PAST
THE NEWSLETTER OF THE PREHISTORIC SOCIETY

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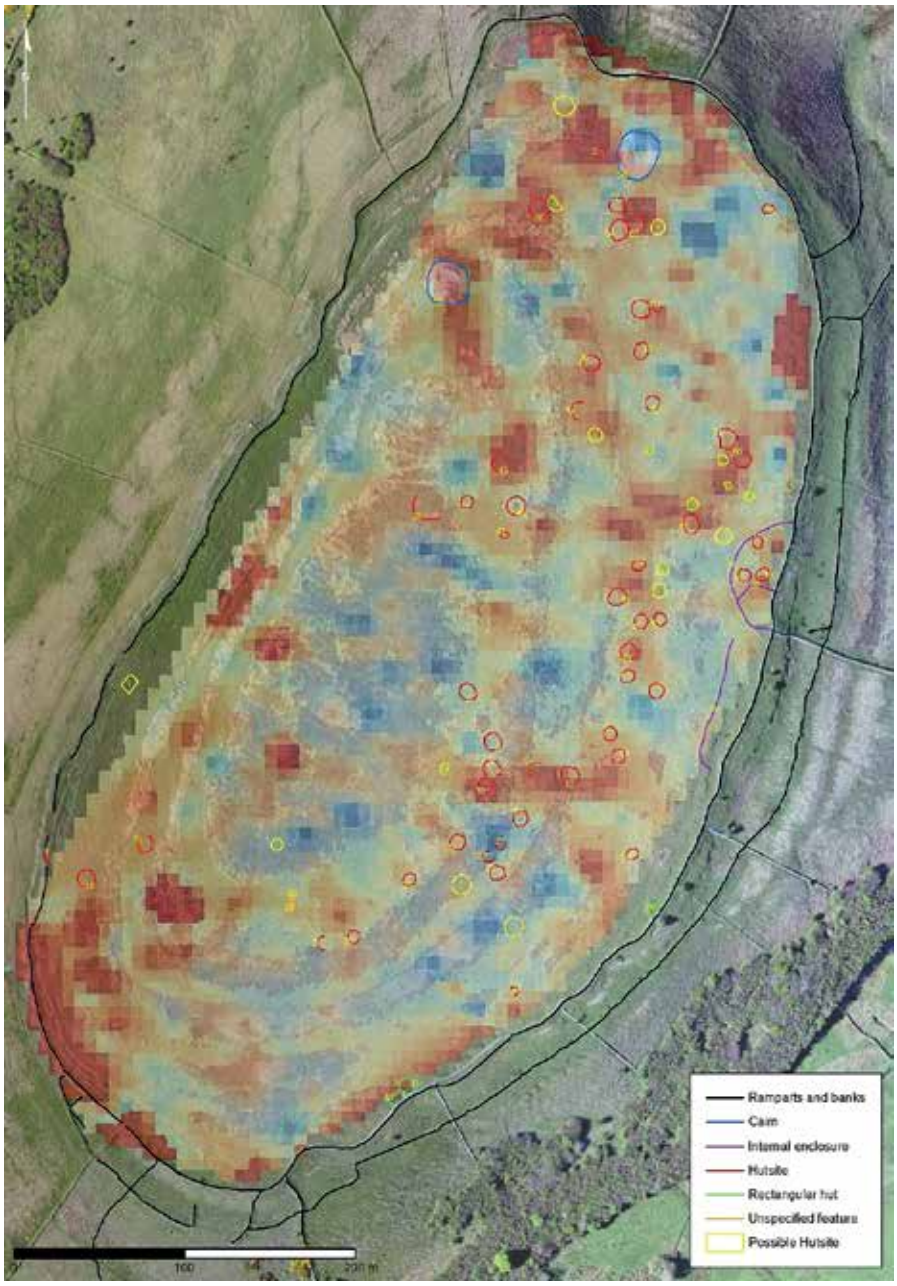
Prehistoric hilltop settlement in the west of Ireland

For two weeks during the summer of 2017, from the end of July through the first half of August, an excavation was carried out at three house sites on Knocknashee, Co. Sligo, by a team from Queen's University Belfast. Knocknashee is a visually impressive flat-topped limestone hill rising 261 m above the central Sligo countryside. Archaeologists have long been drawn to the summit of Knocknashee because of the presence of two large limestone cairns to the north of the plateau, and aerial photographs taken by the Cambridge University Committee for Aerial Photography in the late 1960s also identified an undetermined number of prehistoric roundhouses on the summit. During survey work undertaken in the early 1990s by Tom Condit, Michael Gibbons and Martin Timoney, approximately 30 stone-footed roundhouses were recorded on the plateau, and further structures were identified in a survey undertaken by Margie Carty from NUI Galway during the early 2000s, bringing the total to 42 roundhouses.

However, neither of these two surveys was followed up by excavation, and as the boom of development-driven archaeology during the Celtic Tiger years has largely spared exposed hilltop locations, our archaeological knowledge not only of Knocknashee, but also of prehistoric hilltop settlements in Ireland more widely remains relatively limited in comparison to many other categories of site. This lack of knowledge even extends to basic questions of chronology. Following the first published discovery of roundhouses at Knocknashee

Aerial photograph of Knocknashee with prehistoric cairns and roundhouse footprints



GPS survey results overlain on magnetic susceptibility survey results

in the 1960s, these were interpreted as the dwellings of the 'cairnbuilders', and consequently assigned to the Neolithic, along with similar roundhouse clusters at Carrowkeel and on Knocknarea, both visible from the summit of Knocknashee.

While a Neolithic date for the roundhouse occupation on Knocknarea has since been confirmed, the discovery of a potential rampart beneath a modern dry-stone wall around the plateau's perimeter at Knocknashee, in the survey conducted by Condit, Gibbons and Timoney, cast doubts on the assumed Neolithic date for the roundhouses there and raised the possibility that this was a Bronze Age hillfort. Establishing the date of the roundhouse occupation at the site consequently became one of the main aims of the current project. Further objectives were to determine how the houses on Knocknashee were constructed, and to what extent they were in use coevally.

With these objectives in mind and in order to identify the most promising area for excavation within the site's perimeter, at the start of the present project in the summer of 2016 a new topographical survey was conducted by Thorsten Kahlert, then Sligo IT, and a geophysical survey carried out by Earthsound Geophysics Ltd., led by James Bonsall, at the request of the Queen's University team. The topographical survey was based on an extensive series of UAV-acquired aerial photographs and complementing capture of GPS data on the ground, which allowed the production of a digital elevation model and an orthorectified photographic map of the hill. This facilitated the identification and accurate placement both of archaeological features uncovered by previous researchers and of newly discovered structures, bringing the total number of roundhouses to a minimum of 51 and possibly as many as 60. The geophysical survey work mainly comprised a magnetic susceptibility survey of

Trench location and outline, House 20 to the south, House 19 in the centre and House 18 to the north

Structure-from-motion recording of House 20 under excavation

the entire summit, which suggested areas of more intense human activity. More detailed magnetic gradiometry and earth resistance surveys were undertaken on a 60 × 40 m area in the northern half of the plateau. Within this area, a single trench measuring 35 m in length and between 1 and 4 m in width was excavated last year, cutting through three of the roundhouses identified previously, Houses 18, 19 and 20.

The houses seem to have been built upon raised platforms set into the slight slope of the summit plateau. A layer of grey clay deliberately brought in as flooring material was found in the interior of the southernmost house, House 20. No similar flooring was found in the house immediately abutting to the north, House 19, possibly suggesting that this somewhat larger structure may have been an ancillary building, potentially not intended for human habitation. The walls had a stone core, around which individual dumps of earth had been placed before the final facing of the wall in stone. An entrance to House 20, measuring 1.2 m in width, was revealed in the east wall. Several fragments of probably Bronze Age coarse pottery were found in the entrance area to the house, which also produced some chert flakes. Other finds from House 20 include two fragments of polished stone discs. House 19 produced hardly any archaeological material, save for a couple of small pieces of chert.

The walls of the northernmost house excavated, House 18, were composed of stones which were fewer, smaller and more randomly scattered than those defining the walls of Houses 20 and 19, and it seems likely that the walls of this house had been dismantled and the stone removed for use in other structures already during prehistory, indicating that not all the houses on the plateau were in contemporary occupation. However, according to the series of radiocarbon dates obtained from the excavation, all three houses can be attributed to the Late Bronze Age (1260–815 cal BC at 2σ; based on radiocarbon determinations from ten charcoal samples undertaken at QUB's ^{14}CHRONO Centre), which is in line with the dating of hillforts in other parts of Ireland.

The excavation of the wall of House 18 produced a considerable quantity of lithic material, mostly debitage, but also including one fine butt-trimmed flint knife of likely Late Mesolithic date. Given the location of the flint within the walls, it is probable that this is redeposited residual material from earlier, previously undetected activity on the summit of the hill.

The excavation has answered each of the questions posed. We can now say much more about how the houses on Knocknashee were constructed. We have also determined that most of the activity relating to these structures seems to be Late Bronze Age in date, which fits well with the suggestion that Knocknashee was a hillfort, and we can finally say that all of the roundhouses at Knocknashee were not in contemporary use, with evidence of stones being robbed from House 18 for use in other ancient structures on the hilltop. For the summer of 2018 it is planned to excavate most of the remainder of the three roundhouses that have been partially uncovered in the previous season, to gain a better understanding of their function and of the spatial organisation of their interior. For updates on the project, please visit www.facebook.com/Knocknashee/

We gratefully acknowledge the generous funding received from the Research Excavation Grants Scheme of the Royal Irish Academy, which has enabled us to undertake this project.

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Lower limb robusticity and mobility behaviour in Copper Age northern Italy: a biomechanical analysis

Long bones have been shown to respond to the mechanical strain associated with physical activities undertaken during life. As part of a wider PhD project, the lead author is investigating variations in body size and habitual behaviour in human populations from the central Mediterranean during the Neolithic and Copper Age through the application of 3D scanning technology and metric analysis of long bone morphology. The main aim is to clarify the relationship between cultural diversity and biological variability.

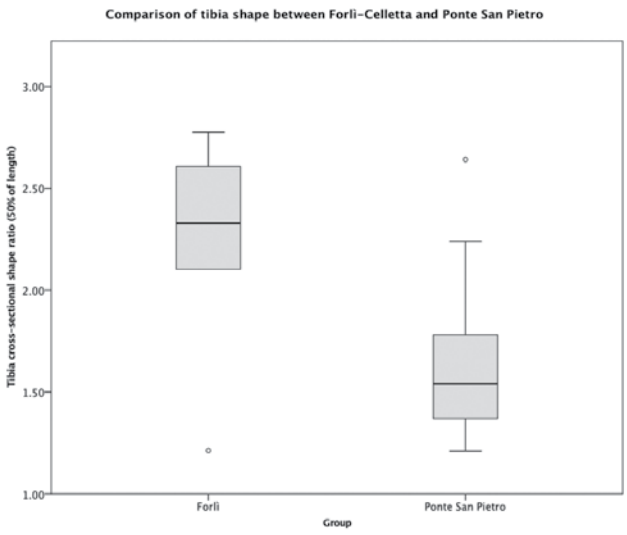
The fourth and third millennia BC were a period of marked change across Europe, with emerging cultural diversity, social change, economic diversification and technological innovation. The central Mediterranean at this time was characterised by the development of distinct cultural groups across the Italian peninsula, Sicily, Sardinia and Malta, and therefore provides the perfect context to explore spatial patterns between culture and biological variability. This project has analysed human remains from the Middle Copper Age (early third millennium BC) necropolis of Forlì-Celletta, situated on the Po plain (northern Italy), and the Early Copper Age necropolis of Ponte San Pietro, Ischia di Castro (central Italy), dated to the mid fourth millennium BC.

Bioarchaeologists have used skeletal biomechanics to reconstruct activity in archaeological populations, with methods traditionally focused on structural adaptation of the long bones. This project uses 3D laser scanning to capture the cross-sectional geometric (CSG) properties related to strength and shape at the mid-shaft femur and tibia. 3D scans were captured using a portable NextEngine 3D laser surface scanner, allowing fragmented bones to be digitally reconstructed. Previous studies of long bone biomechanics have provided insights into diachronic and spatial differences in subsistence strategies, mobility behaviours, activity and the sexual division of labour, all of which could potentially be relevant in our Italian case study.

The femora and tibiae of eight individuals from Forlì-Celletta were compared to those of 17 individuals from Ponte San Pietro in order to compare mobility behaviours and human–landscape interactions between the two groups. Owing to the differential preservation and high bone fragmentation in the Forlì-Celletta sample, biological sex could not be determined for all individuals. As a result, pooled sex statistical comparisons were carried out using independent sample *t*-tests. The results of the preliminary analysis of the lower limb showed no difference in femoral or tibial strength between the individuals from Forlì-Celletta and Ponte San Pietro, although a significant difference in the cross-sectional shape of the mid-shaft of the tibia was observed. The box plot compares the cross-sectional shape of the tibia between both groups, with a lower value indicating a rounder cross-sectional shape and higher values indicating a more elliptical shape. In the Forlì-Celletta group, the tibiae are more antero-posteriorly loaded than those of the Ponte San Pietro group, which are rounder and more medio-laterally loaded.

Example of a 3D digitally reconstructed femur

The results presented here likely reflect differing modes of terrestrial mobility between the two groups owing to their contrasting environmental contexts. Whilst the Forlì-Celletta group is associated with the flat terrain of the Po plain, the Ponte San Pietro group is traditionally associated with pastoral agriculture around the mountainous terrain of Tyrrhenian central Italy. Therefore, the rounder cross-sections of the Ponte San Pietro group may reflect medio-lateral strengthening of the tibia in response to increased levels of terrestrial mobility around rugged terrain, whilst the Forlì-Celletta group exhibits lower limb morphology adapted to unidirectional terrestrial mobility on the flat, even terrain of the Po plain. Whilst no settlement is known for the Ponte San Pietro sample, the results presented here are congruent with the settlement record for the area surrounding Forlì-Celletta during the Copper Age, which shows a preference for the low-lying areas of the Po plain. The results are further corroborated by comparisons with contemporary data, for instance for 'Ötzi' the Tyrolean Iceman, who has a rounder tibial cross-section than the average values for both the Forlì-Celletta and Ponte San Pietro groups. In his case, this was interpreted as an adaptation to high levels of terrestrial mobility on rugged Alpine terrain.



Boxplot comparing tibial shape between the Forlí-Celletta and Ponte San Pietro groups

Future analysis will further compare the human remains from Forlì-Celletta with Neolithic and Copper Age groups from Malta, Sardinia, southern Italy and the Alps in order to explore temporal and regional differences across the central Mediterranean.

Acknowledgements

The authors would like to thank Prof. Jacopo Moggi-Cecchi (Università degli Studi di Firenze) for granting access to the Ponte San Pietro sample. This research was generously funded by the Prehistoric Society Coles award, the Dorothy Garrod memorial fund and the Andrew Sherratt fund.

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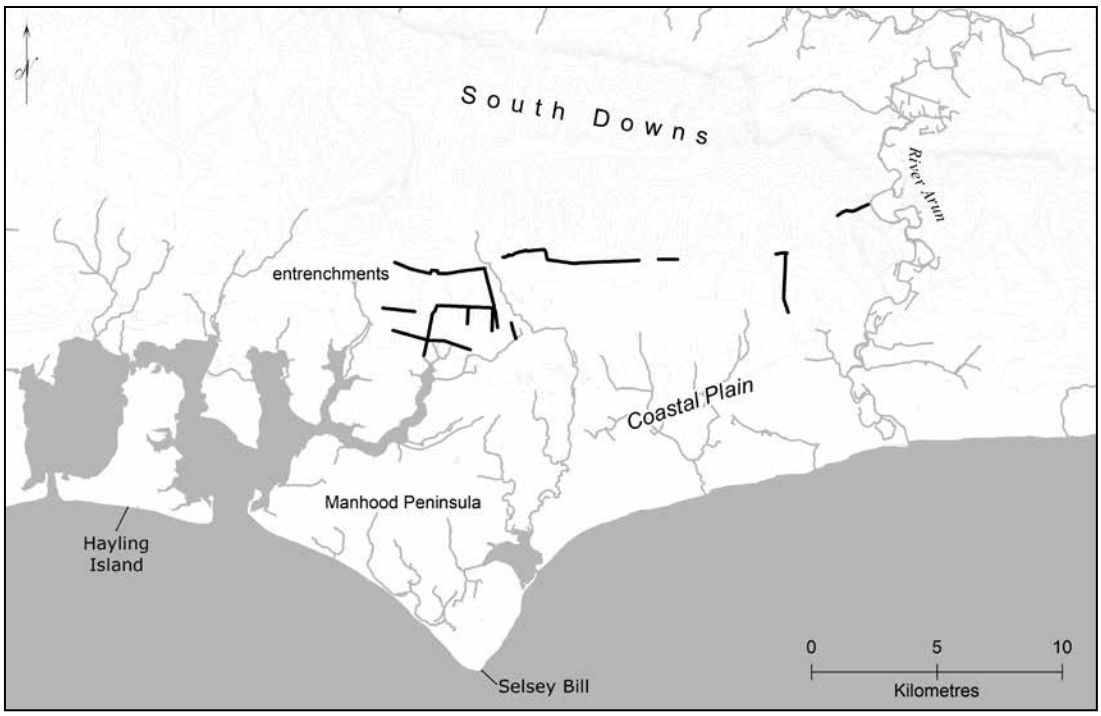
A new understanding of the Late Iron Age territorial oppidum at Chichester, West Sussex

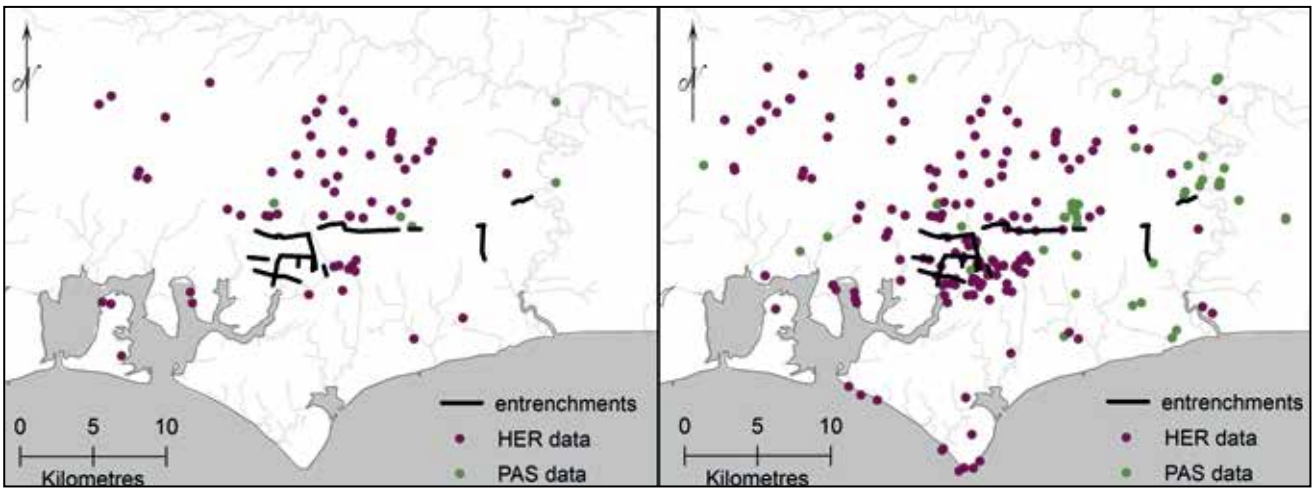
Territorial *oppida*, defined as large-scale settlements delineated by discontinuous earthworks, form an enigmatic part of the substantial changes that occurred across Britain during the Late Iron Age. Despite a number of new research projects into *oppida* across Britain (e.g. Silchester, Stanwick, Bagendon), the territorial *oppidum* surrounding Chichester, West Sussex, is an often cited but poorly understood example of this settlement type. The *oppidum* landscape around Chichester is defined by a number of naturally occurring landscape features, including the River Arun to the east, Hayling Island to the west and the English Channel to the south. The *oppidum* is bounded to the north by the South Downs, a range of chalk hills, and to the south by the Manhood peninsula, with Selsey Bill representing the major headland.

In the course of my PhD research at the Institute of Archaeology, UCL, a landscape analysis of HER (Historic Environment Record) and PAS (Portable Antiquities Scheme) data of this area from the Middle Iron Age to post-conquest period was conducted to better understand the development of the Chichester *oppidum*. Modern-day development in this area has led to a number of developer-funded archaeological investigations, which along with new LiDAR surveys have transformed our understanding of this landscape in the Late Iron Age.

The recognition of the Chichester *oppidum* is partly due to the presence of the linear earthworks that define it, known as the Chichester entrenchments, which have been investigated since the 18th century. Despite limited archaeological evidence, it was assumed that the *oppidum* was centred on the Selsey peninsula to the south of these earthworks. Previous analysis has often emphasised the importance of the historical sources that describe Late Iron Age Britain and has attributed



Location map of entrenchments in the Chichester area

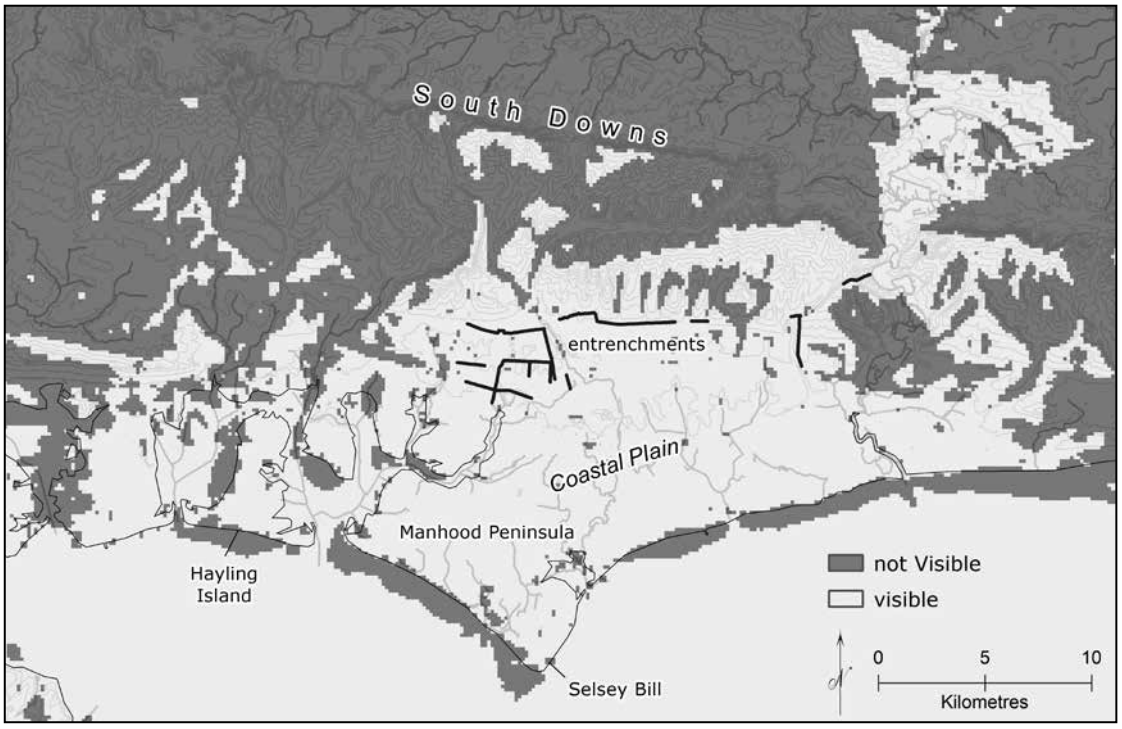


HER and PAS data showing Middle Iron Age (left) and Late Iron Age (right) sites in the Chichester area

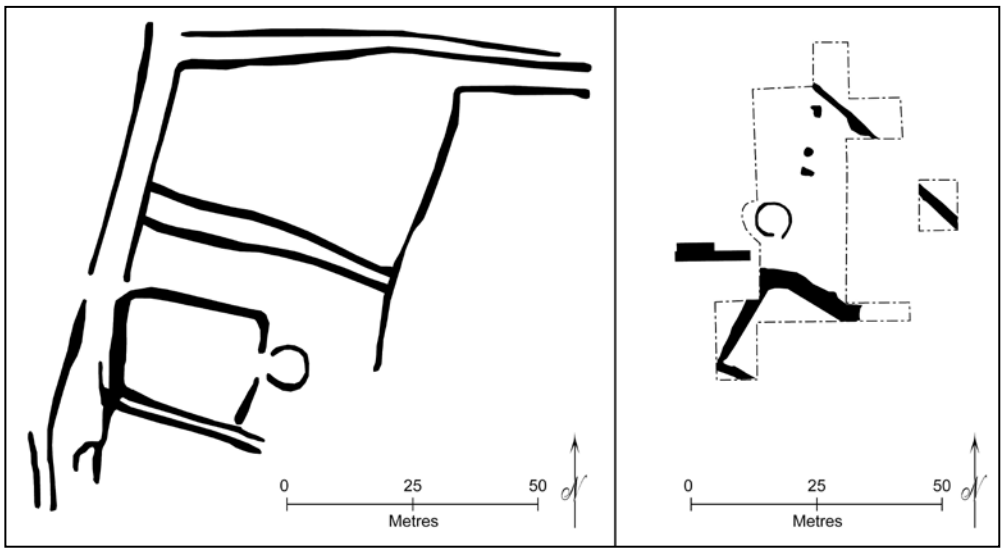
social changes to contact with, and allegiance to, the Roman Empire. However, Sue Hamilton's 2007 examination of Iron Age evidence along the south coast concluded that these social changes were likely a combination of continuing Middle Iron Age traditions and contact with the continent. In fact, although *oppida* are often thought to have emerged in previously 'unoccupied' areas, a number of Middle Iron Age sites are known from across the Chichester area.

A spatial distribution of HER and PAS data illustrates a dense collection of Middle and Late Iron Age sites in some urban areas (Chichester, Havant), while others are notable for the lack of information (Bognor Regis, Littlehampton) despite substantial development over the last 15 years. A cluster of sites along the south coast at Selsey Bill reflects the deposition of large numbers of Late Iron Age coins in this area and off the coast. Although subject to limited modern development, excavations undertaken by Archaeology South-East at Medmerry found little trace of Iron Age or Roman remains. This suggests that this area was inundated during these periods and thus did not represent the focal point of the *oppidum*. The discovery of numerous Iron Age gold coins at Selsey Bill may represent votive deposition in this possibly marshy area and into the sea.

Although the last systematic survey of the entrenchments was undertaken in the 1970s, archaeological investigations over the past ten years have continued to add to our understanding of this complex earthwork system. Viewshed analysis has demonstrated that the entrenchments were feasibly more important to those living on the coastal plain, where the earthworks were visible, while visibility was poorer from beyond the settlement. Furthermore, the effort to construct this monumental system of banks and ditches suggests a high



Viewshed analysis of Chichester entrenchments



Plans of Iron Age farmsteads. Left: Copse Farm, Oving; right: North Bersted

level of co-operation between Late Iron Age social groups. Excavations in 2010 of the Devil's Ditch at Halnaker by Archaeology South-East allowed scientific dating of the lowest deposits within the backfilled ditch. Although no finds were recovered, optically stimulated luminescence (OSL) dating of these deposits gave a broad Iron Age date. Despite earlier debate that this feature may be a medieval deer park boundary, this investigation confirms that the Devil's Ditch was part of the Chichester *oppidum*. The identification of the eastern extent of the entrenchments, known locally as the 'War Dyke', by aerial photography has also been reaffirmed using LiDAR. Investigations by Cotswold Archaeology of an enclosure that abutted the earthwork indicate that the dyke truncated an earlier hilltop enclosure. Excavations by Archaeology South-East in 2017 north-west of Chichester also revealed a possible section of the entrenchments. Despite more than 100 years of archaeological excavation, it is estimated that only 2% of the entire system has been examined. An updated full-scale survey of the entrenchments is long overdue.

The role of agriculture is an often overlooked feature of British territorial *oppida*, although recent research, particularly at Bagendon, has begun to uncover the association between a mixed farming regime and these settlements. At Chichester, excavations at North Bersted, Oldplace Farm and Copse Farm have revealed evidence for Iron Age farmsteads and vast field systems, which likely represented an extensively ditched landscape across the coastal plain. In addition, recent LiDAR analysis of the South Downs ridge by the South Downs National Park Authority has revealed an extensive system of banks and ditches across this now forested region. Although dating evidence is currently sparse, the diversity of field systems (radial, coaxial, agglomerated, linear) suggests that agricultural activity extended over a long period and underwent many reconfigurations. Excavations by Cotswold Archaeology in 2016 as part of the 'Secrets of the High Woods' Project uncovered tentative evidence that field systems in East Dean Woods were Bronze or Iron Age. Moreover, Stuart Eve's report in *PAST* 78 highlighted the stratigraphic relationship of some of these fields to Stane Street Roman road, suggesting that they may be pre-Roman. As many of the farmsteads and field systems on the coastal plain were originally founded in the Middle Iron Age, a similar date could tentatively be afforded for the field systems further north as well. This evidence may represent massive areas of open field systems between Late Iron Age farmsteads, which formed the agricultural heart of the *oppidum*.

In sum, Chichester *oppidum* is an important example of this Iron Age settlement type, with possible origins in the Middle Iron Age. This is demonstrated partly by the continuity of a number of sites from the Middle Iron Age to the post-Conquest period, such as Ounces Barn, Boxgrove, North Bersted and Westhampnett. Other *oppida* may also benefit from detailed reanalysis of past investigations and data generated through developer-funded fieldwork and metal detecting. An underlying theme throughout this discussion is the importance of considering the Middle Iron Age origins of this *oppidum*. This forces us to challenge our perceptions of how other *oppida* were founded across Britain and how these origins may have affected the physical, social and political structure of these settlements.

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Programme of meetings 2018–2019

Date	*Venue*	*Details*
		Prehistoric Society "Grand days out" This summer's programme includes:
Sun 15 July 2018	Dorstone, Herefordshire	**Tour of excavations at Dorstone Hill** Led by Dr Keith Ray and Prof Julian Thomas. Exact date TBC.
Sun 29 July 2018	Avebury, Wiltshire	**Tour of excavations at Avebury** Led by Dr Josh Pollard (University of Southampton).
Sun 5 August 2018	Soulton Manor, Shropshire	**Tour of Soulton long barrow and standing stones** Led by Toby Angel and Tim Ashby, with a talk by Prof Marie-Louise Stig-Sørensen (University of Cambridge). Start: 3pm. Further Days Out are currently being planned. Directions and details for all Days Out will also be posted on the website. **To book any of these events, please email prehistoric@ucl.ac.uk**
Sat 27 October 2018	**Day School** Society of Antiquaries, Burlington House, Piccadilly, London	**Wetlands and Drylands (rescheduled)** This day school continues our series into exploring prehistoric landscapes. It has been rescheduled after heavy snow prevented it running in March this year.
Mon 29 October 2018, 9.30 am – 4pm	**Day Conference** British Museum, London	**The matter in hand: new research on later prehistoric finds** Joint Later Prehistoric Finds Group / Prehistoric Society conference . Further details will be posted online in due course.
Wed 31 October 2018, 5pm	**Lecture** Society of Antiquaries, Burlington House, Piccadilly, London	**The 17th Sara Champion Memorial Lecture** **"*Though they but little....The Bronze Age funerary cups of Britain*"** by Clare Copper, University of Bradford.. Followed by free wine reception and presentation of the Society Undergraduate Dissertation Prize.
Sat 10 November 2018, 2.15pm	**Lecture** Norwich Castle Museum, Castle Meadow, Norwich	**"*Living with monuments: settlement, monumentality and landscape in the Neolithic of the Avebury region*"** by Dr Josh Pollard, University of Southampton, and Dr Mark Gillings, University of Leicester Joint Norwich and Norfolk Archaeological Society / Prehistoric Society annual lecture.
Mon 12 November 2018, 7.30 pm	**Lecture** Scarborough Library, Vernon Road, Scarborough	**"*New perspectives on Neolithic flint mining and stone quarrying*"** by Dr Peter Topping Inaugural joint Scarborough Archaeological and Historical Society / Prehistoric Society lecture.
Wed 27 February 2019	**Lecture** Devon County Hall, Topsham Road, Exeter	**"*The Neolithic Glacier Mummy "Ötzi": his life circumstances and environment*"** by Prof. Oeggl, Innsbruck University Joint Devon Archaeological Society / Prehistoric Society annual lecture.
Fri 1 March 2019, 7.30pm	**Lecture** Truro Baptist Church, Chapel Hill, Truro	**"*The Neolithic Glacier Mummy "Ötzi": His life circumstances and environment*"** by Prof. Oeggl, Innsbruck University Joint Cornwall Archaeological Society / Prehistoric Society annual lecture.
Sat 16 March 2019	**Day School** Society of Antiquaries, Burlington House, Piccadilly, London	**Landscapes of the Dead** Further details will be posted online in due course and a booking form included in the autumn issue of PAST.
Fri 14 – Sun 16 June 2019	**Day conference & Europa lecture** Jersey, Channel Islands	**Europa conference 2019: Neolithic connections** The recipient of the 2019 Europa Prize is Dr Alison Sheridan, National Museums Scotland. The event is jointly hosted with Jersey Heritage. Further details and a booking form will be posted online and advertised in PAST in due course.
Weekly, autumn to spring	**Lecture series** University of Bradford	**University of Bradford Archaeology Guest Lectures** Weekly lectures on prehistoric topics open to members by kind invitation of Dr Alex Gibson. For full details, please see the university's website.

Accounts for 2017

Unfortunately, it was not possible to produce the statement of accounts in time for inclusion in this issue of PAST. It will be published in the November issue and made available online as soon as possible.

A Skara Brae detective story: the discovery of an inscribed slab from the sub-mural burial cist in House 7

Within a display in the Museum of Scotland entitled 'Glimpses of the Sacred' stands an impressive slab with a fine incised decoration along one edge. Although not specifically labelled or marked as such, the stone has traditionally been ascribed to Skara Brae following its original location amongst the material from V.G. Childe's operations at the site, given on permanent loan to the then National Museum of Antiquities of Scotland (NMAS) in 1933.

The original NMAS catalogue of the Skara Brae assemblage, however, includes no specific record of this stone amongst the eight 'slabs and stones, [with] incised marks' listed, nor did any further documentation for it emerge during this author's initial study of the incised stonework. Final publication preparation, together with questions raised by Antonia Thomas' work on the decorated stonework from Ness of Brodgar in particular, made it more pressing to try and establish the precise origin of this striking, yet 'mystery', slab.

Childe noted the decorated stones found during his excavations and sketched some of these within his notebooks. A number were published in his annual reports, but this slab does not feature amongst them. This absence would not of itself be too disquieting, since Childe's dismissal of the stones as 'often random carvings' in his 1931 monograph demonstrates his somewhat capricious attitude towards them.

However, combined with the lack of any definitive museum documentation, the stone's apparent absence from Childe's records did begin to generate some unease. Most crucially, could we be certain it was indeed from Skara Brae and, if so, from where in the settlement?

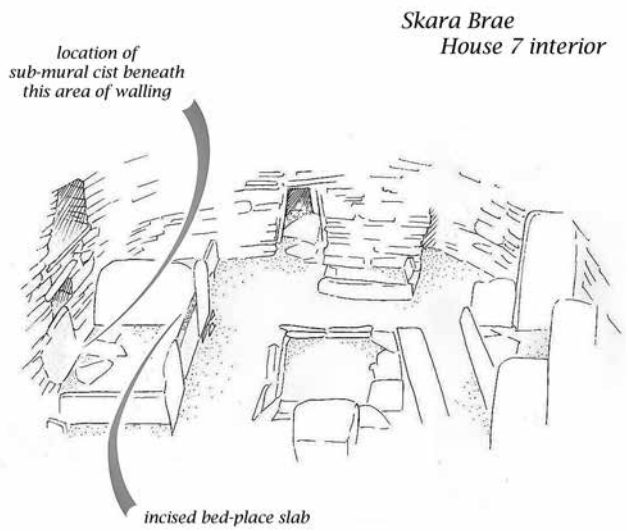
The attempt to pin down its exact origin began with a further detailed trawl through the Childe site notebooks. This threw up an interesting entry in a section covering the excavation of House 7 in 1928:

> … An upright slab was observed projecting upwards into the clay layer. This was found to be the front wall of a cist the capstone whereof was built into the wall of the chamber. In the cist lay a skeleton whose skull was against this front flag.

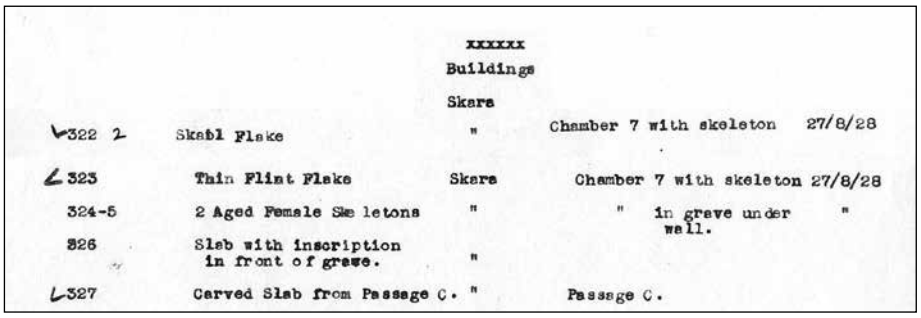
This cist, subsequently found to contain two elderly female skeletons, had been placed under the walling at the back of the western bed-place, Childe's 'pen Y'. This bed-place is fronted by an upright slab which itself bears incised decoration, originally categorised by Childe as 'alphabetiform'.

No further details of the cist's frontal slab are given in the notebook, but in their first publication of work at the site in the *Proceedings of the Society of Antiquaries of Scotland* in 1929, Childe and Paterson record its removal to allow excavation of the skeletons. There is no indication, however, of it being retained as worthy of note.

The 'mystery' stone on display with, right, a close-up of a segment of the incision (photograph: Hugo Anderson-Whymark; © National Museums Scotland)



House 7 – location of sub-mural cist and incised bed-place slab (illustration: Alexandra Shepherd)



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Buildings
Skara

322 2	Skabl Flake	"	Chamber 7 with skeleton	27/8/28
323	Thin Flint Flake	Skara	Chamber 7 with skeleton	27/8/28
324-5	2 Aged Female Skeletons	"	" in grave under wall.	"
326	Slab with inscription in front of grave.	"		
327	Carved Slab from Passage C.	"	Passage C.	

Extract from Office of Works Skara Brae finds list (reproduced by kind permission of Historic Environment Scotland)

No further information could be drawn from Childe's own notebooks or publications, but the Office of Works' formal records of his excavated material from the site proved more helpful, providing a transcription of the list of small finds as entered in the notebooks with number, description, location and date of excavation plus some additions, annotations and amendments. This catalogue lists the finds recovered from the House 7 cist: a Skaill knife, numbered 322, and a thin translucent flint flake, no 323. In the Childe notebook numbers 324–5 were left blank, but the HMOW lists use these for the '2 Aged Female Skeletons' from within the cist. A further gap exists in the Childe notebook for numbers 326–8; the HMOW lists, however, include a crucial entry for no 326, describing it as a 'Slab with inscription in front of grave'. This represents the *sole* record of any otherwise undocumented incised stones within the lists. The Office of Works' catalogues cover the portable artefacts only and do not include any *in situ* stonework. Consequently it is highly improbable that this entry refers to the stone with 'inscription' fronting the bed-place and significantly more likely that it refers to the slab removed from the front of the cist.

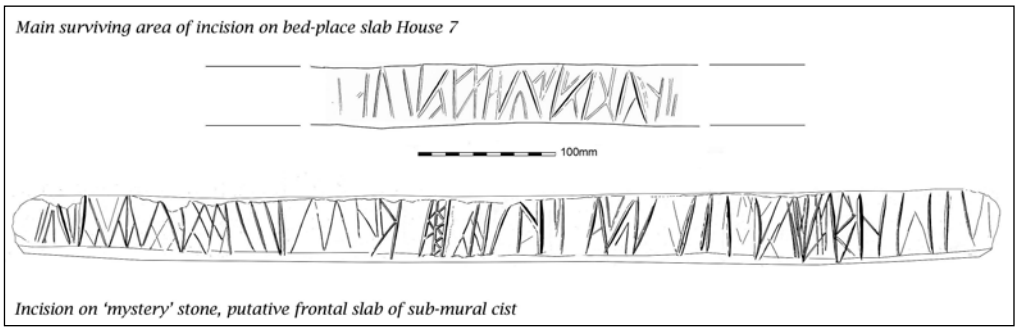
This unprecedented reference to an *incised* frontal slab suddenly presents a persuasive candidate for the identity of our mystery stone. This is further supported by the subsequent entry, no 327, in the HMOW catalogue, assigned to a 'Carved Slab from Passage C'. This well-documented slab was originally located in the old NMAS Queen Street galleries found lying beside the mystery slab in the same case. This physical juxtaposition of the two stones appears to match the numerical juxtaposition in the HMOW lists and adds further confirmation that the 'Slab with inscription' was retained and sent with the rest of the Skara Brae consignment to Edinburgh.

If, as seems to be the case, this Office of Works recorded slab from the front of the cist is the otherwise undocumented mystery stone, then the most surprising factor of its history is how such an arresting artefact could apparently go unnoticed by Childe. However, this omission appears less remarkable when re-reading the description, in his 1929 report with Paterson, of his slow recognition of the more prominent incised bed-place slab:

> Sitting on the edge of this slab examining the floor in front I noticed deep cuts or scratches on its upper edge towards the north end. Closer inspection revealed that these marks were too regular to be accidental and yet not sufficiently symmetrical to be merely decorative. They were, in fact, alphabetiform signs, and formed part of an 'inscription' that doubtless finds its explanation in the interments under the wall behind the slab.

Since Childe had to be sitting on this stone to notice its decoration it seems entirely possible that the frontal cist slab, rapidly removed by the workmen to allow access to the burials, could have escaped his attention. Childe's linking of the bed-place slab to 'the interments under *the wall behind the slab*' [this author's emphasis] suggests a possible conflation during the heat of operations of the two slabs into one, with a concentration in the publication on the *in situ* bed-place slab.

Two further factors support the identification of the mystery stone as the frontal cist slab. The first is its dimensions: Childe



Incision on bed-place slab and mystery stone compared (illustration: Alexandra Shepherd)

records the measurements of the cist as 3 feet 6 inches long, 2 feet 8 inches wide and 1 foot 2 inches deep. The stone's existing dimensions of *c*. 0.76 m by (max) 0.37m [= 2ft 6in by 1ft 2in] correspond almost exactly with these proportions.

The second factor is the close affinity in design between the incisions on this slab and those on the bed-place slab. A detailed comparison will form part of the site's final publication, but suffice it to say that the combinations of incised verticals, obliques and V-forms placed edge-to-edge across the upper narrow surface of both slabs present a design and treatment for which the only close parallel is each other.

This recognition of the mystery stone as the frontal cist slab does more than restore a proper provenance to this impressive artefact. It represents the only slab to be directly, physically, associated with human remains at Skara Brae; its status as a grave slab amplifies and further transforms the sense of marking of place and occasion which the incision on the bed-place slab first introduced. More crucially, it anchors this form of incised statement to an actual building phase of the settlement; its close association to the bed-place slab, both in positioning and similarity of design, tends to pin the two together as part of the same foundation interment event. Childe's initial use of 'alphabetiform' to describe the incision was always a step too far, but *inscription* rather than *decoration* as a categorization of the carving seems to be substantiated by the identification of this slab.

We must thank whoever retained the slab and the Office of Works recorders responsible for preserving the vital scraps of its identity.

Alexandra (Lekky) Shepherd

From salt mines to lake sediments. Investigating human-environment relations in the Hallstatt region, Austria

Mountainous regions represent a challenging environment for human settlement and land use. Nevertheless, the Alps have been home to intense and highly varied human activity for a very long time. As part of this dynamic natural environment, human societies faced abundant natural hazards and themselves caused substantial environmental change. One of the most characteristic aspects of human activity in the eastern Alpine region was the exploitation of mineral resources such as copper ore or salt.

The Hallstatt region, located in the northern Austrian Alps at the foot of the Dachstein massif, offers particularly fascinating insights into the story of humans and mountain landscapes. Currently the earliest dates for underground salt mining in Hallstatt fall into the 15th century cal BC (Middle Bronze Age). But evidence for human activity connected to salt production can be traced back as far the sixth millennium BC. With several interruptions the salt mining tradition in Hallstatt continues up until the present day. The size and depth (100 m below surface) of the prehistoric mining areas clearly demonstrate the scale of salt production and the technological skill of the mining community.

Salt is a valuable raw material. In small quantities it is indispensable for our physical health, it is needed as additive in metal and leather working, but most importantly it is a highly efficient preservative agent allowing for a reliable long-term conservation of foodstuffs such as meat, fish or cheese. It is this latter attribute that made salt a highly sought-after commodity until very recently. From an archaeological perspective, salt-rich finds contexts offer unique insights into prehistoric life, as all organic materials are perfectly preserved. At present only three prehistoric salt mines are known in the world. One is located in northern Iran (Chehrabad) and two in Austria (Dürrnberg/Hallein and Hallstatt). Of these three, Hallstatt shows the oldest and most continuous salt mining tradition.

View of lake Hallstatt with the medieval mining town and the Hallstatt high valley 400 m above the lake. ©D. Brandner

Preservation conditions indside the prehistoric salt mines: Iron Age rucksack made from sheep skin. ©NHMW

In the Hallstatt salt mountain, thick layers of Bronze Age and Early Iron Age mining waste have built up, comprising billions of burnt-down torches, hundreds of broken tools, fragments of bast and grass ropes, objects made from animal hide, fragments of woollen textiles, food remains, human excrements and more rarely construction elements such as stairs.

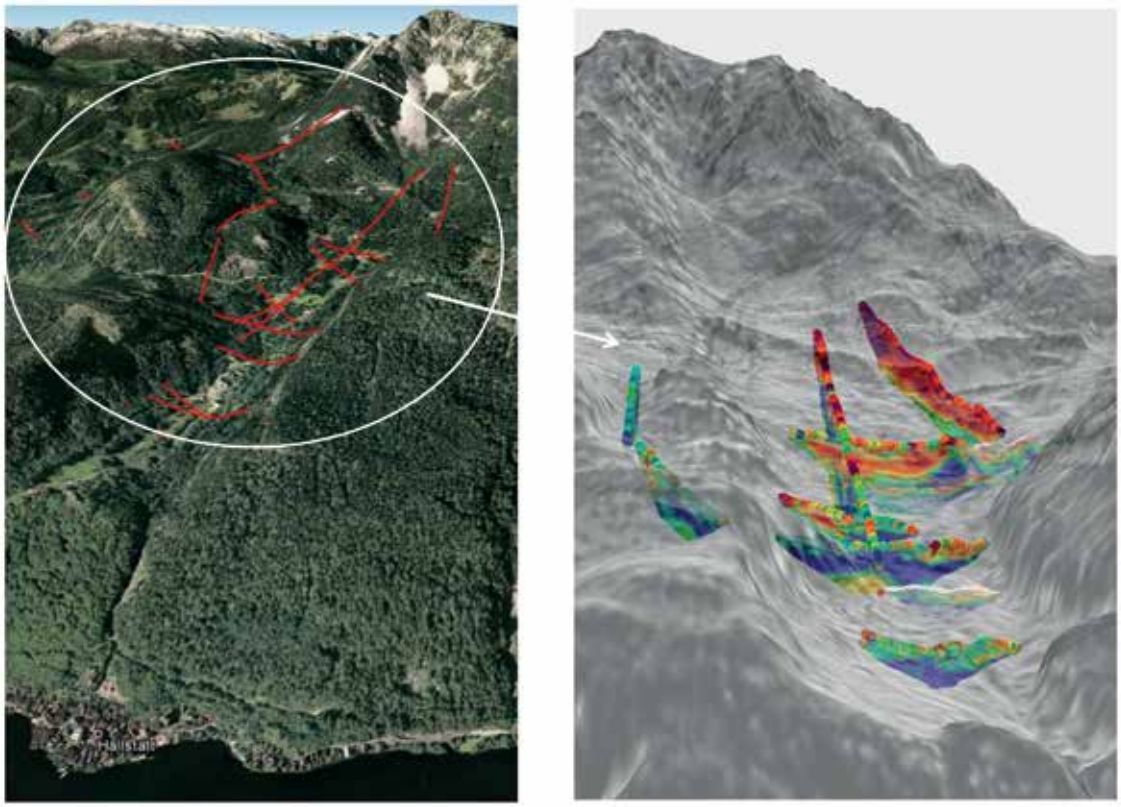
These findings allow for unique insights into the way this large production complex was organized and into the daily life of this Alpine mining community. The working process inside the mines can be reconstructed in detail. For the Bronze Age we observe a highly segmented process with strictly specialized tools for the various tasks (breaking, collecting, transporting). In both mining phases, wood was the most important raw material, employed for the manufacture of tools, construction elements and lighting inside the mine. The enormous amount of wooden objects demonstrates this demand quite clearly and dendrological analysis shows that raw material selection followed strict criteria regarding wood species, quality and dimensions. Investigations of the Iron Age excrements from the salt mines give us a good idea of the miners' diet. A stew made of barley, beans and millet was eaten regularly. Animal bones with impressions of human teeth indicate that the stew was enhanced with meat cuts, mostly pig, rich in fat and gelatine. In addition we find hazelnut shells, apples and wooden containers with residues of fatty substances. The excrements also give us insight into the health status of the miners. They show a high infestation with intestinal worms. Other information on the physical condition of the miners comes from above ground. The anthropological analysis of the large and rich Iron Age cemetery shows that men, women and children experienced a high and monotonous physical work load throughout their entire life.

The archaeological sites in the Hallstatt high valley clearly document large-scale salt production as well as the associated need for raw materials, workforce and food. While our understanding of technology and organisation, resource management and certain aspects of social relations has become increasingly detailed over the years, the nature of the miners' relationship with their natural environment is still poorly understood. How did salt mining impact the environment in terms of animal husbandry, farming and forest management? How did natural hazards influence land use and economic activity in the region? The Hallstatt area is ideally suited to investigate these questions. Apart from representing a long-term focus of intense human activity, different types of sedimentary archives such as lakes and bogs exist and occur in different altitudinal belts. And twice during prehistory, in the Bronze Age and the Early Iron Age, salt mining was disrupted by catastrophic events. Large sediment flows from the surface, so-called mass movements or landslides, filled the underground mining galleries, blocked the entrance to the mines and devastated the high valley. It is currently unclear whether these events led to the discontinuation of salt mining for several hundred years or whether the new mining galleries are located in areas that cannot be investigated at the moment.

To address these questions an interdisciplinary project funded by the Austrian Academy of Sciences and conducted at the Natural History Museum Vienna was started in May 2017. The Facealps project (https://facealps.com/) aims at tracing the human-environment relations in the Hallstatt region from the beginnings of underground salt mining until today through the investigation of a series of sedimentary and anthropogenic archives. In other words, we are working on establishing an inventory of geological and climatic extreme events; enhancing the palaeoenvironmental record of the research area; and investigating human land use dynamics with special attention to change.

The first project year was dedicated to fieldwork and sampling of environmental archives. Up in the valley we focused our attention on the remains of the prehistoric landslides. Geophysical measurements (Electrical Resistivity Tomography, ERT) were taken to assess the volume of the landslide masses. We also took a core from a mire in the high valley for palynological analysis. We spent considerable time on lake Hallstatt, as it is one of our primary archives for environmental history. A multitude of materials such as pollen, insect remains, algae or ostracods are embedded

Human excrements containing beans (Vicia faba), barley and millet from the Iron Age salt mines. ©NHMW



Results of the ERT measurements in the high valley. By measuring the electrical resistivity we aim to determine the size and shape of the prehistoric landslides. Data sources: Land OÖ, GoogleEarth. ©NHM/GBA

in lake sediments over time and can be used as proxies for climatic and environmental conditions. Therefore, lake sediments represent an important source of information for the project. In addition, the shape of the lake floor can be used to trace environmental history and events such as rock falls, earthquakes or landslides. In order to acquire this information we conducted bathymetric measurements of the lake floor and derived a high-resolution digital elevation model. During the coming project year we will conduct further field campaigns, such as coring into the landslide bodies to enhance the existing geoelectric data, but most of our time and effort will be dedicated to laboratory work.

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The experimental building, burning and excavation of a two-storey Trypillia house

The Cucuteni-Trypillia group constituted one of the largest and longest-lived groups in the Neolithic and Chalcolithic of eastern Europe. Totalling over 5,000 settlements, the group was spread over *c.* 250,000 km^2 and lasted from 4800–2800 BC. One of the research goals of the AHRC-funded project 'Early urbanism in Europe? The case of the Trypillia mega-sites, Ukraine' (for a project summary, see *PAST* 81) was a better understanding of how Trypillia houses burnt down at the Trypillia BII mega-site of Nebelivka. For that reason, the project team decided to build two half-size Trypillia experimental houses – one single-storey and one two-storey – burn them down and excavate the burnt remains in order to make a comparison of different house forms. Here, we assess the contribution of the Nebelivka experiment to the wider debate of deliberate house burning.

There were three major issues to which the Nebelivka house-burning experiment could make a useful contribution: (a) whether the burning of experimental one- and two-storey houses left traces that would be recognisable in excavations of Trypillia burnt house remains (Russian: *ploshchadka)*; (b) the quantity of fuel needed for a successful house burning;

and (c) whether house burning was a deliberate social practice.

Based on suggestions made in earlier literature, two 4 × 3 m houses were constructed using a series of sleeper beams resting on levelled ground. All framing timbers were held in place by their own weight unless under tension or when warping caused poor fitting of the joint. Three simple types of joint in various combinations were used in the construction of the pine framing. The use of modern power tools and mixing methods for the daub produced results broadly comparable with Trypillian methods. The estimated construction time for the one-storey house was 139 person-days, for the two-storey house 160 person-days.

After a mild winter in 2014–15, the two-storey house was selected for burning in May 2015, on a mild day with a light breeze. Previous research based on several house burnings had concluded that additional fuel had to be added to a house to reach the temperatures shown by the resultant daub. Because several former Trypillia house-burning experiments had failed to achieve complete combustion, a large quantity of firewood (30 m^3, equivalent to 420 trees 0.15 m in diameter and 4 m in length) was fitted into the two-storey house. It is important to note that almost ten times the amount of wood was needed to burn a two-storey house as was used to build it. This conclusion has important implications for the question of deliberate house burning.

The house was ignited at 12.50pm and continued to burn until mid-afternoon of the following day. A total of 31 stages were recorded for the conflagration. Within 40 minutes, the roof thatch had burnt and the structure had collapsed. After one hour and 15 minutes, the structure of the loft and its ceiling had burnt down. It took a further five minutes before the first section of one of the walls had fallen out and another five minutes before the north wall fell inwards. Further sections of the south and west walls slid down after one and a half and two hours. The vast majority

Photogrammetric plan of quadrant 4 after excavation (photo: Marco Nebbia)

of the structural parts of the house had fallen within four hours of ignition, with only parts of the north and east walls remaining upstanding.

The geophysical planning and excavation of the 4 × 3 m burnt house and surrounding burnt area subsequently took place in one week in August 2017. The villagers had 'protected' the burnt house remains by covering them under 30 cm of earth; the quadrant method was used to excavate 50% of this 'mound'. All phases of deposition were recorded by photogrammetry, with traditional section-drawing for both quadrants. Many of the excavation features found in our test pits were replicated in the burnt house. The floor was defined by burnt floor beams in foundation trenches and retained the clay hearth with finds. We were able to define the sequence of collapse of wall panels (with hazel withies) and floor segments (without withies). The built hearth on the upper floor fell in pieces, demonstrating that most

Burnt wall-lines and ground floor hearth, quadrant 4 (photo: John Chapman)

Wall section with withies, quadrant 2 (photo: Bisserka Gaydarska)

Estimate of quantities of materials used in the construction of 100 full-sized single-storey and 100 two-storey houses with a footprint of 5 x 15 m (the 'Nebelivka module')

'Nebelivka module' of 100 houses	Single-storey	Two-storey
Total volume of timber (m^3)	965	1,773
No of trees of 0.15 m diameter and 4 m length	13,509	24,818
Total volume of wattle (m^3)	120	237
Total volume of daub (m^3)	1,465	2,852
Comprising:		
Clay at roughly 80% by volume (m^3)	1,172	2,281
Temper at roughly 20% by volume (m^3)	293	570
Total volume of roofing material (m^3)	1,524	1,524

Trypillia houses with an intact hearth would probably have been one-storey houses. The orientation of the impressions on daub fragments showed two patterns: a consistent line of fall or a more chaotic set of multiple orientations. The specific collapse of two-storey walls, with the upper wall falling below the lower wall in a 'sandwich' effect, gives a sound criterion for the existence of two-storey houses. The large quantity of vitrified daub shows that, for the first time in Trypillia experimental burnings, temperatures of over 1000° C were reached in the centre of the fire.

There are also wider implications to our research, for instance considering the degree of landscape management. Building a module of 100 houses of mean 15 m length and 5 m width required management not just of skills and labour, but also of various resources (Table 1). Coppicing of hazel trees would need to begin several years in advance to produce withies of suitable size and the selection of structural timber from a large area, with even more resources needed for the burning of many houses. In the process of constructing (and destroying) a mega-site, the coordination of these activities and the formation and maintenance of a reliable supply chain would have had organisational and administrative effects approximating to the level of a specialised industry. The coordinated construction of a mega-site can similarly be viewed as an expression of cohesion, co-operation, obligation and inter-relationship within and outside a much larger community than an immediate kinship group.

Our experiment has therefore made three important contributions to the debate over deliberate or accidental house burning. The large quantity of fuel added to the house ensured a successful conflagration in 2015, which refutes the hypothesis of accidental burning of Neolithic houses. The manner in which second-floor elements had fallen indicates that features such as platforms, hearths and podia were most probably built on the ground floor, although it is possible that they may have slid down in one unit from the upper floor. The good survival of wall panels also indicates that the surviving daub in Trypillia houses derived from the walls as well as the floors. There were distinctive 'sandwich' effects which showed the presence of two-storey structures in Trypillia mega-sites.

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Excavations at Moel-y-Gaer, Bodfari, Denbighshire

Moel-y-Gaer, Bodfari is the northernmost of a series of hillforts in the Clwydian Mountains, North Wales, all of which are very poorly understood in terms of function and dating. Basic survey of six forts was carried out by the *Heather and Hillforts Project* run by Fiona Gale and Denbighshire County Council, although Moel-y-Gaer, Bodfari was not included and subsequent invitation has resulted in the current campaign of work. This began in 2011 with extensive LiDAR analysis, earthwork survey and a range of geophysical surveys, followed in 2012–16 by Phase 1 targeted excavation. Phase 2 of the work started in 2016 and is continuing. The importance of hillforts for understanding the north Welsh Iron Age settlement record has been emphasised within several recent research agendas, and in response to this Bodfari is the only hillfort within the Clwydians with complete geophysical coverage and any considerable excavation based on those results.

Bodfari is the lowest of the Clwydian hillforts at *c.* 200 m, positioned outside the village of Bodfari, five miles north-east of Denbigh. It is situated on the top of a discrete hill strategically located overlooking the confluence of the rivers

The roundhouse under excavation

The middle rampart showing different phases of construction

Chwiler and Clwyd with an enclosed area of *c.* 2 ha. The site is a Scheduled Ancient Monument (CPAT HER PRN 102154, FL073).

Phase 1 excavations concentrated on a section of inner and middle rampart on the western side of the hillfort where the ramparts are well preserved. We also uncovered a roundhouse positioned on an artificially levelled terrace. The middle rampart was particularly exciting, being stone-built and having two and possibly three phases of building. One of the problems with the Iron Age of North Wales is the lack of material culture and an absence of pottery, making detailed dating difficult. In this project we have been able to obtain three radiocarbon dates. One comes from a bank associated with the roundhouse and falls within *c.* 367–183 cal BC. It is taken from bone which, again, is extremely rare for Clwydian hillforts. The other two are from charcoal within a levelling surface at the base of the middle rampart, spanning 406–352 cal BC and giving a date for the beginning of rampart construction.

Phase 2 excavations are concentrating on the possible entrance to the west and the northern inturned entrance. The western entrance is of particular importance as it may represent an early univallate phase in the hillfort's development before the northern main entrance was constructed, together with multivallation around much of the enclosure circuit. The evidence for this early phase is a robbed-out inner rampart recorded within two trenches excavated as part of Phase 1. The one season of Phase 2 excavations has already shown rampart structure on the western side together with the inturned entrance. On the inside of the enclosure, to the east of the possible entrance and seemingly associated with it, there is still much material to be removed, but part of a circular dry-stone structure is beginning to appear. This could be a guard chamber, examples of which are known at several hillforts in North Wales, the nearest being Moel Hirradug to the north. The main inturned northern entrance, which is part of the possibly later multivallate enclosure, is also being explored. Here again the excavations so far have shown a stone-revetted entrance inturn with rubble filling and the suggestion of development from an earlier phase.

The project also has two artists in residence. Simon Callery is a painter who is working on three-dimensional representations inspired by the deposits and surfaces within the trenches. Stefan Gant's work is 'sonic stratigraphy' based on the sound of trowelling but portrayed visually. In the summer of 2018 there will be an exhibition of their work, together with archaeological background information, at the Oriel Plas Glyn Y Weddw, a gallery in Llanbedrog, Llyn peninsula.

We hold an Open Day every year organised by Fiona Gale of Denbighshire County Council and for many years have taken local and visiting volunteers, who we provide with training.

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Further information regarding the project, together with interim reports, is also available on the web at http://www.arch.ox.ac.uk/bodfari.html

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