vases belonging to the Bodrogkeresztúr Culture recovered in the Dabki 9 site, Poland (CZE-KAJ-ZASTAWNY et al. 2011a, b). This site allows observing the evolution of the local communities from the Late Mesolithic to the beginning of the Funnel Beaker culture (ca 4200/4000 BC), when these groups were still characterised by their hunter-fishing-gatherer way of life. More than 1,000km separates the Hungarian plains (Tisza basin) and the shores of the Baltic Sea, where these potteries have been found. The reasons explaining the movement of such fragile objects were probably diverse (for example, the authors refer to the trading of furs, amber, etc.) as well as their modes of transmission (individual odyssey, direct exchange, gifts without material reward, especially when seeking to establish alliances). When looking at the richly-ornamented vases discovered in Dabki, we cannot help but see echoes of the situation found

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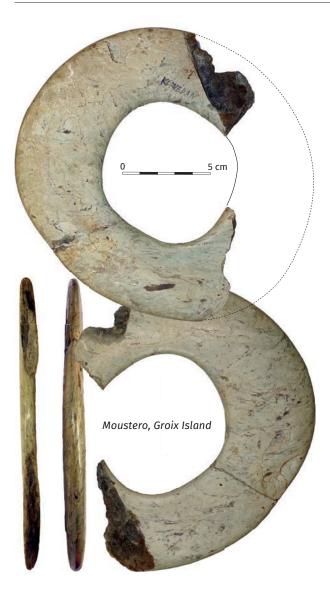


Fig. 3. Irregular stone ring, Moustero, Groix Island (photo/CAD: N. Mather/S. Cassen, Carnac Museum).

in Kerhuen. Most likely, the graphic codes produced at the moment of the fabrication of these objects were not entirely comprehended or understood by the communities who received them at the end of their journey. Nonetheless, the geometry of the ornamentation, the aesthetic of the compositions, the value due to the remoteness and the history that accompanied these objects played a major role, even within a different communication system.

However, beyond their domestic/funerary opposition, there is an important difference between these two seaside sites: there are no intermediate points in France that could help to trace back the course followed by the imported items and thus establish a direct link between the two cultures. Meanwhile, in the case of the Bodrogkeresztúr, the pottery has been

documented in the northern borders of the Hungarian area, within other cultural traditions and just north of Poland. When looking for parallels of imported pottery in Northern France with which to compare our example, one might cite the presence of an Rössen vase (originally identified as a Grossgartach type) in an individual grave of a long mound located in the Cerny necropolis, in Passy/La Sablonnière, Yonne (DUBOULOZ 1994). The similitudes regarding the dates and the architectural structures with the Morbihan case are probably not a coincidence in the middle of the 5<sup>th</sup> millennium, showing a clear search for social distinction in some regions of Western Europe.

In the absence of evidence at intermediate points, we can focus our attention on other objects that could have filled the apparent geographical and historical gap between the two regions. The so-called »Alsatian type« irregular bracelets or ring-discs become a good candidate for extending the discussion on the notion of distance (Fig. 2).

These ring-discs are very easy to recognise due to their unusual shape, in part derived from the morphology of the flat pebbles on which they are made. Their chronology spans the entire first half of the 5th millennium, and they are part of a long-lived family of objects (between 5300 and 4500 BC; pétrequin et al. 2015b), whose earliest examples have a southern origin (Provence and Northern Italy). Documented in both domestic and funerary contexts (Grossgartach and Rössen), these ring-discs are evident signs of social distinction (DENAIRE/JEUNESSE 2008). Their most important production area has been located in Bad Säckingen (Rhine Valley, Germany), thanks to the presence of items partially perforated, made on pebbles collected on the beaches of the dewatered river. A less important production can also be suggested in the Lyon region, probably from pebbles of the ancient Rhône glacier. As their name suggests, the »Alsatian rings« have long been considered as an item whose distribution would have been limited to the Alsace and Trouée de Belfort areas (JEUNESSE 1995). However, a recent re-evaluation of these artefacts - carried out within the framework of the European Research Project JADE – has suggested otherwise: the circulation of the Alsatian rings – irregular perhaps because they were imitating the spondylus bracelets - has reached most parts of the French territory (PÉTREQUIN et al. 2015a), including the Atlantic shores and even the Groix island, in Morbihan (Fig. 3; LE GALL 1996). Thus, the previously-observed gap between the western edge of the SBK area and the Atlantic Seashore can be gradually filled when adding this new object-sign to the equation. Indeed, what was unthinkable becomes the object of a thought...

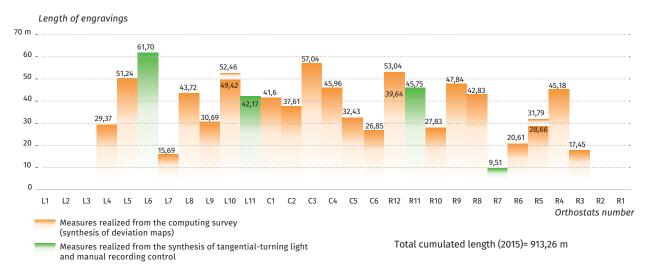


Fig. 4. Diagram of the accumulated lengths of the engraved lines for every orthostate in the Gavrinis passage grave (Larmor-Baden, France). The first method (orange) calculated by using deviation maps (photogrammetric models); the second method (green) by direct measure of the originals or from the drawing synthesis by tangential-turning light.

# THE MEASURE OF THE DISTANCE ON THE ORTHOSTATE OF A PASSAGE GRAVE

In this section, we will completely change both the object of study and the scale of observation. The passage grave in the island of Gavrinis (Larmor-Baden, Morbihan) is well known for the profusion of carvings displayed on its walls, as well as on hidden parts of the cover slabs (PÉQUART et al. 1927; SHEE TWOHIG 1981; LE ROUX 1985). We propose placing the accent on the first orthostate that we studied, three years ago: the number 6, located in the middle of the access to the chamber.

The aim of the project that we carried out in this megalith was to record the totality of the monument, from the cairn to the engravings. The objective behind this was to test whether our general interpretation model about the Breton carved signs could be applied to Gavrinis, as well as whether a structural analysis could generate new results regarding the meaning of this composition. The L6 slab was chosen due to the complexity of its fine signs and owing to the known referent of some of the figures (bow, arrows, head-axes). Two main methods were used: lasergrammetry and photogrammetry on one hand; and the analysis of compiled photos taken under turning oblique lights on the other. The image-processing decorrelation technique (colour differences) completed the methodology (CASSEN et al. 2014).

The second method, while simple and slow, allows achieving very relevant results, e.g. establishing the relations of antero-posteriority between the grooves and thus identifying the successive phases of the engraving process. Such phases are not accidental and are related to each motive, whereby they possibly depend on the hierarchical order of the motives. The possibility

of reconstructing the stages of the semiotic entities allows getting a glimpse into the intentions of the sculptor. However, we shall insist on the length of the carved lines that these methods allowed calculating.

Our concern on this issue arose from experimental work that we carried out to understand the different states of the surfaces documented in Gavrinis, as well as the difficulty in producing the engraved lines. Different tools and techniques were tried. Furthermore, two experimenters were responsible for the engraving, each having their own specific gestures. The slab reproduced during the experimentation was naturally L6 (VOURC'H et al. 2014). During the process, it became clear that the length of the carvings was significant. An initial – purely speculative – estimation led us to consider a total length for the grooves of about 7–8 m. In order to confirm such an impression, we calculated these lengths by computer and we also controlled the data on the experimental object and the original slab by direct measurement. Subsequently, based on this validated basis, we calculated the length of all the grooves inside the passage grave.

The results were quite surprising (Fig. 4). The slab L6 is the surface containing the longest accumulated engraved line, at around 62 m. The total accumulated length for all the engravings displayed on the Gavrinis chamber and passage exceeds 900 m, reflecting a distance completely beyond what our imagination was ready to propose.

We should take into account that this distance is in direct relationship with the time spent in the engraving of the stele. Indeed, here again, our first reasonable estimation was exceeded by the results. We calculated 570 S. Cassen et al.

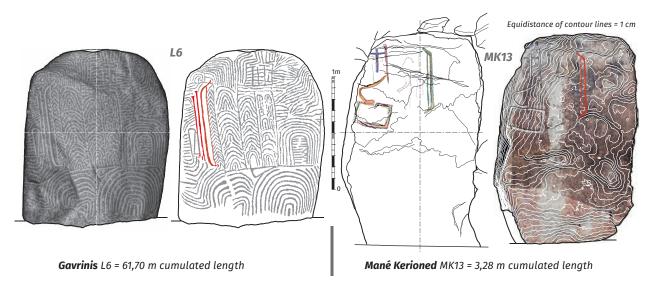


Fig. 5. Comparison between the engravings' accumulated lengths of a bow representation in the orthostates L6 in Gavrinis (Larmor-Baden) and MK13 Mané Kerioned (Carnac) passage graves.

that the total duration of the work for L6 only would have been between 30 and 40 days (for a line 8 mm large and 3–5 mm in depth, carried out on the same granite as the one in Gavrinis, several weeks of experimentation gave 1-2 mn/cm as a result, which is 62 m  $\rightarrow$  103 to 206 hours; 5h/day  $\rightarrow$  20.6 to 41,2 days). In any case, the engraving process was probably a huge task.

Subsequently, it was interesting to compare these results with those derived from another slab. For this purpose, we chose one located in the Mané Kerioned passage grave in Carnac, displaying a bow figuration, as in the case of L6 (Fig. 5). Here, the accumulated length of the engravings is shorter (more than 3 m), which can be achieved in one day (5 to 7 hours). Therefore, with two similar slabs engraved on the same type of granite, the differences in the treatment seem to be out of proportion.

Thus, Gavrinis needed an enormous quantity of work to carry out the representations, a circumstance that might be interpreted as evidence of the vertical distance between individuals or social groups. In such a respect, the work that we are conducting aims to delimitate the different kinds of objects within their chronological requirement: the slabs in connection with the tomb (namely, implying the direct intervention of the builders) and the orthostates that were re-used from earlier contexts (stelae as a previous architecture) but whose signs and scenes were durable in terms of their ability to be understood for the human communities. A second step might be the recognition of the various operators, which were not so numerous if we take into account the identifiable styles and techniques.

# THE WEIGHT OF THE DISTANCE (A JOURNEY BY SEA OF A STELE)

The third way to appreciate a calculated distance brings us back to Gavrinis. Thanks to the excavation and restoration conducted by the Regional Service of Archaeology (dir. CT Le Roux) in the 1980s, we know that the cover slab in the chamber is connected to another slab covering the chamber of Table des Marchands passage grave in Locmariaquer (4km as the crow flies). The two pieces formed part of the same stele, erected in the Grand Menhir alignment (LE ROUX 1985; CASSEN 2009).

However, as impressive as it may be, the important fact concerning these stelae is the rocks employed for their construction. These are an orthogneiss, unknown in the local bedrock on the Locmariaquer peninsula, and a migmatite, whose closest sources

are located 3km away, on this peninsula (QUERRÉ et al. 2006; BONNIOL/CASSEN 2009). Wherever the origins of the orthogneiss sources are (between 8 and 12km, according to the different potential quarries), during the transportation prehistoric people had to cross rias with very strong maritime currents (9 to 11 knots for a strong tidal coefficient). Therefore, in this specific case the distance was not a problem *per se*, since the 10km needed to reach Locmariaquer is not an *unicum* in the European megalithic constructions (KALB 1986; PARKER PEARSON et al. 2011). Instead, the problem stems from the weight of some of the slabs that were transported: around 100t, and up to 335 t in the case of the Grand Menhir.



Fig. 6. Concentration of orthogneiss stelae in the estuary of the Vannes and Auray rivers (Morbihan, France). Location of the Runelo orthogneiss standing stone in the Island of Belle-Île-en-Mer (rocky sea floor is added as an estimation of the Neolithic sea level by bathymetric curve; datum Shom/IGN, WGS 84, proj. Mercator, Landsat ETM image; after Menier et al. 2009 completed).

This problematic was recently challenged by a new analysis conducted on a stele that was erected – together with another one – exactly in the centre of Belle-Île-en-Mer, an island 14 km away from the continent (Cassen et al. 2016). During the 19<sup>th</sup> century, the archaeological literature presented this standing stone as made on an allegedly exotic rock, similar to that used for the construction of the Grand Menhir (Closmadeuc 1902). Unfortunately, the stele was destroyed; nonetheless, we have a quite precise drawing of the monolith, as well as its dimensions and weight estimation (La Sauvagère 1770).

The two standing stones were used as material for building the windows, doorframes and entrance wall of a house in the 19th century (Chasle de la touche 1852). During the fieldwork, different rock samples of the aforementioned building were taken, focusing on those surfaces macroscopically similar to the orthogneiss found in the continent. The main possible source of confusion when trying to establish the origin of the rocks might have been the local porphyroid granites (AUDREN 1984, 1986). However, all of the observations and analyses based on thin sections – allowed us to conclude that this rock was indeed an orthogneiss unknown on the island, whose sources are located in the continent (Fig. 6). Therefore, we are dealing with the transport of a 30t monolith across a distance ranging between 50 and 60 km, 40 km of which was by sea. Consequently, the intuitions and observations made by Closmadeuc in 1896 were correct, when he compared the Runello stele with the rock of the Grand Menhir, the cover slab of Table des Marchands and especially Gavrinis.

Even taking into consideration the existence of a lower sea level (between -3 and -5 m in comparison to the

current marks), Gavrinis was – as it is today – an island at the end of the 5<sup>th</sup> millennium (MENIER et al. 2009) and the transport of the slab from Locmariaquer again raised the fundamental issue of how to cross the water surfaces between these two places.

The 3D model of the slab of Gavrinis has allowed us to calculate the weight of the stele fragment in a much more accurate way than before. With the 24t added to the Table des Marchands piece, the original stele weighed around 85t. Of course, given the weight of the Grand Menhir slab, the problem of its transportation is even more dramatic than in the case of Belle-Ille. Indeed, once again, the difficulty laid not so much in the distance – about 10 km – but rather in crossing an inlet of water with very strong currents. Based on the more precise 3D model, the Grand Menhir weight has been calculated as circa 335t, a value significantly higher than that established by the previous calculations, of 270t (CASSEN et al. 2016).

In the last 30 years, several prehistoric seafaring techniques have been proposed attempting to explain the transportation of such a heavy load in a considerably early chronology. The two most common instruments involved are the wooden rafts and the catamaran made of dugout canoes. While it is possible to carry heavy stones using dugouts, even taking advantage of the Archimedes' principle, all of the calculations that we have conducted suggest an almost certain risk of collapse of these devices when trying to transport loads heavier than 20 to 30 t.

We have experimentally reproduced some of these seafaring techniques, carrying blocks weighing between1 t to 4t. Our results show that there are no significant problems when trying to transport these

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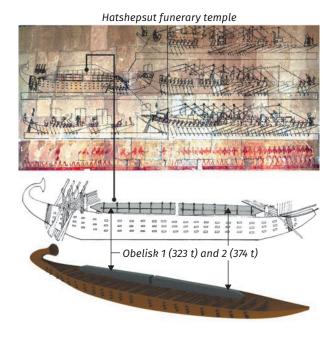


Fig. 7. Scene of the transportation of the obelisks of queen Hatshepsut (–1495, –1475 BC), located in the funeral temple of Deir el-Bahari, Thebes, Egypt (after NAVILLE 1908; HEIZER 1990).

comparatively smaller loads; however, we still are very far from the masses of the largest steles from Locmariaquer. In this respect – and with similar weights (1 t) – the experiments conducted by R. Atkinson (1961) in the 1950s form the best basis for our study. However, we have recently seen – still concerning the *Blue Stones* of Stonehenge – how the transport by catamaran can be quite problematic when leaving the rivers and facing open waters. An example of this can be seen in the *Millennium Stone Project*, which was renamed the *Millennium Stone Fiasco* by the media after the device sank due to the waves and strong currents (JOHN 2008).

The wooden raft is also very practical when moving »small« loads of up to 3–4t, as our experiences have evidenced. However, all of the historical and ethnographical references suggest that it was impossible to carry cargos heavier than 30t across both river and sea waters by using curraghs, goatskins or wood rafts (HA-ZELL/FITZPATRICK 2006). An illustrative example of the dangers of this type of endeavour can be seen in the transportation – along the Tigris River (Iraq) – of two colossal statues of human-faced bulls recovered by V. Place during the archaeological excavations of Khorsabad, near Ninive. Each of these statues weighted c. 30t and they were intended to be moved to the Bassorah harbour (for a final destination to the Louvre Museum) using traditional rafts – called kèlek – made of goatskins (PILLET 1916). It was necessary to use 1,000 of these goatskins bonded to each other with wood pieces to construct a structure capable of bearing the 30t weight. However, after several days of travel, a small collision when passing Bassorah, the effects of the tides and finally the salt water caused one of the rafts to sink, while the other one ran aground, subsequently being covered by the tide. It was impossible for the team to refloat the cargo and this was definitely lost at the bottom of the river.

Of all of the possible hypotheses considered, the best solution seems to be the use of boats. The oldest examples of this type of vessel are the sewn boats, made of planks with their borders bonded together, inspired perhaps by vessels made of skins sewn together and stretched over a wooden frame (similar in Europe to the Welsh corwg or the Irish currag), which - unlike their wooden counterparts - can easily drawn on a beach (PEACOCK et al. 2010). A specimen of this type 26 m long, 5.5 m in width and with a 2.2 m draught will offer a useful load of over 120t. This type of transport vessel has been constructed in India (Kerala) until recently and alongside dugout canoes for fishing purposes (GREESHMALATHA/RAJAMANICKAM 1993; COLLET/POMEY 2012). A possible alternative to facilitate the transportation is again the partial immersion of the stone when transported attached between two boats. However, we have not found historical or archaeological examples of such a solution being used. In all of the cases documented, the cargo was supported by a single boat.

One of the most famous depictions of transport and travel by boat can be seen in the inscriptions located on a wall of the Hatchepsout temple (-1508 to -1458 BC) in Deir-el-Bahari, Egypt (CARLENS 2003). The two monoliths engraved are described as obelisks in the accompanying text (Fig. 7). It is assumed that these two monuments are those standing in Karnak nowadays. Their dimensions are well known (29.5 m high) and their weights would be between 323 and 374t, according to the different estimations (approximately the same as the Grand Menhir). If the weight of the sledge used for its transport is also taken into consideration, the weight would range between 350 and 390t, for a total load of between 680 and 780t. Therefore, a vessel 60 m long would be necessary to ensure the transportation of both obelisks (WIRSCHING 1999).

The main challenge would have been to control the direction and propulsion of the boat. A vessel like this would have never been self-propelled; on the contrary, it would have needed to be towed by at least 27 »smaller« boats (depicted on the temple wall), each of them requiring 32 rowers (namely, more than 860 persons would have involved in the transportation). Put simply, this example allows us to imagine the scale of the vessels that would have been involved in the transportation of the Grand Menhir to the coasts of Lormariaquer. In this sense, It should be noted that

none of the objects transported were depicted engaged on the waterline with the aim of taking advantage of the well-known Archimedes principle.

There is a strong probability of vessels being mobilised for the transportation of the large orthogneis stelae first from the Rhuys peninsular to Locmariaquer and subsequently to Belle-Île-en Mer through Mor Bihan (Little Sea). Future research and/or fortuitous finds would clarify whether the vessel/barge used in this endeavour were made on wooden planks (our expectation) or otherwise if they were made of stretched skins sewn together (a priori too fragile to withstand this kind of colossal effort). In any case, it seems that we should rule out the use of multiple dugout pirogues (due to their huge risk of collapse and the need to distribute the load among a huge number of canoes) as well as log or timber rafts (owing to their heavy weight and reduced manoeuvrability). Given the complex tie-up requirements, the partial immersion of the load does not seem a prerequisite, although the advantages of using the Archimedes principle would have been considerable.

There is no doubt that during the gradual transition to the agriculture and livestock economy in Brittany, the indigenous elite expressed a strong desire for new weapons/tools and socially-valorised ornaments, a demand that have been accompanied by the development of technological innovations. When applied to the boat building and seafaring techniques, such innovations would have granted the control of the circulation of objects through the Atlantic, as well as along the rivers (Loire, Vilaine). Such objects (beads, axes, salt cakes, pottery, etc.) could have functioned as some kind of »currency«, regardless of the type of property that would have been preferred by these communities when making payments. There are several examples among the groups of hunter-gatherers living in rich coastal biotopes, such as the Chumash, in California (GAMBLE 2002) – of the evolution from the dugout pirogues to wooden boats made of sewn planks due to this dynamic of exchanges and competition between men who want what others show them to desire.

# MICROMÉGAS IN CARNAC. IN SEARCH OF THE NEOLITHIC MONUMENTALITY

In the previous sections, three objects of different types and natures have enabled us to reflect on the concept of distance during the Neolithic of Southern Brittany, specifically:

- the huge geographical distance considered when analysing the SBK pottery deposited in the cist under mound of Kerhuen;
- the hardly imaginable linear distance, measured through the details of the engravings of one of the slabs of Gavrinis; and
- the hardly measurable distance travelled by a boat while carrying the heavy monoliths of Runelo and Grand Menhir.

These are three different levels of acceptance of a term that plays around the concept of geographical (observed or cognitive) and topographical space, as well as the chronological and affective space. These levels are different but complementary, since all of them have their origins in the same word: distance (distance, Distanz, distancia) has its origin in the Latin word distantia/distare, which is composed of di- waway« and stare wto be«. Thus, for the archaeologists, distance becomes a measurable interval between two objects, between two points in the space. These points can be separated by the horizon or otherwise located at the extremes of a labyrinthine line that we follow with our finger. It is a symmetrical distance, which only becomes dissymmetrical when we provide

it with significance (expressed in terms of energy expenditure, time spent or effort taken to overcome obstacles, etc.). Distance is also an expression of the relationship between two objects within the standards of a society, space and time (BOGARDUS 1927; HALBWACHS 1938). The unit of measurement (the megalithic »yard«, the number of generations of a family, etc.) is no longer important. Regarding the perceived distance, it obviously cannot be measured with the same tools as the physical ones; rather, it is part of the cognitive (or mental) distances, and these are representations, individual or collective.

Of course, the distance between persons cannot escape these representations. As such, the social distance is a construction: it is the degree of intimacy or estrangement between persons or communities based on values, traditions or prejudices that involve hierarchies, classes, status, etc. (GRAWITZ 1981, 116). However, while the ideal horizontal relationship between individuals is characterised by its gradualness and symmetry, the vertical distance is dissymmetrical in essence. The frontier between the distant fashion of the personal distance and the close fashion of the social distance marks the limit of the power over the other (HALL 1966). This is the non-reciprocal use of the language, the objects, the space and time, as well as the end of the balanced symbolic exchange, whereby giving but making it impossible for people to give back is a way of spoiling the relationship of exchange (BAUDRILLARD 1972).

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# The monumentality: what is that it does?

The three archaeological objects analysed here carry with them – in an intrinsic way – the idea of distance, they are attached to three equally concrete objects of knowledge, which are three architectural forms: the cist, the passage grave and the stele. These three forms implement materials that are more or less heavy, more or less voluminous, but always hard and durable. All together, they are emblematic – each in their own way – of the components displayed in the title of the Kiel conference, where »early monumentality« coexists with »social differentiation«. Therefore, we need to clarify the first term of the title, since the second one is conventionally understood and derived from neighbouring disciplines (sociology and anthropology).

For instance, »monument« is defined by the Diderot's Encyclopédie (JAUCOURT 1765), as any work of architecture or sculpture made to preserve the memory of illustrious men or major events. The famous encyclopaedist added to the description of this term that the first monuments were just »piles of stones« (pierres entassées), located sometimes in a field as a reminder of a victory, sometimes on a grave to honour a specific person (the local word dolmen/dolmin was used in 1792 by La Tour d'Auvergne to describe la Table des Marchands — CHAIGNEAU et al. 2009). In sum, nowadays any monument is an artistic memorial device built to recall a bygone past, materialising a temporality and mediating in the present between the past and future.

Based on these – already old – definitions, the concept of monumentality (*la monumentalité*) was first used in France by archaeologists/antiquarians and then by historians (DENON 1802; HAIGNERÉ/ROSNY 1897) to define what is more appropriate to amaze the intelligence, to impose respect, to subjugate the imagination. In this respect, the monument does not need to be visible on the surface.

Did the Neolithic monument need to be built with specific materials to act as a monument at the time of its construction? Such a question deserves to be posed since the existent terminology no longer helps to clarify the debate. Indeed, a Northern and Western European family of »non-megalithic long mounds« is sometimes distinguished from a family of »megalithic tombs«, whereby the use of large stones and an architectural typology seems sufficient to make clear the pertinence of such a dichotomy (MÜLLER et al. 2014). Thus, internal and external structures are part of an opposition that does not need to be posed in these terms. The »long mounds« in Western France (which should not be confused—in Vendée and Charente-Maritime, where these monuments are not Neolithic—

with the *langgräben*, ritual and funerary monuments documented from the Late Bronze Age to the beginning of the Iron Age; for examples of this, see LAMBOT 2000) can contain funerary structures in their interior (volume of the sepulture, weight of the walls) as impressive as those inside the »megalithic tombs«. Consequently, anthropologists manipulating this archaeological data have based their reflection in a European »megalithism« on the one hand from Sweden to Portugal, while the »long mounds« on the other hand – understood as mere accumulations of earth and for such reason external to the megalithism – would be earlier and reserved to an elite (TESTART 2012, 43). In our opinion, this is a clearly erroneous distinction.

The small cist of Kerhuen, the long passage grave of Gavrinis and the heavy stele of Runelo are examples of three forms of monumentality that are not strictly limited to the funerary sphere: three forms in which the evocation of distance can be perceived, that the remoteness was in the past or in the space, that the movement induced by these buildings has been accomplished, felt or imagined. A distance that has placed these objects aside.

Let us return to the reflection of historians around the concept of monumentality: in other words, their general and abstract mental representation of that object, while archaeologists seem rather to have a notion, namely an intuitive knowledge that synthesises the essential characteristics of this object.

Historians from the 20th century resolutely criticised the concept of monument, underlining its relation with power: the monument as an example of the power of the representation and as the representation of power (MARIN 1981, 1993): the political and/or religious power as an agent willing to appropriate the processes of representation, producing and improving them, because the representation builds itself as an effective power. »Power« – in the pure sense of the word - means being capable of having strength, having a reserve of strength, a strength that is not exerted, but which is ready to be exerted at any moment. It is in this moment when the representation acts to put the strength in signs. In other words, to substitute the external act in which the force is manifested, the signs of strength that only need to be present (namely, to be seen), whereby their meaning, the meaning (le *signifié*) of the signs – the force – can be believed. The representation – in and through its signs – represents the force.

If we now perceive better a »function« in the construction and use of the monument, we know that a double question arises regarding its origin: first of all, a question dealing with the chronology; and afterwards, a question regarding the model.

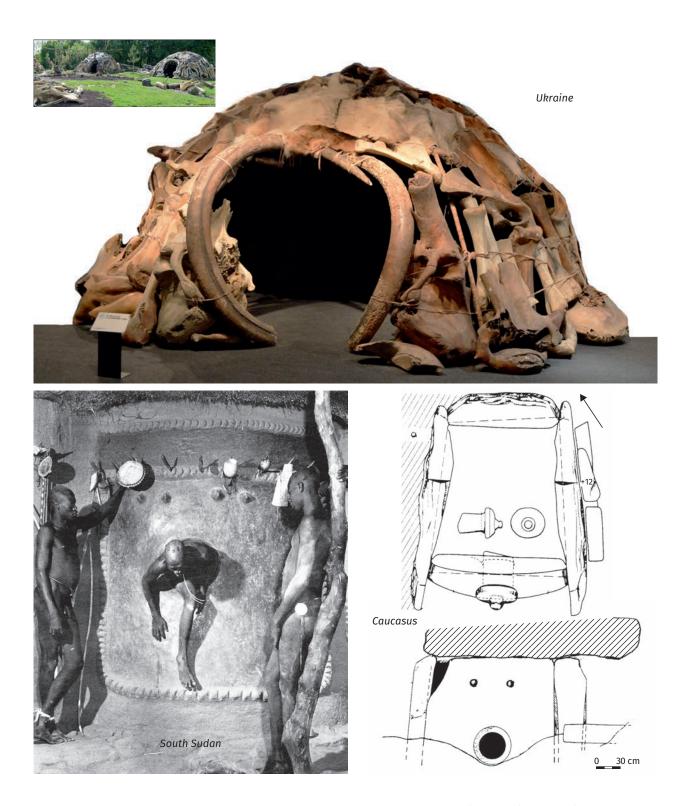


Fig. 8. Image models and monumentality. Mammoth House from Mezhirich/Mewupiu (15 000 BP), Ukraine (Frozon Woolly Mammoth Yuka Exhibit, Yokoyama, Japan; real bones and tusks); reconstruction in Paléosite, Centre interactif de la Préhistoire, Saint-Césaire, France (Photos: S. Cassen). Nuba traditional sleeping room with symbolic representations above the circular door; equivalences in funeral contexts from Caucasus, III<sup>rd</sup> millenium BC (after CASSEN 2000, from MARKOVIN 1997).

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## The monumentality: what it becomes

When we proposed a development model for the first monumental funerary architectures in Western France (BOUJOT/CASSEN 1992), we tried to understand the relationship – in a common space – between the category of cist under mound and that of passage grave under cairn. In the literature, the second category was considered to prevail and illustrate – by itself – the invention of the funeral monumentality. Chronological and architectonic issues were addressed, the latter through a genetic approach. Here, genetics means »concerning the genesis«: genesis rather than origin, because we refused to look for an origin, whether situated in Brittany or connected to the diffusion of the Neolithic from the Paris Basin and Normandy. Accordingly, we were only concerned with the formation of a phenomenon.

The origin is the process by which something arises. Nevertheless, its sense becomes more ambiguous: rather than indicating a kind of crucial point, an instant emergence, the origin often becomes a temporalised process, fraying into many stories, thickening until it becomes a succession of phenomena or events. The search for the moment of the origin is a quest that is fundamentally metaphysical (NIETZSCHE 1886, 58; Teilhard de Chardin 1956, 93). It is not a scientific problem; rather, it has only been solved by the myth or the faith (RICŒUR 1983). Indeed, the philosophers have warned us: those who return to the origins will find new origins.

Of course, to understand the formation of the phenomenon, our first study left aside a radical object and important components of the Neolithic monumentality of Western France: the stele and the symbolic representations displayed in some of them. By integrating all of these components, we could thus play around the alternative between vertical (wall, standing stone) and curved »horizontal« lines (tumulation), as two percepts that in turn act on two different temporalities, since - in the vertical element of architecture – time no longer flows, but rather it springs up (BACHELARD 1931, p. 104). These percepts are in opposition within a structural analysis, although they are not excluded in the world of the continuous perception. They are actually connected by a dialectical process, since the humans make objects and organise and represent the universe that surrounds them.

## The foundation

The first constructions made by the human beings looking for shelter already allow imagining how the invention of a fleeting shape can continue in a sustainable volume. 15,000 years ago, in the plains of Ukraine,

some domestic spaces combined all of the geometrical lines, volume of objects (8 m diameter) and mass of materials, which could make of these constructions the perfect model for a house of the deaths (BIBIK-OV 1981; PIDOPLICHKO 1998). In terms of effort, transporting a mammoth tusk weighing 100 to 200 kg is to some extent comparable with the collective manipulation of a huge stone for the construction of a Neolithic grave in Western Europe (Fig. 8).

This equivalence between the house of the living and the house of the dead was already proposed – mainly by intuition – for the dolmens of Southern Brittany by abbot Mahé in 1825. In 1891, A. Bertrand established such analogies for the French territory, stipulating that the megalithic funerary constructions were built as an imitation of the houses of the living, particularly regarding the way in which bodies and objects were arranged inside the chambers. E. Sprockhoff (1938), P. V. Glob (1949) and G. Childe (1949) proposed similar ideas during the 20th century. The hypothesis was later supported by A. Leroi-Gourhan in 1963 on the occasion of his famous excavation of the Late Neolithic hypogeum of Mournouards. The author established an analogy between the plan of the grave – with its lateral seats for the rest – and the house where those same persons would have slept while alive (LEROI-GOURHAN et al. 1963). In Sardinia, the analogy between some 5th millennium BC hypogea and the roof structure of a wooden building (LILLIU 1963; MELIS 2007) is quite clear, despite the nature of the prototype of such tombs having not yet been established (ROBIN 2014).

In 1996, the excavation of two early Neolithic houses (4900–4700 BC) located in the north-eastern limit of Brittany (Haut Mée, in Saint-Étienne-en-Coglès) was a defining moment, since it allowed us to place the regional emergence of the funeral and symbolic monumentality in a more coherent chronological context (CASSEN et al. 1998). The very trapezoid plan of the best-preserved of two houses – in particular its curved façade – is quite different from the most common LBK model appearing further east. On the other hand, the geometry of the building is almost identical to that of some funerary mounds located in the coast of Morbihan. Therefore, the finding gave us the opportunity to recall the existence of two sets of archaeological facts:

First, the repeated spatial correlation between trapezoidal houses of the 5<sup>th</sup> and 6<sup>th</sup> millennium BC, the exact superimposition of Lengyel/Brzesc Kujavski Culture houses over the earlier LBK ones (CZERNIAK 1998; TUREK 2014) clearly suggests that despite a hiatus of several centuries between the two episodes, the construction of a new structure mimicked the shape of an older pre-existent building (Fig. 9).

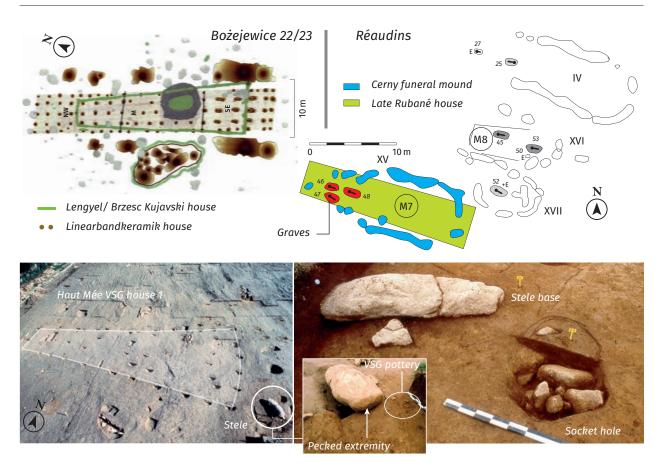


Fig. 9. Funerary monumentality and domestic spaces. In Bożejewice 22/23 (Poland), a Lengyel/Brzesc Kujavski house is overlapping an earlier LBK house (after Czerniak 1998; Turek 2014); in Les Réaudins at Balloy (France), a trapezoidal-shaped Cerny burial mound was built over a house of the late Rubané culture (after Chambon, Mordant 1996); in Le Haut Mée at Saint-Étienne-en-Coglès (France), a stele was erected at the angle of the early Neolithic house 1 (Villeneuve-Saint-Germain culture) (photos: S. Cassen).

Second, the exact coincidence between long houses and funeral monuments has been documented south of Paris. There, a trapezoidal-shaped Cerny burial mound was built over a house belonging to the late Rubané culture (Fig. 9)., whereby such a circumstance has been documented five times at the same site (CHAMBON/MORDANT 1996). Once again, there seems to exist some sort of memory about the existence of an ancestral location (in this case, three or four centuries old). These episodes also suggest the appropriation of the ruins, possibly due to their power of evocation. This is an analogy already exposed by P. Ashbee when discussing the plan of the Fussel' Lodge long barrow (Wiltshire, England) and its possible domestic antecedents on the continent (1966).

Accordingly, the searched equivalence between the domestic and the funerary space beyond life (for ethnographical parallels between symbolic domestic entrances and European megalithic architectures accesses, see Cassen 2000) is completed by a more radical transfer where the monumentality will play on the hardness of the materials used and the filling of the empty spaces. In this sense, a small stele made on granite (1.3 m long) was erected 5 m away of the south-eastern wall of the Haut Mée house. In this specific monument, we can feel all of the durability of the material implemented to immortalise a souvenir or immobilise an image. Above all, this standing stone allows us to reflect on a radical element —the vertical object, the heavy object fighting gravity — to reflect, in conclusion, on the concept of monumentality.

#### The moniment

Two new stelae will hold our attention now, one of them in Northern Brittany (Saint-Samson-sur-Rance) and the other in the south of this region (Locmariaquer).

The first one – La Tremblais – is huge (10 m long, 70 t) and visible from afar, intended to be seen by a broad

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audience. The granite on which it is made came from a source located several kilometres away. It was entirely regularised (Fig. 10). The second one, broken (Fig. 10), is much smaller (1.2 m long), made on a block of local

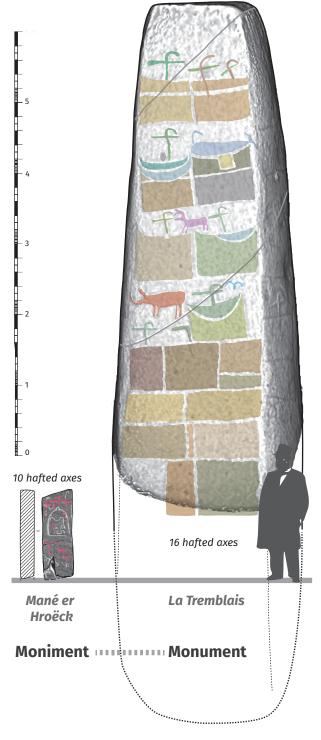


Fig. 10. Representations of hafted axes on the two stelae of Mané er Hroëck (Locmariaquer) and La Tremblais (Saint-Samson-sur-Rance), in Brittany.

granite and it is located at the entry of a tomb (Mané er Hroëck) inside, which one of the most important collections – at the European level – of rare and valuable objects has been found. These include axes made on alpine jade and Iberian sillimanite, beads and pendants on variscite and turquoise coming from Andalusia, etc.

These two Neolithic stelae – so different from one another – share in common the fact that they display the highest number of depictions of hafted axes across France (the first one with sixteen axes scattered over three of its faces; the second with ten concentrated in one of the faces). However, one of them was apparently reserved for a single person, while the other was made public. Would we consider one as lacking monumentality, with the other being the epitome of what a monument means?

Within the public space, the monument is the place for the assembly, meetings and celebrations; thus, contributing to the overtaking of the daily routine. The monument assumes functions, giving them a symbolic, aesthetic, cultural and even cosmic character, irreducible to the functionality (LEFEBVRE 1961). This influence of the monuments on the everydayness is also explained by the semiological richness that they have of their own, due to the very fact of their permanence and their seniority, built and preserved through the ages. However, does the archaeologist have the legitimacy to reject the status of monument — or »megalith« — for the Mané er Hroëck little stele?

G. Bachelard (1933) once wrote that the better we are at miniaturising the world, the better we possess it, whereby what becomes small makes us big. Between the public stele of La Tremblais – which displays a power – and the private stele of Mané er Hroëck offered to a single individual, it is all the work on the monumental image that deserves the approach between the miniature and the gigantism.

As A. Schopenhauer underlined (1818, 1113), in German, the etymology of the name of the art (*Kunst*) indicates what matters in it: the power (*Können*). Indeed, all the efficiency of the image comprises the fact that it establishes the faith in a power that would be inherent to it. The institution of the power, whatever it is, appropriates the representation: it produces its representations of language and image. On the other hand, the representation, the device of the representation, produces its own power: it is working as a power itself.

At the end of the 16<sup>th</sup> century, a Henri IV councillor – R. de Bagarris – wanted to convince the French king to create a history by medals, miniatures appropriate to immortalise the power by the image (MARIN 1991). Moreover, to differentiate the use of the word »monument« – overly-confined to being synonymous with sepulchres, which are also

made for the memory — instead he proposed the neologism »moniment« based on the Latin *monitor* »the one who shows«: a word also used in England by B. Jonson (1623) to celebrate his friend W. Shakespeare, not by the means of a monumental grave but rather a »moniment« that would assure his presence and eternal glory.

#### CONCLUSIONS

Therefore, the estrangement stresses the difference, the distance becomes a stake. As in other periods, Neolithic cultural objects can be studied in terms of their social trajectory and their movement through both social and spatial circuits. Finally, in Voltaire's philosophical tale (1752), when Micromégas travels around the Earth, he too is in the search of an impossible ori-

gin... His name itself – an oxymoron – invites a comparison based on the relativity of proportions. It is a proper noun, with scientific connotations, containing the meaning of his story: every being in the universe – whether from Sirius, Saturn or the Earth – appears as a tension between the micro and the mega.

#### **ACKNOWLEDGEMENTS**

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# Monumentality, liminality and the negotiation of ritual space in the Irish passage tomb tradition

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#### **ABSTRACT**

Irish passage tomb complexes commonly occupy commanding positions in the Irish landscape that can include upland locations and spaces bounded by waterways. In their appropriation of these liminal landscape settings, these monuments arguably capitalise upon the sense of sacredness and isolation associated with out-of-the-way places. The liminal character of these places is arguably harnessed for the construction of a monumental landscape and a relationship between the monument and its environment is established for the construction of a bounded space...a complex.

There are multiple spatial levels to this dynamic. While the relationship between the complex and the

liminal character of its landscape settings has been well established, the relationship between monuments within their complexes has been comparatively less well explored.

Drawing on examples from the Irish passage tomb tradition, this paper will suggest that the spaces between monuments are liminal spaces and that movement through the complex is manipulated by the inclusion of directive features. As the complex developed, the encounter with the space between monuments became increasingly formalised, suggesting increased complexity in terms of how these monumental landscapes were experienced.

# INTRODUCTION

This paper looks at how monumentality in the Irish passage tomb tradition can offer different degrees of access to the message inherent in the construction. By examining the siting of monuments in commanding locations, it will be argued that the monuments can communicate with an audience from a great distance. By examining the architecture of the entrances to these monuments as boundaries, it will be argued that these positions are focal points within the space of the complex that deliberately draw attention to the

distinction between those who were allowed to enter the monument and those who were not. Finally, by examining the relationships between monuments within their complexes, it will be argued through two case studies that the space between monuments is also liminal space and that those who were allowed to enter the complex may have moved through it in a formalised pattern manipulated by the inclusion of directive features in art and architecture

# THE IRISH PASSAGE TOMB TRADITION: AN INTRODUCTION

There are over 260 extant monuments that belong to the passage tomb tradition of Ireland. These monuments are named for the presence of a passage leading to a chamber, often concealed within a cairn of stones and retained by a kerb line of boulders (Fig. 1). These monuments commonly contain a uniform set of artefacts that comprise bone pins, stone balls, pieces of white quartz and a coarse stone pottery known as Carrowkeel ware. Cremation appears to have been the predominant burial rite. These monuments vary in terms of size and

complexity and extend from 5 m to 85 m in diameter. The majority are found in four major concentration referred to as complexes and distributed in an east-west running band extending across the northern third of the country (Fig. 2). The Boyne Valley and Loughcrew complexes are located in the east in County Meath, while the Carrowkeel/Keashcorran and Cuil Irra complexes are located in the west in County Sligo. See HENSEY (2015b) for an up-to-date discussion of the numbers found in each major concentration. In addition to these large and

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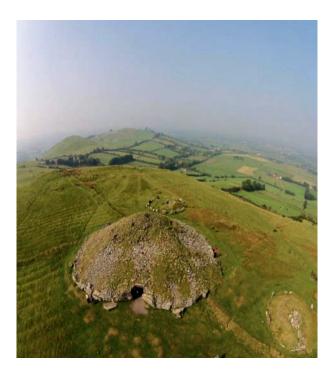


Fig. 1. Aerial view of Cairn T passage tomb (photo: Paul Naessens Western Aerial Photography).

well-known complexes, there are a number of smaller clusters distributed across Ireland. For instance, in Kilmonaster in Co. Donegal, o'NUALLAIN (1968) has recorded the presence of over twelve passage tombs. In the Dublin/Wicklow Mountains, there is a widely-dispersed concentration of monuments at the centre of which appears to have been the largest and most conspicuously sited and memorably named Hellfire Club passage tomb (HERITY 1974; NI LIONAIN/DAVIS 2014; JACKMAN 2016). There is a group of five potential passage tombs in Bremore/Gormanstown, as well as groups in Finner in Co. Donegal and Sheemore in Co. Leitrim (COONEY 2000; 2007; RYNNE 1960). There are also some isolated examples such as Knockroe in Co. Kilkenny, which was excavated by o'sullivan (1987; 1993; 1995; 1996; 2004) and appears to have been the centre of a wider distribution of monuments, although not of the passage tomb monument type. Fourknocks passage tomb near the Naul in north Co. Dublin and the passage tomb known as Duma na nGiall in Tara in Co. Meath have also been thoroughly excavated (HARTNETT 1956; HARTNETT/ o'sullivan 1971; o'sullivan/herity 2005; bayliss/ O'SULLIVAN 2013). Therefore, although the greatest concentration is undoubtedly found within these four major complexes, there are some smaller concentrations as well as isolated examples.

While megalithic art is found in the interior and exterior of the Boyne Valley monuments, it is generally confined to interior of the Loughcrew monuments, except in

some notable instances where it is found outside on individual kerbstones (SHEE-TWOHIG 1981; 2010). Megalithic art is rare in the western passage tombs, but examples do exist (CURRAN-MULLIGAN 1994; HENSEY/ROBIN 2011). This art is referred to as abstract, although ROBIN'S (2008) research has identified a relationship between the architecture of the monument and the motifs strategically placed within it, suggesting that this art was integral to the experience of the monument.

Outside of Ireland, passage tombs are found along the Atlantic seaboard with developed traditions found in Iberia, France, Orkney and Scandinavia. However, the Irish examples are unique in a number of respects: their appearance in sometimes tightly clustered groups is a detail that thoroughly distinguishes them from their counterparts, with the result that the Irish examples allow us to examine the relationship between monuments in detail. The identification of formalised patterns of arrangement within these complexes - such as circular and linear arrays - suggests that these complexes may have been developing with some degree of organisation (COONEY 1990; BERGH 1995). A detailed examination of these spatial configurations has shown that not only are the patterns of arrangement visually comparable in multiple instances; moreover, the developmental junctures that are reached in individual complexes, the relationships established between the core and periphery and the construction of defined spaces where rituals



Fig. 2. Distribution map of four major complexes labelled (map: Dag Hammar after EOGAN 1986, fig. 41).

associated with the usage of the monuments may have been contained are also comparable. The evidence suggests that the articulation of ritual was tightly interconnected with the articulation of space in the Irish passage tomb tradition.

Based on the availability of radiocarbon dates and spatial analyses, it would appear as though the smaller monuments pre-date the largest ones, but the upwards trajectory was not strictly linear (SHERIDAN 1985/1986; COONEY 2000). Some small monuments appear to post-date the largest and most elaborate constructions although this is rare and these examples are limited in number. With the advent of new radiocarbon dates, it is increasingly possible to refine the timeline for the construction/usage of this monument type (WHIT-TLE et al. 2011). The Irish evidence suggests that the height of passage tomb building activity extended from c. 3200 cal BC to c. 2900 cal BC and individual recent studies such as HENSEY (2014; 2015a), which has produced new dates for Carrowkeel/Keashcorran and SCHULTING et al. (forthcoming), which in turn has produced new dates for Knowth, continue to support this. The pilot dating strategy undertaken by BERGH and HENSEY (2013) in Carrowmore – where 25 new AMS dates were returned from samples taken from bone pins – strongly suggests that this group of monuments is the earliest in Ireland with extensive usage extending from c.3600–3200 cal BC. It is increasingly possible to suggest that despite most likely being linked to each other through their locations along navigable rivers, these complexes were developing as regional responses to the ritual needs of geographically-separated groups. For instance, despite being from insecure contexts, the recent published dates from Carrowkeel/Keashcorran would indicate that activity in this particular conservative complex was taking place at the same time as the massive monuments were being added to the Boyne Valley complex (HENSEY 2014; 2015a).

In summary, the Irish examples compare well with their international neighbours but differ substantially when certain factors are taken into account. Their clustering in groups is a detail that allows us to engage closely not only with the relationships established between monuments but also with the relationships established between these monuments and the land-scapes that they transform.

#### **COMMANDING GROUND**

The relationship between passage tombs and the environments within which they are situated has been very well studied and it is commonly suggested that these monuments occupy commanding positions in the Irish landscape that are considered liminal (BERGH 2002). The term liminal is from the Latin limen and means to occupy a position on the threshold. The appropriation of liminal positions in the Irish landscape can take different manifestations. In some instances, the monuments are positioned on the highest available ground such as cairn B in the Carrowkeel/Keashcorran Complex. At Loughcrew, the monuments are dispersed over the highest point in Co. Meath (Fig. 3). Queen Maeve's cairn on Knocknarea Mountain in Co. Sligo is the most dramatically-sited monument in the Irish passage tomb tradition and BERGH (2002) has suggested that the boundary between the monument and the mountain becomes erased in the ultimate expression of appropriation. In the Boyne Valley, the monuments are distributed over only slightly elevated ground, but this space is commanding and liminal for other reasons: it is wrapped with waterways creating an island-like character, which has led many scholars to suggest that this attribute may have been one of the factors drawing the builders of this passage tomb complex to this particular location (MITCHELL 1984; COONEY 2000). At Carrowmore, the commanding attributes of this particular location are far more subtle, but the liminal character of its position is still

perceptible. These monuments loosely encircle an elevated plateau of ground in the lowlands that is framed by high ground topped with monuments to the west, east and south-east, with the effect that Carrowmore appears to occupy the centre of the Cuil Irra peninsula.

Passage tomb complexes are commonly sited with reference to commanding topographical and geomorphological boundaries, natural features in the landscape that may have been considered sacred for their attributes. In instances where there are multiple different types of monument present, the passage tomb occupies the most advantageous seat, as is evident in the Carrowkeel/Keashcorran Complex where MOUNT (1996) has shown how a range of monument types take advantage of differing siting opportunities. This preference is also very evident in the Dublin uplands and has been highlighted by COONEY (2000) and more recently by NI LI-ONAIN/DAVIS (2014). According to BERGH (2002), these commanding locations were an expression of the concept of liminality. These monuments occupy the interface between two situations and their presence regulates and formalises the encounter with this interface. In his comments on the significance of natural places, BRAD-LEY (2000, 105) suggests that at the most fundamental level the positioning of a monument in a place with established significance transforms the way in which these places are experienced by imposing order and proscribing a route.



Fig. 3. Cairn T on Carnbane East photographed from the east.

The relationship between the passage tomb monument type and the liminal character of the landscape within which it is situated has been well explored with the implication that the appropriation of these kinds of setting is an integral part of this expression of monumentality. This persistent emphasis on the appropriation of commanding situations in the Irish landscape has the effect of extending the impact of the monument into the surrounding landscape. This objective is dramatically achieved in the Carrowkeel/Keashcorran

complex in particular where the entire complex of monuments has a directed visibility to the north. Commanding ground is liminal ground and the positioning of passage tombs in these types of situation means that the monuments occupy an interface regulated by the architecture of the complex. BERGH (1997, 142) suggests that monumentality is linked to visibility and the appropriation of advantageous ground means that the impact of these monuments can extend into the hinterland, where anybody can see them.

### **ENTRANCE ARCHITECTURE**

The entrance to the passage tomb has traditionally been studied as the position where threshold rites and rites of separation may have been undertaken as one left the outside world to enter the interior of the monument. Shee-twohig (2000, 93) has likened the experience of crossing the decorated entrances stones in the Boyne Valley to the crossing over of a liminal zone. In his comments on liminality and the entrance architecture of buildings, VAN GENNEP (1960, 25) suggests that an entrance is the ultimate boundary, the instillation and navigation of which may have been a complex affair. He suggests that the dressing of the entrance is different to the dressing of any other space and that other openings do not have the same quality. This is

particularity true of the entrance architecture of the Irish passage tomb tradition where the repetitive usage of specific architectural details creates a place for ritual activity.

In the largest monuments, the entrance is usually quite clearly indicated and elaborately dressed with a mixture of permanent and non-permanent features such as the in-turning of the kerb line, the flattening of the façade, the framing of the entrance with the largest kerbs, elaborately decorated blocking stones, stone settings, platforms of quartz and standing stones. With specific reference to the structured use of megalithic art, ROBIN (2008) has shown how the scaliform motif in particular is commonly found marking junctures and points

of transition within the monument and can also be found at the entrance to these monuments. In the large and unopened Heapstown Cairn in Co. Sligo, HENSEY (2010, 199) has speculated that the presence of a scaliform motif on the kerb might indicate that the entrance to this monument can be found on the southern side. Maeve's cairn on Knocknarea has no known entrance, but BERGH (1995) speculates that it would have been on the southern face of the monument due to the perimeter complexity and concentration of activity on this side of the mountain. At Carrowkeel/ Keashcorran, cairn F was identified as a focal monument for the group owing to its interior complexity but also the especially monumental character of the entrance (MACALISTER et al. 1911/1912). Many of the other monuments have quite distinctive entrances (Fig. 4). In his comments on the significance of the entrance to Knowth, EOGAN (1986, 179) suggests that the collection of features marking the boundary may have underlined the importance of this reserved area for activity creating a backdrop and formalising the encounter with this face of the monument.

The entrance architecture of the largest monuments is usually the most elaborate, but the entrances to the smaller monuments are usually quite clearly indicated as well by the incorporation of distinctive blocking stones or flattened façades and this can be seen in both of the case studies used below. For instance, at Loughcrew, the entrance to the smaller sites is usually blocked with a

long low boulder framed by similarly well-chosen boulders even though the kerb lines are usually haphazardly constructed in general within this complex. Art has recently been discovered on the entrance kerb of cairn X1 by o'sullivan et al. (2010), even though decorated entrance stones outside of the Boyne Valley are rare. At Knowth the entrances to the smaller sites are usually blocked with a stone that is distinctive within the composition for its colour or geology. Art on these smaller sites is generally confined to two types of location: the entrance stone or around on the right-hand side of the kerb line as one faces the entrance. Although the entrances to these smaller monuments are not dressed in a comparably conspicuous manner, their position is indicated in a repetitive manner. However, this is not the case with all of the smaller examples, as there are – for example – no entrance indications in the contiguous boulder circles defining the monuments at Carrowmore, Co. Sligo. The absence of a cairn and subsequent exposure of the chamber and rudimentary passage means that it is still possible to identify an orientation however (BERGH 1995).

The repetitive usage of a collection of features to indicate the presence of an entrance in larger and smaller monuments arguably dramatises the distinction between those who were granted access to the interior of the monument and those who were not. Control over these entrances may have been achieved in a variety of ways. For instance, at both Newgrange and



Fig. 4. The entrance to Cairn H, Carrowkeel/Keashcorran passage Tomb Complex Co. Sligo.

Carrowkeel cairn G, large blocking stones were found and these may have been periodically manoeuvred into or out of place. The negotiation of these entrances as liminal boundaries may have been undertaken in the company of a gathered audience and the repetitive use of a series of features to indicate the presence of an

entrance may have regulated and structured the experience of these places. The knowledge confined to the interior of the monument may have been available to only a select few and the dramatisation of the entrance architecture may have served to underline this for an assembled audience.

#### THE SPACE BETWEEN

The positioning of passage tombs on commanding ground has been studied as the imposition of order upon liminal space and the impact of elevated siting means that the influence of the monument is extended into the surrounding landscape, controlling perception from a distance and impacting on an audience without distinguishing between who was allowed to encounter the message. The entrance to the monument is another liminal boundary and the architecture of this space draws attention to the distinction between those who might have been allowed to enter the monument and those who might not. Both of these examples highlight different degrees of access to the message inherent in the monument.

In her comments on the significance of how people may have undertaken different kinds of journey in prehistory, CUMMINGS and JOHNSON (2007, 60-61) suggest that each megalithic monument »represented in material form a number of important movements around the landscape« and that »movements to, from and around these sites were of fundamental importance«. With this point in mind, there is arguably another liminal space in the Irish passage tomb tradition that has been comparatively less well explored and this is the space between monuments where the emphasis is placed in this paper. The space between monuments is the exterior space of the monument, but it is the interior of the complex and the position where an assembled audience may have gathered. STOUT (2010, 199-208) refers to the details by which the encounter may have been structured as >inclusive< and notably suggests that »from the earliest stages of construction the builders were incorporating architectural detail to enhance the experience of those members of the community who remained outside of the monument«. Examples of these inclusive features include the use of megalithic art and the flattening of the façades of the largest monuments to create a place for ceremony. However, movement through this space may have been structured by the use of these features and within this paper these details are referred to as directive features that manipulated - on an increasing scale - the way in which the space of the complex as liminal space was negotiated, not only including an audience in the ritual expression but directing their encounter with every aspect of it. In his comments on megalithic architecture, тном-As (1990, 170) suggests that »constructed spaces will influence subjective experience in a much more direct way by constraining the pattern of bodily movement, creating patterns of visibility and hiddenness«. Movement through the space of the complex may have been a complicated affair where a sequence of structured encounters was firstly experienced outside of the monument. What follows in both of these case studies is an account of the features that potentially structured this negotiation. The first case study in Knowth is focused on the relationship between monuments in a thoroughly excavated and tightly integrated cluster. Within this group, the monuments are positioned in relation to one another to form an inward-looking array that has a well-defined interior and exterior. At Loughcrew, the monuments are less tightly integrated but harness the irregularities of the topography to achieve the same effects of definition and enclosure. In both instances, directive features are arguably included in the monuments to structure the negotiation of the liminal.

#### STRUCTURING THE LIMINAL AT KNOWTH

## Introduction

The Knowth Passage Tomb cluster is the densest concentration of monuments in the Boyne Valley complex (Fig. 5). They are located on the western extent of the bend in the river Boyne where the river itself encounters a geological obstruction of underlying carboniferous shale and is forced to take a sharp turn to the south.

The complex of monuments occupies the highest point on this glacial till covered shale ridge overlooking the bend in the river Boyne.

The first excavation was undertaken by R.A.S. Macalister (1943) in the vicinity of Knowth site 1 in July 1941. He exposed the kerb line and uncovered sites 11, 12 and 14. The extent to which site 1 was enclosed by smaller monuments was not clearly understood until

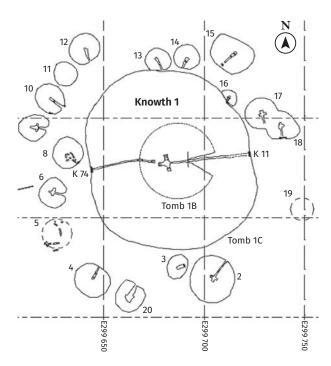


Fig. 5. Distribution of monuments at Knowth (after Prendergast/Ray 2015, fig. A2.1).

later phases of excavation undertaken by Eogan, where the main aim was to confirm the presence of smaller monuments in proximity to site 1 and investigate the relationship between these monuments. Eogan's work revealed seventeen smaller sites in total - numbered from site 2 to site 18 - and this number has since been brought up to twenty. The evidence suggests that Knowth site 1 in particular was successively aggrandised from a smaller monument into the large mound that we see today (EOGAN 1998; Eogan/Cleary forthcoming), (Fig. 5). The monuments at Knowth are arranged in a tightly integrated and inward-looking circular array that is schematically comparable to the circular array of monuments at Carrowmore in Cuil Irra (Cooney 1990; Bergh 1995). The degree to which these monuments are integrated affords us an unparalleled opportunity to examine the relationship between monuments that were arguably carefully placed with reference to one another to define a central space as well as structuring the encounter with the space between monuments, which became increasingly formalised and restrictive as the complex developed.

# Directive features at Knowth

In his comments about how ritual procession may have been directed around the famously decorated kerb line of Knowth site 1 in relation to the equinox events associated with this monument, Eogan (1986, 178) suggests that at Knowth »One might visualise a morning ceremony on the east side and an evening ceremony on the west side«. Part of the event might have involved an enactment of ritual outside of the tomb; for instance, a procession around the mound, taking advantage of the decoration on the kerbstones each one perhaps representing a »station within a system«. It is likely that movement between the entrances of Knowth site 1 was not necessarily only undertaken with reference to the decorated kerb line. If people paused at the decoration of this kerb line, then they were in effect pausing in the space between monuments and they may have done so in relation to those spaces.

There are 238 kerb stones remaining in the kerb lines of the smaller monuments at Knowth. In most instances, large portions of the kerb lines are missing. Site 2 has the best-preserved kerb line with 42 kerbs present within its composition (EOGAN 1984). Sites 10 and 4 were almost completely obliterated. In many sites - namely 2, 3, 4, 5, 8, 13, 14 and 15 - the back of the kerb line in particular has been robbed out. There are only fifteen examples of decoration, meaning that art on these kerbs is rare and focused in two locations: at the entrance or around on the right-hand side of the kerb line (EOGAN 1984). The evidence suggests that the kerb lines were constructed with great care. The individual kerbs are commonly of a uniform height and width and the maintenance of this uniformity appears to have been a concern. In some instances, the kerb stones are sitting on old ground level and are stabilised by packing stones or sunken into sockets to maintain this symmetry (EOGAN 1984). An interesting example of this objective to maintain the uniformity of the upper level of the kerb line can be found in site 13. This monument was modified to facilitate the augmentation of site 1 and the replaced section of kerb line was elevated to match the height of the remaining kerb line. The height was maintained but the face of the kerb line was compromised by being constructed from such comparatively small kerbs, suggesting that the maintenance of the uniformity of the upper level of the kerb line was a priority, more so than the selection of kerbs that might blend in with the remainder of the kerb line.

There are directive features built into these kerb lines most of which are concentrated around the entrances. These features take the form of art but also of architecture. In some instances – such as sites 13 and 15 – the entrance stones are decorated. In site 13 this decorated entrance stone is also framed by two decorated kerbs. In site 15, the largest stone within the composition is the one that blocks the entrance and the stones in the kerb line are graded in height to

frame it (O'SULLIVAN 2004). In sites 8, and 2 and 13, the decoration is confined to the front of the monument close to the entrance. However, in some instances – such as sites 14, 15, 12 and 2 –the decoration is to the right of the entrance around the side of the monument. Both sites 4 and 15 have flattened façades, with site 15 representing the most dramatic and visible instance of this dynamic. Site 4 is located over 7 m from the kerb line of site 1 and is notable for the inclusion of a stone setting in front of its entrance suggesting the direction of attention and movement even in

comparatively open spaces. Site 8 has an in-turn in its kerb to indicate the presence of an entrance, which is also framed with decorated kerbs.

In this thoroughly inward-looking complex of monuments, these directive features are focused on the band of space between site 1 and the smaller monuments, manipulating and regulating the encounter with this space, which was significantly restricted when site 1 was aggrandised and extended out to reach them (Fig. 5). These monuments might originally have framed a much more open space where movement was much less restricted

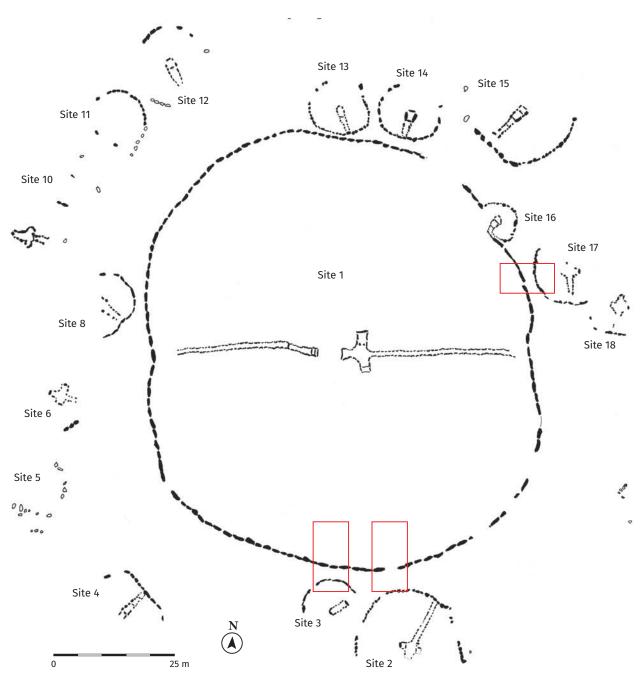


Fig. 6. Decorated junctures at Knowth (after Eogan 1984).

by monumentality. These directive features focus attention on the entrances of these monuments but also around the sides of these monuments where large slabs are included or where there is art located away from the entrance drawing attention to a juncture between monuments. The significance of these features is the implication that the focusing of attention and the direction of movement on and away from the entrance may have been a concern at an earlier stage in the development of the complex than has previously been envisaged. These details suggest a pre-occupation with the landscaping of the encounter with the space between monuments. These features formalise the encounter and as a result, multiple different types of juncture are created. According to (LEFEBVRE 1991, 193) in his reflections on the construction of space, »junction points are often places of passage and encounter, often access to them is forbidden except on certain occasions of ritual import«.

# **Decorated junctures**

At Knowth, decorated junctures are created when a smaller monument is positioned in close proximity to the kerb line of site 1. These junctures have the effect of concentrating the encounter with this decoration. This is most obvious in two instances where sites 3 and 1 and sites 17 and 1 are concerned and slightly less obvious in a third instance where site 1 and 2 are concerned (Fig. 6). In all three of these examples, the satellite faces away from the kerb line of site 1 and thus in this type of juncture entrance to a monument is unavailable. In the two most obvious of these junctures, the kerb of site 1 is heavily embellished, drawing attention to the space between.

At the location where sites 1 and 3 are closest, there is a highly decorated kerb in site 1 and a corresponding façade of long even kerbs on the face of site 3, which presents as an interruption to the patterned arrangement of boulders in this kerb line. There is also a decorated kerb in site 3, which is markedly more elaborate than any of the other decorated satellite kerbs in the complex. This is arguably a decorated juncture, a concentration of the sacred in the space between monuments. The encounter with the artwork on both monuments is intensified by the proximity of site 3 to site 1, which forces people to negotiate this space in single file. Site 3 is particularly unusual in the complex for not having an entrance orientated towards the position occupied by site 1. EOGAN (1984) speculated that this monument either never had an entrance or was orientated to the south away from site 1.

A comparable relationship is established between site 17 and 1 (Fig. 7). In this instance, there is also a highly embellished kerb in site 1 and a corresponding kerb



Fig. 7. Decorated juncture between Knowth Sites 1 and 17 looking north-west.

of unusual geology in site 17, creating another decorated juncture between monuments. In this instance, there is also no possibility of gaining access to either monument from the space between. Site 17 is thought to post-date site 1 and looks away from the central space that it occupies (EOGAN 1986). The space between monuments is even more restricted here and like the relationship between site 3 and site 1, it is only possible to see the art if movement is undertaken in single file. There is comparably more space between site 2 and site 1, but there is a gap in the kerb line of site 1 where one of the kerbs has been taken away, so it is impossible to know if this really is another decorated juncture. However, SITE 2 is also thought to post-date site 1 and looks away from it. This is a juncture with only some of the attributes of the examples noted above, but it is worth noting as another potential example.

Sites 2, 17 and 18 post-date site 1 and thus these monuments may have been placed at points of pre-existing significance in the kerb line of site 1, creating a juncture and a concentration of the sacred in these locations. Site 3 most likely pre-dates site 1, but the same effect is created. These are arguably stopping points within a system of movement undertaken through the space between monuments at Knowth.

# **Undecorated junctures**

Undecorated junctures are created when the kerb line of site 1 sits in close proximity to the smaller monuments that potentially pre-date it. In these instances, the kerb line is usually not heavily decorated. The majority of the smaller monuments face in towards the space occupied by site 1 and in these undecorated junctures entrance can be gained to the smaller monument. At these junctures, the kerb that blocks the smaller monument is



Fig. 8. The relationship between Site 8 and Site 1.

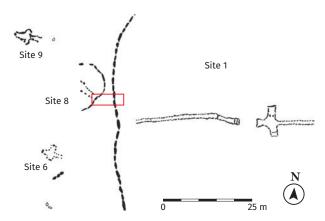


Fig. 9. Plan after EOGAN 1984.

distinctive and the adjacent kerb in site 1 is undecorated/ not highly embellished. In site 13, the largest stone in the composition is kerb 16, which blocks the entrance. The presence and proximity of this monument is arguably reflected in the kerb line of site 1 where a long low undecorated kerb is located directly opposite the entrance. Additional examples exist in sites 15 and 14 where a low profile undecorated kerb is present in the kerb line of site 1 aligned with their entrances. This is slightly more difficult to appreciate in these examples because the kerb line of site 1 is not as close to these smaller sites. The most compelling example of all exists in the space between site 8 and site 1 (Figs. 8, 9). Site 8 is orientated towards the flattened façade of site 1 and its entrance to the undifferentiated western chamber. This façade is composed of the largest kerbs in the composition except for the kerb that faces site 8. This is perhaps the most interesting example because the entrance façades of later monuments are traditionally framed by the largest well-chosen kerbs. In all of these instances, the presence of a pre-existing smaller monument in close proximity to site 1 is arguably reflected in the kerb line of site 1 by the inclusion of a low profile undecorated kerb. Movement through these undecorated junctures must also be undertaken in single file in most instances. There is balance to the construction of these junctures, attention is focused back onto the entrance of the smaller monument where the encounter with it is concentrated and although site 1 is a much larger monument, it does not detract attention from the smaller monuments in these instances. These undecorated junctures are the positions where entrance might have been gained to a smaller monument.

# Negotiating the liminal at Knowth

Movement through the space between monuments at Knowth is arguably constrained through the placement of monuments in relation to one another. In two notable cases, it is not possible to move through the space between monuments at Knowth at all and in these instances movement may have been undertaken around the back of the kerb lines. For example, the space between site 13 and site 1 for example was dramatically reduced when site 1 was aggrandised. Both kerb lines were modified to facilitate their continued independence and in both instances the kerb lines were re-constructed with small and undecorated kerbs, creating the impression that they were not integral to the experience of directed movement. Where site 16 and site 1 were concerned, no such gap was maintained and the two monuments were completely merged. However, the entrance to site 16 was remodelled, so that access to the chamber of the smallest monument in the group might still be obtained, suggesting that it continued in significance even after the largest and most elaborate monument was constructed.

The undecorated junctures are arguably reflective of a relationship between Knowth site 1 and the smaller monuments that pre-date it, while the decorated junctures noted earlier are arguably reflective of the relationship between aggrandised site 1 and the smaller monuments that post-date it. EOGAN (1986, 178) has suggested that movement between the entrances of site 1 may have occasioned an assembled audience to pause at the decorated kerb line like »stations within a system«. The assembled audience may also have paused in the space between monuments where attention was focused not only on the decorated kerb line of site 1 but also on the smaller monument that frames the encounter. Movement through the space between monuments at Knowth may have been formalised in a multiplicity of ways. The interplay between monuments for the construction of decorated and undecorated junctures may simply represent the most visible manifestation of this direction.

## STRUCTURING THE LIMINAL AT LOUGHCREW

### Introduction to Loughcrew

The complex of monuments at Loughcrew is also known in Irish as the Sliabh na Callaigh, which translates into English as the hills of the witch. This complex is located in the north-west of County Meath at the interface between the Shannon and the Blackwater rivers (COONEY 2000). At least 31 extant monuments are distributed over a ridge of four hills, which has a SW/ NE orientation (Fig. 10). These summits rise to over 244 m ASL and there are major concentrations of monuments on two of them with less dense distribution on the eastern extent where the pattern of monument distribution was most likely affected by destruction in the 1800s. The majority of the monuments are orientated towards the east and exist in various states of preservation: seventeen monuments have partial or complete kerb lines, seven monuments have visible and preserved plans and a further 21 monuments retain the footprint of their original plans (MCMANN 1991). The monuments range dramatically in size, extending from 5 m to 53 m in diameter. There is some variation in terms of interior chamber plan some monuments have a stalled plan, while others have a cruciform plan. Fifteen of these monuments have megalithic art confined to their interiors and there are four known instances of megalithic

art found outside of these monuments on the kerb line (SHEE-TWOHIG 1981; 2010).

The monuments were brought to prominence by local school inspector Eugene Alfred Conwell in 1863, aided by artist/geologist George V. Du Noyer, who made drawings of the chamber and field plans of the monuments. Conwell's first paper was presented to the Royal Irish Academy in 1864. He thoroughly investigated the monuments and presented his findings on multiple additional occasions to the RIA (CONWELL 1864; 1866; 1872; 1873) and was responsible for the lettering scheme used to identify each individual monument. Subsequent investigations were carried out by local landowner Edward Crofton Rotherham, who also made numerous presentations to the RIA (ROTHER-HAM 1895; 1897; 1898). The only scientific excavation to have been carried out in line with modern excavation standards was directed by Acting keeper of Antiquities Joseph Raftery in 1946. His focus was placed exclusively on cairn H to confront Conwell's finding of thousands of Le Tene incised bone flakes dating to the Iron Age. His findings led him to suggest that this was an Iron Age monument, but a full excavation report was never published until a summary review was made available by COONEY et al. (2009). The evidence suggests that this was a Neolithic monument

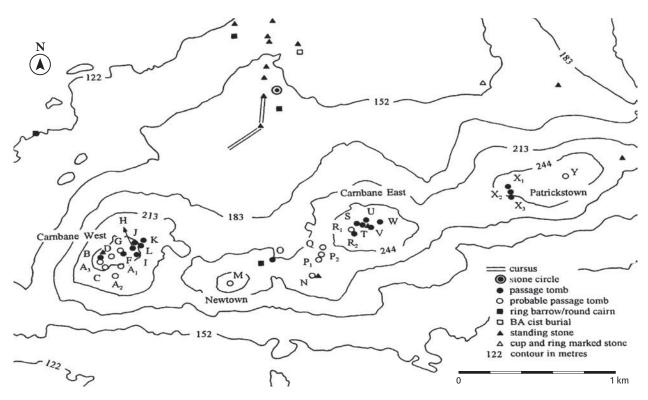


Fig. 10. Distribution map of monuments at Loughcrew (after McMann 1994).

L. McCormack/S. Bergh

that underwent a phase of aggrandisement and was later re-used in the Iron Age. Recent research in the complex by one of us has involved the geophysical investigation of the landscape to clarify the pattern of monument distribution and detect the footprint of ruined monuments (MC CORMACK 2010; 2013; 2014).

## Open zones at Loughcrew

One of the most interesting studies undertaken on this complex was by FRASER (1998), who identified a series of carefully-constructed open zones where gatherings may have been contained (Fig. 11). FRASER (1998, 205) notes that »space is not a neutral arena in which social action is played out; rather it is itself a medium for the production and reproduction and indeed transformation of social relations«. The open zones that she identified are formed through the positioning of monuments in relation to each other as well as the topography to enclose and define spaces where gatherings associated with the monuments may have been contained. The assembled crowd positioned outside of the monument in the space defined by monuments may have played an equally important role for the rituals undertaken by specialists.

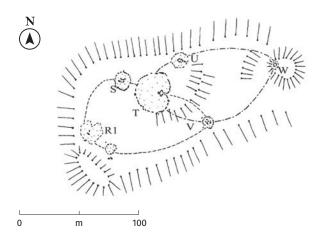


Fig. 11. Open zones on Carnbane East at Loughcrew (after Fraser 1998).

Much emphasis has been placed on the encounter with the interior of the monument and ROBIN'S (2008) research in particular has shown how the structured placement of megalithic art may have directed the interaction with the interior space. THOMAS (1990) suggests that monumental architecture as artificially-constructed space imposes a physical reality on an individual and space can be experienced as a journey orchestrated with physical signifiers as well

as culturally-specific prohibitions. Although his emphasis is placed on the management of the encounter with the interior of the monument, his comments have interesting connotations when applied to the space outside of the passage tomb, because this is the interior of the complex and the architecture of this space may also have constrained movement. The open zones identified by FRASER (1998) are arguably punctuated by directive features that may have formalised the way in which the space between monuments was negotiated in the Neolithic. What follows is a consideration of the use of northern markers built into the kerb lines of the monuments at Loughcrew for this purpose.

## Open zones punctuated by northern markers

The entrance façades of the largest monuments have traditionally been studied as the positions where an assembled audience may have gathered in the Neolithic. These places are studied as liminal zones and this has been explored in an earlier section of this paper. However, there are additional points within the kerb lines at Loughcrew that are conspicuous and our emphasis should be expanded to consider the possibility of gatherings held elsewhere within the complex associated with key points in the kerb line. At Loughcrew, there are various forms of markers positioned on the northern faces of the monuments that arguably direct attention and activity away from the entrance and have a range of views denied to an individual standing at the entrance to these monuments. The most obvious example of these northern markers is the kerb stone known locally as the Witch's Chair, positioned on the northern face of cairn T. This is the only monument within the entire complex for which the possibility of external associated activity has ever been recognised, due to the presence of artwork across its base and owing to its distinctive shape (Figs. 12, 13).

It is the third largest boulder in the cairn T kerb line and its very position within the composition prompts interest because it is the only location associated with cairn T where views of Carnbane West, Newtown Hill and Patrickstown hill can be achieved simultaneously. This kerb is arguably strategically placed to capitalise upon a range of views of the ridge that are unavailable from a position in front of the entrance. In the very centre of the stone, it is also possible to identify a scaliform motif that ROBIN (2008) has linked to points of transition inside of the monument (Fig. 12). This kerbstone also marks the interface between two of Fraser's open zones. This northern marker capitalises on the attributes of this position and although it is unique within the complex it is not without parallel. A comparable emphasis can be identified on the northern face of additional



The Hag's Chair, Lough Crew .- From a drawing by E. Conwell.

Fig. 12. Conwell's (1873) depiction of the Witch's Chair kerbstone with Robin's (2008) scaliform sign circled in red.



Fig. 13. The kerb photographed from the north-west.

monuments within the complex, suggesting that this was not confined to the larger monuments. On Carnbane East, the closest parallel to the Witch's Chair as a northern marker in cairn T can be identified in Cairns U and S, where the largest boulders in the kerb line are located on the northern faces of the monuments (Fig. 14). This

repetitive emphasis on the north and the placement of a conspicuous kerb on the northern face of the kerb line is also traceable over on Carnbane West where the largest kerbs in the kerb lines of Cairns H, D, I and F are also located on the northern faces of the monuments. In these instances on Carnbane West, the kerbstones are



Fig. 14. The northern marker in Cairn U (facing south).



Fig. 15. Northern marker in Cairn F (facing south).



Fig. 16. Northern marker in cairn I (facing south).



Fig. 17. Northern marker in Cairn L (facing south).

immediately distinctive for their size but also in some instances for their shape. In Cairns I and F in particular, there is a hollow in the top of the kerb that is reminiscent of the shape of the Witch's Chair kerb stone (Figs. 15, 16). On the northern face of cairn L there is also a stone set out of the kerb line on the north-western face of the monument (Fig. 17). In all cases, these positions are notable for the availability of views of the complex that are

denied to a person standing in front of the entrances to these monuments.

In summary, the existence of conspicuous points in the kerb line located away from the entrance at these monuments validates the extension of our attention away from the entrance. These directive features may have punctuated the encounter with the open zones that were identified by FRASER (1998).

## Negotiating the liminal at Loughcrew

The kerb line at Sliabh na Calliagh is arguably a ritual interface closely associated with the activities that may have taken place outside of the monument. This emphasis on the northern face of the monument may be an emphasis on the attributes associated with these positions and the availability of views of the complex. However, it is worth noting that there is a great deal of archaeological activity relating to contemporary or later periods in the lowlands directly to the

north of the ridge in Ballinvalley (Fig. 10), (MC CORMACK 2010; SHEE-TWOHIG 2001). The significance of the northern markers is that they may have punctuated ritual procession directed through the spaces between monuments, drawing attention to the wider distribution of smaller monuments even after the largest ones were built. Combined with conspicuously indicated entrances in smaller and larger monuments, these northern markers may have functioned as directive features regulating the encounter with the open zones identified by FRASER (1998).

#### THE NEGOTIATION OF RITUAL SPACE IN THE IRISH PASSAGE TOMB TRADITION

According to LEFEBVRE (1991, 141), »The articulation of space is carried out by its division through the creation of boundaries and the act of making neutral space possesses symbolic meaning, where place can be controlled and classified«. The space between monuments is open space in comparison to the confined interior of the passage tomb monument, but movement through this space may have been carefully proscribed and for this reason it may not have been entirely neutral space. Although this space is the exterior space of the monument, it is still the interior space of the complex and this is especially evident at a site like Knowth where the monuments are clustered so closely together. In his comments on megalithic architecture and the phenomenon of monumental enclosure, RICHARDS (2013, 18) refers to places as having been wrapped with monuments and he suggests that wrapping has the effect of concealment, containment, protection, unification and re-presentation. He notably suggests that »the mode of wrapping dictates the mode of unwrapping and final revelation comes only after a sequence of physically structured experiences have been negotiated«. The space between monuments is arguably a liminal space, a space wrapped with monuments, and although it is not necessarily possible to know the direction from which people entered the space of the complex it is still possible to identify directive features in art and architecture suggesting that it was navigated in a structured manner in the Neolithic.

The construction of public spaces designed to contain gatherings can be suggested in multiple instances in the Irish passage tomb tradition and this paper has endeavoured to suggest that movement and attention were carefully directed within these spaces. In MCPHAIL/WOHLSTEIN'S (1983, 580) research into the processes and practices that underpin an assembly and the type of interactions which take place when people are together for a common purpose, he suggests that »gatherings aren't synonymous with collective behaviour but provide circumstances in which it may occur«. There are two different kinds of gatherings: those that are periodic

and those that are more fluid and take place without the same degree of forward planning or advance notice. In the Irish passage tomb tradition, many monuments are aligned towards equinoctial or solstitial events that may have been the focus of much public ritual and observation in the Neolithic. HENSEY (2008) has suggested that many monuments such as cairn G in Carrowkeel/ Keashcorran have an imperfect alignment and may have been designed to allow people to capture and observe sunlight. It is arguably possible to suggest that solstitial events such as the winter sunrise alignment in Newgrange, the equinox alignment at cairn T in Loughcrew or indeed the postulated equinox alignments at Knowth site 1 may have been the focus of gatherings that were periodic in nature (Fig. 18). MCPHAIL/WOHLSTEIN (1983, 725) notes that within a gathering, variations in locational access can affect the encounter with the receipt of instruction: those closest to the event can see and hear what is taking place, while those further away from the event can probably only hear but not see what is taking place and must take their cue from those in front of them. The front faces of the largest monuments are dressed with features designed to enhance the experience of rituals potentially undertaken in front of the entrances. These monuments completely dominate the public arenas associated with them and although the rest of the space is not identically equipped, it is still possible to suggest that less conspicuous means are deployed for the purpose of controlling the encounter with the space. The evidence consistently suggests that the smaller monuments continued in importance even after the largest ones were built and thus collective locomotion or ritual procession through the space of the complex may have been an integral part of the rituals associated with the usage of the complex. This negotiation of this liminal space may have been guided by the inclusion of directive features that acted as interruptions by creating a common focus. The decorated and undecorated junctures at Knowth and the northern markers at Loughcrew may have caused people to pause in the space between

L. McCormack/S. Bergh



Fig. 18. Sunrise gathering to mark the equinox alignment at Cairn T, Loughcrew September 2012 (photo: Donncha Smith).

monuments. These are the positions where a specific view or encounter is framed by monuments and presented in a manner that can only be appreciated when people move through it in a controlled fashion.

The most restrictive encounters with the monumentality of the Irish passage tomb tradition are the interior spaces of the chambers where few people could fit. The architecture of the entrances arguably dramatises the distinction between those who could enter and those who could not and this contrasts the freedom with which the message inherent in the monumentality can be encountered in the hinterland through the positioning of

monuments in commanding locations. THOMAS (1990, 176) suggests that \*\* the gradual multiplication of bounded spaces which must be passed through in order to gain access to the burial deposit allows for a greater degree of subdivision of the audience\*. This is as true of the space of the complex as it is of the interior of the monument and future research into the Irish passage tomb tradition could benefit from a greater examination of these details. While it is not possible for us to fully know the way in which the ritual spaces of the complex were negotiated, it is still possible recognise the directional cues that may have structured this negotiation.

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# Just passing by? Investigating in the territory of the megalith builders of the Southern European plains. The case of Azután, Toledo

Felicitas Schmitt, Primitiva Bueno-Ramírez, Martin Bartelheim

#### **ABSTRACT**

For years, it was believed that little happened during prehistoric times in the centre of the Iberian Peninsula. The different peoples of the end of the Neolithic and the Chalcolithic were said to be living almost exclusively at the Iberian coasts, while only poor temporal settlements of small size would have existed on the Spanish Mesetas. Like in other parts of Europe, development and progress were believed to derive from the »blessed« lands of the Eastern Mediterranean, whereby the coastland of the peninsula was influenced and developed faster and the hinterland was supposed to remain at the same low level of economy, social differentiations, etc. until the Iron Age. Since research in the centre has intensified since the late-1980s, this view on Spanish prehistory is eventually changing.

A sub-project of the Collaborative Research Center 1070 Resource Cultures of the University of Tübingen (BARTELHEIM et al. 2015) is currently conducting research in different areas of the Iberian Peninsula. In close collaboration with the University of Alcalá de Henares, the project is also

focusing on the Southern Meseta, with an emphasis on the surroundings of the dolmen of Azután. New intensive archaeological and geomagnetic surveys conducted in spring and autumn of 2014, respectively, focused on finds and features from the end of the 4<sup>th</sup> and the whole 3<sup>rd</sup> millennium BC. This already provided insights into the impressive late Neolithic and Chalcolithic structures that – little by little – bring the contemporaneous environment and landscape of this important megalithic monument back to life.

With today's possibilities of different survey methods, the interpretation of aerial and satellite images and the close collaboration with archaeobiology, palynology as well as digital humanities, the aim is to reconstruct the environment and integration of the research area within the communication network of the 3<sup>rd</sup> millennium BC, showing not only the important location of the dolmen – which has already been stressed by P. Bueno and her team – but also the position of the enclosure in its environment during the Recent Prehistory of Iberia.

# INTRODUCTION

The Prehistory of the centre of the Iberian Peninsula was marginalised and until the 1980s the interior of Spain was believed to be a vast empty space, unsuitable for human settlement. Therefore, the number of archaeological investigations was very low until 30 years ago and the knowledge about recent Prehistory was poorly developed (BUENO et al. 2009, 37–42; BUENO et al. 2006, 57). This slightly changed with excavations from archaeological departments of universities as well as rescue excavations in the context of the massive infrastructural construction work. Although CHAPMAN (2008, 195–196) emphasises the growth of knowledge and data about prehistoric sites on the Southern Meseta, he does not withhold that more research was undertaken regarding 5th to 3rd millennium BC sites in the western part of this region compared with the east (CHAPMAN 2008, 223). Furthermore, the recent work on radiocarbon chronology (Balsera et al. 2015) highlights the irregularities and broader differences in the distribution of the available radiocarbon dataset of southern Spain. The authors could determine two main factors:

- the existence of certain research groups with interests in particular >social and cultural processes
   focusing on certain topics and regions (Neolithization Levant, complex societies south-east); and
- 2. since the end of the 1980s, the heritage policies and different objectives of the autonomous regions in Spain varied. On these grounds, construction particularly affected the provinces of Alicante, Valencia, Murcia and the autonomous region of Madrid where due to rescue excavations a lot of data could be collected. Overall, 46% of the radiocarbon dates derive only from Alicante, Almería, Granada and Madrid (BALSERA et al. 2015, 141). The

archaeological record has remarkably increased in recent decades, although the data varies in quality and distribution and the chronologies differ on the southern half of the Iberian Peninsula (CHAPMAN 2008, 246).

In the aforementioned collected data, there is a visible paucity of occupations for the 3<sup>rd</sup> millennium BC of La Mancha and the 2<sup>nd</sup> millennium BC in two provinces of Extremadura (CHAPMAN 2008, 246). However, the investigations of recent years and new studies about the Mesetas demonstrate the Neolithic and Chalcolithic potential hidden beneath the ground (BARROSO et al. 2014; BUENO et al. 2016; BUENO et al. 2013; BUENO et al. 2011; BUENO et al. 2010; BUENO et al. 2005b; DELIBES et al. 2014). More large-scale projects may recover more settlements of possibly even unexpected chronologies for the Spanish Central Plateau. The already well-known relations between the Atlantic facade and the centre of the pen-

insula from the Upper Paleolithic to the Iron Age can be strengthened when considering the architecture of dolmens and the burial patterns, which are similar to those of their Portuguese counterparts. Over 400 megalithic structures in the valleys of the Douro and Tagus Rivers are connected to other Iberian regions in their architectural tradition (BUENO et al. 2016, 157–158). As previously mentioned, the existence of other ritual or settlement sites belonging to the Neolithic and Chalcolithic period (mainly ditched enclosures) should be a logical consequence of the economic and social development of prehistoric societies, made visible and their detection possible by their vicinity to the megalithic structures (BUENO et al. 2005b; BUENO et al. 2011; BUENO et al. 2012).

With the Project A02 »Many Ores and Little Water. Socio-Cultural Change in Connection with the Use of Resources in the Later Prehistory of the Iberian Peninsula«, the chance for new investigations concerning the 4<sup>th</sup> and mainly the 3<sup>rd</sup> millennium BC was provided,

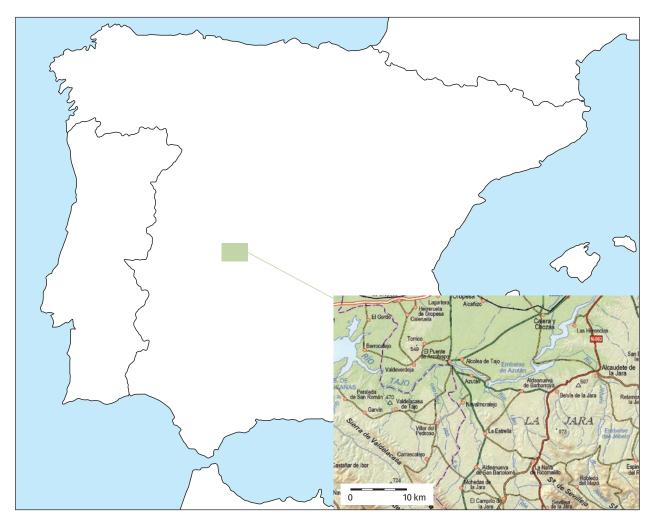


Fig. 1. The map of Spain with indication of the area of the case study. Basis: Modification of the map of Spain 1:500.000 of the Instituto Geográfico Nacional (ign.es, www.centrodedescargas.cnig.es).

especially focused on the area belonging to the living (settlements, enclosures, etc.). The first project phase (from October 2013 until July 2017) comprises two case studies that will each lead to a PhD thesis. One of them is focused on the south of the Iberian Peninsula, while the other has the centre as its focal point. The research presented here refers to the case study about Azután in the Autonomous Community of Castilla-La Mancha, at the western edge of the province of Toledo (Fig. 1). The main objective will be to reconstruct the environment, the settlement patterns and the base of society in that region as completely as possible, eventually comparing the two study areas under special consideration of the resources that they used. In a final step, it will be attempted to answer the question of how the resources might have been valued by the societies in the time around 3000 years cal BC. To reach these aims, different methods are applied.

However, first the central questions and aims shall be outlined. The Chalcolithic period - which in Spain in general covers a time span between 3200 and 2200 cal BC (CHAPMAN 2008, 198; BAL-SERA et al. 2015, 142) and is usually divided into an Early Chalcolithic, Advanced Chalcolithic and the Bell Beaker period (KUNST 2013a) - has a slightly different division for the western tablelands. The Copper Age is supposed to start 300 years earlier and is divided into four phases that drastically diverge from each other regarding their duration: Initial Copper Age (3500-2800 BC), Full Copper Age (2800-2400 BC), Beaker Copper Age (2400-2200 BC) and the Bronze Age transition (2300/2200-2100 BC) at the end of the 3rd millennium (HURTADO/HUNT 1999; CHAPMAN 2008, 223). Despite a different division of the Chalcolithic period, it cannot be assumed that there is sufficient information available for a credible reconstruction of the society of the Southern Meseta. Research in the centre has increased during recent decades, although huge differences between the south coast of the Iberian Peninsula and the interior seem to have been proven. While the southern coastline shows a number of fortified sites with stone walls and wooden or ditched enclosures with sizes up to apparently 300 ha (Zambujal: KUNST 2013b. Perdigões: VALERA 2012a. Valencina de la Concepción: GARCÍA et al. 2013. Los Millares: Gusi I Jener 1991; etc.), on the Mesetas the enclosed sites detected only have measurements of about 2 ha (DÍAZ-DEL-RÍO 2003; GARCÍA 2013). Attempts are often made to explain this through the different economic basis, lower cultural development or differently stratified societies (for further info see: HAYDEN 1995; GARRIDO-PENA 2006; DÍAZ-DEL-RÍO 2008; etc.). The case studies will try to ascertain whether these differences are an actual fact for the Chalcolithic period or

if it is a distorted image of the prehistoric reality due to different intensities and interests of investigation as well as insufficient large-scale research. Therefore, the objective is to work towards supplementing and connecting the new supraregional investigations to the exemplary undertaken research of data and feature comparison in southern Spain (CHAPMAN 2008; BALSERA et al. 2015).

Azután was chosen for the case study due to its favourable location on the terraces of the Tagus River, in a valley between the foothills of the Montes de Toledo and the Gredos Mountains. The megalithic burial mound of Azután – the dolmen – already serves as an indicator for prehistoric social and settlement activity in a time around 4000 and 3000 cal BC. Both the megalithic burial mound and the Neolithic dwelling detected below the chamber of the dolmen are well known as they have been investigated during several excavation campaigns (BUENO 1991; BUENO et al. 2005a; BUENO et al. 2016). Given that a collective burial usually does not stand alone but should rather be accompanied by indications of settlement activities (already mentioned by BUENO et al. 2005b; BUENO et al. 2011; BUENO et al. 2012; BUE-NO et al. 2016), one of the project's objectives is to track the scarcely-known settlement patterns in both the area around the dolmen and - on a larger scale - in the province of Toledo. The available resources in the surroundings of Azután are investigated in connection with the question of how the use of the existent resources formed the prehistoric settlement structures and changed the environment owing to their use or extraction. The mapping of the published and especially the unpublished sites with an inherent Chalcolithic potential was important for the large-scale research in Toledo (Fig. 2). The necessary visit to the archives of the Junta de Comunidades de Castilla-La Mancha (JCCM) in Toledo allowed us to access important unpublished information, which made it possible to increase the number of potential Chalcolithic sites by a remarkable amount. To gain a better insight into the environment, the local settlement conditions during the Chalcolithic had to be defined, which also includes taking a closer look at the available geological, geographical, palynological and climate information. Naturally, the mapping of the possibly used and the available resources in the micro-region was also included, among others. A further question will relate to the existence and the importance of transhumance as a socioeconomic branch for the Chalcolithic society. Such a practice has been repeatedly mentioned for Recent Prehistory, having its roots already in the 3<sup>rd</sup> millennium BC and being an important factor throughout Iberia. Such transhumant activity could probably be traced by investigating the location of megalith-

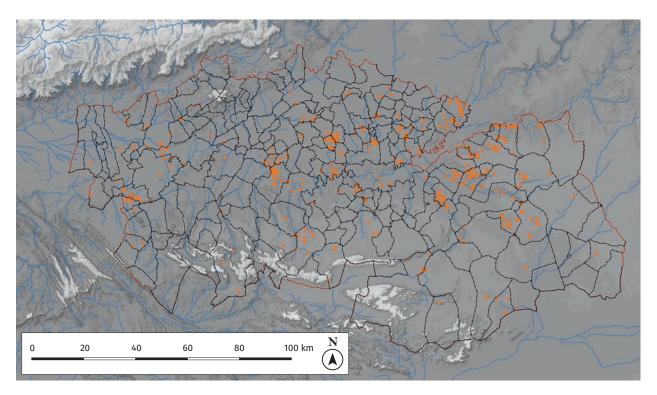


Fig. 2. The province of Toledo with the location of more than 400 prehistoric and mainly Chalcolithic sites. Results of the investigation in the archives of the JCCM, Toledo. Red line marks the border of the province, black lines mark the borders of the municipalities and orange dots indicate the archaeological sites (modified MDT200-Toledo, www.centrodedescargas.cnig.es).

ic structures, their connection with the network of pathways and the analysis of animal and human strontium isotopes (GALÁN/MARTÍN 2009; MURRIETTA-FLORES 2012; DÍAZ-ZORITA 2013). Was its practice relevant for the society or not and did it influence other social practices or developments?

Tackling similar questions, the other case study is working in the surroundings of Valencina de la Concepción. Eventually the final connection and comparison of the results in the south of the peninsula with the results of the centre (focus on Toledo, Cáceres, Madrid and the new work about enclosures on the Northern Meseta (Delibes et al. 2014)) will certainly help to en-

large the knowledge and understanding of the Chalcolithic communities of the Iberian Peninsula.

In this article, only some of the aims can be discussed in a broad manner, placing a focus on the fieldwork campaigns of 2014 and 2015 and the monument-landscape interaction, putting the monuments into the context of the  $4^{\rm th}$  and  $3^{\rm rd}$  millennium environment. Other parts such as the settlement patterns, the valuation of resources, detailed descriptions of artefacts and the structures uncovered during the excavation in 2015 will be stated in the PhD thesis and other publications.

# **GEOGRAPHY AND CLIMATE**

The importance of understanding the settlement conditions makes an outline of the geographical and climatic facts essential, with an emphasis on the situation in the west of the province of Toledo. Moreover, it will also offer a better impression of the environment of the case study. A quick look at the available palynological data from the  $4^{\rm th}$  and  $3^{\rm rd}$  millennium BC following the description of the fieldwork and the preliminary results shall later complete this image and enable a first interpretation of the prehistoric surroundings of the monuments.

Besides its long coastline, the Iberian Peninsula is also characterised by vast plateaus. The Spanish Central Plateaus (Northern and Southern Mesetas) are the largest and most known of these plateaus, situated in the centre of the Iberian Peninsula. They are separated by the Central System (GIBBONS/MORENO 2002, 1). The Southern Meseta is the lower high plateau of both the interior ones but still has an average altitude of 600 m. The main rivers — Tagus and Guadiana — drain to the Atlantic Ocean. The Sierra Morena in the south separates

the southern tablelands from Andalucía and the Baetic and the Iberian mountains separate it from Valencia and the Mediterranean coasts in the east (Chapman 2008, 222-223). The rural district of La Campana de Oropesa forms a bell-shaped corridor between the two mountain ranges of the Central System and the Montes de Toledo and it opens up to the landscape known as Extremadura, in the east of the province of Cáceres. From here onwards, no more difficult-to-overcome elevations or noteworthy obstacles block the way westwards. Nonetheless, both the mountain ranges (North and South) and the rivers (here the Tagus) did not entirely obstruct the passage and they were not necessarily obstacles to exchange and communication in prehistoric times. Especially alongside rivers or across their fords as well as over mountain passes, they lead into the hinterland and the possibility was given to establish contact with people from other areas and perhaps with a different material culture (BUENO et al. 2005b).

The Tagus River is one of the rivers that drains into the Atlantic Ocean. It belongs among the most favoured ones, with a calm and balanced flow condition and a perennial nature. This may have actual-

ly been a problem in prehistoric times, if there were only few passages across the river (GIBBONS/MORENO 2002, 354). For the case study, the plain areas of the Tagus middle basin hold interest. As previously mentioned, Azután is located in the western edge of the province of Toledo, which is part of the Autonomous Community of Castilla-La Mancha and it is one of the traditional and rare passages across the river. However, the mentioned location will be discussed further below.

The parent material of the soil at the middle basin of the Tagus is granite, which facilitated the accumulation of fertile ground on both sides of the river and leads to a favourable situation. The lowlands of the river are filled with tertiary sediment, whereas the hill-tops of the nearby Montes de Toledo are rich in slate. In the plain of Azután and El Puente del Arzobispo, quartz, quartzite and clay layers dominate the picture and closer to the riverbank the clay depositions become more massive (ENADISMA 1972, 5–7). The alluvial land here is formed by so-called "rañas" (alluvial fans) and comprises arenaceous, silty soil with strongly-rounded pebbles. However, the Alluvion shows a layer with clay of excellent consistency. Until



Fig. 3. The red surfaces show the most important surveyed areas in the municipality of Azután. Only the parcels of importance for further research were marked (basis: modified PNOA máxima actualidad, hoja 0654, www.centrodedescargas.cnig.es).

today, the western part of Toledo is famous for its pottery from Talavera and El Puente del Arzobispo, for instance (ENADISMA 1972, 11).

As a physical and geographical factor, the climate influences and shapes the Iberian cultural landscape during both the dry summers and the wet winters. The Southern Meseta – and thus the area of the case study – is characterised by warm and frequent dry conditions with often insufficient amounts of rain. Not only seasonally but also daily changes of temperatures can be extreme (Chapman 2008, 223; Enadisma 1972, 3). The maximum temperatures of the region

around Talavera de la Reina – which includes Azután – are between 35 and 40°C, while the minimum temperatures range between 0 and -5°C. Average annual precipitation is between 400 mm in the east and 500 mm in the west of the Meseta (ENADISMA 1972, 3), whereby rain-fed agriculture without extra irrigation is still possible (ANDREAE 1977, 42).

Not only geology and geography have formed the relief of the Iberian Peninsula; indeed, at least since the time of the farmers and settlers of the Neolithic period humans also changed their environment, as we see in the construction of monuments and the pollen diagrams.

#### METHODS AND MATERIAL

Obviously the area around the municipality of Azután on the southern bank of the Tagus middle basin was promising for further detailed studies and new archaeological results in the wider surroundings of the dolmen. After the mapping of the published and especially the accessible unpublished sites (archives of the JCCM) deriving from archaeological surface survey, the huge prehistoric potential of the province of Toledo developed accordingly. Wherever possible, the information of the Carta Arqueológica from the JCCM required an on-site verification or falsification in the environment of Azután. The archaeological survey was later followed by a geophysical one in selected areas and the fieldwork ended with a small excavation.

# Archaeological survey

In April and May 2014, an archaeological surface survey of a large area in and around the municipality of Azután was carried out. The basis was built by the information about the location of Chalcolithic, Neolithic or simply Prehistoric sites mentioned in the Carta Arqueológica.<sup>2</sup> Based on this information, an area of more than 170 ha in the municipally of Azután was examined. Especially the area in the west of the modern village of Azután right next to the river revealed a large number of promising finds in an area of approx. 90 ha (Fig. 3).

1 Although excavations of the dolmen have been conducted and published in an exemplary manner (BUENO 1991, BUENO et al. 2005a) — in particular the monography of 1991 — the means for additional research were non-existent. With the approval of Project A02 in autumn of 2013 the ground was set for new investigation in close collaboration with Primitiva Bueno, who willingly shared her knowledge of the area and the Southern Meseta in general.

In the municipality of Azután, the almost complete absence of superficial finds in the closest parcels to the dolmen was noticeable (a handful of lithic artefacts). This was not completely unsuspected and it can be explained by erosion as some of the hillocks here fall rather steeply from south-west to north-east and west to east. Despite the proximity to the dolmen, the eroded colluvial soil from the wavy hills of the upper lying foothills of the Sierra Ancha surely covered the area at the transition to the valley with thick layers, although this can only be verified by detailed geomorphological research that has not yet been undertaken. Furthermore, this part of the municipally has been the most intensively surveyed area in recent decades.

From the megalithic burial mound of Azután – directly located in the south-west at the foot of the mountains – to the southern bank of the Tagus, elevations only vary by a few metres. Here, at about 1.2 km distance as the crow flies from the megalithic burial to the river terraces in the west of the modern village of Azután and in the east of the Anguilucha creek, surface finds were detected in high amounts. About 70 ha was surveyed (see Fig. 3). Due to the fertile soil and flat land, it is used agriculturally, whereby the intensive ploughing of the fields revealed a high quantity of material. Unfortunately, the thin soil cover also means that the intensive agricultural use equals a higher destruction of archaeological

2 In Navalmoralejo and large parts of Aldeanueva de San Bartolomé, access to the potential sites was denied because it was private hunting ground. In Alcolea de Tajo, the checked parcels unfortunately could only be falsified for the time between 4000 and 2000 cal BC and the small vacant surfaces of El Puente del Arzobispo showed material of the modern era and today.

features. Further detailed research is urgent and essential to save as much of Recent Prehistory as possible. More than 4,560 surface finds were made and through the following typological comparison of the diagnostic shapes (rims, decorated sherds, bottom sherds, arrow heads, etc.) it could be shown that around 75% of the collected material belongs to the end of the 4th and to the 3rd millennium BC. These surface finds already doubtlessly reveal a chronological connection to the dolmen, although it is not yet clear whether the surface finds cover all of the chronological depth inherent in the megalithic burial. The monument has a calibrated chronology from the end of the 5th millennium BC, proven by Middle Neolithic material, the main occupation phase is to place in the first half of the 4th millennium and maritime Bell Beaker finds also confirm human activity for the second half of the 3<sup>rd</sup> millennium (BUENO et al. 2016, 162 fig. 15.7). Especially due to the massive number of chronological-relevant artefacts found in the area in the west of the modern village of Azután, further investigation with geophysical methods was necessary, followed by punctual excavations.

## **Geophysical survey**

An investigation of different aerial and satellite images – besides the surface survey – additionally helped to define zones for further geophysical survey (Spot 5, orthophotos in IBERPIX – http://www2.ign. es/iberpix/visoriberpix/visorign.html-photographies from the 1940s and 50s - vuelos americanos and the 1970s and 80s – imágenes interministeriales, nacionales). Although the surface in proximity to the dolmen showed a low number of surface finds, the images revealed two possible enclosed structures in the east and south-west of the dolmen. The plan of the eastern feature shows a half-circle and is located at approx. 230 m distance to the dolmen. The other one is situated at about 130 m distance, describes an ellipsoidal form and might be compound by two ellipses (Fig. 4). Surprisingly, there were no visible structures in the aerial images of the part close to the village of Azután where the high quantity of artefacts was recorded.

Geophysics were consulted to clarify the situation described above. It was essential for the protection of the prehistoric monuments, which are invisible to the bare eye. Structures of wood and earth and organic filled negative features could be expected. Therefore, geomagnetism in picotesla (pT) resolution was applied, carried out by Becker Archaeological Prospection. For the geomagnetic survey, the fields to be investigated were measured in grids of  $40 \times 40$  m each

with the Total Station. The high resolution of the resulting magnetograms was enabled by using Caesium magnetometry. Two caesium magnetometers (Geometrics G 858-G) – mainly in quad-configuration – were used throughout the survey. Accordingly, all four sensors are aligned parallel with a distance of 0.5 m on a non-magnetic measurement vehicle. Consequently, the sensors are not used as a gradiometer (vertically aligned) but rather as a total field-component (horizontally aligned). This means that the sensors can be driven parallel - with 0.5 m distance between each of them – over the area of research interest; thus, a width of 2m can be covered with each walk. The sensibility of the caesium magnetometer during a measurement cycle of 10Hz (10 measurements per second with approx. 10-12 cm distance between measurement points) is about 20–30 pT. Therefore, the spatial point density of the measurement with walking speed lies around 10 × 50 cm. Through this method, archaeological-relevant structures up to a depth of to 5 m can be recorded (BECKER/FLADE-BECKER 2015, 2-3; further information: BECKER 1995).

Three different areas were selected for partial geomagnetic investigation. Two of them were the areas in vicinity of the dolmen, exclusively chosen owing to the circular and ellipsoidal structures visible in the aerial images (Fig. 4) and the probable chronological connection of Iberian enclosures with the burial qualified them. Furthermore, the part in the west of the village of Azután should be investigated in detail. The criterion for its selection was the huge amount of diagnostic prehistoric material, although nothing was visible in the aerial images. In the following description, the focus will be placed on the latter, namely the terraces of the Tagus, due to the outstanding results in the geomagnetic images.

The magnetogram and the sketch of the largest features (Fig. 5) illustrates the archaeological features that are abundant, drawn clear and appear in a larger number, as the surface finds already hinted. Nine not completely recorded ditched or heaped constructions are detectable in this image. Besides the double-ditched enclosure in the middle of the investigated area, a huge ditch approx. 8 m in width and with three entrance situations is visible in the south-west. Additionally, several wavy structures as well as a large number of small circular structures that accumulate within the double-ditched structure close to the inner ditch were detected. The small circular structures could have had several usages in prehistoric times. Perhaps they were storage pits, garbage disposal pits, dwellings, graves or something else. However, as some of them show a different magnetism, they surely differ in filling, whereby excavations were essential to clarify their

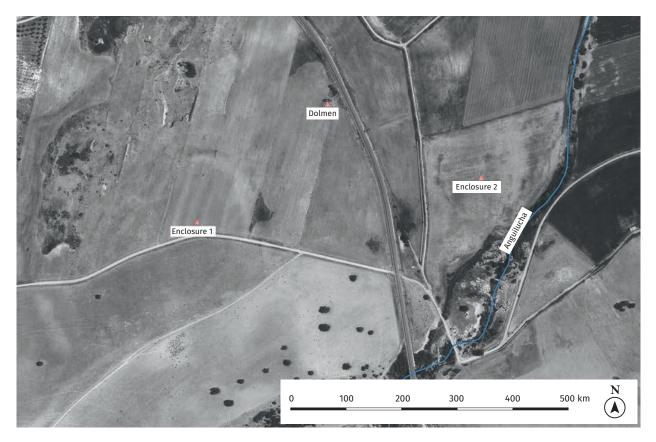


Fig. 4. Features visible in the aerial images of Azután. In the south-west of the dolmen the ellipsoidal enclosure with two ellipses and in the south-east of the dolmen the circular enclosure (basis: modified PNOA máxima actualidad, hoja 0654, www.centrodedescargas.cnig.es).

use to a certain extent. The excavation (two trenches of  $5 \times 5$  m) in the last November-December campaign 2015 will clarify the chronology of the inner ditch of the double-ditched enclosure and three pit structures. Since the material for carbon dating as well as other analyses is being processed at present, just as the artefacts are being catalogued and compared, no unfinished results will be stated here. However, it can be mentioned that the material culture deriving from the pits and the ditch fits in the picture drawn above, while the V-formed shape of the ditch is also well known among the ditched enclosures of Iberia as well as wavy ditches (VALERA 2012b, 30).

# **Description and comparison**

Due to denied access – mostly resulting from the agricultural cycle of certain plants – the geomagnetic image is not complete, although impressive structures could still be revealed (the described structures can all be seen in Fig. 5). Small circular structures scatter all over the plan, albeit with two definite accumulations: one in the extreme north-west of the magnetogram

within a structure approx. 8 m wide probably enclosing them and another almost in the middle of the images in the interior of the double-ditched enclosure, close to its inner ditch. Here, some seem to relate to each other, forming circles or semi-circles. The dimensions of the pits vary in diameter between from 1 m to a maximum 5 m (pits in the north-west). However, this is not exclusively linked to their real size, but also reflects their depth (personal communication of Dennis Wilken, Kiel; Blakely 1996).

In the sketch, the smaller structures are omitted to concentrate on the large constructions. Despite being irrelevant for the project aims due to its chronology, besides the northern edge almost completely recorded is the 240 × 240 m square ditched enclosure. The rectangular construction with a width of 1.5–2 m of the ditches reminds the archaeological eye of the Iron Age square ditched enclosures in South Germany (WIELAND 1999) or marching camps of the Romanization period (KÜSSNER/SCHÜLER 2014). The southern part of the construction shows an entrance/gate situation. The surface finds (some terra sigillata sherds) make an interpretation as a Roman marching camp more likely. Probably connected to it is the

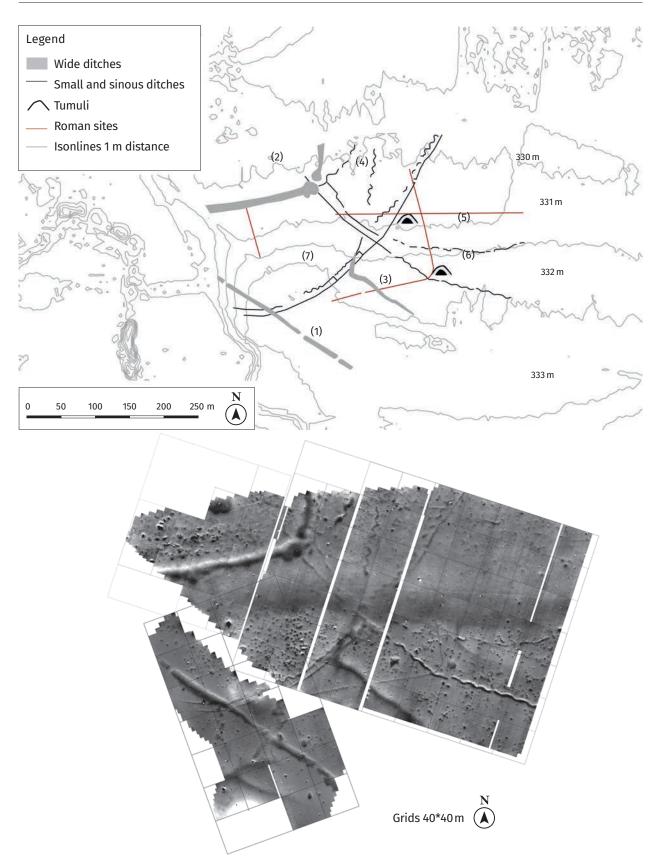


Fig. 5. Sketch of the relevant structures made visible through geomagnetic survey and image of the geomagnetic results in the west of the village Azután and close to the Tagus River. Numbers indicate the structures described in the text. Magnetometric image by Becker Archaeological Prospection.

straight 2m wide line that crosses the eastern ditch from east slowly disappearing to the west in the middle of the images.

The two circular structures were marked as possible tumuli owing to the perfectly round image and the sizes of their diameter between 10 to 12 m. Burial mounds like El Castillejo in Toledo (BUENO et al. 1999) formed the analogy for this interpretation. In the south of the area, a large ditch (1) runs from northwest to south-east and continues in south-eastern direction, meaning that it could not be captured completely during the survey. Three interruptions or entrances are visible: from west to east they appear at a distance of 128 and 57 m and are 5-7 m wide. This construction is difficult to compare since such a structure has not yet been detected in geomagnetic images on the Iberian Peninsula. Perhaps a closer look at other Neolithic and Chalcolithic sites in Europe can give an idea during further analyses.

In the north-west, only the south-eastern part of a 7 to 10 m wide ditch (2) became visible. A 5 m wide opening, two rounded structures and a 2 m wide semi-circle form a gate. Inside the structure, one of the earlier-mentioned accumulations of pits is situated. Another ditch (width 6 m) marked in the sketch (3) seems to run from south-east to north-west and turns north after 123 m, where after approx. 30 m the image becomes blurred. The wavy so-called sinuous ditch (4) that forms a line with (3) could be its continuation. Regardless, the area where at least four different ditches cross each other is an unclear and blurred sector in the image and it cannot be stated for certain whether (3) and (4) were one construction.

Sinuous ditches are known from some archaeological sites of the Iberian Peninsula, most of them in the south-west of Portugal (at twelve sites) and southwestern Spain (at five sites), whereas in the rest of Europe they are rare. Moreover, on the Iberian Peninsula it seems to have been a phenomenon of South Portugal to date. However, as Valera stated in his works, increasingly more ditches with a wavy plan have appeared in recent years (VALERA 2012a, 169; VALERA 2012b, 27) and with the geophysical survey in Azután four partly or completely wavy ditches (no. 4 to 7) have been detected in the centre of the peninsula, in the Tagus middle basin. All four of the ditches are recorded as 2 to 3 m wide magnetic anomalies. Two single »waves« can be seen in the east of the ditched construction in the north-west (2) of the image. Given that it is unclear whether they continue north, their type and form will not be further speculated and nor are they counted among the wavy ditches of Azután. Perhaps they run south-westwards to the gate of (2), as interpreted in the sketch. East of the »waves« the first clear sinuous ditch (4) is sit-

uated, which runs from north to south and is possibly related to structure (3), as mentioned above. The ditch can be followed 80 m and almost in its middle it is interrupted by a 10 m wide opening. The next two wavy ditches (5) and (6) already become visible in the east of the image and probably go further east. Both run – albeit at slightly different angles – from east to north and after the blurred area in the magnetogram it seems as if they were in relation to each other. The northern one (5) is characterised by flat waves in its eastern half, which are irregularly interrupted with 12 openings that are highly variable in width (3 to 13 m). In its north-western part, when it becomes visible again it runs in a slight curve without further waves in the direction of structure (2), where it stops. In the case of the southern ditch (6), the waves are drawn clearer. In its eastern part, three openings with 3, 4 and 6 m width (from east to west) are visible. After the western-most opening, it continues northwest without further waves, crosses structure (2) and ends in its interior. The last partly sinuous ditch belongs to the most outstanding feature revealed by the magnetic measurement, namely the inner ditch of the double-ditched enclosure (7) described below. It is complicated to classify the wavy ditches of Azután to a certain type of Valera's division for the Portuguese representatives (VALERA 2012b) as those described here are all a mixture of flat and sinuous parts. If only referring to the wavy outline, all four of them (see also below) can be assigned to type C: regular wavy serpentine type (VALERA 2012b, 33).

The double-ditched enclosure (7) – detected in October 2014 and in a small part excavated in November and December 2015 – is the largest known in the centre of the Iberian Peninsula, albeit it is not completely revealed. It was named >El Prado < after the topographical area the excavation was carried out. The enclosure is stopped in its course by a modern dirt-tarred road in the south-west and it runs at a flat angle north-east towards the Tagus, indicating an enormous size. In the case that the double-ditched construction formed a complete circle, it would have been situated on both sides of the river and enclosed a surface of approx. 100 ha. However, even if it was limited to the southern bank of the Tagus, it still would have enclosed around 50 ha. The outer ditch is 2 to 3 m wide, without sinuous parts and with one clear interruption of 4m in its northern part. The inner ditch also measures between 2 and 3 m in width and is constructed of wavy and straight parts. At the height of the accumulation of pits in the interior of the enclosure, the first sinuous construction elements begin, before running straight until the first interruption of 2m and afterwards beginning to run in flat waves again. Besides the blurred part in the centre of the geomagnetic image, it continues parallel to the outer ditch in a mostly regular sinuous course. At the location of the interruption of the outer ditch in the northern part of the enclosure, the inner ditch shows an interruption of 18 m followed by two smaller ones (6 m and 8 m). In the southern half, two approx. 6 m long and 2 m wide ditches connect the outer with the inner ditch. The only visible interruption of the outer ditch in the northern part also indicates such connections. The excavation of the inner ditch showed a 1.8 m deep V-shaped profile, starting 40 cm below the humus layer.

Ditched enclosures and double-ditched enclosure have parallels all over the Iberian Peninsula, both at the coast and in the centre. Although ditched enclosures also exist on the Northern and Southern Meseta, they were remarkably smaller (DELIBES et al. 2014; DÍAZ-DEL-RÍO 2003). Examples such as Las Pozas (GAR-CÍA 2013) in the province of Zamora have similar entrance situations and architectural features like the site of Azután. However, together with Las Matillas, Fuente de la Mora and Gozquez de Arriba (DÍAZ-DEL-RÍO 2003) - all in the autonomous community of Madrid - the ditched constructions of the centre show measurements of maximum 2ha enclosed space, which complicates an entire comparison with Azután. As mentioned in the description of the double-ditched enclosure, it has a dimension of 50 ha (if semi-circular) or 100 ha (if circular) and is accompanied by numerous different negative structures. Comparable examples can best be found in the south of the peninsula. The sinuous elements in the western half of the measured surface - including the bended ones - are known in Portugal from sites such as Xancra, Perdigões, etc. and point chronologically to approx. 3500-2200 cal BC (VALERA/BECKER 2011; VALERA 2012a; VALERA 2012b, 29).

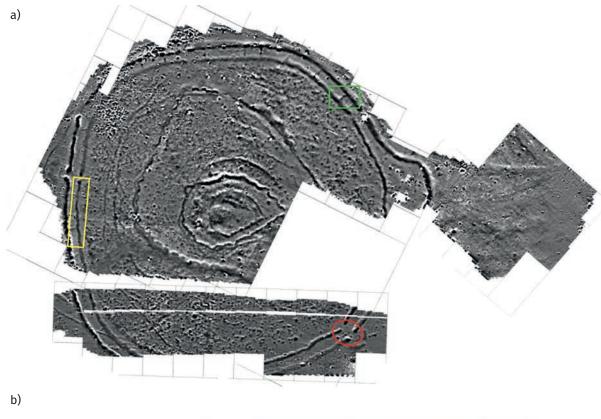
Therefore, a comparison with the sites from the south such as Perdigões (VALERA 2012 etc.), San Blás (HURTADO 2004), Marroquies Bajo (CASTRO et al. 2010), Valencina de la Concepción (GARCÍA 2013) and La Pijotilla (HURTADO 2010) is more convincing and effective. At present, the study can be undertaken through the magnetograms, the images of the sketch of the structures and the few negative structures excavated, given that the analyses and the comparison of the excavated artefacts with other sites is a work in progress. After these investigations have been completed, the comparison can be broadened with a comparative look at the structure, form and content of the features. In a brief over-

view, the constructional elements of Azután will be compared with the Chalcolithic enclosure of Perdigões (VALERA 2012) and La Pijotilla (HURTADO 2010).

Perdigões is a multiphase site in the municipality of Reguengos de Monsaraz, located in the Alentejo hinterland (South Portugal). The structures confronted in this site date from the Late Neolithic until the transition to the Early Bronze Age (3500–2000 cal BC) according to the latest information. Twelve concentric ditches and hundreds of circular pits were uncovered in the magnetograms. Of the pits, 50 have been excavated and several ditches cut to date. As the excavations on this site are continuous and the study of Perdigões started in 1997, much research on the resources, environment and material culture, etc. has already taken place (http://perdresearch.blogspot.de/p/perdigoes-synopsis.html). Its chronology and the intensive study of material, landscape and communication with neighbours makes the prehistoric site an excellent comparison for Azután and the surrounding studies. Similarities become obvious between Perdigões' Chalcolithic double-ditched enclosure (outer circles) and Azután. They both show the same horizontal connections between inner and outer circle, the same entrance situations as well as the same wavy parts of the inner circle, while a number of circular pits are also located in the interior (Fig. 6). As soon as the layers of recent excavations in Azután have been dated and the material culture has been categorised, further comparison will be very interesting and the results are promising.

La Pijotilla, Badajoz (Spain) is only published in articles about the analysis of pottery, metal objects and comparisons of the figurines or in comparison with contemporaneous sites in France (POLVORINO et al. 2001; HURTADO/AMORES 1982; HURTADO 1979-1980). Unfortunately, a complete plan of the site and the exact trenches could not be found, meaning that a sketch-like image has to be used. As far as known, geophysical investigations have not taken place, which explains the absence of magnetograms. Frankly, in the case of the constructional elements we only refer to this site due to a special condition that it might have shared with Azután (HURTADO 2010). The double-ditched enclosure of La Pijotilla is separated by the eponymous Pijotilla brook and at least its outer ditch crossed the waterway. Further geomagnetic survey in Azután at the northern continuation of the enclosure and hopefully also the municipality of Alcolea de Tajo on the northern bank of the river<sup>3</sup> in the future can

3 Although in this area, the construction of irrigation systems with channels laid underground and sprinkler above ground surely destroyed much of the archaeological record. Regardless, if no further constructions take place there is still a chance to find indicators of the  $4^{\rm th}$  and  $3^{\rm rd}$  millennium BC and possibly parts of the enclosure.



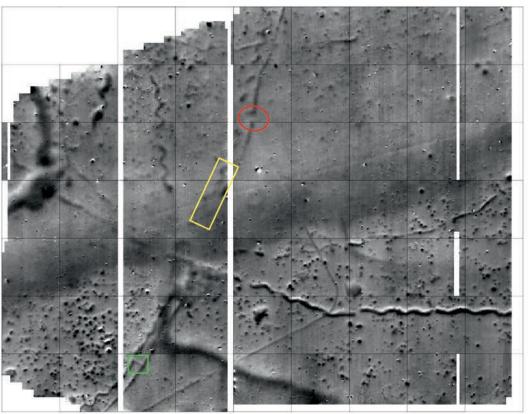


Fig. 6. Comparison of the constructional elements of the enclosures of a) Perdigõs (Valera, 2012, 168) and b) Azután. Green: horizontal connection of the outer and inner circles; red: entrance situation; yellow: wavy structures. In both images the grids measure  $40 \times 40 \,\mathrm{m}$ .

offer a better picture of the whole plan of the >El Prado< enclosure. Eventually, it should be possible to answer

the question of whether the Tagus divided the site or if it formed a semi-circle limited by the river.

## MONUMENT-LANDSCAPE INTERACTION

Following a description of the campaigns of 2014 and 2015 as well as the impressive preliminary results that they already revealed, the part aims to detail an approximation of the environmental conditions of the Southern Meseta. A look at existing studies explains the current situation of the palynological research in the centre of the Iberian Peninsula and the comparability among each other. Given that they are not in the direct vicinity of Azután their application is debatable, although they still give an idea of the landscape between 4000 and 2000 cal. BC. Moreover, they also stress the importance of receiving more information directly from Azután and the Southern Meseta in general. The topic environment also has to be seen in connection with human interaction. Not only the human impact on the change of vegetation holds interest, but also the influence on the network of roads and the communication within the landscape. Therefore, Azután's environment and the special location will be presented.

# The reconstruction and change in vegetation during the Neolithic and Chalcolithic period

Compared with today's conditions on the Iberian Peninsula, we can expect a similar climate but a different density of vegetation and composition of plants. Research investigating the paleoflora unfortunately reminds us that huge areas of the peninsula only allow a limited insight into the archive of the paleoenvironment within the Holocene. To make matters worse, many of these archives are fragmentary or chronologically insecure (LÓPEZ et al. 2009, 91). As notable in the impressive summary of all paleoenvironmetal analyses of the Iberian Peninsula coordinated by Carrión (2012), besides the low number of sites in the centre of the peninsula it is complicated to locate places that have a sequence dating to the end of the 4th and the 3rd millennium BC. To be certain about the climate and vegetation, it is necessary to have a higher number of investigated sites that are located closer to each other as well as in different natural environments and additionally dating to similar times to verify existing results.

Besides the analysis in Azután in the chamber of the dolmen and the dwelling below (4560–3270 cal. BC: LÓPEZ 2012e, 585; LÓPEZ/LÓPEZ 2000), six further sites were included in the description of the environment. Although none of these sites are situated in the closer surroundings but rather each are more than 100 km from Azután, they add pieces to the puzzle of the reconstruction of the environment.

Navalperal de Tormes-El Cervunal (Ávila), 2950 cal BC (GÓMEZ-MANZANEQUE 2012, 426) Valle del Amblés (Ávila), 3740–2240 cal BC (LÓPEZ 2012a, 428) Jarama-V 1 (Madrid), 5730 cal BC (GARCÍA 2012, 548) Cerro de la Horca (Cáceres), 3200–2800 cal BC (LÓPEZ 2012b, 553) Los Barruecos (Cáceres), 4950–3390 cal BC (LÓPEZ 2012c, 555) Valle de Huecas (Toledo), 4530–2220 cal BC (LÓPEZ et al. 2009; LÓPEZ 2012d 588)

An anthropogenic impact on the landscape was already noticeable during the Neolithic period. All pollen analyses that took place in the centre of the Iberian Peninsula and date to Neolithic and Chalcolithic times indicate an increasing cultivation of the landscape. Cereal (Cerealia) pollen and spurs of coprophilic funguses show that large grassland for the cattle and cultivable land for wheat was available (LÓPEZ et al. 2009, 95–97). The analyses of the pollen from 4000–2500 BC already show obvious symptoms pointing to deforestation. The natural holm oak (Quercus ilex) forest seems to transform itself to a rather dehesa-like landscape where the tree cover with oaks ranges around 15% of all vegetation (LÓPEZ et al. 2009, 94-95). The discovery of acorns in archaeological contexts - including in the dolmen of Azután – as well as a growing number of oak and juniper pollen are a sign for the beginning of the dehesa economy (BUENO et al. 2005c, 86-88; BUE-NO et al. 2005b, 84-86). The documentation of leguminous plants during the excavation of the Tumulus of Castillejo (Huecas, Toledo) already suggests a seasonal rotation in the agriculture of the Neolithic period. This is an indication for rather stable settlements and a sedentary lifestyle rather than a semi-sedentary way of life, which traditionally has been assumed in research (BUENO et al. 2005c, 84).

Further evidence for the dehesa and the dominance of sedentary farming and cattle-breeding is provided by the increase in the pollen of bushes, hedges and the bones of domesticated animals such as cattle and pigs. In Azután itself, the 2005 investigations in the chamber of the dolmen and the Neolithic hut below also point to a similar recon-

struction of the environment already in the 4<sup>th</sup> millennium (4000–3900 BC). However, the dolmen surely does not represent the complete variance of the pollen spectrum (LIESAU 2009; LÓPEZ et al. 2009, 96–97; BUENO et al. 2009, 54–55; LÓPEZ/LÓPEZ 2000). Nevertheless, the appearance of wheat in the archaeological record within the hut structure of Azután shows that it was also cultivated in the interior of the Iberian Peninsula, rather than being limited to the coastal areas, as supposed in research years before. The fact that cereals could not be detected was due to the small number of palynological studies rather than a lower cultural level, which has often been discussed in connection with the people of the Mesetas (BUENO et al. 2005c, 86).

## The large scale: inter-environmental connections

The described geomorphological situation, the archaeological fieldwork and the results of palynological studies have already given an idea of the high prehistoric potential that we can expect in the next years. Further geomorphological studies like in other parts of the Tagus (WOLF/FAUST 2015) can also contribute to the completion of the prehistoric environment. It has become obvious that Azután has a favourable location compared to its southern hinterland. In the valley of the Tagus River, on its fertile terraces with abundant clay sources, granite and quartzite deposits in direct vicinity (used for the construction of megalithic monuments, grinding stones and other tools), copper ore deposits in the mountains (MONTE-RO et al. 1990; BARROSO et al. 2003) and probably in a dehesa-like landscape (LÓPEZ et al. 2009), the settlement conditions for the people 5,000 years ago must have been convincing.

The study by Galán and Martín (2009) about megaliths and fords across the Tagus strengthened the settlement conditions for Azután. As aforementioned, the Tagus is a perennial river and at some locations it cuts canyon-like into the ground, which is the case around the city of Toledo and after El Puente del Arzobispo, for instance. In prehistoric times, rivers were not necessarily communication routes but could also be borders, if they were impossible to cross. The figure published in the article of Galán and Martín (Fig. 7) illustrates the location of Azután at one of the rare passages across the river. Furthermore, it shows that not many of these passages existed. The closest one at Talavera la Vieja (O) is still more than 20 km in a western direction. The authors drew a persuasive connection between megalithic monuments, river passages and mountain passes (GALÁN/MARTÍN 2009, 199-202). A different study in the west of Andalusia (MURRIETA-

FLORES 2012) also investigated the connection between all hitherto-known Copper and Bronze Age sites and human movement in a defined study area. Through computational techniques, Murrieta-Flores tried to define and analyse natural corridors, the main routes (MURRIETA-FLORES 2012, 108–113).

Both studies want to strengthen and emphasise the link between routes and site location but do not refer to the local conditions of the sites. It is unclear whether the sites are there due to the routes and the connection to the communication network or owing to the favourable settlement conditions making the paths less important. Azután shows good conditions and the ford through the Tagus suggests that it is situated alongside a route. A closer look at the location of the dolmen of Azután and the other two of the province of Toledo - La Estrella and Navalcán - strengthen the theory of settlements lying next to ways of communication (see also: BUENO 1991 and BUENO et al. 2005a). All of the megalithic burials are located alongside the so-called >cañadas reales<, the traditional herd drive paths of Spain (transhumant ways). In historic times, they were mainly used by herdsmen of flocks of sheep and goat herds to drive the animals from the winter pastures to the summer pastures and in reverse, selling their meat and fur on the way ( $Z\ddot{O}BL$  1982, 6–14). It is not satisfactorily probed yet whether those ways go back to prehistoric times, although the project also tries to evaluate the role that they played during the Chalcolithic. The fact is that Azután and the 13km distant dolmen of La Estrella are situated alongside the >cañada real leonesa oriental <from Puerto de San Vicente to Ávila. The dolmen of Navalcán – which is 30km away from Azután – is located alongside the >cañada real leonesa occidental (Fig. 8).

Further analysis is necessary to identify the mobility of animals and humans to define the importance and regularity of use of the network of ways. To track the mobility, samples of molar enamel from sheep/ goats and - if represented with molars in the archaeological record - cattle, pigs and humans from Azután and other sites were taken. Pigs are usually rather sedentary and whenever possible they were sampled to contrast the results derived from analysing rather mobile sheep/goats and cattle. Analyses of mainly strontium isotopes will be carried out by project partners to ascertain the level of human and animal mobility based on their isotopic markers (PRICE et al. 1994). These investigations will contribute to the understanding of how prehistoric people interacted among each other.

A closer look at the map of the micro-region Azután (Fig. 9) with the new preliminary results offers an insight not only into the prehistoric potential still hidden in the centre of the Iberian Peninsula but also in

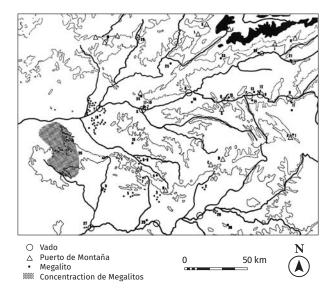


Fig. 7. Map showing a part of the rare passages across the Tagus River. Indicated with the letter N is Azután (Galán/Martín 2009, 197 fig. 1).

terms of how prehistoric societies organised the landscape surrounding them. At the foothills of the Sierra Ancha, the dolmen of Azután marks the way to and through the mountains and the double-ditched

construction on the terraces of the Tagus controlled the river and possibly enclosed the former passage through it. Additionally, the Anguilucha brook seems to separate the landscape in two different areas – in the west the area of the deceased and in the east the area of the living – although this idea still requires further proof. The use of Iberian and European enclosures is not definitely resolved. Some of them might have been exclusively used as settlements or to fortify favourable locations others had a more ritual and distributional/redistributional character (VALERA 2012b, Valera personal communication). The case of Azután still has to be defined, as well as the chronological connection to the megalithic burial. However, to date the double-ditched enclosure is situated on favourable land, in the vicinity of important resources, dominating a ford across the Tagus and connected to the ways of communication. Clear settlement structures (houses or workshop areas) have not yet been detected, although they have been found below the chamber of the dolmen (BUENO et al. 2016 among others). The ditched construction enclosed a space of frequent activities (the high number of pits within) and is surrounded and cut by a variety of other ditches and structures. It was a space of social gathering and further analyses will reveal more about its role for the societies of the 4th and 3rd millennium BC.

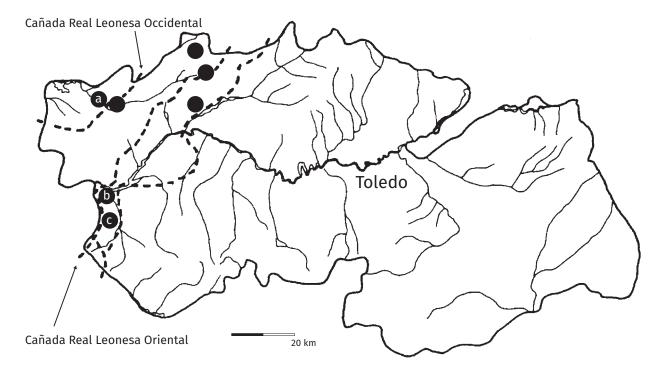


Fig. 8. Map with the main herd drive paths in the west of Toledo. Marked are the three megalithic burials of the province. a: Navalcán, b: Azután and c: La Estrella (after Bueno et al. 2005a, 21 fig. 5).

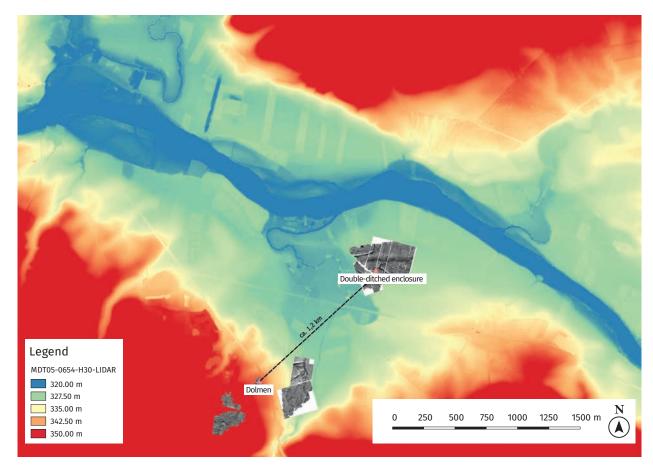


Fig. 9. Map with the location of the dolmen and the geophysical revealed sites and their location to each other (basis: modified PNOA máxima actualidad, hoja 0654 and MDT05 of the same area, www.centrodedescargas.cnig.es).

## **CONCLUSIONS AND FUTURE PERSPECTIVES**

The detected double-ditched enclosure — which is comparable in size and construction to the sites in the south of the peninsula — and the chronological depth from the Neolithic to the Early Bronze Age show constant and massive settlement activity in Azután. Based on mapping the unpublished toledean prehistoric sites, the archaeological survey and the geophysical investigation, the image of the prehistoric interior of the Iberian Peninsula has emerged.

Although similar studies at other site of the province are not possible during the funding time of the project, one gains an impression of the undetected prehistoric potential below the ground. The results from the different surveys already show that the centre cannot be described as deserted space only crossed to get from coast A to coast B. It becomes obvious that this theory was only based on the lack of research in the interior and the habit of not publishing the results of surveys and excavations for a long time. Every new investigation on the Mesetas offers

an insight into the exciting similarities in settlements and burial rites with the south-west coast. Besides the similarities of the Azután and Perdigões enclosures, the burials of the Valle de las Higueras in the north of Toledo (BUENO et al. 2005c) have their parallels in the Algarve and the peninsula of Lisbon in Portugal as well as Andalucía (BUENO et al. 2005b; LAZARICH 2005). The architectural variability, the chronology, the types of ritual and the quantity of hypogea in the Valle de las Higueras (Huecas, Toledo) point to social structures of similar dimensions as in Andalucía and the south-west (BUENO et al. 2016). The work in Azután demonstrated that the assumption stated by Bueno could be proven. The centre of the Iberian Peninsula has not been a communication-free space and the absence of double-ditched enclosures with enormous sizes can no longer be supported.

The work after the excavation in Azután will continue with the analyses of the carbon, palynological and archaeobotanical samples as well as the study of

the excavated material. Future objectives include obtaining additional information for the reconstruction of the Chalcolithic landscape, the detailed investigation of the settlement patterns and the resources forming the base of society. In comparison with the other

case study of the project and other areas of Iberia, a contribution to the socio-cultural dynamics and the role that resources play within these dynamics will be investigated during the remaining time of the project.

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# Monuments on the move. Assessing megaliths' interaction with the North-Western Iberian landscapes

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## **ABSTRACT**

Monuments as such implicitly have a perennial character and act as a presumed means for consecrating or marking out especial places. This would be the case with megalithic mounds, which add their funerary character to the aforementioned features.

However, in recent decades an increasing emphasis has been placed on the relationship between megaliths and movement. This was initially understood in the simpler sense of a correlation between mound location and paths across the landscape, before later on taking on a more structural character, relating to the internal change (mobilisation) of the building components, with the incorporation of allochthonous materials into both the construction itself (vg. bringing in orthostats on non-local stones) and as a part of the grave goods. Accordingly, they appear to evoke more or less distant places and the displacements implied to gathering

them in the framework of the tomb. Such observations can now be better substantiated in areas such as the Barbanza peninsula (Galicia, Spain), where a relatively thorough catalogue of megaliths is available, showing – to start with – that these are far from being bound to the high sierra, despite showing denser concentrations there. The enlisting of Geographical Information Systems and statistics will show how mounds are associated with transit routes and – more locally – with conspicuous areas more often than rock art sites, for instance. As a result, we may contemplate megalithic architecture not as something exclusively or mainly static but rather as dynamic and linked to a cognitive geography developed by communities in the Late Prehistory that carry on the exploitation of different landscapes and resources, from the very coast to the uplands.

# INTRODUCTION: PERENNIAL? UNMOVED? IMMUTABLE?

In a recently published book about Stonehenge (2012), Parker-Pearson recalled the remarks made by Ramilisonina, a Malagasy archaeologist visiting in his company another worldwide-known henge, Avebury: for him, it was self-evident that both monuments – being made of stone – were thus devoted to the dead, since that seemingly everlasting material was only fit for commemorating *ad aeternum* the ancestors of those prehistoric builders.

Like those huge British sites — albeit on a much smaller scale, the funerary mounds with which we are dealing in our study area (Galicia, north-western Spain) act as a memento of sorts, standing for past memories and dead people forever anchored to a particular place. Far from implying an immutable disposition otherwise fitting with the recourse to time-resistant materials as large rock slabs, this chronotopic dimension — fusing and intersecting time and space at specific points of the landscape (GOLDHAHN 2015, 15) — allows for these solid structures to being transformed in multiple ways, whereby they are adapted to different narratives and

shifts in social strategies through time. Thus, in our study area we have detected growing evidence of artefacts and structural elements flowing among megaliths or other kind of sites, whereby other *topoi* and *tempora* may be combined and incorporated into the seemingly ponderous and static funerary mound.

Moreover, in recent decades several researchers have placed an increasing emphasis on the relationship between megaliths and movement (CRIADO/VAQUERO 1993; CRIADO/FÁBREGAS 1994), initially understood in the simpler sense of a correlation between mound location and paths across the landscape, before later on taking on a more structural character, relating to the internal change (mobilisation) of the building components, with the incorporation of allochthonous materials in the construction itself, sometimes after dismantling an earlier monument, or bringing in exotic grave goods (RODRÍGUEZ-RELLÁN et al. 2015). In other instances the situation is reversed and we come across artefacts or features that are taken from — or somewhat recall — the megalithic mounds, yet they are used in

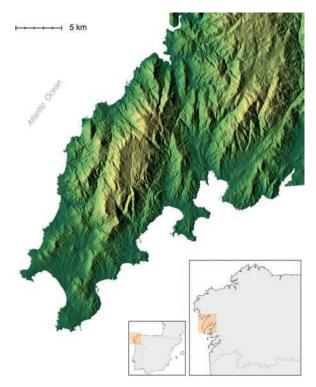


Fig. 1. Location of the study area: the Barbanza Peninsula (Galicia, Spain).

contexts other than funerary and often distant from the tombs themselves (Fábregas et al. 2007, 57).

In this paper, we shall make a brief appraisal of situations in which structural elements and artefacts have been displaced to and from the megalithic mounds, sometimes across fairly long distances. Such »dynamic« nature of the megaliths will be confronted with an analysis conducted by means of GIS and statistics, aiming to understand the role of these monuments within the landscape and the mobility patterns of the prehistoric human groups in a specific area of northwest Spain, the Barbanza peninsula (A Coruña, Galicia) (Fig. 1).

### RAMBLING ALONG

Funerary mounds have exerted an enduring influence over the inhabitants of north-west Iberia, even in historic times, when they were variously employed as shelter, stone quarries or an – intended – source of bullion, not to mention their common use as boundary markers (MARTINÓN-TORRES 2001; 2006; FÁBRE-GAS/VILASECO 2013). An eloquent example of this symbolic persistence is the menhir of Cristal (A Coruña), a standing stone that was recently translated and re-erected in a private garden after having been toppled and buried for an unknown period of time,

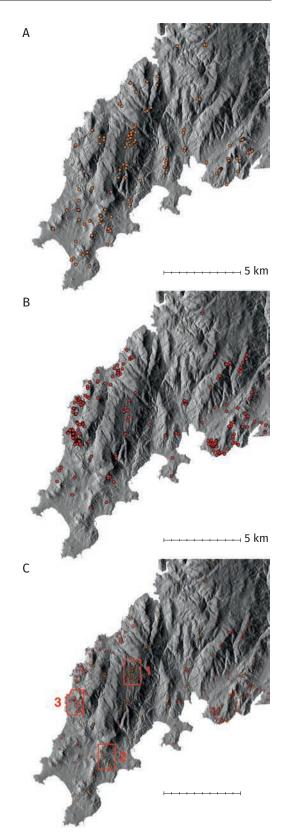


Fig. 2. Distribution of mounds (A) and rock art sites (B) within the Barbanza Peninsula. Three of the areas (C) analysed in detail: 1. Concentration of mounds in the upper part of the peninsula; 2. Concentration of mounds in the lowlands; 3. Concentration of rock art sites.

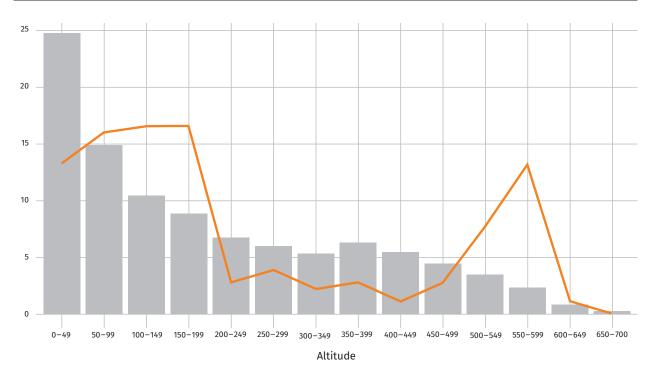


Fig. 3. Altitudinal distribution of mounds (line) compared to that of the terrain in the study area (bars). The y-axis shows the percentage.

possibly even millennia (VILLOCH 1998). This sort of events is by no means restricted to north-west Iberia, as shown in a recent book addressing the after-life of prehistoric monuments in several European regions (DÍAZ-GUARDAMINO et al. 2015). Our evidence for the re-use and indeed the moving around of megalith-related parts or items in our study area — despite not always being as clear-cut as elsewhere — still allow us to offer some reflections and above all consider the relevance of the movement between different areas and diverse social arenas across the Neolithic landscape.

A necessary starting point must take into account the general distribution patterns of the funerary mounds in north-west Iberia: quite often, earlier researchers underlined the noticeable concentration of these sites along medium-height plateaus and the flattened top of mountain ranges (CARRERO/RODRÍGUEZ, this volume). This kind of spatial distribution has been repeatedly remarked in the case of our study area, the Barbanza peninsula (A Coruña, Spain) (CRIADO/ FÁBREGAS 1994; CRIADO et al. 1991), being opposed – for example - to that of prehistoric open-air rock art (Fig. 2). Recent research at the latter begs to qualify this initial impression: despite being true that the highlands of the sierra display an unusual density of barrows, the area above 400 m only accounts for the 26% of the total number of monuments (181 effectives), with the rest being widely distributed along low-lying ridges and in the coastal strip (FÁBREGAS/ RODRÍGUEZ 2012, 37-38) (Fig. 3).

Proceeding further north, we come across a similar observation at the basin of As Pontes (A Coruña): out of the approximately 160 mounds reported in the area, no fewer than 73 - extensive open-air coal extraction destroyed most mounds lying here - were located in the alluvial plain or on the first rises above it, while the rest are placed on the heights surrounding the depression or - rather interestingly - along the ridges leading from the valley into the highlands (VAQUERO 1996; EGUILETA 2009). Knowing that the construction/use of the mounds spans more than two millennia in Western Iberia, such a widespread distribution could simply be the final result of a succession of top-down/bottom-up displacements of the builder's ritual territories along the centuries. While this is a distinct possibility, evidence derived from the analysis of the grave goods and the absolute dating indicates that some megaliths were raised on both the highlands and downhill in a similar chronology (fábregas/rodríguez 2012, 38). Of course, this observation speaks for a process of settlement – or, at the very least, >ritual occupation < – far more extensive and topographically varied than previously thought, this posing the question of Late Prehistory communities moving to and from on a regular basis between the coastal valleys and the mountains nearby.

Rodríguez Casal's research (2006, 62) on the megaliths from the Lugo province (Galicia) showed that sturdier granite or quartzite were much preferred for the slabs shaping the stone chambers. However, the

builders adapted themselves to the geological offer and tended to avoid transport distances beyond a few hundred metres. In this panorama presided by a reasonable economy of effort, one is struck by the finds reported in two Neolithic mounds not far from there (Northern Portugal): Mina do Simão (Oporto), where no fewer than eleven broken stone querns were carefully laid out on the chamber floor (JORGE 1984, 10-11); and in the same area, Chã de Santinhos 2 had as many as eight fragments of quern in the fill of a pit (JORGE 1985, 118-120). While the odd piece of hand-mill could come (as indeed is the case in more than a few tumuli) amidst the dirt and blocks used for raising the mound, these two examples display both an unusual number of these items and a concern with their careful setting, perhaps as a memento of a place (a settlement in the surroundings) or an activity (processing of vegetables) strongly linked to a new human-nature relationship, involving the production of food and a more settled way of life by the end of the 5<sup>th</sup> millennium BC.

The re-use, involving the remembrance or - one may wonder - the desecration of past monuments and particular places can be behind the incorporation to the megalithic tombs of certain stone elements. This seems to be the case at Os Campiños (A Coruña), where a large stone displaying an anthropomorphic outline - reinforced by the carvings on both faces of the slab – was recovered among the remains of a bulldozed mound, suggesting that before its incorporation into the megalithic tomb it was positioned elsewhere, probably as a freestanding stela (FUENTE/ FÁBREGAS 1994; FÁBREGAS/VILASECO 2006). Another much better recorded - instance comes from the passage-grave of Dombate (A Coruña), where at least one of the chamber uprights and the chamber capstone appear to have belonged to earlier stelae that would have stood outdoors (BUENO et al. 2016, fig. 5), in a process similar to that reported at Gavrinis or Mane Lud (Brittany) (CASSEN et al. 2012).

For Dombate, neither example should necessarily involve the transportation of those large slabs from a long distance, as we know that in the same spot an earlier single dolmen was demolished and covered up by the passage-grave tumulus circa the beginning of the 4th millennium BC and thus we cannot rule out this origin for them. By contrast, another passage-grave from the same district - the so-called Casa dos Mouros - shows evidence that one of the chamber uprights was brought from 10km away (CARRE-RA 2011, 311). This slab – like Dombate's – had been carved with a peculiar image (The Thing). Such a motif, sometimes interpreted as a representation of a sperm whale, has also been reported in other north-west Iberian and Breton megaliths, suggesting the existence of an ideological background shared by those Europe-

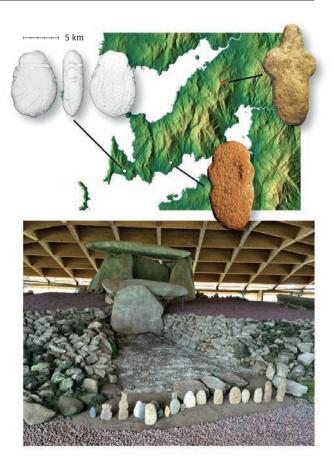


Fig. 4. »Megalithic idols« from the Mámoa do Rei mound (red dot), the settlements of As Forcadas (white dot, West) and Os Remedios (white dot, East). Idols at the entrance of the passage in the Dolmen de Dombate.

an regions in Neolithic times (BUENO et al. 2016; CASSEN et al. 2012), otherwise reinforced by the evidence of contacts between these two areas: the finds of Castellic-type pottery in Dombate and the movement of exceptional objects or raw materials such as the Alpine axes or variscite adornments (CASSEN et al. 2012; RODRÍGUEZ/FÁBREGAS 2017).

Despite involving a shorter range of distances, we return to this notion of shared beliefs or aesthetic preferences when examining the architectural design of a group of passage-graves in the district of Costa da Morte (WNW of Galicia), suggesting the existence of a sort of blueprint (also going down to the inner decoration of the chambers) in an area and chronology that are fairly well delineated (FÁBREGAS/VILASECO 2016, 105). However, we can also find examples of artefacts that can travel not only more or less long distances but also move about different arenas, having just mentioned above the case of the stone querns recovered from a couple of Portuguese dolmens and how this occurrence might imply a certain *evocatio* of the domestic sphere in a funerary context.

Conversely, we may find a possible reminder of the funerary sites from the Morrazo (Pontevedra) uplands in two settlement sites located downhill: a rescue dig at the settlement of Os Remedios (Pontevedra) with an occupation spanning the Neolithic and the Copper Age led to the discovery of a pebble worked to a rough anthropomorphic shape (fábregas et al. 2007, 57); and not far from there, surface collections at the Copper Age settlement of As Forcadas yielded another artefact of similar characteristics (SUÁREZ 1990) (Fig. 4). The excavation of the mound of Mámoa do Rei (Pontevedra) recovered yet another piece near the entrance to the passage-grave (CARRERA/FÁBREGAS 2000). All three items belong to the category of megalithic idols, whose presence has been reported by the end of the 4th millennium BC in several passage-graves of Western Galicia as - again - Dombate (Fig. 4) (FÁBREGAS 1993). Could the Forcadas/ Os Remedios finds be understood as the result of episodic intrusions in the already-closed Neolithic

passage-graves located at the high plateaus of the Morrazo peninsula? Alternatively, do they point to practices of moving around symbolically-charged objects (representing the ancestors, perhaps?) from the highlands – where the denser necropolis are set – to the more populated coastal valleys?

Overall, the evidence the we have mustered in the preceding paragraphs speak about the peculiar character of the megalithic barrows in north-west Iberia: doubtlessly they were ritual containers of deceased members of the different communities, while no less clearly they acted as sites of remembrance and spectacular markers within a social landscape. However, they were not only fixed spots on the land, given that they picked up memories from other places, whether close and familiar or more distant and exotic. Therefore, despite their perennial stance, they were also part of a dynamic, ever-changing conception of the land on the part of their builders, who were moving about in their pursuits across different sections of the landscape.

## MONUMENTS ON THE MOVE: YET ANOTHER GIS APPROACH

The consideration of megaliths as something dynamic or — more precisely — linked to dynamism and movement is not new in north-western Iberia. Galician mounds and rock art sites have been systematically linked to what has sometimes been called the »geography of movement« (INFANTE et al. 1992), with their location analysed in terms of proximity to paths and key points for the transit across the prehistoric land-scapes. In such a theoretical framework, monuments were understood as agents humanising and structuring the space, shaping it according to the perceptions and beliefs of the groups responsible for the construction of the monuments (CRIADO/VILLOCH 2000).

The Barbanza peninsula has been the scene of several approaches of this kind, mostly carried out within the theoretical guidelines of the landscape archaeology (CRIADO/VILLOCH 1998; VILLOCH 1995). Although the results achieved by such studies are very useful, several of them share some of the limitations typical of these pioneering approaches, such as the »gratuity« of many of the statements made regarding complex processes such as movement and perception (LLOBERA 2001). Thus, in most cases, the paths and routes through which the movement would have been implemented were defined in an ad-hoc manner, based on field observations conducted only in the proximity of the sites subjected to analysis (BRADLEY et al. 1994; VILLOCH 2001). As it happens, the resulting path networks do not actually connect different places in the landscape, but rather different clusters of monuments (CRIADO/VILLOCH 2000, fig. 3), thus increasing the risk of artificially overestimating the spatial relationship between mounds or petroglyphs and transit routes. Such a relationship although significant in many cases — may not have been as significant or widespread as some of these studies have claimed.

The irruption of the GIS technology has drastically changed the analysis of movement, allowing the calculation — in a quick and relatively simple manner — of potential routes across the landscape, based on the economy of effort and the energy consumption of the virtual walkers. Thus, least cost path (LCP) analyses have become routine in the archaeological studies. Among the numerous works applying this kind of simulations, some have included innovative solutions trying to solve the limitations of the LCP analysis, such as those derived from the impact of the election of different points of origin and destination on the final outcome (FÁBREGA-ÁLVAREZ 2006; WHITE/BARBER 2012, among others).

The Barbanza peninsula has been also the subject of attention by other researchers using GIS (RODRÍGUEZ 2012; RODRÍGUEZ/FÁBREGAS 2015). Among them, we must highlight the recent work by Llobera (2015), which shows the existence of a link between the mounds located in the highlands of the Barbanza and the transit corridors connecting different parts of the peninsula. In our paper, we will implement a similar approach to Llobera, albeit in a more superficial way. Nonetheless, our results can complement and reinforce the outcomes of these former studies, given that we have extended our analysis to all of the catalogued mounds and rock art sites in the Barbanza peninsula.

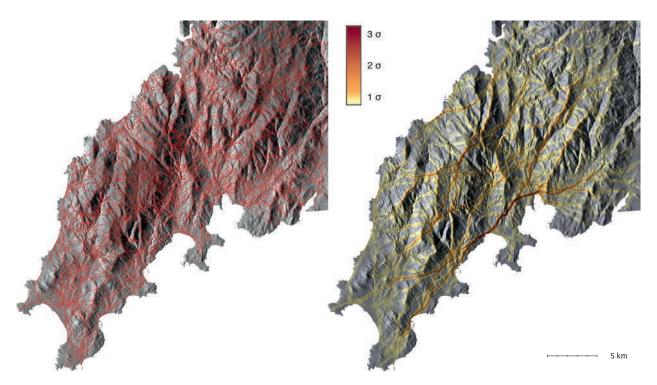


Fig. 5. Least cost paths network and density kernel derived from it (classified according to the number of standard deviations from the mean).

We have taken into account variables such as altitude, distance to the nearest LCP, density of LCPs, topographic prominence (LLOBERA 2001), cumulative viewsheds, horizon height (HOFIERKA et al. 2007) and Sky-view factor (ZAKŠEK et al. 2011), registering their values in the locations of the 181 mounds known in the Barbanza. In order to determine whether they are different from those of other monuments or any other place within the study area, the same variables have been analysed in the location of 351 petroglyphs and 181 (the same number as the mounds) points randomly distributed across the Barbanza peninsula. These calculations have been conducted over a 5-metre resolution DEM and using GRASS GIS (versions 6.4 and 7.0). Aiming to detect the existence of significant differences regarding the variables considered, we have implemented several statistical methods, such as the Kruskal-Wallis non-parametric analysis of variance and Dunn's post-hoc, pair-wise multiple comparison test. Moreover, the mounds and random points have been analysed together using a generalised linear model (GLM). Such statistical analyses have been conducted on R, version 3.2.3 (R Core Team 2015).

In order to contextualise the monuments within the general movement network across the study area, we have used a simple approach based on the calculation of a dense net of LCPs connecting three different types of areas:

- a. Those points in the study area where prehistoric settlements have been documented (FÁBREGAS/RODRÍGUEZ 2012) that may be coetaneous with the construction and use of the megaliths and thus may have belonged to the same communities.
- b. Those areas that may have played a significant role in getting in and out of the Barbanza peninsula.
- Random points located in both the Northern and Southern shores of the Barbanza.

The selection of these areas as points of origin and destiny of our LCP has allowed us to calculate the movement network independently from the mounds and rock art sites, contextualising these monuments in the general transit network across the study area, which connected the settled zones with both shorelines and with the paths in and out of the Barbanza peninsula. This network probably reflects some of the everyday movement patterns of the local groups during the prehistory in a reasonably realistic way.

Thus, 5,800 LCPs have been calculated across the Barbanza peninsula. The sum of all the routes – despite being sensibly lower in number than those calculated by Llobera (2015) – allowed us to estimate the potential transit intensity for the study area, identifying those places with a higher probability of having acted as nodes or key points in the transit network (Fig. 5). The results suggest that two regions –

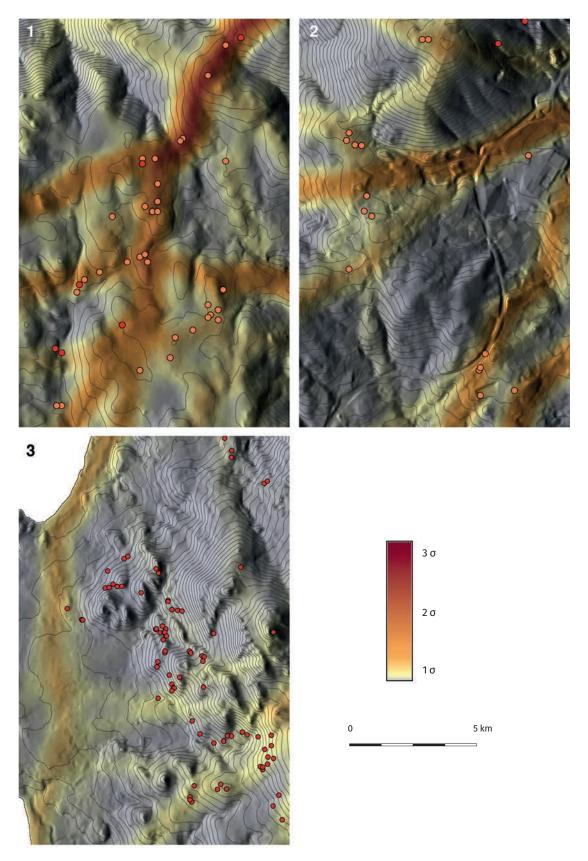


Fig. 6. Detail of the density of least cost paths in the three aforementioned areas of the Barbanza Peninsula and location of mounds (orange dots) and rock art sites (red dots).

one located in the Southern coastal valley and another on the top of the sierra – would have higher probabilities of being transited. Several of the areas of higher potential transit match some of the historical routes in the Barbanza, such as the local branches of the Way of St. James (NÁRDIZ et al. 1999), thus suggesting that this method might be useful for approaching the traditional movement strategies across the landscape.

In order to observe the relationship between the monuments and the different variables considered in this paper in further depth, we have increased the scale of analysis on three areas of special interest (Fig. 2 C): a concentration of mounds located at the top of the Serra do Barbanza (1), a second – less well defined – group of megaliths located in the coastal valley (2) and one of the largest clusters of rock art sites in the peninsula (3).

The analysis of these three areas suggests the existence of a strong relationship between mounds and LCPs (Fig. 6), especially in the case of the cluster located at the top of the Sierra del Barbanza (Fig. 6.1), where all the megaliths located on or immediately adjacent to those areas have a higher probability of being transited, as Llobera has already evidenced (LLOBERA 2015). Meanwhile, the relationship between rock art sites and transit is much less clear, since – except in specific cases – petroglyphs tend to be placed relatively far from such routes. This is absolutely clear in the area where the cluster of petroglyphs is located (Fig. 6. 3), where only a small part of the rock art sites is located near to what are otherwise less important routes.

The KW analysis of variance of the Euclidean distance to the nearest LCP and the density of least cost paths in the area indicates the existence of statistical

Tab. 1. Kruskal-Wallis analysis of variance and Dunn's post-hoc test of the differences between mounds and rock art sites or random points regarding the variables analysed in this paper (\* not different from a statistical perspective).

	KRUS	SKAL-	WALLIS		DUNN	I'S POST-HO	С	1
VARIABLE	X 2	DF	P-VALUE	COMPARE	OBS.DIF.	CRIT. DIF.	DIFF.	P-VALUE
A 14:4d	33.996		4.148e-08	Petroglyphs	109.730	45.121	TRUE	0.0000
Altitude		2		Random	66.740	51.832	TRUE	0.0010
LCD Dancity	110.5	2	2.2e-16	Petroglyphs	196.804	45.121	TRUE	0.0000
LCP Density				Random	149.276	51.832	TRUE	0.0000
Distance to LCP	75.297	2	2.2e-16	Petroglyphs	163.421	45.121	TRUE	0.0000
	75.297			Random	113.944	51.832	TRUE	0.0000
Prom (Ava.)	62.345	2	2.898e-14	Petroglyphs	136.499	45.121	TRUE	0.0000
Prom. (Avg.)	02.343			Random	145.814	51.832	TRUE	0.0000
Prom. (80 m)	12.026	2	0.002447	Petroglyphs	0.767	45.121	FALSE	0.4838*
Prom. (60 m)	12.020			Random	61.964	51.832	TRUE	0.0021
Prom. (160 m)	16.564	4 2	0.000253	Petroglyphs	42.202	45.121	FALSE	0.0126*
Prom. (100 m)	10.504			Random	88.080	51.832	TRUE	0.0000
Prom. (500 m)	32.751	2	7.73e-08	Petroglyphs	67.141	45.121	TRUE	0.0002
Prom. (300m)				Random	123.682	51.832	TRUE	0.0000
Prom. (2000 m)	64.711	2	8.875e-15	Petroglyphs	145.649	45.121	TRUE	0.0000
Prom. (2000 m)				Random	135.709	51.832	TRUE	0.0000
Horizon	12711	2	2.2e-16	Petroglyphs	207.865	45.121	TRUE	0.0000
HOTIZOTI	137.11			Random	206.872	51.832	TRUE	0.0000
Chariou	137.98	2	2.2e-16	Petroglyphs	208.770	45.121	TRUE	0.0000
Skyview		98 2		Random	207.055	51.832	TRUE	0.0000
View LCD	42.193	2	6.886e-10	Petroglyphs	108.950	45.121	TRUE	0.0000
View. LCP				Random	19.861	51.832	FALSE	0.1790*
View. Random	7.1159	1159 2	0.0285	Petroglyphs	49.178	45.121	TRUE	0.0044
				Random	23.243	51.832	FALSE	0.1409*
View. Grid	29.818	2	3.35e-07	Petroglyphs	83.934	45.121	TRUE	0.0000
view. Gilu				Random	0.5193	51.832	FALSE	0.4904*
View. Sum	28.054	2	8.094e-07	Petroglyphs	87.088	45.121	TRUE	0.0000
view. Juiii	20.034			Random	11.602	51.832	FALSE	0.2960*

Tab. 2. Generalized linear model showing the comparison between mounds and random points (a significant at 0 level; b significant at 0.05 level).

PARAMETER	ESTIMATE	STANDARD ERROR	Z VALUE	PR(> Z )
(Intercept)	1.551e+02	1.313e+02	1.181	0.237449
Altitude	-1.620e-03	9.997e-04	-1.621	0.105053
LCP Density	3.671e+00	1.068e+00	3.439	0.000585a
Distance to LCP	-1.144e-03	5.482e-04	-2.087	0.036865b
Prominence (Avg.)	-1.531e+07	4.053e+07	-0.378	0.705708
Prominence (80 m.)	3.827e+06	1.013e+07	0.378	0.705708
Prominence (160 m.)	3.827e+06	1.013e+07	0.378	0.705708
Prominence (500 m.)	3.827e+06	1.013e+07	0.378	0.705708
Prominence (2000 m.)	3.827e+06	1.013e+07	0.378	0.705708
Horizon	-2.589e+00	1.819e+00	-1.424	0.154520
Skyview factor	-1.525e+02	1.314e+02	-1.160	0.246063
Viewshed LCP	-6.622e-03	1.907e-01	-0.035	0.972307
Viewshed Random	1.079e-01	1.953e-01	0.553	0.580600
Viewshed Grid	-1.245e-01	1.943e-01	-0.641	0.521464
Viewshed Sum	2.977e-02	1.889e-01	0.158	0.874776

Null Deviance: 501.84; df: 361; Residual deviance: 335.56; df: 347; AIC= 365.56

differences among the monuments and random locations regarding these variables. More precisely, Dunn's post-hoc test suggests that such differences are more marked between petroglyphs and mounds than between the latter and the random locations (Tab. 1). Nonetheless, the results of the GLM specifically comparing mounds and random points show that the two variables – distance to LCP and LCP density – are significantly different (Tab. 2) and thus the proximity to areas that are more likely to have played an important role in the transit across the Barbanza peninsula would be a useful predictor for the position of barrows.

Therefore, the analysis of mounds and petroglyphs of the Barbanza peninsula seems to support earlier views suggesting a strong spatial relationship between the tombs and the transit routes (CRIADO/VILLOCH 2000; LLOBERA 2015). Meanwhile, such a relationship seems to be much weaker in the case of the rock art sites, as our own fieldwork in the area has already pointed out (FÁBREGAS/RODRÍGUEZ-RELLÁN 2015). This circumstance may be due to the »concealment wish« when engraving the petroglyphs, as might be suggested by

the findings of rock art inside small rock-shelters (Ibid.) or – otherwise – derived from the fact that both types of monuments were related with different scales of movement. Thus, it is possible that mounds were linked to a medium-/long-distance network, as the outcomes of Llobera's analysis (2015) have suggested for the mounds on the top of the sierra. By contrast, rock art might preferably be associated with local routes. However, it is very risky to interpret this circumstance in chronological terms – mounds linked to the territories of the still very mobile Neolithic groups, while rock art associated with the low range mobility of the more sedentary Bronze Ages communities – since we do not know the exact chronology of most megaliths and rock art sites in the area. Thus, geometric motifs such as circular combinations or cupmarks can perfectly be of Neolithic chronology (fábregas/rodríguez-rellán 2015). Conversely, the find of gold implements or small, cist-like monuments suggests that at least part of the megaliths in the study area would have been used or even constructed until the Chalcolithic and Early Bronze Age, the probable zenith of the engraving of petroglyphs (Ibid).

# THE DESCRIPTION OF UNSEEN THINGS

The interaction between mounds, petroglyphs and the prehistoric landscape was probably not only determined by the remoteness or proximity to – for example – important transit routes, but also by their

capacity of being noticed from the surroundings. However, while remoteness is relatively easy to approach from a GIS perspective, the simulations of the level of perceptibility of a given spot/monument

have not yet been implemented in a satisfactory manner. Regarding the Galician prehistoric monuments, their perceptibility has only been addressed sporadically (BRADLEY 2002; 2009), usually being confused with the »visibility« exerted from the monuments (see FÁBREGAS/RODRÍGUEZ-RELLÁN 2015 for a reflection on this problem regarding open-air rock art).

The specific location, size or the presence of a cairn made of quartz cobbles or other shining stones would have acted as important elements for modulating the perceptibility of a given mound (BRADLEY et al. 2000). However, it is important to remember that the capacity to be noticed is not entirely (or even mainly) based on physical factors: the social or ritual significance of a specific mound might have multiplied its perceptibility, regardless of its remoteness or size. A contemporary example of this dynamic that we repeatedly use when referring to the perceptibility of rock art is that of the

small cross painted in the pavement of Elm Street (Dallas, USA), marking the exact spot where President J. F. Kennedy was assassinated. Despite its small size, this sign has become a historical and symbolic landmark for both locals and tourists and it has resisted the attempts by the authorities to delete it. It is likely that similar processes took place in the past, turning what nowadays may have been seen as an ordinary place or mound in a key reference for the local prehistoric communities during a time span of decades or even centuries. Places with such power probably acted sometimes as attractors for the construction of monuments, perhaps being the origin of some of the clusters of mounds and petroglyphs detected in the study area and elsewhere in NW Iberia.

This kind of socially-based factors can hardly be managed by either Archaeology or – more specifically – spatial and GIS studies (GAFFNEY/LEUSEN 1995). Nonetheless, very interesting approaches have been carried

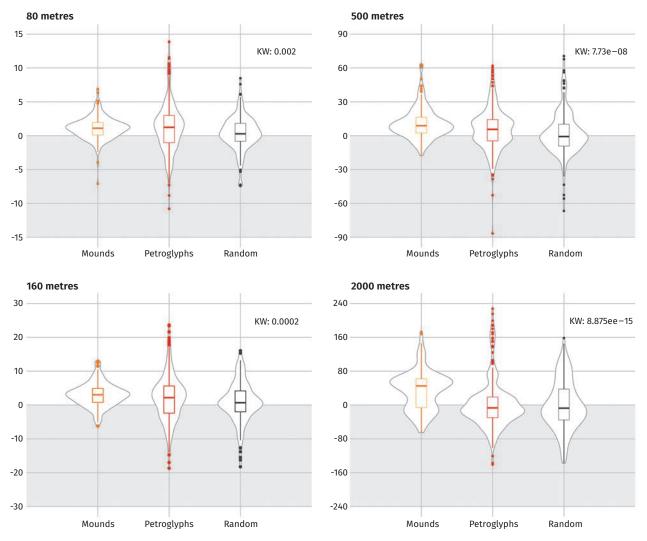


Fig. 7. Topographic prominence of mounds, petroglyphs and random points at different scales/radiuses.

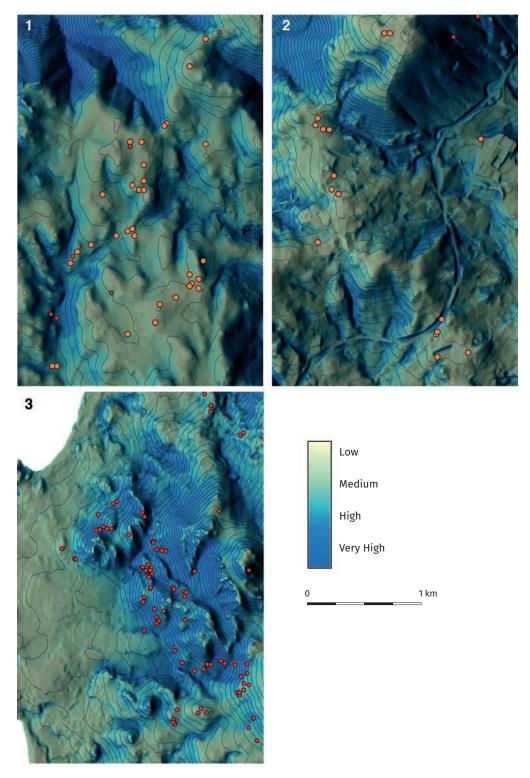
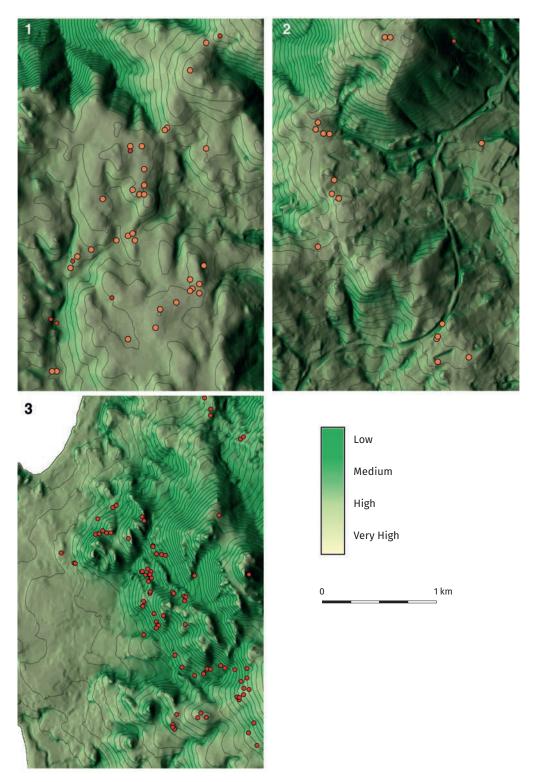


Fig.~8.~Detail~of~the~horizon~height~in~three~areas~of~the~Barbanza~peninsula,~converted~into~a~categorical~variable~according~to~the~quartiles~of~the~original~values.



 ${\it Fig. 9. Detail of the sky-view factor in three areas of the Barbanza peninsula.}$ 

out trying to determine the possible significance of specific places within the landscape (RENNELL 2012; WHEATLEY 2000). Most of them are based on similar concepts: those areas more noticeable from the surroundings are more likely to have acted as landmarks and thus might have played a significant role within the cognitive and symbolic geography of the human groups living nearby. A recurrent setting of archaeological sites in those prominent or conspicuous areas might imply that these were purposely built/engraved in those places where they would have had a higher chance of being noticed and they also shared the importance and/or symbolism of the place.

One of the approaches to analyse the potential significance of a given area within the local landscape is the "topographic prominence", described as the percentage of locations that lie below a specific location within a certain radius (Llobera 2001, 1007). In our case, the analysis of this variable shows how mounds tend to be located in places with a higher prominence, regardless of the scale or radius of analysis (Fig. 7). Barrows are also the monuments with a lower variability, somehow suggesting a quite systematic preference for prominent places.

The KW test of the topographic prominence evidenced the existence of differences among the monuments and random locations (Tab. 1). However, the pair-wise analysis showed that such differences become non-significant when considering the prominence at short range (80 m and 160 m) of mounds and petroglyphs. This circumstance suggests that both types of monuments tend to be preferentially located at places that are prominent at a short range. However, only mounds continue to be located at places that are prominent at medium or long ranges. Unlike the KW analysis, the GLM comparing the 181 mounds and the same number of points randomly located across the study area (Tab.2) does not detect significant differences, suggesting that – at a global level – the topographic prominence would not be a decisive factor for predicting the location of mounds in the study area.

Another important characteristic for ensuring the perceptibility of a given monument is whether it is located in an open space where it could be easily seen from the surroundings. In his work analysing the mounds of the Sierra del Barbanza, Llobera (2015) remarked upon the tendency of mounds to be located in places that would have acted as local horizons, as a circumstance that he relates with the will of modulating the perceptibility of these monuments, either making them patent or restricting their view to certain areas (Ibid.).

We have also approached this variable, albeit in a much simpler way. For this purpose, we have calculated the horizon height (HOFIERKA et al. 2007) in the areas where mounds, petroglyphs and random points are located. The results for the three areas defined ear-

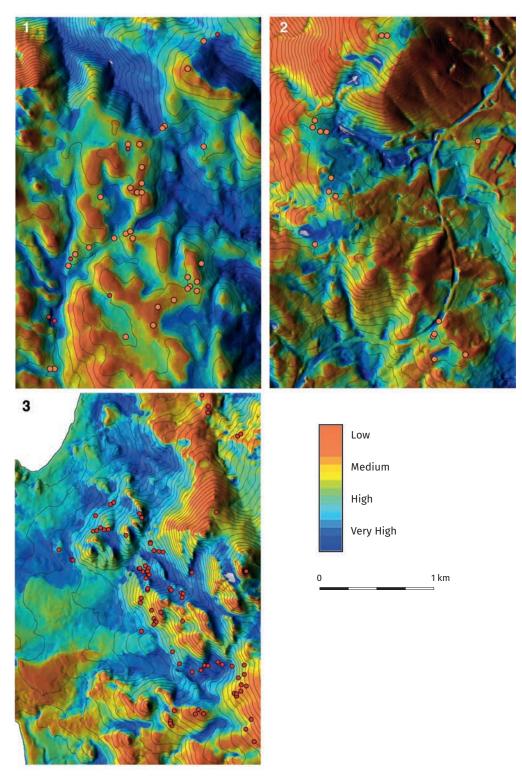
lier show how mounds tend to be mainly located in those places with a low horizon height (Fig. 8), namely in open spaces with no major obstacles impeding their conspicuousness. Being located in these areas, mounds may have been able to act as local horizons and thus become significant landmarks. Again, a completely different situation has been detected for the rock art (Fig. 8.3), which tends to appear in locations that are noticed at short distances and only from specific places.

A type of calculation with outcomes similar to those of the horizon height is the sky-view factor, a value determining the portion of the visible sky from each area as limited by the surrounding relief (ZAKŠEK et al. 2011). The higher this factor, the higher the openness of the area where the monument is located, thus increasing its possibilities of being noticed. As with the former variable, the observation of the results in the three areas analysed in more detail (Fig. 9) show how — unlike rock art sites — mounds tend to be located in open spaces.

Horizon height and sky-view factor values at the location of the points analysed in this paper have proved to be statistically different (Tab. 1). However, the GLM shows – again – that the difference between mounds and random locations is non-significant, suggesting that both variables would have a low predictive power regarding the location of mounds within the study area (Tab. 2). Such a circumstance does not exclude the possibility of mounds sometimes being preferentially located at places where they could have acted as local horizons, as it seems to happen in the clusters analysed in detail in this paper or previous ones (LLOBERA 2015), although our analyses suggest that this is not a characteristic widely shared by the barrows in the study area.

We also have to keep in mind that these location patterns may be affected by more prosaic variables. Thus, the rock art would tend to be located in stepped slopes because the stronger erosive processes there would have exposed more outcrops there than – for example – in the valley bottom. Similarly, the mounds may also tend to be located at the top of the ridges and hills because the soil there is more stable, less prone to erosion and lighter, which would have reduced the effort necessary for constructing these earthen tumuli.

The next step in attempting to measure the perceptibility of mounds and petroglyphs of the Barbanza peninsula was to calculate the level of conspicuity of their specific locations. The calculation of such a variable can be very difficult to implement, although several approaches such as the »visual affordances« or »visualscapes« have proven quite useful (LLOBERA et al. 2010). These simulations are based on calculating either a cumulative viewshed for a significant



 $\textit{Fig. 10. Detail of the sum of the accumulative viewsheds in three areas of the \textit{Barbanza peninsula}.}$ 

number of points unevenly distributed across the area of interest or a total viewshed in which a viewshed analysis is conducted for each of the cells in the study area.

Although the latter approach is probably more realistic and thus preferable, it is very difficult to apply in a study area like ours (composed by c. 70 million cells) without resorting to supercomputation or devoting an excessive amount of time to the calculation. Instead, we have made use of different series of cumulative viewsheds, which have been implemented the following three slightly different methods:

a. Cumulative viewsheds calculated from the LCPs network: points were generated every 500 metres along the 5,800 routes crossing the study area. The aim was to have an approximate idea of what can

- be seen from the paths. Since mounds and petroglyphs have been repeatedly linked to the geography of movement, it seems logical that the visibility should be calculated from those areas where such movement would be more likely to occur.
- b. Cumulative viewsheds calculated from points randomly distributed across the landscape: a total of 5,400 points were randomly generated. Following previous approaches (LLOBERA 2015), this would allow us to have an approximate idea of the general conspicuity of the different places within the study area.
- c. Cumulative viewsheds calculated from points regularly distributed on a grid: 2,193 points forming a grid separated by 500 metres were used as a basis for calculating a high density cumulative viewshed.

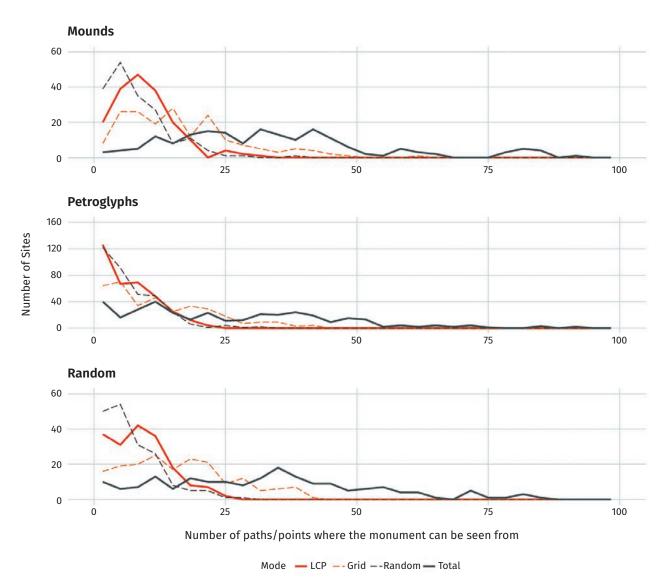


Fig. 11. Number of sites seen from paths or points across the study area.

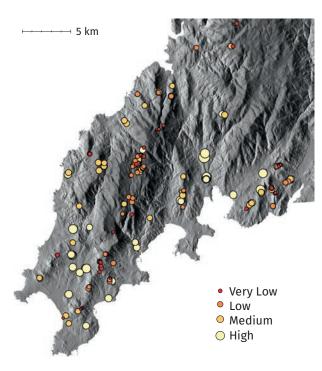


Fig. 12. Classification of mounds according to the sum of accumulative viewsheds in their locations.

Simple and multiple linear regression analyses of the raster maps generated using the different cumulative viewshed methods denote the existence of significant differences regarding the outcomes, a circumstance that can also be seen in the Kruskal-Wallis analysis of those values detected in the specific location of the monuments analysed (chi-squared = 882.08, df = 3, p-value < 2.2e-16). The greatest differences occur between the outcomes of the cumulative viewshed based on the grid points and those generated from the random points. The results of the statistical analysis strongly suggest that both the number of points and the way in which they are distributed can

significantly affect the outcome of the results in our attempts to calculate the conspicuity of the landscape based on the cumulative viewshed strategy.

In an attempt to reduce the effects of this variability, we have decided to use the sum of the outcomes produced by the three aforementioned methods. The resulting map against the location of the monuments in the three areas analysed in this paper (Fig. 10) provides evidence concerning how mounds tend to be located in those places with a medium or high conspicuity, while rock art sites are preferentially located at areas with low or even very low conspicuity. At a global level, we can explore the number of routes or spots from where the monuments can be seen (Fig. 11). The results show how - regardless of the method used for calculating the conspicuity – most monuments are seen from fewer than ten points. This low conspicuity is especially evident for the rock art sites, an important number of which are seen from only two or three points.

Regarding the geographic distribution of the mounds located in places with a higher conspicuity (Fig. 12), those more conspicuous are outside the three areas that we have analysed in further detail in this paper. These are preferentially located at the low-lands of the Barbanza peninsula, not at the top of the sierra, where the global conspicuity of the mounds tend to be low or even very low.

The statistical analysis of this variable has evidenced that despite differences regarding the conspicuity of the places where petroglyphs and mounds are located, the same does not emerge when analysing the differences between mounds and those places chosen at random (Tab. 1); in fact, the conspicuity is not a significant variable in the generalized linear model (Tab. 2). Such a circumstance suggests that although there are mounds that can be located at very conspicuous places, in general the location of these monuments does not seem to be determined by the conspicuity, with significant variability existing among them.

# CONCLUSIONS

A case has been made for mounds in NW Iberia acting not as simple landmarks but rather as reference points in a social landscape presided by a noticeable degree of mobility. This seems to be fit among communities whose life was not altogether settled until well into the Copper Age and groups or individuals moved about relatively ample distances and exploited different sections of the landscape, which included both high – and lowland or coastal areas. It is hardly surprising that mounds should reflect these dynamics and they bring together at the architectonic level or in the grave goods elements, designs or ideas that

evoke sometimes far away territories. Assuming this circumstance, we have tried to ascertain and objectify the relationship between mounds and mobility across the landscape, choosing an area – the Barbanza peninsula – that has been well studied in recent decades.

The results of the calculations made using the GIS and statistical tools suggest that the mounds of the Barbanza peninsula tend to be located near the potential transit routes, as well as close to those areas that might have played a significant role as keypoints or nodes in the movement network across the study area. Such a circumstance seems to endorse the results of both the

traditional approaches and previous GIS analyses implemented in this area and it reinforces the notion of the Galician megaliths as monuments linked to the movement between different sectors of the landscape.

However, at the same time, our results convey the idea that the levels of perceptibility or conspicuity of the monuments' settings are highly variable, with mounds placed in areas that may have acted as local landmarks and others situated in spots that – at least apparently – would have made them less notice-

able from the surroundings. Such variability calls for a qualification of the automatic consideration of these monuments as landmarks intended to be seen. Although such a wish is indubitable for some barrows in the study area, there would be other monuments that may be intended to pass as unnoticed as possible. Such variability is quite logical in a phenomenon that – in NW Iberia – comprises several thousand tumuli and that lasted for more than 2,500 years.

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# General and local spatial trends in Galician megalithic landscapes (North-Western Iberian Peninsula)

Miguel Carrero-Pazos, Antón A. Rodríguez Casal

#### **ABSTRACT**

Having completed the »corpus« of the Galician megalithic complex using objective and scientific viable data obtained through intensive fieldwork during two decades, we now have the possibility to study it as a whole. As such, an overall view of the megalithic complex of Galicia is presented here, based on the most complete dataset, which currently has 3,305 sites. Starting from the contextualisation of the phenomenon provided by previous research, a general ap-

proach to studying the distribution of sites is suggested here, devoting special attention to location patterning in Costa da Morte, one of the areas with the greatest concentration of mounds in the NW of the Iberian peninsula. The results point out that there is a clear variability in the distribution of sites, with the existence of preferences on the geographic site's location, which may indicate a territorial pattern of these past societies.

#### RESEARCH CONTEXT

Galicia is doubtlessly one of the areas in the Iberian peninsula with the highest number of megalithic mounds. Since the 1990s, the megalithic studies group of the University of Santiago de Compostela has conducted a number of research projects searching for the creation of the largest and most reliable documentary corpus possible. As a result, we now have a database with more than 3,000 sites, all of them studied during intensive field work (Fig. 1).

Therefore, now it is time to focus on macro-scale objectives to propose – as in the first part of this paper – a global study of the different areas of Galician Megalithism. In the second part, a study of site location patterning of a specific zone is carried out.

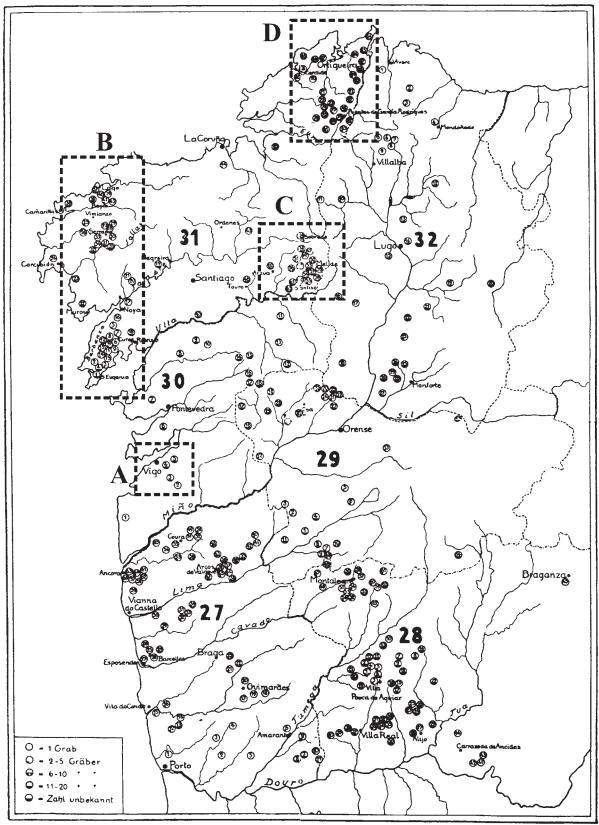
From an overall perspective, G. and V. Leisner initiated the research about the spatial distribution of the megalithic complex in Galicia (LEISNER 1938) during the 1930s, reflecting in some maps the main groups of sites. It is extremely interesting to analyse this proposal, because apart from capturing the surveys that they conducted in Galicia, a higher concentration of sites in coastal areas – rather than inner zones – can be observed (Fig. 2). They highlighted the concentrations of Oia and Monte Penide (Fig. 2A), with more emphasis on the Barbanza Peninsula and Costa da Morte (Fig. 2B). Special relevance was also given to the concentrations of Serra do Bocelo on the Galician Meridian Dorsal (Fig. 2C). To the north, the concentrations of A Serra da Capelada and Coriscada were noted (Fig. 2D). Lugo

and Ourense had groups that were isolated or – in any case – outside the mainstream.

Subsequently, A. A. Rodríguez Casal from the University of Santiago de Compostela presented a cartographic update of Galician megaliths in 1978, based on the distribution map of G. Leisner, albeit picking some new references (published later, RODRÍGUEZ CASAL 1990) (Fig. 3, left). In this sense, he paid attention to the eastern areas of Galicia, traditionally considered as marginal due to the lack of research.



Fig. 1. Examples of megalithic monuments in Galicia. A: Dolmen of A Mamoa do Rei. B: Two mounds of Serra do Leboreiro's group, located in the border of Portugal and Galicia.



Verbreitungskarte der Megalithgräber in der Provinzen Minho (27), Tras-os-Montes (28), Orense (29), Pontevedra (30), La Coruna (31), Lugo (32).\(\chi\)

Fig. 2. Megalithic sites in the Northwest of the Iberian Peninsula, following G. Leisner (modified after Leisner 1938).

From figure 3 (left), greater attention to inner areas can be highlighted, such as Lugo and the western elevations (Fig. 3, left: A). Special relevance is given to the megalithic culture in A Baixa Limia and the whole ridge of Serra do Leboreiro (Fig. 3, left: B), because this area has an extremely high density of sites, as has recently been demonstrated (EGUILETA 1999; SOUSA 2013; VILAS 2015). The next update to emphasise is again a contribution of A. A. Rodríguez Casal, with C. Tavares da Silva (RODRÍGUEZ CASAL 1997).

This brings us to the first years of the 21st century, when new works from the megalithic studies group »Archaeology and ecology of the Galician megalithic phenomenon« of the University of Santiago de Compostela appeared. Thanks to some research projects funded by Galician government, the group started an intense prospection over the whole of Galicia, concluding with a more intensive mapping of the Galician mounds. This was the case with the Lugo province (Fig. 3, right), now truly prospected and mapped with the use of GIS (RODRÍGUEZ CASAL et al. 1997, 526). After this contribution, we must now con-

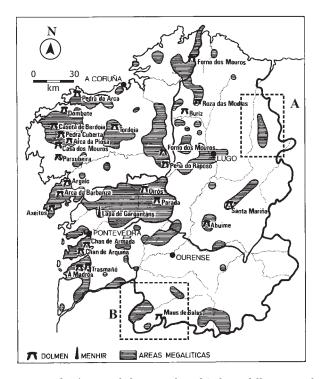
sider the most updated map, which currently has 3,305 megalithic sites (Fig. 4).

This distribution map shows a relatively homogeneous dispersion of mounds throughout the territory in every kind of landscape, from coastal areas to inland sites and even in the highest mountains. This should prompt us to try to reject the idea of searching for one explanation of the site location pattern of these monuments, like the great pioneers of Galician research such as F. Maciñeira – who stated that there was a complete relation among mounds and ancient paths (MACIÑEI-RA 1943–1944) – G. Leisner (LEISNER 1938) and F. López Cuevillas (LÓPEZ CUEVILLAS 1959), who paid attention to the raw material and outcrops. However, explanations of site location patterns must be found in an interlinking of factors, such as geology (type and distance to outcrops), edaphology (soil characteristics, availability of raw material), economy (favourable lands for livestock and tillage), topography (visibility, territorial marks) and even rituals (RODRÍGUEZ CASAL 1990, 40-49), as is being carried out today (CARRERO/ RODRÍGUEZ CASAL 2015).

#### DATA MANAGEMENT. THE MEGALITHIC COMPLEX OF GALICIA AS A MATHEMATICAL STUDY OBJECT

In order to achieve a study of such a great number of sites with multiple variables (attributes) associated to them, for the whole of Galicia we should use a GIS. This proposal

assumes that the megalithic complex — as a phenomenon materialised in archaeological sites, defined by ourselves as a set of morphometric observations during the fieldwork —



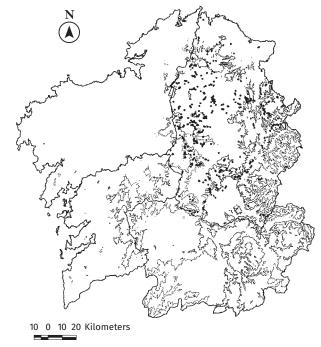


Fig. 3. Left: The megalithic complex of Galicia, following Rodríguez Casal (modified after Rodríguez Casal 1990, 59); Right: Cartography of the megalithic sites in Lugo province (USC Research Group, since 2000).

may be the object of mathematical approaches and as such it can answer the main questions of the mathematical language (BARCELÓ 2007, 19-21) (Fig. 5).

In this sense, if we compare the previous figure with the variables of our database (Tab. 1), we will be able to characterise the megalithic phenomenon, or at

least define it from the mathematical language. From this point, we can use some statistical analyses to study in depth locational regularities among mounds. All of the analyses carried out here have been performed with GRASS GIS, SAGA GIS and R (R Core Team 2015), all open source software.

# SPATIAL STATISTICS

When I. Hodder and C. Orton wrote their classical »Spatial analysis in Archaeology«, they established

three reasons why research in archaeology should adopt the analytical methodology of spatial approxi-

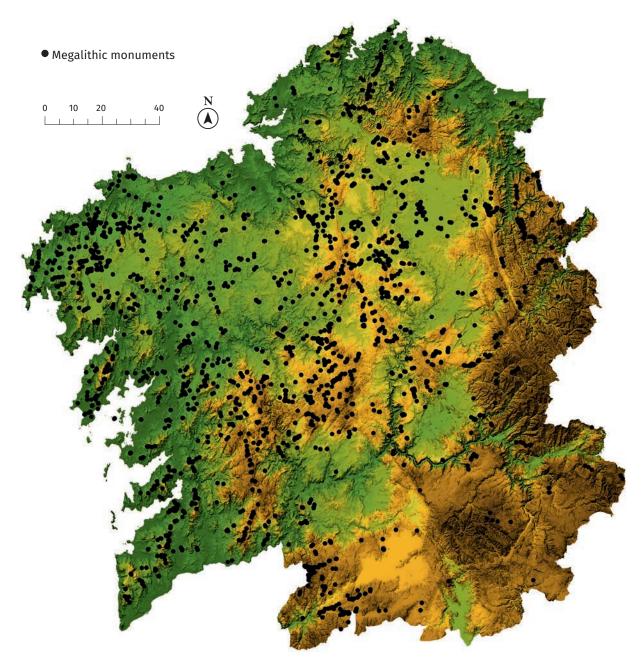


Fig. 4. The Megalithic Studies Group's database (University of Santiago de Compostela).

mation (Hodder/Orton 1976, 12–17). First, they noticed that there was a lack of synthetic vision or some »modus operandi« to offer researchers who wanted to include spatial analysis in their specific work contexts. Second, they needed to remove the implicit subjectivity in cartographic interpretations. In this sense, they considered the development of more rigorous methods of interpretation as a need (Hodder/Orton 1976, 14), based on planning and developing statistical models that contemplate all of the possible analyses, or randomness as a hypothesis to be tested. Finally, a third reason was highlighted, namely the study of the huge amount of distributional information that is often derived from an excavation rather than from a comprehensive database of archaeological sites.

Archaeological data is often spatially defined or can be defined from this perspective. An archaeological phenomenon, a site, a group of sites, a landscape or material from an excavation all have spatial and non-spatial attributes. They always maintain spatial relations with other elements and thus may maintain spatial relationships of negation (not being spatially related to other elements). This can be studied with a GIS. Furthermore, there is the possibility to associate non-spatial data with significant space objects (Conolly/Lake 2009, 33).

In pursuit of this work, we must start with two basic assumptions. First of all, the distribution of points on a map is always a simplification of a complex set of events constituted over time (BEVAN et al. 2013). On the other hand, spatial dependence is perhaps one of the most important concepts that we must assume in this work. In fact, the first law of geography is the principle of spatial autocorrelation, defined by Tobler (1970) as \*\*everything is related to everything else, but near things are more related than distant things\*\*. Therefore, closer objects in space tend to be more similar than objects that are distant. According to Dacey (1964, 559), in terms of a map pattern, pure chance means that each map location has an equal

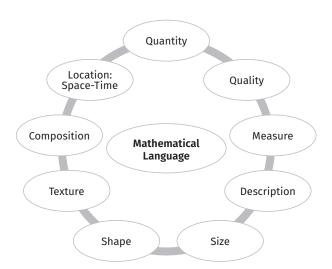


Fig. 5. Characteristics of the mathematical language, following J. A. Barceló (Barceló 2007);

probability of receiving a symbol. Since it is highly unlikely that geographic distributions – particularly locational patterns involving human decisions – are the result of equally probable events, it is expected that most map patterns reflect some system or order. For this reason, map patterns are examined for evidence of a spatial process.

The grouping of a certain number of points in space creates what is known as a dot pattern, which can give us information on the collected variables and their behaviour. The characterisation of a dot pattern holds interest to its description and is achieved through statistical analyses and descriptors that define its structure. To perform these analyses, it is assumed that the spatial structure of a pattern is the result of a point process, which is a random process that generates such patterns. Accordingly, points are the events generated from this process. If we can describe the type of the pattern obtained, we would be able to derive some information about the process that had generated it.

Tab. 1. Qualitative and quantitative variables commonly used to describe the characteristics of a megalithic site.

	QUALITATIVE VARIABLES
1.	Mound composition
2.	Material of megalithic slabs
3.	Typology of the dolmen chaniber
4.	Physical environment
5.	edaphology • Soil deepness • Drainage
6.	Location • Surroundings • Orography

	QUANTITATIVE VARIABLES
1	. Altitude
2	. North-South diameter
3	. East-West diamter
4	. Height
5	. Surface area
6	. Volume
7	. Megalithic slab number

There are three types of pattern that can be generated through a point process:

- Regular: the density is constant and the points are apart from each other.
- Random: there is no structure; rather, the positions of each point are independent.
- Clustered: very high densities of points in certain areas.

The study of some dot patterns is always based on the comparison between the theoretical properties of a random distribution — so-called Poisson distribution — and the observed distribution. If the observed distribution does not correspond to the random, we will be able to reject the null hypothesis of randomness in our data. Among the most common methods is the quadrant analysis. Essentially, it starts dividing our area into regular units (or quadrants) and studying the number of points that appear within each. However, it has some problems, such as the effects of the scale in the analysis (OLAYA 2014, 295). On the other hand, the method of nearest neighbour (CLARK/EVANS 1954)

is based on calculating the distance from each point to its nearest one. Comparing these distances with the value to be expected in a random distribution, we are able to deduct the type of structure in the observed distribution. Finally, one of the most commonly utilised methods is Ripley's K function, which tries to address the problem of the scale of the analysis in the quadrants approach. Following Olaya (OLAYA 2014, 297), rather than fixing a scale of analysis and a fixed set of quadrants, it uses a random number of areas that are studied at different scales, with different sizes. More robust approaches such as the Monte Carlo statistical method allow us to reject the null hypothesis of spatial randomness of a particular process by comparing the actual sample of sites with the output generated from a multiple set of simulations or iterations of random processes. Most authors (FI-SCHER et al. 1997; DRENNAN/PETTERSON 2004; CRE-MA/BEVAN/LAKE 2010; BEVAN et al. 2013) use a number of 999 simulations as an admissible corpus of random observations on which to accept or reject the null hypothesis.

#### GENERAL TRENDS AMONG GALICIAN MEGALITHS

It has been common to carry out megalithic studies in Galicia from a regional perspective, using geographical or geomorphological criteria or current administrative divisions such as counties, understanding them as natural regions that typically share physical, human and historical characteristics that determined their traditional landscape (EGUILETA 1999).

Starting from the documentary corpus that we now have, which has 3,305 sites, we can see that the megalithic monuments are homogeneously distributed in groups throughout the territory, with a high number of isolated cases. This trend seems to be a special character of the megalithic complex in Galicia, which is the homogeneous dispersion of concentrations with small/medium size on the whole of the territory.

However, we are now able to present an approach to study the density of megalithic monuments using two kind of analysis: the pure point density analysis and the kernel density approach. Following Conolly and Lake (2009, 234), the latter is a method typically used in archaeology because it produces smoother and more readily interpreted results than simple density techniques such as cluster analysis or interpolation (SILVERMAN 1986; BEARDAH/BAXTER 1996; BEARDAH 1999).

Point density estimation calculates a value per area units through the point entities that are inside the raster cells. On the other hand, Kernel density estimation uses a two-dimensional probability density function placed across the observation points to create a smooth approximation of its distribution from the centre of the point outwards (SILVERMAN 1986). In both cases, a 50 m resolution DEM has been chosen and after several tests, a radius of 10 km (Fig. 6).

Starting from the study of the concentrations observed in previous figures, we are now able to distinguish some of the most important groups of megalithic sites in Galicia, such as Monte Penide and Morrazo. The highlands or plateaus of Serra do Leboreiro and Baixa Limia are also important. In the northwest, the Barbanza Peninsula, its hinterland and Costa da Morte are the most important groups of sites. In central Galicia, there is an important concentration of sites placed at the elevations of the Meridian Dorsal and in the northeast — placed at high altitude locations — the megalithic monuments of Fonsagrada. Finally, to the south of Lugo's province, we can highlight the concentrations of Monte de Santa Mariña and Edramo.

The previous analyses allow us to study general groups, although there are several limits on density approaches. The first one concerns the analytical window (»the kernel«), the threshold defined by the user. The smaller the threshold, the more concentrated the groups will be (and in a certain sense, the more real the results will be), but the general trend of the raster map will be smaller, as we can see in Figure 7 (A).

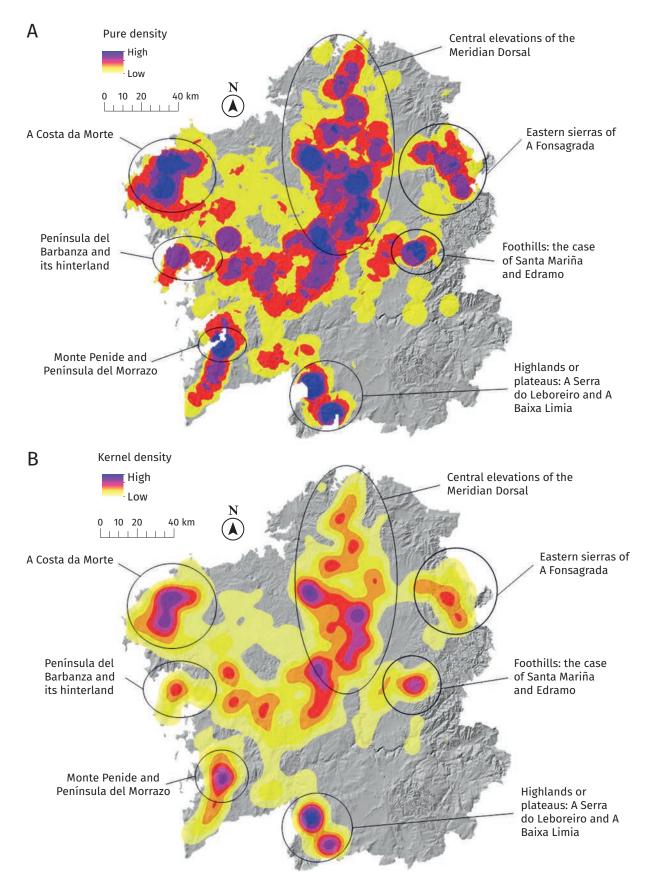


Fig. 6A. Pure point density approach. 6B. Kernel density estimates.

On the other hand, a common problem is how we define the areas located next to division values (Fig. 7B). The value of the central point can be exactly known, but we may answer the extent to which this is real when two closer sites can be in separated groups.

This kind of question will be studied in future approaches, in which we will try to compare these results with a cluster analysis that – despite studying the intensity of points – will study the distances between them, allowing us to create groups of nearest sites.

# SITE LOCATION PATTERNING: COSTA DA MORTE AS A CASE STUDY

In Galicia, works that had to some extent incorporated a spatial perspective to the study of megaliths were always focused on the definition of site location patterns, such as the altimetry position or the geological substrate or visibility and intervisibility between mounds (LÓPEZ CUEVILLAS 1959; BELLO/CRIADO/ vázquez 1984; criado/aira/díaz 1986; criado/ fábregas/vaquero 1990–1991; vaquero 1989, 1990, 1994; CRIADO/VAQUERO 1991, 1993; EGUILETA 1999; VILLOCH 2000). However, following Lake/Woodman (2003, 690), such approaches could be classified as »informal« as they are characterised by the absence of an explicit methodology and the development of a common-sense interpretation based on an intense fieldwork, as mostly happens with visibility studies. Starting from the locational model that can be extracted from all these works, we are now able to define the main locational criteria of the Galician megalithic complex (Tab. 2).

Thanks to the rasterisation of these variables, we will use site predictive modelling to determine the number of variables that correctly predict the distribution of monuments, allowing us to suppose that they were relevant in the configuration of the megalithic landscapes in Costa da Morte. In this work, we are not criticising the validity of previous approaches, but we also seek their complementation through a raster quantification of the known locational variables using GIS and spatial statistics (LLOBERA 2007).

Predictive modelling is a technique that allows the prediction of sites or archaeological materials in a region based on an observed trend in a sample or assumptions about human knowledge (KHOLER/PARKER 1986, 33). It has been used as a tool for managing cultural resources in urbanistic developments (FERNÁNDEZ CACHO 2009).

1 It is an abstract model created through observed patterns in a study sample that defines areas with similar

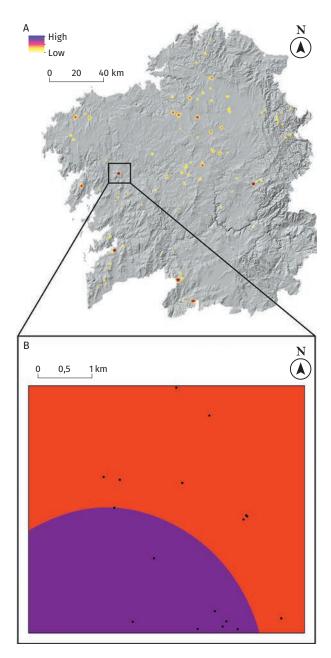


Fig. 7A: Kernel density estimate with a 2000 m radius. 7B. Problems inherent to point density approaches.

However, despite reducing its power to the creation of site potential maps, we use it here for their interesting analytic value. If we have a high precise model, then we should assume that the variables that compose it may have influenced the location of sites. In this sense, it will be considered here as a map of potential archaeological sites rather than a predictive one (RODRÍGUEZ/

environmental characteristics that could have had certain roll in the distribution of sites.

LOCATIONAL ANALYSIS PREDICTIVE MODELING		VARIABLES	DESCRIPTION	
		Elevation	25 m. resolution DEM, obtained from LiDAR data.	
	Physical and	Slope	Maximum inclination of elevation at a given point. Derived from DEM.	
	orographic factors	Hydrology	Potential hydrologic network.	
	Juctors	Geology	Official MAGNA cartography for geology (IGME).	
First order		Wetlands	Topographic Wetness Index (военнея et al. 2002).	
covariates	Potential factors	Topographic prominence	Defined as a function of height differential between an individual and his/her surroundings as apprehended from the individual's point of view (LLOBERA, 2001).	
		Potential transit	Identification of areas that are statistically more likely to be transited, key points or theoretical nodes in a natural transit network (RODRIGUEZ RELLÁN, FÁBREGAS VALCARCE, 2015).	
		Visual prominence of Iandscape	Areas of the landscape that can be perceived more frequently.	
Second order covariates	Cultural factors	Tradition	Evaluation of the spatial dependence between points (attraction or repulsion)	

Tab. 2. Variables that will be considered in the locational study.

FÁBREGAS 2015), aiming at the production of a non-trivial evaluation of the intensity of sites in a specific region and their location (KVAMME 1988; WHEATLEY 2004).

#### Working area and covariable setup

This study focuses in the region traditionally known as Costa da Morte, which embraces a natural area conformed by Bergantiños, Xallas, Muros, Terra de Soneira and Fisterra. The vector limit of this zone also corresponds with river basins (Fig. 8).

An initial problem that had to be considered for this region is the current water reservoirs of Fervenza, Castrelo, Ponte Olveira and Santa Uxía, artificial buildings that were reflected on the DEM as plain surfaces, areas that are nowadays under water but not in the past. Furthermore, they were a real problem when calculating the covariates, such as the mobility through the landscape, because it acted as a great pit that blocked the transit. In fact, thanks to historical aerial images (1956 American Flight) (Fig. 9A), we know that the zone that currently occupies the Fervenza water reservoir was an inhabited and transited area by that time.

To solve this problem, two methods were carried out. The first option was the application of a bilinear interpolation analysis that should take the raster cells near to water, calculate their average and project them to create new cells over the water reservoir. This method was valid for the cases of Castrelo, Ponte Olveira and Santa Uxía's water reservoir, but not for the Fervenza one, due to its great size.

For the latter case, we had to use a different approach that comprised the manual restitution of topo-

graphic elevations prior to the construction of the water reservoir. With this purpose, we used the first edition of the National Topographic Map (1:50.000) through Web Map Service, created in 1968. This map contains the elevation contours and topographic points that had to be vectorised and georeferenced (Fig. 9B). The next step was the interpolation, which allowed us to obtain a topographic restitution surface that is more realistic than the previous approaches.

To start with the study of the distribution of points, we may construct a random sample to make comparisons with the real sample of sites. This random distribution was forced to respect buffers of 1 km around sites to obtain a more representative sample.

Second, both distributions were compared to check whether we can reject the Complete Spatial Randomness of the distribution of sites. For this purpose, a Kolmogorov Smirnoff test was carried out, with the result that both samples may belong to different populations, with a significate *p value* (2.688e-06) (Fig. 10 A).

On the other hand, a homogeneous test of Ripley's K function can now be used to further study the distributions (Fig. 10 B) and its variants L Function (Fig. 10 C) and G Function (Fig. 10 D) allow us to state the independence of both samples, because the real trend does not fall on the random envelope generated by 999 Monte Carlo Simulations.

Finally, another previous step before the study of first-order effects on the distribution of Costa da Morte's megalithic sites was the division of the sample into a study population and a control sample. Starting with 333 sites, 133 were randomly maintained out of the process (40%) to test the validity of the prediction map. Hence, our final working sample comprised 200 cases.

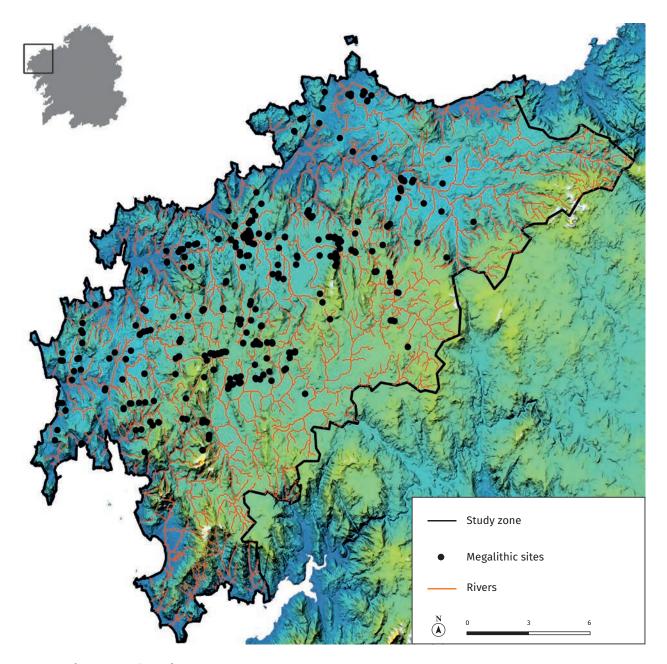


Fig. 8. Working area in Costa da Morte.

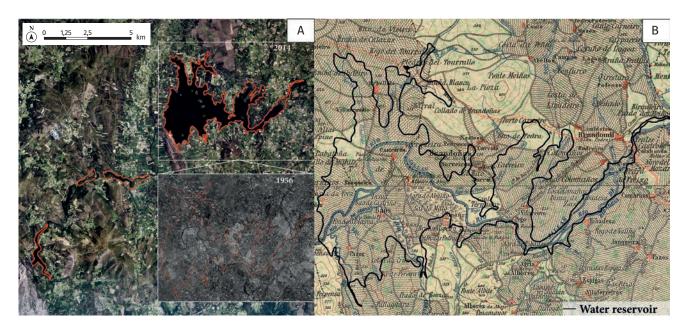
Having verified that the distribution of sites does not respond to a random pattern, we are now in the position to assess the first-order properties of the distribution and their effects on site location patterns. In this sense, basing on the locational criteria previously handled by some authors (VILLOCH 2000, among others), we selected a total of twelve factors (Fig. 11), which were converted into raster variables thanks to GIS.

The first variable analysed was the altitude. The trend shown in figure 12 (A) indicates that the elevations in study area have a homogeneous character. In this sense, all of the altitudinal ranges are equally

represented, being remarkable the locations in low ranges (100–150 m.A.S.L.) and those that correspond to average elevations (300–400 m.A.S.L.). In fact, these seem to be the more repeated locations among mounds, mainly located away from high altitudes.

The geology was also studied following MAGNA official classification with a high presence of sites placed in locations with igneous acidic and metamorphic rocks. These are the predominant geological types in the whole working area.

The slope was calculated following Zvenbergen and Thorne (1987) but reclassified with map alge-



 $Fig. \, 9A \, Current \, or tho image \, and \, historical \, aerial \, image \, (1956) \, for \, reservoir's \, area. \, B: \, Topographic \, National \, Map \, (1:50.000) \, with \, water \, reservoir \, vectorised.$ 

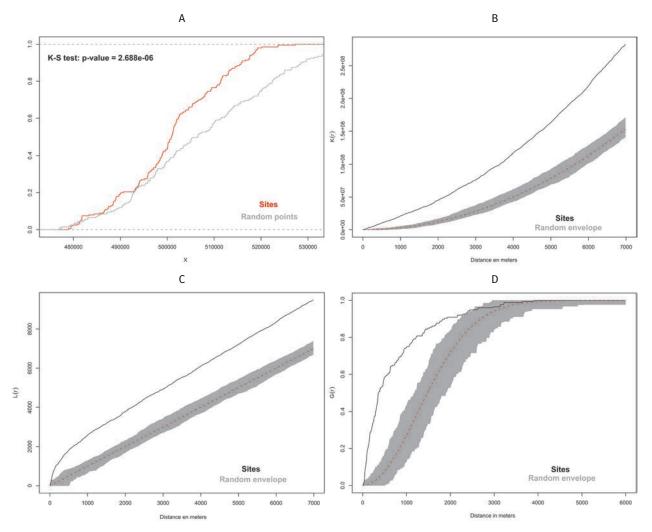


Fig. 10. Test of Complete Spatial Randomness (CSR). A: Kolmogorov-Smirnov. B: Ripley's K Function; C: L Function; D: G Function.

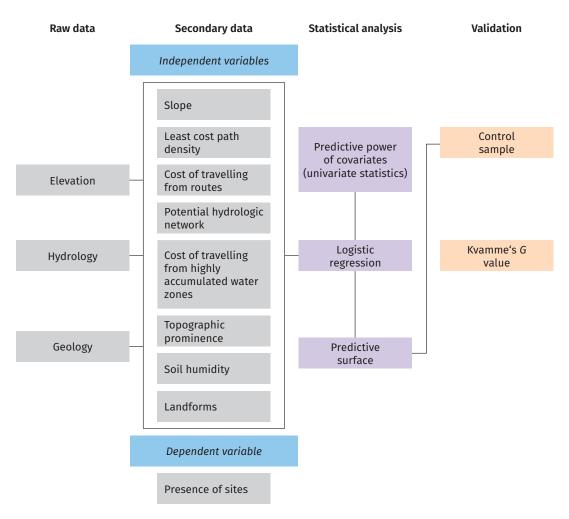


Fig. 11. Methodology of the predictive analysis for the study of megalithic monuments (modified after CONOLLY/LAKE 2009).

bra in GRASS GIS to obtain the FAO's classification of slopes in six classes (EGUILETA 1999). The majority part of sites is placed in areas of class 2 and 3, territories characterised by smoothed inclinations. Similarly, there is a small percentage of sites placed in locations of class 4, mid-steep (Fig. 12 B). The study of landforms was carried out in SAGA GIS, creating a terrain classification based on a topographic position index. The results clearly highlight that plains and open slopes are preferred locations for mounds (Fig. 13 A).

Regarding the topographic prominence, it was calculated using two radii to obtain an evaluation of this variable in local scales (100 m) and macro-scales (1000 m). In this case, we used the topographic position index module of SAGA GIS, which compares the elevation of raster cells with the average of the surroundings previously defined by users through a threshold (GUISAN et al. 1999; WEISS 2001; WILSON/GALLANT 2000).

Another variable that was modelled is the soil humidity, through a SAGA GIS module named the *topograph*-

*ic wetness index*. In this analysis, cells represent runoff values, considering that a high humid area is more susceptible to saturate and being converted into a wetland.

The relation of megalithic monuments with areas of movement in landscapes is one of the locational criteria with more tradition of study in Galicia. Starting from F. Maciñeira's work in the 1930s, it was established as a line of research during the 1990s, known as »geography of movement« (see i. e. VAQUERO 1993-1994; 1995; VIL-LOCH 1995, among many others). To study this factor, we follow the proposal of P. Murrieta (2012; MURRIE-TA et al. 2014) for the study of South Iberian Megalithism, similar to the work of M. Llobera (2015) about the Barbanza Peninsula, also used by C. Rodríguez Rellán and R. Fábregas Valcarce (2015) for the study of Galician Bronze Age rock art. Other works that have contributed to the study of transit simulations include the contributions of E. Cerrillo Cuenca (2007) or A. Bevan and A. Wilson (2013)2.

The human movement models that have been developed thanks to GIS are mathematical models of

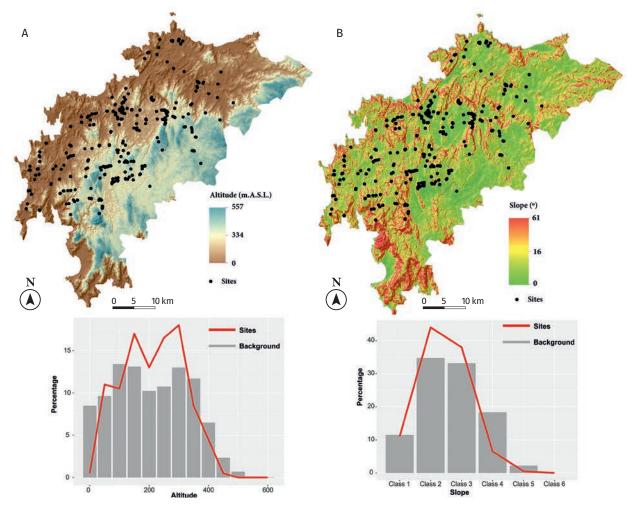


Fig. 12. First order variables. A: Altitude. B: Slope.

movement, developed in raster surfaces with some characteristics or factors that determine the conditions of the movement.

The most important one – for its high use – is the least cost path<sup>3</sup>, understood as the route generated between two points that implies the lowest cost in time or energy, according to some factors (CANOSA 2016).

In this work, we use a methodology that seeks to create a general model of human mobility, starting from the creation of multiple least cost paths that start and stop at the vector limits of the working area. The aim is to obtain a density of least cost paths, which im-

plies calculating the mobility from one point to the total (*one to many*), although the process is repeated for a high number of points (WHITE/BARBER 2012).

This method allows obtaining a density of least cost paths, with areas that could be understood as zones with a high statistical probability of being transited and others not (RODRÍGUEZ/FÁBREGAS 2015, 334).

The next step could be to calculate the cost in time from this group of routes to the megalithic sites, allowing us to study the relation of movement (and its intensity) between the location of sites and the potential transit routes.

- We must also mention the works of White/Barber 2012; Verhagen 2013; Murrieta-Flores et al. 2014; Yubero-Gómez et al. 2015; Orengo/Livarda 2016.
- 3 Following Canosa 2016, the question of human mobility has elicited particular interest since the growth of GIS techniques (LLOBERA 2000; BEVAN 2011; HERZOG 2013a, 2013b;

MLEKUZ 2014). We are aware of the problems and discussions around least cost path analysis (see i. e. HERZOG 2013a), having in mind that this calculus is constantly being improved and modified (see i. e. FÁBREGA/PARCERO 2007; HERZOG 2014; HERZOG/POSLUSCHNY 2011; FOVET/ZAKŠEK 2014; RICHARDS-RISSETTO/LANDAU 2014).

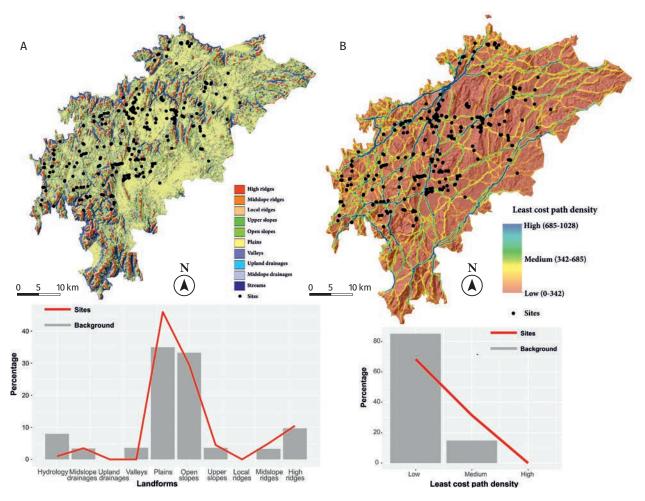


Fig. 13. First order variables: A: Landforms. B: Least cost path density.

To create the least cost path density map, we used GRASS GIS. First, we may create the friction surface, which indicates the cost of passage among all the raster cells. It is common to use variables such as topography, hydrology or vegetation. In our case, the friction surface was created using the first ones, with *r.watershed*. The raster map was subsequently reclassified to assign high values to zones that should block the passage, such as rivers.

Subsequently, with the start and stop points established, we created the cost accumulated surface with *r.walk*, also known as a spreading algorithm<sup>4</sup>. Finally, with *r.drain* we can generate the least cost vector route. The process is then repeated for the whole of the points

taken from the vector area and using *v.kernel* in GRASS GIS we can create a kernel density surface of all of the paths. It subsequently shows areas with a high and low concentration of routes (Fig. 14B). The decomposition of the vector limits in our study area in separate locations every 500 m resulted in 1,095 start and stop points, which produced a total of 1,197,930 potential routes.

The relation between the potential passage and the megalithic sites was also calculated through generating a cost of passage raster (in seconds) from the routes to the whole of the study area, again with *r.walk*.

On the other hand, aiming to analyse the relation between mounds and watercourses, a relation previously stated by different authors (see Vaquero 1990,

4 *R. walk* has some advantages over other implementations, because it uses the modified version of the »Naismith Rule« on pedestrian movement (NAISMITH 1892), consistent with physiological studies of A. MINETTI (et al. 2002).

Moreover, it adequately manages the anisotropic costs, presenting the results in time of passage (seconds) and not in uncalibrated cost units.

among others), the potential accumulation of water in the landscape was calculated, only maintaining the highest values in the final raster. From this point, a raster of cost of passage from highly-accumulated water zones was generated (Fig. 14 A).

The visual prominence of landscape is another variable that has been studied in this work. Starting with Llobera's approaches (2006; 2007), we would be able to identify areas of the landscape that can be perceived more frequently. The calculation of absolute visibility is defined as "the inherent visibility of all locations in a landscape" (Llobera et al. 2010) and is performed by calculating the visibility of each cells

in a DEM. The result indicates areas that are visually more prominent in the sense of a greater visual magnitude (Llobera 2003). However, such approaches need greater computational efforts. Accordingly, for now we decided to make an approximation in a selective way, generating a mesh of regular points over the study area, spaced at 500 m one from the other. Subsequently, for each point the accumulated visibility was calculated (see also Rodríguez/Fábregas this volume).

The results (Fig. 14B) conclude that all of the mounds are located in areas with low and medium visual potential.

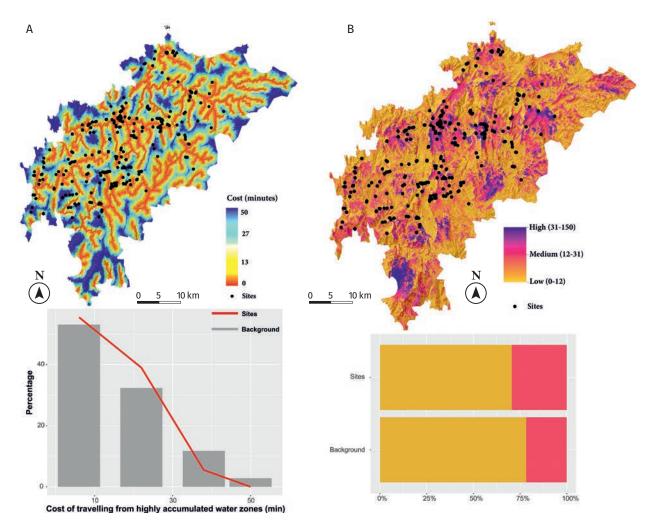


Fig. 14. First order variables: A: Cost of travelling from highly accumulated water zones. B: Visual prominence of landscape.

#### ON THE STUDY OF FIRST-ORDER EFFECTS IN SPATIAL PATTERNING

Three statistical tests were implemented to study the power of covariates for the prediction of sites. First of all, a collinearity test (Pearson R coefficient of correlation) was applied to the whole covariables to determine possible relations among them. The results can be seen in figure 15 and generally conclude that there are not any extremely high correlations.

On the other hand, following the research of Rodríguez/Fábregas (2015), a Mann Whitney-Wilco-xon test (henceforward MWW) was implemented. The aim was to compare the real distribution with a random one, considering that the location patterns of the archaeological data could be different from the random sample (Tab. 3 A). Previous research has only used one random sample (see i.e. RODRÍGUEZ/FÁBREGAS 2015), although here we opted for a Monte Carlo simulation approach, which allows us to compare the real data and 999 random samples with the same number of cases as the real one.

Accordingly, we will be able to state – with heavy statistical arguments – the elimination or consideration of one variable in our site prediction model. Finally, using a univariate linear regression in R (henceforward ULR), the covariates that are good predictors of the presence of megalithic sites were determined (Tab. 3 B).

Starting with the individual study of the covariates, the altitude does not seem to be a good predictor of the site's intensity (ULR = 0.31) and the comparison of its variance with the random sample does not allow to consider its independence (Fig. 16 A), justified by 999 Monte Carlo simulations (Fig. 16 B). For these reasons, this variable was removed from the model.

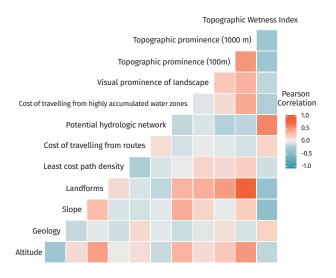


Fig. 15. Test of collinearity (Pearson correlation) for first order variables.

The geology is admitted as a good predictor by URL (0.010), although the MWW (0.91) test indicates that the sample cannot be differentiated from the random population (Fig. 16 A). Since the correlation test does not provide reasons to eliminate this variable, it was then maintained.

With respect to the slope, URL indicates that the variable is a good predictor of the location of sites. However, the MWW provides a non-significant result (0.07) for the difference between both samples, albeit very close to the valid threshold, whereby this variable was maintained in the model. The Monte Carlo approach (Fig. 16B) shows that the presence of sites on slopes between 9 and 15 degrees differs from the envelope of random simulations, which is thus significant.

On the other hand, the study of landforms provided a significant result in ULR (0.02), but not in the MWW (0.70) (Fig. 17 A). Pearson's correlation test indicates that this variable is correlated (0.76) with the topographic prominence index (1000 m) and thus it was eliminated from the model.

The least cost path density is a variable that significantly predicts the distribution of sites and clearly differs from the random sample, whereby it was maintained in the model (Fig. 17 A). Similarly, the cost of travelling from potential routes – which seems to accurately predict the distribution of mounds, altogether with the results of the MWW approach – allows us to consider independence between the sampled populations. Both variables showed significant statistical results in Monte Carlo simulations (Fig. 17 B).

With respect to the potential hydrologic network, the MWW test indicates that the real sample differs from the random one (0.008), although the ULR (0.21) provides non-significant results, whereby the variable was finally removed from the model (Fig. 18 A). In fact, the Pearson correlation test also indicates the presence of low negative correlations of this variable with topographic prominence indexes (-0.29 for 100 m and -0.23 for 1000 m), whereby its elimination as a result of the comparison with 999 Monte Carlo simulations was finally justified (Fig. 18 B).

The cost of travelling from highly-accumulated water zones does not appear to be a good predictor (ULR = 0.20) and the MWW (0.88) – altogether with Monte Carlo's approach (Fig. 18 B) – allows us to eliminate it from the model.

On the other hand, the visual prominence of landscape is a good predictor of a site's presence (ULR = 0.02), although the population does not appear to be different from the random sample (Fig. 18 A). Pearson's correlation test shows very low negative correlations of this variable with the topographic prominence index-

Tab. 3A. Results of MWW test of variance between real sample and the random one. B: Univariate logistic regression.

Α

DEPENDENT VARIABLE: PRESENCE OF SITES	SHAPIRO-WILK'S		STATISTICAL	RESULTS
INDEPENDENT VARIABLE	- TEST	DISTRIBUTION	TEST	P-VALUE
Altitude	0.0003455	Not normal	MWW	0.2929
Geology	0.01168	Not normal	MWW	0.9166
Slope	<2.2e-16	Not normal	MWW	0.07867
Landforms	9.848e-05	Not normal	MWW	0.7031
Least cost path density	<2.2e-16	Not normal	MWW	5.458e-09
Cost of travelling from potential routes	<2.2e-16	Not normal	MWW	0.031i8
Water accumulation	<2.2e-16	Not normal	MWW	0.0008307
Cost of travelling from highly accumulated water zones	5.03e-12	Not normal	MWW	0.8879
Visual prominence of landscape	<2.2e-16	Not normal	MWW	0.1261
Topographic prominence (100 m)	<2.2e-16	Not normal	MWW	0.1244
Topographic prominence (1000 m)	<2.2e-16	Not normal	MWW	1.222e-06
Topographic wetness Index	<2.2e-16	Not normal	MWW	0.167
		-		

В

UNIVARIATE LINNEAR REGRESSION (ULR). D	EPENDENT VARIABLE:	PRESENCE OF SITES
COVARIABLE	P VALUE	DESCRIPTION
Altitude	0.3149028	Bad predictor
Geology	0.01848069	Good predictor
Slope	0.00564585	Good predictor
Landforms	0.02002172	Good predictor
Least cost path density	4.446818e-07	Good predictor
Cost of travelling from potential routes	0.008913884	Good predictor
Water accumulation	0.2146178	Bad predictor
Cost of travelling from highly accumulated water zones	0.2073261	Bad predictor
Visual prominence of landscape	0.02194677	Good predictor
Topographic prominence (100 m)	0.08913093	Bad predictor
Topographic prominence (1000 m)	1.36316e-05	Good predictor
Topographic wetness Index	0.04828611	Good predictor

es and the observed trend in real data seems to be distanced from the average of 999 random simulations, meaning that the inclusion of this variable in the model was justified (Fig. 18 B).

The topographic prominence index  $(100\,\text{m})$  was eliminated from the model, as the variable is not a good predictor (URL = 0.08; MWW = 0.12) (Fig. 19 A), somewhat corroborated by the Monte Carlo approach (Fig. 19 B). On the other hand, large-scale prominence  $(1000\,\text{m})$  yields significant results, whereby the variable was maintained.

Finally, despite being a good predictor of the presence of sites, the topographic wetness index was elim-

inated for presenting a moderate negative correlation with topographic prominence at large scale and slope.

The individual study of covariates through univariate logistic regression and the comparison of the variance between the two sample populations allowed us to eliminate the following variables: altitude, landforms, potential hydrologic network, cost of travelling from highly-accumulated water zones, topographic prominence index (100 m) and topographic wetness index.

Therefore, the variables to be considered in the generalised regression model (henceforth GLM) were ultimately the geology, the slope, the least cost path

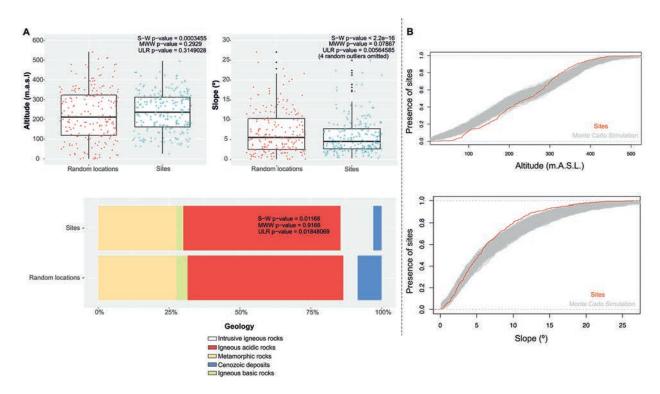


Fig. 16. Individual study of covariates. A: Real-random one sample comparison. B: Monte Carlo Simulation.

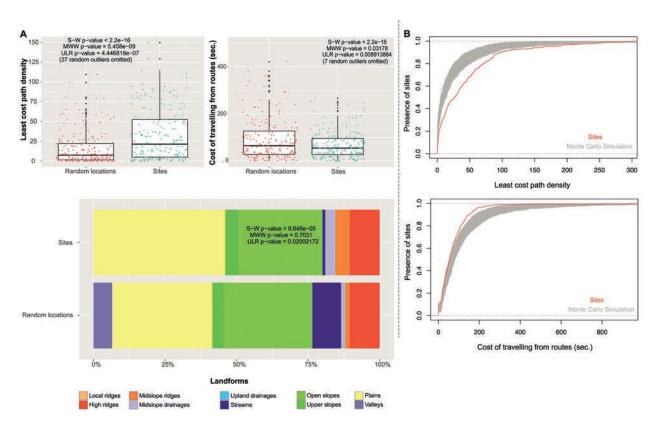


Fig. 17. Individual study of covariates. A: Real-random one sample comparison. B: Monte Carlo Simulation.

density, the cost of travelling from routes, the visual prominence of landscape and topographic prominence (1000 m) (Tab. 4 A).

The results of GLM always depend on how the covariates combine, whereby for this reason it is necessary to test different combinations to derive the best prediction map as possible. This can be carried out in R using stepAIC function of MASS's package (VENA-

BLES/RIPLEY 2002), which allows evaluating the relative importance of different models, starting from the user-defined. The best model will be chosen using the Akaike Information Criteria (henceforward AIC), which gives a measure of relative quality of the model and is commonly used to make comparisons among different models with different possible combinations of covariates (BADDELEY et al. 2016, 335–336).

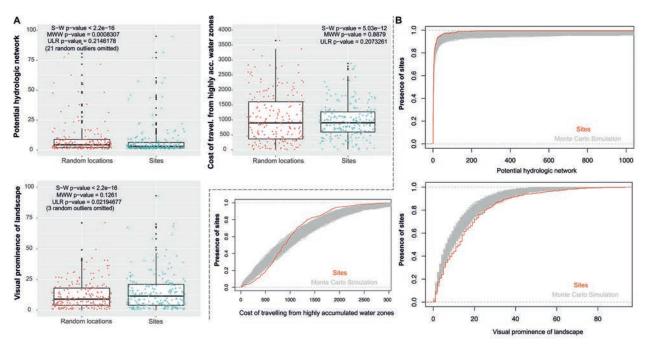


Fig. 18. Individual study of covariates. A: Real-random one sample comparison. B: Monte Carlo Simulation.

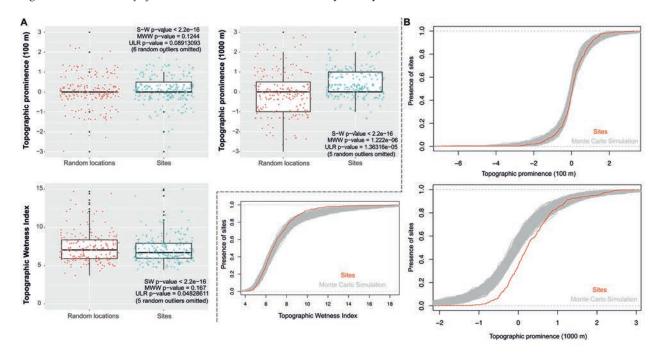


Fig. 19. Individual study of covariates. A: Real-random one sample comparison. B: Monte Carlo Simulation.

The results can be checked in table 4 (B), showing variables that altogether better predict the distribution of sites. These are the geology, the slope, the least cost path density and the topographic prominence index ( $1000\,\mathrm{m}$ ), finally being the visual prominence of landscape and the cost of travelling from routes eliminated.

As a result, we can propose the predictive surface for megalithic mounds in A Costa da Morte with the control sample (Fig. 20 A).

To test the validity of this model, the control case method was applied. Starting from the sites that were kept away from the process (133), 80 of them (60%) are placed in areas with 50% high prediction values, whereby this number is reduced if we choose a higher probability threshold (for 0.7, 31% of sites).

The second approach to test the model is the Kvamme's *G* value, which is based on the formula.

Gain = 
$$1 - \left(\frac{\% \text{ of total surface covered by the model}}{\% \text{ of total sites under the model}}\right)$$

The prediction map was divided into a binary one that shows the presence and absence of predicted sites, under 10 probability thresholds with a range from

Tab. 4. Results of multivariate regression approach.
A: Generalised regression model. B: AIC's best model. C: Kvamme's G Value study for model's validity.

COEFICIENTS	ESTIMATE	STD.ERROR	Z VALUE	PR(< Z )		
(Intercept)	0.810609	0.416621	1.946	0.051694		
Geology	-0.271344	0.129780	-2.091	0.036546	*	
Slope	-0.073582	0.020896	-3.521	0.000430	***	
Least cost path density	0.009957	0.002996	3.323	0.000889	***	
Topographic prominence (1000 m)	0.501605	0.124059	4.043	5.27e-05	***	
Signif . Codes: 0 '***' 0.001 '**' 0.05 ". 0.1 ' ' 1						

Eliminated variables: Visual prominence of landscape, cost of travelling from potential routes

В

SITE ~ GEOLOGY + SLOPE + LEAST COST PATH DENSITY + TOPOGRAPHIC PROMINENCE (1000				
	DF	DEVIANCE	AIC	
<none></none>		499.96	509.96	
Geology	1	504.45	512.45	
Least cost path density	1	513.42	521.42	
Slope	1	513.84	521.84	
Topographic prominence (1000 m)	1	518.38	526.38	

	P R O B A B I L I T Y T H R E S H O L D	NUMBER OF SITES IN THE AREA	O VALUE	NUMBER OF CELLS IN RASTER	S VALUE	GVALUE
Α	0.1	200	1.000	3128143	0.984	0.015
В	0.2	199	0.995	2939840	0.925	0.070
С	0.3	191	0.955	2578030	0.811	0.150
D	0.4	170	0.850	1972415	0.620	0.269
E	0.5	127	0.635	1155117	0.363	0.427
F	0.6	78	0.390	585708	0.184	0.527
G	0.7	42	0.210	271456	0.085	0.593
Н	0.8	17	0.085	107290	0.033	0.602
1	0.9	5	0.025	25516	0.008	0.678
J	0.95	1	0.005	8657	0.002	0.455

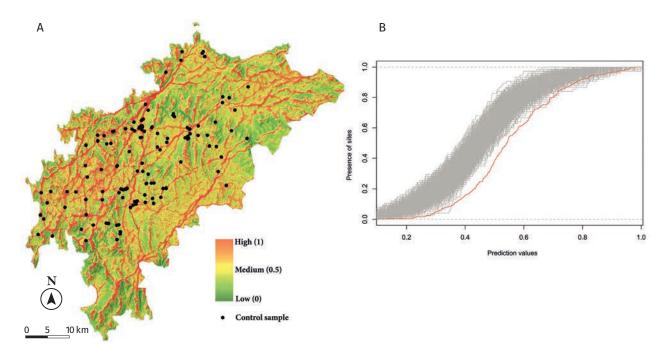


Fig. 20. A: Predictive surface for A Costa da Morte. B: Observed values for megalithic sites and 999 random simulations.

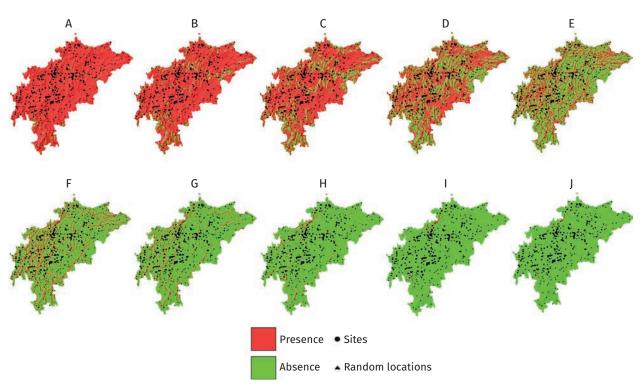


Fig. 21. Probability thresholds for the predicted surface.

0.1 to 0.95 (Fig. 21). Next to that, in R for each threshold, positive probability values for site presence were extracted, converting it to numerical data and then the total percentage of the area where the sites were predicted (*S value*) and the total percentage of sites predicted (*O value*) was calculated (Tab. 4 C).

The Kvamme's Gain value highlights that with a probability threshold of 0.7 (Fig. 21 F-G) the model can be accepted (G=0.59) (EBERT/KOHLER 1988; EBERT 2000; DUCKE/MUNCH 2005; GRAVES 2011; MINK et al. 2006), being 0.9 the threshold that more precisely predicts the sites, although over a low number. However, if we choose 50% of the highest predict-

ed values, a great part of the site's sample now falls under predicted areas, albeit with a low G, whereby the best predictive model should be the one in 0.6 probability threshold (Fig. 21 F), which has an acceptable G value and is able to predict a high number of sites. On the other hand, the comparison of the predicted values for sites with 999 random simulations shows a similar trend, being the predicted values for sites not statistically significant at highest values (Fig. 20 B).

All that has been written suggests that the obtained prediction surface is correct and the covariates could be used to produce a significantly accurate scheme of the distribution of sites within the region.

#### **CONCLUSIONS AND FUTURE WORK**

In this paper, first approaches in spatial analysis for the study of Galician megalithic mounds have been presented from global and regional perspectives. We have also presented the most complete archaeological database that currently we have.

Altogether with GIS and Spatial Analyses and using a predictive approach, the study and factorisation of the locational criteria previously defined by different authors was evaluated for the area of Costa da Morte. Thanks to the analytical evidence provided in this paper, we can now highlight that geology, slope, the potential transit and the topographic prominence of the landscape (large scale) are the variables that better predict the megalithic mounds of Costa da Morte and thus characterise the different megalithic landscapes of this area.

All of these factors suggest a change in the locational patterning of Galician moundscapes, dominating in Costa da Morte an open and smoothed-slope landscape geologically characterised by igneous acidic and metamorphic rocks. In this sense, a strong interrelation seems to exist between the location of the mounds and the areas of the territory most suitable for transit, although it is the confluence between all of the covariates that truly explains and predicts the

megalithic monuments. On the other hand, it is worth noting that altitude does not predict the distribution of mounds in the studied area, given that the general ranges of altitudes through the whole zone show a uniform trend. This could also be observed when comparing the dispersal of mamoas with a random sample, with the elevation trend being similar in both cases. In fact, if we raise the simulations to 999 random samples, there is a small difference between the site's altitudes and the random envelope. Therefore, this variable did not seem to be determinant and allows the revision of the traditional hypothesis that considered it as a homogeneous locational criterion given that a great part of the megalithic monuments in Galicia are placed in mountainous locations.

Therefore, the results indicate the existence of variability in the locational patterns, which means that the traditional discourse should be nuanced taking into account the local scale variances that we have been able to highlight in this paper. In future contributions, it will be interesting to analyse the second-order factors that deal with the study of attraction or repulsion between points, as approaches that can probably be understood as a quantification of what different authors have called the importance of tradition.

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# A GIS approach to the study of megalithic tombs

Riccardo Cicilloni, Marco Cabras

#### **ABSTRACT**

We know over 200 Sardinian dolmens of various types. The rise of the phenomenon seems possible to ascribe during the culture of San Michele of Ozieri (Late Neolithic, 4000–3300 BC). However, the Sardinian dolmens had the widest possible dissemination during the Chalcolithic. The Sardinian phenomenon shows a close relationship with dolmens of Catalonia, Pyrenees, non-coastal departments of French-midi, Corse and Puglia. In the study of megalithic tombs, the analysis of the relationship with the surrounding territory can be an important aid. In this work, we place dolmens and landscape in connection. To understand this relationship, we used the tools offered by GIS. This approach – based on geo-referenced data and a three-dimensional representation of landscape features – can assist the

archaeologist in interpreting the ancient landscape. Among the potential of GIS, the possibility to evaluate – with the creation of a model of the costs of travel – the main trends relating to the movement in relation to the geomorphological characteristics of the territory is particularly interesting. To test the possibilities offered by this type of analysis, a sample area in north-east of the island of Sardinia (Italy) was chosen. The results of cost distance and visibility analyses showed locations in areas that would enhance the function of spatial markers linked to transit or contact areas, for most of the analysed samples. These were probably in connection with pathways functional to internal trade between islander groups. Furthermore, these are probably related to short or long processes of transhumance.

# INTRODUCTION

Since the beginning of the last century, archaeologists have shown an important megalithic phenomenon in Sardinia, constituted from over 200 dolmens, largely situated in the central-northern area of the island. Regarding the typology, the dolmens belong to four main categories: simple type, "corridor" type,

»side entrance« type and »allées couvertes« type. The majority of the megalithic burials of Sardinia belong to the simple type, followed by the allées couvertes, while only few tombs are of the other types (CICILLONI 2009). From the perspective of chronology, there is the lack of radiocarbon datings. However, the data

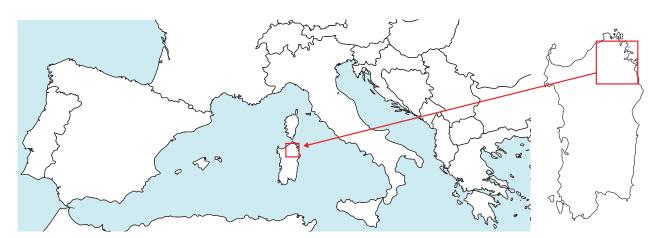


Fig. 1. The study area (North-eastern Sardinia).

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from recent stratigraphical investigations, the archaeological materials sporadically recovered in some dolmens, the structural and cultural relationships among the Sardinian dolmens and other prehistoric monuments of the island as well as typological comparisons with similar megalithic monuments of various extra-insular areas allow assigning the dolmens of Sardinia to a period of time ranging from the Late Neolithic to the Chalcolithic (end of the IV to beginning of the II millennium BC), perhaps with phenomena of reuse in the Bronze age. Recent research has highlighted close structural and cultural relationships between the megalithic monuments of the island and some extra-insular regions, such as the Iberian

Peninsula, France and particularly Corsica. In this work, we aim to systematically analyse the relationship between the megalithic graves and the surrounding environment: in fact, we believe that lithology and especially geomorphology are extremely important factors to better understand the phenomenon of Sardinian dolmens and the locational modalities of these burial structures. To achieve the proposed objective, it was decided to study the dolmenic monuments present in a sample area of north-eastern Sardinia (Fig. 1), corresponding to the territories historically named "Gallura", "Monte Acuto" and "Baronia of Siniscola", characterised by a good concentration of dolmens (Fig. 2).

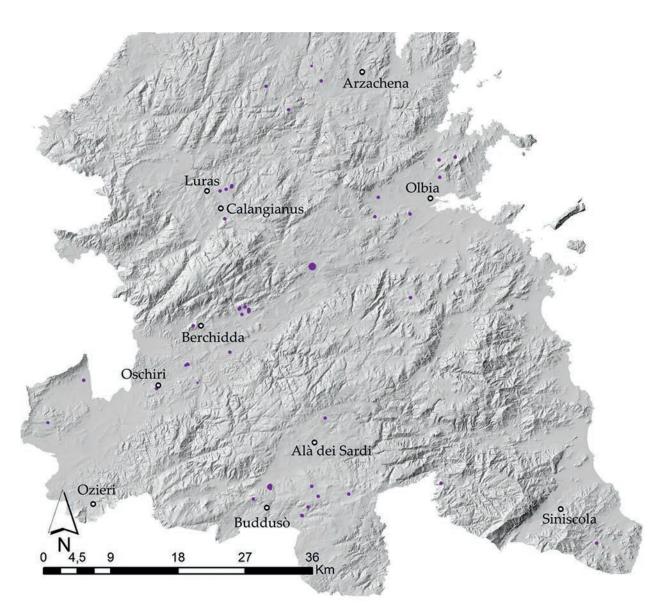


Fig. 2. Distribution map of the dolmens of North-East Sardinia. The size of the marker for the sites reflects the number of monuments.

#### GEOMORPHOLOGICAL CHARACTERISTICS OF THE SAMPLE AREA

The geographical zone under consideration includes an area of about 2230 sq km. From a geomorphological perspective, Gallura – which occupies the north-eastern part of the island – presents relatively rugged landscapes and with limited cultivable areas. The territory mostly comprises granite soils that characterise the morphology, in which orographic terraces are mixed with short dorsal and small ledges that contain granite blocks. The greatest reliefs are constituted by Mount Limbara, Mount Nieddu and Mount Salici. The zone is crossed by rivers, among which the

most prominent are Coghinas, Loscia and Padrogiano. The territory of Monte Acuto, further south, has a morphology with two fundamental elements: a wide basin of confluence to the West (the so-called Field of Ozieri), with its soft and levelled spaces, while to the East there is a rugged tectonic valley recalling the landscape of the near Gallura. Geologically, granite prevails in the East, and trachytic rock in the West. Finally, the Baronia of Siniscola is constituted by schist soils dominated by the imposing limestone hump of Mount Albo (MORI 1975) (Fig. 3).

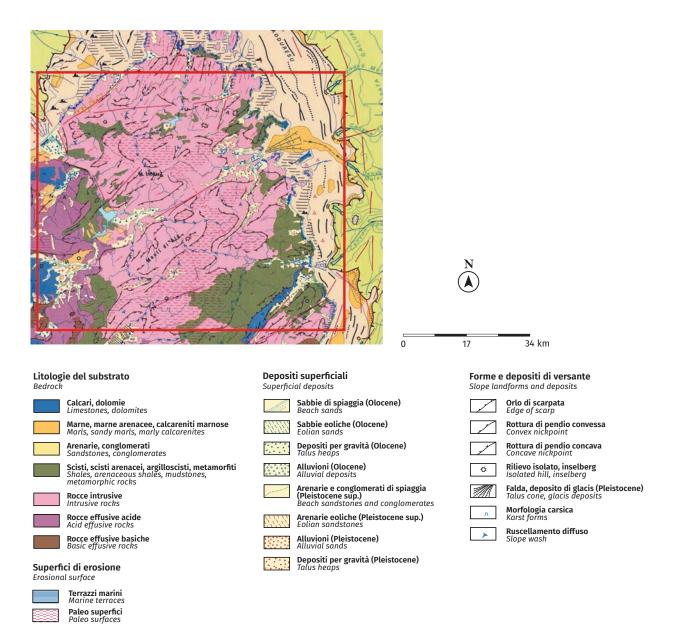


Fig. 3. Geomorphological map of the sample area (from Ulzega 1988).

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#### THE MONUMENTS

This area knows a precocious presence of megalithism, constituted by some megalithic circles (or cromlech), located in Gallura. We know 50 of these, in various locations. These structures are mostly funeral, as evidenced by the frequent presence of lithic cists (or coffres) and the discovery of various skeletal elements, but perhaps – at least in some cases – linked to the cult. Among these circles, the most important is that of Li Muri-Arzachena (Fig. 4): in fact, at this site there is a necropolis comprising five quadrangular lithic cist tombs, four of which are surrounded by circles of stones fixed vertically. These circles – which have a diameter varying from 5.30 m to 8.50 m - are tangent to each other, while in the circles and outside them there are small menhirs. In terms of chronology, thanks to recent investigations on the grave goods found, this site – like the other circles of Gallura – is attributable to the final phases of the Middle Neolithic period, characterised by the cultural aspect of San Ciriaco of Terralba (4300-4000 BC) (ANTONA 2003). In the examined area, there are 53 megalithic tombs,

mostly dolmens of simple type (Fig. 5), with one example of corridor type" and one allée couverte. Among the dolmens of simple type, there are mainly quadrangular plans, and only two examples of circular plans. Some of these dolmens are of uncertain typological attribution. Some dolmens have walls made not by orthostats but rather natural rock, namely the dolmens of S. Stefano-Oschiri, Monte Acuto, Abialzos 1, Abialzos 5-Berchidda, Oronitta and Sa Codina de Matta Oe-Buddusò. The building material more commonly used is granite, which is locally the more diffused type of rock, having regard to the geological structure of the area. Few dolmens are in schist and only one (Montiju Coronas-Ozieri) was built in basalt. Some dolmens in this area show traces of a mound/peristalith, like Su Maccarone 1 (RELLI 1999, 17), Su Laccu, Doli Fichima II and Elcomis (CICILLONI 2009, 150-151). In the dolmens of S. Lorenzo, S. Stefano, Monte Cuccu I-II, Malghesi, Montiju Coronas, Oronitta, Berre e Sa Codina 'e Sa Matta Oe the combination with menhirs is found (BASOLI 1998, 143; CICILLONI 2009, 164–165).

#### **DOLMENS AND LANDSCAPE**

Recent studies about megalithic monuments has revealed – including in relation to their monumental aspects – a strong connection linked to the communication of a message impregnated with social meanings. As also indicated by the monuments taken into account in this work, this factor is suggested by the characteristics of durability and monumentality of several of them, as well as by the locational choices,

which reveal an interesting relationship with the surrounding landscape. A factor that emerges from studies on the megalithic is to pass on a message through a series of »non-utilitarian aspects«. In fact, Furholt, Hinz and Mischka consider that there is a »surplus of meaning« (2012, 14) in some megaliths. Regarding the dolmenic burials, this aspect can certainly be assessed in relation to the interior space required to



Fig. 4. Li Muri – Arzachena (photo: R. Cicilloni, Photographic Archive of the Department of History, Cultural Heritage and Territory – University of Cagliari).



Fig. 5. Dolmen Alzoledda – Luras (photo: R. Cicilloni, Photographic Archive of the Department of History, Cultural Heritage and Territory – University of Cagliari).

accommodate one or more burials. The surplus would be achieved by the size of the monument and the organisation – and sometimes the impressiveness – of the work required for the construction of the monument. Therefore, the intrinsic monumental characteristics combined with a strategic position with respect to the surrounding area can be detected in several graves dolmen of Gallura. The aim of this work has been to evaluate – by means of spatial analysis – the ratio of the dolmenic burials according to a mobility system across the territory that would be developed through a process of optimum use of the terrain forms, in search of the best paths for the time and cost of crossing. Moreover, other scholars have suggested

that the Sardinian dolmenic buildings had a relationship with transhumance routes (TANDA 2009, 67) that may imply a series of relationships — repeated over time — functional to pastoral activity. For this purpose, it remains to be evaluated how the findings resulting from the paleoenviromental data in Sardinian contexts and related to an increase of the domestic animals (Melis 2009, 93; Zedda et al. 2012, 1271) can actually be traced back — for this period of Sardinian prehistory — to activities of transhumance of long, medium or short distance. The relationship between megaliths and transhumance has been already dealt with by computational and statistical methods in the S of the Iberian Peninsula (Murrieta flores et al. 2011).

#### **METHODS**

For the spatial analysis of dolmens, we used GIS applications known in literature as Viewshed Analysis and Least-Cost Path Analysis (hereafter LCPA) (WHEATLEY/GILLINGS 2002, 137–143, 179–192; CONOLLY/LAKE 2006, 214–215, 217, 221–233, 252–255, 262, 294). The purpose was to verify the visual relationships between dolmenic monuments and travelling routes. This methodology allowed us to analyse the visibility along the routes traced by the LCPA. Therefore, the visual perception of a person or a group during crossing this area was simulated. The starting point of the routes is the complex of Li Muri near Arzachena, the oldest and most important megalithic site in this region. The points of arrival are

megaliths located near the edge of this sample area. The starting and arrival points – located long distances between them – allow to conducting LCPA across a wide territory.

#### The offset

The height of the individual who crosses the sample area was assumed as 1.65 cm. The visual perception of the individual has been directed towards dolmens, with the probable presence of a mound/peristalith that reached a vertical development of at least 1.60 m. It was applied a length of sight of 4km on a neighbourhood

Tab. 1. Resume of visual relationships between LCPA and dolmen.

LPC FROM LI MURI TO:	PATH LENGTH	MONUMENTS VISIBLE FROM LCP (*very close but not visible)	
NULVARA	34.7	Terra – San Biagio* – Agnu*	
ORONITTA	86.1	Campo Maiore – San Biagio* – Cabu Abbas* – Saccuri – Ortos* – San Lorenzo* – Doli Fichima – Loelle – Sa Codina 'e Sa Matta Oe – Oronitta	
AGNU	29	San Biagio – Le Casacce* – Alzoledda – Bilella – Ladas* – Agnu	
ELCOMIS	93.9	Campo Maiore – Le Casacce – Cabbu Abbas* – Saccuri – Ortos* – San Lorenzo* – Doli Fichima* – Iselle – Elcomis	
TRAISSOLI	39.5	Le Casacce* – Campo Maiore – Saccuri – Tanca – Oddastru – Traissoli	
CABU ABBAS	32	Le Casacce – Campo Maiore – Saccuri – Cabu Abbas	
BILELLA	25.7	Le Casacce – San Biagio – Ladas – Alzoledda* – Agnu – Bilella	
M. ACUTO	59.5	Taerra – Malghesi – Contizola* – Monte Acuto	
MALGHESI	53.8	Le Casacce – Taerra – Contizola* – Malghesi	
SOS MONUMENTOS I	89.9	Campo Maiore – San Biagio* – Cabu Abbas* – Saccuri – Ortos San Lorenzo – Doli Fichima Loelle – Sa Codina 'e Sa Matta Oe – Oronitta – Loelle – Su Laccu – Sos Monumentos 1 – Sos Monumentos 2 – Sa Codina 'e Sa Matta Oe	
MACCARONE	101.9	Le Casacce – Campo Maiore – Cabu Abbas – Saccuri Ortos*	
ABIAZOS II	51.6	Le Casacce – Taerra – Contizola – Malghesi – Abialzos Mesu Serra I, Mes Serra II, Santa Caterina	

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of 360 degrees. In fact, for a 3 km radius of vision, it would be possible to see with considerable clarity a group of people walking along a path (RUESTES BITRIÀ 2008). In our case, we arbitrarily extended the range of vision by a further kilometre.

#### The surface model

The hypothesis is that the ways of travelling in this period were developed by examining certain natural variables, with the main one being the degree slope of the terrain. Therefore, the main factor selected for the creation of the model on which to apply the analysis of mobility was the slope, which has subsequently been reclassified through GIS according to a cost of journey

that increases with the degree of slope. However, it is worth noting that there are many other factors that may characterise the movement of prehistoric pastoralists societies. The pastoral activities imply a series of social relationships and a knowledge of adjacent territories to carry out economic activities that certainly depended to a certain degree on mobility (MURRIETA FLORES et al. 2011, 411). Nonetheless, we believe that the analysis of the least cost of distance is certainly a good starting point for developing a more organic model to analyse the mobility between the Final Neolithic and Copper Age in Sardinia. In relation to this model of the movement and with the continuation of the archaeological research, it will be possible to investigate the territorial organisation of the human groups of prehistoric Sardinia.

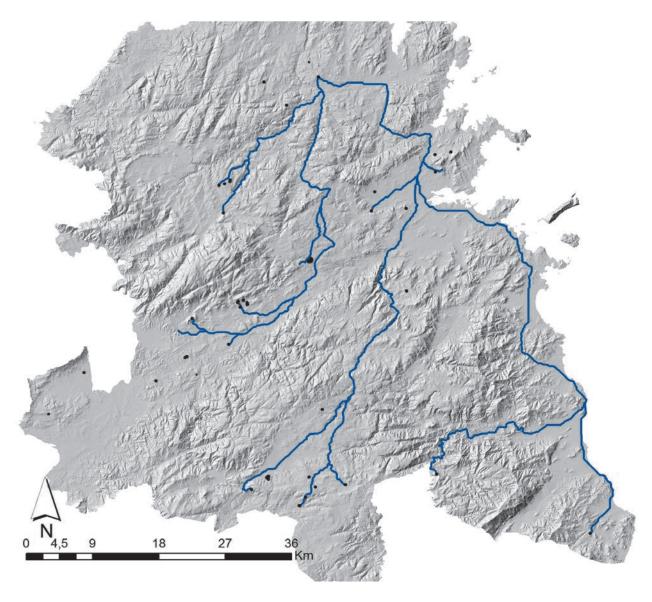


Fig. 10. Least-Cost Path Analysis applied towards the peripheral monuments of the study area.

The LCPA is based on the Cost Surface Model created and calibrated taking into account only the degree of slope of the terrain. We used a DEM with a

10 m (grid) definition, which can be downloaded from the geo-portal of the *Regione Autonoma della Sardegna* (www. sardegnageoportale.it).

#### **RESULTS**

As can be seen from Table 1 and Figures 10 and 11, the intervisibility between LCPA and dolmens seem to emphasise a willingness of manufacturers of dolmenic monuments to mark the territory in monumental terms to legitimise a strong connection with this through memory of ancestors, who lived there before them. It is interesting to underline the coincidence of some paths traced by LCPA with today's roads. For various traits, some of these paths follow roads that are currently used, as can be seen in the case of the »maritime« road that leads from the coast of Baronia of Siniscola to Olbia. It thus remains to determine the real possibility of

travelling through some deep valleys where the GIS has identified plausible paths. The acquisition of new data in the continuation of research – also obtained with a multi-disciplinary approach – aims to implement the movement model and clarify the dynamics of the relationships between human groups in this territory. Instead, the locational modalities are not influenced by the lithic material used for the building, because – as described above – these dolmens are almost exclusively in granite, which was available in large quantities throughout the area. Moreover, the transport of raw material from large distances is not documented.

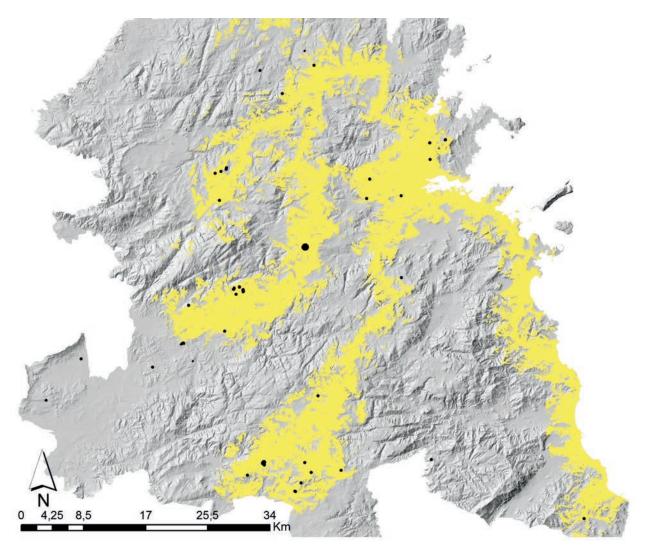


Fig. 11. Viewshed analysis calculated from the paths traced by LCPA.

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# CONCLUSIONS

The study of the location of Sardinian dolmens was carried out taking into account the geomorphology of the environment. The analysis – through the precise geo-referencing of each monument and with the application of GIS tools – seems to confirm what we have already highlighted in previous studies with the macroscopic analysis of the phenomenon (CICILLO-NI 2009). Research has highlighted some features that recur with a certain constancy. First, many of the dolmen considered – as is already written – are very close to nature trails, sometimes coinciding with canyons or valleys. Moreover, compared with the natural way and in general the surrounding area, these monuments are highly visible. Finally, the scattered distribution of the dolmens in all of the area is confirmed, although they form some macro-groupings in the different territories. These monuments are rarely grouped in necropolis with two or three dolmens, but usually they are located in isolated places or – when there are some in the same area - at a good distance from each other, almost to delimit a piece of territory in some way. We believe that Sardinian dolmens should have not only a funerary function, but also a »political« one: in fact, these monuments could be interpreted as »signs of territorial demarcation of segmentary societies«, according with the hypothesis already carried out by Renfrew, with functions of the control and organisation of the territory (RENFREW 1976). During the Late Neolithic (characterised by the Ozieri culture) and the Copper Age, small groups of farmers and shepherds – who lived locally and were not part of a centralised society – may have felt the need for a first territorial organisation in some areas: the possession of the territory could be well testified by the presence of megalithic tombs, perhaps pertinent to burials of ancestors/ leaders/heroes of the various communities.

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# The European Route of Megalithic Culture — Pathways to Europe's earliest stone architecture

Daniela Stefanie Hauf, Rüdiger Kelm

#### **ABSTRACT**

The European Route of Megalithic Culture serves as a platform for museums, geoparks, scientists and experts in tourism to underline the outstanding importance of the megalithic culture for European history, to rediscover and promote the tourism value of its monuments and thus improve their protection as part of the common cultural heritage. It was officially recognised as a »European Cultural Route« by the Council of Europe in 2013. The Priority of the European Route of Megalithic Culture is given to the use of existing roads and nature routeways, as well as promoting mobility

in harmony with nature and current social and recreational trends such as hiking and cycling. Moreover, museums and educational institutions such as school colleges, universities, charities and public bodies are being encouraged to develop new cross-border collaborations in the field of youth education and European exchange programmes. As an example of the work of the international megalithic routes cooperation, the »Stone Age Park Dithmarschen« in Albersdorf (Schleswig-Holstein Germany) is presented, including its cycle routes, pathways, exhibitions and forthcoming projects.

The European Route of Megalithic Culture serves as a platform for museums, geoparks, scientists and experts in tourism from Denmark, England, Germany, the Netherlands, Portugal, Spain and Sweden to underline the outstanding importance of megalithic culture for European history, to rediscover and promote the tourism value of its monuments and thus improve their protection as part of the common cultural heritage.

The goal of the Megalithic Routes Association is to link together the oldest monuments of Europe by cultural routes that not only lead to the megalithic monuments but also highlight the manifold features of the surrounding landscape. Obviously, there is a close link between the origin of megalithic monuments and the history of the cultural landscape: both begin at the same time and symbolise the early efforts of humans to make use of nature by extensive measures to shape the natural environment.

»Megalithic Routes« is a project in which the boundaries between the natural and cultural sciences no longer exist. For this reason, representatives of important European geoparks and nature parks are members of Megalithic Routes, in addition to specialist archaeological and tourism institutions. Together with archaeologists, they are active in creating and constructing attractive cultural routes that aim to highlight the broad spectrum of attempts by prehistoric communities to demonstrate and assert – even thousands of years ago – the »summit of creation«.

The »Megalithic Routes« project is committed to the principles of »low-impact tourism« and it refrains from any irreversible measures affecting the natural environment when developing opportunities for tourism. Priority is given to the use of existing roads and routes, as well as promoting mobility in tune with nature and current social activities such as hiking and cycling (Fig. 1). Moreover, museums and educational institutions such as schools and extracurricular establishments are being encouraged to develop new possibilities for cross-border cooperation in the field of youth education and European exchange programmes for children and young people on the subject of »Megalithic Roots«.

The Megalithic Routes project began in 2004 and was conceived during a meeting between a local historian, Klaus de Laak, the director of the Osnabrück planetarium, the managers of tourism associations in north-west Lower Saxony and the head of the Osnabrück municipal and regional archaeological heritage authority. Their vision was to create the »Straße der Megalithkultur«, a modern route that would link together many of the exciting and instructive megalithic tombs between Osnabrück and Oldenburg. The focus was to be placed on the protection and conservation of these spectacular historic monuments, as well as activities, events and opportunities for tourism. Finally, Europe's first megalithic route built in modern times opened on 15<sup>th</sup> May 2009.

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Fig. 1. Cycling on the German »Straße der Megalithkultur« (photo: Emsland Touristik GmbH).

In parallel with the activities in north-west Germany, a network with partners from Denmark, the Netherlands and Sweden was established, whereby the first international meeting took place in Copenhagen at the beginning of 2011. The Articles of Association (Charter) were adopted at the inaugural meeting on 24<sup>th</sup> August 2012 in Falköping in Sweden. For this purpose, the international network »Megalithic Routes« was founded

and recognised as an international not-for-profit association under German law on 19th November 2012. On 21st December 2012, Dr. Hans-Gert Pöttering, the 12th President of the European Parliament, agreed to accept the patronage of the network »Megalithic Routes«, and in April 2013 »the European Route of Megalithic Culture« was incorporated into the wider programme of Cultural Routes of the Council of Europe.

#### WHAT IS A CULTURAL ROUTE?

According to the definition of the Council of Europe, a cultural route is a cultural, educational heritage and tourism cooperation project, aiming at the development and promotion of an itinerary or a series of itineraries based on a historic route, a cultural concept, figure or phenomenon with a transnational importance and significance for the understanding and respect of common European values (http://www.culture-routes.net/cultural-routes).

The Cultural Routes programme was launched by the Council of Europe in 1987. Its objective is to demonstrate – by means of a journey through space and time – how the heritage of the different countries and cultures of Europe contributes to a shared cultural heritage. The Cultural Routes programme puts into practice the fundamental principles of the Council of Europe, namely human rights, cultural democracy, cultural diversity and identity, dialogue, mutual exchange and enrichment across boundaries and centuries. The first certified cultural route was the St. James> Way 1987, a network of routes that has played a highly symbolic role in the construction of Europe and is travelled by tens of thousands of pilgrims who walk to Santiago de Compostela each year. The St. James< Way was followed by the Hanse towns in 1991. At present, there are 32 European cultural routes certified by the Council of Europe (http://www.culture-routes.net/cultural-routes/list).

The cultural routes function as an <code>>open-air<</code> laboratory of the genesis of Europe. They are the concrete realisation of charters, conventions and recommendations on cultural heritage and sustainable tourism, enacted through an educational approach aiming to raise awareness of the importance of protection and sustainability. Beyond the cultural heritage, the routes also promote inter-culturalism and inter-religious dialogue through an open and diverse interpretation of the European idea.

In December 2010, the Committee of Ministers of the Council of Europe adopted a resolution establishing an enlarged partial agreement (EPA) (http://www.culture-routes.net/council-of-europe/epa).

The EPA seeks to reinforce the potential of cultural routes for cultural cooperation, sustainable territorial development and social cohesion, with a particular focus on themes of symbolic importance for European unity, history, culture and values and the discovery of less well-known destinations. It helps to strengthen the democratic dimension of cultural exchange and

tourism through the involvement of grassroots networks and associations, local and regional authorities, universities and professional organisations. It contributes to the preservation of a diverse heritage through theme-based and alternative tourist itineraries and cultural projects.

The governing board of EPA awards the certification »Council of Europe Cultural Route« and carries out regular evaluations of certified routes in conformity with the Committee of Ministers Resolution CM/Res(2013) 67, which establishes the rules for the award of the »Cultural Route of the Council of Europe« certification (http://www.culture-routes.net/resources/documents). Routes requesting the certification should:

- focus on a theme representative of European values and common to several European countries;
- follow a historical route or (in the case of cultural tourism) a newly-created route;
- give rise to long-term multilateral cooperation projects in priority areas (scientific research; heritage



Fig. 2. The official Cultural Routes website (www.culture-routes.net) (map: European Institute for Cultural Routes).

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conservation and enhancement; cultural and educational exchanges among young Europeans; contemporary cultural and artistic practices; cultural tourism and sustainable development);

 be managed by one or more independent, organised networks (in the form of an association or a federation of associations).

Nowadays, two resolutions define what a cultural route of the Council of Europe is, describing the requirements leading to certification and the criteria that characterise the nature of the themes accepted, the various initiatives that should be implemented and the characteristics of the European networks that manage the cultural routes once they have been awarded the certification by the Council of Europe.

On the new website of the European Institute for Cultural Routes in Luxembourg, all cultural routes are presented with their members, museums, events, etc. (Fig. 2).

As an association that develops a certified culture route, it is necessary to fulfil certain criteria and the program will be evaluated every three years. The most important criteria are that the route has a legal status, a scientific board, includes a minimum of three member countries and can verify activities in the following five priority fields of action:

- 1. Cooperation in research and development
- 2. Enhancement of memory, history and European heritage
- 3. Cultural and educational exchanges for young Europeans
- 4. Contemporary cultural and artistic practice
- Cultural tourism and sustainable cultural development

## SOME EXAMPLES FOR THESE FIELDS IN THE CASE OF MEGALITHIC ROUTES

For the first priority field, working together with universities is very important. Many methods that may have been used in the Stone Age can be tested by the students. Furthermore, the results of the excavations are important to ascertain more about the lives of the people. This is what we can use in other categories to inform or tell the story for the visitors. The picture shows how researchers and students tested how long it takes to build a megalithic tomb, as well as how this is achieved. It was interesting because it only took one day (Fig. 3).

For the second priority field — enhancement of memory, history and European heritage — it was important for us to make these monuments from the Neolithic visible in the landscape. Sometimes you only see some lager stones under other vegetation and you cannot believe that the few stones are part of a major megalithic monument from the Stone Age. This occurred near Osnabrück, Germany, where there is a golf club with seven megalithic monuments and three Bronze Age burial mounds around and inside the golf facility. One of them is directly opposite the restaurant, but no one realised it was there before we cleaned it. Now it is a eye-catcher when people arrive and everyone is asking whether we built it new...

The third priority for a cultural route of the Council of Europe is the cultural and educational exchange with young Europeans. The easiest way to achieve this is through international excavation camps. In the last three years one of our members has excavated megalithic monuments in Mecklenburg-Vorpommern with students from England and Germany.

The fourth priority field is contemporary cultural and artistic practice. Accordingly, the association

of a cultural route has to find ways to combine the old with the new. For our route, we tried it in many different ways; for example, in Denmark, they held



Fig. 3. Reconstruction of a megalithic tomb at the campus of Kiel University in Germany (photo: Hauf).

special acoustic concerts in the chambers of the monuments (Fig. 4), while in Germany they wrapped a megalithic monument in with pieces of red cloth like Christo did with the Reichstag of Berlin.

The megalithic monuments still exist after more than 5,000 years. They have survived wars and natural disasters and now it is up to us to ensure that they will survive the next 5,000 years. For this purpose, it is very important that people begin to realise the existence and age of these monuments and learn about their importance. This can happen in different ways, including with new apps and signposting (mostly in three languages and with a similar design in each country), leaflets and books, all of which tell visitors that they are on the European Route of Megalithic Culture. Moreover, events taking place near or inside a monument are used to show how people lived in the Neolithic, namely the period during which the monuments were built. This is what the fifth priority field – cultural tourism and sustainable cultural development – will tell us.

In 2013, the European Route of Megalithic Culture was incorporated into the programme »the Council of Europe Cultural Routes« and now has members in seven different countries (Denmark, England, Germany, the Netherlands, Portugal, Spain and Sweden). In August 2013, the Megalithic Routes Association celebrated our certification at the megalithic monument of Klekkendehøj on the Island of Møn in Denmark. Ms. Marianne Jelved, the Minister for Culture of Denmark, cut a ribbon with a Stone Age knife as a symbol for the opening of the European Route of Megalithic Culture. Ms. Penelope Denu, the Director of the European Institute for Cultural Routes, also attended the ceremony and presented the certificate to us (Fig. 5).

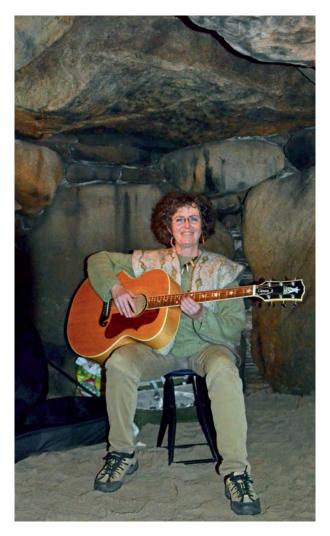


Fig. 4. Acoustic Concert in a megalithic tomb in Denmark (photo: Methling).



Fig. 5. The Certificate Awarding Ceremony at the passage grave of Klekkendehøj on the Island of Møn, Denmark (photo: Kulturstyrelsen, Denmark).

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Fig. 6. »The Long Night of Myth and Legends« celebrated at the megalithic tomb in Jeggen, Germany (photo: Avermann).

# **EUROPEAN DAY OF MEGALITHIC CULTURE**

In the meantime, we have created a corporate identity and common marketing. Since 2013, we have promoted an International Day of Megalithic Culture, which is always held on the last Sunday in April. On this date, events take place in our member regions, celebrating the topic of megalithic culture and its manifestations and covering the five priority fields of action specified by the Council of Europe. Every member of Megalithic Routes commits itself to participating in this event.

The theme of the European Day of Megalithic Culture for the upcoming year is usually announced at the Annual General Meeting preceding that date. For the European Day of Megalithic Culture 2016, the theme was »Megalithic Arts« and in 2017 the theme was »Moving Stones«. In 2015, it was »Outdoor School«, in 2014 it was cycling as a form of sustainable tourism and in 2013, we celebrated the »Long Night of Myth and Legends« (because all over Europe you find many of them in combination with a megalithic monument) (Fig. 6).

In 2014, we were selected as the first cultural route of the Council of Europe to host a blogger trip. This kind of marketing was absolutely new but a fantastic experience for us!

»It's the end of April and I am joining a blog tour along the route of megaliths, in north-west Europe. A question arises in my mind: why should a traveller prefer a tour among huge rocks scattered in green meadows, ancient woods and small rural villages, instead of a romantic weekend in a European capital or a relaxing cruise in the Mediterranean Sea.«

These lines were written by Renato Lamonica, a blogger from Naples, Italy, when he visited some megalithic monuments for the first time.

Groups of bloggers, photographers and videographers were given the opportunity to experience the thematic itineraries of certified cultural routes across Europe by the Council of Europe and the European Commission Joint Programme on Cultural Routes.

The first journey traced the megalithic culture in Europe by exploring the outstanding monuments of megalithic routes in Germany and the Netherlands. The trip went from the Hunebedcentrum in Borger, Netherlands to the Emsland region in Germany, and then to the Landesmuseum in Oldenburg (Fig. 7) and



 $Fig. \ 7. \ The \ Head \ of the \ Archaeological \ Heritage \ Department \ of \ Lower \ Saxony \ explains \ to \ bloggers \ the \ finds \ from \ the \ megalithic monuments in the \ State \ museum \ of \ Lower \ Saxony \ in \ Oldenburg \ (photo: Hauf).$ 



Fig. 8. The »Stone Age Park Dithmarschen« in Albersdorf, Germany is an archaeological open-air museum, focusing on the Neolithic periods in Northern Germany (photo: Stone Age Park Dithmarschen).

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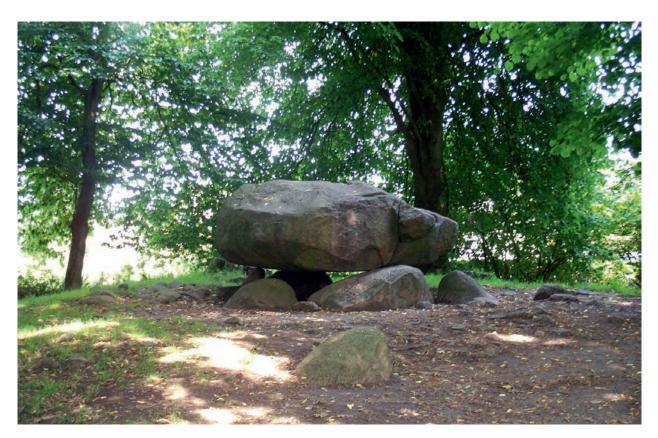


Fig. 9. In the Albersdorf region exist many well-preserved and easy-to-visit archaeological monuments, not least megalithic structures like the so-called »Brutkamp«, the megalithic tomb with the largest capstone in Schleswig-Holstein (photo: Stone Age Park Dithmarschen).

the Wildeshausen Geest region, before ending in the Stone Age Park in Albersdorf.

In 2015, the 4<sup>th</sup> Cultural Routes Summer Seminar (a special conference for the certified cultural routes and candidates, which takes place once a year) was hosted by the European Route of Megalithic Culture in the framework of the HECTOR Erasmus+ project coordinated by the European Institute of Cultural Routes (http://www.culture-routes.net/news/4<sup>th</sup>-cultural-routes-summer-seminar-presentations-online). Fifty participants from twenty countries attended the seminar, representing certified routes, new projects from all over Europe, students, universities and organisations partners of the Erasmus+ HECTOR.

Candidates worked on their certification files with the help of the newly-published guide to cultural routes design and management and with assistance from the team of the institute and certified routes. It was a great pleasure and honour for us!

Social media plays a growing role in the sector of cultural and it is becoming more important to use it. To make your route interesting for all visitors, it is important to also show them the region and landscape, rather than only your special theme (in our case, the megalithic monuments). It is also important to show the visitors how people lived for more than 5,000 years (what they wore, ate and drank and what kind of games they played). That is the reason why we also include museums with this special topic in our route. You can recognise them because they have a special sign on their door stating that they are a member of Megalithic Routes.

### MEGALITHIC ROUTES IN PRACTICE: THE STONE AGE PARK DITHMARSCHEN

An example of the work of the International Megalithic Routes cooperation is the »Stone Age Park Dithmarschen« in Albersdorf, Dithmarschen (Schleswig-Holstein, Germany), which has been a member of

the association since 2014 (Fig. 8–10). The park is an archaeological, open-air museum that integrates the surrounding landscape. Since 1997, the park has been developed on a plot of land over 40 hectares large,

with nine original archaeological monuments under the mission statement of a »neolithic« cultural land-scape. The Stone Age park comprises the Museum of Archaeology and Ecology in Dithmarschen, which has original, on-site structures, as well as a reconstructed, model-like Stone Age settlement of the early through late Neolithic periods (»Stone Age village«). They are there to convey archaeological research results. The Steinzeitpark aims to teach the public about the relationship between the natural environment and the development of the land. It also wishes to gain public support for the protection of our natural and cultural inheritance, which is less abundant today. The Steinzeitpark Dithmarschen attempts to teach peo-

ple in a way that integrates theory, practice, intellect and feelings. We believe that knowledge of the past that has been reflected upon can help us to understand the present, whereby the visitors will develop a desire to delve deeper into the presented topics. The Steinzeitpark Dithmarschen helps to work towards lasting ecological, cultural and business development as a certified educational centre in the region of Albersdorf. In this context, membership in the Megalithic Routes Association plays an important role for the further development of attractive and scientific-based new programmes and events for the public, especially to bring the local and regional archaeological pathways on a broader and international base.

### **FUTURE PLANS**

The latest information about the European Route of Megalithic Culture can be found on our Facebook account or our website, www.megalithicroutes.eu. We plan to include all routes and megalithic monuments in our member regions. For the future of Megalithic

Routes, it is desirable that we can expand our network in Europe, create more routes to make the megalithic culture more visible for the people and extend the European scientific exchange for a better understanding of this phenomenon.



Fig. 10. Part of the educational work of the museum is the presentation of »living history«, including as part of guided tours of the monuments (photo: Stone Age Park Dithmarschen).

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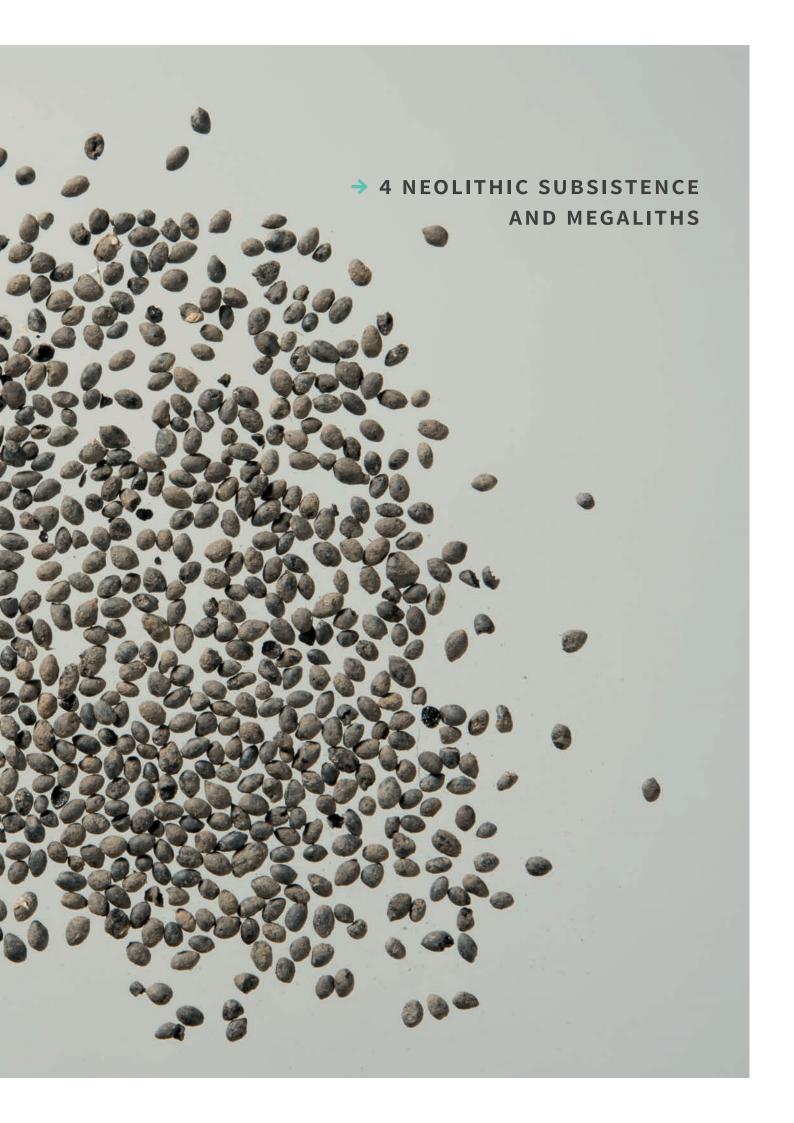
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# Tracing dietary change of the megalithic population in South-Western Sweden

Malou Blank

#### **ABSTRACT**

Subsistence practices during the Neolithic are a highly debated topic in which stable isotopes in human remains have become an important aspect. This article is based on some of the data from a larger study of the Late Neolithic population of Falbygden, in the inland of southwest Sweden. Results from new diet isotope analyses of collagen and apatite, from both Middle Neolithic and Late Neolithic/Early Bronze Age individuals, are presented and related to already published isotope data. The food intake and subsistence between the two periods of extensive megalithic use (the Middle Neolithic

and the Late Neolithic/Early Bronze Age) are compared and variations in isotope values among different categories are discussed. According to the preliminary results subsistence during the Middle Neolithic and the Late Neolithic/Early Bronze Age appears similar, even though an increase in dietary variation in the later period can be observed. Furthermore, an established agriculture with animal husbandry where plant food was a significant part of the diet both during the Middle Neolithic and the Late Neolithic/Early Bronze Age is suggested.

#### INTRODUCTION

Numerous finds of domestic animal remains, cereals and seed impressions as well as pollen diagrams indicating grazing and cultivation reveal the importance of agriculture in southern and central Sweden during the early and middle Neolithic (WELINDER 1998; BERG-LUND et al. 2002; PERSSON 2003; MALMER 2002; SJÖGREN 2003; HALLGREN 2008). There is an ongoing debate about to what extent agriculture was practised in different periods and regions in Sweden. Some argue that the population increase and the spread of new megalithic gallery graves into new areas in the Late Neolithic (2350-1700 cal BC), are indications of extensive cultivation (JOHANSSON 1961; APEL 2001, 331). Osteological studies of Late Neolithic human remains as well as isotopic studies suggest intensified farming in the Late Neolithic in Southern Sweden (ERIKSson et al. 2008; Tornberg 2013; Tornberg 2015). Others claim that cultivation already had an important role in the Middle Neolithic (3350-2350 cal BC) and can be linked to megalithic building (MIDGLEY 1992; SJÖGREN 2003; SJÖGREN/PRICE 2013). By comparing the diet of Middle Neolithic and Late Neolithic individuals, new information can be added to this debate.

One of the regions where Neolithic subsistence and the importance of cultivation has been a controversial

issue is Falbygden. Here, many skeletal remains from the megalithic graves have generally been well preserved due to the calcareous soils and the area is therefore excellent for isotopic research. Since the 1990s there have been several isotope studies conducted in which a substantial number of individuals from Falbygden were included (LIDÉN 1995; SJÖGREN 2003; LINDERHOLM 2008; HINDERS 2011; FORNANDER 2011; SJÖGREN/PRICE 2013). The main focus of the previous research was the earliest period of use of the megalithic graves, the Middle Neolithic. Late Neolithic subsistence on the other hand has not been studied in this region. There are no known Late Neolithic settlements in the area; nevertheless a lot of preserved human remains dated to the Late Neolithic/Early Bronze Age from gallery graves and passage graves are available.

This study is based on stable isotope results from both the Late Neolithic/Early Bronze Age and Middle Neolithic individuals found in some of the megalithic graves in Falbygden. The aim is to investigate the subsistence of the megalithic population and see if any changes or variations in diet can be traced. Diet in the Middle Neolithic and the Late Neolithic/Early Bronze Age are compared and differences between local groups and categories such as age and sex are discussed.

# **BACKGROUND AND PREVIOUS RESEARCH**

Falbygden (Fig. 1), inland southwestern Sweden, is an important area for research on the Neolithic megalithic population in Scandinavia. The area has one of Northern Europe's largest concentrations of passage graves and a substantial number of gallery graves. Systematic studies of the graves have been ongoing since 1860 with a focus on the passage graves and the Middle Neolithic (HILDEBRAND 1864; MONTELIUS 1873; RETZIUS 1899; SAHLSTRÖM 1932; BÄGERFELDT 1992; PERSSON/SJÖGREN 2001; SJÖGREN 2003; SJÖGREN 2008). A few studies have treated the gallery graves and the

Late Neolithic/Early Bronze Age in the area (WEILER 1994; ALGOTSSON 1996; STENSKÖLD 2004). Dolmens and passage graves were built in a rather short period in the transition between the early and the middle Neolithic periods, 3300–3000 cal BC, in the cultural setting of the Funnel Beaker culture (PERSSON/SJÖGREN 1995; SJÖGREN 2003), whereas the construction of gallery graves is not yet completely solved (JOHANSSON 1961; ALGOTSSON 1996; BLANK 2016). Passage graves are associated to the Middle Neolithic period and the less monumental gallery graves to the Late

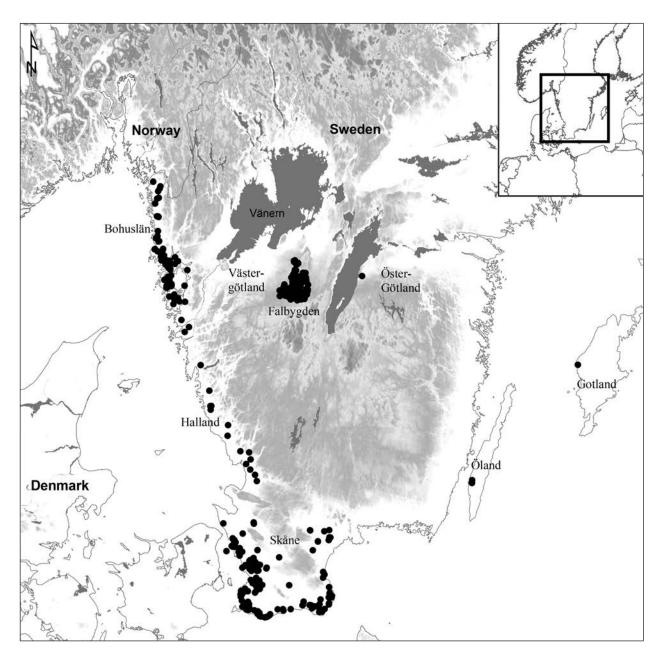


Fig. 1. Southern Sweden with passage graves and dolmens. From Sjögren et al. 2009.

Neolithic. However the passage graves were also used in the Late Neolithic and Middle Neolithic individuals can be found in some of the gallery graves. The megalithic graves in Falbygden seem to have been used for burials above all during the first part of the Middle Neolithic (3350 - 2800 cal BC) and the second half of the Late Neolithic into the Early Bronze Age (1950 - 1300 cal BC) (Blank 2016, Blank 2017).

Excavations of Middle Neolithic settlements contemporaneous with the first period of use of the megalithic graves have been ongoing since the 1980s. Carbonized seeds and bone refuse from these sites were dominated by domestic animals such as cattle, sheep and pigs while wild animals and fish were rarely found, suggesting a subsistence of cultivation and animal husbandry during the Middle Neolithic (Persson 1992; Englund/Sjögren 1994; Sjögren 2007; Axelsson/Sjögren 2015; Sjögren 2017).

As already mentioned the favourable conditions for bone preservation have enabled detailed studies of human and animal remains. A few osteological studies based on the rate of caries in the south Scandinavian Middle Neolithic and Late Neolithic populations have discussed diet and subsistence practices as caries increase when food high in carbohydrates is consumed. According to AHLSTRÖM (2001, 337; 2003, 49) the frequency of caries in Falbygden during the Middle Neolithic was 2-3.4%, which is higher than the frequency found in Mesolithic skeletal remains from southern Scandinavia. In Scania, southern Sweden, the frequency of caries increased during the Late Neolithic (TORNBERG 2013, 8). A growth in stature in south Scandinavian Late Neolithic individuals has been discussed and related to the improvement in health and diet (gejvall 1963; bennike 1985; tornberg 2015). TORNBERG (2013; 2015) suggests that the increased frequency of caries and stature can be explained by an intensification of cultivation during the Late Neolithic. However, both the frequency of caries and stature are greatly affected by genetics and by general nourishment. Results of the frequency of caries and the stature of the Late Neolithic population in Falbygden have not yet been published. There is a problematic study of a gallery grave in Torbjörntorp, Falbygden, showing that the Late Neolithic frequency of caries is much lower than during the Middle Neolithic (HOLMER/MAUNSBACH 1957, 442).

The isotopic research in this particular area has also focused on the Middle Neolithic, even though, for example, LIDÉN (1995) included undated bone material from both passage graves and gallery graves, some of which turned out to be Late Neolithic and Iron Age. Complementary <sup>14</sup>C analyses are desirable as these graves have been reused to a high extent throughout prehistory (BLANK 2016). Previous studies show rather homogenous  $\delta^{13}$ C values around -21% and  $\delta^{15}$ N values centre around 10.5% which can be expected in an inland population with a terrestrial diet (LIDÉN 1995; HINDERS 2011; SJÖGREN/PRICE 2013). The importance of animal resources compared to plants has been debated. Most of these researchers claim that there was a predominance of animal husbandry with a marginal intake of cereals (LIDÉN 1995; FORNANDER 2011, 66; HINDERS 2011; LINDERHOLM 2008). This is based on the rather high δ15N values and terrestrial  $\delta^{13}$ C values indicating that the protein was mainly derived from a high trophic level (animals). According to fornander (2011: 65f) consumption of wild or domesticated pigs was the main source of food. This has been questioned by Sjögren and Price. They argue for a substantial importance of plant foods in the total diet (sjögren 2003; sjögren/price 2013; SJÖGREN 2017). SJÖGREN/PRICE (2013) discuss the enrichment of δ<sup>15</sup>N values due to cultivation practices and slaughter patterns and include the  $\delta^{13}$ C values from apatite to create a more complete picture of the diet. Furthermore, ongoing research on the cultivation patterns and subsistence practices of the Middle Neolithic population, where slaughter patterns on animal refuse and isotope analyses on cattle and seeds are included, is conducted by Sjögren and Axelsson at the University of Gothenburg (see AXELSSON/ SJÖGREN 2015, SJÖGREN 2017; SJÖGREN/AXELSSON this vol.).

Late Neolithic settlements in the area have not been located. Scattered flint tools related to farming and a few impressions of seeds in ceramic vessels have been found in Falbygden and dated to the Late Neolithic (WEILER 1994, 61). Animal bones in gallery graves are quite common, but only a couple of pig bones have been <sup>14</sup>C dated to the Late Neolithic. Nevertheless there are a lot of human remains in the megalithic graves dated to this period.

### **METHOD**

In this article isotopes are being used to investigate diet. Carbon and nitrogen isotope ratios in human bone collagen can be used to estimate part of prehistoric food consumption. The carbon dioxide from the atmosphere is fixated by plants. There are two main

photosynthetic pathways,  $C_3$  and  $C_4$ , which are often referred to in diet studies. The different pathways affect the  $\delta^{13}C$  values in the plants. The  $C_3$  pathway includes most Scandinavian species and leads to plants with bulk  $\delta^{13}C$  values of about  $-27\,\%$ , while the  $C_4$  plants

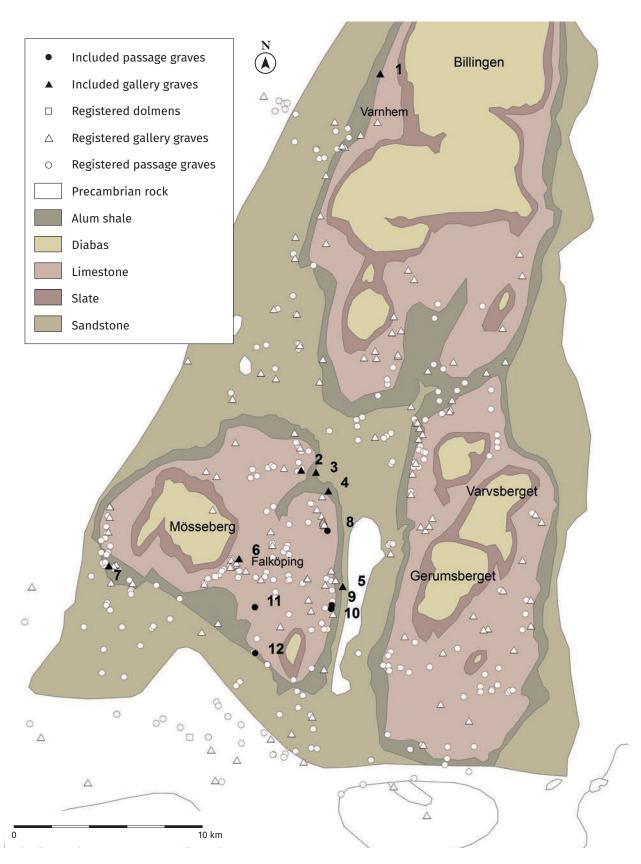


Fig. 2. The megalithic graves in Falbygden included in this study. 1. Varnhem 116, 2. Torbjörntorp 16:3, 3. Torbjörntorp 18, 4. Torbjörntorp 31, 5. Karleby 71, 6. Falköping stad 26, 7. Gökhem Torsagården, 8. Karleby 105, 9. Karleby 59, 10. Karleby 57, 11. Falköping östra 1, 12. Luttra 16.

have bulk  $\delta^{13}C$  values around  $-13\,\%$ . The Carbon isotope ratios are passed through the food chain with some secondary fractionation. In humans and animals a C4 plant based diet results in higher  $\delta^{13}C$  values in collagen than a diet based on C3 plants. However, C4 plants consist of maize, millet and other plants which were not present in Scandinavia during the Neolithic.  $\delta^{13}C$  can be used to distinguish terrestrial or marine diet as marine organisms are isotopically enriched (SEALY 1986). In the Atlantic/North Sea region terrestrial end values around  $-20\,\%$  to  $-21\,\%$  can be expected, whereas marine end value is about  $-12\,\%$ .

Atmospheric nitrogen is incorporated into the biological system via nitrogen fixation by bacteria, soil organisms and root systems. It is absorbed by humans through proteins which are consumed (SEALY 2001). The  $\delta^{15}N$  value increases higher up in the food web and the standard model assumes an enrichment of about 3% per trophic level. In a terrestrial food web this model implies levels at 3% in plants, 6% in herbivores and 9% in carnivores, thus human consumers of terrestrial plants and animals show  $\delta^{15}N$ values in bone collagen between 6 to 10 %. However, this has been debated and the enrichment is today considered higher and might vary within and between species (see HEDGES/REYNARD 2007; FER-NANDES et al. 2012; O'CONNELL et al. 2012; SJÖGREN/ PRICE 2013; WILHELMSON 2017). Thus, the interpretation of the origin of the protein might differ depending on which fractionation level that is considered. Aquatic food webs on the other hand have generally longer food chains, and consumers of fresh water and marine fish and other aquatic predators show  $\delta^{15}$ N values up to 15–20% (schoeninger et al. 1983; Eriksson 2013, 130).  $\delta^{15}$ N values can be affected by breastfeeding and the consumption of juvenile herbivores as these are one trophic level above their mothers. Other factors which elevate  $\delta^{15}N$  values in humans are physiological stress and the intake

of manured crops (HEDGES/VAN KLINKEN 2000; ERIKSSON 2013, 130, 136; FORNANDER 2011, 28; FRASER et al. 2011; SJÖGREN/PRICE 2013, 45). Low  $\delta^{15}$ N values are an effect of a diet based on proteins from low trophic levels, but can also be a result of the lactation effect in mothers (Fuller et al. 2006).

As the bone remodels, the isotopic composition of bone collagen and bone apatite reflects an average diet of the last few years (depending on the type of bone analysed). The turnover of tooth dentine, in contrast to other bone, is insignificant and corresponds to the formation time of the tooth. They therefore offer an earlier average of the food intake than most other bone collagen (HILLSON 1987, 155; ERIKSSON 2013, 135). The tooth starts to form with the mineralisation of the crown and ends with the closure of the apex of the tooth (SMITH 1991, 145). The enamel reflects the diet during the age when the crown is formed.

Different bone tissues reflect different components of the diet. Bone collagen mainly reflects the protein intake while bone and enamel carbonate (apatite) are produced from protein, carbohydrates, and fats (AM-BROSE/NORR 1993, 121-155). Thus, the stable isotopes in collagen primarily reflect the protein intake and not the overall dietary components. Accordingly, low protein food sources, such as vegetables, are underrepresented. To complement the collagen results, 13C analyses on enamel are included. By analysing at the apatite, greater parts of the diet can be studied. It has been argued that the collagen apatite spacing (the difference between the  $\delta^{13}$ C in apatite and the  $\delta^{13}$ C in collagen) is smaller in carnivores than in herbivores (LEE-THORPE et al. 1989; HEDGES/VAN KLINKEN 2000). LEE-THORPE et al. (1989, 590) suggest a collagen apatite spacing of 6.8 ± 1.35 % for herbivores,  $5.2 \pm 0.8$  % for omnivores and  $4.3 \pm 1.0$  % for carnivores. The collagen apatite spacing is described more in detail in AMBROSE et al. 1997; LEE-THOR-PE et al. 1989; SJÖGREN/PRICE 2013.

#### MATERIAL

In this investigation a total of fifty two  $^{14}$ C dated individuals found in five passage graves and seven gallery graves were included (Fig. 2). Twelve individuals were dated to the Middle Neolithic and 35 to the Late Neolithic/Early Bronze Age (Tab. 1.). The samples consisted of 28 teeth (mostly molars), 14 skulls and 10 femur fragments (Tab. 1). In the cases where  $\delta^{13}$ C was

analysed on apatite, the compared measurement on collagen derived from teeth and a slight age difference could be expected, but not a very important one. The  $\delta^{13}$ C in enamel represents childhood diet, while the  $\delta^{13}$ C and  $\delta^{15}$ N values in collagen have been measured on both teeth and other bones representing the diets of different ages (HILLSON 1987).

# **RESULTS AND DISCUSSION**

# $\delta^{13}$ C and $\delta^{15}$ N values in collagen – different categories.

To investigate local variations in the diet, the  $\delta^{13}C$  and  $\delta^{15}N$  values in collagen from individuals from the different grave locations were compared. In an earlier study of the Middle Neolithic population, no differences in diet isotope ratios between categories of age,

sex and social groups were observed, except for minor variations between different sites (SJÖGREN 2003). In this study there is no evidence of any differences connected to the specific graves or geographical locations (Tab.1). However, only a handful individuals from each grave were analysed. No significant difference can be observed between the two kinds

Tab. 1. Individuals included in this study.

SITE	Q I	GRAVE TYPE	MATERIAL	PERIOD	SEX	813C COLLAGEN	8 15 N COLLAGEN	813C APATITE	COLLAGENAPATITE SPACING	R E F
Falköping 26	МЗЬ	GG	Molar 3	MN		-20.6	9.5			Unpublished
Falköping 26	M4b	GG	Molar 2	MN		-21.2	10.2			Unpublished
Falköping Ö1	M21	PG	Molar 3	MN		-20.2	10.2	-14.07	6.13	Unpublished
Falköping Ö1	M20	PG	Molar 2	LN		-20.5	10.3	-15.94	4.56	Unpublished
Falköping Ö1	M22	PG	Molar 2	MN		-20.2	10.7	-13.98	6.22	Unpublished
Karleby 105	MK105:2	PG	Premolar	LN		-20.5	9.4			Unpublished
Karleby 105	MK105:1	PG	Molar 1	MN		-21.3	9.6			Unpublished
Karleby 57	M43	PG	Premolar	MN		-20.6	10.7			Unpublished
Karleby 57	M42	PG	Premolar	MN		-20.8	11.3			Unpublished
Karleby 59	M16	PG	Skull fragment	LN	М	-21.1	8.4	-15.59	5.51	Unpublished
Karleby 59	M11	PG	Molar 2	LN	F	-20.2	9.1	-14.48	5.72	Unpublished
Karleby 59	5386b-20	PG	Skull fragment	MN		-20.7	9.9			FiBiGER et al. 2013
Karleby 59	M13	PG	Molar 2	MN	М	-20.4	10.4	-13.79	6.61	Unpublished
Karleby 59	M12	PG	Molar	LN	М	-20.3	10.7	-13.58	6.72	Unpublished
Karleby 71	M59	GG	Skull fragment	EBA		-20.8	8.9			Unpublished
Karleby 71	M57	GG	Skull fragment	LN/EBA	М	-20.9	9			Unpublished
Karleby 71	M58	GG	Skull fragment	MN		-21.2	9.2			Unpublished
Karleby 71	5386a-71	GG	Skull fragment	LN	F	-20.5	9.4			FIBIGER et al. 2013.
Karleby 71	M14	GG	Molar 2	LN		-20.4	9.4	-13.34	7.06	Unpublished
Karleby 71	K71A	GG	Skull fragment	LN		-20.8	9.6			Unpublished
Karleby 71	M17	GG	Molar	LN/EBA	F	-20	10.8	-14.72	5.28	Unpublished
Karleby 71	M46	GG	Skull fragment	LN		-20.8	10.9			Unpublished
Karleby 71	M15	GG	Molar 2	EBA	М	-19.7	11.3	-14.02	5.68	Unpublished
Luttra 16	10351-3	PG	Skull fragment	LN	F	-20.8	8.2			FIBIGER et al. 2013.
Luttra 16	ML16:3	PG	Skull fragment	LN		-20.4	8.9			Unpublished

of megalithic graves, passage graves and gallery graves (Fig. 3). The gallery graves and passage graves have both been used for burials in the Late Neolithic and possibly to some extent also during the Middle Neolithic. The choice of grave type or the geographical location does not seem to be connected to social groups of different subsistence. Of course this could be difficult to detect if an exchange system of food items were present. It would have been interesting to

compare the megalithic population to individuals buried in other kinds of graves, but this is not possible as no flat graves from the Neolithic periods have been found in the area.

As seen in figure 3 the  $\delta^{13}C$  values range from -21.3% to -19.7% and the  $\delta^{15}N$  values from 8.2% to 11.3%. These values correspond to a terrestrial diet, where some  $\delta^{15}N$  values are quite high following the standard model. As discussed previously,

SITE	<u>a</u>	GRAVE TYPE	MATERIAL	PERIOD	SEX	813 C COLLAGEN	8 15 N COLLAGEN	813 C APATITE	COLLAGENAPATITE SPACING	R E F
Luttra 16	ML16:1	PG	Skull fragment	LN		-21.1	9.2			Unpublished
Luttra 16	M19	PG	Skull fragment	LN		-20.3	9.5	-14.2	6.1	Unpublished
Luttra 16	ML16:2	PG	Skull fragment	LN		-20.6	9.6			Unpublished
Luttra 16	M7	PG	Molar 2	MN	М	-19.9	11	-13.89	6.01	Unpublished
Luttra 16	M8	PG	Molar 2	LN	F	-20.1		-15.12	4.98	Unpublished
Luttra 16	M9	PG	Premolar 1	LN	F	-20.3		-13.18	7.12	Unpublished
Luttra 16	M10	PG	Molar 1	MN	М	-20.9		-14.87	6.03	Unpublished
Torbjörntorp 16:3	M56	GG	Molar 1	LN		-20.6	9.6	-13.35	7.25	Unpublished
Torbjörntorp 18	MTB18:1	GG	Molar 2	EBA		-20.6	8.4			Unpublished
Torbjörntorp 18	M49	GG	Femur fragment	LN		-20.5	8.5			Unpublished
Torbjörntorp 18	M31	GG	Femur fragment	LN		-20.8	8.6			Unpublished
Torbjörntorp 18	M34	GG	Femur fragment	LN		-20.1	9.2			Unpublished
Torbjörntorp 18	M38	GG	Femur fragment	LN		-20.1	9.6			Unpublished
Torbjörntorp 18	M30	GG	Femur fragment	LN/EBA		-20.4	9.7			Unpublished
Torbjörntorp 18	M50	GG	Molar 3	LN	F	-20.7	9.8	-14.05	6.65	Unpublished
Torbjörntorp 18	M48	GG	Femur fragment	LN		-20.4	9.8			Unpublished
Torbjörntorp 18	M52	GG	Molar 3	LN	F	-20.3	9.8	-13.35	6.95	Unpublished
Torbjörntorp 18	M36	GG	Femur fragment	LN		-20.3	10.1			Unpublished
Torbjörntorp 18	M35	GG	Femur fragment	LN		-20.1	10.2			Unpublished
Torbjörntorp 18	M37	GG	Femur fragment	LN		-20.1	10.2			Unpublished
Torbjörntorp 18	M33	GG	Femur fragment	LN		-20	10.2			Unpublished
Torbjörntorp 18	M51	GG	Molar 2	LN	F	-20.1	10.5	-13.4	6.7	Unpublished
Torbjörntorp 31	M54	GG	Molar 1	LN		-20.5	9.2	-14.29	6.21	Unpublished
Torbjörntorp 31	M55	GG	Premolar 1	LN		-20.3	11	-14.62	5.68	Unpublished
Torsagården	GHTors:1	GG	Molar 3	LN		-20.8	9.4			Unpublished
Varnhem 116	M45	GG	Incisive 2	LN	F	-20.3	9.4			Unpublished
Varnhem 116	MV:A	GG	Skull fragment	LN		-19.7	9.7			Unpublished

high  $\delta^{15}$ N values could be a result of a protein intake from a high trophic level, but could also have several other explanations. As already pointed out in earlier research (sjögren 2003; axelsson/sjögren 2015; sjögren 2017) the higher  $\delta^{15}$ N values during the Middle Neolithic are not likely a result of fish consumption. No elevated  $\delta^{15}$ N values can be observed in teeth

with hypoplasia, thus in this case the higher  $\delta^{15}N$  values cannot be directly connected to physiological stress. Of course it cannot be ruled out as physiological stress does not necessarily leave visible traces on the skeletal remains.

When the diet isotopes are plotted and compared between samples taken from tooth dentine and

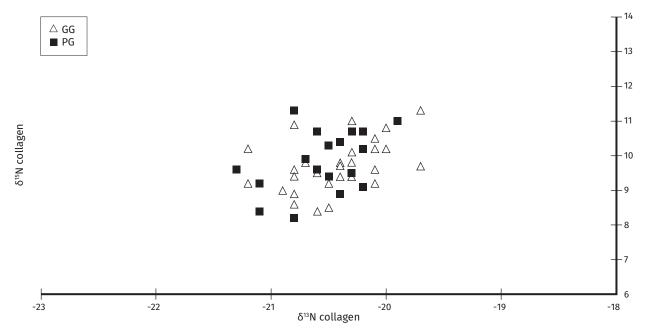
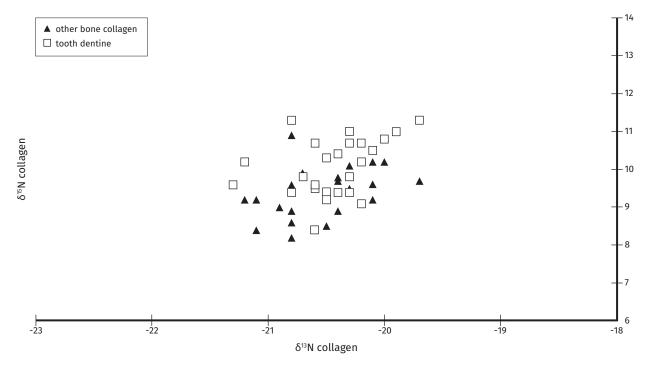


Fig. 3.  $\delta^{13}C$  and  $\delta^{15}N$  values in collagen of individuals buried in passage graves and gallery graves.



*Fig.* 4.  $\delta^{13}C$  and  $\delta^{15}N$  values in tooth dentine and other bone collagen.

other bone collagen, a difference can be seen. In general bone collagen shows lower  $\delta^{15}$ N ratios than tooth dentine (Fig. 4). As seen in table 2, the average of the  $\delta^{15}$ N values from tooth dentine is higher than the average of the samples taken from other bone collagen. One possible explanation for this tendency is that the teeth and other bone material represent different ages, as bone remodels at a different pace while teeth do not remodel to same degree after their formation. The second molars start to form by the age of three, while the first molars begin to form within the first year and could therefore be affected by breastfeeding (HILL-SON 1987). Only three first molars are included in the analyses. These first molars do not show raised  $\delta^{15}N$ values compared to the average ratio implying that the higher  $\delta^{15}$ N values are not a result of breastfeeding (Tab. 1). However, this cannot be ruled out as we do not know how long the children were breastfed. The result might be an indication of some kind of dietary change during their lifetime.

No differences in  $\delta^{15}N$  values between bone elements were observed in an earlier study of Middle Neolithic individuals buried in the Frälsegården passage grave (SJÖGREN/PRICE 2013, 47). If the two categories are compared within the different time periods, the samples from teeth still show higher  $\delta^{15}$ N values (Tab. 2), even though the difference is only statistically significant in the case shown in figure 4 (Mann-Whitney U-test). Most of the individuals in this study were osteologically determined to be adults. There are a couple of juveniles, but these are sampled from teeth, while the samples taken from bones are all adults. Hence, this tendency cannot be further investigated by studying only the other bone collagen. Supplementary studies of diet isotopes from different types of bones from the same individual would be preferable. One of the lowest  $\delta^{15}N$  values was measured in bone collagen from an old Late Neolithic man buried in the passage grave Karleby 59 (Tab. 1). This man must have had problems eating solid food, as he shows evidence of healed trauma to his mandible and ante mortem tooth loss (RETZIUS 1899, 93; FIBIGER et al. 2013, Supp. Table). The low  $\delta^{15}$ N value in this case might be an effect of an intake of protein from a low trophic level during his last years.

The lactation effect in mothers is debated and NITSCH et al. (2010) claim that it is too low to detect while fuller et al. (2006) argue that it is visible in  $\delta^{15}N$ . In this study the sex of 14 individuals was determined and a slight variation in the  $\delta^{15}N$  value between sexes can be observed. The mean  $\delta^{15}N$  in men is 0.67 % higher than in women (Tab. 2). The result is not affected by the different values of tooth dentine and bone collagen as the samples are evenly spread between the categories. If the time periods are analysed separately,

Tab. 2. Mean values of diet isotopes of different categories. N: Number of Individuals, MN: Middle Neolithic, LN: Late Neolithic, EBA: Early Bronze Age. Analyses performed by laboratories in: Belfast, Oxford, Uppsala and Mannheim.

CATEGORY	BONE ELEMENT	z	MEAN (%)	STANDARD DEVIATION (%)
MN	Tooth. femur. skull	11	-20.65	0.358
LN/EBA	Tooth. femur. skull	38	-20.43	0.270
Women (LN/EBA)	Tooth. femur. skull	8	-20.36	0.228
Men (MN+LN/EBA)	Tooth. femur. skull	6	-20.38	0.417
Men (LN/EBA)	Tooth. femur. skull	4	-20.5	0.500
Tooth	Tooth	25	10.1	0.657
Other bone	Femur. skull	24	9.44	0.526
MN	Tooth. femur. skull	11	10.25	0.522
LN/EBA	Tooth. femur. skull	38	9.62	0.584
MN	tooth	8	10.4	0.466
LN/EBA	tooth	16	9.88	0.664
MN	Femur. skull	2	9.55	0.35
LN/EBA	Femur. skull	22	9.47	0.539
Women (LN/EBA)	Tooth. femur. skull	8	9.63	0.600
Men (MN+LN/EBA)	Tooth. femur. skull	6	10.13	0.956
Men (LN/EBA)	Tooth. femur. skull	4	9.85	1.15
MN	Tooth	5	6.20	0.172
MN including (SJÖGREN & PRICE 2013)	Tooth	11	6.24	0.474
LN/EBA	Tooth	16	6.14	0.697

the difference between sexes is still present but it is not statistically significant according to the Mann-Whitney-U-test (Tab. 2). However, the lowest  $\delta^{15}N$  ratio is found in bone collagen from an adult Late Neolithic woman from the passage grave Luttra 16 (Tab. 1). The slight observed differences between sexes gives an indication of women possibly having a lower  $\delta^{15}N$  value due to the lactation effect or variations in diet. More samples from individuals with a known sex are needed to investigate this further.

### $\delta^{13}$ C and $\delta^{15}$ N values in collagen – different time periods

In figure 5,  $\delta^{13}$ C and  $\delta^{15}$ N are plotted in the Middle Neolithic and the Late Neolithic/Early Bronze Age. The Middle Neolithic diet isotopes presented in this article correspond to earlier research (LIDÉN 1995;

sjögren 2003; hinders 2011; sjögren/price 2013). The  $\delta^{13}C$  values from the Middle Neolithic samples show an average of  $-20.65\pm0.358\%$  and an average of  $-20.43\pm0.270\%$  from the Late Neolithic/Early Bronze Age. Thus the difference can be disregarded. The mean of the  $\delta^{15}N$  values on the other hand is higher during the Middle Neolithic than during the Late

Neolithic and differs by 0.63 % (Tab. 2). The decreased  $\delta^{15}N$  values during the Late Neolithic/Early Bronze Age could indicate an increased intake of foods with a lower  $\delta^{15}N$  value, such as plants or animals of a lower trophic level. This argument is supported by osteological research of the frequency of caries discussed earlier (TORNBERG 2013) and other studies (such as

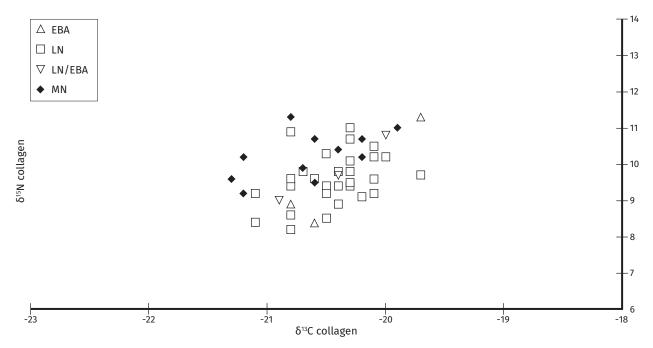
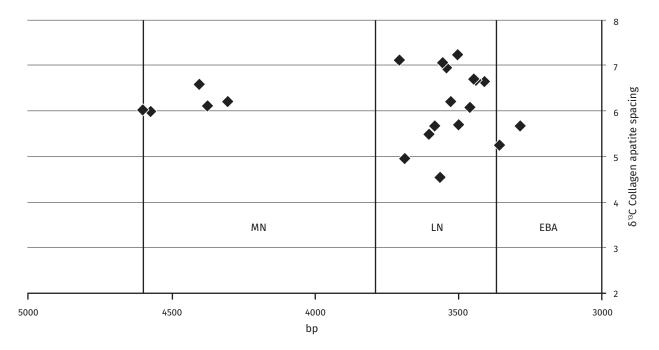


Fig. 5.  $\delta^{13}C$  and  $\delta^{15}N$  values in collagen during the Middle Neolithic and Late Neolithic/Early Bronze Age.



 $\textit{Fig. 6. The collagen a patite spacing during the Middle Neolithic and Late Neolithic/Early \textit{Bronze Age}.}\\$ 

ERIKSSON et al. 2008) which claim an increase of cultivation during the Late Neolithic. An increased general health and stature could also be related to this hypothesis (see TORNBERG 2013; 2015).

Of the Middle Neolithic samples, 82% were taken from tooth dentine, while only 42% of the Late Neolithic/Early Bronze Age derived from tooth dentine (Tab. 1). To exclude the possibility that the observed difference between the periods is a result of the biased sampling, the  $\delta^{15}N$  values were compared exclusively from teeth. As seen in table 2, a difference of 0.5% between the periods still remained. In contrast to when all samples were included, this difference is not statistically significant (Mann-Whitney U-test), which might be an effect of the low number of samples. This tendency is still noteworthy and is going to be explored in forthcoming publications. In figure 5 and table 2 it can also be observed that the range of the Late Neolithic/Early Bronze Age values is considerably wider than for the Middle Neolithic. This might be explained by a more varied diet consisting of different kinds of protein sources.

# The collagen apatite spacing – different time periods

To investigate this further, the collagen apatite spacing of the Middle Neolithic and the Late Neolithic/Early Bronze Age individuals were compared since the  $\delta^{13}C$  in enamel derives not only from protein sources, but from the whole diet and the spacing can therefore give an indication of the proportion of plants consumed (see method). As seen in table 2, the difference in the mean of collagen apatite spacing during the two periods is marginal. The mean collagen apatite spacing of 6.2% is rather high and coincides with results (6.5%) from an earlier study of the Frälsegården passage grave in Falbygden (sjögren/price 2013, 49). The result corresponds better to herbivores than carnivores (LEE-THORPE 1989, 590) and, as has already been argued for the Middle Neolithic individuals (SJÖGREN/PRICE 2013), the collagen apatite spacing supports a substantial intake of plant foods such as cereals and vegetables. If there was an increase in the intake of plant food in the Late Neolithic/Early Bronze Age, then the spacing ought to be higher than in the earlier period, which is not the case (Fig. 6, Tab. 2).

The standard deviation is significantly higher during the Late Neolithic/Early Bronze Age than during the Middle Neolithic, indicating a greater variation in the collagen apatite spacing in the later period (Tab. 2, Fig. 6). In order to get more balanced numbers of individuals between the periods in question, collagen apatite results from an earlier study (SJÖGREN/PRICE 2013) were added (Tab. 2). As can be observed

in figure 7, the variation is still greater during the Late Neolithic/Early Bronze Age than during the earlier period. No correlation between the  $\delta^{\rm 15}N$  values and the collagen apatite spacing were observed. The increased variation of collagen apatite spacing might be an effect of more varied protein intake and a greater variation in the proportion of vegetables consumed by individuals.

# Subsistence during the Middle and Late Neolithic

According to ERIKSSON et al. (2008, 535) the introduction of large scale agriculture took place during the last part of the Late Neolithic on Öland, southern Sweden. The isotopic data shows a dietary shift, from the consumption of marine or mixed marine/terrestrial resources to exclusively terrestrial resources. The isotope values from this period on Öland appear similar to the Middle Neolithic and Late Neolithic results from Falbygden. The fertile soils, the surrounding mountains, and the many fresh water springs especially found in closeness of the megalithic graves in Falbygden, were favorable for cultivation and animal husbandry (see SCHNELL 1966). Falbygden, where a large concentration of megalithic graves can be found, was an important area during the Middle and Late Neolithic. The analysed individuals in this study were all found in megalithic graves. Earlier researchers have argued that the dietary isotope results from the megalithic population in Falbygden reflects a subsistence dominated by animal husbandry were cereals did not play a significant role (FORNANDER 2011, 66; HINDERS 2011; LINDERHOLM et al. 2008). The collagen apatite spacing indicates a substantial intake of plant

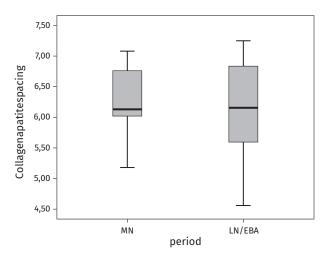


Fig. 7. The collagen apatite spacing during the Middle Neolithic and Late Neolithic/Early Bronze Age, including results from SJÖGREN/PRICE 2013. Boxplot with: median,  $25^{th} - 75^{th}$  percentile, range (95%).

food both during the Middle Neolithic and the Late Neolithic/Early Bronze Age. Thus, it can be argued that cultivation was already important in the Middle Neolithic and in the Late Neolithic/Early Bronze Age, which in this case is related to individuals buried in megalithic graves.

The subsistence does not seem to change dramatically in the Late Neolithic in Falbygden. The slight decreased  $\delta^{15}N$  values indicate a protein intake from lower trophic levels, but the collagen apatite spacing does not support a more plant based diet. An alternative explanation could be changes in cultivation and husbandry practices (manuring and how the domestic animals were kept and fed etc.). More dispersed  $\delta^{15}N$  values as well as a greater variability in

the collagen apatite spacing in the later period could be interpreted as a more varied diet between individuals and a possible indication of an increase in social differentiations and/or more varied subsistence strategies. Mobility could be a possible explanation to dietary change over a lifetime as well as more variations in the diet of different individuals. Likewise, a higher human mobility is an alternative explanation of the increased stature and higher frequency of caries seen in some Late Neolithic populations as these factors are very much hereditary. There is a significant augmentation of the human mobility during the Late Neolithic and movement from more locations than previously can be observed. However this will be discussed in forthcoming publications.

#### CONCLUSIONS

In this article the  $\delta^{13}C$  values in collagen and enamel and the  $\delta^{15}N$  values are discussed from a number of Middle Neolithic and Late Neolithic/Early Bronze Age individuals buried in megalithic graves in Falbygden, south west Sweden. No variation in the protein sources can be seen in the isotopic values between the different grave locations or the different megalithic grave types. There is a slight difference between the  $\delta^{15}N$  values between sexes which could be a result of the lactation effect and/or differences in diet between sexes, but this is not statistically significant. Samples from both tooth dentine and other bone collagen were included and differences in the  $\delta^{15}N$  values were observed between the two categories, even though they were not significant.

The dietary isotopes in collagen appear rather similar during the Middle Neolithic and the Late Neolithic/Early Bronze Age, which agree with earlier studies of the Middle Neolithic population of Falbygden, and correspond to a diet based on terrestrial resources. The slight difference in  $\delta^{15}N$  values between individuals from the two periods can be explained by an increased

intake of protein from a lower trophic level in the Late Neolithic/Early Bronze Age. However, the collagen apatite spacing does not support an increased intake of plant foods during the Late Neolithic/Early Bronze Age.

An increase in the variation of both the  $\delta^{15}N$  and the collagen apatite spacing can be observed during the Late Neolithic/Early Bronze Age. The higher variation in the  $\delta^{15}N$  values might be explained by a greater individual variation of protein sources consumed. The more dispersed collagen apatite spacing in the later period might be explained by a more varied intake of plant food. Some possible interpretations of the variation in diet could be social differentiation, different subsistence strategies, or human mobility.

Collagen apatite spacing is rather high during both periods and suggests a diet consisting of a significant level of plant food. Agriculture with animal husbandry was already well established in Falbygden in the Middle Neolithic and persisted with some possible minor changes in the Late Neolithic/Early Bronze Age. It is potentially connected to the construction of the megalithic graves.

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# Middle Neolithic economy in Falbygden, Sweden. Preliminary results from Karleby Logården

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#### **ABSTRACT**

This paper presents the first preliminary results from the Neolithic lifeways project. The purpose of this project is to develop a new perspective of the Neolithic economy on Falbygden in western Sweden as integrated into a regional network, as well as offering new aspects into agrarian economy and settlement organisation. The role of Falbygden within a larger economic and social network is one of the keys to understand the spectacular megalithic tombs of the area. Within the project, we use the latest isotopic and scientific approaches, along with archaeological, osteological and

botanical analyses to understand economy, landscape use, settlement organisation and regional networks. Fieldwork was conducted at the MN TRB settlement Karleby Logården in 2012–14 and the material is now under analysis. Preliminary results from the osteological analysis indicate an avoidance of wild animals, while also suggesting that pigs, cattle and sheep were raised and used in different ways. The analysis of macrofossils indicates that manure was used and possibly points towards the use of stable fields.

#### INTRODUCTION

The advent of farming in the Neolithic implies a broad range of new knowledge about cereal cultivation and animal herding, as well as the maintenance of breeding stock and the integration of local societies into larger entities. Despite having a profound effect on the use of landscape, social organisation and expression, many of these strategies remain poorly understood due to the difficulties in identifying them from archaeological remains, but not least owing to poor preservation and a lack of source material.

In this paper, we present some preliminary results from recent excavations at the MN TRB settlement site at Karleby Logården in Falbygden, Sweden. These excavations and ongoing analyses promise to shed new light on some of the long-debated questions regarding Neolithic subsistence and economy. The results will have bearing on the character of cultivation systems, e.g. the practice of shifting or stable cultivation,

as well as the practice of manuring and/or crop rotation. Other questions of importance are details of husbandry practices, such as slaughter patterns, the use of secondary products, traction, seasonal movements and the exchange systems of animals.

The importance of cultivation vs. husbandry is another longstanding issue. The material from Logården may contribute to this discussion by allowing better baseline values for interpreting isotopic values in human skeletons. Such measurements are already at hand for a large number of Neolithic individuals from the area, although the interpretations lack in precision since they are based on general assumptions on baseline values.

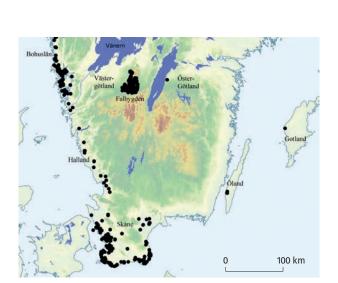
In turn, the answers to such questions have wider implications for issues like labour investment in means of production, access rules, inheritance and the possibility of development of unequal property holdings.

### **NEOLITHIC LIFEWAYS PROJECT**

In recent years, a number of Neolithic settlements have been investigated in Falbygden (e.g. Persson 1992). In particular, the Logården site in Karleby has given a rich material of animal bones, TRB pottery, macrofossils, flint and stone artefacts and building remains (ENGLUND/SJÖGREN 1994). Together with the

largely unpublished material from other excavations, this offers new opportunities for detailed analyses.

The investigations at Logården will be the focus for the recently-started project »Neolithic Lifeways« supported by the Swedish Research Council. The purpose of this project is to develop a new perspective of



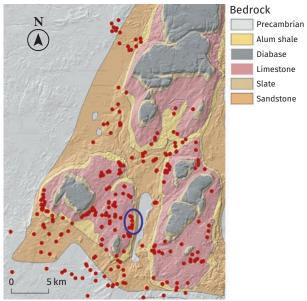


Fig. 1. Map of megalithic tombs in Sweden and Falbygden. The map to the left shows dolmens and passage graves in Sweden. The map to the right shows the passage graves on Falbygden and the bedrock in the area. Karleby is marked by a blue oval.

Neolithic economy on Falbygden in western Sweden as integrated into a regional network, as well as offering new aspects on agrarian economy and settlement organisation. The role of Falbygden within a larger economic and social network is one of the keys to understanding the spectacular megalithic tombs of the area. Here, we aim to use the latest isotopic and scientific approaches, along with archaeological, osteo-

logical and botanical analyses to understand economy, landscape use, settlement organisation and regional networks. Participants in the project are Karl-Göran Sjögren and Tony Axelsson (archaeology), Maria Vretemark (osteology), Malou Blank, Imelda Bakunic and Tony Axelsson (XRF analyses), T. Douglas Price, Alistair Pike (Sr isotope analyses and laser ablation) and Ulf Bergström (petrology).

### **MEGALITHIC TOMBS IN SWEDEN**

Falbygden is an area approximately  $50\times30\,\mathrm{km}$  in size, situated in the inland of west Sweden. The area holds many special properties: it is situated  $200-250\,\mathrm{m}$  a.s.l., which makes it distinct from the surrounding landscape. The landscape is relatively flat but cut up by low ridges, whereby the most prominent features are several flat top mountains rising up to  $300-350\,\mathrm{m}$  a.s.l. The bedrock comprises different sedimentary rocks such as limestone and slate, in contrast

to the surrounding areas, which are made up of Precambrian rocks, mainly gneisses.

Within Falbygden, there is a large concentration of passage graves. 260 of the 400 known Swedish passage graves are situated within this relatively distinct landscape, while only two dolmens are known. Otherwise, megalithic tombs are mainly distributed in southernmost Sweden and along the west coast, with only a few scattered occurrences in eastern Sweden (Fig. 1).

# SETTLEMENTS AT LOGÅRDEN, KARLEBY

In the mid-1980s, very little was known regarding settlement sites contemporary with the passage graves on Falbygden. Through a series of surveys and excavations, this gap was filled (SJÖGREN 2003). These investigations primarily focused on the characterisation and localisation of the sites by field walking and digging evenly distributed pits to retrieve artefacts that

could assist in placing the sites within the chronology of the Swedish Stone age. In a few cases, the topsoil was removed over a larger area. In these cases, several features such as pits and postholes were discovered, although not to the extent that it was possible to see shapes of houses or understand the spatial organisation within the sites. In Karleby parish, where

Logården is located, sixteen TRB sites as well as numerous sites from other periods were identified. The Logården site is one of four closely-spaced sites found on a terrace 300 m east of the passage graves in Karleby (ENGLUND/SJÖGREN 1994).

Over the years, there has also been extensive work on the organisation of the landscape, focusing on spatial relations between settlement sites and passage graves and their relation with the surrounding landscape, albeit not so much on the settlement sites (Persson/Sjögren 2001; Sjögren 2003; Axelsson 2010).

# The Logården site

The Logården site was located during the surveys in the mid-1980s. Initially, an intensive field survey was conducted, where all finds were individually measured with a total station. Through this, the find density in the area could be mapped and three distinct find clusters could be defined (Fig. 2).

In 1989, a first series of excavations was undertaken (ENGLUND/SJÖGREN 1994), revealing a rich cultural layer with bones, pottery, flint and stone artefacts from the MN TRB. Furthermore, a couple of postholes and a large pit (A2) with abundant finds of pottery, bones and cereals was found.

In 2012, it was time to look closer at one of the previously excavated sites. The primary aims of this campaign were to obtain a larger sample of animal bones and macrofossils, i.e. different types of charred grains from cereals and weeds, as well as removing the topsoil to locate postholes and other features in an attempt to understand the organisation of space within the site. The excavations were continued in 2013 and 2014. The area chosen for excavation overlapped the excavation from 1989 (see Fig. 3). From the previous excavations, the size of the site was pretty well known through the system of test pits. Moreover, the occurrence of cultural layer within the site was known, ranging from a few centimetres thick to 0.6 m. The site is located on a slope and the cultural layer is a mix of soil and artefacts moved down the slope through erosion and modern agricultural practice and layers deposited in place. Focus was placed on excavating the cultural layer in metre squares and  $10 \, \text{cm}$  layers. All soil was water sieved using a  $5 \times 5 \, \text{mm}$ net. A few metre squares were selected for flotation with the aim of retrieving macrofossil remains. In order to meet the second objective regarding the spatial organisation within the site, a focus was also placed on stripping and excavating areas upslope from the cultural layer. Overall, 279 square metres of cultural layer were excavated and 83 features classed as pits and postholes were discovered. Around 4m³ of soil was subjected to flotation, which resulted in 301 cereal grains. Overall, 30.2 kg of pottery was found along with 58.7 kg of animal bones and 42.6 kg of flint and stone artefacts. In addition, a geophysical survey of the site and the adjoining fields was performed by the Deutsches Archäologisches Institut in Berlin. The results of this work will be evaluated by fieldwork in the next few years.

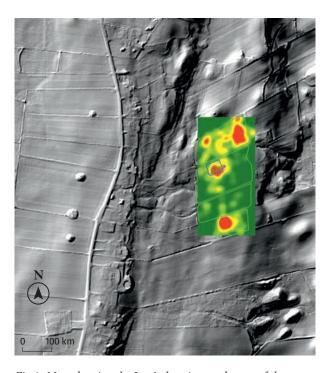


Fig. 2. Map showing the Logården sites and some of the passage graves in Karleby.

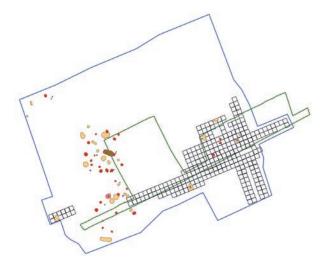


Fig. 3. Excavation plan. The 2012–14 excavation area is marked in blue, the 1989 excavation area in green. Postholes are red and pits are orange.

# Houses

The excavations were a success in many ways. One especially important aspect was the discovery of two (possibly three) Neolithic houses within the site. As mentioned above, previous excavations had revealed postholes, albeit not to the extent that made it

possible to reconstruct structures or buildings. There are no previously known Neolithic houses from the area and thus a lack of reference materials.

Two of the houses on Logården were round, approximately 10 m in diameter. Despite generally being similar, there are some differences in construction and probably in dating (see below). The northern house is

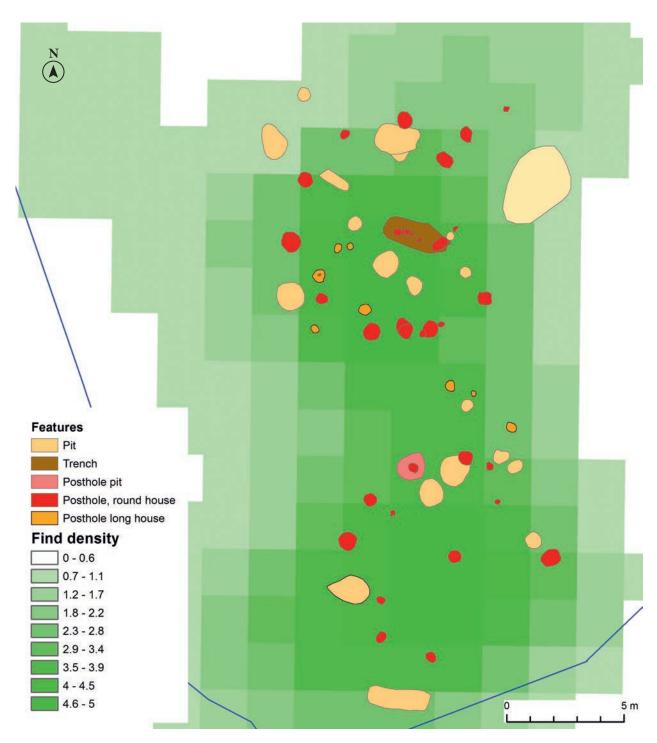


Fig. 4. Plan of houses, with find density in  $2 \times 2$  m squares.

built with deep set and large posts, in a couple of cases with stone lining. In the interior, a short ditch was found, which had a series of postholes in the bottom. One of these posts marks the centre of the post circle and this short row of posts probably had a roof supporting function.

The southern house had a somewhat lighter construction with smaller posts. The roof-bearing construction was also different: it had a substantial central post and inside the walls at least three smaller posts were distributed evenly.

No clear entrances could be found in any of the houses. It is notable that finds in the cultural layer in this area quite closely correspond to the houses (Fig. 4). The vertical setting of the posts and the indications of roof-bearing constructions lead us to classify these structures as houses, rather than timber circles or huts.

In the Swedish Neolithic, the expected house type is a long house. Such houses are well documented all through the Neolithic in both Sweden and Denmark. Usually, they have a central row of roof-bearing posts, as well as lighter wall posts marking a rectangular or oval outline. A closer look at the excavations carried out in Scania in the last ten years reveal that there are also several examples of round structures, even if they are accompanied by rectangular structures (EDRING 2007). On Bornholm (Vasagård, Rispebjerg, Grødby), excavations have revealed similar round structures, dated to the late TRB. For instance, at Rispebjerg at least 24 round constructions have been located (NIELSEN et al. 2014). The function of these houses is unclear. In many cases, they have been interpreted as ceremonial timber circles or platforms rather than ordinary dwellings.

The third house is not complete but comprises a ca. 11 m long row of postholes in NW-SE direction, possibly roof-bearing posts in a two-aisled long house. A few possible wall posts were also documented. Since it overlaps the northern round house, it cannot be contemporary and the single radiocarbon date from it supports a slightly earlier date for the long house.

## **Pottery**

The pottery from the Logården site is what can be termed as typical Middle Neolithic TRB pottery and the composition is well known from previous excavations in the area. Most of the known pottery from Falbygden is found either on settlement sites or outside the entrances of the passage graves, while bog deposits are not known (PERSSON/SJÖGREN 2001). The pottery outside the passage graves has more elaborate decoration and the vessels are generally smaller and more thin-walled than those found on settlement

sites. Settlement pottery is more varied and includes pots of larger sizes, with thicker walls and simpler and more standardised decoration.

The pottery from Logården has not yet been studied in detail. The main category is large or medium-sized

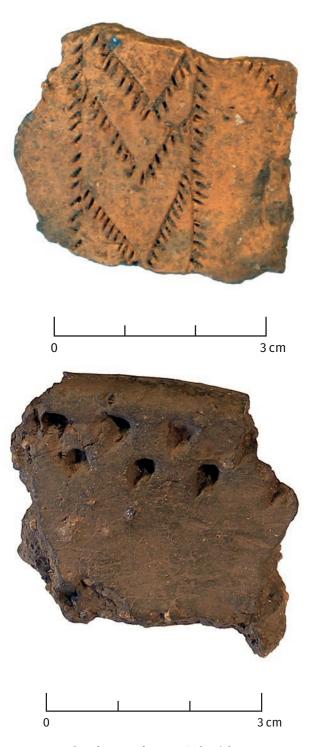


Fig. 5. Examples of pottery from Logården (photo: Tony Axelsson).

funnel beakers, although there are also examples of bowls and pedestalled bowls. Some of the small, thin-walled beakers have elaborated brims and may be classed as brim beakers, similar to those common in Scania (BAGGE/KAELAS 1950-52). The decoration varies: on the larger funnel beakers, vertical belly lines, horizontal rows of pits and impressions and zigzag lines are common, whereas more elaborate vessels may have filled bands with crosshatching or chevrons, while filled triangles, lozenges and chessboard patterns occur. The techniques include drawn lines, furchenstich and tooth and comb stamps. Based on typological comparisons with south Scandinavia, most of the pottery can be paralleled with MN A I-IV styles. No clear EN TRB shards have been identified to date. In one of the postholes of the northern round house, large parts of a very thick-walled, undecorated pot were found, possibly similar to MN V (Store Valby) pottery. Furthermore, a few sherds more reminiscent of Pitted Ware pottery were found. From later periods, only a couple of probable Iron Age shards were found.

A sample of the pottery from the excavation will be subjected to XRF analysis in an attempt to determine whether the pottery — or parts of the material — is made locally or has an origin in another place.



Fig. 6. One of the flint axes found at Logarden (photo: Axelsson).

#### **Animal bones**

A large material of burnt and unburnt animal bones has been retrieved. Most of this is to be seen as food waste, although there are also a number of artefacts such as bone awls, needle points, etc. There are also a few instances of bones decorated with geometrical patterns such as triangles and crosshatching, similar to the decorations found on pottery. The bone material will be discussed further below.

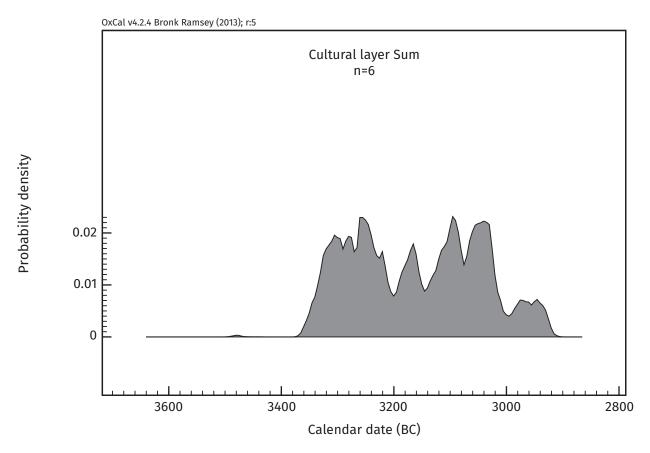


Fig. 7. Summary graph of cereal datings from the cultural layer.

### Flint and stone artefacts

A variety of materials have been used at the site, the most common of which are flint, quartzite and quartz. Diabase, granite, porphyry, sandstone and slate are also present in smaller quantities. As is the case with the bone material, the stone and flint material is highly fragmented and the majority comprises small splinters and flakes.

The most common artefact types are axes and different kinds of scrapers. The number of arrowheads is low, with only five transverse arrowheads found. Furthermore, there are a few borers and chisels. Both thinbutted and thickbutted axes occur, supporting an extended period of use. Axes are made from various materials. Flint, diabase and other rocks occur, with some material probably locally found.

Flint is not found in the local bedrock; indeed, the closest source of high-quality flint is in Scania. The Cambrian flint found in Kinnekulle – some 50 km to the north – has been little used in this period, although it is abundant on late Mesolithic sites. Moreover, the beach flint found along the west coast also does not seem to have been used. The flint is generally of high quality and probably originates in south Scan-

dinavia. It may have been imported as finished axes or preforms, or even as unworked nodules.

Since flint was an imported material, it has been used as much as possible. Broken flint axes have been used as raw material and flakes and other flint waste often show traces of polished surfaces. The only cores that can be identified are very small, bipolar cores, representing the last stage of flint reduction. Flakes made in bipolar technique are also very common. Overall, the flint technology is rather basic. Very few indications of blade production can be seen and the technology seems to be mainly based on flakes, used for scrapers, borers and other small tools, although a couple of blade scrapers were also found. Flint axes seem to have been imported in a finished state, or possibly as preforms. This rather simple flint technology is typical for the west Swedish TRB, in both inland and coastal locations.

Quartzite is mostly found in the form of waste and has been mainly used for making small tools such as scrapers, although it was also used for hammer stones and polishing stones. Quarts also seems to have been used for small tools, although no actual tools have been identified to date. Other material was used for a variety of purposes; for instance, hammer stones, grinders and polishing stones.

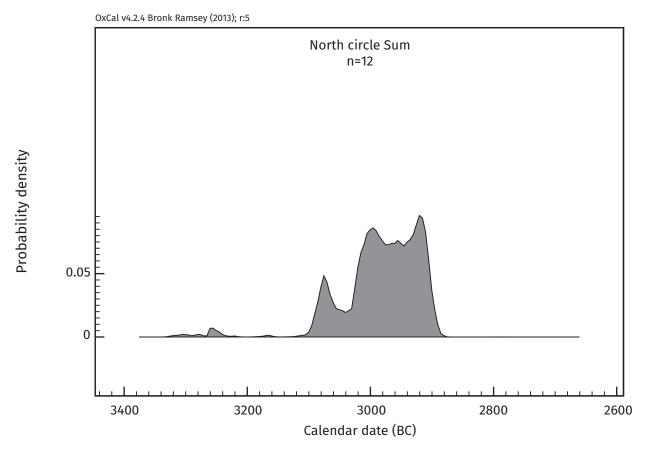


Fig. 8. Summary graph of cereal datings from the northern round house.

# **DATINGS**

Datings have mainly been performed on cereal grains to date, whereby 27 grains have been dated. With two exceptions – namely the shallow pits mentioned below – the dates are well clustered around 3000 cal BC The six dates from the cultural layer suggest activity stretching over a couple of hundred years, starting at ca. 3300 cal BC and ending around 2900 cal BC (Fig. 7). This agrees well with the typological dating of pottery and axes found at the site, suggesting activity during most of the MN A period. However, it should be remembered that the calibration curve shows a plateau at ca. 3300–3000 cal BC, whereby the period of activity could in fact be shorter.

On the other hand, the twelve datings from the northern round house are concentrated to the final phase of activity and it should probably be dated at ca. 3000–2900 cal BC (Fig. 8). From the southern house, only two dates are available, suggesting a dating similar to that of the northern house, although possibly slightly earlier. In any case, both round houses seem to have been constructed in the final phase of activity at the site. A similarly late date is indicated by two dates from the large pit A2, excavated in 1989. For the possible long house, only one date is available, suggesting that this construction is probably somewhat

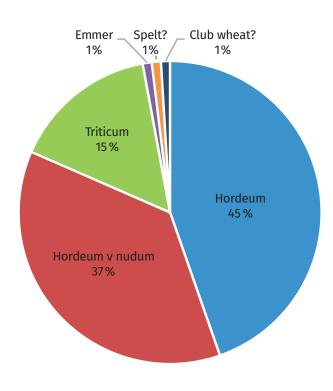


Fig. 9. Proportions of identified cereal grains (n=105).

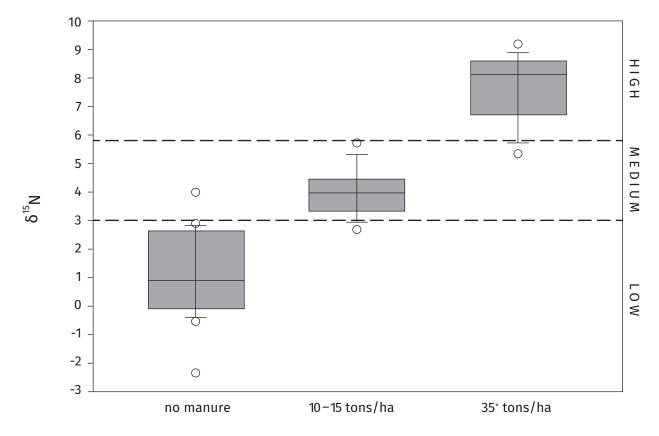


Fig. 10. Results from long-term experiments at Rothamsted, Askov and Bad Lauchstädt (BOGAARD et al. (2013)).

earlier than the round houses. Finally, two shallow pits with black, charcoal-rich filling were dated to the Iron Age and the historic period, respectively.

It should be mentioned that an earlier series of datings made on animal bones suggest an earlier start of the settlement, already in the last part of the EN (ENGLUND/SJÖGREN 1994). Further work will be conducted to evaluate whether these dates can be trusted. Moreover, two bones of horse have been dated: one to the early Bronze Age and one to the historic period.

In sum, the available datings suggest a main phase of activity at the site during the MN A, with only minor indications of activity during the Bronze and Iron Ages and the historic period. The main phase of use coincides with megalith building in the region and probably continues after most passage graves were built (syögren 2011). Regarding the round houses, they probably post-date the period of megalith building (although use of megaliths continued, of course).

#### **MACROFOSSILS**

In the new excavations at Logården, systematic efforts have been made to recover charred cereals and weeds through flotation, something which has hitherto rarely been applied at Swedish Neolithic sites. While all excavated soil from the cultural layer and the structures was subject to water sieving, a selected number of squares as well as all structures classed as postholes were flotated.

Overall, the flotated soil amounts to ca. 4 m³. The flotated material was analysed at the Laboratory for Environmental Archaeology, Umeå University by Karin Viklund.

The result of the analyses was that 301 charred cereals could be identified, while the occurrence of weeds was very low, whereby only a few weeds could be identified. It is also notable that no threshing remains were identified. The density of cereals in the cultural layer was rather low, in the lower parts of the cultural layer up to ca. 7 grains per 100 l. By contrast, some of the postholes – particularly in the northern circle – showed

much higher densities of charred cereals. Pit A2 from 1989 showed a very high frequency, ca. 660 grains/100 l, although here only 6 l was sampled.

Many of the cereal grains were rather eroded and difficult to determine to species. Of the 105 determined grains, barley was predominant and in cases where closer determination was possible, they could be determined as naked barley (*Hordeum vulg. nudum*). By comparison, wheat grains were rather few, whereby only nineteen grains could be determined as wheat. In some cases, closer determination was possible, showing the occurrence of emmer and possibly both spelt and club wheat. Einkorn was not identified.

Despite not being exceedingly large, this sample adds a valuable material to the sparse number of Neolithic cereals already known. The predominance of barley in this northern region of the TRB has been noted earlier (SJÖGREN 2003; KIRLEIS et al. 2012) and is supported by the new data. They also supply short-lived dating material and samples for nitrogen isotope analyses.

### Δ15N AND CULTIVATION PRACTICES

Through the work of Bogaard et al. (2013) and Kanstrup et al. (2014), in recent years it has become clear that  $\delta^{15}N$  values in plants – including cereals – are influenced by cultivation practices, in particular manuring of agricultural fields. This effect has been studied experimentally by analysing cereals cultivated under different regimes at various long-term experimental farms, such as Rothamsted, Askov and Bad Lauchstädt. Thus, a model has been developed, connecting the amount of manuring with  $\delta^{15}N$  values in plants (Fig. 10). Furthermore, it has also been experimentally shown that this effect remains in charred cereals, albeit with a slight raise in  $\delta^{15}N$  values of up to 1 ‰ (Kanstrup et al. 2012).

Opinions of the character of TRB cultivation have varied from long fallow (swidden) cultivation with no manuring (IVERSEN 1941, 1949; STEENSBERG 1979) to more intense, stable forms including ard ploughing

and manuring (ROWLEY-CONWY 1981; SJÖGREN 2003). Therefore, the possibility to gain a more direct insight into this question through nitrogen isotopes is highly interesting.

To date, nineteen Hordeum grains have been analysed for  $\delta^{15}N$ . Measurements were conducted at the Chrono lab in Belfast. In contrast to some other studies, measurements have been performed on single grains, but not on bulk samples. The results are summarised in figure 11. The values have been corrected for carbonisation effect by subtracting 1 %, which gives a conservative corrected value. As can be seen,  $\delta^{15}N$  values are variable, ranging from low to medium values according to the model of Bogaard et al. The mean value is 3.4 % and ca. 75 % of the values are in the medium range according to Bogaard et al. (2013), with a single outlier in the high range.

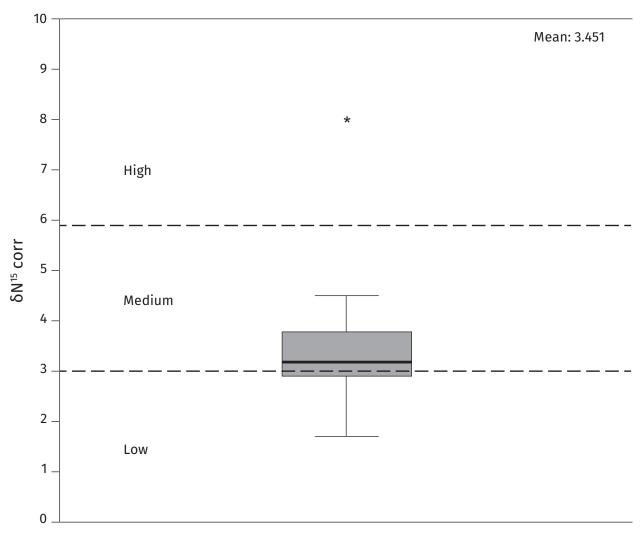


Fig. 11. Box plot of  $\delta^{15}N$  in 19 Hordeum grains from Logården. Values corrected for charring.

We suggest that these analyses indicate that manuring was in fact added to these fields, although probably in varying and – in most cases – not extremely large amounts. This also indicates the existence of long-term cultivation plots, since the practice of manuring implies long-term investment in a particular field. Variation in growth conditions also seem probable. Manure would have likely been a limited resource, preferably

applied to certain fields, while others may have been more extensively cultivated. Variation in  $\delta^{15}N$  levels could thus reflect factors such as distance from the settlement area or the length of time for which different plots have been manured. It should also be remembered that some variation is due to variation within the plants, whereby different grains from the same field do not necessarily show identical isotope signals.

#### **ANIMAL BONES**

Another main result from the excavations is the recovery of a large animal bone sample. This material is currently under study by Maria Vretemark, Västergötlands museum, although we can present some preliminary results here, based on about 95 % of the material.

The bones are completely dominated by domestic species (Fig. 12). Forest animals, fish, birds and small animals (porcupines, rodents, etc.) are only marginal.

It is notable that large forest animals like red deer and elks hardly occur at all, with the former only occurring in the form of antlers.

Figure 13 shows the representation of different domestic animals. The prominent position of pigs is notable. Judging by the size, most of these are probably domestic, whereby only one wild boar has been identified to date. The dog bones reveal some undisputable

# Identified animal groups, NISP

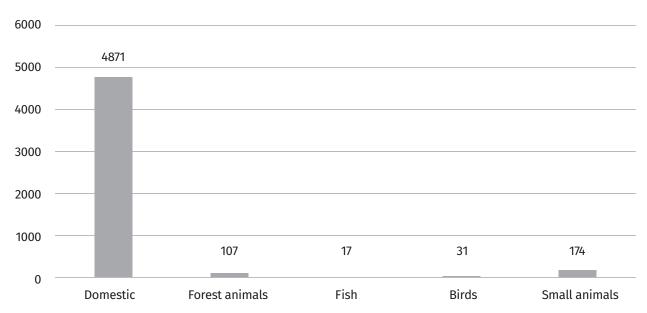


Fig. 12. Representation of broad animal groups.

# Domestic animals, NISP

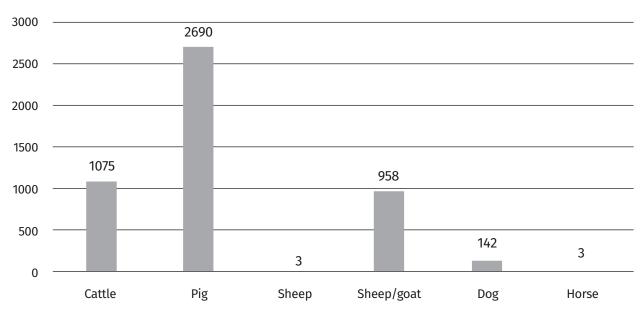


Fig. 13. Representation of domestic animals.

cutmarks, suggesting that dog meat was occasionally part of the diet. The horse bones are likely late intrusions, given that one of them has been dated to the historic period and one to the Bronze Age.

The subsistence economy of MN TRB in Falbygden thus seems to be fully domestic, depending on a combination of cultivation and husbandry, while wild resources largely seem to have been left unused. This is a pattern repeated at other sites in Falbygden as well as

southern Sweden (sjögren 2003). By contrast, in eastern Sweden, the largely contemporary PWC develops a very different lifestyle based on hunting and fishing, with only a minor agricultural component.

The rather well-preserved bone material at Logården will also allow deeper insights into middle Neolithic husbandry practices such as slaughter patterns. Preliminary data suggests that pigs were slaughtered rather young, at about the time when they were full-grown.

On the other hand, cattle and sheep normally reached older ages. This presumably reflects different kinds of orientation: pigs were probably raised mainly for meat while cattle and sheep were also kept for secondary products such as milk and/or traction.

Differences between pigs and other domestic animals are also revealed in studies of mobility. In an earlier study (SJÖGREN/PRICE 2012), it could be shown that more than 50% of cattle found at settlements in Karleby were born and raised outside Falbygden, while

a similar figure applied to sheep. On the other hand, pigs were almost exclusively local. In the ongoing project, we aim to follow up on this aspect conducting Sr isotope analyses on a larger sample, as well as laser ablation on a selected subset of teeth to gain a more detailed picture of mobility.

Hopefully, this will allow us to approach questions of local vs. non-local subsistence, regional exchange patterns and different economic circulation spheres.

### HUMAN DIET AT THE FRÄLSEGÅRDEN PASSAGE GRAVE

Settlement material alone is insufficient to answer all questions about Neolithic subsistence economy, such as the issue of the importance of cultivated plants vs. husbandry. For this purpose, we may turn to direct measures of diet through isotopes in human bones, which are abundant in the megalithic tombs of the area. This question has recently been discussed based on material from the Frälsegården passage grave in Gökhem, ca. 10 km to the west of Karleby (SJÖGREN/PRICE 2013; SJÖGREN 2015).

We will briefly summarise these results.  $\delta^{13}C$  values in collagen suggest terrestrial protein sources with no marine contribution, as expected in this inland area. High collagen  $\delta^{15}N$  values suggest protein sources from a high trophic level. This could indicate animal (meat or milk products) or fish consumption, although the values could also be elevated through cultivation practices, as noted above. Any large contribution of freshwater fish is unlikely, as the results from Logården indicate. To further analyse this issue, we need better insights into the isotope values through the food chain.

At Frälsegården,  $\delta^{13}$ C was also measured in tooth enamel, as this is a measure of the whole diet rather than simply the protein component reflected in collagen values. Based on studies on animals, it has been suggested that the difference between enamel/apatite δ13C values and collagen values can be used to estimate the proportion of vegetables vs. meat in the diet. Carnivores generally show low difference (< 4.5 %) in  $\delta^{13}$ C between apatite and collagen, while the difference is higher in omnivores and particularly herbivores. At Frälsegården, mean δ<sup>13</sup>C in enamel was measured at ca. -14% and the mean difference between enamel and collagen values at ca. 6.5 %. This suggests a substantial input from vegetable sources into the whole diet, even if proteins may have preferably taken from animal sources. It should be remembered that vegetable food sources probably included a range of different species in addition to cereals such as turnips, carrots, peas, beans, etc., which are difficult to identify archaeologically.

### SOME CONCLUSIONS

The project is planned to end in 2018 and the results are preliminary since we are awaiting further results. The tendencies thus far are:

• Emphasis on domestic foods, avoidance of the wild. The two-thirds of the bone material that has been analysed strongly suggests that wild animals were marginal and hardly contributed as food sources. However, they may have been significant in other respects. For instance, bones (teeth) from wild animals like bear and wolf are known from the passage graves, used as different types of pendants. Even if the wild fauna was not important for food, some animals may have had a symbolic value. Moreover, our samples of macro fossils indicate an avoidance of wild plants.

- Differential use of domestic animals. The results that we have obtained thus far indicate that pigs were mainly raised for meat, slaughtered as young individuals and consumed locally. By contrast, cattle and sheep had multiple uses and were also raised to provide secondary products such as milk and traction.
- Different circulation patterns of domestic animals. The results from previous strontium analysis show that the animals played different roles in wider economic systems. The sheep and cattle are largely part of regional circulation systems: the results to date indicate that 50% of the animals were raised outside Falbygden. The situation for pigs is different, whereby they were raised and kept locally.
- Regional economic system. The different types of circulation lead us to understand that the Falbygden

area — earlier looked upon as isolated, defined by the occurrence of passage graves — in fact is part of a larger economic system. This system operates on different levels, with flint from Scania and cattle and sheep from west Sweden. Other studies (SJÖGRENet al. 2009) also indicate a circulation of people. These results together prompt us to conclude that the societies on Falbygden were part of several economic networks where livestock, raw materials and humans were circulated.

• Stable, long-term cereal cultivation. Our analyses of macrofossils indicate the use of manure, which leads us to conclude that the fields were used repeatedly and for a long time. We are dealing with a society organised in a way that enabled long-term investment in both fields and livestock, which sustained large social and economic networks.

#### **ACKNOWLEDGEMENTS**

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# Changing environments in a megalithic landscape: The Altmark case

Sarah Diers, Barbara Fritsch

#### **ABSTRACT**

Recent studies about Neolithic population in the Altmark region (Germany, Saxony-Anhalt) display a differentiated pattern of the development of human settlements, the importance of megaliths and the influence of environmental changes between c. 4000 and 2200 BCE. During the Funnel Beaker period (FBC) the Altmark Tiefstich Group constructed multi-phased megalithic tombs of different types. After 2800/2500 BCE economy and society changed during Single Grave period, but megaliths were still in use for different social practices.

Pollen-analytical results of the Western and Southern Altmark were synchronized with the distribution of dated archaeological sites and excavations of two megalithic tombs. Clear signs of intensified landscape use show up during known construction and usage periods of megalithic tombs. Furthermore clearer signs of anthropogenic influence on the environment in the course of the Single Grave Culture (SGC) correlate with an increase in archaeological sites. Both data sets correlate well and indicate changes in the use of the megalithic landscape between the Funnel Beaker Tiefstich group and the Single Grave groups in the Altmark.

#### INTRODUCTION

### Characteristics of Neolithic landscape

Investigating landscape changes and their implications in the Neolithic one first has to come across a definition of »Neolithic Landscape« or at least what can be expected to have existed from the state of the art of research. First of all, the position of the authors concerning the discussion between the grazing hypothesis (VERA 2000) and the primeval woodland hypothesis which most palynologists support lies at the woodland theory; this is due to the fact that recent investigations and models (e.g. NIELSEN et al. 2012; FEESER et al. 2012; DÖRFLER et al. 2012) show a rather closed canopy for the late Mesolithic and Neolithic for Northern Central Europe which is less dense near the coastal areas. We consider the opening of prevailing woodland cover, woodland economy, cultivars, weeds, livestock, fallow land, settlements and dwellings, ritual sites – amongst them especially graves in form of megalithic tombs – and other signs of human activity as single finds and stray finds as possible factors of Neolithic landscape in the research area.

# Research area

The Altmark in Saxony-Anhalt is situated in the North German plain just North of the lower mountain range and the Middle Elbe-Saale-Region (Fig.1). The area has a maximum extension of c. 70 x 70 km. The river Elbe forms the border of the landscape unit in the North and East. Its relief was formed by the Saalian glaciation; sander and old drift moraine dominate the soils, which are more fertile in the less hilly eastern part.

The Eastern Altmark has better archaeological sources than the Western Altmark: more and better preserved settlements, better preservation conditions for bones. Unfortunately, there is no pollen diagram in this area. Therefore, we concentrate on the western half of the Altmark to be able to draw an integrated picture of the timespan between 4000 and 2200 BCE.

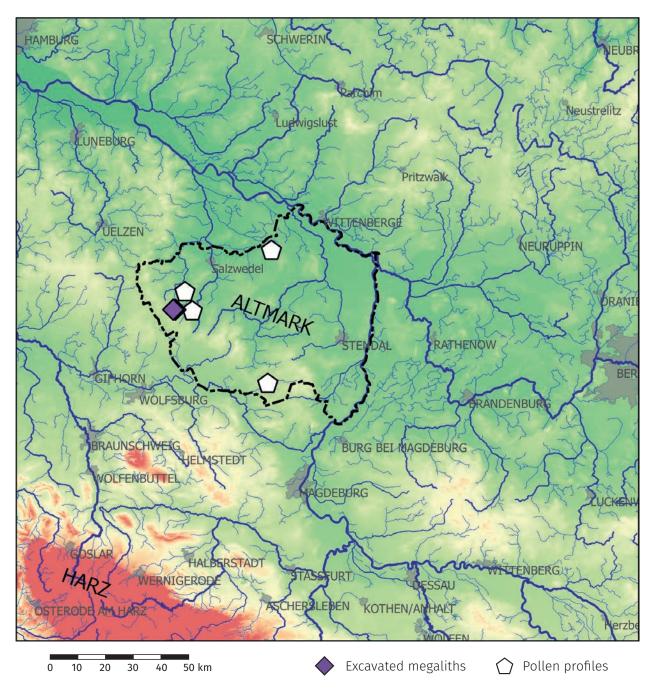


Fig. 1. Geographical setting and focus.

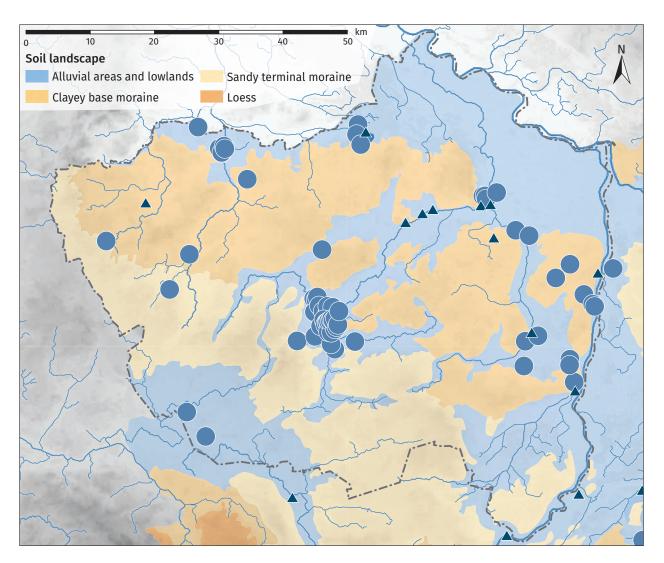
# Focus: Changes and developments from FBC to SGC in the Altmark, Germany

The goal of this article comprises the broad topic on changes and/or developments from the Funnel Beaker Culture (FBC) to the Single Grave Culture (SGC) in the Altmark landscape. Specifically, the question of the position of Megaliths in the landscape and their usage phases will be tackled. This shall be established by means of vegetation history and archaeology alike: palynologically proposed landscape phases of different human impact will be discussed in combination with distribution maps of the known archaeological sites and finds. The combination of both data sets reveals FBC and SGC activity phases between 4000 and 2200 cal BCE which will be discussed.

# CULTURAL CLASSIFICATION AND POSITION OF FBC AND LATE NEOLITHIC IN THE ALTMARK

The Mesolithic in the Altmark region (Fig. 2a) is not really dated till now. Probably it was partly contemporary with the FBC. In 1967, Volker Töpfer published an article about the Paleolithic and Mesolithic settlement of the Altmark (TÖPFER 1967). Except one small stick of wood from underwater investigations in the Lake Arend, which was dated at the end of the 9th millennium (LEINEWEBER et al. 2011, 175 tab. 14.1;

LEINEWEBER/LÜBKE in press), only surface sites are known—either single finds of deer antler axes, bone harpoons or flint axes (Kernbeile) or scatters of flint artefacts and microliths (TÖPFER 1967; OA LDA). The sites are mostly distributed in lowlands, near lakes (Lake Arend or Kalbescher Werder, nowadays a lowland which was still a lake in Mesolithic time; TÖPFER 1967, 40) or along small rivers (Fig. 2a).



# Mesolithic

▲ Single find

Settlement

Fig. 2a. Altmark: Mesolithic sites.

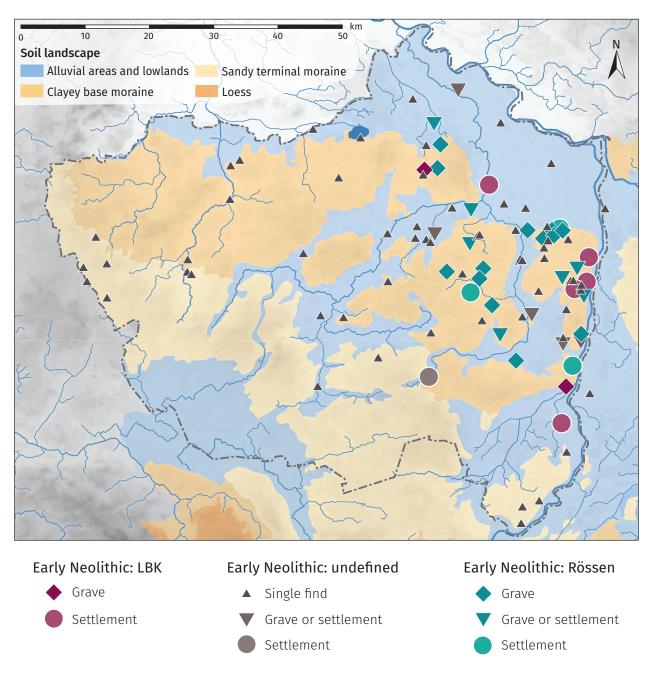
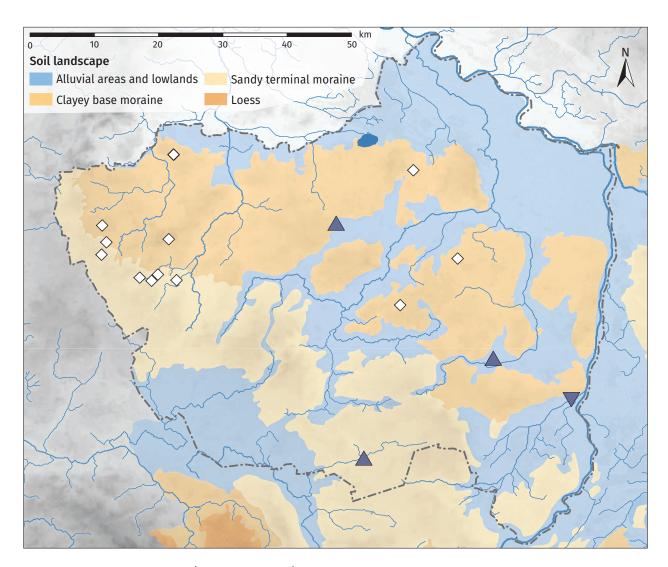


Fig. 2b. Altmark: Early Neolithic sites.

During the early Neolithic (Linear Pottery culture/LBK and Rössen culture) we find several settlements and necropoles only in the Eastern Altmark on the higher terraces along the river Elbe (Fig. 2b). Seven LBK-sites and 25 Rössen sites (settlements and

graveyards) are situated along river terraces and riverside elevations; single finds of adzes and early Neolithic axes we find in the whole region (WETZEL 1964; 1966; OA LDA).



# Early Middle Neolithic (4200 - 3650 BC)

- ♦ Urdolmen?
- ▲ Single find
- ▼ Settlement or grave (Baalberge)

Fig. 2c. Altmark: Early Middle Neolithic sites.

During early Middle Neolithic (i.e. early FBC) we have only some evidence (Fig. 2c): there are very early dates from Lüdelsen 6 for a none-megalithic mound (MÜLLER et al. 2014, 171–175, fig. 5, LIST 2: KIA-43282: 4795+-37 BP; KIA-41750: 4776+-31 BP; KIA-49352: 4720+-30 BP); two copper flat axes from Letzlingen

and Lübbars (MITTAG 2015), and probably some early dolmen (Urdolmen), which are demolished for more than 100 years, were built probably before 3650 BCE or during landscape phase 1 (DANNEIL 1838; KRAUSE/SCHOETENSACK 1893).

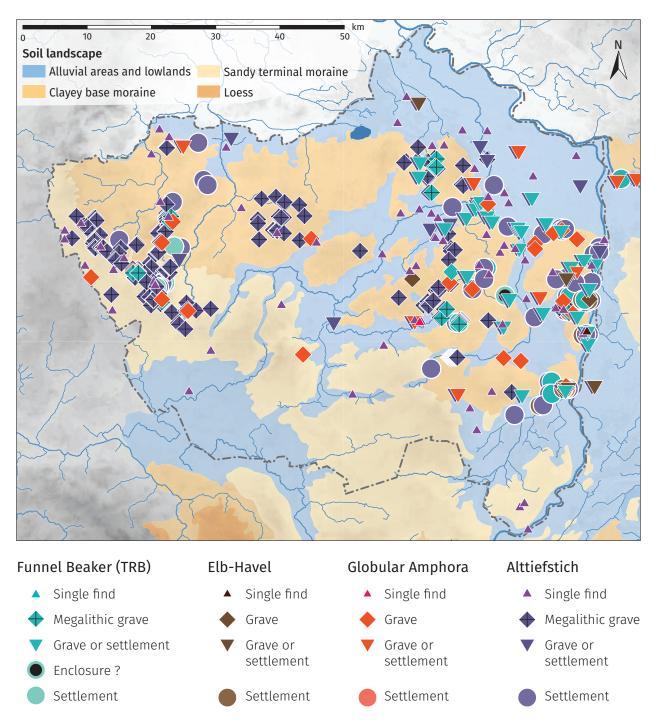


Fig. 2d. Altmark: Funnel Beaker Culture.

During the time of Funnel Beaker Culture (i.e. »Altmärkische Gruppe der Tiefstichkeramik«, early Globular Amphora, Elb-Havel Culture) there are also different pattern in Eastern and Western Altmark (Fig. 2d): The Western Altmark shows most of the megalithic monuments but only some settlements, which we can only identify by numerous finds of

flint-artefacts and Tiefstich-sherds in cultural layers of settlements (which are mostly destroyed), whereas the eastern part of the Altmark is characterized by a much lower number of megalithic graves (which are mostly destroyed), but we find more and wider spread settlements with pits and cultural layers (PREUSS 1980; BOCK et al. 2006).

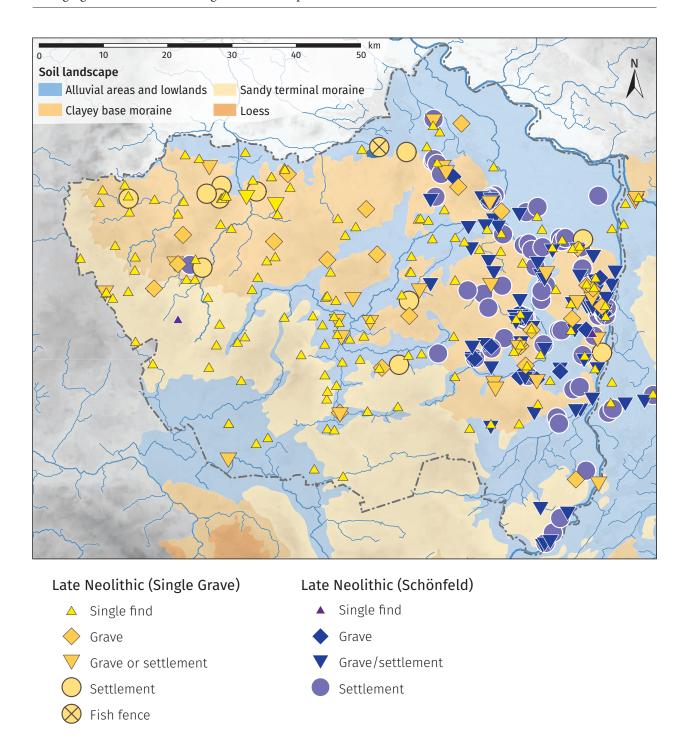


Fig. 2e. Altmark: Late Neolithic.

The Late Neolithic again shows different patterns in Eastern and Western Altmark (Fig. 2e; fritsch/diers in press). In the western part there are mostly single finds of axes (either lost finds or destroyed graves), some graves (mainly cremations, but probably also inhumation graves that didn't survive because of bad bone-preservation) of Single Grave Culture,

only small graveyards (BERAN 1990). Eastern Altmark shows the same distribution of Single Grave Culture (mostly single finds of axes), but in contrary to the western part many contemporary settlements with pits and cultural layers and graveyards (cremation cemeteries) of Schönfeld culture. Single finds of Schönfeld are mostly single sherds (WETZEL 1979; OA LDA).

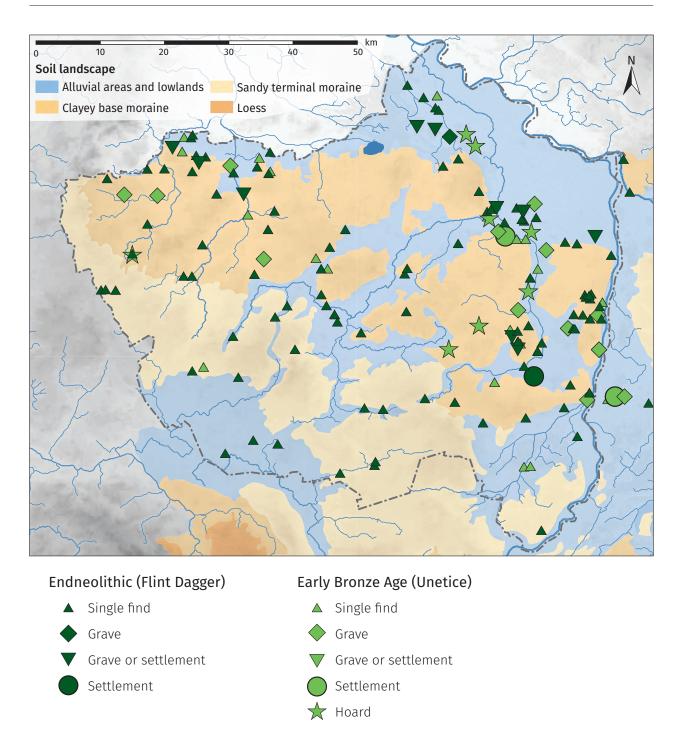


Fig. 2f. Altmark: Endneolithic and Early Bronze Age.

The time after 2200 BCE (Endneolithic) is marked by mostly single finds of flint-daggers; sometimes we find more than one artefact on one site – perhaps a sign for destroyed graves (OA LDA). They show a scattered distribution, only along the river Elbe they seem to avoid the alluvial areas (Fig. 2f). Probably more or less contemporary Early Bronze Age sites contain mainly single finds of bronze flanged axes, some single graves and – mainly in the Eastern Altmark – Uneticehoards and graveyards (MITTAG 2018; ZICH 1996).

# EXCAVATIONS OF THE MEGALITHIC GRAVES LÜDELSEN 3 AND LÜDELSEN 6

The Project »Megalithic Landscape Altmark« ran from 2007 until 2014 and was initiated by Kiel University and the state heritage department of Sachsen-Anhalt (LDA Halle/Saale). It was focusing on the Western and Southwestern Altmark for vegetation history and investigated a micro-region in the West archaeologically by means of excavations (Fig. 3).

The micro-region of 15 per 15 km with more than 40 well known tombs (most of them demolished) was chosen for a detailed archaeological analysis (Fig. 4). The results of two megalithic tombs excavations were

integrated into a chronology system for the Funnel Beaker Tiefstich pottery (MÜLLER et al. in prep.; MÜLLER 2015). They are the first absolute-chronological dated Funnel Beaker sites in the Altmark region. Especially the intensive sampling and analysing of botanical macro-remains helped in the absolute-chronological dating. The results of the excavations are in short as follows (for more detailed reports see DEMNICK et al. 2011, DIERS et al. 2009, DIERS 2014, DIERS 2018, MÜLLER et al. 2014).

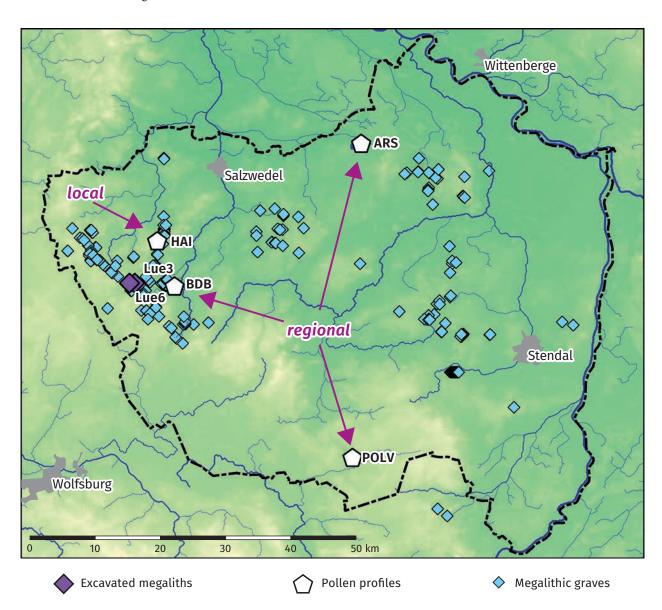
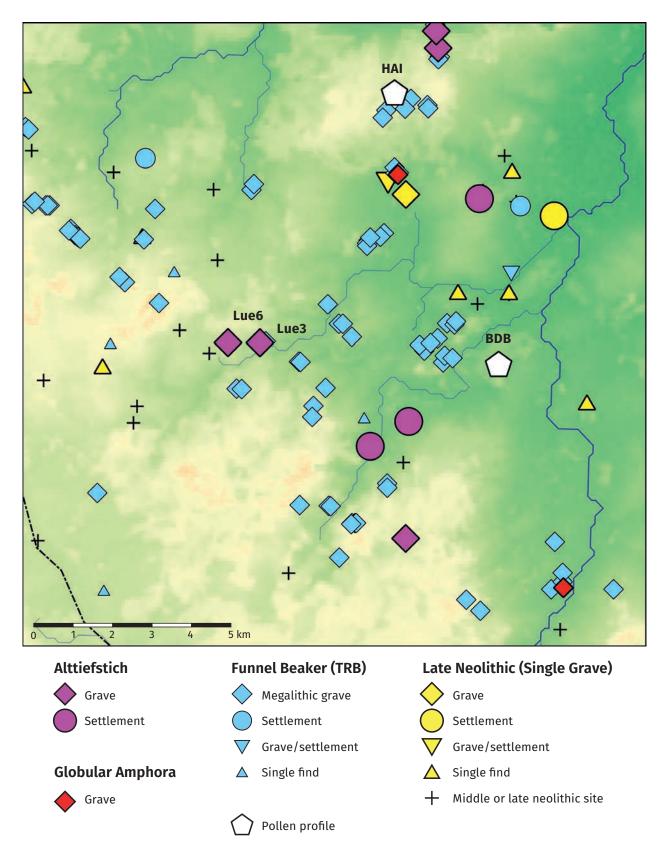


Fig. 3. Altmark: Geographical setting. ARS: Pollen diagram Arendsee; HAI: Pollen diagram Haidberg; BDB: Pollen diagram Beetzendorfer Bruch; POLV: Pollen diagram Polvitz-Letzlingen; Lue3: Megalithic grave Lüdelsen 3; Lue6: Megalithic grave Lüdelsen 6.



 $\textit{Fig. 4. Microregion L\"{u}delsen, extent of 15\,km^2. Neolithic sites and the location of pollen profiles are given (see caption).}$ 

# Dolmen Lüdelsen 3

Around the Dolmen chamber with entrance stones several pits with pottery of different age were found (Fig. 5). Within the still partly preserved mound two hill phases could be distinguished, accompanied by a circular stone enclosure around the older and smaller hill which ended at the entrance (Figs. 5–6). A complex building structure for the first monumental phase is evident.

Radiocarbon dating (DIERS 2014, tab.A.2) revealed first activities at the site before 3600 cal BCE in the

form of depositions in a pit, chronological before the construction of the grave, followed by the chamber with first mound and stone enclosure and at least one following funeral in the 36<sup>th</sup> century BCE. The first mound had a size of app. 8 m in diameter.

Large scale restructuring took place in the 25<sup>th</sup> century BCE by Single Grave people: They emptied the chamber (more thoroughly in the part nearer to the entrance) and at least one funeral took place; furthermore, the mound was enlarged to more than 20 m diameter with only slightly higher elevation than the original mound.

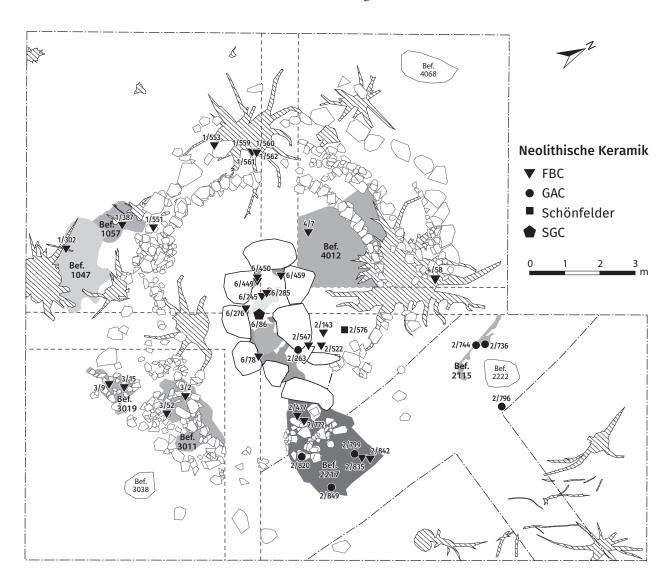


Fig. 5. Lüdelsen 3: Plan of the Megalithic Tomb with the chamber, enclosure made of stones, and mapped Neolithic pottery. FBC: Funnel Beaker Culture; GAC: Globular Amphora Culture; SGC: Single Grave Culture (graph: D. Demnick, translated from Demnick et al. 2011, 252 fig. 13).

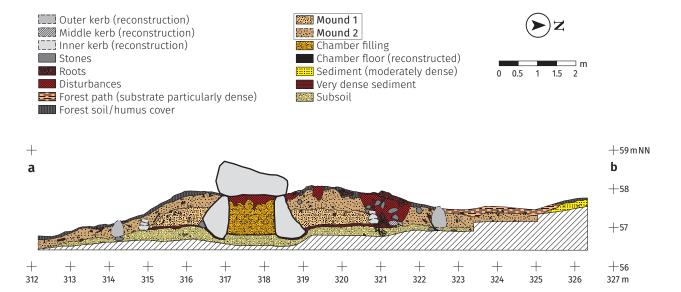


Fig. 6. Lüdelsen 3: Profile facing West with two hill phases, chamber, reconstructed enclosure, and disturbances (red in half tone) given (graph: D. Demnick, partly translated variation of DEMNICK et al. 2011, 246 fig. 10).

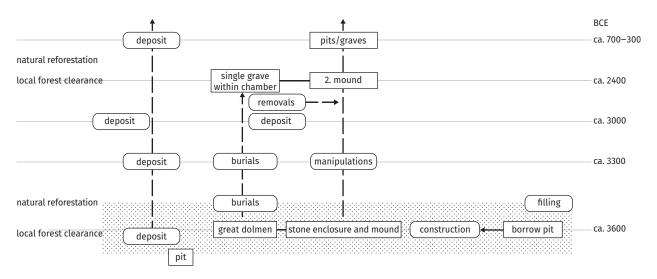


Fig. 7. Lüdelsen 3: Course of Neolithic and younger events and construction activities. In half tone: occurrences during the tombs' construction phase which can be differentiated, but could have happened in a relatively short succession as well (translated from: Demnick et al. 2011, 291 fig. 34).

Apart from the Neolithic evidence there are signs of further activities in pits and stray finds in late Bronze Age, Iron Age and modern times (Fig. 7).

## Non-megalithic mound and passage grave Lüdelsen 6

The today visible passage grave with trapezoidal enclosure of large kerbstones of 35 m length and at least 8 m width (Fig. 8) was preceded by a non-megalithic mound.

Several construction phases were detected (Fig. 9; for details see DIERS 2018, fig. 2.17) and dated absolute-chronologically (DIERS 2018, tab. A.3). The oldest being the non-megalithic phase before 3500 BCE (probably also around 3600 BCE, see MÜLLER et al. 2014). On the surface of this first mound activities such as fireplaces were detected.

Around 3500 BCE or a short while later, the passage grave and a second mound, which was higher than the first one, were built. They were succeeded by the immense enclosure, as the standing places for the megaliths were dug into the hills sides.

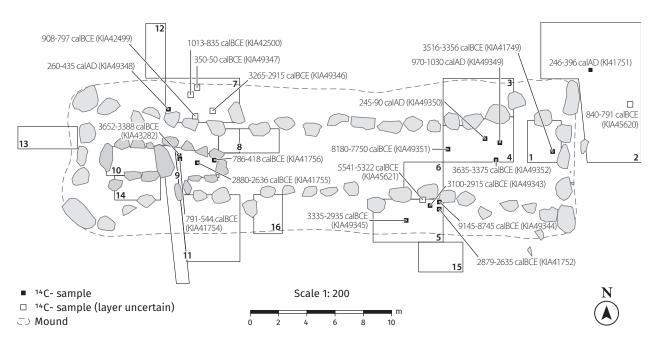


Fig. 8. Lüdelsen 6: Plan of the site with the archaeological/geoarchaeological trenches 1–16 and <sup>14</sup>C-dates. **Dashed line**: today's extent of the burial mound (graph: D. Demnick, translated).

# Dates cross section 1

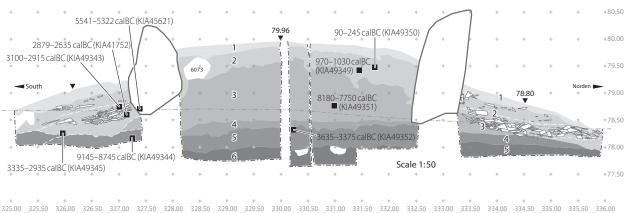


Fig. 9. Lüdelsen 6: Cross-section of the burial mound from South to North (facing West) with position of <sup>14</sup>C-dates and mound layers 1–6 (graph: D. Demnick, translated).

A third mound phase is dating 3100 cal BCE (or possibly younger) and might be connected to Globular Amphora Culture.

The grave chamber itself was empty apart from the remains of an Iron Age burial with cremated bones and finds, but several FBC sherds were found astray in the entrance area.

Other signs of re-use derive from the Late Bronze Age and Early Iron Age (transition), Medieval Times (ridge and furrow systems in direct vicinity even scratching the foot of the mound) and modern times: they show up in form of pits, archaeological and botanical finds as <sup>14</sup>C-dated millets (DIERS 2018, tab. A.3).

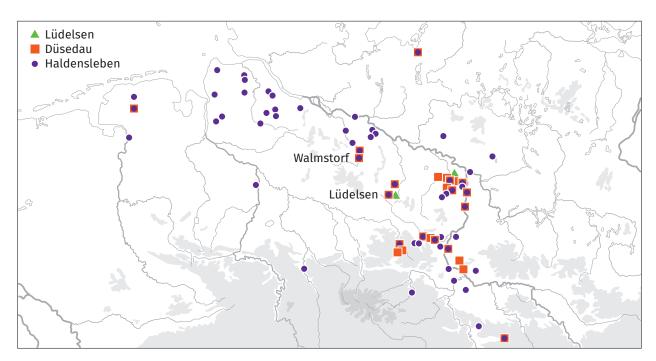


Fig. 10. Distribution area of Altmark Tiefstich Pottery. The distribution is marked with respect to the phases: Lüdelsen (3650–3600 BCE), Düsedau 1–3 (3600–3350 BCE), Haldensleben 1–4 (3350–2900 BCE) (Müller et al. in prep.; Müller 2015 fig. 1).

#### ALTMARK CHRONOLOGY: FBC AND LATE NEOLITHIC

The finds of the Altmärkische Gruppe der Tiefstichkeramik as a regional group of the FBC were recently again analysed by Heiko Tiede, Tim Grünewald, Martin Hinz, Denis Demnick and Johannes Müller; with the aim to get a detailed chronology (MÜLLER et al. in prep., MÜLLER 2015). As there are not enough sealed deposits they used vessels as closed finds where all decorations are contemporary. Basis for the study were 263 vessels from 73 sites in Northern Saxony-Anhalt, Lower Saxony and North-West Mecklenburg which were analysed by correspondance and cluster analysis (Fig. 10).

The groups Düsedau and Haldensleben that were defined by PREUSS 1980 could be identified and subdivided into three respectively four subgroups, an earlier group Lüdelsen was defined. Vertical stratigraphies from the megalithic Tombs Lüdelsen 3 (DEMNICK et al. 2011) and Lüdelsen 6 (MÜLLER et al. 2014, fig. 4; DIERS 2018; fig. 2.17), and a recently excavated settlement in Arneburg-Dalchau in the eastern part of the Altmark (SCHWARZ/RAHMEN 2006; OA LDA) confirmed the correspondance analysis, whereas 16 radiocarbon dates with clear assignment to Tiefstich decorated ceramics from 8 sites fixed the phases (Fig. 11). Phase Lüdelsen lasted only a few decades before 3600 BCE, phase Düsedau about 250 years, phase Haldensleben about minimum 450 years; probably

about 500 years (MÜLLER et al. 2010; MÜLLER et al. in prep.; MÜLLER 2015, 155, fig. 3;).

The **Single Grave Culture** in the Altmark as a part of the Single Grave Culture of North Europe was studied the last time by Jonas Beran in 1990. Because there are only a few ceramic finds (mostly graves) but a lot of axes, we used the classification done by BRANDT (1967), STRUVE (1955) and HÜBNER (2005) and the definitions done by BERAN (1990) and classified early, middle and late Single Grave Culture (Fig. 12). We have a few 14C-dates from the last period starting around 2500 BCE: from a secondary burial in Lüdelsen 3 (DIERS 2014, tab. A.2, KIA-40112: 2563-2473 cal BCE) and from the fish-fence from the Lake Arend, which was excavated and analysed by a research group around Rosemarie Leineweber and Harald Lübke (Leineweber et al. 2011; Leineweber/ LÜBKE in press).

Up to now it was not possible to work out different phases of Schönfeld Culture; only an early phase Fischbeck was separated already by Günter Wetzel in 1979, which appears at the same time as late Tiefstich, Globular Amphora and early Single Grave Culture. Globular Amphora and the mostly in Brandenburg distributed Elb-Havel Culture run partly simultaneously with phase Haldensleben, but last probably longer (BEIER 1988; BEHRENS 1973; MÜLLER 2001).

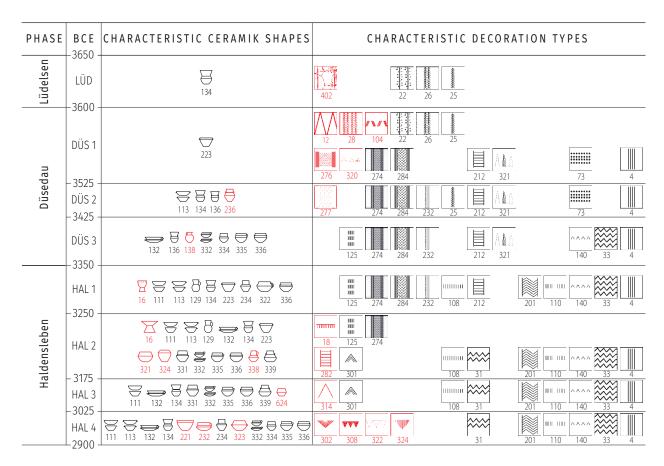


Fig. 11. General development of Tiefstich Pottery of the Altmark group, resulting from Correspondence Analysis (Müller et al. in prep.; Müller 2015 fig. 3).

GLOB 1944	STRUVE 1955	НÜВNЕГ	JAHRE BC (CAL	.)	
ältere Untergrabzeit	ältere Untergrabzeit jüngere Untergrabzeit	älteres Jungneolithikum (JN 1)	Phase 1a		_ 2 _ 2
			Phase 1b	2850–2600 v. Chr .	<u> </u>
jüngere Untergrabzeit					<u> </u>
			Phase 1c		_ 2
ältere Bodengrabzeit	Bodengrabzeit				_ 2
			Phase 2a	2600-2450	- 2
jüngere Bodengrabzeit		Jungneolithikum (JN 2)	Phase 2b	v. Chr.	- 2 - 2
	Obergrabzeit	spätes Jungneolithikum (JN 3)	Phase 3a	2450–2250 v. Chr.	
Obergrabzeit			Phase 3b		_ 2
					- 2
	1				

Fig. 12. Comparative Chronology Table of the Jutland Single Grave Culture (Hübner 2005, p. 660 fig. 477).

#### **METHODS**

#### Pollen

The treatment of pollen data obtained from three sites was following standard procedures (for details about the sampling, laboratory treatment, determination, data processing and age-depth-models as well as displaying see DIERS 2014; DIERS 2018; DIERS et al. 2014). The pollen diagrams presented show selected taxa and pollen types which should have a diagnostic value for the research design. They are plotted against the time scale from app. 4000 to 2200 cal BCE. The reference sum of the curves is that of the land plants without *Calluna*. They are shown in percentages. The anthropogenic indicators were divided into predominantly pastoral and arable indicators of human impact, which differ between the three sites for the time span in focus (Fig. 13).

# Archaeology

Basis for all distribution maps and the typological classifications were the publications of find materials for the different archaeological periods (see

above). Additionally the archives of the state heritage department of Sachsen-Anhalt (OA LDA) and different further publications were used. Because of largely missing radiocarbon dates in the Altmark the absolute chronology is only partly clarified; especially the relationship between Elb-Havel Culture, Globular Amphora, Alttiefstich, and late Neolithic is still largely not understood (see also MÜLLER 2001, 267 fig. 141). Also we know the chronology of the different Single Grave phases – what we do not know because of missing archaeological evidence in the Altmark is the time span of the phases. Therefore all the maps do not show a clear picture, but rather an approximation of past reality. The same applies to the histograms (Fig. 19; 22). Fig. 19 shows the population-density of Western Altmark (district Altmarkkreis Salzwedel) and was calculated on the base of the chronologically fixed and phase-dated sites. Fig. 22 shows the calculated number of sites in the mentioned landscape phases - the number of sites which are only fixed in FBC (landscape phase 1-4), Single Grave Culture or Schönfeld (landscape phase 5–7), Globular Amphora or Elb-Havel Culture (landscape phase 3-5) was converted to the proportionate landscape phases.

#### ANTHROPOGENIC INDICATORS IN THE VEGETATION HISTORY BETWEEN 4000 AND 2200 BCE

The drilling sites considered are situated in the West and Southwest of the Altmark (Fig. 3); they reflect regional and local pollen influx. The two western sites lie within the micro-region of the archaeological project (Fig. 4) the other, regional diagram is situated c. 25 km South-Southeast. The results from Lake Arend (Christiansen 2008) in the northernmost part of the Altmark are also incorporated, were applicable, in the discussion. The focus of the study and the part of diagrams shown comprise the FBC and SGC periods between c. 4000 and 2200 cal BCE. Of interest is here, in regard to the wanted comparison with the archaeological development of find distribution,

the development of anthropogenic indicators in the course of time (for the whole diagrams and interpretation see DIERS 2018). With the onset of the Subboreal the pine-dominated forest was replaced by an oak-mixed forest with hazel, pine, and alder in the humid lowlands of the rivulets. The tree taxa dominate the pollen data with more than 90%. A REVEALS (SUGITA 2007) model for the Altmark (DIERS 2018, fig. 5.2) changes this vegetation composition to c. 60% trees and at least 10% up to > 20% non-arboreal pollen in the course of the time span analysed. The following description relies on the percentage data but one has to keep in mind the possible correction factor.

POLLEN-TAXON/-TYPE	B D B	HAI	POLV
pastoral indicators			
Anagalis-type		r	
Anemone-type X	X		
Anthemis-type		r	
Apiaceae	X	X	X
Aster-type		r	x
Bidens-type	X	X	X
Campanula-type	X		
Caryophyllaceae	X	X	X
Centaurea cyanus	X		
Cerastium-type	X	X	
Poaceae > 37 µm		X	
Cirsium-type	X	r	
Dianthus-type	X		
Filipendula	X	X	X
Galium-type	X	X	x
Gentiana pneumonanthe-type		X	
Gypsophila fast./repens			X
Poaceae	X	X	x
Jasione		X	r
Liguliflorae (Lactuceae)	x (not in sum)	X	X
Melampyrum		X	X
Plantago lanceolata-type	X	X	X
Potentilla-type		r	
Ranunculus acris-type	X	X	r
Rosaceae indet.		X	
Saxifraga hirculus-type			X
Scrophulariaceae		X	x
Silene dioica-type	X	r	
Stellaria holostea	X		
Thalictrum		X	X
Urtica	X		r
Arable indicators			
Anthoceros punct.	Х		
Artemisia	X	X	X
Cerastium-type		X	
Cerealia indet.	X	X	
Chenopodiaceae	X	X	X
Brassicaceae	X	r	x
Cannabis/Humulus	X	X	
Hordeum-type	X		
Plantago major/media		X	
Polygonum maculosa-type (Persicaria)	X		
Rumex acetosa-type	X	r	x
Scleranthus			r
Triticum-type		X	

Fig. 13. Table of anthropogenic indicators, separated into predominantly pastoral and arable indicators (after Behre 1981; sums in fig. 14–17), between 4000 and 2200 cal BCE found in the three pollen profiles in the West (HAI: Haidberg; BDB: Beetzendorfer Bruch) and South (POLV: Polvitz-Letzlingen) of the Altmark, Germany. X: counted, T: rare type.

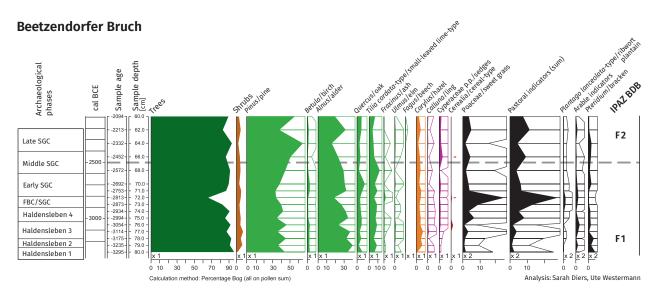


Fig. 14. Beetzendorfer Bruch: Regional pollen diagram in the Western Altmark. Selected taxa and types in percentage of the land plants (without Calluna) plotted on the time-scale c. 3300–2100 cal BCE.

# Regional pollen diagram West: Beetzendorfer Bruch

From c. 3300 cal BCE onwards (due to a hiatus before) the diagram shows a rise in arable and pastoral indicators associated with cereal pollen grains around

3000, 2800 and from 2500 cal BCE onwards (Fig. 14; in the latter period pastoral indicators gain stronger valued compared to the FBC phases). All in all the human pressure on the landscape is very limited.

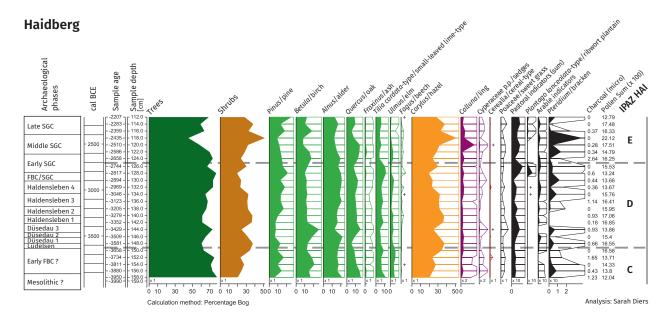


Fig. 15. Haidberg in Bierstedter Holz: local pollen diagram in the Western Altmark. Selected taxa and types in percentage of the land plants (without Calluna) plotted on the time-scale c. 4000–2200 cal BCE.

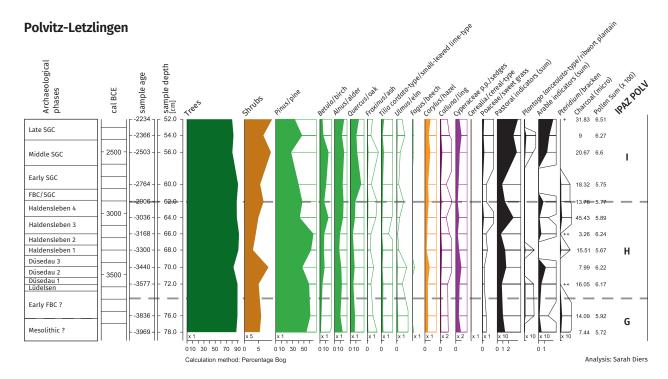


Fig. 16. Polvitz-Letzlingen (Gardelegen): Regional pollen diagram in the Southern Altmark. Selected taxa and types in percentage of the land plants (without Calluna) plotted on the time-scale c. 4000–2200 cal BCE.

#### Local pollen diagram West: Haidberg in the Bierstedter Forst

The record since 4000 cal BCE (Fig. 15) shows a rise in hazel and arable indicators around 3650 cal BCE, slightly later also the pastoral indicators rise. This occurs again in the 31<sup>st</sup> cent. cal BCE and from 2500 cal BCE onwards; but the Late Neolithic is reflected much weaker in this diagram than in the regional one from Beetzendorfer Bruch. All in all the human pressure visible in this diagram approx. 80 m from the next Megalithic Tomb is very weak. Hazel economy can be assumed (see Hellmund 2009, Klooss in press).

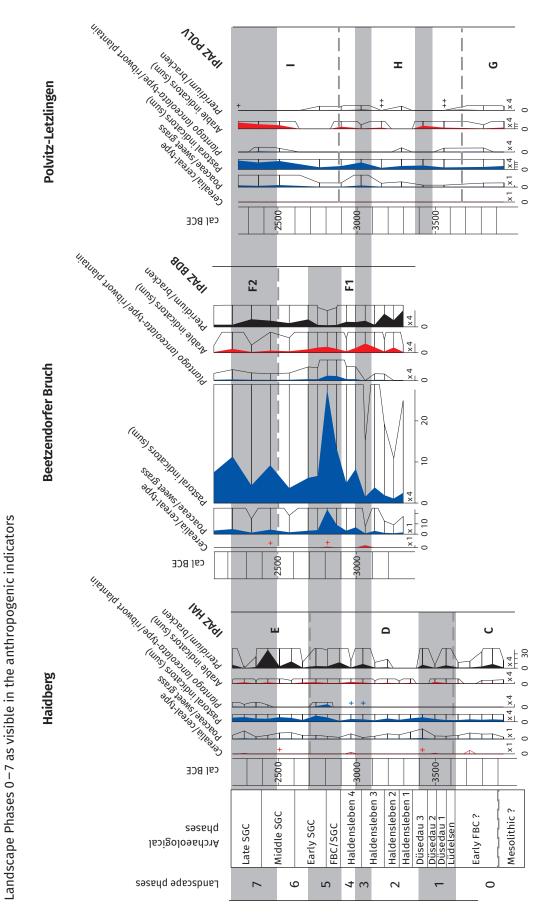
## Regional pollen diagram South: Polvitz-Letzlingen

The regional diagram from the Southern Altmark (Fig. 16) shows the weakest indicators of human presence during the Neolithic. No cereals are reflected between 4000 and 2200 cal BCE but indicators for grazing and cultivation are detectable around 3500 cal BCE, around 3000 cal BCE and from 2500 cal BCE onwards. This diagram shows less impact on the land-scape and less landscape phases than the diagrams in the West.

#### (Over-)regional pollen diagrams North: Lake Arend

The diagrams of Lake Arend (Christiansen 2008; Hellmund 2009) also show low values of non-arboreal pollen grains and within them of pastoral and arable indicators for the Neolithic. Cereals are sporadically present. Between c. 3600 and 3400 cal BCE human impact is visible as limited as in the West, but from 2500 cal BCE onwards the pastoral and arable indicators show higher values than in the West and South, hazel economy, amongst others for the construction of the fish fence (Hellmund 2009) is assumed. Due to the less fine resolution a more detailed development of vegetation in the Neolithic since 4000 cal BCE is not possible for the North.

All in all, the pollen diagrams available for the Altmark show the same broad development of anthropogenic indicators through the time span from c. 4000–2200 cal BCE. Two phases of higher human pressure are detectable: for the FBC c. 3600–3400 cal BCE and for the SGC from 2500 cal BCE onwards. For the other time periods tackled the South and especially the West show a more differentiated pattern of vegetation development.



and South (Polvitz-Letzlingen: POLV) of the Altmark region. Selected taxa and types in percentage of the land plants (without Calluna) plotted on the time-scale c. 4000–2200 Fig. 17. Neolithic landscape phases: Comparison of the anthropogenic influence reflected in the three pollen records in the West (Beetzendorfer Bruch: BDB; Haidberg: HAI) cal BCE. Duration of postulated landscape phases marked by shaded boxes.

#### DISCUSSION: DEFINITION OF LANDSCAPE PHASES 0-7

The results of pollen analyses in the Western and Southern Altmark lead to the conclusion of landscape phases 0 to 7 in the course of time between c. 4000 and 2200 cal BCE (Fig. 17). They differ in intensity of human impact and number of phases between the two areas. In the South fewer phases could be detected. For the North (lake Arend; Christiansen 2008, Hellmund 2009) the resolution does not allow to draw a picture as detailed as for the other two regions (see above). The description follows the Western development. Four phases with human impact on the vegetation could be detected (landscape phases 1, 3, 5 and 7); the other phases were almost bare of signs of human influence.

- Landscape phase 0: before c. 3650 cal BCE
   An undisturbed oak-mixed forest with pine and hazel prevails in the Altmark region.
- Landscape phase 1: c. 3650–3400 cal BCE: FBC settlement/grave phase – Lüdelsen-Düsedau 2 A change in vegetation composition is visible: oak-mixed forest prevails but light-demanding pioneer woody taxa (hazel and beech) rise. Very restricted opening up of the forest can be assumed. In the West cereals might have been grown, arable and pastoral activities are assumed and hazel could have been promoted. In the South this phase is visible from c. 3500 cal BCE onwards, but without evidence for cereal cultivation.
- Landscape phase 2: c. 3400-3100 cal BCE
   Less human impact is visible, hazel and beech have lower values. The oak-mixed forest is strongly reflected.
- Landscape phase 3: c. 3100-3000 cal BCE:
   FBC/GA activity phase Haldensleben 3/4, GA
   In the 31<sup>st</sup> century BCE a very short-lived rise in human impact, visible in the anthropogenic indicators and light-demanding woody taxa, occurs.

- Landscape phase 4: c. 3000–2900 cal BCE
   The light-demanding woody taxa hazel and birch are less frequent. Anthropogenic indicators are very weak, in the South only intermittent detecta-
- Landscape phase 5: c. 2900–2700 cal BCE: transition: GA, Haldensleben 4, early SGC activity phase

After 2900 cal BCE a clear rise in pioneer woody taxa is reflected in both regions as is the rise in anthropogenic indicators in the West. Cereals, arable and pastoral indicators reach their strongest values so far, but not in the South.

- Landscape phase 6: c. 2700-2500 cal BCE

Pioneer woody species stay at comparable high values in the vegetation composition, but there is a short drop in human impact around 2600 cal BCE in the West and still almost no sign of human presence in the South.

Landscape phase 7: c. 2500–2200 cal BCE:
 Middle and Late SGC settlement phase

From c. 2500 cal BCE clearing of the forest and more open areas than before become visible. Herbs and other non-arboreal pollen types rise. Pioneer woody species hazel and birch loose stands, but are still stronger reflected than in the FBC period; the latter is especially well reflected for the South, which is now also showing human impact on the land again. Promotion of hazel can be assumed for the West and is evident for the North (see above).

All in all this settlement phase is reflected stronger than the FBC (landscape phase 1) with cereals in the West and high pastoral indicators in all regions compared to earlier landscape phases, but the opening up of the forest and the human impact is still restricted.

## DISTRIBUTION OF ARCHAEOLOGICAL SITES AND LANDSCAPE PHASES

The aim of our article is to examine, whether the changes of the landscape, economy and higher anthropogenic activities we have seen in the pollen diagrams also can be found in the distribution of our archaeological finds (Fig. 18). The following maps show the

chronologically fixed sites which we can set into one of the defined landscape phases. As it is not possible to fix most of the sites, the maps only give an indicator but do not show a real picture. Small grey diamonds in the figures 20a–g show the distribution of the megaliths.

BCE	LAND- SCAPE- PHASE	ALTMARK WEST	ALTMARK SOUTH (POLVITZ)	ALTTIEFSTICH/ SINGLE GRAVE CULTURE (NO. SITES)	GLOBULAR AMPHORA/ ELB-HAVEL/ SCHÖNFELD (NO. SITES)		NO. SITES/ CT. SDL		NO. SITES/ CT. SDL								
					(10. 31123)	LOGICALLY FIXED SITES		WITH ALL TRB AND LN SITES									
3600				3650–3600 BCE ATS Lüdelsen (2)													
3500	1	3650–3400 BCE farming and grazing	BCE farming and	BCE farming and	BCE farming and	BCE farming and	BCE farming and	BCE farming and	BCE farming and	BCE farming and		3600–3525 BCE ATS Düs 1 (6)		1,60	3,60		
3400					3500–3000 BC farming and grazing	3525–3425 BCE ATS Düs 2 (7)											
3300				3425–3350 BCE ATS Düs 3 (3)				24,89	28,93								
3200	2			3350-3250 BCE ATS Hald 1 (5)		0,67	3,33	24,09	20,93								
3100				3250-3175 BCE ATS Hald 2 (7)													
3000	3			3175-3025 BCE ATS Hald 3 (2)	3100–2800 BCE KAK (39)	1,00	2,00										
2900	4			3025-2900 BCE ATS Hald 4 (4)	EHK (15)	0,00	4,00										
2800		2900–2700 BCE increase of islands of cleared woodland	BCE increase of islands of cleared	BCE			2900–2800 BCE SFK Fischbeck (11)										
2700	5			3000–2500 BC hardly any human impact	2/00/2600 BCE	2800–2200 BCE SFK (150)	6,01	11,59	17. 21	2712							
2600		6		2700/2600- 2500/2400 BCE		7,73	4,72	14,31	37,12								
2500	6			middle SGC (28)													
2400																	
2300	7	2500-2200 BCE increase of open land	2500–2200 BCE increase of open land	2500/2400- 2200 BCE late SGC (98)		21,46	20,60	28,61	47,21								
2200		open tand	open tand														

Fig. 18. Chronology Table: Landscape phases and archaeological phases. ATS: Alttiefstich group of FBC; GA: Globular Amphora; EHK: Elb-Havel Culture; SFK: Schönfeld Culture (S. Diers, B. Fritsch).

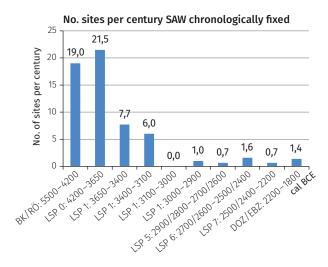


Fig. 19. Landscape phases and population density in the Western Altmark (only Altmarkkreis Salzwedel).

In landscape phase 0 (c. 4200–3650 cal BCE; fig. 2c) there are only three sites during 550 years in the Western Altmark known (the first non-megalithic mound in Lüdelsen 6 and two copper-flat axes from Letzlingen and Lübars; MITTAG 2018). Perhaps some of the Urdolmen were constructed before 3650 BCE.

In the first defined landscape phase 1 (c. 3650–3400 cal BCE; fig. 19; 20a), the beginning of farming and grazing animals is visible in the pollen diagram and also in the map: the first real colonisation can be recognized in Western and Eastern Altmark, the number of sites per century is significant higher and shows settlements and graves.

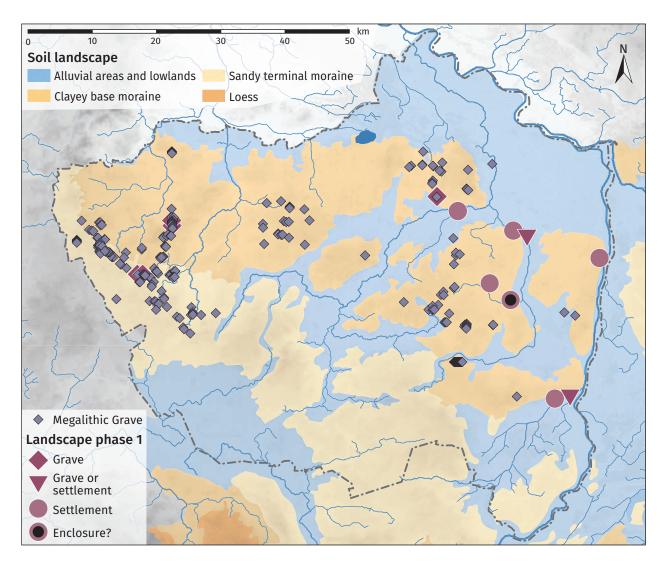


Fig. 20a. Landscape phase 1, c. 3650–3400 cal BCE: chronologically fixed sites (Alttiefstich phase Lüdelsen, Düsedau 1, Düsedau 2).

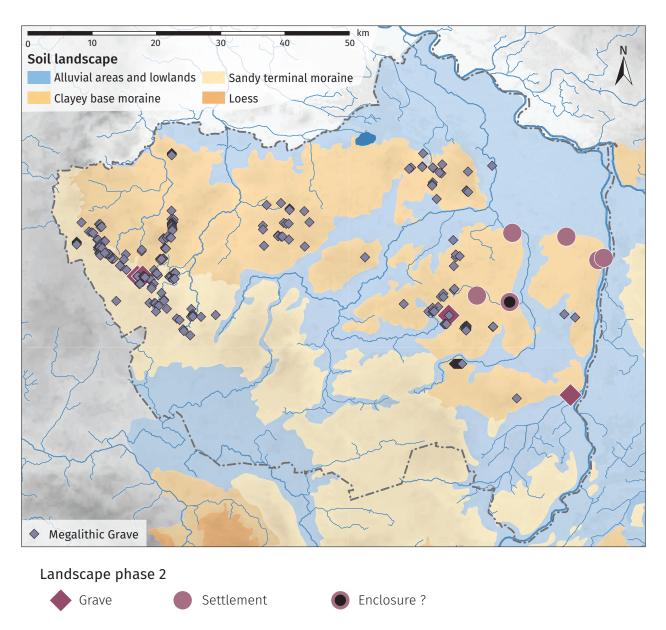
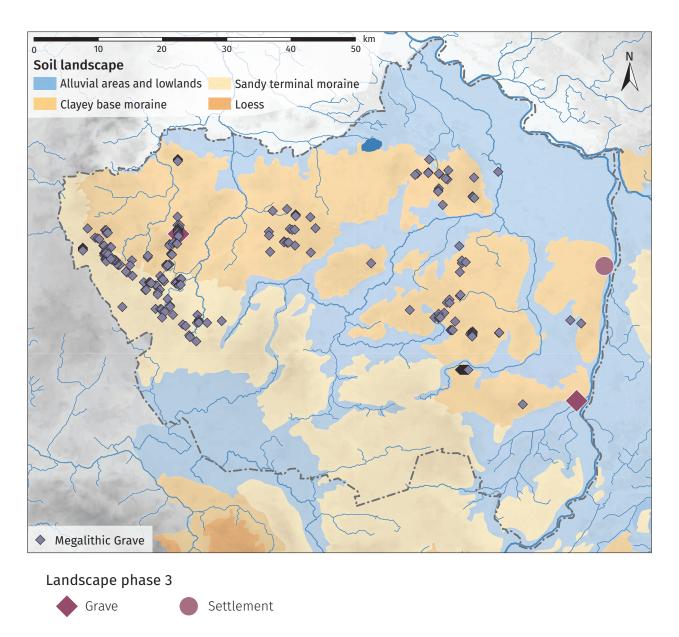


Fig. 20b. Landscape phase 2, c. 3400–3100 cal BCE: chronologically fixed sites (Alttiefstich phase Düsedau 3, Haldensleben 1, Haldensleben 2).

In landscape phase 2 (c. 3400–3100 cal BCE; fig. 19, 20b) the decrease of settlements which became apparent in the pollen diagram is also seen in the

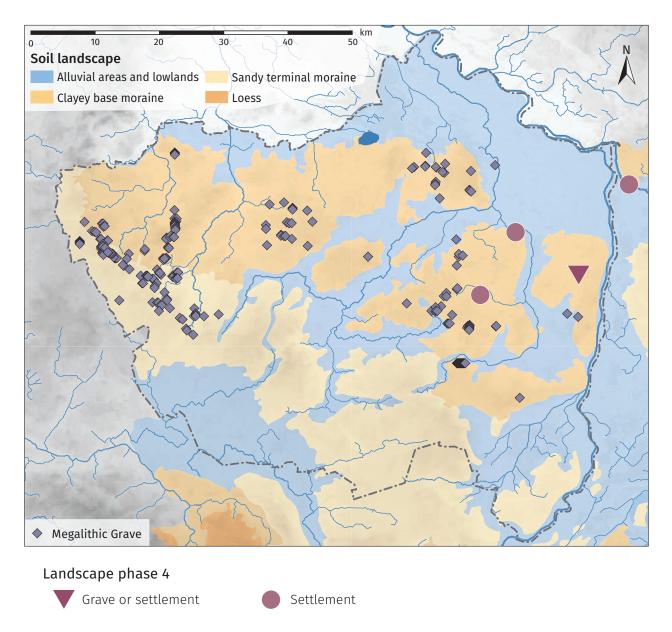
distribution map: there are no settlements, only megaliths in the West.



 $\textit{Fig. 20c. Landscape phase 3, c. 3100-3000 cal BC: chronologically fixed sites (Alttiefstich phase \textit{Haldensleben 3)}. \\$ 

In landscape phase 3 (c. 3100–3000 cal BCE; fig. 19, 20c) we still have one site, that is Leetze, a megalithic grave excavated by Ulrich Fischer in 1938 (FISCHER 1956, 68ff.; FISCHER 1939; PREUSS 1980, 101f.) in the

Western Altmark. The short rise of settlement indicators cannot be seen in the distribution-map, but the time span of the landscape phases 3 and 4 is quite short.



 $Fig.\ 20d.\ Landscape\ phase\ 4,\ c.\ 3000-2900\ cal\ BCE:\ chronologically\ fixed\ sites\ (Alttiefstich\ phase\ Haldensleben\ 4).$ 

In contrary we notice the decrease of human input after 3000 cal BCE in **landscape phase 4** (3000–

2900 cal BCE; fig. 19, 20d): no sites are recognized in the West, only a few in the East.

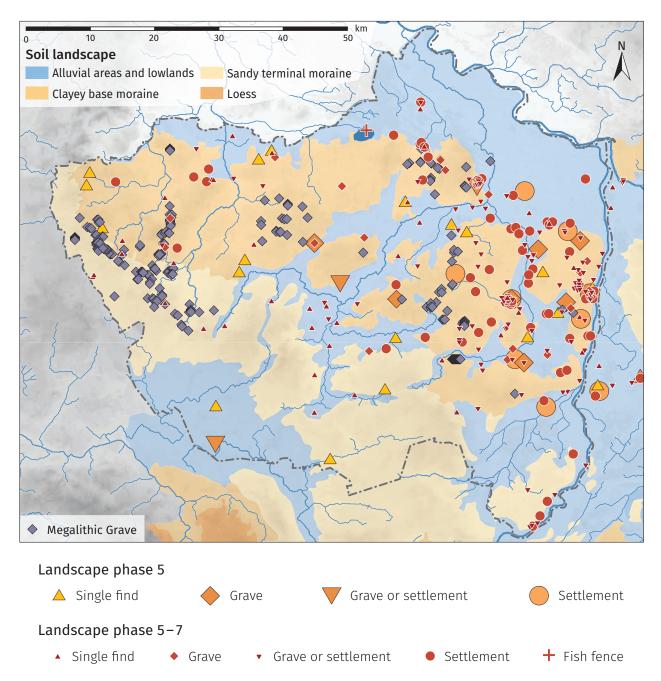


Fig. 20e. Landscape phase 5, c. 2900/2800–2700/2600 cal BCE: chronologically fixed sites (early Single Grave Culture, Schönfeld – Fischbeck group, late Globular Amphora). Landscape phase 5–7 (Schönfeld and not differentiable Single Grave Culture).

After 2900 BCE in **landscape phase** 5 (c. 2900–2700 cal BCE; fig. 19, 20e) – probably with the beginning of the Single Grave Culture – there is the first deep cut, both in pollen diagram as in distribution and way of sites, especially in the Western and Southern Altmark:

mostly single finds of axes are wide spread, perhaps lost axes – but probably reminds of destroyed graves. The Eastern Altmark is mainly indicated by early Schönfeld sites (Fischbeck group); the distribution is similar to Funnel Beaker time.

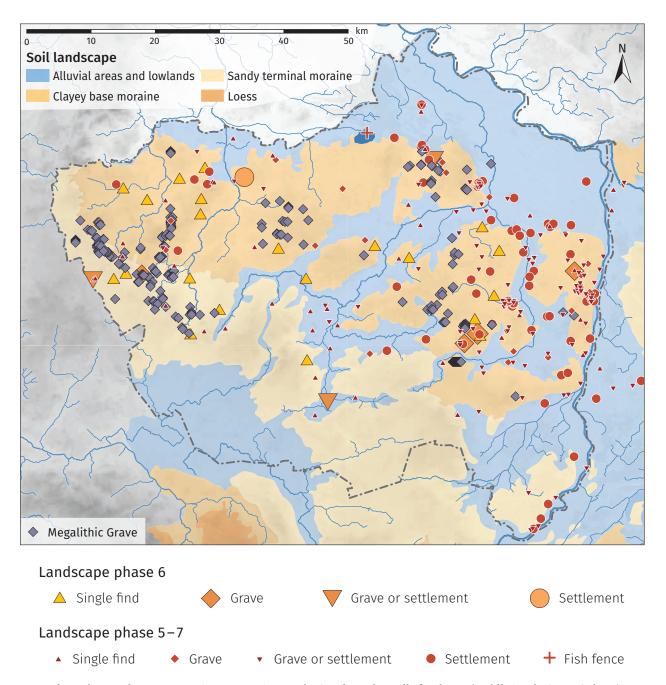


Fig. 20f. Landscape phase 6, c. 2700/2600-2500/2400 cal BCE: chronologically fixed sites (middle Single Grave Culture). Landscape phase 5-7 (Schönfeld and not differentiable Single Grave Culture).

The decrease of human impact in **landscape phase 6** (c. 2700–2500 cal BCE, fig. 19; 20f) cannot be seen in the distribution map (as Schönfeld sites cannot be classified, there are mapped sites of landscape phases 5–7, mainly Schönfeld sites).

In contrary the changes are significant in the last examined landscape phase 7 (c. 2500–2200 cal BCE). The postulated increase of open land in the Western

and in the southern part as well as in the North (Lake Arend) is seen quite well in the distribution map (Fig. 19; 20g): large parts of the Altmark are now used economically, maybe colonized. For example the southern part, which is not very fertile (wetlands respectively dry heath) and the region around the Lake Arend were now utilized for probably different purposes than farming, as for example the

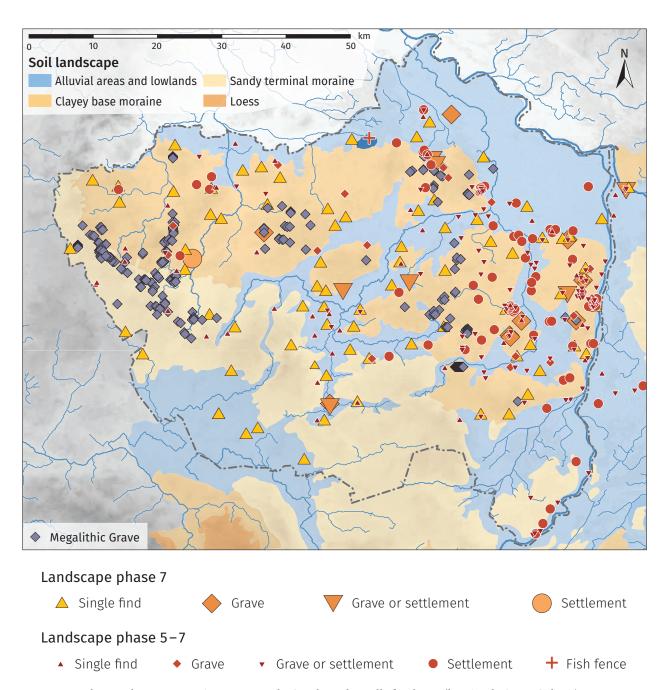


Fig. 20g. Landscape phase 7, c. 2500/2400-2200 cal BCE: chronologically fixed sites (late Single Grave Culture). Landscape phase 5-7 (Schönfeld and not differentiable Single Grave Culture).

late Neolithic fish fence in the Lake shows (LEINE-WEBER et al. 2011). In the Eastern Altmark, the settled and probably more immovable population of Schönfeld culture carried out agriculture and/or horticulture, especially cereal cultivation, but also animal husbandry. Contacts between Single Grave Culture and Schönfeld should have been regularly;

for example there are cremation burials with typical beakers of Single Grave Culture (FRITSCH et al. 2002), typical axes of Single Grave Culture in Schönfeld-graveyards (WETZEL 1979, No. 110, 116, 140; see BERAN 1990, No. 226, 362, 430), but we also find similarities in the ceramics (WETZEL 1979, 77).

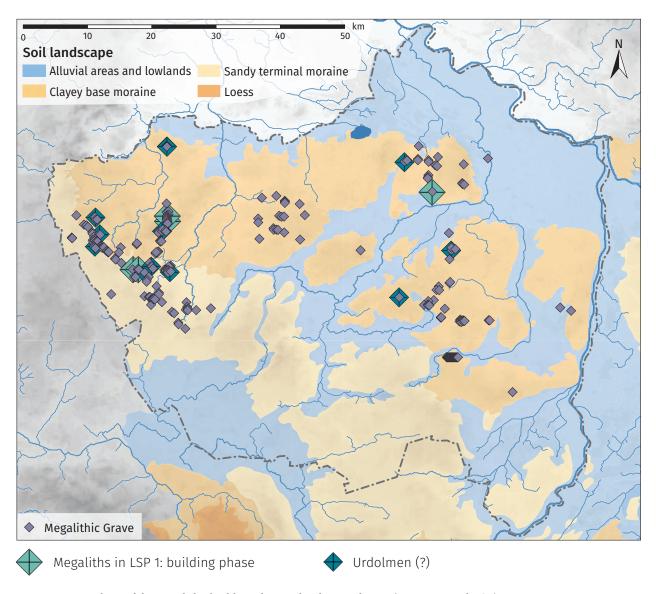


Fig. 21a. Usage phase of the megaliths: building phase in landscape phase 1 (3650–3400 cal BCE).

The combination of landscape phase and typochronological phases of the Tiefstich-pottery (Fig. 11; MÜLLER et al. in prep.) opens up new insights for the usage life and duration of the megalithic monuments. Several, if not most of the megaliths, were built in the first landscape phase 1 (c. 3650–3400 cal BCE; phase Lüdelsen/Düsedau 1–2; fig. 21a). The earliest ceramic finds from megalithic graves point into landscape

phase 1 (Leetze Fpl. 1, Leetze Fpl. 6, Lüdelsen Fpl. 3, Lüdelsen Fpl. 6, Stapel Fpl. 1; PREUSS 1980, 101f., 108; MÜLLER 2015; MÜLLER et al. in prep.). Secondary burials are evident during all Funnel Beaker landscape phases (Fig. 21b), even in the late Neolithic during Single Grave and Schönfeld period the megaliths were present in the life of the people and probably regularly used as burial places (Fig. 21c).

# CONCLUSIONS

This study deals mainly with results for the western and southern part of the Altmark (Fig. 18). The histogram (Fig. 22) shows the chronologically fixed and the calculated number of sites per century including the

Funnel Beaker sites that cannot be assigned to a single landscape phase, particularly the not excavated megalithic graves with several Funnel Beaker usage phases.

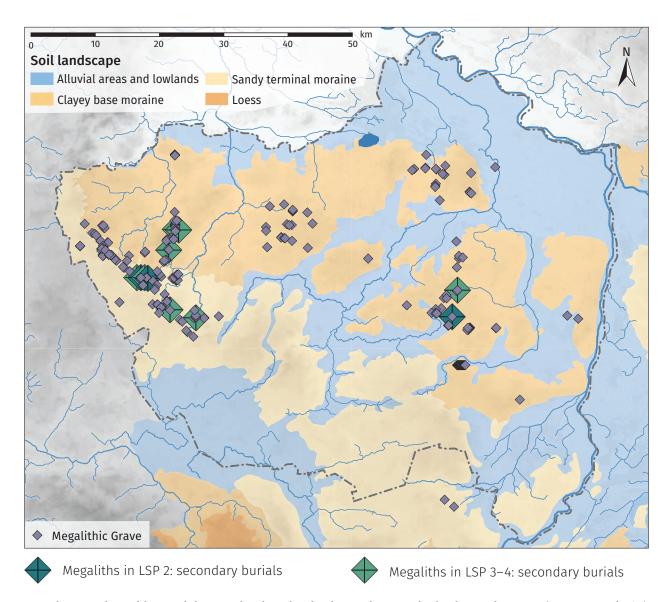


Fig.~21b.~Usage phase of the megaliths: secondary burials in landscape phase~2 and in landscape phases~3-4~(3400-2900~cal~BCE).

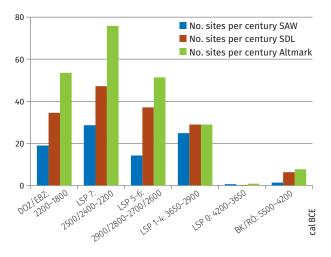


Fig. 22. Calculated number of sites in the landscape phases.

For the period before c. 3650 cal BCE botanical and archaeological data sets show only weak influence on the landscape, which was covered mainly by oak-mixed forest. We see the Funnel Beaker period with Tiefstich pottery as the first community with multiple impacts on the vegetation. The colonisation of the Western Altmark coincides with the start of the megalithic construction period from around 3650/3600 BCE onwards. The farming activities did not happen around the graves, but woodland economy and probably grazing occurred in the vicinity of monuments. During the funnel beaker period (c. 3650–2800 BCE) the impact of human activity varied. After the well-recognised early phase until around c. 3400 BCE, we have phases with less or more signs for human settlement in the West.

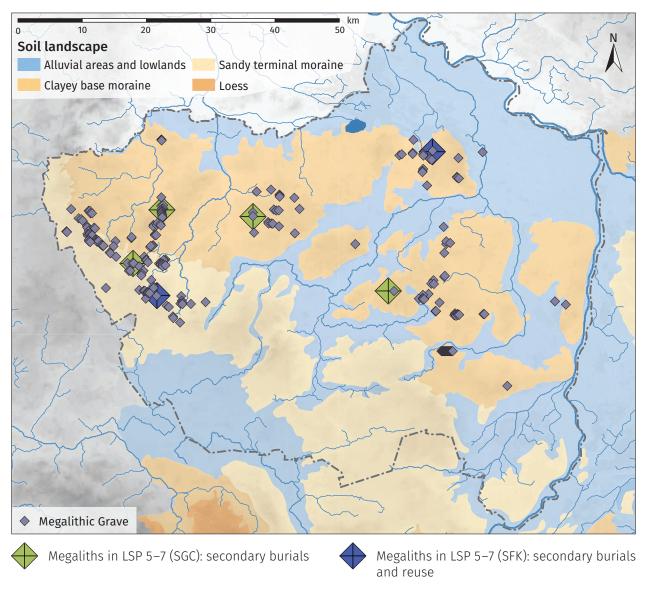


Fig. 21c. Usage phase of the megaliths: secondary burials/reuse in landscape phase 5-7 (2900–2200 cal BCE). SGC: Single Grave Culture; SFK: Schönfeld; LSP: landscape phase.

With the onset of the Late Neolithic around 2900/2800 cal BCE the next good recognisable shift in land-scape use is visible; the human impact in the West increases, especially grazing but also crop cultivation rises. The archaeological record shows a change in the way of distribution of sites throughout the Altmark, perhaps a result of a diversified settlement pattern and a modified economy.

From 2500 cal BCE onwards another significant cut is recognised: in landscape phase 7 in the North, West and in the South alike, open land increases for the first time in the Neolithic. The human impact is still on moderate level but stronger than in the beginning of the colonisation in landscape phase 1. This coincides with an increase in archaeological sites and their fully scattered distribution (see fig. 20g).

Our hypothesis is a differentiation of the economic basis between the Eastern Altmark, where the overwhelming number of Schönfeld sites are located, and the western part, where the predominant numbers of sites belong to SGC: we assume that in the West mainly livestock farming dominated, maybe as semi nomadic with only minor importance of crop cultivation. In addition, we find hints for a significant exploitation of natural resources: fishing, forestry and probably hunting, whereas in the Eastern Altmark a sedentary lifestyle with higher importance of cultivars might have prevailed. The megaliths never lost their function as burial and perhaps ritual sites during the timespan and changing landscape uses.

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# Megaliths, people and palaeoeconomics in Neolithic Malta

Caroline Malone, Finbar McCormick, Rowan McLaughlin, Simon Stoddart

#### **ABSTRACT**

The communities of Neolithic Malta developed within a restricted island environment that provided limited opportunities for economic expansion or success. The development of the curious Temple Culture in the 4<sup>th</sup>/3<sup>rd</sup> millennia BC nevertheless demonstrated an exceptional level of sustainable, yet dense population with a distinctive civilisation. Towards the end of the 3<sup>rd</sup> millennium, the traditional system broke down, the temples were abandoned, and there may

have been related environmental and/or economic failure, which brought in a new Bronze Age cultural system, and with it a much less sustainable approach to managing a marginal place. This paper describes how new environmentally-focused research is tackling the issues of reconstructing past economies and environments, and it attempts to interpret the factors that underpinned the balance between people, place and their megalithic monuments.

#### INTRODUCTION

Neolithic Malta is renowned for its Megalithic Civilisation, which flourished from the mid-4<sup>th</sup> to the mid- $3^{\rm rd}$  millennia BC. The distinctive megalithic »temple« sites and the funerary subterranean hypogea represent a very particular - and island-focused - expression of megalith building in European prehistory, and there are no close parallels even in the central Mediterranean (see Fig. 1 for location). These sites were constructed with high outer walls, which enclose a complex structure that comprises a central axial corridor from which numerous oval-shaped side rooms open, separated by lintels, doorways and sills (STOD-DART/MALONE 2009). The floors of the structures are plaster or stone, while the interior spaces seem to have been corbelled and covered over walls that were often plastered and painted. Within these structures, a variety of offering tables, benches, altars, firepits and other paraphernalia related to food, feasting and ritual activity were assembled (MALONE/STODDART 2011). This food focus suggests that the »temples« were significant stimuli to the emerging Neolithic economy of the islands, and it is the goal of this paper to explore how the palaeoeconomy of Malta was a major factor leading to the construction of these megalithic buildings.

The question of why a distinctive and eccentric island architecture developed in Malta has long occupied scholars (TRUMP 2002; CILIA 2004; MALONE/STODDART 1998; RENFREW 1973), especially since the

surprisingly early chronology of the so-called »Temple-Culture« became evident in the 1960s-70s. The evolution of the temple form has been examined by TRUMP (2002; 2004), and may have emerged from the earlier Mediterranean tomb-building tradition of oval-sometimes multi-chambered-subterranean rock-cut structures. From the mid-4th millennium BC andperhaps earlier, stone-built megalithic buildings evol-ved from simple 2-3 lobed structures into ever-more complex subdivided spaces. Although only the latest rebuilding of the megaliths survive, these invariably contained installations for tethering, slaughtering and cooking animals, altars on which to present offerings, storage facilities and a mass of pottery and stone vessels that ranged in size from miniature to enormous (MALONE 2007; 2008; STODDART/MALONE 2008). In comparison with the much simpler megalithic buildings of northern Europe, the Maltese megaliths represent sophisticated designs, with evidence of plastered and painted floors and walls, figuratively-carved and patterned stonework, and an intriguing repetition of form and activity at different sites. The placement of the paraphernalia and installations appears to have been intentional, highly structured and probably symbolic. The early Maltese were evidently conscious of sidedness, with fire pits and cooking places usually placed on the right side of the central corridor, while large vessels (containing liquids) and libation 754 C. Malone et al.

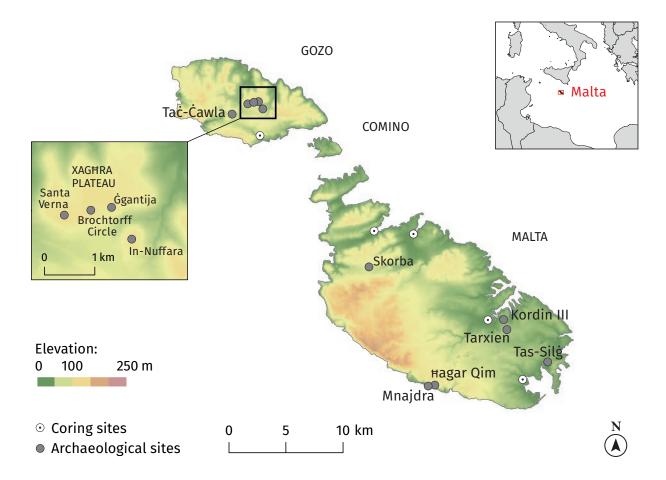


Fig. 1. Location of the Maltese Islands and locations of recent environmental core sampling.

holes were placed on the left side. Where excavation has recorded the deposits and materials (unfortunately very rarely), there is ample indication that food and feasting took place in the temples. Huge quantities of broken pottery and many butchered and burnt animal bones have been noted. However, were they rarely

retained for study. Only now – a hundred years after the first »scientific« excavations began – has it been possible to begin to reconstruct the economy of this enigmatic Neolithic society, and sample afresh sites that may complement the present rather poor archaeological record.

# THE FRAGSUS PROJECT

The Fragsus project is an ERC-sponsored Advanced Research Grant, and this generous funding has provided the opportunity to focus on a number of long-standing questions about the emergence of prehistoric Malta's environment and economy. In particular, we question how a complex prehistoric society developed coping strategies and a sustainable economic system within the tiny (316km²) and quite marginal landscape of Malta and Gozo. The mainly limestone, clay and sandstone islands have no surface water (only seasonal streams), intermittent rainfall, and are subject to intense storms and soil erosion, resulting in thin-soiled rocky dry

landscapes and limited areas of cultivable land. In stark contrast to these limitations, the sheer density of prehistoric megaliths sites, tombs and possible settlements suggests that prehistoric populations developed impressive strategies to deal with the restricted scale and limitations of their fragile landscape. It seems evident that the early settlers of Malta exploited the islands more intensively perhaps than anywhere else in Neolithic Europe, yet managed to sustain occupation for several millennia (from c. 5500–2300BC) until major social and settlement changes at the beginning of the Bronze Age. Given the islands' physical limitations, the archaeological

investigation of domestic sustainability in supporting a considerable population is important, and it has the potential to identify changes that took place in the landscape over the quite short period of human occupation. The investment by Neolithic communities in the creation and maintenance of a complex, labour-intensive architecture - with little apparent practical domestic use – requires explanation and investigation, since by understanding the role of these megaliths we can begin to identify why this particular island culture eventually failed and its megalithic buildings were abandoned. The chronology of prehistoric Malta has had scant application of <sup>14</sup>C dating over the last half-century. Almost all of the absolute dates have been from two sites only (MALONE et al. 2009b), and episodes of early colonisation and development still need refinement. Time measurement holds fundamental importance to provide a linkage between sites, cultures, people, economic strategies and wider environmental change, and it is a major component of the Fragsus project. The collection of an extensive »spine« of accurate and reliable dates derived from various prehistoric phases and environmental core sediment is currently under analysis, producing important new understanding of the human impact on the Maltese environment and its landscape. Much is anticipated, but in particular the initial dates for human settlement at one end of the scale and the end of the Bronze Age at the other, which surprisingly remain almost unknown and undated until now. Five core questions make up the research project as follows:

- 1. What was the impact of human settlement on Malta?
- 2. How did a very small island community in prehistoric times manage to sustain dense, complex life?
- 3. What sort of agriculture was used, and what did people eat?
- 4. What was the size and nature of the early Maltese population?
- 5. Was there social-economic or environmental failure at the end of the Temple Culture?

It is timely to re-examine these issues, because it is 200 years since Ġgantija temple on Gozo was first explored (VELLA et al. 2011), a hundred years since Tarxien was excavated (ZAMMIT 1916), and now 25 years since our Brochtorff Xaghra Circle work (MALONE et al. 2009a) began to apply scientific archaeological methods to early Malta. It is time to reassess where we stand now, with new methodologies and questions emerging that enable focusing interdisciplinary work on the many questions that need addressing. Current technologies (geophysics, environmental reconstruction, landscape reconstruction, GIS, palaeoeconomic reconstruction, population studies and dietary isotopes, etc.) present opportunities to address new questions with new approaches. Furthermore, time itself is running out for some of the sites of Malta, since archaeological resources in small islands are under immense human pressure for economic development and environmental change (GIGLI et al. 2012). Soon there will be rather few sites and landscapes left to work with. In this paper, we shall concentrate on the issues of economy and megaliths in the landscape, as well as the possible impact that these had on the society and long-term success or failure of prehistoric Malta.

#### **BACKGROUND OF HUMAN SETTLEMENT IN MALTA**

Malta was colonised significantly later than islands in the eastern Mediterranean, namely after the much larger islands of Sardinia and Corsica. Indeed, the earliest evidence of human settlement on Malta is between 5600-5400 BC, based on current <sup>14</sup>C dating. The islands appear to have been colonised from Sicily-Calabria, with the first inhabitants using similar impressed pottery styles to the Stentinello in Sicily, the Ghar Dalam, which seems to have been established along with a fully-agricultural economy. Work undertaken by David Trump in the 1950s/60s (TRUMP 1966), and before that by Themistocles Zammit, Thomas Ashby and T.Eric Peet (ZAMMIT 1916; 1917; 1920; 1930; ASHBY et al. 1913) recognised a pottery sequence that was generally similar to Italy and Sicily, as well as the fact that the typical Mediterranean ovicaprid-dominated economy was supplemented with pig and cattle.

The indigenous wild fauna in Malta does not seem to have figured significantly, and although red deer were frequent in Pleistocene levels at Ghar Dalam (DES-POTT 1923), they were probably extinct or insignificant by the time of human occupation of the islands, even if some deer were found in the Tarxien temples. This lack of local animal food contrasts with other relatively-isolated Mediterranean islands; for example, at Sardinian sites indigenous fauna were exploited by Neolithic people from possibly as early as c.7000-6000 BC (Corbeddu Cave-sondar et al. 1995; Santa Maria in Acquas-Melis/Mussi 2002; MUSSI/MELIS 2002; DAWSON 2013). Indigenous fauna also supported the earliest communities on Cyprus from c.11,000-9000 BC (KNAPP 2010) and Crete c.7000 BC (STRASSER et al. 2010) before the introduction of domesticated animals. Lacking suitable game,

Malta may have had insufficient space to attract early settlers in need of more substantial hunting territory (MALONE 1997/1998), or it may be the case that the 80km distance from Sicily (and the limited resources) deterred pre-farming or incipient farming settlement. Instead, fully-developed agricultural colonists seem to have arrived in small numbers and left indications of some occupation in rock shelters and caves, such as Ghar Dalam. More substantial settlement developed in favoured locales within the hilly, limestone landscape of Malta-Gozo. Field survey on Gozo has shown that specific soils, elevations, aspects and the all-important proximity to a perennial water source were factors in the choice of location. Given the limited options across the island-scapes, some places continued to support Neolithic populations for over two-and-a-half millennia (BOYLE 2014), with

major megalithic »temples« also favouring the same locations. Excavation and surface survey has routinely demonstrated that »temples« invariably cover earlier sites, with a succession of cultural levels, floors and occupation rubbish. However, by the Bronze Age, new locales were favoured, especially more elevated, defendable and strategic sites such as Borg In-Nadur and Bahrija. Indeed, many-probably most-of the temple sites were abandoned, or re-used in very different ways. At Tarxien temple, the early excavations by Zammit revealed cremation pyres and burials set into some of the temple structure, accompanied by completely different cultural materials and metals for the first time (ZAMMIT 1930, TRUMP 2002). The evidence from the Brochtorff Xaghra Circle suggested domestic occupation of subsidence hollows above the collapsed funerary caves (CUTAJAR et al. 2009).

#### THE ENVIRONMENTAL PROBLEM

The early landscapes and environments of Malta have only recently become the focus of study by archaeologists, since earlier generations were more intent on establishing the culture sequence than reconstructing the environment. Malta presents very problematic landscapes, with thin soils, scarce deep sediments and few wet environments that preserve organic matter. However, sediment coring work in the 1990s led by Chris Hunt and Patrick Schembri resulted in useful insights into the potential for environmental reconstruction (CARROLL et al. 2012; FENECH 2001; 2007; HUNT 1997). To build on that experience, a systematic coring programme has been directed to the coastal inlets of the islands. Alongside this, a detailed soil study of the land surface seeking out the soil history as well as the distribution of soil types has been incorporated into the project goals. These collectively draw together a series of palaeo-environmental reconstructions of the ancient landscape, focused on the period from the first arrival of human occupants to Malta until the end of the Bronze Age. They should reveal the changing viability of soils, vegetation and economic output from the first Neolithic to the Bronze Age. In particular, pollen can identify episodes when vegetation cover was drastically affected by humans or a fluctuating climate. Such change would have had a considerable impact on the economies of the island-bound communities of Malta. Initially, the islands supported an open-wooded environment when people first began to settle around 5200 cal BC. However, the pollen history shows rapid clearance soon after humans arrived, and over time the species that dominated were open-landscape taxa associated with cereal farming and sparse low shrubs.

Soil erosion presented on-going issues, although its impact was shown most dramatically in later prehistoric-early historic times, with vast soil loss filling the valley bottoms and washing into the sea. At Xemxija Bay, up to 30m of muddy sediment has been recorded at the junction with the present coastline, and dates from deep levels suggest most of the sediment is post Neolithic. Today, the landscape is dominated by stone-walled terrace systems designed to contain soil depth and sufficient moisture for cultivation of olive, vines and cereal-food crops (BOWEN-JONES et al. 1961; CASSAR et al. 2008). Recent research at Mgarr Ix-Xini – a narrow inlet and valley in Gozo (Pace pers. comm.) - suggests that terracing may have developed from the 6th century BC. Nonetheless, before that process commenced, landscape degradation may have been rapid and catastrophic in its impact on Malta's viability, since there are immense deposits of eroded late Bronze Age soils present in the core samples, and material from classical and historical periods suggesting catastrophic erosion events since the 1st millennium BC. Curiously, despite perhaps being aided by a more favourable climate, the Neolithic communities appear to have managed their soil resource much more effectively that the supposedly more sophisticated societies of more recent times. We know this from our investigations beneath the later Neolithic temples of Ggantija, Kordin III and Santa Verna and the settlement of Taċ Ċawla, whereby ancient rich, dark organic soils still survive in depth, and they indicate a reasonably well-managed system of land use, vegetation, manuring and water retention (French and Taylor pers. comm.). Nowhere else in Malta can such soils be found on the surface, and instead the highly-mineralised

»Mediterranean« soils – the classic *Terra Rossa* – now dominate much of the landscape. The fertility of the environment is thus impoverished and much is marginal in terms of farming, although the base rock of much of the land surface is Globigerina Limestone. This rock is rich in phosphorous and thus surprisingly fertile, with or without organic matter (Flood, pers. comm.), and when modern farming techniques of irrigation and fertiliser are applied it supports quite productive farming. A gradual detrimental impact of tree and vegetation clearance is evident, perhaps as tree crops and more intensive farming in unsuitable areas

such as steep slopes seem to have increased by the Early Bronze Age. The settlement focus changed to more fortified headlands and hilltops, and the traditional subsistence may have changed somewhat, as possibly new groups settled across Malta. However, did the practices that had become adapted to the specific conditions change much over the centuries? The increasing assemblage of animal bones now under study begin to suggest that the carrying capacity of the Maltese landscape truly had limitations, which seem to be reflected in the ratios of types of animal and their patterns of slaughter (McCormick pers. comm.).

#### ANIMALS AND ZAMMIT - THE OBSERVATIONS FROM TARXIEN

A century ago, the excavations of the newly-discovered megalithic site of Tarxien (1915–1920s) were underway, under the direction of Zammit (ZAMMIT 1916; 1917; 1920; 1930). More than any other site, Tarxien revealed quantities of feasting refuse and animal bone in context (see Fig. 2), as well as significant artistic representations of animals, including sheep, goat, pig and bulls that tallied conveniently with the species apparently present in the rubbish. Prior to that work, Ashby and Peet had set up good recording methods at the megalithic temple sites of Kordin III,

Santa Verna and Mnaijdra, and they noted (and probably kept) quantities of animal bone, molluscs and traces of cooking and burning (ASHBY et al. 1913). From Zammit's site diaries, it is possible to plot the likely positions of animal bone, fires and broken pottery and trace some of the actions and practices of Neolithic people at these sites (MALONE 2008; STODDART et al. 1993). Clearly skulls, frontal and horns of cattle, sheep and goats were used to symbolise feasts since they were placed in prominent and visible places within the Tarxien temples. Some were placed on

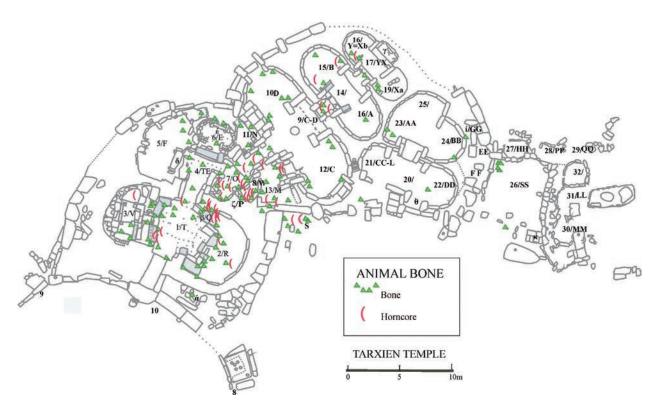
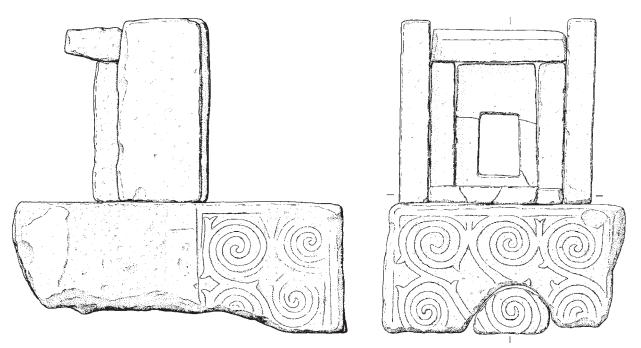


Fig. 2. Distribution of animal bones within Tarxien temple, according to the excavation notes of Themistocles Zammit (1915-19).



 $\textit{Fig. 3b. Elevation of the Tarxien Altar with a \textit{``scupboard''} containing goat horns and \textit{flint knives (photo: C. Malone)}. \\$ 



 $Fig.\,3c.\,\,Detail\,of\,the\,\,scupboard {\it white} (replica\,\,on\,\,site)\,(drawing:\,Jason\,\,Gibbons).$ 

thresholds or altars, while others seem to have been stacked around hidden storage rooms, or even placed inside an altar »cupboard« (See Fig. 3b and 3c showing altar and cupboard at Tarxien). Unfortunately, almost no bones survive today from these early excavations, with much either lost in WWII or simply discarded. Seeds were also recorded and kept from the work at Tarxien, but they were related to the Bronze Age cemetery levels, and were dated to the 2<sup>nd</sup> millennium BC (RENFREW 1972). Since the earlier 20<sup>th</sup> century work, only the ruined temple site of Skorba has been studied in detail, with excavations from 1960–63 (TRUMP 1966). This work established the

first radio-carbon chronology for Malta, and also retrieved – but did not undertake detailed study of – animal bone, and it did not systematically apply wet sieving to retrieve plant remains. The economy of the so-called temple period has thus remained poorly understood and has not been subjected to sufficient research. Much of the present work addresses this issue, and there are already indications that the cereal economy was wheat and barley, lentil, pea and bean, with other plants also in use (J. Bates pers. comm.). The final reports on this work will be forthcoming in future years.

#### BROCHTORFF XAGHRA CIRCLE

Between 1987 and 1993, a new burial complex was excavated (by Malone, Stoddart and Trump, see MALONE et al. 2009a) with the goal of understanding the funerary rituals and biological anthropology of the prehistoric community of Gozo. Incidentally, the excavations retrieved a substantial assemblage of animal bones and molluscs, but they did not trace carbonised plant remains in what was essentially a burial cave deposit. However, the work was supported by the most detailed absolute dating programme yet undertaken in Malta, and it demonstrated both the proportions of animals present and the impact of food on some of the buried humans, through isotopic analysis (RICHARDS et al. 2001; STODDART et al. 2009). The issue of the availability of food and its deposition in death rituals illuminates one part of the subsistence of Neolithic Malta, although in the present study our questions have been directed towards exploring how diet and subsistence changed over centuries and millennia, closely related to the

ever-increasing landscape stress that a large population may have placed on natural resources. Although the Brochtorff Xaghra Circle produced a specialised funerary assemblage of animal bone, the proportions of animals represented are similar to other contemporary prehistoric contexts, with an emphasis on ovicaprids in preference to other stock animals. There are many reasons for this preference, because ovicaprids not only yield a useful meat return – even within weeks of birth – but they can also cope with dry conditions and little surface water, requiring on average only about 10 litres of water daily. Flocks can be grazed on hillslopes, fallow and post-harvest land, and are easily moved around the Maltese landscape. In later times, this was organised with drove-ways, fields and commons for open grazing (McCormick pers. comm.). By contrast, cattle are slow to mature, and need copious quantities of water daily. Modern milking cows consume daily up to 85 litres, while beef cattle average about 45 litres (BURTON 1965,

TYPE OF LIVESTOCK	AVERAGE DAILY CONSUMPTION (L)	PEAK DAILY CONSUMPTION (L)		
Cattle				
Dairy cows in milk	70	85		
Dairy cows dry	45	60		
Beef cattle	45	60		
Calves	22	30		
Sheep				
Nursing ewes on dry feed	9	11.5		
Mature sheep on dry pastures	7 8.5			
Mature sheep on irrigated pastures	3.5	4.5		
Fattening lambs on dry pastures	2.2	3		
Fattening lambs on irrigated pastures	1.1	1.1 1.5		

Table 1. Adapted from Burton (1965).

see Table 1), but perhaps less was required for small »prehistoric« cattle (which represents about 18% of body weight) from the limited locations where water is available throughout the year. The pictorial evidence (bull reliefs, sow and piglet relief, ovicaprid reliefs) as well as the bone refuse from Tarxien suggests that cattle were highly valued, and the record of bone remains indicates they were eaten from time to time. They may have also been kept for their milk, although unequivocal evidence for this has not been found in the bone assemblages nor through analysis of lipid residues absorbed in Neolithic pots (DEBONO SPITERI/CRAIG 2014). However, perhaps more importantly, cattle used in traction would have been vital aids in maximising cultivation and in the movement of stones for megalith building. Their size and their considerable demand on fodder and water may well have been a limiting factor in the size of herds kept in Neolithic Malta, so the ratio of cattle bones found on most prehistoric sites may well correspond with the actual proportions that were kept.

# Sheep/Goat age at death (N=18) 97 97 90 00-5 months 5-12 months 12-28 months 28+ months Approximate age

Fig. 5. Taċ Ċawla. Sheep/goat age slaughter pattern based on tooth eruption and wear (based on HIGHAM 1967, 106).

#### AGRICULTURE AND PRODUCTION

The density of the likely human population of Temple period Malta has been speculated upon over the years, with Renfrew (RENFREW 1973, 168–9) suggesting that there may have been 11,000 inhabitants in Neolithic Malta, organised into six territories each with about 2,000 inhabitants. However, the lack of extensive settlement data – indeed with barely half

# Tac-Cawla bone distribution

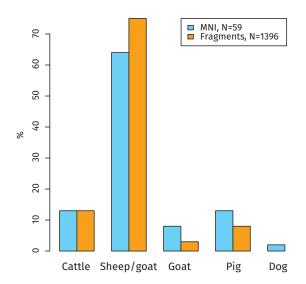


Fig. 4. The species representation of animal bone at the Taċ Ċawla domestic site.

a dozen domestic structures across Neolithic Malta in total - and the very incomplete palaeoeconomic record mean that the pattern of exploitation of the islands remains unknown. However, what is known is the potential impact of people concentrating their efforts on competitive building, and - within those buildings – on competitive feasting (HAYDEN 2014, chapters 6 and 7). Such activities and the likely over-exploitation of resources that spatially-constrained island societies often indulge in implies that there was very intensive production of some foods, perhaps specifically intended for feasts. We know that the main crops comprised wheat and barley, some millet, peas, lentils and beans, and that the overwhelming stock were ovicaprids, usually forming over 70% of all animals killed. Cattle amount to about 10-12% and pig around 10%, while wild animals and marine foods do not appear to have held much significance (RICHARDS et al. 2001; STODDART et al. 2009.). The recently-excavated site of Tac Cawla on Gozo has produced an economy that spans from Zebbug to Tarxien in date, as represented in Fig. 4.

Throughout prehistory and – it seems – historical periods (DE GROSSI MAZZORIN/BATTAFARANO 2012, 361), the broad ratio of sheep-goat/cattle/pig faunal assemblages from various sites remain similar, or even more focused on ovicaprids (by Punic times, 96% of bones from the University of Malta's work at Tas-Silġ were sheep/goat). During each phase, the treatment of the carcass repeats a pattern that is distinctive of

Malta, and suggests the maximum extraction of food and utility, with bones crushed and fragmented into tiny pieces, presumably through cooking and marrow removal. The many enormous cooking pots and vessels from the »temple« sites suggest that stews or brews were commonly prepared for ceremonial feasting. These destructive - indeed pulverising - practices inevitably hinder the archaeological study of the animal bone and its preservation generally, accounting for the lack of comprehensive study to date. The great majority of the ovicaprids present were sheep, although goat were present in small numbers in all assemblages. On most sites, the ageing material is limited given the extreme degree of fragmentation. The largest sample – from Taċ Ċawla (Fig. 5) –shows two peaks in slaughter. The first is for young animals, all of whom were killed at the age of 3–5 months. Some neo-natal bones were also present, but no mandibles survived. The 3–5 month age group represented lambs

fattened before slaughter. The high incidence of these can be seen as indicative of a marginal environment. The land and available water supply simply could not support the rearing of larger numbers of animals until the next peak in slaughter, i.e. in their second year. They were seemingly despatched when fodder became scarce and at an age when the cull of lambs/kids was a more economical time to slaughter animals, i.e. as they were approaching maturity.

Pigs and cattle are much more difficult to rear in the Mediterranean climate. Cattle need good grazing and large quantities of water, especially in warm weather, where a modern adult bovine can require between 38 and 50 litres of water a day, and much more for lactating cows (around 115 litres daily). Ancient animals would have required less due to their small size, but they would have still required substantial quantities of available water, a particularly acute problem in Malta.

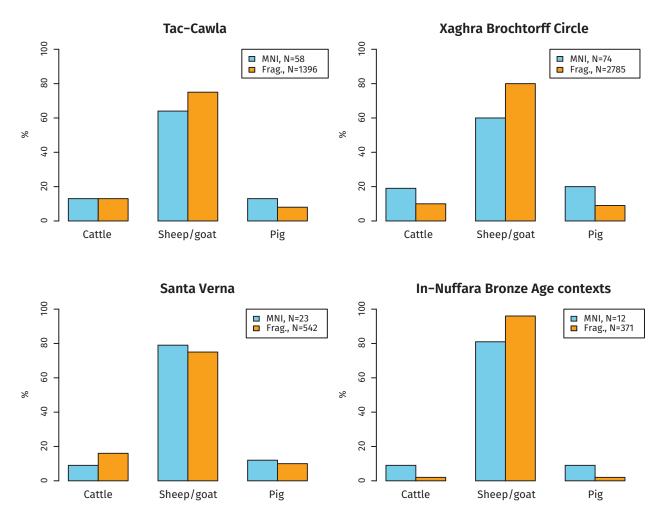


Fig. 6. Animal bone distribution of the main domesticates from different Neolithic sites (The Xagħra data is based on Stoddart et al. 2009).

Pigs thrive best in woodland and on root crops rather than grasses. Conditions suitable for their rearing would have been extremely limited and this is reflected in the low numbers kept. The distribution of animal seen at Taċ Ċawla indicated the exploitation of an environment that was best suited – but certainly not optimal – for the rearing of sheep, albeit with low levels of cattle and pig. There is remarkable uniformity in the distribution of the species (Fig. 6) at each of the sites currently under study. Evidently, the environment dictated the livestock economy of the time, whether in prehistory or later, since medieval assemblages from Malta are broadly similar to those notes in Neolithic contexts (MC CORMICK/MC LAUGHLIN in prep.).

Cattle bones are present in small numbers on most prehistoric sites and the ageing data is usually negligible. Nonetheless, the very small sample of cattle bones indicates that both old and young were present at the settlement site of Taċ Ċawla, while the temple offerings (recorded in the archives only from antiquarian excavations) suggest mature animals were slaughtered. At Taċ Ċawla, the majority of animals were slaughtered between 18-36 months, although the older animals suggest that dairy production and traction were likely. However, it is extremely unlikely that cattle were bred primarily for their dairy produce, since milking cows need even more water than »dry« bovines. Most likely, they were bred firstly for their powers of traction, as was the case in the Roman world (MACKINNON 2004, 86–87), as well as perhaps as symbols of wealth and authority in the social world of early Malta.

#### **CEREAL AGRICULTURE**

The absence of detailed botanical study of prehistoric sites in Malta to date prevents much generalisation about how early communities employed agriculture/horticulture. Nonetheless, based on the recently-sampled Taċ Ċawla settlement site on Gozo spanning the Żebbuġ, Ġgantija and Tarxien phases, 3600 to 2300 cal BC-a pattern of plant exploitation is emerging. While wheat and barley are the main cereal crops, barley seems to be the dominant crop, better adapted to the climatically-harsh and often dry conditions and rather saline atmosphere of Malta (Bates, pers. comm., see also, RENFREW 1972, 145, comment on the immature grains likely affected by drought) (Fig. 7a, b). The significance of pulses is heightened by their potential to provide dietary protein when animals were relatively scarce in the diet. Site assemblages typically include grind stones, which suggests that preparation of ground grain was an activity that took place, not only on settlements

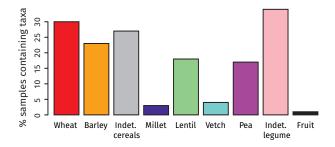


Fig. 7a. Frequency of plant remains at Neolithic Taċ Ċawla.

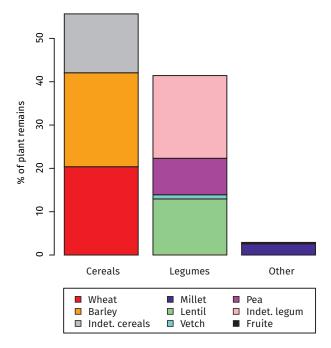
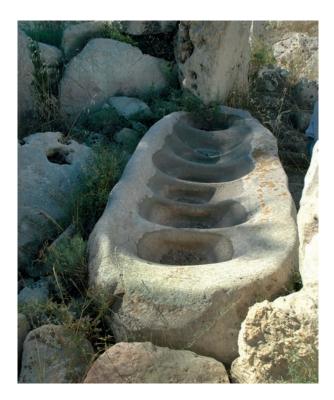


Fig. 7b. Relative frequency of crop types present.

but also in the »temples« where perhaps ceremonial or symbolic grinding took place. One especially impressive segmented »trough« is located in the temple of Kordin III (Fig. 3a). The Fragsus soil work discussed above indicates that Neolithic communities managed the productivity of their soils effectively, with relatively little erosion or damage to humic content, and thus the fertility. We might speculate that the smallwalled field systems that still survive over much of the rocky plateau landscapes of Malta and Gozo became established very early in the farming practices of the islands, but were perhaps concentrated on the very upper slopes close to temple structures, rather than being ubiquitous in the landscape as they are today. The fields would have been very small and appeared more like gardens, ideally suited to the horticultural – hoe rather than plough – type of early cereal growing that we can envisage for the 6<sup>th</sup>/5<sup>th</sup>/4<sup>th</sup> millennia BC. Fruit,



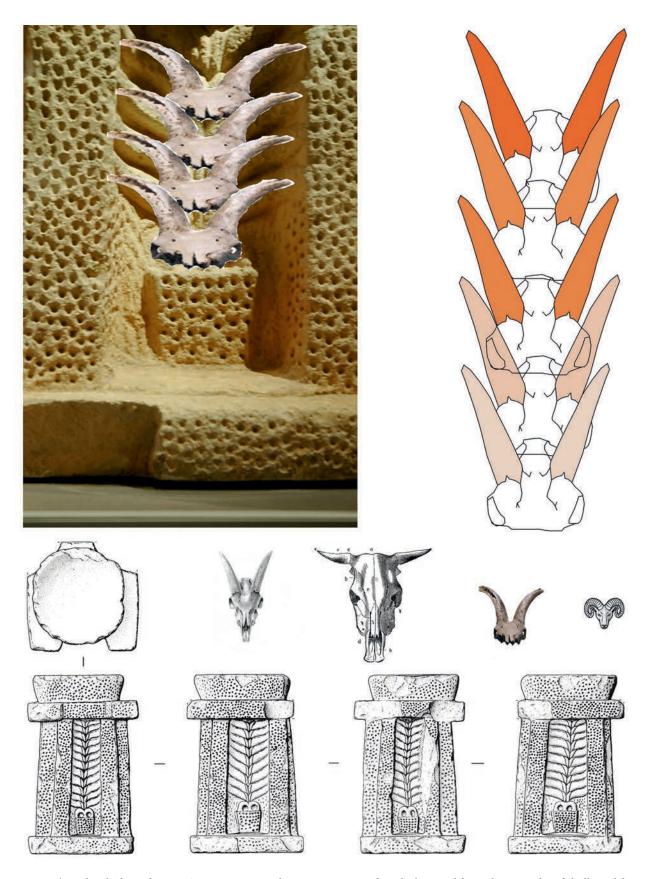
nuts and other products are not well known yet from the botanical assemblages, but it is likely that arbore-al crops became established and eventually expanded onto the unstable slopes, perhaps exacerbating soil erosion. Certainly the rise in pollen associated with vine and olive seems to tally with accelerated deposition in the sediment cores from classical times onwards (indeed, these are further confirmed by studies at Tas-Silġ, see FIORENTINO et al. 2015).

Fig. 3a. The Kordin Trough in situ at Kordin III (photo: C. Malone).

# TAC CAWLA AND THE EMERGING ECONOMICS

The interpretation of the domestic environment of prehistory Malta has been long constrained by the lack of detailed excavation or analysis of economic materials. The work at Skorba retrieved large quantities of animal bone and seeds, although rather summary reports resulted (TRUMP 1966). The site of Tac Cawla on Gozo was identified in the 1980s, assessed in the 1990s and finally excavated with the goal of extracting economic materials in 2014. This site comprises remnants of domestic structure, (see Fig. 8) including plaster floors and low walls, and despite being very badly disturbed by later land use it has produced the first truly systematically-collected economic profile of the Temple period. The animal bones discussed above and the plant remains are typical of the Neolithic of the central Mediterranean, but the emphasis on barley over wheat, the lack of fruits or nuts suggest a very particular island economy. The site location is revealing since it is on the south edge of the Victoria-Rabat coralline plateau, which sits directly on the aquifer clay that emerges immediately below the limestone, providing a ready source of almost-continuous water supply. The soil is well developed in the area; indeed, it is shown to be an ancient soil of some fertility and local intelligence describes the area as some of the best in the island. The structure that was uncovered - despite surviving in height to less than a metre – was an oval stone-walled

»building« with a build-up of plaster »torba« floors inside, rubbish and cooking places outside, and a succession of levels of occupation, spanning from the Żebbuġ to the full Tarxien »Temple Period« c 4000 – c 2500 BC. At the earlier levels, the structure seemed to enclose a natural rock ramp that possibly led down to a spring emerging from the perched aquifer below, and one interpretation is that the wall protected the water source from animal disturbance or separated the living areas from the muddy water hole. The spring must have failed and the hollow filled in, since there were stone layers of deliberate packing to form the base for later plaster floors. Regardless of the domestic sequence, the presence of reliable water - as with the contemporary temple buildings - was evidently and logically the main factor in the choice of settlement location. The recent work has systematically sampled the archaeological deposits for seeds, bones, molluscs, micromorphological activity indicators, dating evidence, and environmental indicators and in the process of final reporting. This work provides a much more precise understanding of the management of food production in early Malta, and potentially informs on the issues discussed here concerning why restricted and probably diminishing food supplies stimulated the building of massive, high-investment megalithic buildings. Logically, the restricted islands and their dense population was the



 $Fig.\,8.\ The\ "Floral\ Altar\ of\ Ha\'gar\ Qim",\ suggesting\ the\ representation\ of\ stacked\ animal\ frontals,\ examples\ of\ skulls\ and\ frontals\ of\ sheep\ and\ goat,\ and\ elevation\ drawing\ of\ the\ altar\ (idea\ developed\ by\ C.\ Malone,\ drawing\ Jason\ Gibbons).$ 

least suited to monument building anywhere in Europe, and yet the population was stimulated or perhaps even compelled to invest in the rituals of food and food production owing to the uncertainties. The detailed AMS chronology for the Neolithic finally emerging from Taċ Ċawla and related studies under the auspices of the Fragsus project is beginning to show that there are very early (towards the mid–6<sup>th</sup> millennium BC) episodes of settlement that are fully agricultural and have a wide range of cereals and pulses in the economy. Intensification recurs at intervals over the long prehistoric and early historic sequence, and undoubtedly there are episodes of activity that are manifested in the rebuilding and expansion and remodelling of the temple structures.

At the Santa Verna temple site on Gozo – close to Ggantija and the Brochtorff Xagħra Circle – the 2015 excavation has extracted important dating on the occupation sequence. This shows early settlement (of Għar Dalam-Skorba phases in the 6th millennium BC) underlying the later temple, which in turn starts small, but is rebuilt and expanded in the mid-4th millennium BC (Ġgantija phase) before finally being deliberately dismantled, seemingly before the full florescence of the »Temple Period« (around 3200–2500 BC). This site is also located on prime soil, close to springs and in a commanding position, and it is clearly more than a domestic site, but significantly is formed from the domestic into something grander and symbolic.

#### **TEMPLES AND MEGALITHS**

The goal of this paper is to investigate the interrelationship between megalith building and the early economy of Malta. This theme has received some attention (MALONE in press) with the suggestion that competitive feasting practices were one factor stimulating the increasing impact of human exploitation on landscape stability. It is worth examining the nature of the so-called »temple« megaliths, which on close inspection have rather little to do with religion, and rather more evidence for functions that focused on the storage, preparation and presentation of food. Of course, such practices are often imbued with symbolic meaning and heavily ritualised, but food nevertheless seems to be a key element in the buildings. For example, the façades of the megaliths were usually constructed with a stone display bench that often incorporated a tethering hole. We might imagine cattle or goats fastened by rope in full public view, alongside piles of foodstuffs, as well as serving and drinking vessels. There they could be slaughtered in public view, an act in front of the gathered community who would later enjoy the festive meal. Tie holes are prominent at the temples of Tarxien, Hagar Qim, Mnajdra and Ġgantija, where the relatively-late constructions remain relatively intact. Inside the buildings, the layout described above involves a passage along a central corridor, often rising upwards over thresholds, and passing a series of holes drilled into the floors. These are plausibly interpreted as »libation holes« and they also occur in the perimeter stonework of several sites (Tarxien, Hagar Qim for example), as well as »ritual« troughs set out within the façade of Tarxien. The symbolism of liquid and water is clearly a significant aspect of the temple functions, since most of the temple locations that Fragsus has examined through ground-penetrating radar and survey are associated

with water sources. For example, Ġgantija is located directly over a geological fault, as a spring emerging beneath the façade wall. Large — indeed colossal — stone and ceramic vessels were incorporated into the layout of the temples, usually located on the left-hand side of the corridor at a relatively deep point of the building. Opposite, fire pits seem to mirror the vessel locations, presenting a beguiling and possibly symbolic opposition of fire and water, hot and cold, which may reflect the early Maltese ritual ideology (MALONE 2007; STODDART et al. in press).

The architectural elaboration of the Maltese Temples – previously considered to be part of a complex religion focused on Mother Goddesses and fertility cults (GIMBUTAS 1982; 1989; 1991) – is much more effectively interpreted as a response that exerted social control over food and the management of scarce resources. The function of the temples was as a food repository, food symbol, food distributory and shrine to past food and feast. These functions also embody the memory-making that great formal social gatherings can provoke, memorialised through the strategic display of a set of horns, dinner »service« of ceramic serving vessels, the sensory repetition of formal ritual and much else. The elaborate so-called »floral« altar from Hagar Qim is much more plausibly interpreted as a stack of goat/sheep frontals beneath the killing table above (Fig. 9), which had – and still has – the power to symbolise the act of slaughter and the preparation of meat for the feast. Although most cult practices involve food preparation and distribution practices, sacrifice and ritual consumption, few megalithic sites in Europe or elsewhere conserve the detailed and extravagant traditions that can be interpreted from the data of Neolithic Malta. The investment demonstrated in the display facilities

the infrastructure of the temples, the theatrical layout that enhanced dramatic presentation of food through narrow exits to the public spaces outside, and the control access to the interior, all of which hint towards a very particular attitude to food itself (MALONE 2007). The notion that such structures might be a response to the tough local conditions has not been widely debated, although it is a model that fits the available zooarchaeological data and consensus emerging from palaeo-environmental and land-scape studies, all of which indicate that the temples were points of stability in an otherwise hostile and dynamic landscape. It is clear that various environmental and social factors coincided in the  $4^{\rm th}-3^{\rm rd}$  millennium BC, leading to the emergence and florescence of the Maltese Temple Culture.

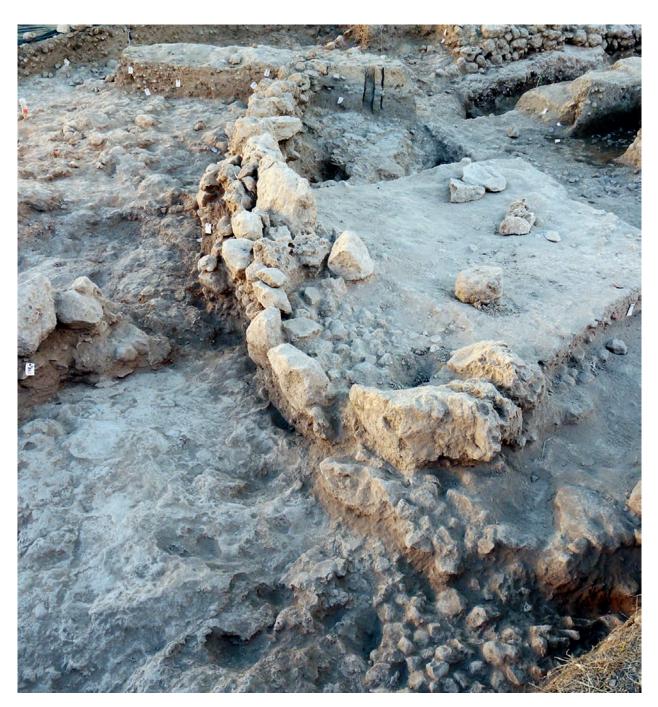


Fig. 9. Taċ Ċawla Gozo, 2014 excavation of Temple period and earlier domestic structure.

#### CONCLUSIONS: THE EMERGENCE OF AN ECONOMIC UNDERSTANDING OF MEGALITHIC LANDSCAPE IN MALTA

Roy Rappaport's Pigs for the Ancestors (1967) provides – at first sight – an obvious parallel for what we conceive to have happened in prehistoric Malta. Both ethnographic New Guinea and prehistoric Malta comprise elaborate rituals amongst distinctive horticulturalists on relatively-isolated islands. However, it is instructive to emphasise the differences, because these highlight the key elements of our current understanding of the economics of prehistoric Malta. The first and most obvious point is that the island of Malta substantially differs in terms of its ecology and the principal domesticates. The tropical nature of New Guinea and the prolific life cycle of pig underwrite the potential competition between gardens and pig numbers, leading to a potential need for regulation. In Malta, the maintenance of animals is very severely curtailed by fodder and water, and thus resilience is the key factor, a feature noted in all areas of the prehistoric Maltese life: the human remains, the chosen crops, the limited husbandry focused on sheep and goat, the soils and

the living conditions. The second relates to the critique of Rappaport's original thesis (PETERSEN 1980). Rappaport conceived that there were two worlds – the emic cognised world of the New Guinea, and the etic operational world (of adaptation) – that he was able to analyse. In the prehistoric Maltese world, we primarily conceive a world of strategy by the participants. The Maltese temples were a central point of the strategy of resilience that included feasting in temples as a primary scheme. This was also a subtle strategy, because the most prominently-curated bones – the horns and feet of cattle – were simultaneously the most rare, the most conspicuous and the least nutritious in the daily life of the inhabitants. These temples – planted on good soils and good water supplies - were foci of integration, continuity and resilience in an uncertain environment, symbols of past success, aspiration and power over the natural elements that controlled and limited a Neolithic island world.

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