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SI 1- Archaeological background of the Beaker Complex

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Introduction

Since the time of the Riva del Garda conference (1998), what used to be known as the Bell Beaker Culture is now more often referred to as the Bell Beaker Phenomenon, Bell Beaker Complex or simply Beaker Complex¹. The reason for speaking of a Beaker Complex is that traditionally, an archaeological ‘culture’ is defined as a regionally restricted assemblage of certain types of remains – pots, implements, ornaments, burial rites and house forms – that tend to recur². Beakers and associated artefacts do have strong similarities across western and central Europe, but there is also substantial variation, which has made many archaeologists uncomfortable with the term “culture”³.

In discussing the Beaker Complex, it is important to begin by noting that there is major contention in the archaeological literature about its interpretation, with some archaeologists who are authors of this paper having very different views from others. We have therefore attempted to write this archaeological summary as neutrally as possible, highlighting points that all co-authors agree upon. This is in line with the philosophy of this paper, which is to refrain from discussion about archaeological implications except where the evidence is overwhelming. By focusing on the genetic facts, we hope that archaeologists across the spectrum of opinions will perceive this study as a reliable presentation of the genetic findings and thus as a valuable reference for future debates.

We finally add a note on our terminology for the chronological placement of the Beaker Complex. When we refer to the period when the Beaker Complex flourished, we use the term “Copper Age”. This terminology is accurate everywhere in Europe because copper was an important part of the economy for all groups practicing the Beaker Complex. In contrast, we avoid the terms used to chronologically place the Beaker Complex in central and northern Europe (“Late Neolithic” or “Final Neolithic”), southern Europe (“Chalcolithic” or “Late Copper Age”), and Hungary and southeastern Europe (“Early Bronze Age”). While the terms are accurate within each regional sequence, they are confusing when considered together and so we prefer “Copper Age.”

Objects associated with the Beaker Complex

The Beaker Complex consists of a set of artefacts, also called the Beaker package, generally found in burial contexts, and frequently found together in one grave and in a similar position in relation to the (crouched) body. Burials often contain only a selection of objects from the set. A famous exception is the very rich Amesbury Archer burial that contains almost the entire set of characteristic artefacts⁴.

Beaker burials generally include a Beaker vessel, which may have been associated with drinking or presentation of food. The iconic pottery vessel of the early Beaker Complex is the *Maritime Bell Beaker*, defined by its monotonously repeated decoration of up to fifteen horizontal bands covering the whole surface from bottom to rim. Bands are mostly bordered and filled by using comb-stamp impressions, or a shell (*Cardium*) when readily available. It is only in Sicily where the painting of the horizontal bands is practiced. The form is, compared to later Beakers, slimmer and less curvy. Vessels are usually thin-walled, finely tempered, surface polished, and well fired in an oxidizing atmosphere to create a bright red colour. Horizontal bands were originally filled with a white paste to have a distinctive red-white effect. The name ‘Maritime’ refers to an often coastal distribution along the Atlantic and Mediterranean shores. Pure Maritime Beakers are rare in Britain and Ireland, and in Central Europe east of the Rhine. There are varieties of the Maritime Beaker with horizontal bands zoned in cord-impressions (‘Cord-Zoned Maritime Beakers’, CZM) and/or marked by decoration of the inner rim.

In male Beaker burials, there is often paraphernalia associated with archery, including stone wrist-guards and flint arrow-heads^{5,6}. The archer paraphernalia sometimes includes bow and crescent shaped pendants, often carved from boar’s tusks or (in the Mediterranean) shell. Copper tanged daggers and (in Iberia and France) copper Palmela ‘points’ add to the impression that hunting and fighting may have been important to males associated with the Beaker Complex. Female Beaker burials also tend to include a characteristic set of objects. These include buttons with V-shaped holes on one side, which are made of tooth, bone, antler, shale or amber, and characteristic head ornaments, notably metal hair, temple or *noppen* rings. In Iberia, however, V-perforated buttons and beads are usually associated to males. There are major geographical differences in preferences for particular sets of objects. For example, wrist-guards are infrequent in Iberia, while Palmela points are prominent only in the west. Arrowheads

also show distinct differences in manufacture, for example when comparing Brittany and Denmark⁷.

Absolute chronology and geographic origins

The Beaker Phenomenon is restricted to the period between 2500 and 2000 BCE over most of its geographic range¹. Only in western Iberia is there radiocarbon evidence for an earlier presence of beakers, reaching perhaps back as early as *c.* 2750 BCE⁸. However, there is contention about whether the Beaker Phenomenon is indeed so old in Iberia. While arguments for an Iberian origin have always been popular^{9,10}, since the 1970s the Dutch model¹¹ has gained prominence amongst scholars driven largely by the availability of more radiocarbon dates. The Dutch model also rests on arguments that the Maritime Beaker style, now acknowledged as standing at the beginnings of the Beaker sequence, may have developed locally out of the All-Over-Ornamented Beaker style of the lower Rhine region, which are clearly a feature of the late Corded Ware–Early Bell Beaker transition there. However, it is important to recognize that the original motivation for the Dutch model—based on ¹⁴C dating—has become weaker in recent years due to fluctuations in atmospheric ¹⁴C fractions over the key period. This means that it is difficult to precisely resolve dates over a several-hundred year period that overlaps the time of the Beaker Complex^{12,13}, which limits the value of ¹⁴C dating for resolving questions about the geographic origin.

We have not settled the questions of the geographic origin of the Beaker Complex in this study. However, because of the long-standing interest of the role of Iberia, we have paid special attention to our findings from individuals from this peninsula. Our result that the majority of Beaker-associated skeletons from Iberia are genetically continuous with previous Iberian populations—with no evidence for a strong contribution of Iberian Beaker-associated populations to non-Iberian Beaker-associated ones—is an important fact to take into account in future discussions of the origin and spread of the Beaker Complex.

Beyond the question of origin, it is clear that from 2600 BCE onwards the Beaker Complex gained momentum over an ever-widening region of Europe as a set of ideas, values and as a world-view. Its fast spread over large distances has long been speculated to be associated with the movement of people, and many archaeologists still consider this a strong explanation while others view the spread as also potentially driven by the

communication of ideas. Whatever the mechanism—and the genetic findings of this study show that both played important roles—it is clear that the set of Bell Beaker objects and burial customs developed into a well-defined package. Within about 150 years the Beaker Complex expanded to encompass a vast territory: From northern Africa in the south; to Ireland and Britain and Denmark in the north; to Portugal in the west; and to Hungary and Poland in the east. By integrating into existing regional traditions, the phenomenon was itself transformed, becoming absorbed into regional communities with particular characteristics.

Economy and settlement organization

Communities that were associated with the Beaker Complex relied on a mixed subsistence economy with both pastoral and agricultural elements, varying in their ratio depending on the environment. Hunting, gathering and fishing may have also played a substantial role¹⁴.

With a new focus on metal, the exchange networks of the Bell Beaker period differ substantially from the flint-dominated networks of previous periods. Across all of western Europe, materials and objects such as copper¹⁵, exotic stones for wrist-guards^{16,17} and jet and ivory for V-buttons^{18,19}, circulated widely across Bell Beaker associated networks. Exploitation and exchange of copper e.g. from Ross Island in Ireland²⁰, are also clearly documented. Individuals associated with the Beaker Complex were responsible for introducing metal for the first time to Britain, Northern France and the Netherlands. The importance of metal in Beaker society is also demonstrated by some twenty-five graves and hoards in different parts of Europe containing metallurgical objects.

Settlements associated with the Beaker Complex are probably the least unifying aspect across Europe. Predominantly, they maintain the settlement pattern of already existing regional traditions. Thus, in the Iberian west and in southern France their settlements are often characterized by fortified sites. Northwestern and central Europe, as well as northern Italy, are marked off by a more dispersed settlement system without hillforts. An oval house tradition persisted in Sicily and the round house tradition persisted in Britain, right across the Beaker transition. In Denmark and in the Low Countries, Beaker artefacts are found on settlements with late Neolithic material, and with long houses similar to those used already in the earlier Middle and Late Neolithic

periods^{14,21}. In the north, as well as in the East-Group, small independent and likely family-based farmsteads provided the backbone of the settlements, often on the best farming soils²².

Social organization and burial traditions

Despite the fact that many thousands of graves have been excavated, it is not clear that there were any institutionalized high status groups in Bell Beaker Europe. The reason for this is that the complex as it is known from graves is characterized by a striking uniformity in the set of grave goods. This does not exclude the existence of apparently important individuals like the Amesbury Archer⁴ or other seemingly high status individuals buried with gold objects in Central Europe and Iberia. It is also important to recognize the possibility of an ascertainment bias: the Beaker burials that are best characterized, some of which discovered underneath burial mounds, may represent an exclusive segment of society. Some archaeologists have suggested that the burials of the Beaker Complex represent a social elite that introduced new customs and technologies²³. It is plausible that the majority were buried without elements of the Beaker package and therefore are less recognizable in archaeological context. The Oostwoud burials that are part of the present study are an example of this²⁴, although the genetic data show that they are similar in their ancestry to individuals buried with richer artefacts in Britain and central Europe.

The end of the Beaker Complex

The Beaker Complex waned earlier in the east and south than in the west and north. In the East-Group, decorated Beaker vessels disappear, for example, in the course of the 23rd century BCE when the plain cups and plates/bowls of the *Begleitkeramik* entirely superseded them in graves and settlements. Some elements of the Beaker Complex, such as stone wrist-guards and bone V-perforated buttons, continued to be used as grave goods in the Early Bronze Age in the Unĕtice area, as well as in Southern Germany until c. 2000 BCE²². In many regions of Europe, this kind of regionalization occurs after c. 2300 BCE, ‘converting’ the original Bell Beaker into regionally different forms and decorative styles. Stuart Needham therefore has termed this the *Fission Phase* in Britain, in order to distinguish from the earlier *Fusion Phase* when in a short period of time everything appears to have changed to a Beaker style of burial and life²⁵.

In several parts of Europe, the last phase of the Bell Beakers is associated with Barbed Wire decoration. This development continued well into the second Millennium in some regions, including central Iberia²⁶, southeastern France²⁷, Britain²⁸, Poland, northern Germany²⁹ and the Lower Rhine¹⁴.

Ancient DNA in the context of other methods for studying beaker mobility

Since the first European-wide conference on Bell Beakers in Oberried, archaeologists have used tooth morphology, ¹⁴C-dating and study of similarities in material culture, especially in pottery, to discuss the origin and distribution of Bell Beakers. They have also carried out studies of stable isotopes to study the movement of individuals in their lifetime, as well as the exchange and spread of artefacts. These analyses have provided critical information about the use of different types of objects, and about the social processes behind the mobility. The genetic approaches used here need to be viewed in this context, that is, as a powerful new set of methods that need to be embraced just as previous scientific methods have been embraced by archaeologists to gain new understanding of the Beaker phenomenon.

An analysis of dental traits in ~2000 individuals³⁰, including Bell Beaker-associated and pre- and post-Bell Beaker populations, suggested the existence of two distinct Bell Beaker populations, corresponding to the eastern and southern domains. That study also inferred a migration from the Iberian Peninsula towards the east reaching as far as Switzerland, an inference that is not supported by our genetic data. To provide some guidance for thinking about how these observations could be reconciled, we note that a portion of morphological variance is due to environmental factors and therefore may not reflect the relationships between populations as accurately as genetic data. Moreover, the genetic variation underlying morphological traits may be restricted to a small subset of the genome. In contrast, the recovery of genome-wide ancient DNA data makes it possible to study hundreds of thousands of neutrally evolving independent genetic markers. These markers provide information about the whole range of ancestors of a given individual, resulting in inferences with strong statistical support.

A particularly important comparison to the inferences about human mobility that can come from ancient DNA is in the study of stable isotopes. The application of strontium and oxygen isotope measurements (in combination) has shown that many Beaker-associated communities had a high level of mobility among both males and females,

with the Amesbury Archer⁴ standing out as an example of long-range migration from the continent to the British Isles. Most recently, the British Beaker People project, studying over 250 individuals, provided evidence of local and regional interaction, with 28% of the samples having evidence of migration during their lifetime³¹.

It is important to recognize that the strong inferences about population transformations from ancient DNA—shown most clearly in this study in our time series in Britain where the Beaker Phenomenon is associated with an approximately 90% replacement of the ancestry of the British population by migrants from the continent with a span of at most a few hundred years—are not directly comparable to the inferences from analysis of stable isotopes. Strontium isotopes are sensitive only to mobility within a lifetime, whereas genetic evidence also reflects mobility of ancestors. Isotopic analysis can only detect mobility between two geographic regions with different isotopic signatures based on the local geology, whereas genetic analysis can only detect migration between regions with two different ancestry signatures. Thus, the two methods together provide complementary information, and when combined are likely to provide more information about patterns of mobility and migration in the Beaker Complex than either alone.

SI 2- Archaeological context of newly reported individuals

Dates

In what follows, we give dates in one of two formats. If there is no direct radiocarbon date, we give a date based on archaeological context, in a format like “2500–1700 BCE”. If there is a direct radiocarbon date, we give a date in a format like “95.4% CI calibrated radiocarbon age (Conventional Radiocarbon Age, Lab number),” using the prefix “cal” to indicate a date that is obtained from skeletal material for the same individual that yielded DNA (an example is “5983–5747 calBCE (6980±50 BP, Beta-226472)”). We calibrated all dates in OxCal 4.2.3³² using the IntCal13 calibration curve³³.

We note that in the course of generating 111 new radiocarbon dates for this study, we found that two individuals (RISE568 and RISE569) from Brandysek for which shotgun sequencing data was originally reported in Allentoft et al. 2015³⁴ and labelled as being from the Bell Beaker culture, were in fact misattributed. Our direct radiocarbon dating supports a much later date for RISE569: 660-770 calCE (1300±30 BP, Poz-84461). Thus, these individuals have not been included in our analysis.

Galeria da Cisterna (Almonda karst system, Torres Novas, Portugal)

Contact person: João Zilhão

River Almonda originates in a karst spring located at the base of a ~75 m high cliff. Galeria da Cisterna is a fossil outlet of the karst system, located ~5 m above the current spring. The length of this narrow, meandering passage is approximately 100 m, and its cross-section is in general less than 2×2 m. The current entrance was exposed in the 1920s by a landslide, which allowed access and limited archaeological work carried out between the years 1937 and 1942^{35–37}. Three loci were identified and focused on in subsequent excavations: AMD1, AMD2 and AMD3.

The AMD2 locus, excavated in the years 1988–89, featured a shallow Holocene deposit containing funerary contexts with grave goods spanning the interval between the Early Neolithic and the Iron Age. The lack of internal stratigraphic differentiation of this Holocene deposit is primarily due to the repeated prehistoric and early historic human habitation of the site, compounded by the activity of burrowing animals. A set of typical

Bell Beaker V-perforated ivory buttons and a small fragment of a gold spiral suggested that a Bell Beaker component ought to exist among the human bone remains. This was eventually corroborated by direct radiocarbon dating to this period of four right first pedal phalanges^{38,39}. Two produced genome-wide DNA:

- I0839/AMD2-F23-90: 2457–2206 calBCE (3847±29 BP, OxA-28859)
- I0840/AMD2-G18-187: 2456–2201 calBCE (3836±29 BP, OxA-28857)

Cova da Moura (Natural Cave, Torres Vedras, Portugal)

Contact person: Ana Maria Silva

The natural cave of Cova da Moura (Torres Vedras, Portugal) was discovered in 1930, with excavations undertaken in 1932 and in 1961^{40–42}. This cave was used as collective burial place between 3700 and 2200 BCE (Middle Neolithic to the Copper Age), according to the results of seven radiocarbon dates obtained on human bones^{43,44}. The human remains were found commingled and fragmented. The study of the human remains performed by Ana Maria Silva^{43,45} indicated a minimum number of 90 individuals, both sexes, and 15 non-adults. In terms of material culture, Cova da Moura is by far the richest burial known in the region. Grave goods include limestone and bone idols, green stone pendants, gold artefacts, engraved slate plaques, bone, ivory, and variscite rabbit figurines, beads, and pre-Beaker and Beaker ceramics^{40–42,46}. Further studies of this bone assemblage include isotopic analysis for dietary inferences⁴⁷ and mobility⁴⁸, as well as nonmetric dental traits to assess populations affinities⁴⁴. We generated genome-wide DNA data from one individual:

- I4229/CDM3: 2336–2063 calBCE [2289–2135 calBCE (3775±25 BP, PSUAMS-1750), 2296–2063 calBCE (3783±29 BP, OxA-33490), 2336–2135 calBCE (3790±30 BP, OxA-33491)]

Verdelha dos Ruivos cave (Vialonga, Portugal)

Contact person: João Luís Cardoso

This site is a small natural funerary cave with 44 Bell Beaker burials distributed across four different levels. The main use of the cave as a funerary space occurred in the second quarter and in the transition to the second half of the 3rd millennium. The decorated ceramics found in the site included⁴⁹: one maritime beaker vessel with

stippled decoration, one beaker vessel with stippled linear decoration, two smooth-profile vessels with incised decoration, one shoulder vessel with stippled decoration, one large vessel with incised decoration, one Palmela bowl with stippled decoration, six Palmela bowls with incised decoration, one calotte-shaped beaker with stippled decoration and some unclassifiable vessels with incised decoration. The incising technique suggests a rather late chronology of the assemblage, although there is residual presence of earlier styles such as the maritime stippled vessels and beaker vessels with stippled linear patterns.

Four radiocarbon dates were obtained on human bones^{8,50}:

Grave 2: 2880–2490 calBCE (4100±60 BP, GrN-10972)

Grave 4: 2620–2460 calBCE (4000±35 BP, GrN-10973)

Grave 2: 2580–2430 calBCE (3960±40 BP, GrN-10971)

Unknown grave: 2570–2300 calBCE (3940±45 BP, ICEN-1242)

Unfortunately, the location of the skeletons within the cave is unknown, as they do not appear on published plans. Doubts remain as to whether they can be included in any of the four identified and registered burial phases. However, the small size of the natural cavity and the filling sequence used (it was filled uniformly with the bodies systematically deposited in decubitus lateral, in holes covered with slabs) suggests that it was only used as a necropolis for a limited period of time. This conclusion is reinforced by the uniformity of radiocarbon dates obtained and the overall coherence of the recovered remains, particularly the ceramic ware. Thus, it can be considered that the archaeological collection is coherent, as it resulted from funeral offerings made over a limited time period. We analysed 3 individuals from this site:

- I6466/RISE1183: 2700–2300 BCE
- I6467/RISE1184: 2700–2300 BCE
- I1970/V-2: 2700–2300 BCE

Bolores (Torres Vedras, Portugal)

Contact person: Ignacio Soriano, Katina Lillios

This site is described in Szécsényi-Nagy et al⁵¹. We successfully analysed 1 individual:

- I6601/Bol 5A, Adult 2 11B 4 663: 2800-2600 BCE

Paris Street (Cerdanyola del Vallès, Barcelona, Spain)

Contact person: Joan Francès Farré

During urban construction work at Paris Street in Cerdanyola del Vallès (Vallès Occidental, Barcelona province) in 2003, a large amount of skeletal material and associated pottery was unearthed. Follow-up excavation uncovered a Chalcolithic hypogeum with more than 9,000 human remains as well as lithic and ceramic material, the latter assigned to the Bell Beaker tradition⁵².

The hypogeum displays several occupational phases. The oldest one presented an ash layer underlying the first inhumations that could have a ritualistic significance. Charcoal from that basal layer was dated to 2878-2496 calBCE (4110±60 BP, UBAR-817). The first funerary phase (UE-15) shows a large number of successive inhumations (minimal number of individuals 36) that are still in anatomical position, placed in lateral decubitus and with flexed knees. Seven arrow points were retrieved from this layer. A thin, upper layer (UE-5) probably represents a re-organization of the existing funerary space, prior to the second funerary phase (UE-2). At UE-5, two Bell Beaker vessels of maritime style were retrieved. The UE-2 layer comprises fewer inhumations, and all of them were accompanied by typical Bell Beaker vessels: three in Maritime style, and two in epi-Maritime style. There were also numerous additional pieces of diverse typology. Over this layer, a final one, labelled UE-3, contained two more skeletons arranged over riverbed pebbles with a Bell Beaker vessel of a regional style known as "Pyrenaic". A bone from this layer yielded the youngest date in the hypogeum of 2469-2206 calBCE (3870±45 BP, UBAR-860). We recovered ancient DNA data from 10 individuals:

- I0257/10362A: 2571–2350 calBCE (3965±29 BP, MAMS-25937)
- I0258/10367A: 2850–2250 BCE
- I0260/10370A: 2850–2250 BCE
- I0261/10378A: 2850–2250 BCE
- I0262/10381A: 2850–2250 BCE
- I0263/10385A: 2850–2250 BCE

- I0823/10360A: 2850–2250 BCE
- I0825/10394A: 2474–2300 calBCE (3915±29 BP, MAMS-25939)
- I0826/10400A: 2833–2480 calBCE (4051±28 BP, MAMS-25940)
- I1553/10388A: 2850–2250 BCE

Arroyal I (Arroyal, Burgos, Spain)

Contact person: Manuel A. Rojo Guerra

This site is described in Szécsényi-Nagy et al⁵¹. We successfully analysed 5 individuals from this site:

- I0458/Roy1/SU25, Skull 1: 2458–2206 calBCE (3850±30 BP, UGA-15904)
- I0459/Roy2/UE25, Isolated human jaw: 2600–2200 BCE
- I0460/Roy3/SU25, Skull 2: 2461–2210 calBCE (3860±30 BP, UGA-15905)
- I0461/Roy4/SU19, Inhumation 1: 2348–2200 calBCE (3827±25 BP, MAMS-14857)
- I0462/Roy5/SU25, Inhumation 2: 2465–2211 calBCE (3870±30, UGA-15903); 2566–2346 calBCE (3950±26 BP, MAMS-25936)

Samples Roy1 and Roy3 were genetically first-degree relatives and belonged to different mitochondrial haplogroups, which points to a father-son relationship.

Camino de las Yeseras (San Fernando de Henares, Madrid, Spain)

Contact person: Corina Liesau, Patricia Ríos, Concepción Blasco, Jorge Vega, Roberto Mendiña, Pilar Prieto

Most of our knowledge about this site has been gathered from four excavation campaigns, three of which have been rescue archaeology interventions by different companies. This has conditioned the information available about the site. The site of Camino de las Yeseras is one of the greatest Chalcolithic ditched enclosures (approximately 22ha.) in central Iberia. It is essential to our understanding of the Chalcolithic period: the Pre-Beaker burials and the impact that Bell Beaker customs and funerary rituals had on the consolidation of social inequalities among the first metallurgical societies of the Central Iberian Peninsula^{26,53}.

Strategically located at the confluence of two important rivers, it was probably a central place located on a suitable and well-communicated landscape comprising two valleys for livestock and farming activities, and close to a rich resource catchment area where flint, salt, and clay are found. From the end of the fourth to the middle of the second millennia cal. BCE it was an important production and exchange centre of raw materials and objects. Since the second half of the third millennium cal. BCE, Bell Beaker burials are documented mainly on the south area of the site, and comprise different types of tombs, contemporaneous to other non-Bell Beaker ones, mainly collective burials with scarce grave goods.

Except for one collective Bell Beaker burial in a pit, three so-called *Funerary Areas* reveal the intentional delimitation of space and can be placed chronologically between the end of the third millennium and the first centuries of the second millennium cal. BCE. Like pantheons, the huts with sunken floors at Camino de las Yeseras have two or more tombs excavated at the bases of their edges, as well as one deep hypogeum and one or several artificial caves. These pantheon-like structures were respected through time and reveal consecutive funerary and commensality activities within them. Although the sizes of the tombs are independent of the number of individuals buried within them, the hypogea include relevant prestige items such as ornaments in gold and ivory, and the covering of bodies with cinnabar. The artificial caves, on the other hand, include mainly Bell Beaker pottery of the Ciempozuelos incised style. The osteomorphological and size features noted on some of the Bell Beaker individuals suggest they had a peculiar appearance (e.g. gigantism, deformed head) when they were alive.

Samples I4245/RISE695 and I6623/RISE696 were obtained from a tomb with a double inhumation in a small artificial cave from *Funerary Area 2*. A 1–5-year-old child (I6623) was inhumed at the far end of the cave and was covered by the body of a 20–30-year-old woman (I4245), carefully placed in supine position with the head to the left and flexed legs. The woman's head, which rested on a pillow made with a grass fill, revealed an intentional cranial deformation from childhood. As the bones of the child are packed together at the back of the cave, it is not possible to determine whether this burial is a primary or secondary inhumation, but the body of the women was decomposed within the infilled space. In terms of the grave goods, a small decorated cup was found on the child, whereas two bigger decorated inlaid cups had been placed

between the breast and left arm of the woman. The archaeological context strongly suggests that both individuals were interred at the same time, although the radiocarbon dates do not overlap:

- I4245/RISE695, sample #5, A35 ext. El. 03-VII. Ue 03, Ind 1: 2461–2292 calBCE (3875±20 BP, PSUAMS-2320)
- I6623/RISE696, sample #6, A35 ext. El. 03-VII. Ue 03, Ind 2: 1956–1743 calBCE (3525±40 BP, Ua-35021)

Samples I6626 and I6622 were also obtained from *Funerary Area 2*. I6626 is from an individual inhumation in a hypogeum with exceptional grave goods in which gold, ivory ornaments and cinnabar stands out. The other sample, I6622, is from an individual inhumation in an artificial cave. All Bell Beaker vessels of the *Funerary Areas* in Camino de las Yeseras provided incised Bell Beaker vessels of the so-called local styles, in this case, Ciempozuelos^{26,53}.

- I6626/RISE693, sample #3, A36 El 03-III: 2500–1750 BCE
- I6622/RISE694, sample #4, A35/36 El 03-X: 2800–1750 BCE

Sample I4247/RISE698 was obtained from a tomb with a collective inhumation in a small artificial cave from *Funerary Area 3*. At least four individuals have been identified, of which one is a mature female, two are adult mature men, and another adult is possibly also a male and the only complete skeleton documented in this tomb, while the others are secondary depositions, mainly skulls, mandibles and some long bones. The grave goods include a copper awl, one Bell Beaker, two incised cups, one undecorated vessel, one granite millstone and one sandstone mortar. We sampled the mature female for aDNA analysis:

- I4247/RISE698, sample #8, Fondo 5 UE05: 2465–2211 calBCE (3870±30 BP, PSUAMS-2120)

Sample I6542 was obtained from a collective inhumation in a hypogeum in the *Funerary Area 1*:

- I6542/Yes 12A, Area 31 UE09 Element1-I: 2500–1750 BCE

The remaining analysed samples come from 4 Chalcolithic non-Bell Beaker graves. Sample I6604 belongs to one individual from a double male inhumation in a big pit

without grave goods. Sample I6608 comes from an individual inhumation in a pit. The other 6 samples come from 2 collective burials with mill stones at the bottom of the pits. The collective inhumation of Area 85 (I6609 and I6612) stands out as a simultaneous burial of 6 young women in a small pit, while the grave A10 UE05 E07 is a collective burial of 10 individuals; one adult women and several infants and juveniles were inhumed successively, as demonstrated by the taphonomical and chronological dates of individuals 1 and 8 (I6610 and I6605)^{26,53}.

- I6604/Yese 2A, Area 10 UE03 E01 Ind 2: 2127–1905 calBCE (3630±30 BP, Ua 35012)
- I6608/Yese 5A, Area 36 E02 Ind 2: 2020–1768 calBCE (3555±40 BP, Ua 35022)
- I6609/Yese 6A, Area 85 E02 Ind 2: 2436–2143 BCE
- I6612/Yese 9A, Area 85 E02 Ind5: 2479–1945 BCE
- I6605/Yese 3A, Area 10 UE05 E07 Ind 1: 2479–2287 calBCE (3905±35 BP, Ua 35013)
- I6613/Yese10A, Area 10 UE05 E07 Ind3: 2479–1945 BCE
- I6610/Yese 7B, Area 10 UE05 E07 Ind 8: 1971–1745 calBCE (3530±40 BP, Ua 35014)
- I6543/Yese 13A, Area 10 UE05 E7 Ind 4: 2479–1945 BCE

Humanejos (Parla, Madrid, Spain)

Contact person: Rafael Garrido-Pena, Raúl Flores-Fernández. Ana M. Herrero-Corral

This site is described in Szécsényi-Nagy et al⁵¹. We analyzed individuals from 5 different tombs^{54,55}.

Tomb 1461 is a multiple burial with 6 individuals (2 adults and 4 subadults) and no Bell Beaker finds⁵⁶. Remains from one subadult individual were dated to 2852–2346 calBCE (4009±56 BP, Ua41492). We analysed 5 individuals:

- I6628/Hume 2, UE 1461.87: 2900–2300 BCE. Subadult female. Second or third-degree relative of I6630.
- I6629/Hume 3, UE 1461.54: 2900–2300 BCE. Subadult male.

- I6630/Hume 4, UE 1461.43: 2900–2300 BCE. 26-30-year-old female.
- I6596/Hume 8, UE 1461.76: 2900–2300 BCE. Subadult male.
- I6617/Hume 19, UE 1461.2 Ind 1: 2900–2300 BCE. 27-30-year-old male.

Tomb 455 is a Bell Beaker burial with 3 adult males and one subadult. Two radiocarbon dates were obtained from this tomb: 2338–2046 calBCE (3781±36 BP, Ua40217), 2456–2146 calBCE (3825±37 BP, Ua40218). We analysed 3 individuals:

- I6539/Hume 5, UE 455.2: 2500–2000 BCE. Adult male.
- I6588/Hume 10, UE 455.2: 2500–2000 BCE. Adult male. Second or third-degree relative of I6539.
- I6589/Hume 11, UE 455.9: 2500–2000 BCE. Adult male.

Tomb 1853 is a Bell Beaker burial with 2 mixed adult individuals (1 male and 1 female). We analysed one individual:

- I6585/Hume 14, UE 1853.6: 2345–2136 calBCE (3797±32 BP, Ua43525)

Tomb 2014 is a Bell Beaker burial with 2 adult males. One radiocarbon date was obtained from this tomb: 2474–2294 calBCE (3907±33 BP, Ua43531). We analysed one individual:

- I6587/Hume 15, UE 2014.1: 2500–2200 BCE

Tomb 1964 is a Bell Beaker burial with 1 adult female:

- I6584/Hume 21, UE 1964: 2500–2000 BCE

El Virgagal (Tablada de Rudrón, Burgos, Spain)

Contact person: Elisa Guerra Doce, Germán Delibes de Castro

El Virgagal is a non-megalithic burial mound built in the later third millennium BCE, well into the Copper Age. It is located in the margin of a highland, 300 m above the Rudrón river, one of the tributaries of the Ebro, offering an extensive view and a 360° panorama. The mound is circular; 12 m in diameter and 1 m high. A massive limestone block in the eastern area of the mound stands upright as a milestone or a stela.

This monument was excavated between 1979 and 1983. Grave goods consist of many sherds of Beaker pottery corresponding to the Ciempozuelos style –the three characteristic types of pot found in Ciempozuelos Beaker tombs are present: Bell Beaker, carinated bowl and hemispherical bowl–, three stone wristguards, a V-perforated button possibly made of ivory, and a number of undiagnosed pottery sherds that might be from Beaker or Middle Bronze Age vessels⁵⁷. Furthermore, in the summer of 1997 the run off from heavy rain scoured through the monument revealing two gold items, which originally came to light as finger rings⁵⁸, and have been recently identified as basket-shaped ornaments⁵⁹.

The re-examination of the skeletal remains found during the excavations has identified at least seven individuals, some of them with canid gnawing suggesting that they were exposed before being buried at El Virgazel. It seems that the monument was originally built to cover the burial of an adult male, aged 25-45 years, whose remains lay in the centre of the monument (Burial 1). He was buried on his right side in a flexed position, aligned west to east, with his head facing towards the north. Unlike the other burials which were partial and disarticulated, almost the entire skeleton was present and some bones were articulated, suggesting that this was the primary burial. The corpse was likely deposited within a structure made of stone slabs and as a result the burial decomposed in an empty space. This burial was radiocarbon dated to the late third millennium BCE and has provided ancient DNA data:

- I5665/RISE911: 2281–1985 calBCE (3730±40 BP, Poz-49174)

The radiocarbon dates suggest that four other individuals were probably also Bell Beaker inhumations (Numbers 3, 5, 6 and 7). The two remaining individuals were dated to the Middle Bronze Age, *circa* 1700-1500 BCE.

La Magdalena (Alcalá de Henares, Madrid, Spain)

Contact person: César Heras Martínez, Virginia Galera Olmo, Ana Bastida Ramírez

The archaeological site of La Magdalena is located on the youngest terrace of River Henares, on the right margin, northeast from the city of Alcalá de Henares (Madrid). This site is traversed by at least four paleochannels that lead into the previously mentioned river.

The excavation of the site found at least nine different cultural periods, divided in two groups, separating the prehistoric cultures and the historic ones by a temporal hiatus^{60,61}. The group at hand is the first one, formed of Bell Beaker and Bronze Age burials.

The earliest necropolis is the Bell Beaker one (last quarter of the third millennium BCE), with six burials of different morphology and conservation, all of them found in a strip at the centre of the east sector of the site. The structures are formed of two tumuli, two hypogea and two artificial caves, with three votive deposits associated with them. A mound and a hypogeum were affected by an earthquake on the second half of the fourth century A.D.

The mound 4081 is conformed by a rectangular ground plan (2,4 m x 2,1 m) and a surviving height of 0,74 m, and it has been modified by several roman structures. This is the resting place of an adult male (I6471) and an infant, buried at different phases. Bound to the adult we found two pots, a Ciempozuelos type beaker, a palmela point and a flint knife.

- I6471/RISE700, sample #10, STTL 4313: 2500–2000 BCE

The mound 4134 was found extremely damaged because of the earthquake. A non-decorated elliptic bowl and undetermined human remains, greatly altered by the collapse of its roof, were found.

The hypogeum 4600 has an oval ground plan (3,38 m x 1,72 m x 1,6 m), and its entrance was blocked by a limestone orthostat found in its original placement. This structure shows two burial phases. In the earliest one we found the remains of an undetermined adult woman associated with a Ciempozuelos beaker and a non-decorated pot. The latest phase contained the remains of two women: an adult and a mature individual in a left lateral decubitus position. Both of them are missing their skull and the first two cervical vertebrae.

The hypogeum 7100 was equally destroyed by the earthquake, and shows remains of a slab that used to be part of the blockage of the entrance. Like the mound affected by the earthquake, the pottery and the human remains are greatly fragmented. It is possible to recognize at least two vessels, one non decorated, and the other a Ciempozuelos style beaker.

The artificial cave 4463 is the best preserved one. It is a single inhumation (I6475) of a young woman between 16 and 20 years old. She was buried with a V-perforated button made from African ivory and a suid canine next to her neck. Near her head, a non-decorated vessel and an arsenical copper awl in her left hand, were found. She was sprinkled with red ochre containing cinnabar.

- I6475/RISE704, sample #14, STTL 4467: 2500–2000 BCE

The artificial cave 5005 was found greatly altered because it was opened and closed multiple times. This caused the breakage of the slab that acted as a door. This structure presents the inhumation of two undetermined adult men buried at different phases. The earliest one presents red ochre sprinkled on it (I6472). Two non-decorated bowls are bound to this structure, but it is impossible to determine to which remains they were associated with.

- I6472/RISE701, RISE702, sample #11,#12, STTL 5010: 2500–2000 BCE

The three votive deposits, associated with the artificial caves, are mostly composed of the beaker-bowl set, all of them mostly of the Ciempozuelos style. One of the beakers presents a decoration made of large irregular zig-zag lines.

There are also four Bronze Age individual burials covered with limestone and quartzite. Like the Bell Beaker ones, one of the inhumed skeleton was covered by red ochre.

Camino del Molino (Caravaca de la Cruz, Murcia, Spain)

Contact person: Joaquín Lomba Maurandi, Azucena Avilés Fernández, María Haber-Uriarte

This site is described in Szécsényi-Nagy et al⁵¹. We successfully analyzed four individuals from this site, two of which have been radiocarbon dated. While the first individual corresponds to the time when Bell Beaker pottery was circulation in southeast Iberia, the other three belong the early-middle Copper Age:

- I0453/Cmol79: 2460–2140 calBCE (3830±40 BP, Beta-261524)
- I0455/Cmol123: 2900–2670 calBCE (4210±40 BP, Beta-261529)
- I0456/Cmol140: 2920–2340 BCE
- I0457/Cmol165b: 2920–2340 BCE

Hégenheim (Haut-Rhin, France)

Contact person: David Billoin and Anthony Denaire

The Hégenheim site is located at the left bank of the Rhine river, a few kilometres from the town of Basel. It was the focus of an emergency excavation during the summer of 2004, when an individual Bell Beaker burial next to a Merovingian necropolis was uncovered^{62,63}. The burial consists of an oval pit, north-south oriented, 1.80 meters long and 1.30 meters wide. The skeleton was positioned at the bottom of the pit, in lateral decubitus position on the right side, with flexed knees and elbows. The position indicates that the body is in its primary arrangement. There is suggestive evidence that the grave was covered by perishable material (plausibly a wooden structure).

The grave goods are limited to a decorated vessel, placed in a functional position, just behind the head. It is a large beaker of the S profile and flat-bottomed: 24 cm in height and 20 cm in maximum diameter. The external colour grades from reddish to brown; the vessel is polished and decorated both externally and internally. The latter decoration is restricted to the first two centimetres at the edge and consists of four parallel lines impressed with an S-twisted cord. The external decoration covers all of the beaker except for a short, one-and-a-half centimetre band below the edge. It consists of a series of ten strips alternated with oblique impressions with a comb, limited above and below by a line made with a cord. The decoration can be attributed to a mixed maritime style, considered to be an early stage of the Bell Beaker tradition.

The Hégenheim individual (13-Grave9, I1392) is an adult mature individual who is genetically female. The spatial orientation and the grave goods are consistent with a female Bell Beaker burial.

- I1392/13-Grave9: 2832–2476 calBCE (4047±29 BP, MAMS-25935)

Rouffach – Rue de Pfaffenheim (Haut-Rhin, France)

Contact person: Philippe Lefranc and Anthony Denaire

The burial of Rouffach “Rue de Pfaffenheim”⁶⁴ was discovered in 2014 during prospecting and not subsequently pursued. It consists of a grave of a female over 30 years of age, south-north oriented. She was deposited on her back with knees flexed right and hands turned to the face. The pit does not show any clear differentiation to the

surrounding sediments. The funerary goods include a small vessel of sinuous profile with a handle, placed in a functional position behind the body, about 10 cm from the left shoulder. Seventeen V-perforated bone buttons, all placed around the right hemithorax, were also found. These kind of grave goods, especially the non-decorated vessel, suggest that this burial corresponds to a late, evolved Bell Beaker phase, and the radiocarbon date on the skeleton confirms this attribution:

- I1391/12-GraveExcavation2014: 2346–2133 calBCE (3795±35 BP, Poz-68164)

Sierentz - Les Villas d'Aurèle (Haut-Rhin, France)

Contact person: Luc Vergnaud

Villas d'Aurèle site is located in the municipality of Sierentz, on the left bank of the Rhine, 14 km away from the town of Mulhouse. The site is located on the summit of the Rhine river upper terrace. It was the subject of an emergency excavation in 2010, when the remnants of numerous structures from the Neolithic to the early Iron Age were uncovered. Four Bell Beaker burials, comprising a small funerary area of 55 m of length in a northwest-to-southeast axis were excavated^{65,66}.

Burial 68 (I1390): This well-preserved burial had a quadrangular shape with rounded corners, measuring 2.30 meters long by 1.80 meters wide. The walls were sub-vertical and the bottom was flat. Traces of lines of dark material and fragments of wood stakes, indicate that it originally contained wood, probably a structure around the body. The individual is an adult male, aged 30-59 years. He was lying on his left side, in a hyperflexed position following a northwest-southwest axis (the head facing northwest). The body was accompanied with two decorated vessels, eight flint elements (three of them arrow points of concave base), a grooved sandstone, a stone wristguard, and a fragment of a wild boar tusk. The two vessels are beakers with an S-profile, of a beige colour and decorated with geometric, horizontal lines produced by a comb and with a cord. One vessel alternates bands of short horizontal and vertical lines with bands of incised diamonds while the other alternates oblique incised bands with herringbone patterns. The style of the pottery indicates a medium Bell Beaker phase, although the arrow points seem to suggest an Oriental tradition of the European Bell Beakers. There are two radiocarbon dates from this skeleton and we used the union for analyses:

- I1390/11-Grave68: 2566–2299 calBCE [2566–2524 calBCE (3910±35 BP, Poz-41227); 2489–2299 calBCE (3875±35 BP, Poz-41226)]

Burial 69 (I1389): This burial is well preserved, similar to burial 68. The shape of the grave is quadrangular with rounded corners, and measures 2.25 m long by 1.70 m wide. The remnants indicate a now-missing wooden structure around the body. The individual is a male with an age around 17–19 years. He was left lying at the centre of the pit, in a flexed position over the left side of the body, along a northwest-to-southeast axis (the head facing northwest). Genetic data indicate that this individual is a first degree relative of individual I1390. They share both mitochondrial and Y-chromosome haplogroups, which points to a sibling relationship (brothers). The funerary goods consist of two decorated vessels, thirteen flint elements (eight of them arrow points), a grooved sandstone, a fragment of marcasite and a pendant made of bone. The two beakers are very similar to those from burial 68, although the decorations are different. The style of the pottery also indicates a medium Bell Beaker phase. There are two radiocarbon dates from this skeleton and we used the union for analyses:

- I1389/10-Grave69: 2468–2278 calBCE [2481–2289 calBCE (3935±35 BP, Poz-41229); 2468–2278 calBCE (3925±30 BP, Poz-41228)]

Mondelange - PAC de la Sente (Moselle, France)

Contact person: Arnaud Lefebvre and Michiel Gazenbeek

This site is located in the Moselle valley, about 20 km north of the town of Metz. It was found during a rescue excavation in 2007 that uncovered 25 burials, nine of them dated to the later Bell Beaker tradition or to the transition to the Bronze Age^{67,68}.

Burial 487 (I1381): The grave has a rectangular shape with rounded corners, measuring 2 m long and 1.2 m wide, with a preserved depth of 40 cm and a west-east orientation. The individual is a 10–11-year-old juvenile that lies on his left side, facing west and showing upper and lower limbs hyper-flexed. There are numerous funerary elements within this grave, including Bell Beaker vessels at the eastern corner and a stone tool placed between the thorax and the right elbow.

Burial 515 (I1382): The grave has a rectangular shape, with a flat bottom and a west-east orientation. Three of the corners show semicircular digging that probably contained posts of 25 cm in diameter. The grave measures 2.4 m long and 1.3 m wide and is 0.8

meters deep. The filling is made of brownish sandy silt containing small pebbles. The individual was an adult male lying on his left side, facing west. The upper limbs are flexed, with the right hand over the left humerus and the left hand placed in front of the face. The lower limbs are also flexed with the knees oriented to the north. Genetic data indicate that this individual is a second-degree relative of I1381. There are numerous funerary elements within this grave. A stone wristguard is placed next to the left shoulder. Two vessels are placed close to the feet, one near the axis of the body and the other one next to the south wall. One flint arrow point was found between both vessels, at 10 centimetres over the bottom of the pit. The two beakers, one decorated and the other not - with a peculiar morphology - suggest an evolved, late Bell Beaker phase, with oriental influences. The radiocarbon date from this skeleton is:

- I1382/3-Grave515: 2435–2136 calBCE (3805±35 BP, GrA-4468)

Marlens - Sur les Barmes (Haute-Savoie, France)

Contact person: Joël Serralongue and Pierre-Jérôme Rey

The Marlens - Sur les Barmes site is located in the French Alps, southeast of lake Annecy. It arose from an accidental discovery instead of systematic archaeological prospecting. The site is a crevice that opens at the bottom of a rocky wall, near massive fallen rock debris; the skeleton has been placed inside⁶⁹. The entrance is a very narrow gallery that has a height of only 60 cm. The interior space measures 2.50 m by 1.50 m with an irregular height that reaches 1.70 m at the highest point. The walls consist of large, fractured blocks. The original cavity was enlarged by removing some blocks. The skull was found in a small cavity formed by a natural layout of small stones.

The individual (I1388) is a young male of about 24 years of age. It was associated with a fragment of a Bell Beaker vessel. The decoration is made by a combination of horizontal bands and radial elements including ladder and lattice patterns. This type of incised-printed decoration points to regional Bell Beakers, specifically to the group from the Rhone-Provence of a recent phase. The radiocarbon date from this skeleton is:

- I1388/9-Grave1: 2456–2135 calBCE (3805±40 BP, Lyon-3099)

La Fare (Forcalquier, France)

Contact person: Olivier Lemerrier

The site of La Fare (Forcalquier, Alpes-de-Haute-Provence) is located in the south-east of France, in the Pre-Alps of the south about 80 km north of Marseilles. The site occupies the top of a vast promontory dominating the neighboring valleys. The site was excavated from 1991 to 1999 under the direction of André Müller, Olivier Lemerrier and Robin Furestier⁷⁰.

Burial S14 is located on the margin of a small occupation of the regional Late Neolithic attributable to the Rhone-Ouvèze group. It presents itself as a vast oval pit 2.50m by 2.30m, oriented southeast-northwest and extended in its southern part by a basin of 0.50m long by 0.70m wide, forming an access step to the main pit. The pit accessible by a step under a monolith was probably covered with a floor, blocks and a mound. The body is placed on the bottom of the pit in the west half. It is strictly oriented north-south, head to the north. It is positioned on the left side, the upper and lower limbs flexed.

The archaeological furniture consists of six objects. A copper dagger blade was placed beside the head behind the skull. A small object in the shape of a bone reel was found on the bottom of the pit in front of the head. In the southern part of the pit, under the "access step", were three ceramic beakers, two of which were inverted in front of a small bench in the substrate and a little higher up in the sediment infiltration mass. One is an early Bell Beaker with mixed decoration (comb and cord), the other two are characteristic beakers of the Rhone-Ouvèze group. Screening of the entire sediment of the structure yielded only one small segmented bone pearl.

The skeleton is that of a man aged between 30 and 40 years, of the so-called "alpine" cranial architectural type, about 1.72 m and wounded by inclusion in the olecranon of a fragment of Flint causing ankylosis of the left elbow.

The skeleton is preserved in the Musée de Préhistoire des Gorges du Verdon (Quinson, Alpes-de-Haute-Provence). The radiocarbon date for this individual is:

- I2575/Grave S. 14: 2476–2211 calBCE (3895±40 BP, GrA-22988)

The dolmen of Villard (Lauzet-Ubaye, France)

Contact person: Aurore Schmitt

The tomb excavated during 4 months from 1980 to 1983⁷¹ is located at an altitude of 1267 m near the Morgon relief. It is composed of a rectangular funerary chamber made of 6 slabs and a cover slab, an entrance corridor and a tumulus of around 12 m in diameter. A total 2575 human remains were discovered in the chamber. At least, 25 individuals (16 adults and 9 juveniles) were buried successively in the grave. Partial articulated bodies represent only 5% of the remains, as most of the bones are disarticulated. A single sedimentary layer was observed but two levels of human remains organization were distinguished⁷². Grave goods are scarce compared to the number of individuals: two incomplete Bell Beakers vessels, a copper dagger, a wrist-guard, few lithic tools and ornaments. The first radiocarbon date provided by a human remain from the base of the funerary layer is in accordance with the grave goods (Ly 9995: 3895±/− 35)⁷². The second radiocarbon date, from the top of the layer (Ly 9994: 3515±/−40)⁷², indicates that the tomb was, at least, reused during the middle Bronze age.

Two disarticulated crania from the oldest funerary level were sampled:

- I3874/Vil-Lauz-1435: 2201–2036 calBCE (3725±25 BP, PSUAMS-1835). Adult, genetically female.
- I3875/Vil-Lauz-1316: 2134–1947 calBCE (3655±25 BP, PSUAMS-1834). Adolescent, genetically male.

Clos de Roque (Saint Maximin-la-Sainte-Baume, France)

Contact person: Aurore Schmitt

The preventive archaeological excavation in 2011 of the site of Clos de Roque at Saint-Maximin-la-Sainte-Baume revealed pre-and protohistoric human remains⁷³ over an area of 11200 m². The early period of the Middle Neolithic (4950–4450 BCE) is documented by 9 features. Four of them contained human remains but no grave goods⁷⁴. We successfully analysed three individuals from this site:

- I4303/ST2009: 4779–4587 calBCE (5820±30 BP, PSUAMS-2260). The burial has a sub-circular shape. The pit measures 1.7 m with a preserved depth of 0.8m. The individual is a man deceased after 40 years old. He was lying of her left side in a flexed

position following a south-north axis (head at the south). Genetic data shows that he was a second-degree relative of I4304/ST2224.

- I4304/ST2224: 4788-4590 calBCE (5830±35 BP, PSUAMS-2226). The feature, probably a domestic pit, has a circular shape. It measures 1.1m and is preserved on 0.60 m. The individual is a male juvenile deceased between 6.5 and 10 years old. The skeleton is completely disarticulated.
- I4305/ST2215: 4826-4617 calBCE (5860±35 BP, PSUAMS-2225). This feature has a sub-circular shape, measuring 1,60 m long and 1,38 m wide. It is 0.25 m deep. This burial is installed in a domestic pit. The individual is a young female lying on her back, lower limbs flexed on her left side. The orientation follows a south-north axis (head at the south).

Collet Redon (La Couronne-Martigues, France)

Contact person: Aurore Schmitt

The site is located close to the Mediterranean Sea and was excavated in 2014 and 2015. The collective tomb, made of stones, has a sub-quadrangular shape. Two sepulchral levels were discovered with at least 11 individuals. Only one subject is partially articulated. Apart from human remains, 6 pearls made in limestone were found. A bone from the lower level produced a date of 3501–3112 calBCE (4585±35 BP, Poz-80330). We successfully analysed one individual from this site:

- I4308/CL14-172: 3501–3112 BCE. A petrous temporal from the lower level. It belongs to an adult female.

Via Guidorossi (Parma, Italy)

Contact person: Maria Bernabò-Brea

The site of Via Guidorossi at Parma, in the Po plain, was excavated in 2009 and corresponds to an advanced Bell Beaker period, dated to 2200–1930 years calBCE⁷⁵.

Tomb number 1 contained two skeletons, labelled individuals A (US-8) and B (US-9). Both were placed into an excavated structure of about 2.2 x 2.2 meters, with an opening at the northeast corner. Individual A was a ~30-year-old woman placed in a south-north orientation, while individual B (I2478), the best preserved of both, was a 30-40-year-old

male. This skeleton was placed with flexed legs on his left side, with his left arm also flexed and the right one extended. He was oriented north-south, with the head pointing north and the face looking to the east. Two Bell Beaker vessels, one decorated with incised triangles in a central band and the other undecorated, were placed at his feet, while two additional vessels were located close to the opening of the funerary structure. The decorated pottery is similar to objects found in other Bell Beaker Italian sites such as Rubiera (Reggio Emilia). Some lithic implements, including a remarkable knife, were found between the legs of individual B. The only similar lithic knife in a Bell Beaker context has been found at Fosso Conicchio near Viterbo. We obtained aDNA from both individuals:

- I2477/Tomb1, ind A: 2200–1930 BCE
- I2478/Tomb1, ind B: 2200–1930 calBCE (3671±40 BP, LTL-5035A)

A second tomb, excavated in a sub-quadrangular form, contained three more skeletons, labelled A (US-12), B (US-13) and C (U-14), all of them placed in flexed position. Individuals A and C were 60 and 50-year-old males, respectively, while individual B, who was lying between them and in inverted orientation (north-south), was a 15- to 18-year-old young female. Several decorated Bell Beaker vessels were located within this second grave. The bipolar orientation of the Guidorossi burials – south-north for females and north-south for males, all facing to the east – points to traditions found in central European Bell Beaker sites, such as those from lower Austria and Moravia. We obtained aDNA data from one individual:

- I1979/Tomb2, ind B: 2200–1930 BCE

Pergole 2 (Partanna, Sicily, Italy)

Contact person: Sebastiano Tusa

This site is a small artificial cave excavated in May 2006⁷⁶. Three main phases of use of this collective grave have been identified. The first corresponds to a few partially preserved Eneolithic burials. The second phase contains twelve secondary burials related to the later Sicilian Copper Age. The last phase is separated by a vault collapse and contains burials related to the Bell Beaker culture, accompanied by the usual Beaker cup, a large footed bowl with the typical *pointillé* decoration, a miniaturistic vase and a long bone dagger. We sampled three individuals from the Bell Beaker phase:

- I4930/P2-4-US8-5: 2500–1900 BCE
- I4933/P2-7-US5: 2500–1900 BCE
- I4936/P2-10-US11: 2500–1900 BCE

Oostwoud-Tuithoorn (West Frisia, Netherlands)

Contact person: Harry Fokkens

In 1956 and 1957, two burial mounds were excavated at Oostwoud-Tuithoorn, with additional research in 1963, 1966 and 1978^{24,77,78}. Both burial mounds were located on a levee or crevasse splay of a large tidal creek system, about 40 km inland. The silt and clay sediments in which the skeletons were embedded provided an excellent context for bone preservation. After approximately 800 BCE the area was submerged until the building of dykes after 1000 CE. There is plenty of settlement evidence in the area from Late Vlaardingen/ Late Corded Ware groups, but few Bell Beaker associated remains. The Oostwoud-Tuithoorn burials are in that sense unique, even though they probably represent a much more extensive but difficult to detect settled landscape.

The sequence at this site starts with skeleton 575, dated between 2579–2284 calBCE (3945±55 BP, GrN-6650C). After a few decades, the site was likely converted into arable land. The next stage is the erection of Tumulus II, in which 11 individuals were buried between 2200 and 1900 calBCE: eight male individuals (skeletons 127, 228, 229, 233, 235, 236, 239, 242) and three female individuals (skeletons 243, 247 and possibly 232)²⁴. Furthermore, an isolated mandible (230 Extra) was found, possibly belonging to skeleton 235. Genetic data indicate that skeletons 228, 236 and 242 are second- or third-degree relatives. Several phases of mound extension have become visible through bundles of prehistoric plough marks that surround a circular or oval mound. The arable land underlying and around the burial mound contained many Bell Beaker and pot beakers sherds (Bell Beaker settlement ware). In essence, this dates all skeletons buried in mound II to older than approximately 1900 BCE. The male individuals were all buried on their left side, facing south. The three females were buried on the right side, facing west or north. All individuals were laid down in a crouched position typical for Beaker burials. Apart from occasional flint artefacts no burial gifts were present.

In the Early Bronze Age, between 1900 and 1700 BCE probably, at 20 m distance, a second burial mound (Tumulus I) was raised in which two skeletons have been interred,

probably in the already existing barrow (skeletons 230 and 231). Both skeletons were buried in a manner typical for the Middle Bronze Age, stretched on their backs. Both are dated between 1880 and 1650 calBCE (3440±40 BP, GrA-17225 and 3450±BP, GrA-17226). The burial mound was surrounded by a circle of 80 cm wide pits with a diameter of approximately 20 m. Probably at the same time a 35-m long alignment of almost identical pits was dug in connection with the older mound (Tumulus II). The stratigraphy of the arable land, the graves and the pit circles and alignments demonstrate that the Oostwoud-Tuithoorn burial mounds constituted a small persistent place, a burial ground that was used intermittently but consistently, probably by several generations of a local group of inhabitants. We successfully analysed eleven individuals from this site:

- I5748/skeleton 575-M22: 2579–2284 calBCE (3945±55 BP, GrN-6650C)
- I4067/skeleton 127-M1: 1945–1692 calBCE (3500±50 BP, GrA-15602)
- I4068/skeleton 228-M3: 2132–1952 calBCE (3655±20 BP, PSUAMS-2318)
- I4069/skeleton 229-M4: 2188–1887 calBCE (3640±50 BP, GrA-6477)
- I4070/skeleton 230 barrow I-M7: 1881–1646 calBCE (3440±40 BP, GrA-17225)
- I4071/skeleton 231 barrow I-M10: 1883–1665 calBCE (3450±40 BP, GrA-17226)
- I4073/skeleton 236-M13: 2196–1903 calBCE (3660±50 BP, GrA-15598)
- I4074/skeleton 242-M14: 2278–1914 calBCE (3690±60 BP, GrA-15597)
- I4075/skeleton 243-M15: 2119–1938 calBCE (3635±20 BP, PSUAMS-2337)
- I4076/skeleton 247-M18: 1883–1751 calBCE (3490±20 BP, PSUAMS-2319)
- I5750/230 Extra-M8: 2300–1900 BCE

The skeletons are stored in the provincial depot of the province of Noord-Holland at Castricum. We thank the staff of the depot and archaeologist R. van Eerden, archaeologist of the province of Noord-Holland, for the kind permission to sample the Oostwoud skeletons. Sampling (E. Altena) and first analysis of the skeletal remains (B. Veselka) was made possible by a grant from the Leiden University Fund/Bakels Fund.

Landau an der Isar (Ldkr Dingolfing-Landau, Bavaria, Germany)

Contact person: Karl-Göran Sjögren

On a terrace above the Isar river (a tributary of the Danube) in the outskirts of Landau town, a Bell Beaker settlement and an adjacent cemetery were excavated in 1992⁷⁹. The graves were nine inhumations, of which two were double graves, and two were cremations. In 1981⁸⁰, a single, richly furnished, Bell Beaker grave was excavated ca 80 m further to the west. The graves in the cemetery were also rich, with items such as gold and copper objects. Six graves were arranged in a NW-SE line, while the remaining three were somewhat further to the west.

One individual from grave 9 was sampled for the Rise project (RISE562). This somewhat disturbed grave contained the skeleton of an adult female, lying on her right side. The cranium was found by the pelvis, probably due to disturbance. In the grave were 12 bone buttons with V perforations, a copper awl, and two red painted beakers with horizontally zoned decoration. Unique for Bavaria, a thin rectangular gold sheet, ca 6x3 cm, with perforations was also found. At the feet were bones from half a young pig.

Here, another four individuals were analyzed, from graves 3, 4, 5 and 7. Grave 3 was a double grave, containing two children, one ca 4 years and one ca 5 years old⁸¹⁻⁸³. The skeletons were lying in tucked “hocker position” and facing in opposite directions. Each child was accompanied by an undecorated vessel. Grave 4 contained the skeleton of an adult woman. She was lying in right hocker position with head to the SE. At her feet were two undecorated handled vessels. Grave 5 was of an adult female, lying in right hocker position with the head to the SE. At her feet was a single undecorated handled vessel. Grave 7 was of an older adult woman. The somewhat disturbed skeleton was lying in right hocker position with the head towards the SE. In the chest region were 8 V-drilled bone buttons, by the left lower arm was a copper dagger, and at the feet were three undecorated vessels.

Sr isotopes on bone and tooth samples from six individuals from Landau were measured by Price et al (2004)⁸⁴. They suggest the individual in grave 7 was born locally while all others were migrants.

- I5020/RISE562/F0228/obj. 136/92, grave 9: 2458–2206 calBCE (3848±34 BP, Hd-19835)

- I5523/F0226/grave 7: 2500–2000 BCE
- I5524/F0224/grave 5: 2500–2000 BCE
- I5525/F0274/grave 4: 2500–2000 BCE
- I5526/F7806/grave 3 ind 1: 2500–2000 BCE. Daughter or sister of I5524.

Augsburg Sportgelände (Augsburg, Bavaria, Germany)

Contact person: Karl-Göran Sjögren

This cemetery was discovered in 1991 during the building of a sports facility for Augsburg university^{82,85}. The site contained settlement remains and graves from the Bell Beaker and Urnfield periods. It is located on a terrace on the western side of the river Lech. Somewhat further south, another group of Bell Beaker burials had been found earlier.

The Bell Beaker grave field consisted of 22 graves and is one of the larger cemeteries from this period in Bavaria. Of these there were 9 males, 5 females, 2 children and 2 individuals of undetermined age and sex. The graves formed a long row in a N-S direction, but could be seen to form three subgroups.

Two burials were sampled for the Rise project, grave 3 (RISE560) and grave 4 (RISE559). Grave 3 contained the skeleton of an adult male, accompanied by a wrist plate, two flint arrowheads and a large red painted bell beaker. Grave 4 has not been published and details are not available.

Here, another four samples were analysed, from graves 9, 10, 13 and 22. Details of these graves are not available. Sr isotopes on bone and tooth samples from 17 individuals were measured by Price et al (2004)⁸⁴. The results suggest the individual in grave 3 was both born locally while those in graves 4, 9, 10 and 13 were migrants.

- I5017/RISE559/F0174/grave 4: 2461–2207 calBCE (3855±35 BP, Poz-84458)
- I4132/RISE560/F0187/grave 3: 2500–2000 BCE. Father or son of I5519.
- I5519/F0172/grave 10 adult: 2500–2000 BCE
- I5520/F0196/grave 9 adult: 2500–2000 BCE
- I5521/F0209/grave 22 adult: 2500–2000 BCE

- I5522/F0264/grave 13 child: 2500–2000 BCE. Daughter or sister of I5521.

Unterer Talweg 58-62 (Augsburg, Bavaria, Germany)

Contact person: Philipp W. Stockhammer, Ken Massy

The site of “Unterer Talweg 58-62” is situated in Haunstetten, a quarter of Augsburg to the very south of the city and approximately 1.6 km south of the cemetery of Hugo-Eckener-Straße, from which individuals are also included in this study. The cemetery was excavated in 2007 and consists only of two burials, a single burial (Feature 67) and a double burial (Feature 68) lying close to each other. Each was originally covered by a small tumulus with a surrounding ditch. Genetic data from two individuals from the double grave (Feature 68) were included. The double burial was placed in a rectangular shallow pit below a tumulus of diameter approximately 3.15 m. Skeleton 1 was a male individual, placed in contracted position on his left side with head pointing to the north adjacent to him. Skeleton 2 was placed in the opposite direction – following the sex-specific burial norms of the Beaker Complex in Southern Germany. The two individuals seem to have been interred at the same time, which also fits the radiocarbon dates:

- E09537_d/Feature 68 Skeleton 2: 2464–2212 calBCE (3870±30 BP, MAMS-29075)
- E09538/Feature 68 Skeleton 1: 2471–2300 calBCE (3909±29 BP, MAMS-29074)

Close to the back of the male individual, a bowl was placed in the burial pit and a wrist-guard was placed on one of his lower arms. A decorated Bell Beaker was found close to the back of the female individual. Seen from a stylistic and relative chronological perspective, the beaker and the wrist-guard point to a rather early time within the Beaker Complex, which is also consistent with the radiocarbon dates.

Unterer Talweg 85 (Augsburg, Bavaria, Germany)

Contact person: Philipp W. Stockhammer, Ken Massy

The site of “Unterer Talweg 85” (due to a change of the street numbers after the excavation, the site is sometimes also known as “Unterer Talweg 49”) is situated in Haunstetten, a quarter of Augsburg to the very south of the city and only 300 m north of Unterer Talweg 58-62, from which individuals are also included in this study. The cemetery consists of two small groups of burials, group I with 5 graves and group II

with 2 graves, both situated roughly 20 m apart from each other. Group I, the so-called northern group, was excavated in 2001. Three single burials were radiocarbon dated and their 2 sigma ranges fall between 2465 and 2152 calBCE⁸⁶. We obtained genetic data from the dentine of the individual in grave I/3 (feat. 1343). This was a male individual in contracted position with an arrowhead and several pieces of flint as grave goods.

- E09569/Grave I/3: 2397–2149 calBCE (3819±24, MAMS-18949)

Hugo-Eckener-Straße (Augsburg, Bavaria, Germany)

Contact person: Philipp W. Stockhammer, Ken Massy

The site of “Hugo-Eckener-Straße” was excavated in 2010, when the city of Augsburg in Bavaria opened new land for construction. It is situated roughly 2.3 km north of the cemetery Unterer Talweg 58-62, from which individuals are also included in this study. The cemetery comprises 11 graves, nine of which are single and two of which are double burials, all clearly attributable to the Beaker Complex. This is a typical size for cemeteries of the Beaker Complex in southern Germany and can be understood as the burial place of a nearby hamlet. The individuals were all placed in contracted positions with the respective orientation of their head depending on their sex (males: contracted position on the left side of the body with the head in the north and a view to the east; females: contracted position on the right side of the body with the head in the south and a view to the east) and the graves were arranged in a north-northeast/south-southwest oriented row. Individuals of ten of the graves were radiocarbon dated with their 2 sigma ranges lying between 2562 and 2039 calBCE⁸⁶. Genetic results from dentine of three individuals (graves 3, 8, 10) were included in this study:

Grave 3 (Feature 168) contained a female individual. In front of the lower leg of the woman, an undecorated Bell Beaker was placed together with a stone with worked surface (marks of polishing and picking).

Grave 8 (Feature 180) contained a double burial from which skeleton 1, a male individual with his head pointing to the NE. Parts of the lower body were missing and it was obviously buried together with a female individual (skeleton 2) as the female body was partly placed directly on the male one. There are no burial goods nor is there any evidence of later disturbances of the burials.

Grave 10 (Feature 190) contained a female individual in canonical position. A cup with a handle from its rim was situated in front of the upper leg/knee of the individual.

The radiocarbon dates for individuals from this site with genome-wide data are:

- E09568_d/Grave 8 Skeleton 1: 2461–2210 calBCE (3860±25 BP, MAMS-18918)
- E09613_d/Grave 3: 2289–2141 calBCE (3788±23 NP, MAMS-18913)
- E09614_d/Grave 10: 2268–2046 calBCE (3748±19 BP, MAMS-18921)

Osterhofen-Altenmarkt (Gde Osterhofen, Ldkr Deggendorf, Bavaria, Germany)

Contact person: Karl-Göran Sjögren

This cemetery is located just south of the Altenmark monastery in Deggendorf, at the confluence of the Danube and Isar rivers in lower Bavaria. Prehistoric graves were discovered when a sports facility was being built, and the site was excavated in 1989^{82,87–89}. A total of 33 features were registered, 11 of which were showed to be Bell Beaker graves. Five of the graves were of females and six of males, all except one arranged in a NE-SW line. No child burials were found. Unusually, two of the graves were shown to be chamber graves with wooden walls. Bell Beaker graves had already been found earlier, ca 500 m to the north of this cemetery, and probable BBC settlements have also been documented in the vicinity.

Two graves were sampled for the Rise project (RISE563/grave 3 and RISE564/grave 6). Here, two further individuals were sampled, from graves 9 and 10.

Grave 3 contained a skeleton of an adult male in left hocker position with the head towards the north, accompanied by a Bell Beaker. Grave 6 had a wooden chamber and contained the burial of an adult male lying in left hocker position. Grave goods consisted of a Bell Beaker, a wrist guard, 11 flint arrow heads, and some flint flakes. Grave 9 was somewhat disturbed but contained the skeleton of an adult female in right hocker position, accompanied by a bowl and two cups. Grave 10 contained the skeleton of an adult male in left hocker position with the head to the north. In the grave a wristguard, a copper object, two small vessels, a bowl, and a bow-shaped pendant were found.

Eight individuals were sampled for $^{87}\text{Sr}/^{86}\text{Sr}$ by Price et al (2004)⁸⁴. Three of them (among them the individuals in graves 6 and 10) were suggested to be locals and five to be migrants.

- I5021/RISE563/F0234/obj. 8, grave 3: 2572–2512 calBCE (3955±35 BP, Poz-84553)
- I5022/RISE564/F0241/obj. 25, grave 6: 2500–2000 BCE
- I5023/F0243/obj. 28, grave 9: 2500–2000 BCE
- I5529/F0238/obj 21, grave 10: 2500–2000 BCE

Bruck (City of Künzing, County of Deggendorf, Bavaria, Germany)

Contact person: Volker Heyd

This site is a cemetery of 9 graves, excavated in 1990 in a rescue excavation by the county archaeologist of Deggendorf, Karl Schmotz. In an area of 40 x 20 m there were 7 inhumations as well as one inurned cremation and another cremation with ashes shattered in the burial pit. A total of 8 out of the thus 9 graves are arranged in a single, approximately 28 m long, northwest-southeast oriented line (only grave 1 is off this line, approximately 20 m away to the west). Following bio-anthropological determinations as well as archaeological criteria, based on the gender differentiated burial custom of the Bell Beaker East Group and equipment rules, the graveyard yields burials of 4 men, 4 women and one child. Chronologically all graves belong to the middle phase A2 of the southern German Bell Beaker chronology⁹⁰. Outstanding are grave 8, a senile man buried in the centre of a circular ditch, perhaps indicating a mound, and grave 9, a metal craftsman. We successfully analysed three individuals from this site:

- I3604/Obj. 278, grave 9: 2350–2250 BCE. Left-sided crouched (slightly bent to the back) burial in a 0.9 x 1.5 m sized and approximately 0.75 m deep rectangular grave-pit. Inventory consists of 2 (1 larger and 1 smaller) metope-decorated Bell Beakers behind the back, wristguard, 4 flint arrow-heads, 2 flints and copper awl. These were piled together between feet and grave-pit, and probably originally deposited in a bag. The grave contains a metalworker's kit consisting of larger gravel-stone, arrow-shaft smoother, trapezoid-formed cobblestone, adze fragment with intentionally flattened

edge, sandstone, 2 flint arrow-heads and at least 5 boar's tusks. Scientific analysis of the stones and adze showed that gold and copper were worked with them. Anthropological analysis indicates that this an adult man.

- I3607/Obj. 335, grave 7: 2350–2250 BCE. Left-sided crouched burial in a 0,95 x 1,4 m sized rectangular grave-pit; inventory consists of decorated handled Bell Beaker behind the head and 2 flint arrow-heads.
- I5019/RISE561/Obj 372: 2350–2250 BCE. This grave, situated some 120m to the north of the others, was discovered during rescue excavation in 1991. It was rather disturbed by a drainage ditch but contained undecorated cups and a bowl.

Alburg (Lerchenhaid-Spedition Häring, City of Straubing, Bavaria, Germany)

Contact person: Volker Heyd

The site is a cemetery of 18 graves, excavated in 1982 in a rescue excavation by the State Heritage Office. The excavation completely dug out this graveyard of c. 10 x 30 m. Almost all graves are laying in long rows, oriented north-south. Only grave 5 is off one of these rows, and it could not be established whether this really belongs to the cemetery. Individual grave pits are dug in the Löss soil underground with sizes of up to 1,4 x 0,8 m, orientation always along the cardinal axis of north-south. All graves, except no. 10, contain single burials and follow the typical gender differentiated burial custom of the Bell Beaker East-Group⁹¹ with men laying crouched on their left-hand side with heads in the north; and women on their right-hand side with heads in the south; all burials are thus facing east. Altogether there are 8 left- and 8 right-hand sided crouched burials, encompassing men, women, 3 adolescents and 5 children. All graves belong chronologically to the later, *Begleitkeramik (accompanying pottery)* -dominated phases A2b, B1 and B2 of the southern German Bell Beaker chronology⁹².

Only grave 9 – the earliest grave of the cemetery – yields a broad metope-decorated Bell Beaker and grave 18 a non-decorated handled Beaker, while all others are characterised by various forms of cups, jars, plates and bowls. The early graves 9 and 16, and grave 8, are isotopically determined as outliers⁹³. Additional equipment consists of bow-shaped bone/boar's tusk pendants; V-perforated bone/antler buttons; a bone pin; arrowheads; and other flints; deer teeth, as well as other animal bones as grave offerings. The cemetery stands out due to 6 graves, all belonging to women, yielding

many V-formed perforated bone/antler buttons, amongst these 29 pieces in grave 6 alone and 22 pieces in grave 15, here laid out "in a U-formed line from the clavicle to the lower departure of the sternum and then upwards again to the other clavicle", most of them with the perforated side facing upward. We successfully analysed thirteen individuals from this site:

- I3601/Grave 15: 2300–2150 BCE. Right-sided crouched burial; anthropologically adult woman.
- I3602/Grave 16: 2300–2150 BCE. Right-sided crouched burial; anthropologically adult woman.
- I3600/Grave 14: 2300–2150 BCE. Left-sided crouched burial; anthropologically a young adult; inventory includes four-footed plate/bowl.
- I3599/Grave 13: 2300–2150 BCE. Left-sided crouched burial; anthropologically adult man. Genetic data show that he is a first-degree relative of I3588/Grave 2, likely his brother.
- I3588/Grave 2: 2300–2150 BCE. Left-sided crouched burial; anthropologically adult man.
- I3589/Grave 3: 2300–2150 BCE. Left-sided, N-S oriented, crouched burial; inventory consists of bone pin, 5 decorated bow-shaped bone pendants, 2 fragmented boar's tusks and 11 flints, all deposited behind the back; anthropologically adult man.
- I3590/Grave 4: 2339–2143 calBCE (3802±26 BP, BRAMS-1217). Right-sided crouched burial; anthropologically adult; inventory includes cup with an incised decoration. Genetic data show that she is a first-degree relative of I3593/Grave 6.
- I3594/Grave 9: 2300–2150 BCE. Half-way supine with flexed legs, half-way slightly right-hand side crouched burial, south-north oriented; inventory consists of broad metope-decorated beaker, 10 V-formed perforated bone buttons and 3 flints; anthropologically adult woman. Genetic data show that she is a first-degree relative of I3597/Grave 12.
- I3592/Grave 8: 2458–2204 calBCE (3844±33 BP, BRAMS-1218). Right-sided crouched burial; anthropologically adult woman.

- I3593/Grave 6: 2398–2146 calBCE (3817±26 BP, BRAMS-1215). Right-sided crouched burial; anthropologically adult woman.
- I3597/Grave 12: 2300–2150 BCE. Left-sided crouched burial; anthropologically an infant.
- I3587/Grave 1: 2300–2150 BCE. Left-sided crouched burial without skull (probably intentionally removed); anthropologically a child; inventory includes 6 deer teeth.
- I3596/Grave 11: 2300–2150 BCE. Left-sided crouched burial; anthropologically a child; inventory includes four-footed plate/bowl, decorated with incisions on the rim.

Irlbach (County of Straubing-Bogen, Bavaria, Germany)

Contact person: Volker Heyd

The site is a cemetery of 24 graves, excavated in 1987-89 in a rescue excavation by the county archaeologist of Straubing-Bogen, Karl Böhm. Most graves are badly damaged by ploughing, and likely several more were completely destroyed prior to the excavations. As a consequence, many single finds are not attributable to individual graves. The Irlbach cemetery might originally have yielded 30 graves, on an overall area of 60 x 30 m; this makes it the largest cemetery in Bavaria/southern Germany to date. Following the occupation plan, the cemetery consists of three grave groupings: A western part with 6, a central part with 14, and an eastern part with 3 graves plus one more isolated grave (no. 6). Particularly in the central part, many graves are arranged in north-south oriented rows. Individual grave pits are dug in the Löss soil underground, often quite shallow, with orientation always along the cardinal axis of north-south. Due to additional erosion all graves, except of nos. 10 and 22, are in various degrees damaged by ploughing. The majority of graves, except number 17 and potentially 12 and 13 too, follow the typical gender differentiated burial custom of the Bell Beaker East-Group. Altogether there are 10 left and 10 right-hand sided crouched burials, encompassing men, women, 4 adolescents and 4 children. Particularly remarkable are the graves no. 2, representing a double inhumation of a woman and a child; no. 14 as it yields the only tanged copper dagger; no. 17 as this anthropologically securely determined woman should be lying on the right instead of the left-hand side; and numbers 20 and 22 as intentionally disturbed in antiquity, with grave 22 having seen the removal of a copper object.

Chronologically, all graves belong to the later, so-called *Begleitkeramik* (accompanying pottery) -phases A2b, B1 and B2 of the southern German Bell Beaker chronology⁹⁴, with graves nos. 5 and 10 of the central group likely being the founding graves (phase A2b). There is however not a single decorated Bell Beaker in this cemetery. The four graves of the eastern grave group are the latest interred, also representing the latest Bell Beaker stage (phase B2) in Bavaria. Two of them, numbers 6 and 11, and grave 16 of the western group, are isotopically determined as outliers⁹³. The equipment is characterised by only one undecorated Beaker (grave 7), but various forms of many cups, plates and bowls. Additional equipment consists of bow-shaped bone/boar's tusk pendants from 4 graves; V-perforated bone/antler buttons from 3 graves; a flint from grave 9; non-local gravel-stones from 4 graves; as well as animal bones as grave offerings from 6 graves. We successfully analysed 17 individuals from this site:

- I6591/RISE914, grave 1: 2500–2000 BCE. Likely right-sided crouched burial; anthropologically adult woman.
- I6590/RISE915, grave 2: 2500–2000 BCE. Double inhumation, main individual likely right-sided crouched burial; anthropologically adult woman (sampled for aDNA) and child.
- I4248/RISE916, grave 3: 2500–2000 BCE. Left-sided crouched burial; anthropologically adult man.
- I4249/RISE917, grave 4: 2500–2000 BCE. Right-sided crouched burial; anthropologically infant.
- I4250/RISE918, grave 5: 2434-2150 calBCE (3825±26 BP, BRAMS1219). Right-sided crouched burial; anthropologically infant.
- I5655/RISE919, grave 6: 2500–2000 BCE. Half-way supine with flexed legs, half-way slightly right-hand side crouched burial, SSE-NNW oriented, facing E to NE; inventory consists of heavy cup, wide plate with horizontal handle, bowl-like pot with 4 little handles, and further higher vessel; anthropologically adult (mature) woman.
- I5656/RISE920, grave 7: 2500–2000 BCE. Anthropologically infant.
- I5657/RISE921, grave 8: 2500–2000 BCE. Left-sided crouched burial; anthropologically juvenile. First-degree relative of I5658 and I4248.

- I5658/RISE922, grave 9: 2500–2000 BCE. Right-sided crouched burial; anthropologically adult woman. First-degree relative of I5657 and I4248.
- I5659/RISE923, grave 10: 2500–2000 BCE. Left-sided crouched burial; anthropologically adult man.
- I5833/RISE924, grave 11: 2500–2000 BCE. Left-sided crouched burial; anthropologically juvenile male.
- I5660/RISE925, grave 14: 2500–2000 BCE. Left-sided crouched burial, NE-SW oriented with green staining at one forearm; inventory consists of 2 cups, of those one with incised decoration, four-footed plate/bowl with vertical handle and decorated with incisions on the rim and 6 non-local pebbles; a single-find tanged copper dagger likely belongs to this graves and was only removed by ploughing; anthropologically adult man. First-degree relative of I6624.
- I5661/RISE926, grave 16: 2500–2000 BCE. Left-sided crouched burial; anthropologically adult man.
- I5834/RISE927, grave 17: 2500–2000 BCE. Left-sided, probably slightly supine position; anthropologically adult (mature) woman.
- I5663/RISE929, grave 19: 2500–2000 BCE. Left-sided crouched burial; anthropologically infant.
- I5835/RISE930, grave 20: 2500–2000 BCE. Left-sided crouched burial; anthropologically adult man. First-degree relative of I5833.
- I6624/RISE932, grave 22: 2500–2000 BCE. In a 1,4 x 0,7-0,8 m sized and only moderately deepened pit lies a likely intentionally re-opened, right-sided crouched burial, S/SSW-N/NNE oriented, with face to the top and green staining in the area of the right lower jaw ramus; inventory consists of two cups, one larger the other smaller, a bowl, and 4 decorated bow-shaped bone pendants and 16 V-formed perforated bone buttons found on the chest, as well as animal bones; anthropologically adult woman.

Manching-Oberstimm (Gde. Manching, Kr. Pfaffenhofen a.d. Ilm, Bavaria, Germany)

Contact person: Karl-Göran Sjögren

The site, also called Oberstimm Ost, is located on a terrace near the Danube in the region of Ingolstadt in upper Bavaria. It was discovered in 1982 when a roman military camp and a Hallstatt period settlement were excavated, which had been located by air photography^{89,95,96}.

Four Bell Beaker graves were found, three of which formed a northwest-southeast line (graves 1-3). The graves were oriented along this line and consisted of rectangular pits, probably with internal wooden cist constructions. Grave 2 contained a male burial while graves 1, 3 and 4 contained females. The individual in grave 1 was originally determined as male but has now been genetically sexed as female.

Grave 2 had a copper dagger, a wrist plate and a bundle of arrowheads. Two vessels were also found, a metope-decorated beaker and a large bowl, approximately 50 cm in diameter. Grave 3 had seven amber buttons with V-perforations and three vessels, of which two decorated beakers and a cup with handle.

As normal for females, the individual in grave 1 was buried on its right side in contracted position and the head towards the south. Grave 1 had a wrist plate and a hafted copper awl, also considered as a female attribute, and a bone button. The grave also contained three pottery vessels, of which one was a metope-decorated beaker and one a bowl. We obtained genome-wide data from this individual:

- I5527/F0215, grave 1: 2500–2000 BCE

Grave 4 was located a couple of meters to the west from the line formed by the other graves. It contained the skeleton of an adult woman, lying on her right side with the head to the south. In the grave were a series of amber and bone beads and buttons, some with V-drilled holes, and a beaker with metope decoration. We obtained genome-wide data from this individual:

- I5014/RISE556/F0003/Grave 4: 2500–2000 BCE

No direct ¹⁴C dating has been performed. Measurement of Sr⁸⁷/Sr⁸⁶ isotope ratios were performed by Gisela Grupe and T. Douglas Price on tooth and bone samples from

grave 2 (males) and graves 1 and 4 (females). The results suggest that the male and the female in grave 1 may have been locals, while the female in grave 4 was non-local and had spent her early years in an area with more radiogenic bedrock^{84,97}.

Weichering (Ldkr. Neuburg-Schrobenhausen, Oberbayern), Bavaria, Germany)

Contact person: T. Douglas Price

This site was described in Price et al 2004⁸⁴. We analysed 4 individuals from this site:

- I5530/F0178, grave 17: 2500-2000 BCE
- I5531/F0180, grave D: 2500-2000 BCE
- I6481/F0182, grave 3: 2500-2000 BCE
- I6482/F0184, grave A: 2500-2000 BCE

Worms-Herrnsheim (Germany)

Contact person: Günter Brücken

The isolated grave with individual I5836 was situated in the extended iron-age-cemetery of Worms-Herrnsheim, which includes about 300 graves, and that is notable for its rich graves. In 1993, a singular Bell Beaker grave of a 8-year-old child (female according to genetic data) was found 1000 metres south of the main cemetery⁹⁸. The grave of individual I5836 was found in 2014 and contained a female placed in contracted position on the right side of the body with the head to the south and a view to the east. Behind his back, a decorated Bell Beaker and a copper awl were placed. An animal bone was laid next to her head.

- I5836/FM 14-003: 2500–2000 BCE

Petit-Chasseur (Sion, Valais, Switzerland)

Contact person: Marie Besse and Jocelyne Desideri

The megalithic necropolis of Petit-Chasseur (Valais, Switzerland) is localised in the centre of the town of Sion, at the heart of the Alps. This necropolis is composed of twelve monuments, numbered MI to MXIII, of varied forms and sizes, built and occupied between 3200 and 1600 BCE. Rescue excavations were conducted between

1961 and 1988, under the successive supervision of Olivier-Jean Bocksberger, Alain Gallay, Manuel Mottet and Sébastien Favre.

We distinguish seven major occupation phases at the site:

Phase 1 is associated with the beginning of the final Neolithic in the Valais region, and with the construction of dolmen MXII. Phase 2 is represented by the end of the final Neolithic and dolmen MVI. Both have a triangular basement wall wrapped around the square funerary chamber. Phases 3 to 5 are attributed to the Bell Beaker occupation of the site. During phase 3 the Bell Beaker population constructed three dolmens with lateral doorways (MI, MV, MXI). Phase 4 is marked by the emptying of dolmen MVI and its re-use by Bell-Beaker populations, who placed their own deceased individuals inside. Phase 5 saw the construction of six small funerary chambers (MII, MIII, MVII, MVIII, MIX, MX). Phases 6 and 7 are attributed to the Early Bronze Age, with a cremation pit, adventitious cysts, single flat graves, a ceramic deposit, and the presence of postholes. The necropolis was then recovered by sediment and became invisible.

In total, over 200 individuals have been inhumed in these collective graves. For all occupation phases, a great number of archaeological artefacts have been uncovered: numerous ceramics, flint and crystal objects (blades, arrowheads, circle segments, nucleus...), a polished lithic industry with numerous arrowheads, varied ornaments (in silver, gold, and diverse seashells), archer's wrist guards, V-perforated buttons, spindles, polishers, and a copper awl. More spectacular are the 31 engraved anthropomorphic stelae, richly decorated, that make the site renowned. Some faunal and archaeobotanical elements complete this assemblage.

Five Bell Beaker individuals were tested (2 from dolmen MVI and 3 from dolmen MXI), but only the ones from dolmen MXI yielded aDNA data:

- I5755/BB_01_MXI: 2470-1985 BCE
- I5757/BB_18_MXI: 2470-1985 BCE
- I5759/BB_23_MXI: 2470-1985 BCE

Human bones from dolmen MXI have been dated to 2470–2042 calBCE (3820±70 BP; B-3061) and 2468–1985 calBCE (3790±80BP; B-3064).

Velké Přílepy (Prague, Czech Republic)

Contact person: Karl-Göran Sjögren

This site, situated in western Prague, was excavated in 1994-96⁹⁹. Settlement remains and cemeteries from several prehistoric periods were found, stretching from the Funnel Beaker period to the Iron Age. In one of the investigated areas, a cemetery was found, containing 13 Corded Ware burials, 8 Bell Beaker and five Únětice burials. Schwarz places the Bell Beaker graves in her phase III⁸⁹.

Two Bell Beaker individuals were sampled:

- I6468/F0553/grave 188: 2500–1900 BCE. Child lying on its right side, head to the south. This grave contained pottery in the form of “Begleitkeramik”.
- I6480/F0551/grave 185: 2500–1900 BCE. Skeleton of an adult male lying on his left side with the head towards the north.

Sr isotopes were analyzed for three BB individuals, including the two individuals analysed here. All were classified as immigrants⁸⁴.

We also generated sequencing data from one Early Bronze Age individual reported in Allentoft et al³⁴:

- I5035/RISE577, F0565, gr. 238: 2300–1900 BCE.

Prague-Jinonice (street Butovická, Prague 5 - Jinonice, Czech Republic)

Contact person: Milan Kuchařík, Michal Ernée

In 2007, part of the Bell Beaker cemetery was unearthed during a rescue excavation at Prague-Jinonice. Six of the seven excavated features were inhumations, and the last one was a funerary feature interpreted as a site of incineration. Based on skeleton position three of the buried individuals were male, two female and one indefinite. One of the female burials (grave no. 4) was probably placed in a wooden chamber. Burial assemblages consisted mainly of undecorated pottery (1–3 vessels), accompanied in one case by a flint arrow-head and in another grave by 11 antler buttons¹⁰⁰.

- I4946/Grave 1/Feature 500/07: 2297-2147 calBCE (3805±20 BP, PSUAMS-2801). Right-sided crouched burial, head towards the south-west. Sex: orientation – F,

anthropology – F, DNA – F. Age: adult (23–35 years). Grave goods: two vessels (bowls)¹⁰⁰.

- I4895/Grave 3/Feature 502/07: 2273–2047 calBCE (3750±20 BP, PSUAMS-2852). Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – ?, DNA – M. Age: infant (7 years). Grave goods: one vessel (small jar)¹⁰⁰.
- I4947/Grave 4/Feature 504/07: 2500–2000 BCE. Hardly disturbed, likely right-sided crouched burial, head towards the south to south-east. Sex: orientation – F(?), anthropology – F(?), DNA – M. Age: adult (50–60 years). Grave goods: three vessels (jar, small jar, bowl), two big round decorated antler buttons, nine small v-shaped antler buttons, animal bones inside and outside the bowls (*Sus scrofa domestica*)¹⁰⁰.
- I4896/Grave 5/Feature 505/07: 2288–2142 calBCE (3785±20 BP, PSUAMS-2853). Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – ?, DNA – F. Age: infant (6 years). Grave goods: two vessels (small jar, bowl)¹⁰⁰.
- I5514/Grave 6/Feature 507/07: 2500–2000 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – F(?), DNA – M. Age: adult (30–40 years). Grave goods: one vessel (small jar) and one flint arrow-head¹⁰⁰.

Prague-Jinonice (“Zahradnictví”, Prague 5 – Jinonice, Czech Republic)

Contact person: Miroslav Dobeš, Petr Velemínský

The rescue excavations at the site Jinonice – Holman’s gardening took place in 1984–1986 during the construction of the subway^{101–103}. A total of 29 graves were found, dated to the older phases of the Únětice culture on the basis of grave equipment (ceramic and bronze inventory) and burial ritual^{103,104}. The skeletal remains of 36 individuals were found in the graves¹⁰⁵, with predominance of adults between 20–40 years of age. However, the burial ground was not excavated completely. With the exception of two graves, grave goods (mainly pottery) were found in all graves.

- I7195/Grave 54/: 2200–1700 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – ?, anthropology – M ?, DNA – F. Age: adult (40–50 years). Grave goods: two jugs and small pot.

- I7196/Grave 59: 2200–1700 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – ?, anthropology – ?, DNA – M. Age: adult (35–50 years). Grave goods: bronze hair ring, bone awl, flint industry.
- I7197/Grave 77: 2200–1700 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – ?, anthropology – M ?, DNA – M. Age: adult (20–30 years). Grave goods: three vessels (bowl, two cups).
- I7198/Grave 82: 2200–1700 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – ?, anthropology – ?, DNA – F. Age: adult (20–30 years). Grave goods: vessel (bowl).
- I7199/Grave 84-I: 2200–1700 BCE. Disturbed burial. Sex: orientation – ?, anthropology – M ?, DNA – M. Age: adult (20–30 years). Grave goods: six vessels (bowl, cup, jug, fragments of three other vessels). Same grave as I7200.
- I7200/Grave 84-II: 2200–1700 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – ?, anthropology – F?, DNA – F. Age: adult (40–60 years). Grave goods: six vessels (bowl, cup, jug, fragments of three other vessels).
- I7201/Grave 88: 2200–1700 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – ?, anthropology – F, DNA – F. Age: adult (30–40 years). Grave goods: five vessels (bowl, two cups, fragments of two other vessels) and bronze hair rings. This grave contained another inhumation burial (not analysed).
- I7202/Grave 94: 2200–1700 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – ?, anthropology – ?, DNA – M. Age: adult (20–30 years). Grave goods: two vessels (bowl, cup), flint arrowhead and bronze hair rings.
- I7203/Grave 97: 2200–1700 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – ?, anthropology – ?, DNA – M. Age: adult (20–30 years). Grave goods: vessel (cup), flint industry.

Prague-Kobylisy (street Ke Stírce, Prague 8 - Kobylisy, Czech Republic)

Contact person: Milan Kuchařík, Michal Ernée

In 2005/2006, part of a Bell Beaker cemetery was unearthed during a rescue excavation at Prague-Kobylisy, street Ke Stírce.

Eleven excavated features were inhumations and one (grave no. 6) was a cremation grave possibly with an incineration place. Based on the skeleton positions, six of the buried individuals were male, one female and five undetermined. The cemetery is not yet published, but currently being prepared for the publication. There were also EBA Aunjetitz-Culture skeleton graves in the area. Eight of the excavated Bell Beaker skeletons (graves) were well preserved and sampled for DNA analysis:

- I4885/Grave 4, feature 528: 2289-2143 calBCE (3790±20 BP, PSUAMS-2843). Left sided crouched burial, hardly disturbed, head towards the north-east. Sex: orientation – M, anthropology – (?), DNA – M. Age: infant (5–6 years). Grave goods: 2 vessels – small jar, bowl.
- I4886/Grave 8, feature 541: 2205-2042 calBCE (3740±20 BP, PSUAMS-2844). Left sided crouched burial, well preserved with animal disturbance, head towards the north-east. Sex: orientation – M, anthropology – (?), DNA – M. Age: infant (9–13 years). Grave goods: bowl with animal bones inside.
- I4887/Grave 9, feature 542: 2201-2039 calBCE (3730±20 BP, PSUAMS-2845). Left sided crouched burial, disturbance or secondary inhumation, head probably toward north-east. A chop injury is visible on the head. Sex: orientation – M, anthropology – F (?), DNA – M. Age: infant (7–8 years). Grave goods: one bowl.
- I4888/Grave 10, feature 543: 2190-2029 calBCE (3700±20 BP, PSUAMS-2846). Left sided crouched burial, head toward north-east. Sex: orientation – M, anthropology – M (?), DNA – M. Age: infant (6–7 years). Grave goods: two vessels – one bowl and one jar.
- I4889/Grave 11, feature 544: 2281-2062 calBCE (3765±20 BP, PSUAMS-2847). Left sided crouched burial, head toward the north-east. Sex: orientation – M, anthropology – M, DNA – M. Age: mature individual. Grave goods: three arrowheads, stone wrist-guard, antler flint-knapping tool, bow-covering made of animal bones.
- I4890/Grave 12: feature 545: 2500–2000 BCE. Left sided crouched burial, head toward north-east. Sex: orientation – M, anthropology – M, DNA – M. Age: mature individual. Grave goods: three vessels – bowl, two jars, stone wrist-guard, five arrowheads.

- I4891/Grave 13, feature 546: 2281-2062 calBCE (3765±20 BP, PSUAMS-2848). Extended position with crouched hands on the shoulders, head toward north-east. Sex: orientation – M, anthropology – M, DNA – M. Age: adult. Grave goods: one vessel – big bowl, two arrowheads.
- I4945/Grave 14, feature 547: 2291-2144 calBCE (3795±20 BP, PSUAMS-2854). Right sided crouched burial, head toward south-west, probably rests of wooden chamber, bowl lies on the stair. Sex: orientation – F, anthropology – F, DNA – F. Age: mature individual. Grave goods: one vessel – big bowl, animal bones, three small v-shaped antler buttons.

We analysed 4 additional individuals from this site (2 Early Bronze Age and 2 Middle Neolithic):

- I4884/feature 515: 1882-1745 calBCE (3480±20 BP, PSUAMS-2842)
- I4892/feature 551: 1881-1701 calBCE (3475±20 BP, PSUAMS-2849)
- I4893/feature 552, Grave 17: 4449-4348 calBCE (5550±20 BP, PSUAMS-2850)
- I4894/feature 552, Grave 18: 4488-4368 calBCE (5610±20 BP, PSUAMS-2851)

Radovesice (Czech Republic)

Contact person: Miroslav Dobeš, Petr Velemínský

The Bell Beaker graves come from a rescue excavation in the pre-mine of the brown coal mine. They were discovered in two locations, which are approximately 800 m apart.

The two skeleton graves located next to a church were studied in 1978 by J. Muška from M Teplice (graves 116 and 117). Both were richly equipped with vessels, copper daggers and awl, stone wristguards and gold and silver jewelry. Both belong to the typologically older phase of the Bell Beaker period.

Thirteen graves (here graves 2, 53, 59, 67, 68, 69, 70, 71, 73 and 74) located by the road near Kostomlaty were studied by J. Muška from the Museum of Teplice in 1980-1981. They were spread over an area of 100 x 25 m and they were part of a bigger cemetery. Most of the graves could be assigned typologically to the earlier Bell Beaker period.

- I7205/Grave 2/80: 2500–2200 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – M, DNA – M. Age: adult (30–40 years). Grave goods: vessel (cup)¹⁰⁶.
- I7210/Grave 68/80: 2500–2200 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – M, DNA – M. Age: adult (35–50 years). Grave goods: none¹⁰⁶. This individual is the father of I7212.
- I7212/Grave 70/80: 2500–2200 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – ?, DNA – M. Age: infant (8–9 years). Grave goods: flint industry^{106,107}.
- I7211/Grave 69/80: 2500–2200 BCE. Right-sided crouched burial, head towards the south-west. Sex: orientation – F, anthropology – F?, DNA – F. Age: adult (20–30 years). Grave goods: none¹⁰⁶.
- I7213/Grave 71/80: 2500–2200 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – F, anthropology – F?, DNA – F. Age: juvenile (17–18 years). Grave goods: two vessels (bowl, cup)¹⁰⁶.
- I7282/Grave 116/78: 2500–2200 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – M, DNA – M. Age: adult (30–40 years). Grave goods: two vessels (beaker, cup), copper dagger, stone wristguard, antler artefact, boar fang, flint industry¹⁰⁸. This individual is a first-degree relative of I7283.
- I7283/Grave 117/78: 2500–2200 BCE. Right-sided crouched burial, head towards the north-east. Sex: orientation – atypical (right side = female, orientation and grave goods = male), anthropology – F, DNA – F. Age: adult (over 50 years). Grave goods: two vessels (beaker, ornamented cup), gold and silver jewelry, copper dagger, copper awl, flint industry^{91,107,108}.
- I7286/Grave 53/80-I: 2500–2200 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – M, DNA – M. Age: adult (20–30 years). Grave goods: three vessels (beaker, cup, bowl), stone wristguard^{106,109}.
- I7287/Grave 59/80-I: 2500–2200 BCE. Disrupted burial. Sex: orientation – ?, anthropology – ?, DNA – M. Age: infant (4–5 years). Grave goods: three vessels (bowl, two cups), flint industry^{106,107,109}.

- I7288/Grave 59/80-II: 2500–2200 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – M, DNA – M. Age: adult (30–40 years). Grave goods: two vessels (bowl, cup)^{106,109}.
- I7289/Grave 67/80: 2500–2200 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – M, DNA – M. Age: adult (40–50 years). Grave goods: none^{106,109}. This individual is the brother of I7214.
- I7290/Grave 73/80: 2500–2200 BCE. Right-sided crouched burial, head towards the south. Sex: orientation – F, anthropology – F?, DNA – F. Age: juvenile (17–20 years). Grave goods: V-bored amber and bone buttons, amber beads^{106,107}.
- I7214/Grave 74/80: 2500–2200 BCE. Right-sided crouched burial, head towards the south-east. Sex: orientation – F, anthropology – F?, DNA – F. Age: juvenile-adult (15–25 years). Grave goods: two vessels (two cups)^{106,107}.

Lovosice (NW Bohemia, Czech Republic)

Contact person: Milan Kuchařík, Václav Smrčka

A rescue excavation performed by the Institute of Archaeological Monument Care of Northwestern Bohemia in 2002 revealed a Bell beaker cemetery with only 1 inhumation grave:

- I6476/RISE736, Grave 4/2002: 2500–1900 BCE. Skeleton: hardly disturbed, grave pit was very shallow. Right sided crouched burial, head toward south. Sex: orientation – F, anthropology – F, DNA – F. Age: Adult (40-50 years). Grave goods: 1 beaker vessel in the western part of the grave pit.

Lochenice (NE Bohemia, Czech Republic)

Contact person: Milan Kuchařík, Václav Smrčka

This site was excavated by Charles University (Prague) between 1977–1982. A Bell beaker cemetery with 24 graves, 22 inhumations and 1 cremation grave was discovered. We analyzed one Bell Beaker individual:

- I5666/F0519, Grave 20, feature 1/82: 2500–1900 BCE. Skeleton: hardly disturbed, grave pit was very shallow. Sex: orientation – ?, anthropology – ?, DNA – M. Age: infant (3-4 years). Grave goods: 4 vessels – bowl, beaker, two jars.

Brandýsek (Czech Republic)

Contact person: Miroslav Dobeš, Petr Velemínský

The Brandýsek burials dated to Bell Beaker period were explored by O. Kytlicova (Archaeological Institute of the Academy of Sciences, the Czech Republic) in 1955–1956. Previously, several graves had been destroyed by mining in the area and therefore the burial ground is certainly not complete. Kytlicova estimated that approximately half of the graves were preserved. From the Bell Beaker period, a total of 23 individuals in 22 graves with standard equipment (pottery, two Copper daggers, Copper awl, flint arrowheads, bone pendant) were examined, dated to the earlier Bell Beaker period according to the pottery style. Relatively unusual is the use of stone in some graves, as well as the grave with two individuals^{110–112}.

- I7249/Grave 3: 2500–2200 BCE. The grave was greatly damaged by a bulldozer and the position and orientation of the skeleton could not be determined. Sex: orientation – ?, anthropology – ?, DNA – M. Age: juvenile (15–20 years). Grave goods: fragments of two cups^{109,110}.
- I7250/Grave 4: 2500–2200 BCE. Right-sided crouched burial, disturbed, head towards the south. Sex: orientation – F, anthropology – F ?, DNA – F. Age: adult (20–30 years). Grave goods: vessel (polypod bowl)^{109,110,112}.
- I7251/Grave 8: 2500–2200 BCE. Heavily disturbed, head towards the north. Sex: orientation – M, anthropology – ?, DNA – M. Age: infant (7–15 years). Grave goods: fragments of vessels (bowl)¹¹⁰.
- I7269/Grave 12: 2500–2200 BCE. Left-sided crouched burial, head towards the north-east. Sex: orientation – M, anthropology – M ?, DNA – M. Age: juvenile (15–18 years). Grave goods: none^{110,111}.
- I7270/Grave 19A: 2500–2200 BCE. Right-sided crouched burial, head towards the south-west. Sex: orientation – F, anthropology – F, DNA – F. Age: adult (20–30 years). This individual was buried together with I7271 in the same grave. Grave goods: three vessels (bowl, Bell Beaker, cup) and small flint dagger^{109,110}.
- I7271/Grave 19B: 2500–2200 BCE. Left-sided crouched burial, head towards the north-east. Sex: orientation – M, anthropology – M ?, DNA – M. Age: adult (30–50

years). Grave goods: three vessels (bowl, bell beaker, cup) and small flint dagger^{107,110,111}.

- I7275/Grave 26: 2500–2200 BCE. Left-sided crouched burial, head towards the north-east. Sex: orientation – M, anthropology – M, DNA – M. Age: adult (40 - 60 years). Grave goods: vessel (bowl) and bone pendant^{109–111}.
- I7276/Grave 34: 2500–2200 BCE. Heavily disturbed, the position and orientation of the skeleton could not be determined. Sex: orientation – ?, anthropology – ?, DNA – M. Age: infant (2 – 3 years). Grave goods: two vessels (bowl, cup)^{109–111}.
- I7278/Grave 71: 2500–2200 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – M, DNA – M. Age: adult (30 - 50 years). Grave goods: three vessels (bowl, cup, jug) and small copper dagger^{109–111}. This individual is the brother of I7271.

We also analysed three Corded Ware individuals from this site:

- I7272/Grave 23: 2900–2500 BCE. Right-sided crouched burial, head towards the west. Sex: orientation – M, anthropology – ?, DNA – M. Age: infant (4 - 6 years). Grave goods: vessel (small beaker), pelvis of cattle^{107,111,112}.
- I7279/Grave 74: 2900–2500 BCE. Right-sided crouched burial, head towards the west. Sex: orientation – M, anthropology – ?, DNA – M. Age: infant (5 – 6 years). Grave goods: two vessels (beaker, amphora)^{107,112}.
- I7280/Grave 78: 2900–2500 BCE. Right-sided crouched burial, head towards the west. Sex: orientation – M, anthropology – ?, DNA – M. Age: infant (3 – 4 years). Grave goods: vessel (beaker)^{107,112}.

Prague 5 – Malá Ohrada (Czech Republic)

Contact person: Miroslav Dobeš, Petr Velemínský

One grave was excavated by J. Kovářík (The City of Prague Museum) during the construction of the Malá Ohrada housing estate in Prague-Stodůlky in 1979.

- I7281/Grave 2/Feature 507/07: 2500–2200 BCE. Left-sided crouched burial, head towards the north. Sex: orientation – M, anthropology – F ?, DNA – F. Age: adult (35 – 50 years). Grave goods: one vessel (unornamented bell beaker).

Moravská Nová Ves (Czech Republic)

This site was described in Price et al 2004⁸⁴. We analysed 4 Early Bronze Age individuals from this site:

- I5037/RISE579, F0579, gr. 27: 2300–1900 BCE
- I5042/RISE584, F0591, gr. 8: 2300–1900 BCE
- I5043/RISE585, F0593, gr. 81: 2300–1900 BCE
- I5044/RISE586, F0597, gr. 6: 2300–1900 BCE

Clachaig (North Ayrshire, Scotland)

Contact person: Alison Sheridan

This is a chamber tomb of Clyde type (Canmore ID 39676, <https://canmore.org.uk/site/39676/clachaig-arran>)¹¹³, located on the south coast of the Isle of Arran^{114,115}. The chamber is divided into two segments by sill-stones and overlapping side-slabs, and there may originally have been more: the insertion of a cist during the Early Bronze Age may have destroyed further chamber segments. The associated cairn is roughly oval, but there may originally have been a concave forecourt façade, now obscured by cairn slip (or deliberate infill). The monument was excavated by Thomas Bryce in 1900. Finds comprised a complete Early Neolithic decorated bipartite bowl, a large part of an Early Neolithic lugged jar, and a stone axehead from the chamber's compartments, with sherds of an Early Bronze Age Food Vessel and a flint knife from the cist. Bones from ox and pig, many from young animals, and possibly lamb bones were found in the chamber and a young pig's upper jawbone was found in the cist. The human remains consisted of the remains of 14 individuals, of both sexes and including adults and children, in the chamber and fragmentary remains of a further individual in the cist. A petrous temporal belonging to adult female skull 'B' from the chamber was successfully analyzed for ancient DNA:

- I2988/GENSCOT60: 3517–3362 calBCE (4645±29 BP, SUERC-68711)

This individual had already been radiocarbon-dated in 2004, along with three others from the chamber (namely Bryce's 'A', 'C' and 'D'¹¹⁶). The previous date for 'B' differs little from the new date: 3627–3363 calBCE (4670±40 BP, GrA-25617). The date for individual 'A' is 3658–3384 calBCE (4800±40 BP, GrA-25616); that for individual 'C' is 2570–2310 calBCE (3949±36 BP, UB-6897) – clearly a secondary deposit – and that for individual 'D' is 3632–3373 calBCE (4708±37 BP, UB-6898).

Distillery Cave (Oban, Argyll and Bute, Scotland)

Contact person: Ian Armit

Distillery Cave is located at around 12 m above present sea-level, at the foot of cliffs in the modern town of Oban¹¹⁷ (Canmore ID 23064, <https://canmore.org.uk/site/23064/oban-distillery-cave>)¹¹³. It was discovered during building work in 1890 and later destroyed during the construction of a distillery complex in the early part of the twentieth century. The cave was relatively small, measuring some 3 m wide and 3 m high at its mouth, some 4 m deep, and lessening to around 1.3 m high at the rear. Concentrations of marine shell were recovered as well as objects of flint and bone, one of which has produced an Early Bronze Age radiocarbon date¹¹⁸. Human remains, representing at least 12 individuals, were recovered, ranging in age from infants to mature adults¹¹⁸. It is unclear whether they represent disturbed burials or the deposition of disarticulated human remains. There is no surviving contextual information that might be used to associate the human remains with any of the material artefacts found in the cave. Three human petrous bones were successfully analyzed:

- I2660/GENSCOT29: 3514–3353 calBCE (4631±29 BP, SUERC-68703)
- I2691/GENSCOT30: 3701–3640 calBCE (4881±25 BP, SUERC-68704)
- I2659/GENSCOT28: 3762–3644 calBCE (4914±27 BP, SUERC-68702)

Holm of Papa Westray North (Orkney, Scotland)

Contact person: Alison Sheridan

This is a Neolithic chamber tomb of stalled cairn type (Canmore ID 3243, <https://canmore.org.uk/site/3243/papa-westray-holm-of-papa-westray-north>)¹¹³, located on the small island of Holm of Papa Westray, in the Orkney archipelago. The stalled

chamber has four compartments plus a cell opening off its inner end; the monument is orientated north-west^{119–121}. The cairn is rectangular and measures around 11.8 by 6.3 m; the chamber is linked to one end of the cairn by a short passage. It was excavated by George Petrie in 1854, and more thoroughly by Anna Ritchie in 1982–3. Finds include round-based pottery from inside the monument, plus Grooved Ware and coarse Beaker from secondary activity outside the cairn; tools of flint, chert and quartz; a stone pounder, stone pot lids and stone Skail knives; a bone bead, points and a whalebone object; and pumice. Animal remains of various species were found, including those of sheep that had eaten seaweed as part of their diet¹²². Human remains were found inside the chamber, with a few in the entrance passage and the forecourt; an MNI of 9–10 was estimated, comprising both sexes and adults and children. Four individuals were successfully analyzed for ancient DNA; details of their sample numbers and radiocarbon dates are as follows:

- I2650/GENSCOT10: 3500–3360 calBCE (4754±36 BP, SUERC-68642)*
- I2636/GENSCOT08: 3520–3362 calBCE (4651±33 BP, SUERC-68640)
- I2651/GENSCOT11: 3330–3090 calBCE (4525±36 BP, SUERC-68643)*
- I2637/GENSCOT09: 3510–3340 calBCE (4697±33 BP, SUERC-68641)*

* indicates that the calibrated result has been adjusted for minor marine offset; recalibration undertaken by Rick Schulting.

Sixteen additional radiocarbon dates exist for Holm of Papa Westray North, of which five are from human remains, two are from Orkney vole and nine are from other animals^{123–130}. The dates indicate funerary use within the second half (mainly the third quarter) of the fourth millennium; Bayliss et al.¹³⁰ have Bayesian-modelled the start of human deposition at 3685–3375 cal BC, and its end at 3370–2795 cal BC, at 95% probability. The new dates fit well within this time range.

Isbister (Orkney, Scotland)

Contact person: Alison Sheridan

This is a Neolithic chamber tomb that combines features of both stalled cairns and Maeshowe-type passage tombs, and is located close to cliffs at the southern end of South Ronaldsay in the Orkney archipelago (Canmore ID 9554,

<https://canmore.org.uk/site/9554/south-ronaldsay-isbister>)¹¹³. It was dug into by the local farmer, Ronald Simison, in 1958, 1976–79 and 1982, and limited excavation was undertaken by Roy Ritchie from the Inspectorate of Ancient Monuments in 1958. Additional, small-scale excavation was undertaken for Orkney Islands Council in 1987, and there was clearly some digging into the chamber prior to 1958^{120,131–136}. The monument is popularly-known as ‘The Tomb of the Eagles’ (but see below on the date of the eagle remains). The chamber, 8.2 m long, is divided into five segments by four pairs of transversely-set orthostats, with the end compartments being wider than the rest of the chamber. There are also three side-cells. The passage leads from the mid-point of the chamber (and roughly at right-angles to it) to the outside of the roughly oval cairn, and is orientated ENE. The cairn is encased around its western half by a roughly D-shaped rubble mound edged by a semi-circular wall, and an earlier wall, termed a ‘hornwork’, extends NNE from the cairn. The numerous material finds, which include fragments of 45 round-based pots including several Unstan bowls, fragments of a flat-based pot, and several friable, shell-tempered sherds, are catalogued in ref. ^{120,133}. A wide variety of faunal remains were found, including those of white-tailed sea eagles which radiocarbon dating has shown to relate to secondary deposition during the second half of the third millennium, long after the monument was constructed¹³⁷. Abundant human remains were found – over 15,000 fragments¹³³ – with some sealed below the floor slab of the south end compartment, some in the cells, many on the floor of the chamber, many filling the chamber, and many unstratified. A few bones were found outside the monument. Meticulous re-examination of these bones by David Lawrence^{135,136} concluded that Chesterman’s initial MNI estimate of 341 was a gross over-estimation, with the actual figure likely to be around 85. Ten bones were successfully analyzed for ancient DNA, and nine of these have been radiocarbon-dated (with the tenth failing due to insufficient collagen for dating); details of their sample numbers and radiocarbon dates are as follows:

- I2630/GENSCOT02: 2581–2464 calBCE (3999±32 BP, SUERC-68632)
- I2932/GENSCOT70: 2571–2348 calBCE (3962±29 BP, SUERC-68721)
- I2933/GENSCOT71: 3011–2886 calBCE (4309±29 BP, SUERC-68722)

- I2934/GENSCOT72: 3330–2910 calBCE (4466±33 BP, SUERC-69071). The calibrated result has been adjusted for minor marine offset; recalibration undertaken by Brian Tripney.
- I2935/GENSCOT73: 3336–3012 calBCE (4451±29 BP, SUERC-68723)
- I3085/GENSCOT74: 3339–3027 calBCE (4471±29 BP, SUERC-68724)
- I2977/GENSCOT75: 3009–2764 calBCE (4275±33 BP, SUERC-69072)
- I2979/GENSCOT77: 3334–2942 calBCE (4447±29 BP, SUERC-68726)
- I2629/GENSCOT01: 3180–2780 BCE
- I2978/GENSCOT76: 3336–3024 calBCE (4464±29 BP, SUERC-68725)

There are a further 28 radiocarbon dates (including six replicate determinations) for human bone from Isbister, plus four dates (including one replicate determination) for animal bone^{129,130,136–140}. These are consistent with the dates obtained for the GENSCOT project and indicate an initial, main period of use during the late fourth millennium into the beginning of the third, followed by episodes of secondary funerary use during the first half of the third millennium, the third quarter of the third millennium, and (from a ‘cist’ in the ‘hornwork’) the mid-second millennium. Bayesian-modelling of the dates by Bayliss et al.¹³⁰ places the date range for the initial, main period of use at 3380–3105 calBCE (start) to 3080–2835 calBCE (end), both at 95% probability. Note that the individual represented by individual I3085 (GENSCOT74) had previously been radiocarbon-dated¹³⁶: 4507±37 BP (OxA-25624); the result is not significantly different from the newly-obtained date.

Macarthur Cave (Oban, Argyll and Bute, Scotland)

Contact person: Ian Armit

Macarthur Cave is located at the foot of cliffs in the modern town of Oban, where it was discovered during quarrying operations in 1894 (Canmore ID 23066, <https://canmore.org.uk/site/23066/oban-macarthur-cave>)¹¹³. Although the blasting associated with these works caused such damage that it is difficult to determine the original size or shape of the cave (which cannot now be traced and may have been entirely destroyed), it seems to have been a minimum of around 10 m deep by 6 m

wide¹⁴¹. Human bone representing a minimum of four individuals was recovered, at least some of which appears to have been disarticulated^{117,118,141}. Radiocarbon dating has shown that, although there are material artefacts of Mesolithic age within the cave, some of the human remains date to the Middle Iron Age¹¹⁸. Two human metacarpals were successfully analyzed for ancient DNA and proved to derive from the same adult male individual. One of these was dated, giving a surprisingly early, Neolithic date:

- I2657/GENSCOT26: 3952–3781 calBCE (5052±30 BP, SUERC-68701)

Point of Cott (Orkney, Scotland)

Contact person: Alison Sheridan

This is a Neolithic chamber tomb comprising a stalled chamber set within a large horned cairn (Canmore ID 2756, <https://canmore.org.uk/site/2756/westray-point-of-cott>)¹¹³, located beside a cliff on the northeast coast of the island of Westray in the Orkney archipelago. It was excavated by John Barber and Eoin Halpin in 1984 and 1985 in response to the threat of destruction through coastal erosion^{120,142}. The chamber is divided into four compartments or ‘stalls’ by jamb-stones, the rear compartment being divided into two cist-like structures. The chamber (around 8.5 m long) is linked to the horned forecourt (16 m wide) by a short passage, and the cairn – over 31 m long – is roughly trapezoidal with concave long sides; the entrance is aligned south-south-east. Apart from human remains, finds comprise sherds of several round-based pots, 71 pieces of flaked flint, a piece of pumice (possibly deposited naturally), two pieces of worked stone and seven pebbles, and 16 beads (probably constituting a necklace) made from the teeth of killer whale, pilot whale and sperm whale. Over 600 fragments of disarticulated human bone were found, representing a minimum of 13 individuals. The partial remains of at least five adults, two subadults and five infants were found in the chamber and passage. The remains of two infants (one neonatal) were found inserted into the north end of the cairn. Six adult bone fragments (from ribs and radii from two adults) found in the upper levels of the collapse of the core-cairn surrounding the chamber may be disturbed from the chamber, rather than secondary deposits. Two individuals were successfully analyzed for ancient DNA: GENSCOT79, dentine from a lower molar tooth from a male of indeterminate age from compartment 3 and GENSCOT78, a petrous temporal from a juvenile female from compartment 1 (the outermost compartment):

- I2796/GENSCOT79: 3700–3380 calBCE (4856±33, SUERC-69074) (adjusted to allow for a slight marine offset: Brian Tripney, pers. comm.)
- I2980/GENSCOT78: 3361–3102 calBCE (4530±33 BP, SUERC-69073)¹⁴⁰

There are nine other dates from human bone from Point of Cott, and nine dates for animal bone, mostly not from single-entity individuals^{128–130,142} (<https://www.canmore.org.uk/c14index/2756>, accessed April 2017). Seren Griffiths has Bayesian-modelled the start of the dated human remains deposition at 3620–3390 cal BCE at 95% probability, and its end at 3010–2670 cal BCE at 95% probability. Another similar exercise undertaken by Alex Bayliss et al.¹³⁰ has concluded that the primary period of human deposition in the monument was between 3800–3380 cal BCE and 3010–2545 cal BCE, at 95% probability in each case. The newly-obtained date for individual I2980 fits within this range, while that for individual I2796 appears to be somewhat earlier.

Quoyness (Orkney, Scotland)

Contact person: Alison Sheridan

This is a Neolithic, Maeshowe-type passage tomb (Canmore ID 3395, <https://canmore.org.uk/site/3395/sanday-quoyness>)¹¹³, located on the eastern shore of the island of Sanday in the Orkney archipelago. It was first excavated in 1867 by local antiquary James Farrer, then in 1951–2 Vere Gordon Childe undertook limited excavation of the cairn and platform^{120,143}. The monument consists of a central rectangular chamber and long narrow passage (orientated south-east) enclosed within a sub-circular cairn; the cairn is surrounded by a platform. The chamber has a tall, steeply-corbelled roof rising to a height of 4 m, and six cells project from it. The cairn consists of a pear-shaped core with a thick surrounding casing and a secondary outer casing. The surrounding platform, 41 m by 32 m, slopes up to the outer limit of the cairn. Finds comprise human and animal bones, pottery, a fine polished bone pin, two ground slate objects, several stone discs, two stone Skaiill knives, two rectangular slate objects, a cut tip of a deer antler, a rectangular piece of whalebone and a broken piece of pumice. The human remains were found in the outer section of the passage, in four of the cells, and in a pit set into the chamber floor, covered with a flagstone. Remains of 12 to 15 skulls were found, and the other bones comprised the remains of at least 10

adults of both sexes, two or three children over 10 years old, and probably two under 7 years old. Two adult left petrous temporals (GENSCOT03 and GENSCOT04) were submitted for ancient DNA analysis, but only GENSCOT03, a male, produced results. The radiocarbon date for this individual is:

- I2631/GENSCOT03: 3098–2907 calBCE (4384±36 BP, SUERC-68633)¹⁴⁰

There are four other radiocarbon dates for human remains from Quoyness. Two (2899–2626 calBCE (4190±50 BP, SRR-752) from a tibia and 3020–2679 calBCE (4265±50 BP, SRR-753) from a femur) were obtained during the 1970s for Colin Renfrew^{120,144}. One from a rib (3336–3096 calBCE (4487±18 BP, MAMS-14921/S-EVAA-24027)) was obtained in 2012 for Michael Richards¹³⁹. One from an adult tibia was obtained in 2016 as part of PhD research based at the SUERC radiocarbon dating laboratory but its details have not yet been released.

Raschoille Cave (Oban, Argyll and Bute, Scotland)

Contact person: Clive Bonsall

Raschoille Cave is a small cave on the west coast of Scotland, near the town of Oban (Canmore ID 22924, <https://canmore.org.uk/site/22924/oban-glenshellach-road>). The cave, eroded in Precambrian slates and phyllites, lies about 13 metres above sea level and close to the altitudinal limit of the Holocene marine transgression. During the Neolithic, when relative sea level was still several meters higher than today, the cave occupied a position at the edge of a sheltered marine embayment. The cave entrance was exposed in 1984 when talus deposits were cleared during construction work. A rescue excavation was undertaken by members of the local archaeological society.

The uppermost deposits within the cave consist mainly of loose angular slate debris derived from mechanical breakdown of the roof and walls of the cave. Within these stony deposits the excavators recognized several stratigraphic units ('layers I–VII'), based on variations in the size and alignment of the rock fragments, the amount of interstitial soil material, the degree of compaction of the material, and the presence/absence of calcareous coatings or deposits within the material. It is debatable, however, whether these 'layers' have any real chronological value.

Archaeological remains were found mainly in layers II–V, with the greatest concentration of material in layers III–IV. They comprised disarticulated human bones

and small numbers of animal bones, fish bones, marine shells, and carbonized plant remains. Since no articulated groups of human bones were recovered, most likely their presence in the cave was the result of secondary burial of excarnated remains.

Part of the human bone assemblage from Raschoille Cave was examined by Kathleen McSweeney and Laura Bonsall at Edinburgh University. (the rest being held at the National Museums Collection Centre, Granton, from which the samples from I3041, I5370 and I5371 were obtained: see below and Supplementary Table 1). The Edinburgh university sub-assemblage comprised a total of 1046 bone fragments and teeth, from at least 10 individuals, including both adults and children. AMS ^{14}C measurements on postcranial bones from different individuals were obtained from the Oxford Radiocarbon Accelerator Unit, and range from 4980 ± 50 to 4535 ± 50 BP / *c.* 3800–3200 calBCE¹⁴⁵, which date the burial activity in Raschoille Cave to the earlier part of the Neolithic in western Scotland.

The petrous temporal bones from nine individuals (from layers III and IV) were selected for ancient DNA analysis:

- I3133/ORC_III_10.4: 3632–3378 calBCE (4725 ± 20 BP, PSUAMS-2154)
- I3134/ORC_III_17.21: 3634–3378 calBCE (4730 ± 25 BP, PSUAMS-2155)
- I3135/ORC_III_19.1: 3641–3384 calBCE (4770 ± 30 BP, PSUAMS-2068)
- I3137/ORC_IV_17.19: 3800–3200 BCE
- I3136/ORC_III_21.3: 3521–3366 calBCE (4665 ± 30 BP, PSUAMS-2069)
- I3138/ORC_IVa_87.6: 3264–2924 calBCE (4415 ± 25 BP, PSUAMS-2156)
- I3041/ORC_III.13.18: 3942–3037 BCE
- I5370/ORC_III 12.10: 4000–3300 BCE
- I5371/ORC_II_95.2: 4000–3300 BCE

Tulach an t’Sionnaich (Highland (Caithness), Scotland)

Contact person: Alison Sheridan

This is a Neolithic passage tomb (Canmore ID 7901, <https://canmore.org.uk/site/7901/tulach-an-t-sionnaich>)¹¹³, orientated SSW, whose

associated cairn has a complex, multi-period history of construction that ended in it becoming a long cairn with a heel-shaped cairn at its southern, higher end^{146,147}. The monument lies 215 m and 270 m respectively east of the two Tullochs of Assery, at the north end of Loch Calder, and it was excavated by Corcoran in 1961 and 1963 as part of the same fieldwork initiative. The small, squarish chamber and passage had initially been encased within a small round cairn, but this was subsequently enlarged and converted to a heel-shaped cairn with a straight façade and (probably) short projecting horns. The façade blocks the passage entrance. In a third phase of construction, the heel-shaped cairn was enlarged and a long, rectangular ‘tail’ was added, converting the monument into a long cairn some 58 m long (it would be worth revisiting this part of the constructional sequence to double-check whether the long tail was indeed added at this stage, or whether it had been an earlier addition). Finds were few, comprising sherds from two Early Neolithic pots, sherds from a Beaker, sherds from a Bronze Age pot used as a cinerary urn and part of a medieval or later pot; a dozen flint chips and flakes (including one possibly used as a scraper), several scorched; and a pitchstone flake. Bones from various animals were found in the chamber and in the upper levels of the cairn, and remains of terrestrial and marine mollusca were found among the material that had been deliberately deposited to fill the chamber. Remains of six human individuals were found, including the cremated bones of one (possibly female, possibly adult) from the secondary, Bronze Age deposit in front of the heel-shaped cairn¹³⁷. The others were all from the lowest layer in the chamber, and comprised the remains of an adult, probably male, in his early thirties; a young adult, probably female; a relatively old individual (represented by a mandible fragment); fragments of a possible fourth individual; and two fragments possibly from an infant. A petrous temporal from an adult male (presumably the individual in his early thirties) yielded ancient DNA:

- I2634/GENSCOT06: 3704–3535 calBCE (4851±34 BP, SUERC-68638)

Three radiocarbon dates – one from human bone, two from animal bone (unidentified species) – were obtained by Niall Sharples in the mid-1980s¹⁴⁸: human bone from the chamber floor was dated to 3634–3361 calBCE (4685±60 BP, GU-1334), while animal bone from the filling of the chamber duly post-dated this: 2917–2620 calBCE (4210±60 BP, GU-1330) and 2872–2465 calBCE (4055±70 BP, GU-1331). In addition, the cremated remains from the Bronze Age pot were dated in 2005: 2201–1980 calBCE

(3705±35 BP, GrA-28611)¹³⁷. These confirmed the suspected Early Bronze Age date of this secondary deposit.

Tulloch of Assery A (Highland (Caithness), Scotland)

Contact person: Alison Sheridan

This is a Neolithic chamber tomb, located at the northern end of Loch Calder, near Thurso in the former county of Caithness (Canmore ID 7934, <https://canmore.org.uk/site/7934/tulloch-of-assery>)¹¹³. It comprises two Orkney-Cromarty-Hebrides-style passage tomb chambers set within a short-horned cairn, the passage of the southern chamber facing south and that of the northern chamber facing north. The northern chamber has two ‘platforms’ or bench-like features. Along with the nearby chamber tombs of Tulloch of Assery B and Tulach an t’Sionnaich, it was excavated by John Corcoran in 1961, in advance of work to convert Loch Calder into a reservoir, thereby partly submerging the monument (The southern chamber had been almost completely emptied at some point prior to 1961^{146,147}). The artefactual finds include an oblique arrowhead of grey flint, three flint flakes, two flint blades and two flint chips, of which one is probably natural rather than knapped. A fragment of rock crystal was also found, along with 19th and 20th century artefacts. The remains of between nine and 11 people (of both sexes and including adolescents as well as adults) were found in six discrete deposits within the northern chamber. One sample of human bone – a petrous temporal from an adult male – was successfully analyzed for ancient DNA:

- I2635/GENSCOT07: 3653–3390 calBCE (4796±37 BP, SUERC-68639)¹⁴⁰

Two other radiocarbon dates had previously been obtained from human remains from this monument^{147,148}: bone from the south-west ‘bench’ in the northern chamber was dated to 3702–3378 calBCE (4800±60 BP, GU-1338) – an almost identical result to the new date – while bone from the tightly-contracted, articulated skeleton of an adult, probably male, found near the centre of the chamber, produced a date of 1437–1127 calBCE (3055±60 BP; GU-1329), confirming it to be a Middle Bronze Age secondary deposit. The early to mid-fourth millennium dates provide important evidence for the date of short-horned cairns.

Tulloch of Assery B (Highland (Caithness), Scotland)

Contact person: Alison Sheridan

This is a Neolithic chamber tomb, located at the northern end of Loch Calder, near Thurso in the former county of Caithness, located just 30 m SW of Tulloch of Assery A (Canmore ID 7907, <https://canmore.org.uk/site/7907/tulloch-of-assery>)¹¹³. It comprises a three-compartment stalled chamber with a long, curving entrance passage set asymmetrically within a circular cairn 29 m in diameter. Like its neighbours Tulloch of Assery A and Tulach an t'Sionnaich, it was excavated by John Corcoran in 1961, in advance of work to convert Loch Calder into a reservoir^{146,147}. Finds include the remains of 13 vessels of Early Neolithic modified Carinated Bowl pottery, from a layer of burnt material clearly predating the construction of the chamber, plus two flint points, possibly arrowheads; a base of a leaf-shaped flint arrowhead; the tip of a chert arrowhead (found embedded within a human vertebra); a flint scraper and various flakes, fragments, cores and split pebbles of flint; three fragments of rock crystal and two rounded quartz pebbles; and a bone 'scoop'. Some of the lithic finds were discovered in the burnt layer below the paving of the chamber (together with small fragments of unidentifiable burnt bone). A few animal bones of various species were found in the chamber and passage (with a small number found below the paving). Human remains from a minimum of five individuals were found, mostly heaped up on a layer of slabs in the centre of the innermost compartment of the chamber. The individuals comprise two adults. One of these was aged around 48 to 54 and was the person who was probably killed by the arrow that landed in the lower back. There was also a smaller individual aged around 36 to 38. There was also a child (represented by a phalange from a foot) from the central compartment; a young adult (represented by a molar tooth) from the outer compartment; and a foetus or neonate (represented by half a mandible) from the passage. One sample of bone from the oldest adult (who appears to be the person who had been killed by the arrow), a petrous temporal, was successfully analyzed for ancient DNA and was found to be female:

- I2633/GENSCOT05: 3766–3642 calBCE (4911±32 BP, SUERC-68634)

Six other dates had previously been obtained for this monument, five from animal bone and one from charcoal, and including three from beneath the paving of the chamber floor^{147,148}. All of those dated samples are of unidentified species, and are unlikely to

have been single-entity samples. Thus, the results should be treated with caution. While the latest date, from animal bone from the chamber filling, suggests secondary activity during the second half of the third millennium, 2458–2042 calBCE (3795±60 BP, GU-1337), the others suggest that there may have been some mixing of material in antiquity between that from the burnt layer beneath the chamber floor paving and that on the chamber floor. Charcoal from the burnt layer produced a date of 3772–3383 calBCE (4840±65 BP, GU-1339); animal bone from below the paving produced dates of 3635–3139 calBCE (4655±60 BP, GU-1336; adjustment is required for a possible slight marine offset) and 3096–2145 calBCE (4095±165 BP, GU-1335). Animal bone from the chamber floor produced dates of 3942–3644 calBCE (4965±60 BP, GU-1332) and 3637–3342 calBCE (4670±65 BP, GU-1333).

Unstan Chamber Tomb (Orkney, Scotland)

Contact person: Alison Sheridan

This is a chamber tomb, listed by Audrey Henshall as belonging to her ‘Orkney-Cromarty’ group¹⁴⁷ (Canmore ID 1740, <https://canmore.org.uk/site/1740/unstan>)¹¹³. It has an approximately round cairn and a roughly centrally-placed stalled chamber, with one cell leading off from one compartment and with an entrance passage leading from the penultimate compartment on the south-east side of chamber. The end compartments may each have had a shelf. It was excavated in 1884 by Robert Stewart Clouston, who found that the chamber was floored with white clay, above which was a layer of black, charcoal-rich ‘ashy or earthy matter’¹⁴⁷. Finds comprised a large amount of pottery (with over 30 vessels represented), and many human and animal bones. Pottery was found throughout the chamber and in the passage, with most sherds found in the compartment where the passage enters the chamber. Lipid analysis of three sherds has revealed that some of the pots, at least, had been used to cook with dairy fat. The human remains were found on the floor of each compartment, and there were also several contracted skeletons in the compartment entered by the passage, lying on the black layer, and two further such skeletons in the cell. The position of the animal bones was not recorded but it is assumed that they, too, were throughout the chamber; they include bones of horse, which must post-date the Neolithic. The human bone sampled for aDNA analysis, and others that were radiocarbon-dated, along with this specimen in 2017, on behalf of Historic Environment Scotland, were acquired by National Museums Scotland

from Newham Heritage Services in 2016. They had been in the Passmore Edwards Museum, having been taken to London by Clouston when he moved south. A right petrous temporal from an adult male was successfully analyzed for ancient DNA:

- I7554/NMS Unreg 1: 3366–3103 calBCE (4541±32 BP, SUERC-73433 (GU43891))

The other two radiocarbon-dated specimens of human bone from Unstan – from two further males – produced the following dates: adult male mandible: 3349–3037 calBCE (4491±32 BP, SUERC-73438 (GU43893)); young adult male maxilla: 3350–3096 calBCE (4503±32 BP, SUERC-73434 (GU43892)).

Achavanich (Highland [Caithness], Scotland)

Contact person: Maya Hoole

This is a Copper Age/Early Bronze Age cist (alternative name Craig-na-feich; Canmore ID 317871; <https://canmore.org.uk/site/317871/achavanich>) that contained the contracted skeleton of a young adult female accompanied by a Beaker, a cattle scapula and three flint artefacts. It was found during quarrying in early 1987 and was excavated by the Highland Regional council archaeologist, Robert Gourlay. Due to unfortunate circumstances the site was not published at the time but a current research project by the author has shed new light on the assemblage.

Positioned on a low ridge, the rectangular, slab-built cist with its large capstone was set into a rock-cut pit, unmarked on the surface. The artefactual finds comprised a Beaker (of basic 'S'-profile), two flint flakes and a tiny flint thumbnail scraper. The cattle scapula, from an immature or subadult animal, may have been deposited in the cist as an offering of a joint of meat. All the grave goods were found close to the upper part of the body.

The skeletal assemblage consisted of the incomplete remains of one individual aged 18–22 years. Ancient DNA analysis supports the osteological identification of the sex as female. The individual was tightly contracted in the grave, partially positioned on her right-hand side, with knees close to her chest. Her head was at the western end of the cist and was facing south-east. Further studies of this assemblage include histological assessment of the bone for post-mortem treatment, isotopic analysis for information on diet and mobility, and a pollen assessment of the Beaker for environmental data¹⁴⁹.

A sample from the petrous temporal bone was successfully analysed for ancient DNA:

- I5385/SB529A2: 2460–2140 calBCE (3827±33 BP, SUERC-71005)

Two other radiocarbon dates have been obtained from this site. In the early 1990s, as part of the British Museum's Beaker Dating Project, a date of 2280–1955 cal BCE (3700±50 BP, BM 2590) was obtained from the skeleton¹⁵⁰. More recently, as part of the current research initiative, a date was obtained from the cattle scapula: 2460–2150 cal BCE (3829±32 BP, SUERC-73443). The weighted mean of the three dates has been calculated as 2300–2140 cal BCE (3808±21 BP) (Derek Hamilton, pers. comm.).

Dryburn Bridge (East Lothian, Scotland)

Contact person: Ian Armit

Dryburn Bridge is an Iron Age enclosed settlement on the East Lothian coastal plain that also contains evidence for burials of an Early Bronze Age date¹⁵¹ (Canmore ID 58802, <https://canmore.org.uk/site/58802/dryburn-bridge>)¹¹³. These burials comprised two well-built stone cists, each containing two crouched individuals. Cist 1 contained the skeletal remains of a crouched inhumation (Burial 5), with the disarticulated remains of a second individual (Burial 4) lying over their pelvic region; both were adult males. Cist 2 contained a further crouched inhumation of an adult male (Burial 10) along with the disarticulated remains of a child of around 6–8 (Burial 11). A Beaker vessel was found resting on the slabs above Cist 2. Two human bones were successfully analyzed for ancient DNA:

- I2567/GENSCOT14, Burial 5, Cist 1: 2275–1884 calBCE [2131–1884 calBCE (3615±40 BP, SUERC-4072); 2275–2024 calBCE (3725±35 BP, SUERC-4083)]
- I2568/GENSCOT15, Burial 10, Cist 2: 2287–2039 calBCE (3755±35 BP, SUERC-4078)

Sorisdale (Coll, Argyll and Bute, Scotland)

Contact: Alison Sheridan

This is a grave, cut through a thin layer of midden (domestic waste) and located close to the remains of a house, situated on the north-east coast of the Hebridean island of Coll (Canmore ID 21703, <https://canmore.org.uk/site/21703/coll-sorisdale>)¹¹³. The grave pit

was orientated roughly east-west and was waisted in plan. It had suffered from some coastal erosion and its stratigraphical relationship to the house could not be determined. In the grave were found the remains of a young adult, around 20 years of age, osteologically identified as being female¹⁵²; this sex attribution was confirmed through the analysis of ancient DNA by this project. The remains were not in correct anatomical order, and this could not be accounted for by coastal erosion: it appeared that the body had decayed prior to its burial. Isotopic analysis of molar enamel for the *Beaker People Project* had indicated that this individual had not been raised in the area³¹. Near the head of the individual were found the remains of an All Over Cord-impressed Beaker. A petrous temporal was successfully analyzed for ancient DNA:

- I5367/SB518A: 2470–2140 calBCE (3879±32 BP, OxA-14722)

An earlier, and very similar date had previously been obtained for this individual during the British Museum's *Dating Beakers Project*: 2474–2207 calBCE (3884±46 BP, BM-1413¹⁵³).

Thurston Mains (Innerwick, East Lothian, Scotland)

Contact person: Alison Sheridan

This is a short, irregularly-shaped cist, with external dimensions of 145 cm (4 feet 9 inches) long, 91 cm (3 feet) wide at one end and around 61 cm (2 feet) wide at the other (Canmore ID 58918, <https://canmore.org.uk/site/58918/thurston-mains>)¹¹³. It was discovered in 1939 during ploughing and was excavated by Robert Stevenson of the (then-named) National Museum of Antiquities of Scotland¹⁵⁴. Unusually, it was found to contain the tightly-contracted skeletons of not one but two individuals, both women – one lying on her left, the other on her right, lower limbs facing each other – along with a Beaker (found behind the back of Skeleton 1) and a flint knife, found around the middle of the cist. Skeleton 1 – the slightly better-preserved of the two women, and located at the broader end of the cist – was aged around 30 and 160 cm (5 feet 3 inches) tall and Skeleton 2 was aged around 30–35 and around 157 cm (5 feet 2 inches) tall. Both individuals have been radiocarbon-dated, and two samples from Skeleton 1 – a mandible (I5471) and a right metatarsal (I2413/ GENSCOT13) – have successfully been analyzed for ancient DNA, although different genetic signatures were obtained from the two samples, with the former showing steppe ancestry while the latter does not. The

metatarsal I2413 is currently being re-dated to check whether it might accidentally have come from a different individual, although there is no reason to suspect mixing of material from more than one site in the storage box. Unfortunately, a sample taken for ancient DNA from Skeleton 2 (I5472) failed genome-wide analysis. The skeletal element from Skeleton 1 that was previously dated is a tibia, and the date is as follows:

- I5471/skeleton 1: 2266–2025 cal BCE (3721±33 BP, OxA-13097)

The date obtained from a maxillary tooth from Skeleton 2 is 2296–2140 calBCE (3794±26 BP, OxA-13660). This supports the archaeological evidence suggesting that the two bodies were deposited in the cist at the same time.

Aberdour Road (Dunfermline, Fife, Scotland)

Contact person: Alison Sheridan

This is a short cist, measuring 102 x 54 cm (3 feet 4 inches by 1 foot 9 inches) internally (Canmore ID 50851, <https://canmore.org.uk/site/50851/dunfermline-aberdour-road>)¹¹³. It forms part of an unmounded Early Bronze Age cemetery, discovered during earth-moving preparatory to house-building in 1972¹⁵⁵. The cist contained the contracted skeleton of a youth aged 12–14, lying on the right side, head at the west end of the cist; ancient DNA revealed the sex as male. In front of the youth's face was an Early Bronze Age Food Vessel pot, lying on its side. Behind the pelvis was a flint knife as well as a flint strike-a-light and iron ore nodule, the last two constituting a fire-making kit. A left petrous temporal was successfully analyzed for ancient DNA:

- I5515/cist 3: 2035–1776 calBCE (3581±40 BP, SRR-292)

Boatbridge Quarry (Thankerton, South Lanarkshire, Scotland)

Contact person: Alison Sheridan

This is a short cist, one of two discovered in 1970 during gravel quarrying¹⁵⁶ (Canmore ID 47482, <https://canmore.org.uk/site/47482/boatbridge-quarry>)¹¹³. The cist was orientated north-east/south-west and measured around 100 by 60 cm (3 feet 3 inches by around 2 feet) internally, with a capstone 25 cm (around 1 foot) thick. It contained the contracted skeleton of an adult male aged around 44–48, who had suffered from an unusual form of osteoarthritis in his back that would have restricted his mobility; he had

been laid on his left side, with the head at the north-east end of the cist. Also present in the cist, with its legs behind the adult's pelvis, was a contracted skeleton of a child, lying on its right, with the head to the south. There were no grave goods – at least, none that were archaeologically visible. A second cist located 14 m away, on the same gravel ridge, contained the contracted skeleton of an unusually tall adolescent male, accompanied by a Beaker; this individual has been radiocarbon-dated to 2397–2138 cal BCE (3803±32 BP, OxA-V-2168-42) and 2481–2040 cal BCE (3835±75 BP, GU-1117) and it is assumed that the occupants of cist 1 had been roughly contemporary. A right clavicle from the adult was analyzed for ancient DNA:

- I5473/cist 1: 2400–2100 BCE

Covesea Cave 2 (Moray Firth, Scotland)

Contact person: Ian Armit

Covesea Cave 2 is a large, open sea cave located on the southern coast of the Moray Firth in north-east Scotland^{157–159} (Canmore ID 16280, <https://canmore.org.uk/site/16280/covesea>). It measures around 56m long by 25m wide, with a sloping roof that reduces from some 14m high at the front of the cave to around 1m at the rear. The floor lies around 10m above the high tide mark. Cave 2 is one of several along this stretch of the Moray coast that were used for ritual, funerary and occasional habitation activity extending from the Neolithic to the early modern period. Excavations in Cave 2 have demonstrated activity of unknown character in the Middle Neolithic followed, after a significant hiatus, by episodes of funerary activity in the Early Bronze Age and Late Bronze Age. The human remains from these periods comprise disarticulated and dispersed fragments that appear to represent the residue of an excarnation rite. Surviving deposits from the Late Bronze Age indicate the presence of stake-built structures. The Early Bronze Age bones are residual within the predominately Late Bronze Age assemblage. Three human petrous bones were successfully analyzed for aDNA:

- I2860/GENSCOT66: 970–816 calBCE (2738±29 BP, SUERC-68715)
- I2861/GENSCOT67: 977–829 calBCE (2757±29 BP, SUERC-68716)
- I3132/GENSCOT68: 2119–1888 calBCE (3614±33 BP, SUERC-69070)

Covesea Caves (Moray Firth, Scotland)

Contact person: Ian Armit

The Covesea Caves are a series of sea caves located on the southern coast of the Moray Firth in north-east Scotland^{157–159} (Canmore ID 16278; 16280, <https://canmore.org.uk/site/16278/sculptors-cave-covesea>, <https://canmore.org.uk/site/16280/covesea>). Several of these caves were used for ritual, funerary and occasional habitation activity, collectively extending from the Neolithic to the early modern period. Although separate assemblages of human remains are documented from three of these caves (Cave 1; Cave 2 (see separate entry); and the Sculptor's Cave), there is also a small collection of human bone that is known only to derive from 'the Covesea Caves' and which may derive from any of these three, or potentially some of the numerous other small caves along the same stretch of coast. Two human petrous bones from this mixed assemblage were successfully analyzed for aDNA:

- I3130/GENSCOT64: 978–830 calBCE (2758±29 BP, SUERC-68713)
- I2859/GENSCOT65: 911–810 calBCE (2714±29 BP, SUERC-68714)

Doune (Perth and Kinross, Scotland)

Contact person: Alison Sheridan

This is a short cist, found during sand quarrying in 1954^{160,161} (Canmore ID 24749, <https://canmore.org.uk/site/24749/doune>)¹¹³. Part of the cist had already fallen off the edge of the quarry but the remaining part measured 61 cm (2 feet); it was orientated north-east–south-west. It contained skeletal remains of a child aged between 5 and 8 years, probably 6 or 7; the sex has been determined as male through the present ancient DNA analysis. The small size of the cist interior suggests that the body had probably been deposited in a contracted position. The child was accompanied by a small Food Vessel and part of a larger Food Vessel, plus and a miniature battle-axehead – one of only a handful of such objects from Britain. Significantly, another cist nearby (at Glenhead, Doune), under a cairn, and with the remains of a female aged between 15 and 21 years, contained a small Food Vessel and a miniature macehead – the latter being another exceptional find¹⁶². Several Early Bronze Age short cists have been found in the

area. A petrous temporal from the Doune child was successfully analyzed for ancient DNA:

- I5516: 1750–1630 calBCE (3400±35 BP, SUERC-2869)

Eweford Cottages (East Lothian, Scotland)

Contact person: Ian Armit

This is an Early Bronze Age cist grave that contained the contracted skeleton of an adult male, lying on his side and accompanied by a flint knife (Canmore ID 57670, <https://canmore.org.uk/site/57670/eweford>)¹¹³. A boulder adorned with prehistoric cup-marks was found nearby but may not be associated with the cist. The cist was a chance find and was excavated in 1975 by Helen Nisbet, but not published at that time. The individual was found to have suffered from rickets. The skeleton was radiocarbon dated to 2140–1916 calBCE (3650±40 BP, SUERC-5318) and this result was published in 2007¹⁶³ (there is a confusion in this publication where the location of the cist is mistakenly attributed, in the volume's appendix, to the nearby site of Eweford West). One molar from this individual was successfully analyzed for ancient DNA:

- I2569/GENSCOT17: 2140–1916 calBCE (3650±40 BP, SUERC-5318)

Leith (Merrilees Close, City of Edinburgh, Scotland)

Contact person: Alison Sheridan

This is a short cist, discovered during earthmoving operations in 1884 (Canmore ID 51933, <https://canmore.org.uk/site/51933/edinburgh-merrilees-close>)¹¹³. It measured 130 cm (4 feet 3 inches) long and 53 cm (1 foot 9 inches) wide, and had been covered by a massive capstone measuring 137 by 84 cm (4 feet 6 inches by 2 feet 9 inches). Unusually, it was found to contain two sets of human remains, rather than the more normal one, and despite an initial statement by anatomist Sir William Turner that one was female and one was male¹⁶⁴, subsequent re-examination by Professor R W Reid concluded that both had been female¹⁶⁵. (The current aDNA study concluded that Skeleton A was indeed female; Skeleton B is of indeterminate sex.) Skeleton A, the better preserved of the two, is of an adult, with a meso-brachycephalic skull; her height was estimated at 160.3 cm (5 feet 3 inches) and evidence for spina bifida occulta was noted in her vertebrae. Skeleton B is an adult of advanced years, with a

hyperbrachycephalic skull like that of the woman from Achavanich (I5385). This individual appears to have been noticeably taller than Skeleton A, at 175.2 cm (5 feet 9 inches). The exact disposition of the human remains in the cist was not recorded, other than noting that the larger of the two skulls (possibly that of Skeleton A) was at the north-west end of the cist. The differential state of preservation of the remains led Wells¹⁶⁵ to conclude that the bodies had been deposited sequentially rather than simultaneously. An Early Bronze age pot, a Food Vessel, was found near the larger of the two skulls. A phalanx from Skeleton A and a long bone from Skeleton B were analyzed for ancient DNA, although it was not possible to determine whether the two individuals had been related:

- I5469/skeleton A: 1643–1504 calBCE (3300±30 BP, SUERC-2867)
- I5470/skeleton B: 1620–1450 calBCE (3260±35 BP, SUERC-2868)

These dates are late for a vessel of the Food Vessel tradition but their internal consistency between the two bodies suggests that there is no reason to doubt their validity. The similarity between the dates might indicate that there had not been a long interval between the two hypothetical episodes of interment.

Stenchme, Lop Ness, Sanday (Orkney, Scotland)

Contact person: Ian Armit

A crouched human burial was excavated in 2000 from eroding coastal sand dunes on the island of Sanday, Orkney (Canmore ID 306622, <https://canmore.org.uk/site/306622/sanday-stenchme>)¹¹³. The Early Bronze Age burial lay in a stone cist measuring 1.3 m north-south by 0.9 m east-west, and was apparently associated with lithics and pottery (<https://canmore.org.uk/site/306622/sanday-stenchme>). A human petrous bone was successfully analyzed for ancient DNA:

- I2981/GENSCOT80: 2009–1497 calBCE [1741–1497 calBCE (3320±50 BP, AA-51418); 2009–1696 calBCE (3520±40 BP, AA-43651)]

Longniddry, Grainfoot (East Lothian, Scotland)

Contact person: Ian Armit

A small, rectangular stone cist was excavated in 1989 during the installation of a swimming pool inside a nineteenth century building at Grainfoot, Longniddry (Canmore ID 54950, <https://canmore.org.uk/site/54950/grainfoot-longniddry>). The cist contained the disturbed and disarticulated skeletal remains of two individuals; an adult male aged around 25-40 and a female around 45-60 (Dalland 1991). The bones were in poor condition and few could be allocated with confidence to either skeleton. The human remains were accompanied by the left fore-limb of a pig, presumably deposited as a food offering. One of its bones (though it is unclear which) was dated to 1279–980 calBCE (2930±50 BP, GU-2762). A human petrous bone from the burial was successfully analyzed for aDNA: sample I2656_d (male). Although it cannot be determined whether this is the same individual that provided the radiocarbon date, there is no reason to doubt that the two individuals in the grave were buried at broadly the same period.

- I2656_d/GENSCOT25: 1279–980 calBCE (2930±50 BP, GU-2762)

Longniddry, Evergreen House, Coast Road (East Lothian, Scotland)

Contact person: Ian Armit

Several Bronze Age burials were exposed during landscaping work on Evergreen House, Longniddry, on the East Lothian coastal plain in 2000 (Canmore ID 182426, <https://canmore.org.uk/site/182426/longniddry-evergreen-house>)¹¹³. Rescue excavation revealed three crouched inhumations (Skeletons 2, 3 and 4), one of which (an elderly female, Skeleton 3) was contained in a stone cist, along with further disturbed, disarticulated bones¹⁶⁶. The three complete burials were clustered tightly together, though in separate graves and on separate alignments. In total, at least five adults, both male and female, were represented. The remains are likely to have formed part of a larger Bronze Age burial ground and it is indeed possible, based on the presence of concentrations of large stones, that the three excavated inhumations may have lain under a single (now almost vanished) cairn. Initial problems in the radiocarbon dating were resolved through redetermination by the dating laboratory¹²⁴. Three adult human

petrous bones were successfully analyzed for ancient DNA from each of the three most complete skeletons:

- I2573/Skeleton 4/GENSCOT21: 1501–1302 calBCE (3144±37 BP, OxA-16486)
- I2653/Skeleton 2/GENSCOT22: 1500–1300 BCE
- I2654/Skeleton 2/GENSCOT23: 1500–1300 BCE

Pabay Mor, Isle of Lewis (Western Isles, Scotland)

Contact person: Ian Armit

A crouched burial of Middle Bronze Age date was excavated in 2002 in eroding sand dunes on the small island of Pabay Mor off the west coast of Lewis (Canmore ID 237343, <https://canmore.org.uk/site/237343/lewis-pabay-mor-meathannan>)¹¹³. The body of a mature adult male, damaged by erosion, was aligned north-south, lying on its right side with legs very tightly flexed¹⁶⁷. Although there was no apparent cist, the burial was marked by a stone on its west side. The burial, although disturbed, was apparently associated with a small pottery vessel, a polished pebble and a piece of worked pumice. The disarticulated mandible of an infant was also recovered. A human molar from this individual was successfully analyzed for ancient DNA:

- I2655/GENSCOT24: 1442–1273 calBCE (3105±35 BP, SUERC-9172)

Great Orme Mines (Llandudno, Wales)

Contact person: Nick Jowett

Situated on a limestone outcrop rising to the west of the Victorian seaside town of Llandudno in North Wales, the Great Orme bronze age copper mines were discovered in 1987 during a reclamation scheme of a derelict 19th century mine site. Over 5 miles of tunnels have been discovered dating between 1860–900 BCE. During excavation on surface at the mine site in 1991, an almost complete human mandible was discovered in a mixed context, probably an ancient burial disturbed by 19th century miners. The radiocarbon date, 1693–1600 calBCE, makes the mandible contemporary with the main phase of mining activity on the Great Orme. One tooth from this mandible yielded ancient DNA:

- I1775/GOM245: 1693–1600 calBCE (3344±27 BP, OxA-14308)

North Face Cave (Llandudno, Wales)

Contact person: Nick Jowett

Situated on a limestone outcrop rising to the east of the Victorian seaside town of Llandudno in North Wales, the Little Orme's North Face Cave was excavated between 1962 and 1976 by John Blore. The partial remains of four human skeletons from individuals between 4–18 years old were recovered along with a single amber bead. In 2015, a section of human maxilla was found within material disturbed by potholers at the end of the cave. The maxilla was a close match to one of the previously discovered mandibles. A section from the maxilla was dated to 1415–1228 calBCE. One tooth from this mandible was considered for genetic analysis:

- I2574/NFC07151: 1415–1228 calBCE (3065±36 BP, SUERC-62072)

Culver Hole Cave (Port Eynon, West Glamorgan, Wales)

Contact: Tom Booth

Culver Hole Cave (also known as Three Chimneys Cave) is a sea cave located to the south of Port Eynon village on the Gower Peninsula of South Wales. A disarticulated assemblage of human remains, mostly crania and long bones, representing at least 41 individuals was recovered from the cave during explorations by Davies, David and Penniman in 1861, 1921 and 1931-2 respectively^{168–171}. These explorations also recovered an assemblage of domesticated animal bones, pottery dating typologically to the Middle-Late Bronze Age and Iron Age, as well as numerous finds dating to the Roman period, including a bronze goddess figurine. The position of the cave on the coast has meant that it has been subject to several tidal incursions that have disturbed the archaeological deposits and may have been responsible for the loss of the smaller human bones. Therefore, the original positions and completeness of the human skeletons are unknown. The nature of the finds and their associations with the human remains showing lower levels of tidal disturbance suggests that interment of bodies took place in the Middle-Late Bronze Age and that the cave was later reused as a shrine in the Roman period. The human bone assemblage is curated at the National Museum of Wales in Cardiff. Ancient DNA from a sample of a disarticulated petrous temporal from the Middle-Late Bronze Age (25.221/2.48) assemblage was included in this project:

- I5364/25.221/2.48: 1600–800 BCE

Rhos Ddigre (Llanarmon-yn-Iâl, Denbighshire, Wales)

Contact: Tom Booth

Rhos Ddigre (or Rhosdigre – named after a nearby farm that has now been renamed Rhos Ifans) is part of a group of caves known as Rhos Ifas located near Llanarmon-yn-Iâl village, Denbighshire. Rhos Ddigre was explored in 1869–72 by William Boyd Dawkins and the archive is currently held at the National Museum of Wales in Cardiff^{172–174}. The exploration uncovered an assemblage of human bones representing at least two individuals deposited on an assemblage of artefacts and charcoal which was interpreted as an old occupation floor. Amongst these artefacts were several flints, a greenstone polished axe and pottery fragments all dating typologically to the Neolithic.

Boyd Dawkins described the posture of the human remains from Rhosdigre as ‘crouching’, by which he seems to have meant ‘seated’ rather than laid on the floor supine or on one side. The bodies had originally been interred whole and intact but decomposition in a seated position meant that the skeletons had collapsed into a semi-articulated heap of bones. Two adult crania are all that survives from the Rhos Ddigre human bone assemblage and it is possible that only these elements were originally retrieved from the cave. In spite of the typology of the associated artefacts, a radiocarbon date from one of the crania dated it to the Middle Bronze Age (1494–1322 calBCE, 3141±26 BP, OxA-17562). However, the other cranium, which showed signs of having been subject to peri-mortem blunt force trauma, produced a date in the Late Neolithic¹⁷⁵. Ancient DNA from a sample of the petrous portion of the temporal bone of the Late Neolithic cranium was included in this study:

- I5358/29.607/12: 3080–2904 calBCE (4334±27 BP, OxA-17563)

Tinkinswood (Cardiff, Glamorgan, Wales)

Contact person: Tom Booth

Tinkinswood burial chamber is a megalithic chambered tomb of the Cotswold-Severn type located to the southwest of the city of Cardiff in the Vale of Glamorgan, South Wales. It was excavated in 1914 by John Ward, but also more recently by the University of Cardiff in 2011^{176,177}. The monument consists of a single chamber constructed from

local mudstone, limestone and conglomerate divided into ‘bays’ by linear sets of upright stones. The stone chamber was covered by a stone long cairn defined by a drystone revetment wall. The cairn is in a characteristic shape, producing two protruding ‘horns’ at the sides of the entrance defining a paved forecourt area. A limestone slab recovered from a short passage through the cairn into the chamber was suggested to have been used to seal the chamber.

A disarticulated commingled assemblage of human remains representing at least 50 individuals (16 male, 21 female and 8 children) was recovered from the bays of the burial chamber. A small assemblage of human bones was also recovered from the forecourt and it was suggested that bones may have been brought out of the tomb for use in ceremonies. The human bone assemblage may have formed as a result of the successive deposition of whole with gradual disturbance and manipulation of skeletons, or the interment of defleshed bones after bodies had decomposed elsewhere. The chamber also contained broken sherds of Early Neolithic pottery, as well as Beaker pottery and an assemblage of animal bone. Sherds of Early Neolithic pottery were also recovered from the forecourt.

The Tinkinswood human bone assemblage is curated at the National Museum of Wales in Cardiff. Recent radiocarbon dating of the human remains by Cardiff University has produced Early Neolithic dates around 3700 BCE. Genetic data from a sample of the petrous portion of a temporal bone from Tinkinswood (19.210/28.593) were included in this study.

- I5359/19.210/28.593: 3800–3600 BCE

Hasting Hill (Sunderland, Tyne and Wear, England)

Contact person: Chris Fowler

The round barrow at Hasting Hill sits on the summit of a limestone hill overlooking the remains of an Early Neolithic causewayed enclosure and a cursus monument. The approximately 12 m diameter barrow was excavated in 1912 by C.T. Trechmann^{178,179} who located nine different burial features including four short cists, two square cists, a grave, a stone lined pit, and two ‘unurned’ deposits of cremated bone. The different burial modes, grave goods, and radiocarbon dates from two of these burials, along with different depths of the burials depicted in Trechmann’s illustration, suggest periodic

burial at the barrow over several centuries¹⁸⁰. Five of the burials were accompanied by Food Vessels. All that currently remains of the burials are two displays in Sunderland Museum, in which the cists (described by Trechmann¹⁷⁹ as ‘secured entire’) have been reconstructed and the human remains are stored. The cists are Trechmann’s finds 9 and 12, and the flexed burials in each match the description of those from the excavation.

Find 12 was a short cist oriented northwest-southeast and located at the northeast periphery of the barrow. The skeleton of an infant was lying on its right side on the bedrock at the base of the cist, with its head to the southeast and a Food Vessel placed behind its head. A flint knife and an ‘ox tooth’ were also recovered, although their location with respect to the skeleton is not recorded. Recent osteological analysis identified the infant as about one year old at death. He was genetically male. An ulna from this individual was radiocarbon dated:

- I2421/TWCMS Sk2008-3075, find 12: 1931–1756 calBCE (3524±28 BP, OxA-26256)¹⁸¹

Find 9 was a short cist oriented east-west¹⁷⁹. The excavator focused his description on a flexed skeleton of an adult male, lying on his right on the limestone bedrock with his head to the west and his arms raised so his hands covered his face (two other burials at the site had arms and hands positioned in this way, which is only recorded in one other case in Northeast England). A left rib yielded a radiocarbon date of 2194–1977 calBCE¹⁸⁰. A flint knife was placed in front of the forearm, a vessel in front of the face, and a bone pin or point behind the shoulders. The cist also contained 5 periwinkle shells, fish, bird and animal bones (see below) and an antler tine pick. The vessel has both Beaker and Food Vessel characteristics: it is coarse with a high-bellied s-profile shape and decorated with diagonal stab marks. Analysis of a metacarpal from this adult male did not yield ancient DNA. However, recent osteological analysis suggests a more complex use of the ‘Find 9’ cist, identifying eight weathered (bleached and cracked) bones from a child approximately 5 years old at death, and the cremated remains of an adult¹⁸¹. Further examination during aDNA sample selection located two unburnt adult teeth not from the flexed burial. Trechmann’s report mentions that that this cist contained what he thought were ‘some bird bones and a few calcined mammalian (non-human) bones...’¹⁷⁹, but the human remains identified recently are not mentioned. Although it cannot be excluded that remains from other burials were intermixed with the cists put on display in the museum, it seems likely that the newly-identified remains

were not recognised as human by the excavator. Taking this as the simplest explanation, the radiocarbon date of 2465–2209 calBCE from the tooth (sample I2612) suggests earlier use of this cist; it is possible the flexed burial was placed into an already-old burial feature. The aDNA identifies the tooth as from a woman:

- I2612/TWCMS Sk2008-1953, find 9: 2465–2209 calBCE (3865±35 BP, Poz-83492)

Hexham Golf Course (Hexham, Northumberland, England)

Contact person: Chris Fowler

Recovered in 1921, the human remains were found in a short cist oriented north-south on a natural prominence. No artefacts were located, nor were any other archaeological features noted. Recent osteological analysis identified the individual as approximately 22–28 years old at death¹⁸¹. Some of the remains show signs of exposure to high temperatures. Ancient DNA analysis reveals the sex as female. The radiocarbon date confirms an Early Bronze Age date for this burial:

- I2609/MOA 1956.46 Box 136: 2023–1772 calBCE (3560±40 BP, Poz-83423)

Reaverhill (Barrasford, Northumberland, England)

Contact person: Chris Fowler

The short cist at Reaverhill was situated on the summit of a hill, oriented northeast-southwest, and was excavated in 1964. Smaller stones were packed into voids between the solid side and cover slabs, and the base was gravel subsoil without paving. The cist yielded a copper alloy flat-riveted dagger blade, with all 3 rivets present, and the partial remains of an adult that were ‘in disorder’¹⁸². The ancient DNA analysis confirms the osteological sex identification of male, and anthropological analysis suggests that he was about 30–40 years old at death¹⁸¹. The radiocarbon date for this individual is:

- I2618/MOA 1964.2 Box 102A: 2135–1951 calBCE (3660±28 BP, OxA-26254)

Low Hauxley (Northumberland, England)

Contact person: Clive Bonsall

The archaeological sites at Low Hauxley were exposed by coastal erosion of the sand dune systems around Druridge Bay in northeast England, and were the subject of several salvage campaigns between 1983 and 2014¹⁸³. Mesolithic to post-Medieval remains occurred in palaeosols beneath and within the dune sand sequence, while Mesolithic human footprints and animal tracks were preserved in an intertidal peat deposit.

The main site (Site 1) occupied a low hillock in the pre-dune land surface, flanked by wetland depressions. During the Beaker period a flat cist cemetery was constructed on the hillock. It comprised at least three large stone-lined cists; each contained a single inhumation burial, two of which were accompanied by Beaker pots. Radiocarbon dating places these burials around the end of the 3rd millennium BCE. During the EBA a cairn was raised over the cist cemetery and expanded on several occasions, by people who cremated their dead and used Food Vessels as burial goods. In the first half of the 2nd millennium BCE to the north of the main cairn, a smaller cairn (Cairn 2) was constructed over a single inhumation burial that had no associated grave goods. Blown sand deposition on the hillock began around the time of the construction of Cairn 2¹⁸⁴, and the cairns were buried and protected by sand dunes until the 20th century AD, when storm surges exposed the Low Hauxley sites destroying a large part of Cairn 1 and (probably) the underlying cist cemetery.

A total of 10 inhumations and cremations were recovered from the two cairns. We analyzed two individuals – burial 3 from Cairn 1 (dating to the Copper Age/Beaker period) and burial 10 from Cairn 2 (dating to the EBA):

- I6679/UK_LH3: 2125–1891 calBCE (3621±34 BP, OxA-5553/4)
- I6680/UK_LH10: 1877–1626 calBCE (3420±38 BP, OxA-5555/6)

Summerhill (Blaydon, Tyne & Wear, England)

Contact person: Chris Fowler

A series of short cists are recorded spread over several hundred metres at Blaydon, and at least five were excavated in the 1930s¹⁸¹. Cists 3 and 4 at Summerhill were excavated

in 1938¹⁸⁵. One set of remains from the excavation of cists 3 and 4 is stored in the Great North Museum although it is not certain whether these remains, which yielded aDNA sample I2610, are from cist 3 or 4. Cist 3 contained a Food Vessel and a flexed skeleton oriented north-northeast to south-southwest, lying on its left. Cist 4 contained a Beaker and a burial oriented east-west, also laying on its left. Osteological analysis identified the remains as a female who was approximately 18 years old at death, and ancient DNA confirms the sex attribution. The radiocarbon date for this individual is:

- I2610/MOA 1973.4H Box 167D, 1: 1936–1746 calBCE (3515±35 BP, Poz-83498)

The radiocarbon date would be late for the style of Beaker in cist 4, but fall within the known currency of Food Vessels.

Trumpington Meadows (Cambridge, England)

Contact person: Christopher Evans

The site was located alongside the River Cam on the southern fringes of the village of Trumpington, to the south of the university town of Cambridge. The excavations were conducted in 2010–11 and identified funerary activity and associated settlement remains from the Neolithic, Bronze Age, Iron Age and Anglo-Saxon periods.

The Beaker burial, F.1596, comprised two individuals buried in a sub-rectangular grave, toe-to-toe, each with a fineware Beaker set close to their heads. Oriented north–south, the grave was approximately 2.5 m long and 1 m wide. The bodies had been laid out so that their positions almost exactly mirrored each other. Both were in a tightly crouched position with their heads at opposite ends, each facing west and their feet intermingled. It is not possible to say which individual was placed first: Burial 1 (Skeleton 3383), a female aged 16–18yrs, was at the north of the grave, lying crouched on her right side; Burial 2 (Skeleton 3384), a male 17–20yrs old, lay in the southern end crouched on his left side. Their backs formed a straight line, parallel to the edge of the cut, suggesting that they were interred at the same time. Both skeletons had elements that appear to that have been displaced, possibly the result of differential post-mortem decomposition or delayed burial. Genetic analysis determines that they are second-degree relatives, for example niece-uncle, nephew-aunt or maternal half-siblings. The direct radiocarbon dates for the skeletons are:

- I3255/TRM10, skeleton [3383]: 2136–1951 calBCE (3661±31 BP, SUERC-49482)

- I3256/TRM10, skeleton [3384]: 2204–2029 calBCE (3722±31 BP, SUERC-49483)

Over Narrows (Needingworth Quarry, Cambridgeshire, England)

Contact person: Christopher Evans

A small Beaker cemetery underlay a Collared Urn-associated Bronze Age round barrow (part of the Low Grounds barrow-group), located on one of the mid-stream *Over Narrows* ridges where the River Great Ouse debouches into the fenland marshes^{186,187}. Its main series of burials occurred within a deep pit-grave. First was F.1080 (Skeleton 5487, I2454), an adult female, 18–25 years of age. Lying crouched on her right side (head to the north), she had a jet bead necklace and a Beaker placed by her head. The pit-grave had, thereafter, been recut and an adult female, over 40 years old (F.1079, Skeleton 5486, I2455), was interred in a tightly crouched position with her head to the west. Both females were successfully analyzed for ancient DNA.

Two infants were inserted into the feature's upper profile, with a third laid out within a discreet pit beside (F.1074 & F.1075). Off to one side was a separate burial, F.1068 (Skeleton 5451), a young female adult of 17–20yrs. Lying crouched on her right side (head to the northwest), she was accompanied by a fineware Beaker.

We obtained genome-wide ancient DNA data from two individuals:

- I2454/OVE08 feature F.1080 skeleton 5487: 2200–1980 calBCE (3703±28 BP, OxA-24595)
- I2455/OVE08, feature F.1079 skeleton 5486: 2130–1910 calBCE (3631±28 BP, OxA-24594)

Other samples were analysed from later burial contexts. Two were Middle Bronze Age inhumation burials occurring within the adjacent O'Connell Ridge settlement:

- I7572/OVE08 feature 1373 skeleton 8248: 1510–1320 calBCE (3160±40 BP, SUERC-28365)
- I7571/OVE08 feature 1437 skeleton 8389: 1450–1260 calBCE (3100±40 BP, SUERC-28364)

Also analysed was a sample from an inhumation burial, Feature 529, occurring within the upper mound deposits of Barrow 2 in the Southern Over Barrow Group. While not

dated as such, it definitely post-dates the monument's Early Bronze Age dated primary cremation and, accompanied by three distinct type-artefact toggles, there can be no doubt of inhumation's Middle Bronze Age attribution:

- I7568/Feature 529 skeleton 896: 1600–1300 BCE

Baston and Langtoft (South Lincolnshire, England)

Contact person: Marcus Brittain and Benjamin Neil

The landscape around the villages of Langtoft and Baston has been subject to detailed investigation by the Cambridge Archaeological Unit since the 1990s in advance of gravel extraction, in which a widespread Bronze Age landscape has been revealed. Set between the Rivers Welland and Glen, this is situated on the humose skirtland of fen at a junction of solid First Terrace sand and gravel, and soft Oxford Clay that until recently was sealed by thick overlying peat. The Bronze Age landscape would initially have been fairly dry open pasture, but by the end of the Bronze Age was gradually inundated by marine transgression, turning the landscape into active saltmarsh and coastal reed swamp marshland that was largely uninhabitable¹⁸⁸.

Evidence for the earliest Bronze Age are a number of burials on the very edge of the dry land overlooking the fen, where inhumations were sealed by covering barrow mounds c. 2000-1700 BCE. Collard Urn is the primary pottery tradition of this phase, and contemporary evidence for settlement is sporadic and limited. Forms of mixed Collared Urn/Deverel Rimbury pottery appear by c. 1700-1550 BCE with a number of dwellings and a palisaded enclosure, perhaps alongside some areas of ditched field systems. Also belonging to the latter part of this phase are two crouched inhumations. One (F.320) is that of an adult male (50+ years) within a shallow grave and accompanied with a cylindrical clay loom weight and pot sherd¹⁸⁹. The second (F.523) was placed on the base of a large pit; this was adjacent to the ditch terminus of a coaxial field system, but was cut by later pits containing Deverel Rimbury pottery, and may therefore predate the field system¹⁹⁰. The body was that of an adult male (35+ years) that was adorned with two cannel coal toggles either side of the neck of the skeleton, possibly worn as hair pieces or fastened within the ear lobes. Remains of a small dog lay over the left shoulder of the body.

One radiocarbon date was obtained from human bone for each of the inhumations:

- I7570/Feature 320 [3043] 1695–1598 calBCE (3347±30 BP, SUERC-74471)
- I7569/Feature 523 [596]: 1620–1595 calBCE (3266±30 BP, SUERC-74472).

Inhumation subsequently ceased as a funerary practice, and burial became focused upon a cemetery of cremations held within Deverel Rimbury vessels and in association with five ring ditches. An extensive ditched field system with long connecting trackways is attributed to this phase, with its ditches actively diverting around the cemetery, and sites of associated settlement, both enclosed and unenclosed. This phase is dated c. 1550–1100 BCE, the latter marking the corresponding marine transgression and inland migration with decline of the field systems.

Biddenham Loop (Bedfordshire, England)

Contact person: Mike Luke

To the west of Bedford extensive open-area excavations by Albion Archaeology have been undertaken within the large meander of the River Great Ouse known locally as the Biddenham Loop^{191,192}. The Middle Bronze Age saw major changes with an open, monument-dominated, early prehistoric landscape being sub-divided by the establishment of fields and trackways. The two resultant field ‘systems’ broadly coincided with two Neolithic/early Bronze Age monument clusters. Adjacent to the field systems were unenclosed settlements dated to the middle-late Bronze Age. Thirty-five contemporary human burials were identified on the basis of radiocarbon dating. As in the Early Bronze Age, cremation was the dominant burial rite: there were twenty-five cremation burials although the presence of ten inhumations demonstrates that an alternative burial rite was available. The inhumations were located within an Early Bronze Age ring-ditch monument on the periphery of a cremation cemetery (three), within or adjacent to field boundaries (three) and within a segmented ditch (four).

The three inhumations within the cremation cemetery were all probable females under 25 years old, interred in a crouched position. Only one of the inhumations contained grave goods — a Deverel-Rimbury vessel that had been deliberately broken and the pieces placed in two clusters, one next to the legs and one by the arms. Bayesian modelling of the radiocarbon dates suggests that the inhumations were contemporary with the cremation burials¹⁹³. Burial in this area began in 1565–1390 calBCE (95%

probability) and the burials took place for 135–445 years (95% probability). We obtained aDNA data from each of the three inhumations:

- I7579/Burial SG22029, context 360: 1500–1310 calBCE (3135±35BP, SUERC-25532)
- I7626/Burial SG22030, context 556: 1400–1130 calBCE (3025±35BP, SUERC-25533)
- I7580/Burial SG22031, context 425: 1270–1010 calBCE (2935±35BP, SUERC-25537). This individual is the sister of I7579.

The three inhumations placed adjacent to or within field boundaries were all over 250m apart. They comprised an unsexed 12–17-year-old sub-adult, an unsexed adult and a 26–35-year-old male. All were in a crouched position. Only one was buried with grave goods — five amber beads, one glass bead and a finger ring; from their positions these objects were probably worn. We obtained aDNA data from two inhumations:

- I7627/Burial SG21392, context 1327: 1420–1210 calBCE (3055±35BP, SUERC-25538)
- I7628/Burial SG23997, context 10423: 1250–970 calBCE (2895±35BP, SUERC-25541)

Four inhumations and one cow were buried within a short length of segmented ditch. The bodies had been interred in crouched positions at the base of the ditch and were spaced at least *c.*1m apart. Where identifiable, these individuals were probable males ranging in age from 12–17 to >46 years. The only possible grave good was a single amber disc bead, found within the skull case of the youngest individual. Bayesian modelling of the dates suggests that the burials, including the cow, began in 1480–1140 calBCE (95% probability) and spanned as many as 510 years (95% probability)¹⁹³. We obtained aDNA data from each of the four inhumations:

- I7577/Burial SG1227, context 1115: 1390–1120 calBCE (3005±35BP, SUERC-25499)
- I7576/Burial SG1229, context 1113: 1210–1000 calBCE (2900±30BP, SUERC-26285)

- I7575/Burial SG1231, context 1100: 1300–1040 calBCE (2950±35BP, SUERC-25498)
- I7578/Burial SG1233, context 2528: 1270–1010 calBCE (2930±35BP, SUERC-25497)

Clay Farm (Cambridge, England)

Contact person: Natasha Dodwell and Richard Mortimer

Clay Farm lay on the southern fringes of Cambridge in the parish of Trumpington. The excavations were conducted by Oxford Archaeology East in 2010–11 and recorded settlement and funerary activity from the Neolithic to Romano-British periods over an area of 18 hectares, with the extensive Middle Bronze Age activity being the main focus for further study¹⁹⁴. Strip fields, enclosures and two separate, contrasting settlement areas were excavated. Adjacent to the west of Clay farm was a second excavation that comprised a barrow and Middle/Late Bronze Age cremation cemetery.

A Middle Bronze Age inhumation burial, Grave 6035 (skeleton 6036), lay in a large ditched enclosure within the northern settlement area. The grave was orientated roughly east to west and was relatively short and deep, measuring 1.3m long, 0.85m wide and 0.6m deep. It held a single crouched inhumation, lying on its front/left side with legs crouched with the head at the east end. Features of the skull and pelvis were consistent with those of a female, while dental attrition and other traits suggest an age of between 20 and 30 years. Severe cribra orbitalia, possibly caused by iron deficiency anaemia, periostitis and sinusitis were all observed and refer to non-specific health stress encountered during childhood and adulthood. Lesions observed in the individual's spine suggest exposure to extreme mechanical stress from a young age.

The direct radiocarbon date for the skeleton that yielded genetic data is:

- I7574/Grave 6035 (skeleton 6036): 1411–1259 calBCE (3055±30 BP, SUERC-38250)

The part of the site named Area E contained enclosure ditches and pits associated with field systems as well as parts of a settlement. This included eight deposits of human remains dated through radiocarbon dating, artefact typology and/or stratigraphy to the Middle Bronze Age. These deposits included one articulated skeleton recovered from a

pit associated with ditches enclosing a field system, with the rest consisting of isolated disarticulated single bones found in ditches, mostly crania but also including some long bones. Ancient DNA from the petrous portion of the loose temporal bone from one of these cranial deposits (2530) consisting of several bone fragments from an enclosure ditch that had been radiocarbon dated to the Middle Bronze Age was included in this study. These cranial fragments had been estimated osteologically to have belonged to a male individual and showed cortical bone modifications possibly indicative of trampling, suggesting a complex predepositional taphonomic history.

- I7640/2530: 1436–1296 calBCE (3100±30 BP, SUERC-28349)

Turners Yard, Fordham (Cambridgeshire, England)

Contact person: Natasha Dodwell and Richard Mortimer

Two barrows were excavated by Oxford Archaeology East in 2012 to the south of the village of Fordham on a chalk ridge with the Fen to the west and the River Snail to the east¹⁹⁵. Between the two barrows was a cemetery of 21 Late Bronze Age cremation burials and cremation related features. The smaller of the two barrows (18m internal diameter) held a single, large Collared Urn, containing the cremated remains of an adult individual, possibly a male, accompanied by a copper alloy knife-dagger and a pierced bone point. At the centre of the second, larger barrow (27m internal diameter) was a crouched burial which had been heavily disturbed by animal burrowing: several sherds of Beaker pottery and part of a jet or jet-like bracelet were recovered from it. In the base of this barrow ditch a second inhumation, Burial 410 was found, tightly fitted into a small grave, placed on her back, with knees pointing upwards. This skeleton was a young adult female (18-22years), with dental disease (calculus, caries, periodontitis) and lesions characteristic of cribra orbitalia and periostitis.

The radiocarbon date for Skeleton 410, who yielded DNA data, is:

- I7573/Burial 410: 1666–1509 calBCE (3306±27 BP, SUERC-44496)

Dairy Farm (Willington, Bedfordshire, England)

Contact person: Marcus Brittain and Christopher Evans

The Willington landscape shows extensive occupation from the Upper Palaeolithic and into the Saxon era¹⁹⁶. The Dairy Farm site comprises a steep clay landfall that plateaus over 1st and 2nd terrace gravels along the valley of the River Great Ouse. Now covered by thick alluvium, the lowest areas of the valley comprised small islands formed by meandering channels broken off from the river's main course. The entirety of one of these islands was studied as part of a wider landscape investigation at Dairy Farm in advance of gravel extraction, showing that this was clearly habitable during the Late Mesolithic to Middle Neolithic, as documented by surface artefacts. Access to the island declined in the Late Neolithic to Early Bronze Age, but ceremonial and funerary monuments of this age are known at a higher gradient of the valley at Dairy Farm; however, as protected ancient monuments these were not a part of the excavation program.

Only limited Late Neolithic-Early Bronze Age flintwork has been found, and Beaker pottery was confined only to the two known burials. Contemporary settlement activity has, therefore, not been identified. The burials were both situated in proximity to the monuments, but were shallow 'flat' graves with no obvious above-ground markers. A mature adult male, F.66 (I2452), was found crouched on his left side, with a notched flint dagger that lay at the head, and with a fineware Beaker close to the feet. The individual had suffered a compound fracture to the right femur; this had healed, but in a slipped position, the result of which would have been considerable physical impairment. This individual was successfully analyzed with ancient DNA. The other, F.192, was an unsexed adult with poor bone survival. Crouched on its right side, the individual was accompanied with a copper alloy pin and a near-complete Beaker vessel (fineware).

The radiocarbon date for the individual analyzed in this study is:

- I2452/BEDFM2009.12, feature F.66 skeleton 186: 2277–1920 calBCE [2277–2030 calBCE (3735±35 BP, Poz-83405); 2195–1920 calBCE (3700±30 BP, Beta-444979)]

West Deeping (Lincolnshire, England)

Contact person: Christopher Evans

A 2007 investigation of the Middle Bronze Age field system and settlements at West Deeping, close to the fen-edge in South Lincolnshire, revealed three Early Bronze Age burials in close proximity. Of these, Burial 5 (F.320, I2453) contained a remarkable series of grave goods. Tightly crouched within a shallow grave, the sub-adult lay on its left side, with the knees on the chest, facing west. Five barbed-and-tanged arrowheads, a flint flake, and a flake knife accompanied the body. A length of worked red deer antler and a strip of cattle-sized rib bone were also present, with their position indicating that they may have been attached to the back of the deceased. Their association with the arrowheads suggests that they may have been archery-related, perhaps part of a bow or as a quiver stiffener, or else as a pressure-flaker for the manufacture of barbed-and-tanged arrowheads. While the burial lacked a Beaker (as did the other two graves, both of which had flint implements and, one, both a bone and antler pin), the accompanying finds – especially the arrowheads – suggest a ‘Beaker-type’ assemblage. The radiocarbon date for this individual is:

- I2453/CQWDO7, feature F.320 skeleton 1126: 2289–2041 calBCE (3760±35 BP, Poz-83404)

Windmill Fields, Ingleby Barwick (Stockton-on-Tees, North Yorkshire, England)

Contact person: Thomas Booth

The Windmill Fields site is an area of the Ingleby Barwick housing development in the valley of the River Leven, on the southern edge of Stockton-on-Tees (NZ 4460 1255). It was excavated in 1996 by Tees Archaeology in advance of construction¹⁹⁷. The excavations revealed a flat grave cemetery including six burials containing the remains of at least 11 individuals. A diverse series of funerary traditions were represented by these burials and radiocarbon dating of the human remains suggested that there was a broad correlation between tradition and chronology, covering the Beaker period to the Early Bronze Age. The oldest remains from the site had been disarticulated and placed in a wooden cist. This style of deposition was followed by a tradition of unaccompanied single articulated burial, then single articulated burial with grave goods.

Disarticulated unaccompanied incomplete skeletons representing two adult males (Sk 3 and Sk 4) were recovered from the remains of a wooden cist. Histological analysis of bone from Sk 3 suggested that these individuals had probably been excarnated¹⁹⁸. Sk 3 and Sk 4 produced radiocarbon date of 2397-2043 calBCE (2-sigma OxA-8652). Individual Sk 4 was analysed with aDNA:

- I5382/Sk 4: 2280–1980 calBCE (3725±40 BP, OxA-8728)

A middle adult female (Sk 1) and a young-middle adult male (Sk 2) were recovered unaccompanied from earthen graves. Sk 1 and Sk 2 had been disturbed by a digger, but reconstructions of their positions suggested that Sk 1 had been buried flexed on their right side with their head to the southwest whilst Sk 2 was buried lightly flexed on their left side with their head to the southwest. Histological analysis of a femur from Sk 2 suggested that this individual had originally been mummified. Radiocarbon dating of Sk 1 produced a date of 2289-2036 calBCE (2 sigma, OxA-8650). Individual Sk 2 was analysed with aDNA:

- I1767/Sk2: 2200–1970 calBCE (3705±35 BP, OxA-8651)

A complete articulated skeleton of an older adult female (Sk 7) was recovered from another earthen grave. This burial had been disturbed by ploughing and it was difficult to gauge its position and the original placement of the accompanying artefacts. Grave goods included a piece of hematite and Beaker-style pottery. Individual Sk 7 was analysed with aDNA:

- I1765_d/Sk7: 2330–2040 calBCE (3780±40 BP, OxA-8729)

A complete articulated skeleton of a middle adult male (Sk 5) was found in an earthen grave with a piece of hematite and a stone mace head. They were buried flexed on their left side with their head to the east. Histological analysis of the bone suggested that this was a primary inhumation. The radiocarbon date from this skeleton placed it later in the Early Bronze Age at 1736-1614 calBCE (2-sigma, UB-7173).

The remains of a young-middle adult female (Sk 6) had been buried in a tightly flexed position on their right side with their head to the west. This was a rich burial containing two copper alloy bangles, 41 tubular copper alloy beads, 25 v-perforated jet buttons, one biconical jet bead and 75 small jet rings. Histological analysis of the bone suggested that this was a primary inhumation. This skeleton produced an Early Bronze Age

radiocarbon date of 2029-1900 calBCE (2-sigma, UB-4174). The burial was accompanied by disarticulated incomplete remains (mostly consisting of crania and long bones) of an additional four individuals (Sk 8):

- I7635/Sk 8: 2195–1978 calBCE (3690±28 BP, BRAMS-1286)

Staxton Beacon (Staxton, North Yorkshire, England)

Contact person: Oliver Craig

Staxton Beacon is a cemetery site located on the North Yorkshire wolds, near the village of Staxton, and consists of a combination of round barrows and flat graves. A flat grave cemetery was excavated by Stead in 1957, whilst one of the round barrows (Staxton Beacon) was excavated by Manby in 1958-9^{199,200}. The barrow included ten inhumations and a cremation along with the remains of a partially-burnt wooden structure. The burial tradition and grave furniture suggested that all individuals interred in the Staxton Beacon barrow dated to the Beaker or Early Bronze Age period. Palaeogenetic data from Burial 11 are included in the current study:

- I1770/Burial11: 2400–1600 BCE

Yarnton (Oxfordshire, England)

Contact person: Gill Hey

Yarnton is a large gravel extraction quarry situated in the Upper Thames Valley, approximately 5 miles north of Oxford. Archaeological excavations took place between 1990 and 1998, during which time evidence of prehistoric settlement, burial and landscape development was investigated, including inhumation burials of early (Beaker) and middle Bronze Age date²⁰¹.

Beaker period skeletons 8772, 8633, 8784 and 8779 were found on the Summertown-Radley gravel terrace overlooking the floodplain of the Thames, the first three of which were placed in and around an earlier Neolithic U-shaped enclosure. Burial 8772 was an adult female more than 45 years of age, who had been placed in a deep grave within the entrance to the enclosure. She lay semi-crouched, on her left side, with her head to the south-east, in a wooden coffin or on a bier. There were no grave goods. An infant

(8633), 12-14 months old, also positioned south-east to north-west, had been buried just 2m away.

Skeleton 8784 lay in a shallow grave 6m south of the enclosure. The body was disturbed and not so well preserved but is believed to be an adult aged upwards of 18 years, and possibly female (confirmed with aDNA data). The head lay to the south. Thirty-five metres to the east was burial 8779, a neonate which had been placed in the top of a pit with Beaker pottery, worked flint, a polished bone point, animal bone and charred plant remains. The body had been disturbed but was articulated, and it is uncertain whether the pit deposit was related to the death of this newborn or whether the body was one of a number of symbolically-charged objects placed within the pit. We obtained genome-wide ancient DNA data from four individuals:

- I2443/SK 8772 (YCF 95), 2: 2290–1980 calBCE (3740±40 BP, OxA-8868)
- I2445/SK 8633 (YCF 95): 2397–1930 calBCE [2137–1930 calBCE (3650±35 BP, Poz-83407), 2397–2043 calBCE (3785±40BP, OxA-8806)]
- I2446/SK 8784 (YCF 95): 2460-2140 calBCE (3815±40 BP, OxA-8807)
- I2447/SK 8779 (YCF 95): 2116–1911 calBCE (3625±25 BP, PSUAMS-2336)

Abingdon Spring Road cemetery (Abingdon, Oxfordshire, England)

Contact person: Tim Allen

Skeleton 3036 came from Abingdon Spring Road cemetery, approximately 1km north-west of Abingdon town centre, Oxfordshire, at NGR 448700 197620 on the Summertown/Radley terrace of the Thames gravels²⁰². It lay within a grave numbered 3037 that was orientated north-south, was sub-rectangular, and was 1.60m long 0.96m wide and survived 0.14m deep. Skeleton 3036 was crouched in the central part of the grave, measuring 1.16m from head to toes. It was lying on its right side with the head to the south, and with the knees flexed, the right arm with the elbow out in front of the body, and the left arm folded and the hand in front of the face. The skeleton was that of an adult female of 20-24 years of age. A copper awl was positioned just below the upper legs parallel to them. The radiocarbon date for this individual is:

- I2450/SK 3036 (ABSRC00): 2457–2208 calBCE (3850±21 BP, weighted mean) [(3841±40 BP, NZA-15865) (3834±45 BP, NZA-15866)]

Central Flying School (Upavon, Wiltshire, England)

Contact: David Dawson

Human remains and a comb decorated Beaker were found during excavations in 1915 at the Central Flying School²⁰³. We analysed one individual from this site:

- I4950/DZSWS:C.36: 2500–1800 BCE

Flying School (Netheravon, Wiltshire, England)

Contact: David Dawson

Two Beaker graves (Cunnington's No.1 and 2) containing single crouched burials were found in 1926 by workmen during excavation of the foundations for the new aerodrome at Netheravon Flying School²⁰⁴. Both burials contained females and each was placed with a Beaker of long-necked form (Southern style). The Beaker in grave No.1 is the more elaborately decorated, whilst that from grave No. 2 has simpler comb-zoned bands. The burial in grave No.2 also contained the remains of a young child (15 months). We analysed two individuals from this site:

- I4951/DZSWS:X133.1: 2500–1800 BCE
- I5512/DZSWS:X132.1: 2500–1800 BCE

Fussell's Lodge (Salisbury, Wiltshire, England)

Contact: Tom Booth

Fussell's Lodge is a long barrow funerary monument is located at Fussell's Lodge farm on the edge of Salisbury plain in south Wiltshire. It had been originally identified and surveyed by O.G.S Crawford and was excavated by Paul Ashbee in 1957 on behalf of the Ministry of Works²⁰⁵. The site archive has been subject to an extensive radiocarbon dating programme and analysis within a Bayesian statistical framework to discern the sequence of construction and use²⁰⁶. The monument began as a trapezoidal timber enclosure perhaps covered by hide, textile or a wooden lid defining a linear mortuary zone around 7m in length. This timber structure was extended at a later stage to incorporate more human remains. The monument was closed by the construction of a flint cairn over the timber structure. The flint cairn was possibly covered by a cattle

hide. After a substantial burning episode that charred the cattle hide and some of the mortuary deposits, a 52m long trapezoidal or wedge-shaped long barrow mound was built over the cairn. This long barrow was defined by a timber revetment and flanking ditches.

Disarticulated commingled human bones representing the remains of 34 individuals (26 adults and eight children) were recovered from the Fussell's Lodge mortuary structure. This assemblage can be split into discrete bone groups based on how they were discovered in situ. Bone Groups A and B were recovered from the primary mortuary structure and consisted of variably ordered bone stacks orientated along the structure's axis. Bone groups B and C were recovered from the structure extension and originally thought to represent the complete articulated remains of two individuals buried in flexed postures. However, further examination revealed that that they were actually composed of the disarticulated remains of at least four individuals that had been rearranged to resemble articulated skeletons. Generally, bones from Bone Groups A and B were older than those from B and C, suggesting the remains had been deposited progressively through the mortuary structure or that the older bones had been stacked at the back of the structure as new interments were introduced. The lack of cortical bone modification and representation of the small bones of the hand and feet suggested that whole bodies had originally been interred in the tomb and skeletons had been deliberately manipulated and disturbed by successive interments. However, it is possible that the assemblage includes small numbers of 'ancestral bones' that were brought to the tomb after having been curated or interred elsewhere. An ox skull and sherds Early Neolithic Bowl Pottery were also recovered from inside the mortuary structure.

In common with other tombs of this era, the radiocarbon dating programme at Fussell's Lodge, which included seventeen human bones, suggested that Early Neolithic activity at the site was relatively short-lived and that the individuals represented in the monument had died and been deposited in the tomb over short timescales. Deposition of remains probably began in the 38th Century BCE and the monument was closed by the construction of the long barrow 3630-3620 calBCE, with the human remains specifically dating to 3755-3660 calBCE. The human skeletal remains from Fussell's Lodge are currently curated at the Natural History Museum in London. Genetic data obtained from samples of two petrous portions of temporal bones from Fussell's Lodge were included in this study.

- I6750/PA SK 3332: 3755–3660 BCE
- I6751/PA SK 3324: 3755–3660 BCE

Barrow Hills (Radley, Oxfordshire, England)

Contact Person: Tom Booth

Barrow Hill Fields is located to the southwest of the town of Radley in Oxfordshire and has yielded several notable archaeological sites dating to varied periods^{207–209}. Most prominent amongst these sites is a Beaker or Early Bronze Age linear round barrow cemetery composed of 17 barrows on a northeast-southwest orientation. This famous group of barrows was originally identified in the 1930s and 11 were excavated between 1931 and 1953 by Leeds, Bradford, Williams and Atkinson in advance of gravel works^{210–212}. Barrow 2 was excavated in 1976 in advance of road works and further excavations of the area were undertaken in 1983–5 prior to development. The barrow mounds have mostly been ploughed away and the monuments now can only be identified by the ring ditches that would have originally surrounded the barrow mound. The barrows contained a mixture of Bronze Age inhumations and cremation burials as well as some later Saxon interments.

The Barrow 15 ring ditch, which was located slightly to the south of the main barrow alignment, was excavated by Leeds and Bradford with the Oxford University Archaeological Society. This barrow is unusual in having been enclosed by two concentric ditches. The primary burial (MH7) was recovered from a large rectangular pit measuring 3m by 1.5m and 0.6m below the modern ground surface. The burial contained the skeleton of an adult male. The position of the skeleton was not provided, but the bones of the lower leg seemed to have been deposited separately from the rest of the skeleton, which was in anatomical articulation, suggesting to the excavators that the lower legs had been partially desiccated and dismembered. A carbonized log or plank of wood lay in the middle of the primary grave pit and a flint arrow-head was recovered from the pit bottom. A second grave also located near the centre of the monument contained the remains of two infants. A group of six to eight post holes were found 0.6m to the north of the primary burial, although their date and function were uncertain. This skeleton was later radiocarbon dated to the Early Bronze Age. Genetic data from a sample of the petrous portion of the temporal bone of MH7 were included in this study.

The human remains are currently curated in the collections of the University of Cambridge Duckworth Laboratory.

- I7638/MH7 Barrow 15/EU 1.4.6: 2290–1770 calBCE (3660±80 BP, OxA-4357)

Barton Stacey (Hampshire, England)

Contact person: Alistair Barclay

The burial was found during archaeological excavation by Wessex Archaeology on the Barton Stacey to Lockerley Gas Pipeline and was located 7 km west of Winchester (Hampshire)²¹³. Burial 40172, in isolated grave 40173, was that of an adult female (18–25 years). A radiocarbon date obtained from the skeleton (SUERC-26241) indicates that the burial was made during the start of the early Bronze Age:

- I2604/62412_40173: 2210–2030 calBCE (3730±30 BP, SUERC-26241)

Upper Swell Long Barrow (Chipping Norton, Gloucestershire, England)

Contact person: Tom Booth

Upper Swell (also known as Pole's Wood East) is a Cotswold-Severn type Neolithic long barrow located around half a mile north of Nether Swell Village, near Chipping Norton in Gloucestershire. The long barrow was investigated in 1875–6 by the Reverend David Royce and Professor Rolleston^{177,214}. It consisted of a 120-foot-long cairn bounded by a wall of flag stones orientated northeast to southwest with a characteristic 'horned' structure around the entrance. A small narrow passage through the cairn led to a 'trench-grave' that had been dug directly into the old ground surface. The trench grave was 2 feet deep, 6 foot 4 inches wide and extended 28 feet down the long axis of the monument. Slabs of stone found in the entrance passage were thought to have originally sealed the monument. There was no obvious stone or wooden structure associated with the trench grave and the cairn material appeared to lie directly over it.

Disarticulated commingled human remains representing at least 13 adults and five children were recovered from the trench grave and the entrance passage. A single complete skeleton thought to belong to a 20–25-year-old female was found in anatomical order in the trench grave. The bones around the articulated skeleton had been moved out of place to accommodate it. The excavators believed that the

assemblage had accumulated as a result of successive interments, with earlier skeletons gradually becoming more disturbed and commingled, and the articulated female skeleton constituting the final interment. Many of the bones had been gnawed by rodents and some showed water damage. An assemblage of animal remains, bone and flint tools as well as sherds of coarse pottery were also retrieved from the grave trench. None of the finds or human remains from Upper Swell have been dated using absolute methods. However, the typology of the tomb and finds suggests that they date to the Early Neolithic. The human bone assemblages are currently curated at the Natural History Museum in London. Genetic data from a sample of the petrous portion of a temporal bone from Upper Swell (PA SK 1855) was included in this study.

- I6762/PA SK 1855: 4000–3300 BCE

Waterhall Farm (Chippenham, Cambridgeshire, England)

Contact: Tom Booth

Two tumuli (possible round barrows) on Waterhall Farm, near Chippenham, Cambridgeshire were excavated by Edward Martin in 1973 on behalf of the Department of the Environment in advance of destructive road works for the Newmarket bypass²¹⁵. The main bulk of one of the barrows (Barrow B) lay underneath the fence of a water-pumping station and could not be fully excavated. An excavation of a quadrant section through the other barrow (Barrow A) led the excavator to conclude that the barrow was actually a natural chalk mound. Further trenches cut across the mound revealed skeletons of five adult females, three adult males and three immature individuals distributed across five graves. The graves were closely packed together, in some cases intercutting one another at the centre of the mound. The excavator believed that these burials represented a flat grave cemetery, rather than an attempt to use a natural feature as a round barrow. Some graves contained multiple individuals in variable states of anatomical articulation suggesting repeated revisiting and recutting of graves for burial of new bodies and manipulation of old skeletons.

Grave I contained two unaccompanied skeletons deposited top to tail: an adult female tightly flexed on her left side with her head to the east on top of a 30-35-year-old male on his left side with his head to the west. The excavator believed that the grave had been reopened to deposit the second individual. Grave II was the largest grave measuring

2.1m long by 1.5m wide by 0.85m deep and was slightly separate from the rest. The grave contained a complete articulated skeleton of a 40-50-year-old female flexed on her right side with her head to the northwest. A pile of disarticulated bones representing two adult females and two children had been placed on top of the skeleton of the 40-50-year-old female. Sherds of a single Beaker pot were mixed with these disarticulated bones. The 20-30-year-old disarticulated female skeleton was radiocarbon dated to the Early Bronze Age as part of the British Beaker isotope study. Numerous flint flakes (which, interestingly, could be refitted suggesting knapping activity occurred around the grave itself), an ox metapodial, a coal bead and a small bronze or copper cylinder were also found distributed throughout the grave, but any associations between the finds and the skeletons had been lost. Grave III was cut into Graves IV and V and contained the articulated remains of an 18-20-year old male skeleton buried prone and tightly flexed with his head to the west. The skeleton was accompanied by cranial bones and teeth of a 6-7-year-old child but no grave goods. Grave IV was cut into the fill of Grave V and included the unaccompanied articulated remains of a 25-30-year-old female flexed on her left side with her head to the south. The grave fill contained some disarticulated human remains that probably derived from the Grave V individual and had been disturbed by the cutting of Grave IV. Grave V included the disturbed unaccompanied remains of an 18-20-year-old male positioned supine with his legs flexed to the left and his head to the south.

The human remains from Waterhall Farm are currently curated at the Duckworth Laboratory at the University of Cambridge. Ancient DNA data obtained from the petrous portion of a temporal bone associated with the dated disarticulated human remains of the 20-30-year-old female from Grave II (Accession No. EU 1.4.114) were included in this study.

- I7639/Grave II/EU 1.4.114: 2040–1660 calBCE (3520±70 BP, HAR-3880)

Whitehawk Causewayed Enclosure (Brighton, Sussex, England)

Contact: Tom Booth

The Whitehawk causewayed enclosure is a scheduled ancient monument located near Brighton racecourse in the east of the town of Brighton, Sussex, UK. It was first recognised as a significant monument in 1821 by the Reverend J. Skinner and has been

subject to several excavations in the early and late 20th Century^{216,217}. The main excavation activity was undertaken in 1929 and 1932-3 by E. C. Curwen in advance of road construction. The monument occupies six hectares and consists of four concentric ditches, with some evidence for associated banks, divided by causeways. Where they survived, excavations of the banks revealed evidence of a timber post palisade. The enclosure is situated between two low hilltops overlooking the coastal plains to the south. As with most Neolithic causewayed enclosures, the Whitehawk camp is thought to have been occupied periodically for meetings, feasts and ritual ceremonies.

The inner and second ditches contained the greatest number of finds including broken Neolithic Bowl pottery, bones and domestic refuse whilst the fourth ditch was archaeologically sterile. The third ditch included the complete articulated skeletons of at least four individuals: two young adult females (Skeleton I/128 and II/129), one (I/129) accompanied by an articulated infant around 39 weeks old (Skeleton IIa/129a) and a 6-8-year-old child (Skeleton IV/140). Skeleton II showed evidence for carnivore gnawing on their left rib, suggesting that the body had been exposed for a short while. This skeleton also showed some possible perimortem trauma on their right parietal. A fifth articulated skeleton (Skeleton III/139a) representing a young adult male was recovered from the inner ditch. Disarticulated human remains representing at least six individuals were scattered throughout the first three enclosure ditches: three young adults and one adult of indeterminable sex, one 7-8-year-old child and one juvenile. The individuals represented by the disarticulated material had been defleshed before selected disarticulated remains were interred in the enclosure ditches. A small number of disarticulated fragments showed signs of low-temperature burning. Only one cut mark was identified on an isolated humerus and possibly one on an infant mandible and there were no cortical bone modifications observed indicative of sub-aerial exposure. Therefore, it was most likely that these individuals had been buried or deposited in a protected/sheltered environment before certain bones were retrieved for redeposition. The archive of the site (including the human remains) is curated by Brighton Museum and Art Gallery.

Skeleton I and Skeleton II have both been radiocarbon dated to the British Early Neolithic²¹⁸. None of the other human remains have been radiocarbon dated but an extensive programme of radiocarbon dating and modelling has been performed on the Whitehawk deposits as part of the Gathering Time project. The best model of the

radiocarbon dates suggest that the Whitehawk monument was used for 75–260 years (95% confidence) from the middle of the 37th Century BC, which gives a latest possible date of death for the disarticulated remains. Ancient DNA data from the petrous portion of the temporal bone of the disarticulated Skull 4 (R3688/130) are included in this study. This cranial fragment had been aged osteologically and was inferred to belong to a young adult male, although the biological sex derived from the genetic evidence suggests that it belonged to a female individual. This discrepancy is attributable to the uncertainties in osteological sex estimations of fragmentary crania.

- I6761/Skull 4 (R3688/130): 3650–3400 BCE

Wick Barrow (Stogursey, Somerset, England)

Contact: Tom Booth

Wick Barrow (also known as Pixies' Mound or Burrow Sidwell) is a round barrow located in the parish of Stogursey, Somerset, UK. It was excavated in 1907 by the Somerset Archaeological and Natural History society with the Viking Club (Society for Northern Research) under the assumption that it belonged to the Viking or Anglo-Saxon period²¹⁹. However, with the discovery of the first skeleton, it became clear that the barrow was prehistoric and dated to the Beaker period. The excavators estimated that the barrow would have stood around 11 feet (3.3m) high and was surrounded by a stone wall enclosure. A depression at the top of the barrow suggested that it had been disturbed in antiquity, probably during the Roman period based on finds recovered from the barrow mound. Fragmentary disarticulated human remains and the possible remains of a cist found beneath this depression suggested that the Roman-era encroachers has discovered and disturbed the primary burial.

The grave containing Skeleton No. 1 was located slightly to the east of the centre of the barrow around. Skeleton No. 1 was buried flexed on its left side in an earthen grave with its head to the northwest accompanied by fragments representing three-quarters of a Cord-Zone Maritime Beaker distributed from its right shoulder down to the lumbar vertebrae. The excavators believed that the Beaker had been buried incomplete. Further sherds of 'British pottery' and scattered human teeth were found near the skull. Slightly further north of Skeleton No. 1 was a large oval pit measuring 1.8m by 0.6m containing the commingled disarticulated remains of five adults and one child. The cranial

fragments from this pit exhibited impressions of textile. The excavators could not discern any order to this deposit and reburied many of these bones, considering them to be of little use.

The earthen grave containing Skeleton No. 2 was located slightly to the west of the centre of the mound and deeper than Skeleton No. 1, around 0.9m from the barrow surface. Skeleton No. 2 was buried tightly flexed on its left side with its head to the north. The skeleton was accompanied by an Wessex/Middle Rhine Beaker positioned at its right shoulder and two flint knives located close to the pelvis and the lumbar vertebrae respectively.

Skeleton No. 3 was recovered from an earthen grave just within but above the northern margin of the walled enclosure, around 1m below the surface of the mound. The skeleton was highly flexed on its right side with its head to the south. It was accompanied by an Wessex/Middle Rhine Beaker positioned near the right tibia, as well as a group of stone tools, including two flint scrapers located between the legs and the axial skeleton. An additional fragmentary, incomplete and disarticulated adult female skeleton accompanied by the teeth of a child was recovered outside the barrow about 1m south of the walled enclosure. This skeleton was accompanied by small fragments of 'British pottery' and a sheep tooth. Several snail shells were recovered from inside the long bone shafts.

None of the Wick Barrow skeletons have been dated using absolute methods, but their artefactual and monumental associations suggest that they belong to the British Beaker period (c.2400-2000 BCE). Petrous portions of temporal bones were sampled from Skeleton No. 1 and 2 for this study, but only the sample from Skeleton No. 2 passed quality controls. Ancient DNA data from Skeleton No. 2 was included in this study. The site archive including the human remains are curated at the Somerset Heritage Centre.

- I6775/Skeleton No. 2: 2400–2000 BCE

Wilsford Down (Wilsford-cum-Lake, Wiltshire, England)

Contact person: Tom Booth

A discrete cluster of four round barrows (named G51-G54) located on Wilsford down in the parish of Wilsford-cum-Lake, Wiltshire were originally investigated by William Cunnington in 1805. These barrows were excavated by Ernest Greenfield in 1958 after

they began to be damaged by ploughing²²⁰. Samples of skeletons from G52 and G54 were included in this study and therefore only these two barrows will be discussed here. Some of the human burials had been severely disturbed by Cunnington's excavations and there were some logistical issues and discrepancies with the documentation of Greenfield's excavations, meaning that some of the relationships and positions of artefacts and skeletal remains are uncertain and should be taken with caution.

Wilsford-cum-Lake G52 is the westernmost barrow and probably originally consisted of a mound surrounded by a ditch. Four superimposed grave pits had been cut into the centre of the mound, suggesting recutting of graves for each successive interment. Pit 1 was the deepest at 1.15m and probably therefore the earliest feature, but had mostly been removed by Pits 2 and 3. Where evidence of its original contents remained, they seemed to suggest that Pit 1 had originally included a human cremation burial. Pit 2 consisted of an oblong grave 2.4m by 1.8m by 0.76m containing an articulated skeleton of an adult male that had been placed flexed on its left side, probably with its head to the northeast and accompanied by two fragments of a Wessex/Middle Rhine Beaker placed next to their right heel (Interment 2). The top half of this skeleton had been disturbed by Pit 3 leaving only the lower half of the body *in situ*. One fragment of the Beaker had been recovered from the fill of Pit 4 and it is likely that the Beaker fragments accompanying Inhumation 2 had been moved from their original position when Pit 3 was dug. Several other sherds of this Beaker were recovered from the fill of Cunnington's investigatory pit.

Pit 3 was 0.9m by 0.9m by 1.07m, had been dug through the centre of Pit 2 and contained the articulated skeleton of an infant aged 16-20 months in an extended position with its head to the northwest (Interment 3). A rusticated Beaker had been placed at the infant's feet. Pit 4 had been dug entirely through the earlier pit fills and contained the articulated skeleton of a 17-25-year-old female buried on her right side with her head to the southeast. The lower body had been removed by Cunnington's pits and placed nearby, rendering any artefact associations uncertain. Unstratified disarticulated bones were found throughout the fill of Cunnington's pit and Pit 4, probably representing the disturbed remains of previous interments.

The Wilsford-cum-Lake G.54 round barrow consists of an outer mound and a slightly ovoid core measuring 14m in diameter. The original grave pit, which was slightly off centre had been badly disturbed by Cunnington's investigations, which had left a hollow

at the centre of the mound. Below this hollow was a disturbed area located to the east of the grave containing a dense concentration of artefacts including sherds of a Cord-Zone Maritime Beaker, an All-Over Cord Beaker, a Wessex/Middle Rhine Beaker and four barbed-and-tanged arrowheads. A disturbed area to the east of the grave contained another sherd from an All-Over Cord Beaker. These areas of disturbance were thought to reflect piles of artefacts that Cunnington's diggers had displaced from the burial and piled up on the side of the grave edge. It is assumed that all of these artefacts originally accompanied the burial.

The grave itself was orientated NW-SE with only a human cranium belonging to a 17-25-year-old male remaining in situ on its left side orientated northwest facing northeast. A flat three-rivet bronze dagger had been placed in front of the cranium and a stone battle axe was situated above the cranium. The fill of Cunnington's disturbance through the grave contained sherds of an All-Over Cord and Wessex/Middle Rhine Beaker, a barbed-and-tanged arrowhead, 14 fragments of deer antler and parts of the human skeleton. The variety of artefacts found in this grave would make it quite rich and even though the remains of only one individual were recovered, the level of disturbance suggests that some of the artefacts may have been residual, and associations between artefacts and the skeleton have to be approached with caution.

The site archive including the human remains is stored in the Wiltshire Heritage Museum in Devizes. None of the G52 and G54 skeletons have been dated using absolute methods, but the associated artefacts place them in the Beaker period. Ancient DNA data from samples of petrous portions of the temporal bones belonging to G.52 Inhumation 4 and the G.54 burial were included in this study:

- I6777/G.54: 2400–2000 BCE
- I6778/G.52 Inhumation 4: 2400–2000 BCE

Amesbury Down (Wiltshire, England)

Contact person: Alistair Barclay

The site of Amesbury (Boscombe) Down is part of a large-scale housing development that has taken place in several phases since the 1990s. It is located on an area of chalk downland to the south-east of Amesbury and just outside the boundary of the Stonehenge World Heritage Site. Excavations by Wessex Archaeology between 1993

and 2015 has revealed Neolithic monumental features, Beaker and other Early and Middle Bronze Age burials and funerary deposits, numerous prehistoric pit deposits (Powell and Barclay forthcoming). Some of the discoveries are of international importance and include the Beaker burials known as the ‘Amesbury Archer’ and the ‘Boscombe Bowmen’⁴. The site forms part of the wider Stonehenge monumental and funerary landscape.

In total ten burials from the site of Amesbury Down are included in this study. This represents approximately 20% of the total number of individuals excavated from an overall total of just over 30 graves. The date range of these burials goes from the final Neolithic to the start of the middle Bronze Age and includes a significant number of Beaker burials including a few of British Chalcolithic date. A number of the early Beaker burials have rich and important grave assemblages. The site has some of the best evidence from Britain for early Beaker non-local connections indicated by isotopic (strontium/oxygen) analysis and material culture providing direct links with mainland Europe – in particular the ‘Amesbury Archer’.

Burials 25004 and 25005 are two individuals from the collective burial known as the ‘Boscombe Bowmen’, a type of burial that is unique to the site and generally difficult to parallel in Wessex and Britain as a whole. The grave, which had been disturbed and truncated by road construction and a service trench, produced the skeletal remains from a minimum of nine individuals of which four were articulated. Grave goods include eight beakers, seven of All-Over-Cord (AOC) type and one of Cord-Zoned-Maritime (CZM) type, a boar’s tusk ‘scoop’, worked flints and an antler pendant. Because of the nature of the grave it is difficult to directly associate any of the grave goods with a particular individual with complete confidence. Among the British individuals dated to after 2450 calBCE in our dataset, the skeleton from burial 25004 has the lowest amount of steppe-related ancestry:

- I2416/25004: 2470–2200 calBCE [2460–2200 calBCE (3845±27 BP, OxA-13624), 2470–2285 calBCE (3830±30 BP, Beta-432804)]
- I2417/53535_25005: 2500–2140 BCE (based on associated dates in same context especially 25004)

The ‘Boscombe Bowmen’ grave was later marked by a Bronze Age barrow, which in turn became the focus for a small cemetery. Burial 25217 was placed in a grave just east

of this barrow. It contained the crouched skeleton of a subadult individual, genetically female although initially thought to be a male ('Amber boy'), who was buried with a 'necklace' of over 80 small cylindrical amber beads. The skeleton was directly dated by NZA-32497 (Powell and Barclay forthcoming):

- I2639/25217: 1600–1430 calBCE (3225±25 BP, NZA-32497)

Burial 1238, known as the 'Companion', was found 3 m east from the burial of the 'Amesbury Archer' and contained the remains of an adult male⁴ (Powell and Barclay forthcoming). The burial included a pair of gold hair ornaments, a boar's tusk and five worked flints. The skeleton is directly dated by OxA-13562:

- I2565/1238: 2470–2140 calBCE (3829±38 BP, OxA-13562)

Burial 6033 (adult female) was found in a large chambered grave (6012) at the centre of round barrow 6203 (Powell and Barclay forthcoming). The burial had been disturbed in antiquity and was found in a partially articulated state. The grave also contained an antler tine, a flint arrowhead and a knife, and sherds of Beaker pottery. The skeleton is directly dated by NZA-32788:

- I2418/6033: 2440–2200 calBCE (3835±25 BP, NZA-32788)

Burial 5289 was one of a pair (with 5292) from closely spaced graves (Powell and Barclay forthcoming). Both contained single tightly crouched burials of a similar early Bronze Age date. Burials 5292 and 5289, directly dated by SUERC-34539 and NZA-32484 respectively, were those of adult males and contained no Beaker material culture. DNA data indicate that they were a father-son pair. The radiocarbon date for these individuals are:

- I2596/5289: 2280–2030 calBCE (3739±30 BP, NZA-32484)
- I2597/5292: 2280–2030 calBCE (3735±30 BP, SUERC-34539)

Burial 12134 was made in a large chamber cut into the natural chalk (Powell and Barclay forthcoming). No evidence for a barrow was found, although it is possible that the grave was marked by an earthen mound as two further burial deposits were added in the Early Bronze Age, both associated with Food Vessels. At its base the chamber, part of grave 12125, contained the burial of an adult male associated with a long-necked 'Southern' style Beaker. The skeleton was directly dated by NZA-32494:

- I2598/12134: 2140–1940 calBCE (3664±30 BP, NZA-32494)

Burials 13382 and 13385 were found near the western edge of the overall site and close to a timber post setting of Late Neolithic date. Both burials are considered to belong to the Beaker culture, although only one (13385) contained a Beaker. Burial 13385 was that of an adult male and contained a long necked Beaker of ‘Southern’ style. The skeleton was directly dated by NZA-32490:

- I2566/13385: 2210–2030 calBCE (3734±25 BP, NZA-32490)

Burial 13382 also contained the remains of a male adult, which was directly dated:

- I2457/13382: 2480–2031 calBCE [2480-2280 calBCE (3890±30 BP, SUERC-36210), 2200-2031 calBCE (3717±28 BP, SUERC-69975)]

The upper grave fill was cut by a secondary grave, which contained a cremation burial (adult male) with a Food Vessel. A fragment of cremated human bone was directly dated by 1750-1620 calBCE (3390±25 BP, NZA-32509).

Burials 62027 and 62014 were found in the southern part of the site (Powell and Barclay forthcoming). Burial 62014 was made in a cylindrical grave pit (62004) and was immediately south of pit 62025 that contained burial deposit 62027. Burial 62014 is unusual in that the body had been placed on a deposit of burnt domestic material that included charred grain, quernstone, a range of broken Beaker vessels, worked bone, flintwork and daub. It is a non-typical Beaker funerary burial and has been identified as a ‘domestic’ burial – one of two that occur at Amesbury²²¹. The burial is that of a female juvenile (9-11 yr) and is directly dated by SUERC-54823:

- I2459/62014: 2460–2140 calBCE (3829±30 BP, SUERC-54823)

Two similar radiocarbon dates were obtained on short-lived plant remains from the underlying deposit. The dates are consistent with the British Chalcolithic and are similar to those obtained for burials 25004 and 1238 (see above).

Burial 62027 included a skull and was recovered from grave-like pit 62025, which may represent a revisited burial deposit that was manipulated in antiquity. The skull is directly dated by SUERC-53041:

- I2460/62027: 2030–1820 calBCE (3575±27 BP, SUERC-53041)

Burial 61231, made in grave 61230 and possibly covered by a flint cairn, was that of a female (17-19 years) placed with a number of amber spacer plates and two beads. Two statistically consistent radiocarbon dates (SUERC-49182 and SUERC-50639: X^2 $df=1$ $T=0.1$ (5% 3.8)) were obtained on the skeleton to confirm the date, which falls within the earlier part of the Middle Bronze Age. The grave cut a feature that contained a low carinated All-over-Combed Beaker.

- I2458/61231: 1490–1290 calBCE (3122±34 BP, SUERC-49182)

Porton Down (Wiltshire, England)

Contact person: Alistair Barclay

The site is located on Porton Down, 1.5 km east of the village of Porton and to the north-east of Salisbury. It was excavated during 2011 and 2015 by Wessex Archaeology²²². Burial 5108 (subadult female) was crouched and had the remains of a neonate placed over its shoulder and right arm. No grave goods were present. Ancient DNA data shows that the subadult female is the daughter of I2457/13382, who was excavated in Amesbury Down (5 km apart from Porton Down). A radiocarbon date was obtained from this female individual (SUERC-43374):

- I2600/5108: 2140-1940 calBCE (3646±27 BP, SUERC-43374)

The grave (5110) was a metre to the west of the central grave complex (5171) within a segmented ring-ditch. Radiocarbon dates indicate that both the ditch and the primary burial are of early Beaker or British Chalcolithic date. The ring-ditch contained a small cemetery of Beaker and early Bronze Age date and is noteworthy for its relatively high proportion of female and immature individuals. Other than pots, including Beakers, few of the burials contained grave goods.

We analysed one additional individual from this site. Grave 5117 contained an infant burial (5116: 6-9 months) with a small decorated Food Vessel. The aDNA analysis indicates that the skeleton is female.

- I2461/5117: 2150–1900 BCE (based on associated dates from other burials)

MOD Boscombe Down, Amesbury (Wiltshire, England)

Contact person: Alistair Barclay

The site is located within the area of MOD Boscombe Down and on part of what is known as Amesbury Down and forms part of the wider Stonehenge landscape²²³. The airfield contains numerous barrows and is just south of the Newton and Earl's Farm barrow groups and east of the important funerary landscape of Amesbury Down and its important Beaker burials (the 'Amesbury Archer' and the 'Boscombe Bowmen'). The burial, 62260_39, was found during the groundworks for a new fire hydrant. It had been badly disturbed but appeared to have been placed in a small oval grave that was covered by a cairn of flint nodules. The grave contained the burial of an adult male (35-45 yr) and four flint flakes. A radiocarbon date, NZA-28700, indicates that the burial was made towards the end of the early Bronze Age and after Beakers had gone out of use:

- I2464/62260_39: 1750–1610 calBCE (3379±30 BP, NZA-28700)

East Kent Access (Phase II) (Thanet, Kent, England)

Contact person: Alistair Barclay

The burials were found by Oxford Wessex Archaeology (Joint Venture) in excavations ahead of the construction of the East Kent Access Phase II road scheme (EXEKA09)²²⁴. Thanet is a former island on the most easterly point of Kent, an area well-known for its concentration of barrows. The three sampled burials are from two of ten barrows investigated on the route of the roadscheme, a number of which belong to larger barrow cemeteries.

Two of the burials, 126005 and 246136, were found within the interior of barrow 216090 (Zone 21) and are of early Bronze Age date. Burial 246136 contained the crouched skeleton of a probable female subadult/adult (16-19 yr) as well as a triple conjoined miniature Food Vessel, an amber button and a copper alloy pin. Burial 126005 contained the crouched remains of a probable female adult (40-55 yr). The third burial, 136128, was one of a series of burials found within barrow 134097/193125 (Zone 13). The grave (136129) contained the crouched skeleton of a probable adult male (35-45 yr). The fourth burial (220053) that of a female was part of a linear group of inhumation burials (Zone 21) and is directly dated by SUERC-40718.

Radiocarbon dating (SUERC-40713, 40718, 40290 and 40721) indicates that all four are similar in date and post-date the main period of Beaker use:

- I2601/EXEKA09_126005: 1960–1750 calBCE (3535±35 BP, SUERC-40713)
- I2602/EXEKA09_136128: 1900–1690 calBCE (3490±30 BP, SUERC-40290)
- I2463/EXEKA09_246136: 1930–1740 calBCE (3505±35 BP, SUERC-40721)
- I2462/EXEKA09_220053: 2130–1890 calBCE (3625±35 BP, SUERC-40718)

Totty Pot (Cheddar, Somerset, England)

Contact person: Thomas Booth

Totty Pot is a cave in the Mendip Hills located around 5km east of Cheddar village (ST 4825 5358)²²⁵. The cave was discovered by Christopher Hawkes in 1960 and was excavated by Hawkes, Willie Stanton and Wessex Cave Club between 1960 and 1965. The excavations uncovered a substantial collection of human and faunal bones as well as a small lithic assemblage dating typologically to the Mesolithic. A small excavation undertaken in 1998 by Gardiner and the University of Bristol found further Mesolithic stone tools as well as a few small sherds of pottery dating to Beaker, Bronze Age and Romano-British periods²²⁶.

Unfortunately, around half of the human bone assemblage was destroyed and the extant collection consists of just sixty identified elements. Representation of smaller skeletal elements as well as a lack of cortical weathering or scavenger gnawing suggests that individuals had been deliberately interred in the cave soon after death and decomposed *in situ*. At least six, but more likely seven, individuals are represented amongst the remains: three or four adults (possibly two males and two females), an older child (around 10-years-old) and two young children (2-3 and 3-6-years-old).

An adult left humerus and left femur (TP 1) produced radiocarbon dates in the earlier Late Mesolithic (7445-7080 calBCE (2-sigma combined, BM-2973, OxA-16457))²²⁷. However, radiocarbon dates from a further five long bones produced dates spread through the Neolithic. An adult left femur (TP 6, 3630-3370 calBCE, 2-sigma, OxA-16458) dated to the Early Neolithic. A right ulna from a 2-3-year-old child (TP 2004.9/419, 3355-3035 calBCE (2-sigma, OxA-16462)) an adult left femur (2004.9/68, 3340-3025 calBCE (2 sigma, OxA-16459)) and a right femur from a 3-5-year-old child

(TP'63, 3335-2930 (2-sigma, OxA-16461)) produced dates in the Middle Neolithic. A left femur from a 10-year-old child (TP 2004.9/257) dated to the Late Neolithic was analyzed with aDNA:

- I5374/TP 2004.9/257: 2830–2461 calBCE (4008±39 BP, OxA-16460)

Eton Rowing Course (South of Boveney Court, Buckinghamshire, England)

Contact person: Tim Allen

Skeleton 5587 was found at the Eton Rowing Course on gravel terrace deposits on the north bank of the river Thames (NGR 493533 177530), south of Boveney Court, Buckinghamshire. It lay within a grave on the north edge of a natural hollow that contained an extensive early Neolithic midden deposit, and which continued to receive material in the middle and late Neolithic and the Beaker period²²⁸. The grave was orientated ENE-WSW, and was 1.47m long and up to 0.66m wide, with a squared western end and a more pointed eastern end. Skeleton 5587 was tightly crouched in the central part of the grave, measuring 0.84m from head to toes. It was lying on its right side with the head to the west, and with the knees drawn up and the arms folded, the hands in front of the face. The skeleton was that of an adult female of 25-30 years. A sheep/goat mandible and a pike vertebra were recovered from the area between the ribs and arms, and five flint flakes or blades were also recovered from the grave fill. The radiocarbon date for this individual is:

- I2605/SK 5587 (DBC 96): 3632–2945 calBCE [3632–3373 calBCE (4710±35 BP, Poz-83483), 3369–2945 calBCE (4500±60 BP, BM-3173)]

We analysed one additional individual from this site:

- I2606/SK 5856 (DBC 96): 3330–2900 BCE

Banbury Lane (Northampton, Northamptonshire, England)

Contact person: Oliver Craig

The Banbury Lane site is located to the southwest of Northampton (SP 725 582) and was excavated by Northamptonshire Archaeology in 2012 in advance of a new housing development²²⁹. The main feature was a Neolithic triple-ditched circular enclosure monument. A large pit had been dug through the entranceway of the central ditch and

was found to contain the disarticulated and disordered remains of at least 145 individuals (Burial 1)²³⁰. The disarticulated remains of at least two young children had been deposited in the outermost ditch around the same time (Burial 2). A later satellite burial consisting of an unaccompanied single articulated adult skeleton was recovered around 30m to the southwest of the monument (Burial 3).

Human remains from the top and bottom layers of Burial 1 were radiocarbon dated by Museum of London Archaeology, Northampton and produced consistent British Middle Neolithic date ranges of 3360-3100 calBCE (2-sigma – unpublished) and 3360-3090 calBCE (2-sigma). All of the remains from Banbury Lane that were analysed with aDNA came from Burial 1:

- I0518/NBL11_2016.1: 3360–3100 BCE
- I0519/NBL11_2011.2: 3360–3100 BCE
- I0520/NBL11_2002.1: 3360–3100 BCE

Canada Farm (Sixpenny Handley, Dorset, England)

Contact person: Thomas Booth

Canada Farm is located on Cranborne Chase, near the village of Sixpenny Handley. The site originally consisted of a round barrow funerary monument surrounded by a two-phase penannular ditch, although the barrow mound has since been ploughed away^{231,232}. It was excavated in 2009 by Martin Green due to fears that it would eventually erode away. Nine post holes located immediately to the northwest of the ring ditch indicated the former presence of a circular wooden structure, possibly a mortuary house or excarnation platform. The excavations identified a central grave pit containing a single inhumation burial (F1). Four satellite inhumation burials (F4, F5, F6, F8) and a cremation inhumation (C1) had been cut into the second phase ditch, whilst one (F3) was located just outside. Superficially, the completeness and correct anatomical articulation of all of the skeletons suggested that they had been buried intact soon after death. However, osteological and microscopic analysis suggested that most of the bodies had been manipulated post mortem and that there had been a significant delay between their deaths and final burial.

F1 included the remains of a 25-30-year-old male on his left side facing east. The remains had probably been interred inside a wooden coffin, and were accompanied by a boar's tusk, an antler pendant or toggle, a flint flake and a Middle Rhine/Wessex style Beaker. The skeleton was complete and mostly articulated; however the mandible had been removed and placed in the northwest corner of the coffin. The proximal articular ends of both humeri were slightly out of anatomical articulation. Signs of carnivore-gnawing on some of the bones confirmed that there must have been a delay between this individual's death and burial. Two radiocarbon dates obtained from this skeleton (2620-2470 calBCE (2-sigma) and 2470-2290 calBCE (2-sigma)) were statistically inconsistent with one another. It has yet to be resolved which of these dates is likely to be most accurate, although both dates place the death of the individual at the beginning of the Beaker period in Britain. Both dates are anomalously early when compared to the typology of the accompanying Beaker pot, suggesting that the period between death and burial was likely to have been a century or more. The correct anatomical articulation of the skeleton inferred the persistence of substantial soft tissue. This observation, as well as results from the histological analysis of the femur from this skeleton, were consistent with this individual having been mummified previously. This Beaker-associated individual was analysed with aDNA:

- I5379/F1: 2470–2290 calBCE (3900±30, SUERC-32210)

Burial F3 was located just outside the ditch phases and included the unaccompanied remains of 12-13-year-old possible female buried supine with their legs flexed to the right and their head to the southwest. Osteological and microscopic analysis identified artificial drill holes in long bone diaphyses and epiphyses suggesting that the body had been subject to significant post mortem manipulation. Histological analysis of these bones indicated that the body had decomposed normally and that the drill holes may represent holes for dowels used to peg the decomposing body together. A Middle Bronze Age radiocarbon date was obtained from this skeleton (1620-1500 calBCE (2-sigma, NZA-34642)).

Burial F4 was cut into the second phase barrow ditch and contained the unaccompanied remains of an 18-19-year-old male buried supine and tightly flexed with their head to the southwest. Osteological examination found probable cut marks on the neck of the right scapula, indicating that this individual had also been manipulated post mortem. This Middle Bronze Age individual was analysed with aDNA:

- I3082/Burial F4: 1620-1390 calBCE (3157±25 BP, NZA-34643)

Burial F5 was also cut into the second phase ditch adjacent to F4. It included the remains of a 10-12-year-old possible male interred supine with their legs tightly flexed to the left and their head to the northeast. Drill holes similar to those found throughout the F3 skeleton were observed on a metacarpal from F5. Histological analysis of the tibia suggested F5 had been subject to similar post mortem treatment as F3. The F5 skeleton has not been radiocarbon dated but its proximity to F4 and similarity to F3 in terms of funerary treatment suggested that it dates to the Middle Bronze Age.

Burial F6 was cut into the second phase ditch and contained the unaccompanied remains of a 3-4-year-old child flexed on its left side with its head to the northeast. There was no osteological evidence for post mortem manipulation of the kind observed in the other skeletons and histological analysis was consistent with this individual having been buried intact soon after death. This skeleton has not been radiocarbon dated but was assumed to date to the Middle Bronze Age.

Burial F8 included the unaccompanied remains of a 17-25-year-old individual of indeterminate sex. The skeleton had been severely plough-damaged, making it difficult to determine its original position. Osteological analysis found no evidence for any additional post mortem treatment. Histological analysis of a long bone from this individual was consistent with them having been buried intact soon after death. This skeleton has not been radiocarbon dated but is assumed to date to the Middle Bronze Age.

Melton Quarry (North Ferriby, East Riding of Yorkshire, England)

Contact person: Fraser Brown

The site of Melton Quarry, Melton, North Ferriby, East Riding of Yorkshire (NGR SE 9684 2850) contained several burials associated with the ploughed-out remnants of a chalk and flint-rubble cairn. Earliest in the sequence, was Skeleton 1029: a tightly-flexed crouched burial of an older female, lying on her right side, with her head to the south-west, facing east. She lay in a shallow, oval scoop in the chalk bedrock and was accompanied by a copper-alloy awl. The grave had been backfilled with silty clay. Sealing the backfill, were the stones of the cairn, within which lay poorly-preserved Skeleton 1009: an adult of osteologically-indeterminate age and sex (genetically male),

in a north/south aligned crouched position, with her head facing south. Skeleton 1008 was a single metacarpal and part of the left femur of an Infant, aged between 2-4 months. This had possibly been placed between the crouched legs and the torso of Skeleton 1008. We recovered aDNA data from Skeleton 1009:

- I7630/Skeleton 1009: 1880–1692 calBCE (3458±27 BP, SUERC-72661)

Lesser Kelco Cave (Giggleswick Scar, North Yorkshire, England)

Contact: Tom Booth

The Kelco Caves, named Greater (or Old) Kelco and Lesser Kelco, are located at the base of a low limestone cliff within Kelco wood in Giggleswick Scar near the town of Settle in the North Yorkshire Dales^{233,234}. Greater Kelo cave has a long excavation history beginning in the 19th century, with the most recent excavations having taken place in the 1920s and 30s. Finds recovered from the cave include Roman pottery, other Roman objects and sherds of Late Neolithic Peterborough-ware pottery. A small assemblage of animal and human bones was also recovered from the cave. There is little documentation of the excavations, and hence there is no contextual information on the state of the human remains *in situ*. A small assemblage of human remains from Greater Kelco Cave is located in the private collections of Tom Lord at Lower Winskill Farm, but without documentation it is unclear whether this represents the whole or only part of original assemblage. A single mandible from the cave belonging to a child aged 2-5 years old is curated in the Craven Museum in Skipton.

The Lower Winskill Farm Greater Kelco human assemblage represents the remains of at least three adult individuals, two probable males and a probable female. The assemblage is highly fragmentary and mostly consists of long bones, with a noticeable absence of axial elements and crania. There is little evidence for cortical modifications indicative of subaerial exposure, suggesting that fresh bodies were originally interred in the cave. Assuming that the extant assemblage is representative of the whole, the conspicuous absence of skeletal elements suggests that remains were manipulated and selectively removed after the bodies had mostly skeletonised.

The entrance to the smaller Lesser Kelco Cave is located around 40 metres to west of Greater Kelco Cave. The site was excavated in two phases between 1928 and 1932 (Simpson 1950; Jackson 1962). Evidence for several hearths were found in the cave as

well as Roman pottery and objects, Neolithic Peterborough Ware pottery, a polished stone axe, a flint tool, a bronze coin and a sizeable assemblage of faunal remains representing various domesticated and wild species. These initial excavations recovered two human crania, two mandibles and some phalanges (Skulls 1 & 2). Two more human crania were subsequently recovered by two school boys between excavation seasons. An adult left ulna and right radius were recovered from a different part of the cave, near the entrance during excavations that took place at an unspecified later date.

The Lesser Kelco cave human assemblage is kept in the Lower Winskill Farm collection. However one of the human crania collected by the schoolboys, the mandibles and the phalanges are absent. The assemblage represents the remains of at least three individuals mostly represented by the three crania. Osteological analysis of the skulls determined that Skull 1 belonged to an adult female, Skull 2 to an adult male and the skull retrieved by the schoolboys (named Dr. Lovett's Skull, after the person who retrieved the skull from the schoolboys) was estimated to have belonged to an adult male. The original excavators had suggested that the predominance of crania in this assemblage was the result of post-cranial elements having been washed away. However, this seems to be an unlikely scenario given that cranial remains are usually more prone to fluvial transportation. It is more likely that the crania were brought to the cave after having been defleshed elsewhere. The lack of cut marks or evidence for cortical bone modifications indicative of sub-aerial exposure suggests that defleshing occurred in a sheltered environment. This is interesting in the context of the human bone assemblage from Greater Kelco Cave where cranial remains are largely absent. Assuming the Greater Kelco archive is representative of the original assemblage, it is possible that funerary activity in these caves was connected and that bodies had been left to skeletonise in Greater Kelco before the crania were retrieved and deposited in Lesser Kelco. One of the crania (Skull No. 1) has been radiocarbon dated to the Early Neolithic, which contrasted with the Late Neolithic Peterborough Ware pottery found in the cave. The radius and ulna from Lesser Kelco Cave differ from the rest of the assemblage in that they show dark staining and evidence of carnivore gnawing. The taphonomic history of these remains is clearly divergent from the cranial assemblage and it is possible that they date to a different archaeological phase.

DNA data from a sample of the petrous portion of the temporal bone from the dated Skull No. 1 was included in the study. The genetic data contradicted the osteological

assessment in suggesting that this individual was male, which may attest to the uncertainties in estimating sex from the cranium alone.

- I6759/Skull No. 1: 3650–3522 BCE

Raven Scar Cave (Ingleton, North Yorkshire, England)

Contact: Tom Booth

Raven Scar Cave is located close to the summit of Ingleborough Hill, the second-highest mountain in the North Yorkshire Dales. It was excavated in the 1970s by Danson and Dickinson and the finds are currently stored in the collection of Tom Lord at Lower Winskill Farm. Substantial human and faunal bone assemblages were recovered from the cave floors^{233,234}. At least 15 individuals are represented amongst the human bone assemblage, although only 4 individuals are represented by post-cranial material. This pattern of deposition suggested that cranial bones had been selectively deposited in the cave. The largest proportions of human remains were recovered from the lofty, domed Main Chamber immediately in front of the cave entrance. Part of the Main Chamber had been deliberately sectioned off with stones forming a cist-like structure. A narrow, twisting passage leads from the back of this chamber into the hillside.

The excavations and post-excavation analysis of the human remains defined a broad zonal structure to the cave reflecting the internal architecture and patterns of deposition. The human assemblage from the Main Chamber and front passage was dominated by juvenile cranial remains, particularly loose teeth. The loose teeth were distributed sporadically around the Main Chamber and front passage, but there were notable clusters of anterior dentition. Eight disarticulated mandibles were distributed through the Main Chamber and passageway. Skeletal part representation, particularly with regards to dentition, was much more proportionate in the middle and rear aspects of the passage. In addition, human bones from the middle and rear parts of the passage showed much higher occurrences of canid chewing and rodent gnawing than the remains from the front of the passage and Main Chamber. The bones from the rear of the passage mostly consisted of small bone fragments and splinters, suggesting that they represented a carnivore scat.

Leach argues that two discrete depositional processes present the simplest explanation for these taphonomic patterns. Firstly, a limited number of whole bodies were scavenged by carnivores and transported to the middle and rear aspects of the passage. These bodies were exposed in the cave entrance as part of excarnation rites or had been retrieved from outside the cave. The overrepresentation of cranial elements, particularly teeth, suggests that juvenile heads were deposited in the cave entrance and left to decompose, or perhaps to mummify. These heads were left long enough for the mandible and anterior teeth to disarticulate from the cranium. These elements are usually the first to detach from crania during early decomposition. The defleshed crania were then retrieved, leaving the anterior dentition and mandibles behind. The mandibles were then distributed through the chamber and passageways through further scavenger action. A discrete deposit of two disarticulated femora showing evidence for early post mortem breakage may represent a third discrete depositional practice.

Finds (metalwork, pottery, stone tools) dating typologically to prehistoric and Roman periods were found throughout the cave, although it is unclear whether they were associated with mortuary activity. Two human bones have been radiocarbon dated: a human humerus from the ‘carnivore accumulated’ assemblage which exhibited sharp-force trauma caused by a metal blade, and an isolated tooth from the Main Chamber. These bones were chosen to represent the two patterns of deposition (carnivore action versus selective deposition of cranial elements). The bones produced statistically indistinguishable dates in the Late Bronze Age (1025-911 calBCE (combined), OxA-13536, 2808±29, OxA-13535, 2832±29) suggesting that the assemblages were the result of contemporaneous exposure of bodies and selective deposition of cranial elements. These Late Bronze Age dates and interpretations of treatment are similar to those derived from a similar assemblage of human remains from Sculptor’s Cave, part of the Covesea Caves. Ancient DNA data from a petrous portion of a temporal bone retrieved from the Main Chamber and associated with the selective cranial deposition activity (Skull 1a) is included in this study.

- I5383/Skull 1a: 1090–900 BCE

Carsington Pasture Cave (Brassington, Derbyshire, England)

Contact Person: Tom Booth

Carsington Pasture Cave is located in the southern Peak District, around one kilometer east of Brassington village, Derbyshire. The cave was originally explored and excavated in 1998 by members of the Pegasus Caving Cub and archaeologists from the University of Sheffield, revealing three successive chambers joined by near-vertical passages^{235–237}. New explorations have periodically produced more finds from the cave, which are held in the collections of Andrew Chamberlain at the University of Manchester.

Large quantities of disarticulated human and faunal bone were recovered from all chambers and adjoining passages. The human bone was mostly concentrated in the second chamber and represented the remains of at least 20 individuals, mostly mature adults and neonatal infants. The neonatal infant remains were mostly complete, in partial articulation, and were concentrated in the centre of the second chamber, suggesting that this area was reserved for primary deposition of young infants. The adult bones were dispersed through the three chambers although skeletal part representation suggested that whole bodies were originally interred, with sediment and carnivore action (as indicated by telltale gnaw marks on a small proportion of bone surfaces) distributing the remains through the chambers over time. Very few dateable finds were recovered from the cave. However, a bone pin and a worked antler fragment dating typologically to the Bronze Age and Neolithic respectively were found in the second chamber. Roman pottery and coins found in passages leading off from the entrance chamber and evidence for post-medieval mining suggested that the cave was continuously accessible.

Ancient DNA data was obtained for this project from a disarticulated adult left femur from the second chamber that was originally mistakenly associated with a mostly-complete partially articulated adult male skeleton known as ‘Sven’. Histological analysis of the femur found that it was remarkably well-preserved, suggesting that the conditions in Carsington Pasture Cave had inhibited decomposition, or that the individual had been excarnated or dismembered. This femur was radiocarbon dated to the British Early Neolithic:

- I3068/CPC03066: 3692–3522 calBCE (4820±34 BP, UBA-29003)

A pair of cut marked femora, possibly from the same individual, were recovered from the passageway between the 2nd and 3rd chambers. The distribution of cutmarks suggested that this individual had been dismembered rather than defleshed. Histological analysis of one of these femora found that it was remarkably well-preserved consistent with dismemberment soon after death (Booth 2016). An initial radiocarbon date obtained from this bone placed it in the Late Neolithic or Copper Age, however there were some technical questions about its date's reliability. Redating produced a Beaker/Early Bronze Age date, which is taken to be the more reliable of the two. Ancient DNA data from this femur was used in this study:

- I5373/CPC98314: 2195–1981 calBCE (3694±25 BP, BRAMS-1230)

Cissbury Flint Mine (Worthing, West Sussex, England)

Contact Person: Tom Booth

Flint mines are one of the earliest aspects of the Neolithic cultural package that appears in Britain, with recent modelling of radiocarbon dates placing their earliest occurrence at c.4000-3800 BCE in southeast England²¹⁸. Flint was used by Neolithic people primarily for making stone axeheads, and would have been readily retrievable from the ground surface^{238,239}. The mines are thought to have facilitated the acquisition of higher-quality flint. The mines were dug using antler picks and consist of deep vertical shafts with several horizontal galleries extending outwards from the bottom. Human remains are rarely recovered from flint mines and these contexts are not usually regarded as typical mortuary sites. Many of the human skeletons recovered from the mines have been regarded as the victims of accidents or cave-ins. However, a strict functional interpretation of Neolithic flint mines has been challenged more recently with the disparity between the considerable effort it would have taken to dig the mines and the marginal improvement in the quality of stone suggesting that the mines should be regarded as ritual monumental structures^{240–242}. Many of the Early Neolithic mines show evidence for ritual behavior in the form of artistic engravings on the mine walls as well as on small chalk blocks. Some human skeletons deposited in flint mines show signs of having been subject to formal burial.

The Cissbury flint mine was originally excavated by a group of antiquarians in the late 19th century, and was further excavated by John Pull between 1953 and 1955. The site

archive is currently stored in Worthing Museum. The Cissbury Mine belongs to an early group of flint mines on the West Sussex Downs and may be the earliest example from Britain. It is composed of 200 shafts up to 12 metres deep. Like many of the other Early Neolithic Flint mines, Cissbury includes engraved walls and small chalk blocks. Two human skeletons were recovered from the galleries during the 19th century excavations, and both were interpreted to represent the result of fatal mining accidents. A third human skeleton was found at the entrance to Gallery 1 in Shaft 27. This individual was an adult of indeterminable sex in an extended position, accompanied by a series of carved chalk objects. The presence of arranged chalk carvings suggested that this skeleton represented a formal burial. The burial was part of the final sequence of deposits and may have formed part of a ritual closing of the mine shaft. The upper right third molar of this skeleton was radiocarbon dated to the British Early Neolithic. Ancient DNA data generated from a bone sample extracted from the petrous portion of the temporal bone of this individual was included in this study:

- I5366/Shaft 27: 3644–3384 calBCE (4775±34 BP, OxA-34470)

Ditchling Road (Brighton, Sussex, England)

Contact: Tom Booth

The Ditchling Road Beaker burial was excavated in 1921 as part of preparations for the eponymous road to the south of Stanmer Park in Brighton, Sussex. It consisted of a flat shallow earthen grave containing the skeleton of a 25-35-year-old male in a flexed position on his left side with his head to the northeast facing southeast. The skeleton was accompanied by barbed flint arrowhead recovered from beneath the skull and a Beaker positioned next to his legs. A quantity of snail shells from a variety of species had been placed in front of its mouth. The skeleton is curated at Brighton Museum and Art Gallery. Ancient DNA data from a sample of the petrous portion of the temporal bone of this individual were included in this study.

- I6774/R2315/3: 2287-2044 calBCE (3760±30 BP, SUERC-74755)

Neale's Cave (Paington, Devon, England)

Contact person: Tom Booth

Neale's Cave (also known as Lynx Cave) is located inside the grounds of Paington Zoo near the town of Paington in Devon. It was excavated in 1958-59 by Neale and Sutcliffe²⁴³⁻²⁴⁵. The cave is best known for its assemblage of faunal remains, which includes horse, reindeer, red fox, hare, wolf, red deer, cattle, lynx, badger and mole. The lack of any unambiguous domestic species suggested that remains represented a Mesolithic or mixed Mesolithic/Late Glacial assemblage. One of the horse bones produced a Late Glacial radiocarbon date 10,603-10,097 calBCE (10420±75, OxA-6670) during the Younger Dryas climatic event²⁴⁶. The site archive is curated in the Natural History Museum in London.

The Neale's Cave assemblage also included fragments of human cranium representing at least one individual. Osteological assessment suggested that at least one adult of indeterminable sex was represented. The lack of any postcranial elements may suggest that the body was defleshed elsewhere before the cranium was deposited in the cave. No datable archaeological artefacts were recovered from Neale's Cave, but the nature of the faunal assemblage suggested that the human remains dated to the Mesolithic. However, radiocarbon dating of one of the cranial fragments (NHM EM.425) produced an Early Bronze Age date (Rick Schulting, pers. comm.). DNA data from a sample of a petrous process of a temporal bone (NHM EM.588) from Neale's Cave were included in this study. As all of the cranial bones could have come from one individual, it is likely, although not guaranteed, that the temporal bone came from the same person as the dated cranial fragment.

- I5441/EM.588: 2000–1600 BCE

Nr. Ablington (Figheldean, England)

Contact person: David Dawson

Primary burial with a long necked Beaker found within barrow G25 (11) and reported on by Hawley²⁴⁷ at Barrow Clump, near Ablington. Parts of three individuals are represented within the collection of bones.

We analysed one individual from this site:

- I5513/DZSWS:X146.1 b: 2500–1800 BCE

Nr. Millbarrow (Winterbourne Monkton, Wiltshire, England)

Contact person: David Dawson

A cist burial some 300 yards from Millbarrow and over a mile north of Avebury was discovered in 1855 by workmen on land owned by Mr Eyles. The circular cist was capped by a large sarsen stone and had been cut into the natural chalk²⁴⁸. It contained the disarticulated remains of four or five skeletons. Hillier's account notes that there were no finds. The account notes that no finds were recovered, although the museum records list a Beaker. One individual dated to the Neolithic period was sampled:

- I4949/DZSWS:C.11a: 3630–3377 calBCE (4715±20 BP, PSUAMS-2513)

River Thames (Mortlake/Syon Reach, London, England)

Contact person: Tom Booth

Hundreds of human crania have been dredged from the River Thames, particularly during the Victorian period, with most recent finds deposited in the Museum of London or London's Natural History Museum^{249,250}. There are notable clusters of find spots for human crania along the river, the most prolific being Mortlake, Hammersmith and Kew, Walthamstow and Battersea. These foci partly relate to the frequency of dredging activity, but also parts of river with high sedimentation rates or tight bends that 'catch' loose crania. Crania are highly mobile in an aquatic environment, therefore it is difficult to assess the significance of their disassociation from the post-cranial remains. They could reflect the remnants of various different rites, including 'water burial', involving river-deposition of whole bodies, erosion of burials from the riverbank or deposition of defleshed crania. As most crania were not recovered from their original depositional contexts, they were not usually accompanied by dateable material, although in a few cases crania were tentatively associated with metalwork or stone tools.

Radiocarbon dating programmes targeting the Thames skull collections have produced dates ranging from the Neolithic to Medieval periods²⁵¹. However, there is a concentration of dated crania in Later Prehistory and the Middle-Late Bronze Age specifically. The distribution of Bronze Age Thames crania broadly corresponds with finds of contemporaneous metalwork, which echoes a broader Bronze Age European

pattern of ritual deposition of metalwork and human remains in wet environments. Considered within this European context, it has been argued tentatively that the Bronze Age Thames crania reflect this tradition of ritual deposition.

A cranium of a possible adult male with three healed blunt force trauma injuries was recovered from the Syon Reach stretch of the Thames, in Twickenham and is currently kept in the Museum of London collections. Most of the crania recovered from the Thames show dark staining as a result of long term burial in anoxic river sediments. The Syon Reach cranium is one of a minority that show little staining, suggesting that it had been deposited in the river relatively recently and had probably eroded out of a terrestrial burial. The radiocarbon date of this cranium places the date of death in the Beaker period. Ancient DNA data from this individual was included in this study and suggests that they are actually female, which is indicative of the uncertainties of sexing ancient skeletons based on the cranium alone:

- I5376/A13603: 2457–2142 calBCE (3819±33 BP, OxA-14728)

A cranium of indeterminate sex that is currently held in the collections at the Museum of London was one of 46 recovered from the Mortlake docks. The cranium had been stained dark brown suggesting that it had lain in river sediment for a significant time and had originally been deposited in the river either as part of a whole body or a defleshed bone. The radiocarbon date of this cranium placed it in the Early Bronze Age. Ancient DNA data from this individual is included in the study:

- I5377/A13495: 1900–1690 calBCE (3485±33 BP, OxA-14731)

Samborzec (Małopolska, Poland)

Contact person: Piotr Włodarczak

The site was located on the loess upland in the vicinity of the Vistula valley (western Małopolska; SE Poland). The excavations were conducted in the 1960s²⁵². A complex of small cemeteries dated to the late and final Neolithic has been found (Złota, Corded Ware and Bell Beaker graves). The cemetery from the Bell Beaker period consisted of 10 graves. The features were linearly structured and oriented on the N-S axis. Grave pits presented simple rectangular constructions without any additional outer elements. The deceased were lying in contracted position, males to the left side and women to the right side. Their equipment was typical for the Eastern group of the Beaker complex.

Anthropologically, the skeletons from Samborzec show very characteristic morphological traits distinguishing them from other Neolithic and Early Bronze groups from SE Poland. The skulls are classified as short or very short. Their main characteristic is the shape of the back part, namely the distinct flattening of the upper part of the occipital bone and of an area of the parietal bone²⁵³. Such a morphology suggests that this population was genetically foreign to the territory of Małopolska. We obtained genome-wide ancient DNA data from three individuals:

- I4251/RISE1122/grave no. 7: 2432–2151 calBCE (3825±25 BP, PSUAMS-2321). Male inhumation burial (25–30 years) with northwest-southeast orientation, located on the left side. The grave goods consisted of two vessels (bowl and unornamented cup), a flint blade dagger and a flint scraper.
- I4252/RISE1123/grave no. 1: 2286–2139 calBCE (3780±20 BP, PSUAMS-2338). Child inhumation burial (11–13 years; genetically male) with northeast-southwest orientation, located on the left side. There was a ceramic bowl and an undecorated cup.
- I4253/RISE1124/grave no. 13: 2457–2208 calBCE (3850±20 BP, PSUAMS-2339). Male inhumation burial (25–30 years), with N–S orientation, located on the left side. The only element of equipment was a ceramic bowl, posed in the northern part of the grave.

Dzielnica (site 17, woj. opolskie, Upper Silesia/Górny Śląsk, Poland)

Contact person: Mirosław Furmanek, Agata Hałuszko, Artur Rapiński

The site Dzielnica 17 is located on the left bank of the Odra river, between Kędzierzyn-Koźle and Racibórz. The excavation of the site has continued since 2004. The fieldwork led to the uncovering the Linear Pottery culture, Stroke Ornamented Ware culture and Lengyel culture settlements, a Lengyel culture enclosure, Bronze Age settlements and a Corded Ware culture burial. In 2015–2017, three burials of the Bell Beaker culture and 9 burials of the Chłopice-Veselé culture were uncovered. The burial ground probably documented cultural transformation from the Eneolithic Bell Beaker culture to the Early Bronze age.

Two samples were analysed but only one yielded genome-wide data:

- I6531/HB0068, feature 243: 2287–2039 calBCE (3755±35 BP, Poz-86947). This burial contained the remains of an adult male 35–39 years old at death. The individual

was placed on the right side with legs bent in the knees with head toward the north and facing west. The grave goods included: an undecorated cup, a flint heart-shaped arrowhead, a bone awl and a flint blade.

Iwiny (site 13, woj. dolnośląskie, Lower Silesia/Dolny Śląsk, Poland)

Contact person: Agata Hałaszk

The site Iwiny 13 is located about 8 km south of Wrocław. A rescue excavation was undertaken during construction works of an eastern road ring for Wrocław by archaeologists of the archaeological company (In Situ Roland Marek, Mateusz Krupski, Łukasz Lisiecki). Several traces of settlement from various periods and 3 graves were uncovered.

Feature 83 was a partly destroyed burial of a female adult 40-50 years old at death. She was lying on her right side, in crouched position with her head to the south. Probably the only grave good was a destroyed vessel. Pathological lesions were visible on the skull (presence of chronic otitis media, mastoiditis, multiple minor injuries) and on both tibia (periostitis). The radiocarbon data for this individual is:

- I6579/HB0022, grave 83: 2336-2047 calBCE (3780±35 BP, Poz-75954)

Jordanów Śląski (site 7, woj. dolnośląskie, Lower Silesia/Dolny Śląsk, Poland)

Contact person: Agata Hałaszk

In 2014 during rescue excavation conducted by archaeological company Akme Zdzisław Wiśniewski sp. z o. o. (under the direction of Małgorzata Opalińska-Kwaśnica and Przemysław Guszpit) a single Bell Beaker burial was uncovered. The grave (feature 14) was partly destroyed, and only the lower part of the skeleton and a few fragments of skull were preserved. The grave contained the burial of a 20-28-year-old male, lying on his left side following a south-north axis with skull in the north and flexed legs. The only grave good was an unornamented cup. A petrous bone was successfully analysed:

- I6580/HB0024, feature 14: 2300-2150 BCE

Kornice (site 33, woj. śląskie, Upper Silesia/Górny Śląsk, Poland)

Contact person: *Mirosław Furmanek, Agata Hałaszkó, Maksym Mackiewicz*

The site Kornice 33 is situated on the left bank of the Psina river around 8 km west of Racibórz, in a region located in the foreground of the Moravian Gate, playing a vital role in the communication and transmission of the cultural patterns between areas situated south of the Carpathians and Sudetes and Northern Europe. The rescue excavation ahead of the development of the window factory Eko-Okna started in 2008-2009 (Elwira Holc, Ewa Matuszczyk, Jan Chochorowski) and has continued in a large-scale from 2013 by the Science Foundation “Archaeologia Silesiae” covering an area of over 30 hectares²⁵⁴. The fieldwork led to the uncovering of Upper Palaeolithic activities, Neolithic settlements including a vast Globular Amphora culture settlement with trapezoidal longhouses, a small occupational complex of a cemetery and a Bell Beaker settlement, two small early Bronze Age cemeteries, a multi-phase Bronze Age open and enclosed settlement with cemetery, a Roman Period settlement, an Early Medieval cemetery and a Late Medieval village. The Bell Beaker cemetery was excavated in 2013 and 2015 and comprise 8 graves. The preservation of osteological material was variable due to the local variability of soil’s chemical properties. The deceased were buried in rectangular-shaped pits and oriented along north-northwest – south-southwest axis. A ring ditch with diameter of c. 4.7 m and no central burial may also be related to the Bell Beaker culture.

We obtained genome-wide ancient DNA data from four individuals from the Bell Beaker cemetery:

- I6534/HB0030, feature 14/15: 2457-2150 calBCE (3830±35 BP, Poz-75936). Skeleton of a young male (12-16 years old) was placed on the left side with head toward the north and facing east. On the right ilium pathological lesions of probably cancer or tuberculosis were visible. The grave goods comprised three undecorated vessels (a bowl and two cups).
- I6535/HB0032, feature 1562/13: 2464-2206 calBCE (3860±40 BP, Poz-66259). It contained the remains of juvenile male (15-20 years old). Endocranial porosity of unknown origin was observed on his left parietal bone. The grave goods comprised three undecorated vessels (a bowl and two cups) and a retouched flint flake made of local erratic raw material. The bowl contained poorly preserved animal bones, most

likely the remains of food offerings. Genetic data show that he was brother of individual I6582/HB0040 (feature 34/15).

- I6581/HB0031, feature 1561/13: 2456-2146 calBCE (3825±35 BP, Poz-66185). The burial contained remains of an adult male (30-35 years old at the death). The deceased was positioned on his back, with legs bent at the knees at a sharp angle and strongly bent arms with hands placed on the shoulders. The grave goods comprised three vessels (an ornamented four-footed bowl decorated on the rim and two cups). The bowl contained poorly preserved animal bones, most likely the remains of food offerings. Multiple palaeopathologies were identified on these skeletal remains. Some lesions may be evidence of episodes of violence or other circumstances resulting in head injury. The high degree of teeth wear can be caused by frequent clenching and “grinding” affected by using them in a tool-like manner or bruxism resulted by chronic stress. Other traits identified on lower limb bones indicate that the individual most frequently assumed in sitting position, with his thighs and shanks in one/almost one plane. Poirier’s facet, often observed in horse riders, is evident. The combination of traits observed on the humerus may have resulted from using a bow. Genetic data show that he was father of individual I6535/HB0032 (feature 1562/13) and individual I6582/HB0040 (feature 34/15).

- I6582/HB0040, feature 34/15: 2344-2058 calBCE (3790±35 BP, Poz-75951). The burial contained remains of a 20-25-year-old female. The deceased was positioned on his back with head toward the south and facing east and legs bent at the knees. The grave goods comprised three vessels, V-perforated bone buttons, series of amber beads and a pair of silver ear-rings.

Racibórz-Stara Wieś (Cegielniana Street, woj. śląskie, Upper Silesia/Górny Śląsk, Poland)

Contact person: Agata Hałaszkó

The site is located on the left bank of the Odra river, in northwest part of Racibórz. The grave was uncovered as an accidental discovery during agricultural work in 2012 and then excavated by the team of the Museum in Racibórz (Romuald Turakiewicz, Marcin Rezner). It contained a 41-47-year-old male in flexed position lying on its right side with northeast–southwest orientation and the head to the southwest. The grave goods

consisted of one stone battle axe, an unornamented cup, a flint arrowhead, two Štramberk points, a flint perforator, retouched blades and a flint retouched flake. The burial is considered to belong to the Chłopice-Veselé culture. The radiocarbon date for this individual is:

- I6537/HB0049 – grave 1: 2291-2042 calBCE (3765±35 BP, Poz-54136)

Strachów (woj. dolnośląskie, Lower Silesia/Dolny Śląsk, Poland)

Contact person: Mirosław Furmanek, Agata Hałaszkó

This single Bell Beaker grave was excavated in 1971 by Elżbieta Noworyta (The Museum of Archaeology in Wrocław)²⁵⁵. The site is situated 800 m north of Strachów. The excavations of the site were conducted in 1969-1973 and led to the uncovering of numerous settlements from the Neolithic, Hallstatt, Roman and Early Medieval periods. The grave contained the burial of an adult female (25-30 years old), lying on his back following a south-north axis with skull in the south and flexed legs. The grave goods consisted of a broad metop-decorated cup, 8 V-perforated bone buttons and 2 amber pendants. Archaeological artefacts and a skeleton are stored in Muzeum Ślązańskie in Sobótka (thanks to Wojciech Fabisiak). The radiocarbon date for this individual is later than expected and does not match the archaeological context:

- I6538/HB0057, grave 1: 2009-1766 calBCE (3545±35 BP, Poz-86950)

Żerniki Wielkie (site 1, woj. dolnośląskie, Lower Silesia/Dolny Śląsk, Poland)

Contact person: Mirosław Furmanek, Agata Hałaszkó

The grave was undercover as an accidental discovery during sand extraction in 1965 and studied by S. Pazda and J. Lodowski²⁵⁶. The grave contained the burial of an adult female (24-29 years old) and partly preserved grave goods: a cup and a four-footed bowl. The radiocarbon date for this individual is:

- I6583/HB0056, grave 1: 2290-2051 calBCE (3770±30 BP, Poz-65207)

Budakalász, Csajerszke (M0 Site 12) (Hungary)

Contact person: András Czene

The burial site of Budakalász is situated 1 km north of the boundary of Budapest, on the right side of the Danube. A total of 4 hectares of the cemetery area were excavated in 2005–2006 and 3 more acres were surveyed by sounding trenches around the excavated part of the cemetery. In this area, 943 graves from the Bell Beaker period have been found. Most graves are cremation graves with the ashes in urns. The 58 inhumed burials usually follow a north-south orientation, and occasionally a south-north one. The deceased usually lay on their side, in a slightly contracted position. The most frequent types of grave goods are bowls and jugs laid by the feet. Copper objects, daggers, wrist-guards, arrow heads were usually placed by the arm. Ongoing stable isotope analyses and radiocarbon dates will be published in separate studies (Czene in prep., Kulcsár et al. in prep).

Grave 276 (I3528, GEN 85): Skeletal male burial with north-south orientation, located on the left side, legs bent at the knees. At the southern part of the grave vessels and two stone artefacts were found.

- I3528/GEN85/Grave276: 2559–2301 calBCE (3931±31 BP, DeA-11507)

Grave 597 (I3529, GEN 86): Skeletal female burial with a south-north orientation, located on the right side, legs bent at the knees. A vessel was placed at the legs and two small bone buttons with V-shape perforation were found at the neck and at the inner part of the right arm.

- I3529/GEN86/Grave597: 2500–2200 BCE

Budapest-Békásmegyer, Királyok útja (former Vöröshadsereg útja) (Hungary)

Contact person: Anna Endrődi, Gabriella Kulcsár

The site is situated in northern part of Budapest, on the western bank of the Danube River. Rózsa Kalicz-Schreiber uncovered 154 burials of the cemetery between 1960 and 1983, at Budapest, Békásmegyer–Királyok útja. The cemetery, according to her estimates, had originally contained between 200–300 hundred graves. Inurned burials dominated in the investigated cemetery section covering an area of 7700 m². The

inhumation burials of the Békásmegyer cemetery contained jugs of the southern type rather than the Bell Beakers type. No more than four of the 30 inhumation graves yielded genuine Bell Beakers, while five contained various elements of the Beaker package such as stone wrist-guards, stone arrow-heads and bone buttons with V-shaped perforation. Jugs of the southern, Somogyvár–Vinkovci/proto-Nagyrev type were deposited in 15 inhumation burials; nine inhumation graves did not contain any grave goods. Eighteen of the 28 scattered cremation burials contained genuine Bell Beakers, while three yielded locally made copies or bowls with a stamped rim. New radiocarbon dates were generated for three burials of the Budapest–Békásmegyer cemetery. The individuals taken from inhumation burials yielded roughly similar dates for the cemetery section: 3845±36 BP (Grave 193; DeA-2875), 3831±35 BP (Grave 432a; DeA-2876), 3874±33 BP (Grave 445; DeA-2877). A Bayesian analysis of the three AMS dates from the cemetery dates its use to approximately 2410–2220 calBCE²⁵⁷.

Grave 219/B (I2364, GEN 10a): Double burial excavated in 1966. Two individuals were lying on their right side in contracted position, without grave goods. Individual B is an adult male. The radiocarbon date for this individual is:

- I2364/GEN_10a, Grave 219/B: 2470–2060 calBCE [2295–2060 calBCE (3779±28 BP, DeA-6749); 2470–2285 calBCE (3883±29 BP, DeA-7216)]

Grave 445 (I5015, RISE557): Burial of an adult female lying on her right side, in contracted position, excavated in 1982. The skeleton was incomplete, and oriented south to north, with hyper-flexed legs. Pottery grave good (a jug) was situated beside the lower leg, at the northwestern part of the grave pit.

- I5015/RISE557/F0158/Grave 445: 2467–2211 calBCE (3874±33 BP, DeA-2877)

Grave 452 (I2365, GEN 11a): Burial of an adult male lying on his left side, in contracted position, excavated in 1982. The skeleton was incomplete, and oriented north-northwest to south-southeast, with hyper-flexed legs. Pottery grave goods (a Bell Beaker, an urn, a bowl, and a jug) were situated beside the lower leg, at the southern part of the grave pit. Other grave goods include an arrowhead, and two stone tools.

- I2365/GEN_11a/Grave 452: 2465–2205 calBCE [2465–2205 calBCE (3858±32 BP, DeA-6762); 2465–2213 calBCE (3871±29 BP, DeA-7220)]

Szigetszentmiklós, Felső Úrge-hegyi dűlő (Hungary)

Contact person: Róbert Patay

The cemetery is located in the northwestern part of Csepel Island near Budapest. The archaeological investigation of the site was conducted between 2006 and 2007. A total of 716 features were uncovered, amongst them 218 burials of the Bell Beaker period. One remarkable feature of this burial ground is the unusually high proportion of inhumation burials: 102 graves of the 218 excavated graves were inhumations. Another element of the central European funerary tradition could also be documented in the Szigetszentmiklós cemetery, namely inhumation performed according to strict rites. The proportion of the deceased laid on the right and the left side was roughly equal and they were oriented either northeast-southwest or southwest-northeast. Anthropological analysis of the skeletal remains indicated that men were always interred on their left side, while women were laid to rest on their right side, with the face turned toward the east in the case of both male and female burials. A comparable burial practice was observed in cemeteries of the Bell Beaker East Group in central Europe.

A series of five AMS radiocarbon dates from the cemetery can be subjected to Bayesian analysis. If we assume that the graves represent a single phase, the time span of the use of the cemetery can be placed to approximately 2420–2190 calBCE^{257,258}.

Grave 49 (I2741, GEN 20): Male individual lying on his left side, in contracted position. The rectangular shaped grave pit, oriented northeast–southwest, was enclosed by a round ditch. Grave goods include a Bell Beaker, a bowl, a stone wrist-guard and a dagger. The radiocarbon date for this individual is:

- I2741/GEN_20, Grave 49: 2458–2154 calBCE (3835±35 BP, Poz-83641)

Grave 133 (I2786, GEN 56): Male individual lying on his left side, in contracted position. The rectangular shaped grave pit, oriented northeast–southwest, was enclosed by a round ditch. Grave goods include a bowl, a jug, and a stone silex. The radiocarbon date for this individual is:

- I2786/GEN_56, Grave 133: 2459–2206 calBCE (3850±35 BP, Poz-83639)

Grave 552 (I4178, GEN 58): Male individual lying on his left side, in contracted position. The rectangular shaped grave pit, oriented northeast–southwest, was enclosed by a round ditch. Grave goods include a Bell Beaker, and a bowl.

- I4178/GEN_58/Grave 552: 2500–2200 BCE

Grave 688 (I2787, GEN 59): Male individual lying on his left side, in contracted position. The rectangular shaped grave pit, oriented northeast–southwest, was enclosed by a round ditch. Grave goods include a small jar. The radiocarbon date is:

- I2787/GEN_59/Grave 688: 2458–2202 calBCE (3840±35 BP, Poz-83640)

Szigetszentmiklós-Üdülősor (Hungary)

Contact person: Anna Endrődi

The archaeological site of Szigetszentmiklós-Üdülősor is situated on a wide elevation in the Danube flood. A rescue excavation in 1988 and 1989 was performed on Csepel island, 3 km off the administrative border of Budapest, 100 m off the bank of the Soroksár-branch of the Danube, on the trace of motorway M0. Refuse pits, houses and graves were revealed within the excavated area. Based on the evidence of the revealed periods (MCA/Ludanice culture, LCA/Kostolac culture, Bell Beaker culture, Celtic Period, Medieval Árpadian Age) it was a large, long-lived place. On the excavated 2,500 m² area, during the 1988–89 campaign in Szigetszentmiklós-Üdülősor 150 Bell Beaker archaeological features were unearthed: refuse pits, a timber-framed house and 15 graves. Farther, 350 m off the settlement a grave-group was excavated with a skeleton grave, 12 urn graves and other type of cremation graves where the ashes were scattered onto the bottom of the grave.

Later, in 2008, the excavations were continued as part of the salvage operation preceding the enlargement of M0 Motorway. The number of features yielding finds of the Bell Beaker–Csepel group is 767 (together with the ones from the 1988–89 season). The overall extent of the Early Bronze Age settlement uncovered to date is *ca.* 14,000 m². During the 2008 campaign, another 51 graves were unearthed at this site. Most of these graves were urn graves, a few were scattered cremation burials and a single grave was a symbolic one (containing no ashes).

In summary, the total number of excavated graves was 67 (together with the symbolic one). The graves were found farther from the settlement and the Danube, in line with the cemetery section investigated earlier. Five skeletons thrown into the pits were unearthed at the edge of the settlement closer to the Danube: Features 1, 12, 119, 244, 458. In 4 cases the skeletons lay in an unusual position. Three of these burials did not

have any grave goods, while the Feature 12 contained an early Nagyrév cup with the mouth downward placed next to the body laid face down.

The analogies of the archaeological material excavated from Szigetszentmiklós-Üdülősor settlement and grave group can be found among the well-known assemblages of the Csepel group of the Bell Beaker culture. The assemblages dated to the EBA II/b in the neighbourhood of Budapest are related to the early phase of the Nagyrév culture and not to the Bell Beaker culture. There is very little typological relationship with the Bell Beaker culture, which means that early Nagyrév finds occur in and nearby Budapest too. There is an interaction between the assimilating Bell Beaker and early Nagyrév cultures marking the beginning of the period. The process came to an end at the end of the early Nagyrév culture. The assemblages of the settlement and cemetery in Szigetszentmiklós-Üdülősor prove that the infiltration of the Bell Beaker Complex is a reality at the end of the EBA I/a (end of the Makó phase), and it must have preceded the development of the Nagyrév culture in the area nearby Budapest. People of the Bell Beaker Complex merged into the local inhabitants gradually. This integrating process already began in the EBA II/a – this period is contemporary with the early phase of the Nagyrév culture, with Somogyvár-Vinkovci II, Člópice-Veselé, Nyírség and Óbéba-Pitvaros cultures²⁵⁹.

The observations made at Szigetszentmiklós-Üdülősor, namely the buried vessel depot of eight intact vessels from the Feature 779, the graves containing bodies in an unusual position forming a distinct cluster at the edge of the cemetery, separate from the Bell Beaker–Csepel burial ground, the grave pottery deposited with the mouth downward suggest that the individuals belonging to proto- (early) Nagyrév community were presumably treated as “enemies”. Wedged into the heartland of the proto-Nagyrév culture, the Bell Beaker-Csepel communities controlled the strategic areas on the Danube and on the eastern fringes of the Beaker distribution²⁶⁰.

We analysed 6 individuals from this site:

Grave 1 (I7045/HUNG499): A pit with a female (40-50 years old) individual in contracted position that was revealed within the settlement. The filling of this pit was different from the other features of the settlement²⁶¹; it was yellowish clay from the subsoil. The pit was oval, with curved bottom. The SE-NW oriented skeleton was laid on its right side, close to the SW wall of the pit. The right hand was under the face and

the left arm in front of the face. Finds of the pit/Bell Beaker period: handled jug with biconical body and a slightly curving rim situated next to the grave, handled bowl with T-shaped rim located in the northern part of the grave, fragments of a badly preserved pot in front of the skeleton (which was disintegrated during excavation), fragments of grindstones, antler tools in front of the knee and copper wire found close to the cranium.

- I7045/HUNG499/Grave 1: 2500–2200 BCE

Grave 13 (I7044/HUNG498): Inhumation grave in contracted position. The trace of the grave pit was not observable. The S-N oriented male (50-70 years old) individual laid on its right side²⁶¹. The arms were located in front of the ribs, the legs were bent in knee. The grave goods were next to the pelvis, behind the skeleton. Finds/Bell Beaker period: handled jug with biconical body and a slightly outward-curving rim, handled bowl with short curved neck and with 4 little symmetrical handles.

- I7044/HUNG498/Grave 13: 2500–2200 BCE

Grave 12 (I7041/HUNG495t): Round pit (size: 128×130 cm, depth: -79 cm) with light brown homogeneous filling and hard clay wall. On the straight bottom of the pit a N-S oriented male (20-25 years old) individual was unearthed, laid on its left side but in abnormal prone position. The left arm was under the body, whilst the right one was close to the upper part of the body. Both arms were bent back (the right hand was just under the scapula); both hands were in front of the cranium; both legs were bent in knee. Finds/proto-Nagyrév period: a little handled, profiled cup, upside down in depth - 63 cm, next to the eastern wall of the pit. Some sherds appeared above the skeleton and could be remains of intentionally broken vessels²⁶⁰. This individual is a brother of I7043.

- I7041/HUNG495t/Grave 12: 2500–2200 BCE

Grave 244 (I7042/HUNG496): Round pit with cylindrical wall and straight bottom. On the bottom of the pit a child (10-12 years old; male according to genetic sex) individual in unusual, unfolded position was revealed, without any grave goods. The cranium was located on its left side, close to the southern wall of the pit. Orientation: SSW-NNE. The lower limbs were on the right side of the body. This skeleton is a typical “thrown-in” body and could be presumably dated to the early phase of the Nagyrév culture²⁶⁰.

- I7042/HUNG496/Grave 244: 2500–2200 BCE

Grave 119 (I7043/HUNG497): Round pit with cylindrical wall (with a slightly concave part on the eastern side) and with curved bottom. On the bottom of the pit (in the centre of it) a ESE-NNW oriented child (12-14 years old; male according to genetic sex) individual in a left sided contracted position was located. The grave was partly disturbed, without grave goods. There was only one piece of EBA sherd found on the ribs. The left arm situated under the chest, but the right arm is missing. The mandible was not in its right anatomical position²⁶⁰.

- I7043/HUNG497/Grave 119: 2500–2200 BCE

Grave 458 (I7040/HUNG494t): Round pit with mixed dark brown filling, with cylindrical wall and straight bottom. On the bottom of the northwestern part of the pit a child (11-12 years old; female according to genetic sex) individual in unusual “thrown-in” position was unearthed. The NE-SW oriented skeleton was laid down on the back, with his cranium next to the wall of the pit. The left leg is straight, whilst the right one was drawn up. The cranium was situated on its right side, so the vertebral column was in a little bit twisted position, the hands were on the chest. The cranium was injured on its left side. Beside the skeleton a cranium of an ovicaprid, a gavel stone, and some sherds were found²⁶⁰.

- I7040/HUNG494t/Grave 458: 2500–2200 BCE

Mezőcsát-Hörcsögös (Hungary)

Contact person: János Dani

The human bones belong to the collection of Hungarian Natural History Museum, Department of Anthropology. The total number of excavated graves from the Mezőcsát-Hörcsögös cemetery is 16. Most of the graves (8 scattered cremations and 6 inhumations) were located under an earthen tumulus (kurgan) and 2 additional inhumation graves were unearthed outside the mound (the “First cemetery”). In the middle of kurgan an aniconic stone slab²⁶² was erected, symbolising the burial site of a Late Copper Age community. The number of the children was relatively high: 6 from a total 16 graves. The cremation burials contained most of the grave goods (mainly vessels). Based on the typological examination of Nándor Kalicz and László György, this cemetery can be attributed to the Viss group of the classical Baden culture.

We analysed 4 individuals from this site:

Grave 1 (I5116/HUNG847): This child (most probably a newborn or a few weeks old) was situated under the southeast part of the mound, approximately 80 cm below the modern surface. The 45-cm-long and 15-cm-deep pit was rectangular with rounded corners and was covered by stone slabs. The west-east oriented, approximately 45-50-cm-tall baby lay on its right side in contracted position²⁶². A small-handled jug was deposited on the chest. The human bones are in the collection of Hungarian Natural History Museum, Department of Anthropology, inv. no: 12037.

- I5116/HUNG847/Grave 1: 3400–3000 BCE

Grave 3 (I5117/HUNG848): Under the southeast section of the kurgan there was a southwest-northeast oriented inhumation burial of an approximately 140-cm-tall individual (male according to genetic sex) in supine position with drawn up legs and with supported skull²⁶². The 28 cm deep pit was oval and it was located 55 cm below the surface. The right arm was bent to the chest, while the left one lay beside the body. The positioning of the body is very similar to the burials of the Yamnaya culture. A fragment of an obsidian blade from the filling of the grave was found. The human bones are in the collection of Hungarian Natural History Museum, Department of Anthropology, inv. no: 12039.

- I5117/HUNG848/Grave 3: 3400–3000 BCE

Grave 4 (I5118/HUNG849): Under the southeast section of the kurgan, close to grave 3, a special south-north oriented burial in an oval pit was excavated. The body was in a sitting position, with contracted legs on the left side²⁶². After the decomposition of the body, its upper part fell forward. The skeleton belongs to a 170-175-cm-tall male. No grave goods were found. The human bones are in the collection of Hungarian Natural History Museum, Department of Anthropology, inv. no: 12040.

- I5118/HUNG849/Grave 4: 3400–3000 BCE

Grave 10 (I5119/HUNG850): This inhumation grave was situated in the eastern part of the kurgan. The north-south oriented grave contained a child skeleton (female according to genetic sex), with the body laid on its back in a strongly contracted position on the right side²⁶². The skeleton was found 108 cm below the surface without grave goods. The human bones are in the collection of Hungarian Natural History Museum, Department of Anthropology, inv. no: 12189.

- I5119/HUNG850/Grave 10: 3400–3000 BCE

SI 3- Direct AMS ^{14}C Bone Dates

We report 111 new direct AMS ^{14}C bone dates (Supplementary Table 5) from eight different laboratories (Penn State University Accelerator Mass Spectrometry Facility [PSUAMS] – 35, Oxford Radiocarbon Accelerator Unit [OxA] – 3, Scottish Universities Environmental Research Centre [SUERC] – 36, Poznan Radiocarbon Laboratory [Poz] – 19, Curt-Engelhorn-Zentrum Archaeometrie [MAMS] – 7, Bristol Radiocarbon Accelerator Mass Spectrometer [BRAMS] – 5, Beta Analytic [Beta] – 2, Rafter Radiocarbon Laboratory [NZA] – 4) and recalibrate 106 previously published radiocarbon dates from 13 different AMS ^{14}C (Arizona [AA] – 2; Beta Analytic [Beta] – 2; Bristol Radiocarbon Accelerator Mass Spectrometer [BRAMS] – 1; Debrecen AMS [DeA] – 5; Groningen [GrA] – 8; Curt-Engelhorn-Zentrum Archaeometrie [MAMS] – 5; Rafter Radiocarbon Laboratory [NZA] – 5; Oxford Radiocarbon Accelerator Unit [OxA] – 26; Poznan Radiocarbon Laboratory [Poz] – 9; Scottish Universities Environmental Research Centre [SUERC] – 37; Uppsala Accelerator [Ua] – 1; Belfast [UBA] – 1; and University of Georgia [UGA] – 2) and ten conventional ^{14}C laboratories (Bern [B] – 2; British Museum [BM] – 1; Groningen [GrN] – 2; Scottish Universities Research & Reactor Centre [GU] – 1; Harwell [HAR] – 1; Heidelberg [Hd] – 1; Kiev [Ki] – 1; Lecce [LTL] – 1; Lyon [Ly] – 1; NERC Radiocarbon Laboratory [SRR] – 1). Bone preparation and quality control methods for the previously published ^{14}C dates are described elsewhere and the details can be found on laboratory-specific websites.

Bone samples for the newly reported direct AMS ^{14}C dates were manually cleaned and demineralized in weak HCl and, in most cases (PSUAMS, UCIAMS, OxA, SUERC, Poz), soaked in an alkali bath (NaOH) at room temperature to remove contaminating soil humates. Samples were then rinsed to neutrality in Nanopure H_2O and gelatinized in HCl²⁶³. The resulting gelatin was lyophilized and weighed to determine percent yield as a measure of collagen preservation (% crude gelatin yield). Collagen was then directly AMS ^{14}C dated (Beta, SUERC) or further purified using ultrafiltration (PSUAMS, OxA, Poz). At PSUAMS, bone samples with low collagen yields were hydrolyzed and resulting amino acids purified using an XAD chromatography (XAD Purification²⁶⁴).

It is standard in some laboratories (PSUAMS, OxA, SUERC) to use stable carbon and nitrogen isotopes as an additional quality control measure. For these samples, the $\delta^{13}\text{C}$,

%N and C:N ratios were evaluated before AMS ^{14}C dating. C/N ratios for well-preserved samples fall between 2.9 and 3.6, indicating good collagen preservation²⁶⁵. Detailed bone preparation and quality control methods are published elsewhere for PSUAMS^{264,266} and OxA²⁶⁷.

All ^{14}C ages are corrected for mass-dependent fractionation with measured $\delta^{13}\text{C}$ values²⁶⁸ and calibrated with OxCal version 4.2.3³² using the northern hemisphere terrestrial calibration curve (IntCal13)³³. Stable nitrogen and carbon isotopes suggest slight variations in diet in these agricultural populations across Europe that can be attributed to varied access to marine and/or aquatic resources. The ^{14}C dates for individuals with elevated nitrogen isotope values may be slightly (~50-100 yr) older than the true age. However, no clear regional or geographic (coastal vs. interior) differences were identified (Figure S1).

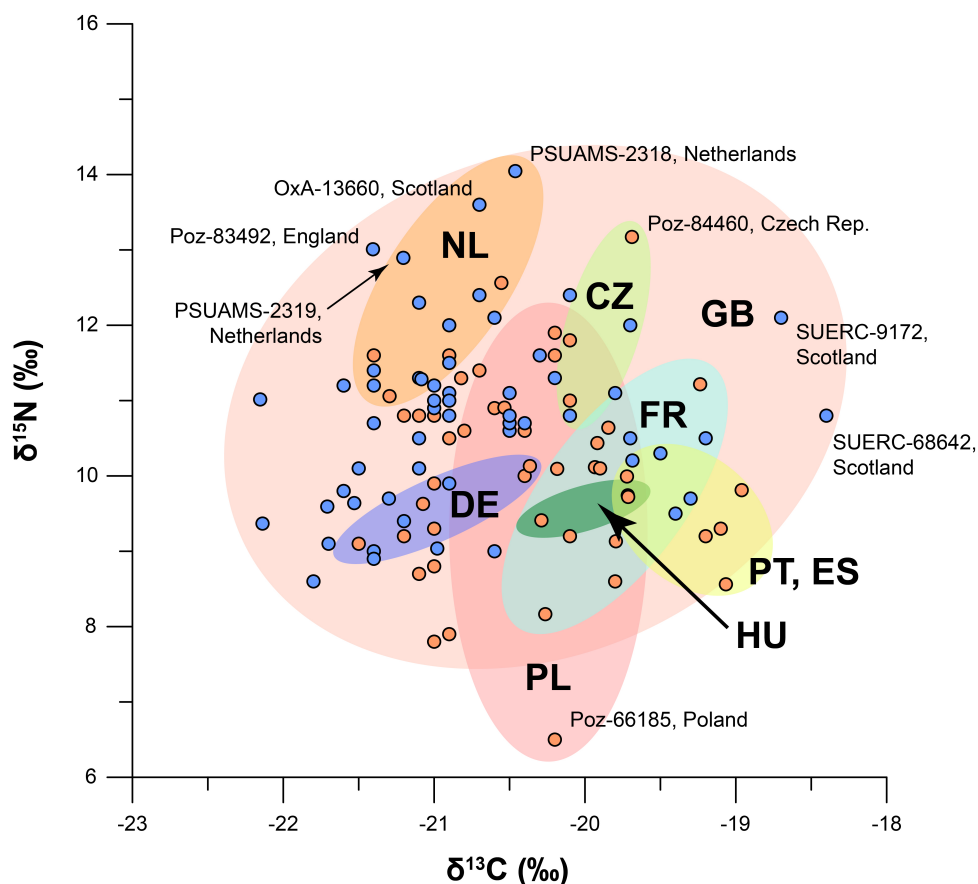


Figure S1. Isotopic signatures ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) of dated samples with quality-control information (n=112). Results are summarized by country (CZ – Czech Republic; DE – Germany; ES – Spain; FR – France; GB – Great Britain; HU – Hungary; NL – The Netherlands; PL – Poland; PT – Portugal) and substantial outliers labeled. Points are color-coded according to whether sites are coastal (blue) or terrestrial (orange). While a greater marine influence is perceived in coastal areas of The Netherlands and Great Britain (as denoted by $\delta^{15}\text{N}$), results in general are fairly undifferentiated.

SI 4- Experimental procedures

In the Methods section we describe the experimental protocol followed for samples that were processed at Reich's lab, Harvard Medical School, Boston. In this note we described lab procedures for samples that were partially or completely processed at other labs (Supplementary Table 1):

Libraries built at the Laboratory of Archaeogenetics of the Institute of Archaeology, Research Centre for the Humanities, Hungarian Academy of Science, Budapest

Beaker period teeth and petrous bone samples from Hungary were taken under sterile conditions in the Hungarian Museums and anthropological collections. Eight samples were cleaned and powdered in Budapest, at the Laboratory of Archaeogenetics of the Institute of Archaeology, Research Centre for the Humanities, Hungarian Academy of Sciences, following published protocol²⁶⁹. DNA was extracted from 0.08-0.11g powder via published methods²⁷⁰, using High Pure Viral NA Large Volume Kit columns (Roche)²⁷¹. DNA extractions were first tested by PCR, amplifying the np 16117-16233 fragment of the mitochondrial genome, and visualized on a 2% agarose gel. DNA libraries were prepared from clean and successful extraction batches using “UDG-half” repairing method²⁷². We included milling (hydroxylapatite blanks to control for cleanliness) and extraction negative controls in every batch of libraries. Barcode adapter ligated libraries were amplified with TwistAmp Basic (Twist DX Ltd.), purified with Agencourt AMPure XP (Beckman Coulter), and checked on 3% agarose gel²⁷³. Library concentration was measured on Qubit 2.0 fluorometer. After the initial quality control analysis, promising libraries were shipped to Reich's lab.

Libraries built at the National History Museum, London

DNA extractions and library preparations were conducted in a dedicated ancient DNA laboratory at the National History Museum (London). We used approximately 25mg of finely drilled bone powder and followed the DNA extraction protocol described in Dabney *et al.* (2013)²⁷⁰ but replaced the Zymo-Spin V column binding apparatus with a high pure extender assembly from the High Pure Viral Nucleic Acid Large Volume Kit (Roche). Library preparations followed partial uracil–DNA–glycosylase treatment²⁷² and a modified version of the Meyer and Kircher (2010)²⁷⁴ protocol: the initial DNA

fragmentation step was not required and all clean-up steps used MinElute PCR purification kits (Qiagen). The index PCR step included double indexing²⁷⁵, the polymerase AmpliTaq Gold and the addition of 0.4mg/mL BSA. The index PCR was set for 20 cycles with three PCR reactions conducted per library. Amplified libraries were then shipped to Reich's lab

Libraries built at the Australian Centre for AncientDNA, University of Adelaide

Libraries were prepared following the same protocol as in Haak et al. (2015)²⁷³ and shipped to Reich's lab.

Libraries built at the Institute for Archeological Sciences in Tübingen

Sampling was performed in the cleanroom facilities at the Institute for Archeological Sciences in Tübingen on teeth selected from the human remains from the Lech Valley, Bavaria, Germany. The teeth were treated with ultraviolet (UV) light from all sides for 10 min to reduce surface DNA contamination and then sawed transversally at the border of root and crown before sampling dentine powder from the inside of the crown with a sterile dentistry drill. Between 40 and 120 mg powder were used for each DNA extraction following an established protocol²⁷⁰, resulting in 100µl of DNA extract for each sample.

An initial screening was performed by converting 20ul of extract into double-stranded next-generation sequencing libraries^{274,275} which were shotgun-sequenced and sequenced after enrichment for human mitochondrial DNA²⁷⁶.

For those samples that showed sufficient human DNA preservation and a low rate of modern contamination on the mtDNA, uracil–DNA–glycosylase (UDG) treated libraries²⁷² were prepared out of the 60 ul of DNA extract. These libraries were enriched for a targeted set of ~1.2 million nuclear SNPs (1240k SNP set)^{273,277}.

Enriched libraries were paired-end sequenced on a HiSeq4000 at the IKMB in Kiel, Germany, using 2x150+2x8 bp reads.

SI 5- Y-chromosome analysis

We performed Y-chromosome haplogroup analysis on all the male individuals in the study using the nomenclature of the International Society of Genetic Genealogy (<http://www.isogg.org>) version 11.110 (21 April 2016). Here we provide an overview of the results. Overall, Y-chromosome haplogroups are highly correlated with steppe ancestry proportions in the autosomes.

Iberian Beaker-associated individuals without a genome-wide signal of steppe ancestry belonged mainly to haplogroups I2 and G2 (Supplementary Table 4), both present in high frequencies in European Neolithic farmers^{273,278–280} and also in Iberian Copper Age populations. Haplogroup G2 probably entered Europe from the Near East during the Neolithic expansion, and haplogroup I2 was likely introduced into the Neolithic population through admixture with European hunter-gatherers. Two Iberian individuals (I0257 and I0261) without steppe ancestry belonged to haplogroup R1b but likely not to R1b-L23 and therefore not to R1b-S116/P312. Similar R1b haplogroups (ancestral for L23) were present in low frequencies in Europe during the Neolithic period, as they have been previously observed in both central Europe (I0559) and Iberia (I0410)²⁷³. Interestingly, 4 Beaker-associated males from Iberia belonged to R1b-M269, and the two with higher coverage could be further classified as R1b-S116/P312. These 4 individuals displayed a clear signal of steppe ancestry in the autosomes, highlighting the association between R1b-M269 and steppe-related genetic affinities. These individuals represent, to our knowledge, the earliest observation in Iberia of R1b-M269 and R1b-S116/P312, lineages that dominate the Y-chromosome composition in present-day Iberian populations.

Outside Iberia, Beaker Complex individuals present a striking uniformity in paternal lineages, with 87 out of 93 males (excluding relatives) belonging to haplogroup R1b (Supplementary Table 4). Where R1b downstream mutations could be determined (n=60), all but two males belonged to R1b-S116. The six individuals outside Iberia without R1b Y-chromosomes were excavated in Hungary (n=4), Germany (n=1) and England (n=1). Interestingly, most of these individuals presented low amounts of steppe ancestry in the nuclear genome as compared to other individuals from the same regions (Figure S2a).

Another striking observation is the haplogroup composition of Neolithic males in Britain (n=34), who displayed entirely I2a2 and I2a1b haplogroups. Thus, there is no evidence at all for a contribution to Neolithic farmers in Britain of the Y chromosome haplogroups (e.g., G2) that were predominant in Anatolian farmers and in Linearbandkeramik central European farmers.

We detect 28 males who belonged to R1b-L21/M529, all of them dated to the Beaker and Bronze Age periods and excavated in Britain. This matches the high frequency of this clade in modern populations from the British Isles.

We finally comment on three individuals with uncertain attributions:

-Sample I0261 can be assigned to haplogroup R1b1a based on mutations R1b1a:L1345:21558298G->T; R:F652:23631629C->A and R:M651:9889199G->A. Haplogroups I, G, R1a and R1b1a1a2a can be excluded due to the presence of ancestral alleles for I (CTS11979:23401471C->T), G (M3600:21954611G->A, PF3134:15275200C->G), R1a (L145:14138745C->A) and R1b1a1a2a (L23:6753511G->A). Thus, it seems that I0261 belonged to R1b, but not to the R1b-S116/P312 (R1b1a1a2a1a2) clade that is present in most Beaker-associated individuals outside Iberia.

-Sample I0257 can be assigned to haplogroup R1b1 based on derived alleles at mutations R1b1 (L1349: 22722580T->C) and R (P224:17285993C->T, L1347:22818334C->T). Haplogroups I, G and H can be excluded due to the presence of ancestral alleles for I (CTS2193:14214481G->T, PF3641:7688470 T->C, PF3660:8466652G->A), G (CTS1283:7309873T->G, CTS2016.1:14155765G->A, CTS2125:14190447A->G, CTS4761:15802681C->T, CTS9011:18615020A->T, M3474:7930724C->A, PF3134:15275200G->C) and H (M2942:17887908A->G). This individual and I0261 could belong to the same haplogroup, but for I0257 we cannot exclude any R1b1 subclade.

SI 6- *f*-statistics

We computed *f*-statistics on the *HOIII* dataset using ADMIXTOOLS²⁸¹ using default parameters. This set of techniques relies on the study of allele frequency correlation patterns across populations and provides formal tests for whether admixture occurred. The *f₄*-statistics requires knowledge of the history of divergence between populations. Given the unrooted topology $(A,B)(C,D)$ describing the relationship between populations *A*, *B*, *C* and *D*, the following statistic averaged across all loci can be computed, $f_4(A, B; C, D) = (p_A - p_B)(p_C - p_D)$, where p_A , p_B , p_C and p_D are the frequencies of one of the two alleles at each locus for population *A*, *B*, *C* and *D*, respectively. If the simple population topology holds (no asymmetrical gene flow after divergence), allele frequency differences between *A* and *B* should not be correlated with allele frequency differences between *C* and *D* and the statistic is expected to be 0. In contrast, if there was gene flow between *A* and *C* (or *B* and *D*) allele frequency differences will be correlated and the statistic is expected to be positive. Similarly, gene flow between *A* and *D* (or *B* and *C*) will result in a negative statistic. To assess statistical significance, we compute standard errors using a weighted block jackknife approach²⁸² over 5 Mb blocks. We also compute corresponding Z-scores to determine how many standard errors the statistic deviates from 0.

f₄-statistics

To increase statistical power to detect allele frequency differences, we grouped Beaker-associated individuals excavated in nearby sites and presenting similar population affinities. Specifically, we grouped individuals that satisfied the following conditions:

- They were excavated in sites separated by less than 150 kilometres.
- They did not significantly differ with regard to statistic $f_4(\text{Mbuti, Test; Steppe_EBA, Anatolia_N})$, using 1.5 standard errors as our criterion (Figure S2a). We found that this *f₄*-statistic is highly sensitive to ancestry differences between Beaker-associated individuals, and is mainly affected by different levels of steppe-related ancestry, which is the main cause of genetic differentiation in our dataset.
- They were processed using the same UDG treatment. We do not co-analyze non-UDG-treated and UDG-treated individuals.

We then recomputed the statistic $f_4(\text{Mbuti, Test; Steppe_EBA, Anatolia_N})$ (Figure S2b) with the new grouping scheme in Table S1. We used this scheme for f_4 -statistics, outgroup f_3 -statistics, $qpAdm/qpWave$ and $qpGraph$ analysis.

Details on notable results from f -statistic analysis reported in the main manuscript

Presence of steppe ancestry in three individuals from Arroyal I and Virgagal (Burgos, Spain)

We show in Table S2 f_4 -statistics of the form $f_4(\text{Mbuti, Test; C_Iberia_CA, BK_Spain_BUR2})$. Several populations are asymmetrically related to C_Iberia_CA (Central Iberia Copper Age) and BK_Spain_BUR2 (individuals I0461, I0462 and I5665). Specifically, populations from the Steppe such as EHG ($Z=4.7$) and Steppe_EBA ($Z=5.2$), are significantly closer to BK_Spain_BUR2 than to C_Iberia_CA. In Table S2 we find BK_Spain_BUR1 (the other two individuals from Arroyal I: I0459 and I0460) and C_Iberia_CA to be symmetrically related to ancient West Eurasian populations. This confirms the visual impression from PCA (Fig. 1c; Extended Data Fig. 3a) and supports separation of individuals from Arroyal I and Virgagal into two groups, BK_Spain_BUR2 with steppe ancestry and BK_Spain_BUR1 without.

Presence of steppe ancestry in five individuals from Camino de las Yeseras, La Magdalena and Humanejos (Madrid, Spain)

Similar to the previous case, we show in Table S2 f_4 -statistics of the form $f_4(\text{Mbuti, Test; BK_Spain_MAD1, BK_Spain_MAD2})$ and $f_4(\text{Mbuti, Test; BK_Spain_MAD1, BK_Spain_Mag1})$. These statistics support the presence of Steppe-related ancestry in BK_Spain_MAD2 (individuals I6472, I6623, I6539 and I6588) and BK_Spain_Mag1 (individual I6471), in contrast to the remaining 7 individuals from Madrid region (BK_Spain_MAD1) who lack this genetic signal. Sample I6471 is assigned a different label as it appears to have significantly more Steppe-related ancestry than the BK_Spain_MAD2 group (Figure S2a).

Ancestry heterogeneity in Haut-Rhin (France)

In Table S2 we show that BK_France_Heg (one individual from Hégenheim) and BK_France_HAR (two individuals excavated a few kilometres from Hégenheim) are not symmetrically related to ancient West Eurasians. Populations from the Steppe such as EHG ($Z=6.1$) or Steppe_EBA ($Z=6.5$) share more alleles with BK_France_HAR than

with BK_France_Heg, documenting very different population affinities in individuals excavated from nearby sites.

Steppe ancestry in Beaker-associated individuals from southern France

We tested for symmetry between Beaker-associated individuals from southern France (BK_France_Mar and BK_France_AHP) and Middle and Late Neolithic individuals from the same region (France_MLN). Steppe populations share more alleles with both BK_France_Mar (Table S2) and BK_France_AHP (Table S2) than with France_MLN. This observation suggests that the arrival of the Beaker Complex in southern France was mediated by migrants with steppe genetic affinities.

Ancestry heterogeneity in Via Guidorossi (Parma, northern Italy)

Two Beaker-associated individuals from Parma (BK_Italy_Gui2 and BK_Italy_Gui3) are slightly shifted towards populations with steppe ancestry in the PCA (Fig 1c), while the remaining individual (BK_Italy_Gui1) is not. We tested for symmetry between BK_Italy_Gui1 and both BK_Italy_Gui2 and BK_Italy_Gui3 (Table S2). Neolithic and Copper Age European populations share more alleles with BK_Italy_Gui1 than with BK_Italy_Gui2 or BK_Italy_Gui3. Furthermore, Steppe populations share more alleles with BK_Italy_Gui3 than with BK_Italy_Gui1, showing that individuals from this site did not form a genetically homogeneous group. This is especially interesting since BK_Italy_Gui1 (a woman) and BK_Italy_Gui3 (a man) were buried together in the same tomb.

Ancestry heterogeneity at Szigetszentmiklós-Felső-Úrge hegyi dűlő (Hungary)

The Carpathian Basin represents the easternmost limit of the Beaker Complex distribution. Our data set includes four individuals from the Szigetszentmiklós-Felső-Úrge hegyi dűlő site in Hungary with very different genetic affinities (Figure S2). To illustrate this, we tested for symmetry between the most extreme individuals: BK_Hungary_Sfu1 and BK_Hungary_Sfu3 (Table S2). The analysis supports high genetic differentiation between these two individuals, with steppe populations sharing more alleles with BK_Hungary_Sfu3 than with BK_Hungary_Sfu1.

SI 7- *qpGraph* analysis

In this section we model the relationships between populations in an Admixture Graph framework with the software *qpGraph* in ADMIXTOOLS²⁸¹, using the *HOIII* dataset. This software takes as input an admixture graph and fits admixture proportions and drift paths to the genetic data, trying to match as closely as possible the observed f -statistics. This method allows us to model multiple admixture events and therefore it is helpful for exploring complex phylogenies where simple f_4 -statistics are confounded. For each model that we test, we report the difference between estimated and modelled f -statistics for the worst-fitting f -statistic, as the number of standard errors (Z -score) using a block jackknife.

Investigating the relationship among Neolithic/Chalcolithic European populations

Before the arrival of steppe ancestry, most of Europe was inhabited by closely related populations with the same ancestry components: one component derived from Anatolian farmers and the other from European hunter-gatherers. This does not mean, however, that European Neolithic farmers from different parts of Europe were undifferentiated from a genetic point of view.

We began by exploring whether Middle/Late Neolithic and Copper Age populations share more affinity with any Early Neolithic population, computing f_4 -statistics of the form $f_4(\text{Mbuti}, \text{Test}; \text{EN1}, \text{EN2})$ (Fig. 2b and Table S3). All the Iberian populations (including Beaker-associated groups) show genetic affinity to Iberia_EN, indicating some degree of continuity through the Neolithic and Copper Age periods. In Hungary, continuity is also supported by Hungary_LCA sharing more alleles with Hungary_EN than with other Early Neolithic populations. Interestingly, Neolithic populations from Britain, Ireland and southern France share significantly more alleles with Iberia_EN than with central European Early Neolithic populations. However, the data point to a complex pattern of relationships among these populations. For instance, our Scotland_N population (the Neolithic group with highest quality data) shares significantly more alleles with both Iberia_EN ($|Z|=5.801$) and Hungary_EN ($|Z|=5.464$) than with LBK_EN, and it is symmetrically related to Iberia_EN and Hungary_EN ($|Z|=-1.359$).

To verify that these observations were not driven by different proportions of hunter-gatherer admixture, we modelled population relationships with *qpGraph*. We designed a

simple admixture graph that includes Anatolia_N, Iberia_EN, LBK_EN and WHG (Figure S3a), and fit our populations of interest as a mixture of WHG and ancestry related to either LBK_EN or Iberia_EN (Figure S3b). Models fitting populations from Iberia, southern France and Britain as a clade with LBK_EN show a poor fit to the data (Figure S3c), even though the differences in WHG ancestry proportion (higher in Iberia_EN than in LBK_EN) are explicitly modelled. In contrast, most of these populations can be well modelled as a clade with Iberia_EN (Figure S3c). We next added Hungary_EN into the admixture graph (Figure S4a) and fit our populations of interest as a mixture of WHG and ancestry related to either LBK_EN, Iberia_EN or Hungary_EN (Figure S4b). Most Iberian groups are consistent with being a clade with Iberia_EN but not with LBK_EN or Hungary_EN (Figure S4c). Three populations (France_MLN, Scotland_N and England_N) that show genetic affinity to both Iberia_EN and Hungary_EN in f_4 -statistics (Table S3) cannot be well modelled as a simple clade with any of the three Early Neolithic populations. In those cases, the fit improves when they are modelled as having ancestry from both a clade related to Iberia_EN and Hungary_EN (Figure S5). To generate confidence intervals for the ancestry proportion from the Iberia_EN-related clade, we computed the approximate log-likelihood of the admixture graph model²⁸¹ for a grid of values from 0 to 1 in increments of 0.01 (Extended Data Fig. 5). We integrated the interpolated likelihood surface and used this to compute a 95% central confidence interval. We obtained a 95% confidence interval of 57.3-83.6% Iberia_EN-related ancestry for France_MLN, 57.0-74.7% for Scotland_N and 56.2-77.8% for England_N.

These observations suggest that Neolithic populations from both Britain and southern France derive part of their ancestry from the Mediterranean route of Neolithic expansion. We caution, however, that the relationships between Neolithic European populations are likely very complex, including multiple admixture events²⁸³, and that the available ancient DNA data are still sparse (especially for the Early Neolithic period). As a consequence, the admixture graph models presented here likely represent a simplification of the true history relating these populations.

SI 8- *qpAdm/qpWave* analysis

In this section we aim to fit the ancestry of our populations/individuals of interest into genetic models with estimated mixture coefficients. We use the knowledge gained in previous sections to investigate different models under the framework described in Haak et al²⁷³ and implemented in *qpAdm* and *qpWave* (<https://github.com/DReichLab>). One aspect of this methodology that makes the inferences robust is the fact that, unlike *qpGraph*, the phylogeny relating the different populations, which can be complex, does not need to be known.

This method relates a *Test* population (our population of interest) to a set of *Outgroup* populations via a set of *Reference* populations. There are three main prerequisites. First, the *References* should not be equally related to the panel of *Outgroups*, i.e. they must share different amounts of genetic drift with them as a result of their deep evolutionary history. Second, the *References* must be clades, with respect to the *Outgroups*, of the populations that contributed ancestry to *Test*. Third, the *Outgroups* must be related to *Test* via the *References*, not directly. Given this setup, we can write f_4 -statistics of the form $f_4(\text{Test}, O_1; O_2, O_3)$, where O_1, O_2 and O_3 are different *Outgroups*, as a weighted sum of the statistics of the *Reference* populations:

$$f_4(\text{Test}, O_1; O_2, O_3) = \sum_{i=1}^N \alpha_i f_4(\text{Ref}_i, O_1; O_2, O_3)$$

Given a set of n *Outgroups*, there are $n \binom{n-1}{2}$ possible arrangements of the *Outgroups*, resulting in many different equations that can be used to estimate the α_i mixture proportions. The main advantage is that these statistics are affected only by drift shared between the *References* and the *Outgroups*, not by drift specific to the *Reference* populations or the *Test*. Therefore, we do not need to use as *Reference* the exact population that was involved in the admixture event. Instead, we can use a very drifted population, as long as it forms a clade with the admixing population. For each tested model we provide mixture proportions for each reference population and standard errors of the mixtures proportions. This methodology also provides a formal test for whether the model of the *Test* population as a mixture of the reference populations is a good fit to the data (if P-value > 0.05).

We carried out the analysis on the *HOIII* dataset and used a basic set of 9 *Outgroups*: Mota, Ust_Ishim, MA1, Villabruna, Mbuti, Papuan, Onge, Han, Karitiana. These populations are located in informative places of the phylogeny and are unlikely to have contributed directly to our *Test* populations.

Steppe ancestry in Beaker-associated individuals

With PCA, ADMIXTURE and *f*-statistics, we learned that our newly reported individuals reside along the Steppe Early Bronze Age-European Neolithic axis of genetic differentiation. Thus, we tried to model them as a mixture of Steppe_EBA + Anatolia_N + WHG (Table S4). These values were used for Fig. 2a. Many populations can be explained by a mixture of Anatolia_N + WHG without any contribution from Steppe_EBA, indicating a lack of Steppe-related ancestry.

Investigating hunter-gatherer admixture in Neolithic/Chalcolithic Europe

A possible cause of genetic differentiation in Neolithic Europe is the presence of differential affinity to hunter-gatherer individuals from different regions²⁸³. To investigate this, we added ElMiron and GoyetQ116-1 to the 9 *Outgroups* set and modelled Neolithic and Copper Age Europeans as a mixture of Anatolia_N, LaBraña1 (a Mesolithic hunter-gatherer from Spain) and KO1 (a hunter-gatherer from Hungary found in a Neolithic context). This analysis revealed a striking pattern of more LaBraña1-related hunter-gatherer ancestry in Iberian populations (Table S5; Extended Data Fig. 4), especially in Iberia_EN and Iberia_MN where the hunter-gatherer ancestry is modelled as 100% LaBraña1-related. If we use Loschbour instead of KO1 as a source we obtain similar results (Table S6), with the hunter-gatherer component in central European populations residing beyond Loschbour in the LaBraña1-Loschbour cline.

Testing possible sources for Neolithic ancestry in Beaker Complex individuals

To understand the ancestry of Beaker Complex individuals we wished to characterize their Neolithic ancestry component, with a particular focus on determining whether Beaker Complex individuals outside Iberia had Iberia-related ancestry.

We learned in the previous section that, before the emergence of the Beaker Complex, populations from Iberia and central Europe harboured some degree of genetic differentiation. We thus took advantage of these differences and designed a *qpAdm* analysis to test the fit of different Neolithic/Copper Age populations as a source for the Neolithic component in Beaker Complex individuals. To increase power, we first split

our Beaker Complex dataset into two groups: individuals from Iberia and individuals from outside Iberia. Then, we modelled their ancestry as a mixture of Steppe_EBA and one of the following Neolithic/Copper Age populations:

- Iberia_MN
- C_Iberia_CA
- N_Iberia_CA
- SE_Iberia_CA
- SW_Iberia_CA
- Germany_MN
- Poland_LN
- Hungary_LCA
- Sweden_MN
- France_MLN

We used the basic set of 9 *Outgroups* and added LBK_EN, Iberia_EN, LaBraña1 and ElMiron in order to increase our ability to detect differences in Iberia-related affinity. We show in Table S7 mixture proportions and P-values for the different models. For Beaker Complex in Iberia, populations outside Iberia are strongly rejected as sources and only Iberian populations (Iberia_MN, C_Iberia_CA, SE_Iberia_CA, SW_Iberia_CA) show a good fit. The other Copper Age Iberian population, N_Iberia_CA, fails as a source likely because it harbours more hunter-gatherer ancestry (Extended Data Fig. 4) than do other Iberian populations. In contrast, for Beaker Complex individuals outside Iberia, models using Iberian populations as a source for their Neolithic ancestry are rejected. We obtain a good fit for Poland_LN and Sweden_MN, two populations with a hunter-gatherer component close to KO1 on the cline defined by LaBraña1-KO1 (Extended Data Fig. 4; Table S5), and beyond Loschbour on the cline defined by LaBraña1-Loschbour (Table S6). Other central European populations such as Germany_MN or Hungary_LCA are rejected, but their fit can be improved by adding KO1 as a third source (Table S8), suggesting that the true admixing population likely had more hunter-gatherer ancestry than either Germany_MN or Hungary_LCA.

The magnitude of population turnover in Britain associated with the Beaker Complex

In this section we modelled the ancestry of Copper Age (including Beaker-associated) and Bronze Age individuals from Britain as a mixture of Beaker Complex individuals from mainland Europe (represented by our Beaker Complex individuals from Tuithoorn-Oostwoud, the Netherlands) and the Neolithic population from Britain that includes all our Neolithic individuals from England, Scotland and Wales. We added *Anatolia_N* and *Steppe_EBA* to the 9 *Outgroups* to increase the power to distinguish between the two sources of ancestry (Table S9). In Figure 3 we show admixture proportions for individuals with more than 100,000 SNPs. To verify that the mixture proportions computed in Table S9 were not affected by the particular geographic sampling scheme of our Neolithic individuals from Britain, i.e. more individuals from Scotland (n=35) than from England (n=14) and Wales (n=2), we recomputed those values using as the Neolithic source only Neolithic individuals from England (Table S10) or Scotland (Table S11) instead of all the Neolithic individuals from Britain. We obtained very similar results regardless of the Neolithic population used as a source.

We finally checked if our British Neolithic individuals were genetically homogeneous. Using *qpWave* we tested, for each individual, where it was consistent with being a clade with the British Neolithic population (including all the British Neolithic individuals except the one being tested). We used the set of 9 *Outgroups* plus *Anatolia_N* and *Steppe_EBA*. In Table S12, we provide P-values for the model testing whether a given individual and the British Neolithic population are consistent with being a clade. Only 3 individuals are not consistent with being a clade with the rest of British Neolithic individuals. PCA and ADMIXTURE (Extended Data Fig. 3) suggest that this was due to those individuals having significantly higher WHG admixture than the rest of British Neolithic individuals. Indeed, this was confirmed as the fit for those three individuals greatly improved when we added WHG to the model (Table S12).

Since all our British Neolithic individuals lack Steppe-related ancestry and form a tight clade with the other individuals from the same population (with the exception of 3 individuals with significantly higher WHG-related ancestry), we represent them as having 100% Britain Neolithic component (blue) in Figure 3.

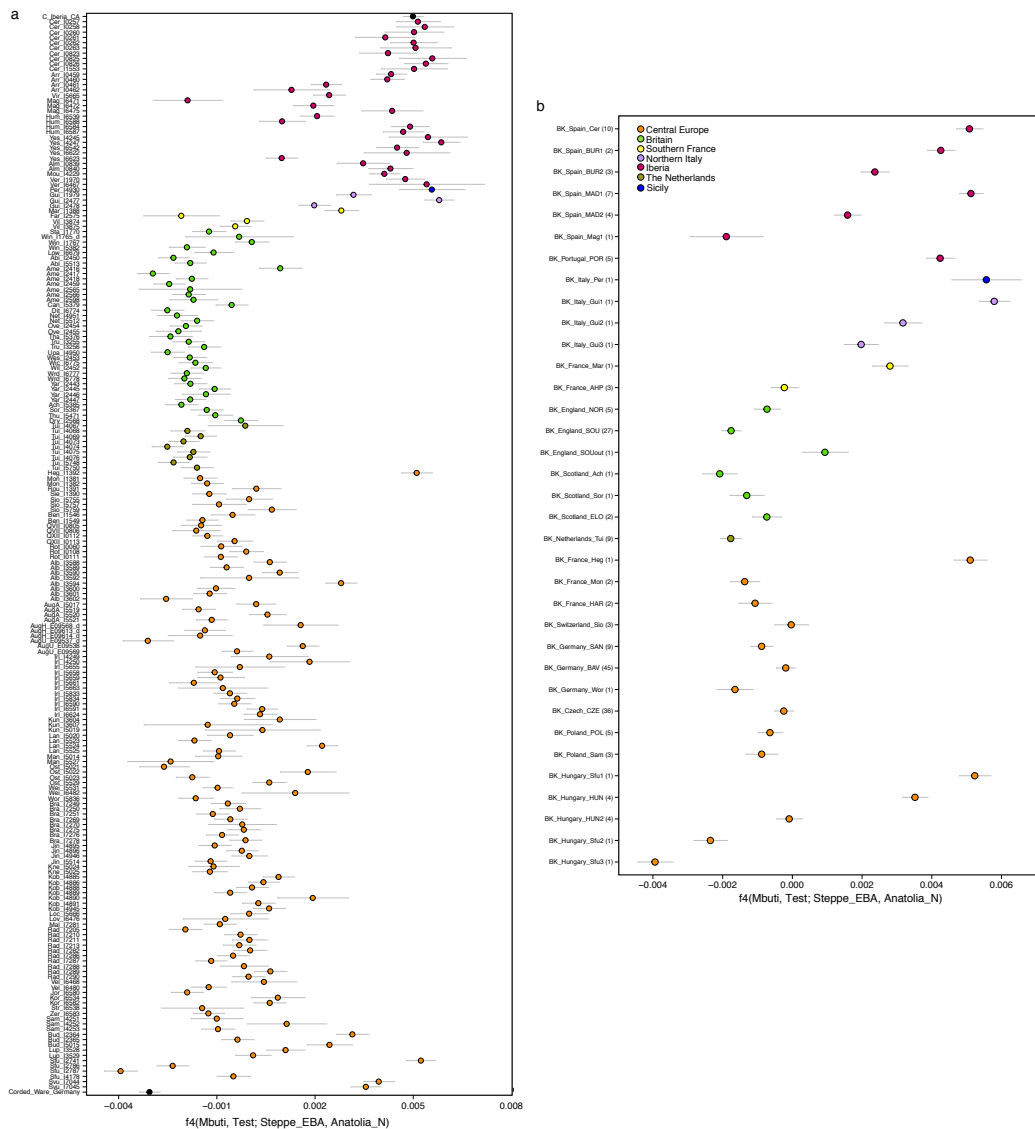


Figure S2. f_4 -statistics of the form $f_4(\text{Mbuti, Test; Steppe_EBA, Anatolia_N})$ measuring steppe affinities (more affinity to Steppe_EBA results in lower values of the statistic). **a**, Individually for each Beaker-associated individual. **b**, Using the grouping scheme in **Table S1**. Number of individuals for each group is given in parentheses. Error bars represent ± 1.5 standard errors. EBA, Early Bronze Age; Anatolia_N, Anatolia Neolithic.

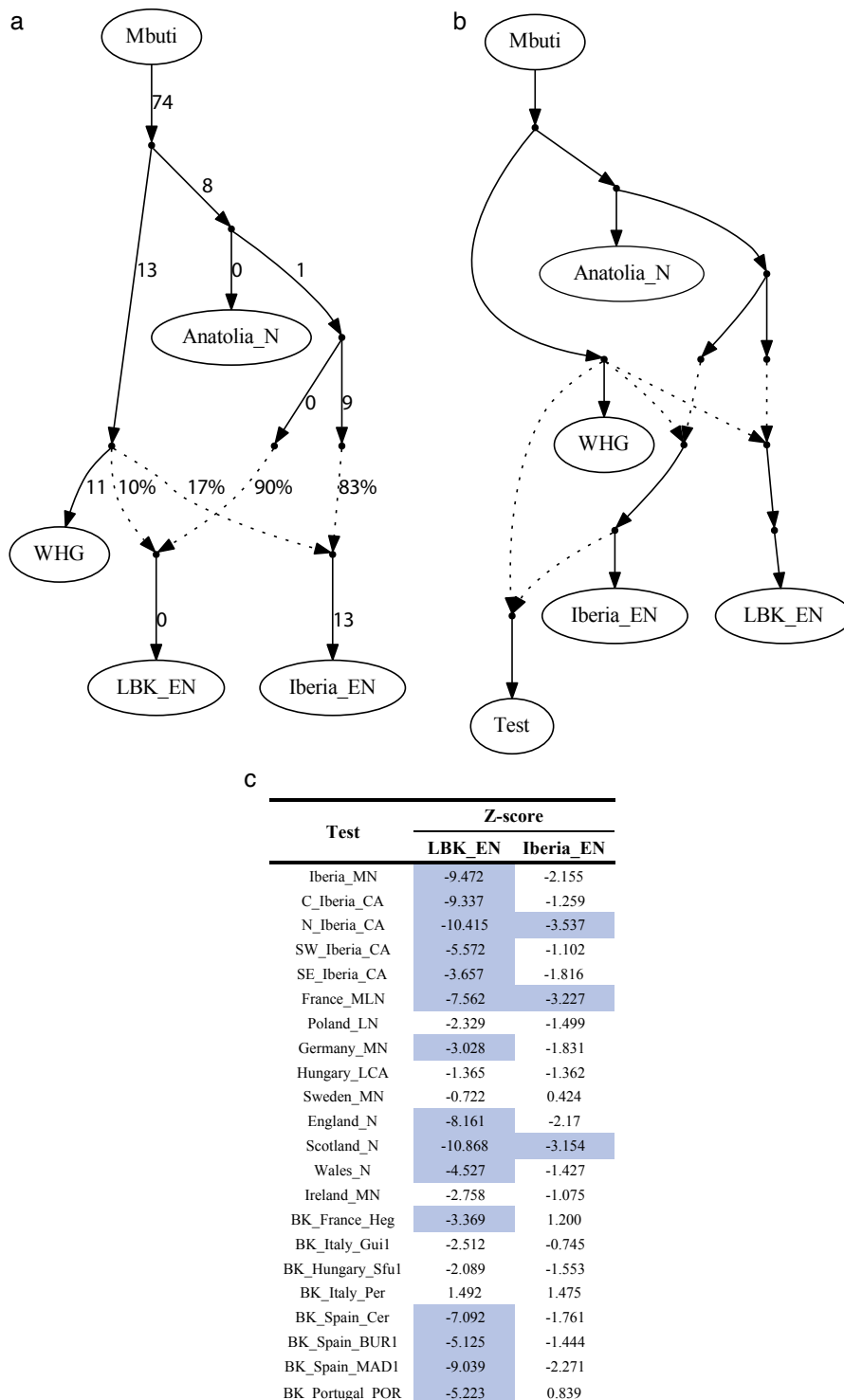


Figure S3. Modelling the relationships between Middle Neolithic/Copper Age and Early Neolithic European populations. **a**, Admixture graph that models the relationships between Anatolia_N, Iberia_EN, LBK_EN and WHG. All f -statistics agree between the model and data to within $|Z|=1$. **b**, Fitting *Test* populations as a clade with Iberia_EN or LBK_EN (here with Iberia_EN as an example). **c**, Z-scores for the worst-fitting f -statistic when inserting the test population into the model in (b) (highlighted if $|Z|>3$).

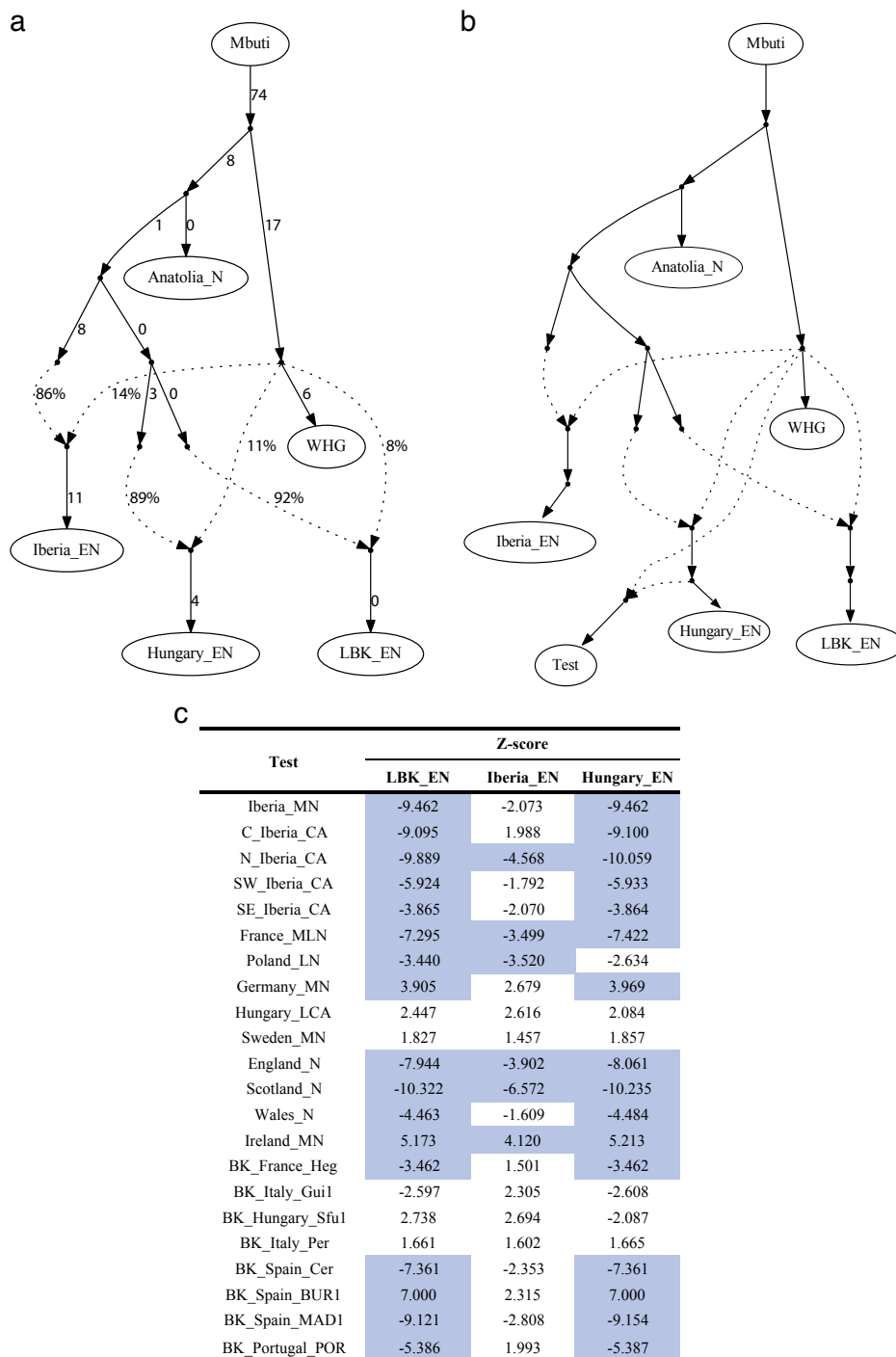


Figure S4. Adding Hungary_EN to the admixture graph model. a, Admixture graph that models the relationships between Anatolia_N, Iberia_EN, LBK_EN, Hungary_EN and WHG. All f -statistics agree between the model and data to within $|Z|=2$. **b**, Fitting *Test* populations as a clade with Iberia_EN, LBK_EN or Hungary_EN (here with Hungary_EN as an example) **c**, Z-scores for the worst-fitting f -statistic when inserting the test population into the model in (b) (highlighted if $|Z|>3$).

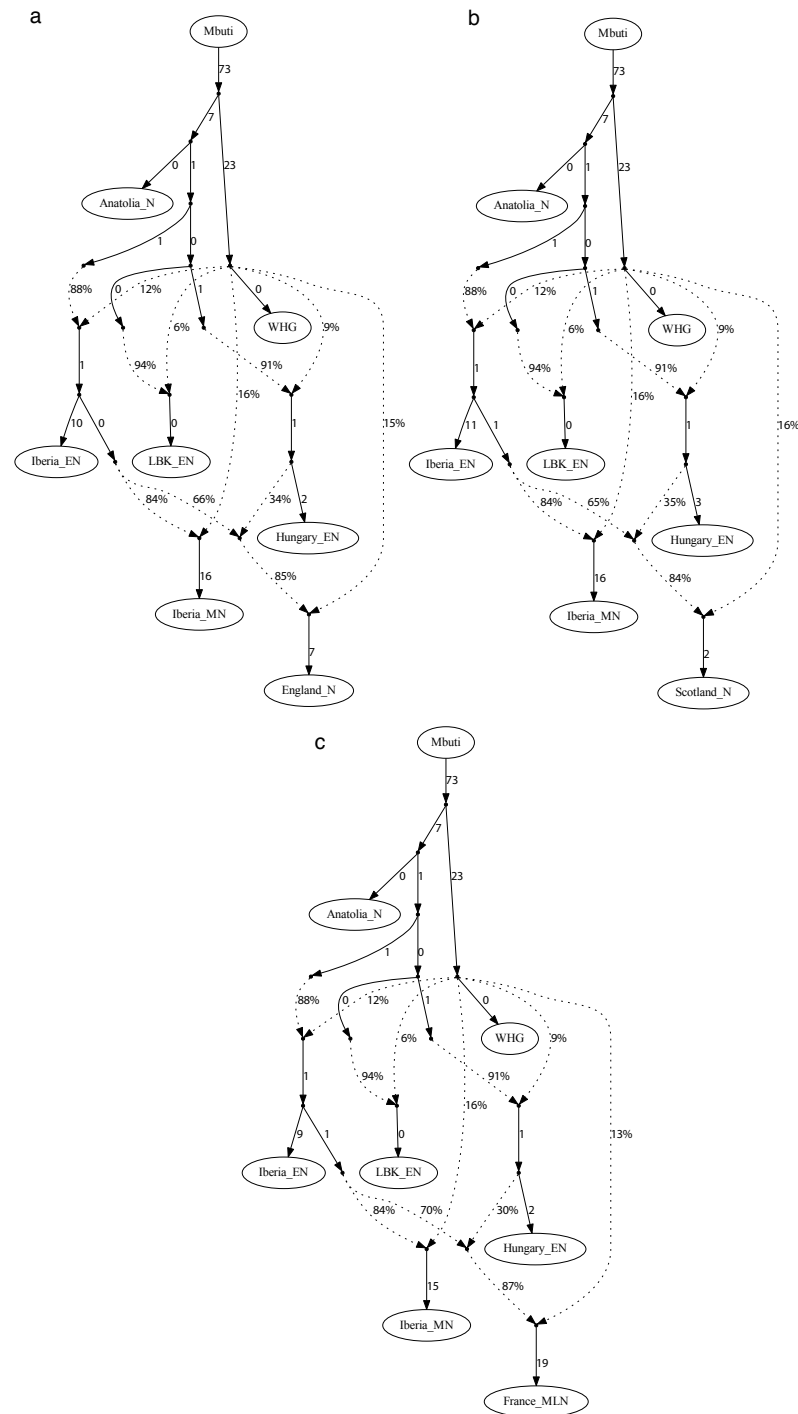


Figure S5. Admixture graphs fitting **a**, England_N, **b**, Scotland_N and **c**, France_MLN as a mixture of sources related to both Iberia_EN and Hungary_EN, plus WHG. Worst-fitting Z-score is 2.031 for **a**, -3.059 for **b** and -3.139 for **c**.

Table S1. Grouping scheme based on ancestry and geographic location.

ID	SiteID	Label
I0257	Cer	BK_Spain_Cer
I0258	Cer	BK_Spain_Cer
I0260	Cer	BK_Spain_Cer
I0261	Cer	BK_Spain_Cer
I0262	Cer	BK_Spain_Cer
I0263	Cer	BK_Spain_Cer
I0823	Cer	BK_Spain_Cer
I0825	Cer	BK_Spain_Cer
I0826	Cer	BK_Spain_Cer
I1553	Cer	BK_Spain_Cer
I0459	Arr	BK_Spain_BUR1
I0460	Arr	BK_Spain_BUR1
I0461	Arr	BK_Spain_BUR2
I0462	Arr	BK_Spain_BUR2
I5665	Vir	BK_Spain_BUR2
I6471	Mag	BK_Spain_Mag1
I6472	Mag	BK_Spain_MAD2
I6475	Mag	BK_Spain_MAD1
I6539	Hum	BK_Spain_MAD2
I6588	Hum	BK_Spain_MAD2
I6584	Hum	BK_Spain_MAD1
I6587	Hum	BK_Spain_MAD1
I4245	Yes	BK_Spain_MAD1
I4247	Yes	BK_Spain_MAD1
I6542	Yes	BK_Spain_MAD1
I6622	Yes	BK_Spain_MAD1
I6623	Yes	BK_Spain_MAD2
I0839	Alm	BK_Portugal_POR
I0840	Alm	BK_Portugal_POR
I4229	Mou	BK_Portugal_POR
I1970	Ver	BK_Portugal_POR
I6467	Ver	BK_Portugal_POR
I4930	Per	BK_Sicily_Per
I1979	Gui	BK_Italy_Gui2
I2477	Gui	BK_Italy_Gui1
I2478	Gui	BK_Italy_Gui3
I1388	Mar	BK_France_Mar
I2575	Far	BK_France_AHP
I3874	Vil	BK_France_AHP
I3875	Vil	BK_France_AHP
I1770	Sta	BK_England_NOR
I1765_d	Win	BK_England_NOR
I1767	Win	BK_England_NOR
I5382	Win	BK_England_NOR
I6679	Low	BK_England_NOR
I2450	Abi	BK_England_SOU
I5513	Abl	BK_England_SOU
I2416	Ame	BK_England_SOUout
I2417	Ame	BK_England_SOU
I2418	Ame	BK_England_SOU
I2459	Ame	BK_England_SOU

I2565	Ame	BK_England_SOU
I2566	Ame	BK_England_SOU
I2598	Ame	BK_England_SOU
I5379	Can	BK_England_SOU
I6774	Dit	BK_England_SOU
I4951	Net	BK_England_SOU
I5512	Net	BK_England_SOU
I2454	Ove	BK_England_SOU
I2455	Ove	BK_England_SOU
I5376	Tha	BK_England_SOU
I3255	Tru	BK_England_SOU
I3256	Tru	BK_England_SOU
I4950	Upa	BK_England_SOU
I2453	Wes	BK_England_SOU
I6775	Wic	BK_England_SOU
I2452	Wil	BK_England_SOU
I6777	Wrd	BK_England_SOU
I6778	Wrd	BK_England_SOU
I2443	Yar	BK_England_SOU
I2445	Yar	BK_England_SOU
I2446	Yar	BK_England_SOU
I2447	Yar	BK_England_SOU
I5385	Ach	BK_Scotland_Ach
I5367	Sor	BK_Scotland_Sor
I5471	Thu	BK_Scotland_ELO
I2568	Dry	BK_Scotland_ELO
I4067	Tui	BK_Netherlands_Tui
I4068	Tui	BK_Netherlands_Tui
I4069	Tui	BK_Netherlands_Tui
I4073	Tui	BK_Netherlands_Tui
I4074	Tui	BK_Netherlands_Tui
I4075	Tui	BK_Netherlands_Tui
I4076	Tui	BK_Netherlands_Tui
I5748	Tui	BK_Netherlands_Tui
I5750	Tui	BK_Netherlands_Tui
I1392	Heg	BK_France_Heg
I1381	Mon	BK_France_Mon
I1382	Mon	BK_France_Mon
I1391	Rou	BK_France_HAR
I1390	Sie	BK_France_HAR
I5755	Sio	BK_Switzerland_Sio
I5757	Sio	BK_Switzerland_Sio
I5759	Sio	BK_Switzerland_Sio
I1546	Ben	BK_Germany_SAN
I1549	Ben	BK_Germany_SAN
I0805	QVII	BK_Germany_SAN
I0806	QVII	BK_Germany_SAN
I0112	QXII	BK_Germany_SAN
I0113	QXII	BK_Germany_SAN
I0060	Rot	BK_Germany_SAN
I0108	Rot	BK_Germany_SAN
I0111	Rot	BK_Germany_SAN
I3588	Alb	BK_Germany_BAV

I3589	Alb	BK_Germany_BAV
I3590	Alb	BK_Germany_BAV
I3592	Alb	BK_Germany_BAV
I3594	Alb	BK_Germany_BAV
I3600	Alb	BK_Germany_BAV
I3601	Alb	BK_Germany_BAV
I3602	Alb	BK_Germany_BAV
I5017	AugA	BK_Germany_BAV
I5519	AugA	BK_Germany_BAV
I5520	AugA	BK_Germany_BAV
I5521	AugA	BK_Germany_BAV
E09568_d	AugH	BK_Germany_BAV
E09613_d	AugH	BK_Germany_BAV
E09614_d	AugH	BK_Germany_BAV
E09537_d	AugU	BK_Germany_BAV
E09538	AugU	BK_Germany_BAV
E09569	AugU	BK_Germany_BAV
I4249	Irl	BK_Germany_BAV
I4250	Irl	BK_Germany_BAV
I5655	Irl	BK_Germany_BAV
I5658	Irl	BK_Germany_BAV
I5659	Irl	BK_Germany_BAV
I5661	Irl	BK_Germany_BAV
I5663	Irl	BK_Germany_BAV
I5833	Irl	BK_Germany_BAV
I5834	Irl	BK_Germany_BAV
I6590	Irl	BK_Germany_BAV
I6591	Irl	BK_Germany_BAV
I6624	Irl	BK_Germany_BAV
I3604	Kun	BK_Germany_BAV
I3607	Kun	BK_Germany_BAV
I5019	Kun	BK_Germany_BAV
I5020	Lan	BK_Germany_BAV
I5523	Lan	BK_Germany_BAV
I5524	Lan	BK_Germany_BAV
I5525	Lan	BK_Germany_BAV
I5014	Man	BK_Germany_BAV
I5527	Man	BK_Germany_BAV
I5021	Ost	BK_Germany_BAV
I5022	Ost	BK_Germany_BAV
I5023	Ost	BK_Germany_BAV
I5529	Ost	BK_Germany_BAV
I5531	Wei	BK_Germany_BAV
I6482	Wei	BK_Germany_BAV
I5836	Wor	BK_Germany_Wor
I7249	Bra	BK_Czech_CZE
I7250	Bra	BK_Czech_CZE
I7251	Bra	BK_Czech_CZE
I7269	Bra	BK_Czech_CZE
I7270	Bra	BK_Czech_CZE
I7275	Bra	BK_Czech_CZE
I7276	Bra	BK_Czech_CZE
I7278	Bra	BK_Czech_CZE

I4895	Jin	BK_Czech_CZE
I4896	Jin	BK_Czech_CZE
I4946	Jin	BK_Czech_CZE
I5514	Jin	BK_Czech_CZE
I5024	Kne	BK_Czech_CZE
I5025	Kne	BK_Czech_CZE
I4885	Kob	BK_Czech_CZE
I4886	Kob	BK_Czech_CZE
I4888	Kob	BK_Czech_CZE
I4889	Kob	BK_Czech_CZE
I4890	Kob	BK_Czech_CZE
I4891	Kob	BK_Czech_CZE
I4945	Kob	BK_Czech_CZE
I5666	Loc	BK_Czech_CZE
I6476	Lov	BK_Czech_CZE
I7281	Mal	BK_Czech_CZE
I7205	Rad	BK_Czech_CZE
I7210	Rad	BK_Czech_CZE
I7211	Rad	BK_Czech_CZE
I7213	Rad	BK_Czech_CZE
I7282	Rad	BK_Czech_CZE
I7286	Rad	BK_Czech_CZE
I7287	Rad	BK_Czech_CZE
I7288	Rad	BK_Czech_CZE
I7289	Rad	BK_Czech_CZE
I7290	Rad	BK_Czech_CZE
I6468	Vel	BK_Czech_CZE
I6480	Vel	BK_Czech_CZE
I6580	Jor	BK_Poland_POL
I6534	Kor	BK_Poland_POL
I6582	Kor	BK_Poland_POL
I6538	Str	BK_Poland_POL
I6583	Zer	BK_Poland_POL
I4251	Sam	BK_Poland_Sam
I4252	Sam	BK_Poland_Sam
I4253	Sam	BK_Poland_Sam
I2364	Bud	BK_Hungary_HUN
I2365	Bud	BK_Hungary_HUN2
I5015	Bud	BK_Hungary_HUN
I3528	Lup	BK_Hungary_HUN2
I3529	Lup	BK_Hungary_HUN2
I2741	Sfu	BK_Hungary_Sfu1
I2786	Sfu	BK_Hungary_Sfu2
I2787	Sfu	BK_Hungary_Sfu3
I4178	Sfu	BK_Hungary_HUN2
I7044	Svu	BK_Hungary_HUN
I7045	Svu	BK_Hungary_HUN

Table S2. Z-scores of statistics of the form f_4 (Mbuti, Test, Pop1, Pop2). Negative values indicate that Test is closer to Pop1 than to Pop2, and the opposite for positive values. Significant values are highlighted ($Z > 3$ in green, $Z < -3$ in red). Number of individuals for each group is given in parentheses.

Test	f_4 (Mbuti, Test; C_Iberia_CA, BK_Spain_BUR1)	f_4 (Mbuti, Test; C_Iberia_CA, BK_Spain_BUR2)	f_4 (Mbuti, Test; BK_Spain_MAD1, BK_Spain_MAD2)	f_4 (Mbuti, Test; BK_Spain_MAD1, BK_Spain_Mag1)	f_4 (Mbuti, Test; BK_France_Heg, BK_France_HAR)	f_4 (Mbuti, Test; France_MLN, BK_France_Mar)	f_4 (Mbuti, Test; France_MLN, BK_France_AHP)	f_4 (Mbuti, Test; BK_Italy_Gui1, BK_Italy_Gui2)	f_4 (Mbuti, Test; BK_Italy_Gui1, BK_Italy_Gui3)	f_4 (Mbuti, Test; BK_Hungary_Sfu1, BK_Hungary_Sfu3)
AfontovaGora3 (1)	-0.218	4.345	4.147	1.118	5.831	1.203	7.69	1.428	3.526	6.899
Anatolia_Chalcolithic (1)	-0.004	-1.337	-1.726	-1.74	-1.944	0.133	-2.053	-2.463	-2.839	-2.519
Anatolia_N (24)	-0.635	-5.8	-7.232	-3.776	-6.915	-2.582	-11.449	-2.853	-5.372	-10.97
Anatolia_N_Bon.SG (4)	0.448	-2.072	-2.364	-3.033	-3.031	-1.323	-6.661	-0.665	-3.012	-5.914
Anatolia_N_Kumtepe.SG (1)	0.649	-0.729	-1.166	-0.196	-0.433	-0.278	-3.376	-0.646	-0.353	-2.557
Anatolia_N.SG (2)	0.515	-3.916	-4.387	-3.13	-5.345	-2.139	-9.358	-1.578	-5.079	-8.352
Anatolia_N_Tep_Cif.SG (4)	-0.355	-1.968	-4.488	-1.542	-3.66	0.186	-6.384	-1.903	-3.039	-7.018
Armenia_Chalcolithic (5)	0.452	-0.607	0.294	-2.719	-0.15	0.284	-1.047	0.077	-1.282	-1.671
Armenia_EBA (3)	-0.992	-0.132	-0.474	-0.386	0.104	-0.702	-0.836	0.688	-0.151	-1.13
Armenia_MLBA (1)	0.604	2.33	0.865	0.879	1.407	0.262	-0.406	-0.206	1.672	0.235
Armenia_MLBA.SG (8)	0.411	0.548	-0.491	-1.542	0.054	1.024	1.785	3.042	0.938	0.823
Bichon (1)	2.591	-1.824	-0.818	0.262	-1.231	0.829	-2.11	-2.26	-0.91	-1.886
CHG (2)	2.038	3.274	3.149	1.121	1.476	0.17	2.926	1.627	0.696	3.962
C_Iberia_CA (25)	-	-	-9.127	-4.012	-5.204	-3.593	-11.103	-3.505	-4.333	-10.463
C_Iberia_CA.SG (3)	2.028	-4.516	-6.782	-4.655	-4.168	-3.009	-8.474	-2.314	-4.343	-8.981
Corded_Ware_Czech (3)	-0.707	-1.457	-0.302	-0.007	1.027	0.084	0.288	-0.188	0.734	-0.485
Corded_Ware_Estonia.SG (1)	0.698	-0.088	2.133	0.149	1.154	0.204	0.35	-0.434	-0.567	1.828
Corded_Ware_Germany (12)	0.18	3.041	3.322	0.866	3.174	1.882	4.294	-0.46	1.328	3.677
Corded_Ware_Germany.SG (4)	1.844	2.636	2.308	1.055	2.455	-1.11	3.306	1.307	0.222	2.55
Corded_Ware_Poland.SG (1)	0.931	0.356	1.23	0.544	-0.353	-0.952	-0.138	0.195	-0.006	0.846
Czech_EBA (16)	-0.811	-2.56	-0.732	-0.733	0.308	0.013	-1.066	-1.947	-0.573	-1.121
EHG (3)	1.58	4.722	4.273	0.403	6.05	1.203	5.794	1.47	2.557	7.584
EIMiron (1)	0.176	-0.422	-2.538	-1.395	0.273	-0.615	-2.88	-2.686	-0.36	-2.909
England_CA_EBA (23)	-1.156	-0.746	1.976	0.441	2.865	1.159	2.556	-0.919	1.282	0.79
England_LBA (1)	-1.257	1.776	-1.558	0.125	0.203	0.543	1.761	0.541	-1.442	-1.234
England_MBA (19)	-0.997	-1.714	1.129	-0.598	2.328	0.728	1.585	-0.558	0.087	0.523
England_N (14)	-1.534	-7.436	-7.02	-4.024	-5.314	-2.5	-10.234	-3.533	-4.215	-10.539
France_MLN (4)	-1.567	-7.448	-7.48	-3.127	-5.032	-	-	-2.819	-4.466	-8.776
Germany_BA.SG (1)	-0.232	-1.531	-1.398	0.678	-2.143	0.326	-0.87	0.331	-0.578	-3.599
Germany_LN (4)	0.352	1.442	0.508	-1.031	0.649	0.807	0.472	-0.85	0.878	-0.176
Germany_MN (7)	0.595	-3.349	-5.586	-4.058	-4.834	-0.507	-7.22	-2.671	-3.395	-9.128
GoyetQ116-1 (1)	-0.988	-0.57	-1.4	-1.589	1.485	0.164	-0.242	-2.313	-1.105	-0.483
Greece_EN.SG (1)	1.209	-1.296	-4.402	-1.753	-6.256	-0.174	-6.092	-0.954	-2.465	-5.295
Greece_FN.SG (1)	1.291	-2.281	-4.136	-3.182	-6.145	-1.732	-7.689	-2.139	-4.803	-5.697
Greece_LN.SG (1)	1.529	-2.884	-4.327	-2.215	-3.399	-2.501	-5.704	-3.188	-4.402	-6.826
Halberstadt_LBA (1)	0.458	1.041	0.809	-0.144	-0.133	-0.103	1.117	1.389	0.971	-1.162
Hungary_BA (5)	-0.887	-4.216	-3.163	-1.984	-0.98	0.749	-3.148	-2.578	-2.294	-4.275
Hungary_EN (10)	-2.068	-6.496	-6.384	-3.211	-5.686	-1.743	-8.852	-3.697	-4.532	-10.666
Hungary_LCA (19)	-0.598	-6.21	-7.155	-3.098	-6.288	-2.558	-10.115	-3.568	-5.01	-10.121
Iberia_BA_C.SG (1)	0.93	-0.097	-3.477	-1.613	-2.5	-1.518	-2.196	1.089	-0.397	-3.765
Iberia_EN (6)	-1.082	-6.252	-7.835	-4.579	-5.719	-2.307	-11.342	-3.388	-4.648	-10.153
Iberia_EN.SG (1)	0.185	-3.771	-5.482	-2.338	-3.639	-1.228	-5.993	-1.691	-4.452	-8.679
Iberia_MN (4)	-0.178	-7.296	-7.572	-3.38	-5.26	-3.818	-10.72	-2.845	-3.388	-10.24
Iceman.SG (1)	1.3	-3.224	-4.025	-2.506	-4.647	-0.801	-6.493	-2.745	-2.989	-6.246
Iran_Chalcolithic (5)	0.141	-1.831	-0.806	-0.722	0.696	-0.257	-1.788	0.279	-0.53	-1.232

Iran_IA.SG (1)	1.87	2.025	-0.508	-1.529	-1.882	0.666	-1.45	-1.554	-2.033	-0.426
Iran_Late_Neolithic (1)	-0.968	-0.355	-0.247	-2.061	0.206	0.476	0.598	-0.037	1.483	1.458
Iran_Mesolithic (1)	0.102	-2.428	-1.88	-0.406	1.592	-0.477	-0.146	0.33	-0.404	-0.279
Iran_N (5)	0.301	0.273	0.061	1.951	1.296	0.594	1.95	0.192	1.043	2.111
Iran_N.SG (4)	1.251	3.75	1.878	1.265	1.714	0.938	2.306	1.269	1.184	3.572
Ireland_BA (3)	1.236	2.733	1.183	0.75	1.747	0.443	1.235	0.012	0.148	1.937
Ireland_MN (1)	1.301	-4.094	-5.2	-3.2	-4.432	-1.74	-5.419	-1.408	-2.292	-7.387
Israel_Natufian (6)	-1.341	-3.859	-4.146	-2.973	-1.424	-0.798	-5.093	-0.924	-3.206	-4.844
LBK_EN (29)	-0.92	-6.129	-7.022	-3.742	-6.493	-2.105	-11.036	-2.406	-5.483	-11.557
Levant_BA (3)	-1.509	-4.04	-3.169	-1.735	-2.33	-1.307	-5.529	-1.738	-2.839	-3.825
Levant_N (12)	-2.241	-5.237	-3.506	-3.62	-4.275	-1.238	-9.188	-2.474	-3.046	-6.043
MA1 (1)	0.582	2.249	5.528	1.178	4.189	0.713	5.741	2.261	3.687	5.603
mota (1)	1.694	0.34	-0.334	-0.308	1.658	-0.278	-2.091	-1.3	-0.401	-0.438
Netherlands_BA (2)	-1.275	-1.303	0.716	-0.18	3.065	-0.086	1.588	-0.273	0.411	3.414
N_Iberia_CA (14)	-2.356	-9.192	-8.141	-3.67	-4.617	-3.345	-10.886	-3.214	-3.58	-9.741
Nordic_BA.SG (3)	0.927	-0.964	0.76	-0.743	-0.592	-0.21	-2.008	0.387	0.667	1.171
Nordic_LBA.SG (1)	0.403	0.555	-0.17	-0.388	-1.602	1.191	-0.962	0.476	1.268	-0.441
Nordic_LN.SG (4)	0.309	0.81	0.488	-0.941	1.258	0.038	0.346	0.752	1.027	1.531
Nordic_MN_B.SG (1)	1.623	0.757	0.978	0.02	0.885	0.087	1.461	-1.631	-1.379	2.117
Poland_BA (3)	0.066	1.004	1.047	0.16	3.592	0.74	2.698	0.14	2.078	3.365
Poland_LN (6)	-0.279	-4.817	-3.41	-2.588	-3.247	-1.627	-7.37	-3.208	-3.506	-7.853
Remedello_CA.SG (3)	0.777	-3.588	-5.221	-1.558	-2.991	-2.28	-7.709	-1.762	-2.76	-7.456
Russia_EBA.SG (1)	2.02	2.753	1.137	-0.768	4.211	0.627	3.389	0.9	0.341	5.288
Scotland_CA_EBA (6)	-1.41	-1.335	1.655	0.021	2.132	-0.229	2.191	-0.852	0.415	2.266
Scotland_LBA (5)	-2.029	-0.944	0.425	-0.176	1.832	0.87	0.482	-0.682	0.554	1.149
Scotland_MBA (4)	-0.832	-2.359	0.517	-0.434	2.637	0.683	1.258	0.447	-0.321	0.555
Scotland_N (34)	-2.208	-7.933	-7.601	-3.763	-5.923	-2.186	-10.638	-3.894	-4.261	-11.416
SE_Iberia_CA (4)	0.923	-3.13	-1.525	-2.544	-3.387	0.123	-4.313	-1.666	-2.164	-3.464
SHG (6)	2.178	1.314	2.54	0.191	4.403	0.944	2.997	-0.634	0.838	3.428
Steppe_EBA (9)	1.592	5.181	5.894	2.386	6.475	3.298	7.73	2.812	3.535	9.702
Steppe_EBA.SG (6)	1.541	4.705	6.081	1.163	4.83	2.438	7.746	2.711	3.298	10.061
Steppe_Eneolithic (3)	1.711	4.875	5.469	1.18	5.514	3.182	7.838	1.789	2.716	6.591
Sweden_MN (4)	-0.211	-1.755	-3.705	-2.879	-3.735	-0.177	-6.071	-0.513	-3.315	-6.697
SW_Iberia_CA (1)	0.806	-4	-4.964	-1.543	-3.048	-0.213	-6.679	-1.227	-2.513	-6.158
Unetice_EBA (7)	0.807	1.26	1.861	-0.643	2.698	-0.625	1.243	-0.084	-0.346	1.882
Unetice_EBA.SG (3)	0.962	0.798	1.872	0.85	2.692	0.916	1.406	0.25	0.451	2.691
Vestonice16 (1)	-1.591	-1.237	-0.002	0.482	-0.034	-0.667	-0.882	0.335	1.793	0.762
Villabruna (1)	0.583	-1.031	-1.787	0.135	-0.084	-1.18	-1.934	-2.011	-0.301	-2.139
Wales_CA_EBA (1)	-1.104	0.992	0.279	-0.136	2.35	-0.281	-0.549	-0.235	2.777	1.671
Wales_MBA (2)	-0.56	-1.885	0.37	1.989	0.636	-0.24	-0.276	-0.061	0.61	1.008
Wales_N (2)	0.265	-4.853	-5.389	-2.121	-4.273	-3.282	-8.443	-2.224	-2.007	-7.783
WHG (3)	1.924	-2.118	-1.57	-1.654	0.279	-0.864	-0.948	-1.148	0.659	-2.249
BK_Czech_CZE (36)	-0.933	-1.833	0.244	-1.18	1.802	1.088	0.522	-1.276	-0.031	-0.081
BK_England_NOR (5)	-0.759	-1.169	2.346	0.239	2.893	0.934	1.609	0.24	1.456	0.697
BK_England_SOU (27)	-0.673	0.609	2.343	-0.067	3.682	0.927	3.019	-0.704	0.49	2.392
BK_England_SOUout (1)	0.057	-1.614	-1.657	-2.87	-0.058	-0.645	-0.421	-0.799	0.151	-0.967
BK_France_AHP (3)	-0.02	-0.284	-0.319	-1.485	2.873	1.219	-	-1.297	0.544	-1.09
BK_France_HAR (2)	0.552	-0.365	-0.196	-0.562	-	0.215	1.792	-0.642	1.49	2.237
BK_France_Heg (1)	-1.148	-3.461	-4.194	-2.968	-	-2.112	-7.956	-2.692	-3.004	-5.228
BK_France_Mar (1)	-0.824	-3.117	-3.071	-2.011	-1.337	-	-3.268	-1.764	-0.357	-3.486
BK_France_Mon (2)	-0.234	0.277	2.1	-1.191	1.905	1.263	1.248	-0.146	0.829	2.393
BK_Germany_BAV (45)	-1.234	-2.57	0.023	0.143	1.685	0.384	0.543	-1.085	-0.174	-0.67
BK_Germany_SAN (9)	1.715	-0.423	1.547	-0.234	1.631	0.286	0.661	0.373	0.158	0.371

BK_Germany_Wor (1)	-0.594	0.118	-0.265	1.202	0.815	0.068	2.634	1.848	2.638	0.333
BK_Hungary_HUN (4)	-0.498	-3.386	-3.704	-3.095	-2.676	-0.114	-5.888	-2.162	-3.491	-5.645
BK_Hungary_HUN2 (4)	1.838	-0.049	0.844	-0.889	0.701	-0.017	-0.059	-0.216	-0.319	-0.508
BK_Hungary_Sfu1 (1)	-1.776	-4.28	-5.16	-3.001	-4.46	-1.733	-7.541	-2.321	-2.024	-
BK_Hungary_Sfu2 (1)	1.051	1.62	2.043	-1.06	3.344	0.307	1.954	-0.405	-0.815	2.421
BK_Hungary_Sfu3 (1)	-1.293	1.842	2.652	-0.469	3.41	0.371	1.552	0.088	1.72	-
BK_Italy_Gui1 (1)	0.347	-3.777	-4.013	-1.923	-4.861	-2.288	-7.84	-	-	-6.304
BK_Italy_Gui2 (1)	0.104	-0.263	-1.532	0.045	-1.73	-0.905	-4.283	-	-2.002	-3.254
BK_Italy_Gui3 (1)	0.437	-2.868	-0.55	0.403	-1.438	0.173	-1.232	-1.534	-	-2.584
BK_Netherlands_Tui (9)	-0.989	-1.228	1.972	0.478	3.055	1.499	2.737	-0.674	1.462	2.855
BK_Poland_POL (5)	-1.461	0.423	1.035	-0.532	2.996	-0.198	-0.722	-0.542	0.426	0.629
BK_Poland_Sam (3)	0.454	-1.151	0.618	-0.936	1.198	0.061	1.568	0.795	0.353	1.173
BK_Portugal_POR (5)	-0.128	-4.875	-5.232	-2.498	-3.277	-2.385	-7.917	-2.927	-2.599	-5.328
BK_Scotland_Ach (1)	0.837	-0.808	0.989	0.264	1.95	0.74	1.13	0.258	1.123	0.726
BK_Scotland_ELO (2)	-1.438	0.27	-1.091	1.154	0.877	0.487	0.034	0.17	0.557	-0.296
BK_Scotland_Sor (1)	0.107	-0.62	0.473	-0.409	1.529	0.779	1.105	0.812	1.283	0.779
BK_Italy_Per (1)	0.563	-0.567	-1.544	0.141	-1.179	-0.218	-2.824	-1.598	-0.961	-0.803
BK_Spain_BUR1 (2)	-	-3.779	-5.222	-2.12	-1.339	-1.351	-6.05	-2.582	-2.799	-7.363
BK_Spain_BUR2 (3)	0.734	-	-3.251	-1.143	-1.872	-1.248	-2.805	-1.167	-2.75	-4.418
BK_Spain_Cer (10)	1.351	-4.952	-5.989	-3.612	-2.774	-1.409	-7.724	-2.018	-2.025	-7.989
BK_Spain_MAD1 (7)	-2.073	-7.669	-	-	-4.914	-3.568	-10.295	-3.016	-4.188	-8.977
BK_Spain_MAD2 (4)	-0.541	-2.577	-	-0.319	-1.091	-0.377	-3.816	-1.495	-1.388	-3.007
BK_Spain_Mag1 (1)	-1.069	0.904	0.96	-	1.544	-1.11	-1.708	-1.06	1.422	0.694
BK_Switzerland_Sio (3)	1.105	-1.362	-0.706	-0.345	0.999	-0.154	-1.21	-0.504	0.689	0.348

Table S3. f_4 -statistics of the form $f_4(\text{Mbuti, Test; EN1, EN2})$. "EN" refers to Early Neolithic populations. Number of individuals for each group is given in parentheses.

Test	EN1-EN2		EN1-EN2		EN1-EN2	
	Iberia_EN-LBK_EN		LBK_EN-Hungary_EN		Iberia_EN-Hungary_EN	
	f_4	Z	f_4	Z	f_4	Z
Iberia_MN (4)	-0.001342	-7.018	0.000054	0.345	-0.001347	-6.276
C_Iberia_CA (25)	-0.001096	-6.724	0.000182	1.297	-0.000893	-4.788
N_Iberia_CA (14)	-0.001194	-6.827	0.000578	4.1	-0.000587	-3.078
SW_Iberia_CA (1)	-0.001343	-4.304	0.000027	0.114	-0.00131	-3.862
SE_Iberia_CA (4)	-0.001086	-2.721	0.000118	0.375	-0.000866	-1.857
France_MLN (4)	-0.000925	-4.689	0.000412	2.673	-0.000479	-2.195
Poland_LN (6)	-0.000158	-0.81	0.000477	3.103	0.000281	1.304
Germany_MN (7)	-0.000097	-0.463	-0.00023	-1.376	-0.00028	-1.252
Hungary_LCA (19)	0.000369	2.342	0.000239	1.795	0.000563	3.278
Sweden_MN (4)	-0.000137	-0.542	-0.000108	-0.56	-0.00022	-0.803
England_N (14)	-0.000778	-4.515	0.000557	3.989	-0.000287	-1.57
Scotland_N (34)	-0.000893	-5.801	0.000711	5.464	-0.00023	-1.359
Wales_N (2)	-0.000608	-2.562	0.000111	0.61	-0.000501	-1.916
Ireland_MN (1)	-0.000496	-1.839	-0.000554	-2.803	-0.001028	-3.665
BK_France_Heg (1)	-0.000509	-1.894	0.000175	0.917	-0.000274	-0.975
BK_Italy_Gui1 (1)	-0.000192	-0.748	0.000341	1.721	0.000135	0.485
BK_Hungary_Sfu1 (1)	-0.000058	-0.22	0.000224	1.126	0.000229	0.8
BK_Italy_Per (1)	-0.000418	-0.576	-0.000245	-0.447	-0.000626	-0.789
BK_Spain_Cer (10)	-0.001092	-4.625	0.000432	2.445	-0.000751	-2.921
BK_Spain_BUR1 (2)	-0.000962	-4.144	-0.000178	-0.952	-0.001141	-4.464
BK_Spain_MAD1 (7)	-0.001071	-5.459	0.000344	2.235	-0.000781	-3.624
BK_Portugal_POR (5)	-0.000939	-4.394	0.00014	0.791	-0.00083	-3.359

Table S4. Modelling populations as a mixture of Steppe_EBA, Anatolia_N and WHG. Table shows *qpADM* mixture proportions for each source population with standard errors, and P-values evaluating the fit of the model. Number of individuals for each group is given in parentheses.

Test	Mixture proportions						P-value
	Steppe_EBA	SE	Anatolia_N	SE	WHG	SE	
BK_Spain_Cer (10)			0.750	0.017	0.250	0.017	0.615
BK_Spain_BUR1 (2)			0.732	0.020	0.268	0.020	0.345
BK_Spain_BUR2 (3)	0.230	0.041	0.559	0.041	0.211	0.019	0.022
BK_Spain_MAD1 (7)			0.750	0.016	0.250	0.016	0.340
BK_Spain_MAD2 (4)	0.345	0.041	0.461	0.038	0.195	0.017	0.608
BK_Spain_Mag1 (1)	0.502	0.142	0.381	0.136	0.117	0.062	0.401
BK_Portugal_POR (5)			0.776	0.020	0.224	0.020	0.413
BK_France_Mar (1)	0.171	0.063	0.618	0.062	0.211	0.027	0.991
BK_France_AHP (3)	0.509	0.043	0.296	0.042	0.195	0.018	0.570
BK_France_HAR (2)	0.483	0.054	0.366	0.053	0.151	0.024	0.297
BK_France_Heg (1)			0.806	0.025	0.194	0.025	0.387
BK_France_Mon (2)	0.510	0.046	0.350	0.045	0.140	0.020	0.741
BK_England_NOR (5)	0.440	0.036	0.374	0.036	0.186	0.016	0.245
BK_England_SOU outlier (1)	0.308	0.083	0.476	0.083	0.216	0.036	0.997
BK_England_SOU (27)	0.578	0.021	0.260	0.021	0.162	0.009	0.682
BK_Scotland_Ach (1)	0.616	0.060	0.286	0.059	0.098	0.025	0.142
BK_Scotland_ELO (2)	0.480	0.044	0.325	0.043	0.195	0.020	0.365
BK_Scotland_Sor (1)	0.436	0.057	0.344	0.055	0.220	0.025	0.981
BK_Netherlands_Tui (9)	0.581	0.027	0.248	0.027	0.171	0.012	0.583
BK_Italy_Gui1 (1)			0.831	0.024	0.169	0.024	0.399
BK_Italy_Gui2 (1)	0.256	0.059	0.651	0.059	0.092	0.026	0.642
BK_Italy_Gui3 (1)	0.297	0.057	0.569	0.058	0.134	0.026	0.096
BK_Italy_Per (1)			0.926	0.057	0.074	0.057	0.877
BK_Hungary_HUN (4)	0.138	0.034	0.683	0.035	0.179	0.015	0.239
BK_Hungary_HUN2 (4)	0.466	0.036	0.373	0.034	0.161	0.016	0.779
BK_Hungary_Sfu1 (1)			0.772	0.024	0.228	0.024	0.487
BK_Hungary_Sfu2 (1)	0.589	0.058	0.286	0.058	0.125	0.024	0.804
BK_Hungary_Sfu3 (1)	0.750	0.059	0.190	0.059	0.060	0.024	0.070
BK_Switzerland_Sio (3)	0.338	0.054	0.536	0.052	0.126	0.024	0.502
BK_Poland_POL (5)	0.430	0.039	0.385	0.039	0.185	0.016	0.034
BK_Poland_Sam (3)	0.455	0.063	0.387	0.060	0.157	0.024	0.052
BK_Germany_BAV (45)	0.441	0.020	0.402	0.020	0.158	0.008	0.080
BK_Germany_SAN (9)	0.482	0.028	0.357	0.028	0.161	0.012	0.644

BK_Germany_Wor (1)	0.511	0.068	0.365	0.068	0.124	0.027	0.070
BK_Czech_CZE (36)	0.450	0.020	0.377	0.020	0.173	0.008	0.055
C_Iberia_CA (25)			0.729	0.010	0.271	0.010	0.361
SE_Iberia_CA (4)			0.744	0.032	0.256	0.032	0.355
SW_Iberia_CA (1)			0.762	0.027	0.238	0.027	0.183
England_N (14)			0.716	0.011	0.284	0.011	0.457
England_CA_EBA (23)	0.491	0.022	0.349	0.021	0.160	0.009	0.255
England_MBA (19)	0.489	0.022	0.334	0.021	0.177	0.009	0.047
England_LBA (1)	0.559	0.069	0.323	0.070	0.118	0.029	0.118
Scotland_N (34)			0.713	0.008	0.287	0.008	0.687
Scotland_CA_EBA (6)	0.538	0.035	0.281	0.034	0.181	0.015	0.148
Scotland_MBA (4)	0.515	0.034	0.320	0.034	0.165	0.014	0.365
Scotland_LBA (5)	0.462	0.033	0.351	0.033	0.187	0.014	0.535
Wales_N (2)			0.785	0.021	0.215	0.021	0.644
Wales_CA_EBA (1)	0.512	0.064	0.342	0.062	0.146	0.026	0.672
Wales_MBA (2)	0.664	0.092	0.200	0.087	0.135	0.037	0.490
France_MLN (4)			0.720	0.017	0.280	0.017	0.411
Netherlands_BA (2)	0.506	0.045	0.299	0.044	0.194	0.018	0.929
Poland_BA (3)	0.571	0.037	0.256	0.037	0.173	0.015	0.276
Czech_EBA (16)	0.492	0.023	0.344	0.022	0.164	0.010	0.644
Corded_Ware_Czech (3)	0.404	0.035	0.445	0.036	0.151	0.015	0.896
Czech_MN (2)			0.913	0.017	0.087	0.017	0.642
Hungary_LCA (19)			0.856	0.008	0.144	0.008	0.607
Hungary_BA (5)	0.194	0.031	0.595	0.031	0.212	0.013	0.082
Previously published							
Iberia_MN (4)			0.756	0.015	0.244	0.015	0.504
C_Iberia_CA.SG (3)			0.788	0.015	0.212	0.015	0.578
N_Iberia_CA (14)			0.671	0.012	0.329	0.012	0.416
Germany_MN (7)			0.811	0.018	0.189	0.018	0.623
Ireland_MN (1)			0.793	0.025	0.207	0.025	0.360
Poland_LN (6)			0.730	0.015	0.270	0.015	0.174
Sweden_MN (4)			0.760	0.023	0.240	0.023	0.298
Corded_Ware_Germany (12)	0.706	0.031	0.183	0.031	0.111	0.014	0.489

Table S5. Mixture proportions for the model Anatolia_N + LaBraña1 + KO1. Table shows *qpADM* mixture proportions for each source population with standard errors, and P-values evaluating the fit of the model. Number of individuals for each group is given in parentheses.

Test	P-value	Mixture proportions					
		Anatolia_N	SE	LaBraña1	SE	KO1	SE
Iberia_EN (6)	9.13E-01	0.883	0.014	0.126	0.040	-0.009	0.038
Iberia_MN (4)	9.16E-01	0.691	0.017	0.308	0.047	0.001	0.048
C_Iberia_CA (25)	5.72E-01	0.689	0.011	0.182	0.032	0.130	0.032
N_Iberia_CA (14)	1.77E-01	0.620	0.013	0.207	0.039	0.173	0.039
LBK_EN (29)	2.53E-01	0.952	0.008	0.002	0.024	0.046	0.024
Germany_MN (7)	2.50E-01	0.796	0.019	0.013	0.055	0.191	0.054
Hungary_EN (10)	2.14E-01	0.876	0.010	0.015	0.031	0.109	0.031
Hungary_LCA (19)	8.40E-01	0.846	0.009	-0.007	0.025	0.161	0.025
Poland_LN (6)	2.33E-01	0.706	0.017	0.027	0.046	0.268	0.045
France_MLN (4)	3.27E-01	0.677	0.018	0.144	0.050	0.179	0.050
Sweden_MN (4)	6.35E-01	0.735	0.026	-0.014	0.075	0.279	0.072
England_N (14)	8.00E-01	0.680	0.012	0.124	0.031	0.196	0.031
Scotland_N (34)	5.67E-01	0.680	0.009	0.099	0.025	0.221	0.026

Table S6. Mixture proportions for the model Anatolia_N + LaBraña1 + Loschbour. Table shows *qpADM* mixture proportions for each source population with standard errors, and P-values evaluating the fit of the model. Number of individuals for each group is given in parentheses.

Test	P-value	Mixture proportions					
		Anatolia_N	SE	LaBraña1	SE	Loschbour	SE
Iberia_EN (6)	9.47E-01	0.874	0.018	0.157	0.058	-0.032	0.045
Iberia_MN (4)	9.25E-01	0.687	0.021	0.331	0.071	-0.017	0.056
C_Iberia_CA (25)	2.67E-01	0.723	0.013	0.142	0.048	0.136	0.039
N_Iberia_CA (14)	6.02E-01	0.677	0.015	0.102	0.052	0.221	0.042
LBK_EN (29)	1.63E-01	0.963	0.010	0.000	0.033	0.037	0.026
Germany_MN (7)	3.70E-01	0.852	0.024	-0.074	0.084	0.221	0.068
Hungary_EN (10)	1.07E-01	0.906	0.014	-0.012	0.048	0.106	0.038
Hungary_LCA (19)	2.88E-01	0.890	0.012	-0.053	0.040	0.163	0.032
Poland_LN (6)	1.86E-01	0.798	0.023	-0.111	0.080	0.313	0.062
France_MLN (4)	5.30E-01	0.739	0.023	0.043	0.075	0.218	0.060
Sweden_MN (4)	3.22E-01	0.820	0.036	-0.106	0.119	0.287	0.092
England_N (14)	3.51E-01	0.734	0.014	0.051	0.047	0.215	0.038
Scotland_N (34)	5.41E-01	0.743	0.010	0.014	0.037	0.243	0.030

Table S7. Modelling Beaker Complex (BC) populations as a mixture of Steppe_EBA and different Neolithic/Copper Age populations. Table shows *qpADM* mixture proportions for each source population with standard errors, and P-values evaluating the fit of the model. P-values > 0.05 are highlighted. Number of individuals for each group is given in parentheses.

Test	Neolithic/Copper Age source	P-value	Mixture proportions		SE
			Steppe_EBA	Neolithic/Copper Age source	
BC Iberia combined	Iberia_MN (4)	1.66E-01	0.158	0.842	0.014
	C_Iberia_CA (25)	7.23E-01	0.150	0.850	0.011
	N_Iberia_CA (14)	1.76E-05	0.177	0.823	0.011
	SE_Iberia_CA (4)	1.15E-01	0.043	0.957	0.008
	SW_Iberia_CA (1)	6.11E-01	0.114	0.886	0.015
	Germany_MN (7)	8.17E-11	0.153	0.847	0.018
	Poland_LN (6)	3.36E-06	0.121	0.879	0.014
	Hungary_LCA (19)	2.72E-59	0.221	0.779	0.012
	Sweden_MN (4)	6.28E-03	0.086	0.914	0.020
	France_MLN (4)	4.53E-02	0.174	0.826	0.014
BC outside Iberia combined	Iberia_MN (4)	1.11E-12	0.469	0.531	0.010
	C_Iberia_CA (25)	7.48E-10	0.474	0.008	0.526
	N_Iberia_CA (14)	2.18E-10	0.482	0.518	0.009
	SE_Iberia_CA (4)	9.93E-03	0.178	0.822	0.010
	SW_Iberia_CA (1)	1.04E-02	0.359	0.641	0.013
	Germany_MN (7)	2.51E-13	0.469	0.531	0.012
	Poland_LN (6)	1.84E-01	0.424	0.576	0.010
	Hungary_LCA (19)	6.05E-55	0.522	0.478	0.009
	Sweden_MN (4)	2.45E-01	0.403	0.597	0.014
	France_MLN (4)	4.61E-04	0.478	0.522	0.010

Table S8. Modelling Beaker Complex (BC) populations as a mixture of Steppe_EBA, KO1 and different Neolithic/Copper Age populations. Table shows *qpADM* mixture proportions for each source population with standard errors, and P-values evaluating the fit of the model. P-values > 0.05 are highlighted. Number of individuals for each group is given in parentheses.

Test	Neolithic/Copper Age source	P-value	Mixture proportions					
			Steppe_EBA	SE	Neolithic/Copper Age source	SE	KO1	SE
BC Iberia combined	Iberia_MN (4)	1.32E-01	0.133	0.015	0.853	0.016	0.014	0.015
	C_Iberia_CA (25)	5.77E-01	0.123	0.012	0.876	0.013	0.001	0.011
	N_Iberia_CA (14)	1.66E-01	0.180	0.012	0.887	0.015	- 0.067	0.014
	SE_Iberia_CA (4)	1.21E-01	0.038	0.008	0.967	0.010	- 0.005	0.007
	SW_Iberia_CA (1)	5.13E-01	0.095	0.016	0.895	0.018	0.010	0.015
	Germany_MN (7)	5.46E-05	0.093	0.018	0.803	0.019	0.104	0.016
	Poland_LN (6)	3.53E-07	0.100	0.015	0.901	0.017	- 0.002	0.015
	Hungary_LCA (19)	2.63E-20	0.105	0.012	0.738	0.011	0.156	0.011
	Sweden_MN (4)	2.01E-03	0.059	0.021	0.926	0.026	0.015	0.021
	France_MLN (4)	3.29E-02	0.144	0.015	0.833	0.018	0.022	0.018
BC outside Iberia combined	Iberia_MN (4)	1.11E-12	0.461	0.011	0.523	0.011	0.015	0.011
	C_Iberia_CA (25)	5.79E-10	0.465	0.009	0.526	0.009	0.009	0.008
	N_Iberia_CA (14)	3.91E-08	0.492	0.009	0.541	0.011	- 0.033	0.010
	SE_Iberia_CA (4)	1.49E-02	0.176	0.010	0.817	0.011	0.008	0.006
	SW_Iberia_CA (1)	2.16E-02	0.352	0.013	0.628	0.015	0.021	0.011
	Germany_MN (7)	9.00E-02	0.431	0.011	0.485	0.011	0.085	0.010
	Poland_LN (6)	2.91E-01	0.417	0.010	0.569	0.011	0.013	0.009
	Hungary_LCA (19)	2.04E-02	0.440	0.007	0.451	0.007	0.110	0.006
	Sweden_MN (4)	5.44E-01	0.393	0.014	0.579	0.016	0.028	0.013
	France_MLN (4)	2.11E-03	0.465	0.011	0.510	0.012	0.025	0.011

Table S9. Modelling Copper Age and Bronze Age individuals from Britain (including Beaker-associated) as a mixture of BK_Netherlands_Tui and Britain_Neolithic. Table shows *qpADM* mixture proportions for each source population with standard errors, and P-values evaluating the fit of the model.

Individual	Label	P-value	Mixture proportions			
			BK_Netherlands Tui	Britain Neolithic	SE	SNPs covered
I5379	BK_England_SOU	2.46E-02	0.800	0.200	0.039	700532
I2612	England_CA_EBA	6.43E-01	0.969	0.031	0.075	55173
I2416	BK_England_SOUout	9.99E-01	0.597	0.403	0.050	136956
I2450	BK_England_SOU	6.20E-01	1.052	-0.052	0.039	904314
I2417	BK_England_SOU	6.46E-02	1.182	-0.182	0.040	829575
I2418	BK_England_SOU	5.95E-01	1.000	0.000	0.039	656573
I2461	England_CA_EBA	5.79E-01	0.970	0.030	0.040	771469
I2565	BK_England_SOU	4.31E-01	0.950	0.050	0.129	14794
I5367	BK_Scotland_Sor	3.00E-01	0.900	0.100	0.043	750069
I5385	BK_Scotland_Ach	1.74E-01	1.045	-0.045	0.040	543435
I2459	BK_England_SOU	6.12E-01	1.066	-0.066	0.041	519046
I4950	BK_England_SOU	8.60E-01	1.087	-0.087	0.040	777787
I4951	BK_England_SOU	2.90E-01	1.063	-0.063	0.050	181249
I5376	BK_England_SOU	4.39E-01	1.137	-0.137	0.058	142558
I5512	BK_England_SOU	9.08E-01	0.973	0.027	0.041	863895
I5513	BK_England_SOU	6.12E-01	1.003	-0.003	0.039	816408
I2446	BK_England_SOU	4.46E-02	0.913	0.087	0.063	97727
I2457	England_CA_EBA	8.18E-01	0.955	0.045	0.041	718630
I6774	BK_England_SOU	3.83E-01	1.083	-0.083	0.041	597958
I6775	BK_England_SOU	8.20E-01	0.966	0.034	0.041	670798
I6777	BK_England_SOU	5.64E-02	1.026	-0.026	0.040	783327
I6778	BK_England_SOU	4.84E-01	0.998	0.002	0.042	580860
I1765_d	BK_England_NOR	6.66E-01	0.942	0.058	0.138	13484
I2453	BK_England_SOU	3.59E-01	1.001	-0.001	0.040	610725
I2445	BK_England_SOU	6.61E-01	0.895	0.105	0.039	854563
I2568	BK_Scotland_ELO	1.11E-01	0.759	0.241	0.039	570382
I2597	England_CA_EBA	4.58E-01	0.991	0.009	0.040	824991
I5471	BK_Scotland_ELO	7.64E-01	0.884	0.116	0.043	619372
I2443	BK_England_SOU	2.58E-01	1.005	-0.005	0.040	894847
I5382	BK_England_NOR	7.61E-01	0.970	0.030	0.047	321701
I2566	BK_England_SOU	1.20E-01	0.960	0.040	0.043	485091
I2604	England_CA_EBA	2.26E-01	0.953	0.047	0.040	760401
I3256	BK_England_SOU	5.89E-01	0.936	0.064	0.039	843389
I2452	BK_England_SOU	8.08E-01	0.937	0.063	0.039	913255
I2454	BK_England_SOU	7.98E-01	1.022	-0.022	0.039	818929
I5373	England_CA_EBA	2.37E-02	1.066	-0.066	0.045	234326
I7635	England_CA_EBA	8.70E-01	0.992	0.008	0.043	483056
I1767	BK_England_NOR	7.54E-01	0.742	0.258	0.040	729987
I2567	Scotland_CA_EBA	7.62E-02	0.945	0.055	0.038	589224
I3255	BK_England_SOU	8.52E-01	0.997	0.003	0.041	861509
I2618	England_CA_EBA	4.12E-01	0.921	0.079	0.042	643010
I2598	BK_England_SOU	9.17E-01	0.989	0.011	0.062	85900
I7638	England_CA_EBA	1.37E-01	0.922	0.078	0.041	600303

I2569	Scotland_CA_EBA	6.25E-01	0.910	0.090	0.102	23665
I2455	BK_England_SOU	5.65E-01	1.022	-0.022	0.058	120698
I2447	BK_England_SOU	9.65E-01	0.993	0.007	0.039	913061
I2462	England_CA_EBA	3.79E-01	0.647	0.353	0.038	816976
I6679	BK_England_NOR	6.38E-02	0.892	0.108	0.046	186564
I3132	Scotland_CA_EBA	2.65E-01	0.908	0.092	0.039	773258
I1770	BK_England_NOR	3.69E-01	0.883	0.117	0.041	483474
I2460	England_CA_EBA	4.78E-01	1.156	-0.156	0.112	23341
I5515	Scotland_CA_EBA	4.58E-01	0.811	0.189	0.050	169789
I2609	England_CA_EBA	3.98E-01	0.897	0.103	0.044	273312
I2601	England_CA_EBA	4.04E-01	0.857	0.143	0.043	498474
I7639	England_CA_EBA	4.42E-02	1.050	-0.050	0.071	59649
I2421	England_CA_EBA	6.22E-01	0.897	0.103	0.041	393274
I2610	England_CA_EBA	8.67E-01	0.864	0.136	0.065	78777
I2463	England_CA_EBA	5.57E-01	0.933	0.067	0.045	234559
I5441	England_CA_EBA	3.12E-01	0.882	0.118	0.045	215435
I2602	England_CA_EBA	9.32E-01	0.897	0.103	0.039	641305
I5377	England_CA_EBA	4.79E-01	0.864	0.136	0.037	836940
I7630	England_CA_EBA	3.47E-01	0.984	0.016	0.118	17178
I2981	Scotland_CA_EBA	2.27E-03	0.871	0.129	0.040	788384
I6680	England_CA_EBA	3.18E-02	0.890	0.110	0.036	891333
I5516	Scotland_CA_EBA	4.01E-01	0.822	0.178	0.042	246356
I2464	England_CA_EBA	4.94E-01	0.917	0.083	0.075	52649
I1775	Wales_CA_EBA	6.71E-01	0.881	0.119	0.041	410642
I2639	England_MBA	3.74E-01	0.899	0.101	0.039	579584
I3082	England_MBA	2.20E-01	0.842	0.158	0.036	692741
I7568	England_MBA	6.06E-01	0.854	0.146	0.038	770395
I7569	England_MBA	1.81E-01	0.970	0.030	0.076	55240
I7570	England_MBA	9.17E-02	0.878	0.122	0.038	776944
I7571	England_MBA	1.09E-01	0.944	0.056	0.039	772247
I7572	England_MBA	3.88E-02	0.884	0.116	0.038	653822
I7573	England_MBA	1.00E-01	0.899	0.101	0.037	710327
I7574	England_MBA	6.71E-01	0.959	0.041	0.037	789815
I7575	England_MBA	4.01E-01	0.886	0.114	0.038	804626
I7576	England_MBA	4.16E-01	0.805	0.195	0.039	785638
I7577	England_MBA	4.14E-01	0.857	0.143	0.038	779194
I7578	England_MBA	3.97E-01	0.901	0.099	0.039	776322
I7580	England_MBA	2.12E-01	0.971	0.029	0.039	771152
I7626	England_MBA	1.82E-01	0.878	0.122	0.038	768905
I7627	England_MBA	1.94E-02	0.864	0.136	0.039	780543
I7628	England_MBA	6.51E-02	0.839	0.161	0.042	409259
I2573	Scotland_MBA	9.69E-02	0.916	0.084	0.040	611500
I2653	Scotland_MBA	7.37E-01	0.886	0.114	0.039	574585
I2654	Scotland_MBA	1.32E-01	0.997	0.003	0.041	518165
I5364	Wales_MBA	1.06E-01	1.054	-0.054	0.105	27760
I2458	England_MBA	9.84E-01	0.788	0.212	0.038	812721
I7640	England_MBA	3.52E-01	0.929	0.071	0.039	801482
I2655	Scotland_MBA	1.97E-01	0.817	0.183	0.040	835188
I2574	Wales_MBA	2.74E-01	0.858	0.142	0.065	77807
I2656_d	Scotland_LBA	3.57E-01	0.765	0.235	0.110	15271

I5383	England_LBA	8.35E-02	0.945	0.055	0.045	291948
I3130	Scotland_LBA	3.52E-01	0.889	0.111	0.038	811519
I2861	Scotland_LBA	2.26E-01	0.831	0.169	0.039	615178
I2860	Scotland_LBA	2.11E-01	0.862	0.138	0.038	830544
I2859	Scotland_LBA	7.15E-02	0.819	0.181	0.038	810185
	CA_EBA combined (including Beaker- associated)	1.60E-01	0.953	0.047	0.015	
	MBA combined	6.69E-02	0.897	0.103	0.016	
	LBA combined	3.61E-01	0.858	0.142	0.022	

Table S10. Modelling Copper Age and Bronze Age individuals from Britain (including Beaker-associated) as a mixture of BK_Netherlands_Tui and England_N. Table shows *qpADM* mixture proportions for each source population with standard errors, and P-values evaluating the fit of the model.

Individual	Label	P-value	Mixture proportions		SE	SNPs covered
			BK_Netherlands Tui	England_N		
I5379	BK_England_SOU	2.47E-02	0.798	0.202	0.039	700532
I2612	England_CA_EBA	6.41E-01	0.971	0.029	0.078	55173
I2416	BK_England_SOUout	9.92E-01	0.603	0.397	0.049	136956
I2450	BK_England_SOU	6.29E-01	1.054	-0.054	0.040	904314
I2417	BK_England_SOU	5.79E-02	1.184	-0.184	0.041	829575
I2418	BK_England_SOU	5.95E-01	1.000	0.000	0.039	656573
I2461	England_CA_EBA	5.83E-01	0.968	0.032	0.041	771469
I2565	BK_England_SOU	4.32E-01	0.950	0.050	0.129	14794
I5367	BK_Scotland_Sor	2.93E-01	0.900	0.100	0.043	750069
I5385	BK_Scotland_Ach	1.72E-01	1.045	-0.045	0.040	543435
I2459	BK_England_SOU	6.15E-01	1.067	-0.067	0.041	519046
I4950	BK_England_SOU	8.71E-01	1.090	-0.090	0.041	777787
I4951	BK_England_SOU	2.83E-01	1.062	-0.062	0.051	181249
I5376	BK_England_SOU	4.10E-01	1.134	-0.134	0.059	142558
I5512	BK_England_SOU	9.05E-01	0.975	0.025	0.042	863895
I5513	BK_England_SOU	6.12E-01	1.002	-0.002	0.040	816408
I2446	BK_England_SOU	4.47E-02	0.912	0.088	0.064	97727
I2457	England_CA_EBA	8.32E-01	0.952	0.048	0.041	718630
I6774	BK_England_SOU	3.64E-01	1.081	-0.081	0.041	597958
I6775	BK_England_SOU	8.27E-01	0.964	0.036	0.041	670798
I6777	BK_England_SOU	5.45E-02	1.023	-0.023	0.040	783327
I6778	BK_England_SOU	4.84E-01	0.998	0.002	0.042	580860
I1765_d	BK_England_NOR	6.91E-01	0.917	0.083	0.130	13484
I2453	BK_England_SOU	3.59E-01	0.998	0.002	0.041	610725
I2445	BK_England_SOU	6.77E-01	0.893	0.107	0.039	854563
I2568	BK_Scotland_ELO	1.37E-01	0.759	0.241	0.039	570382
I2597	England_CA_EBA	4.59E-01	0.991	0.009	0.041	824991
I5471	BK_Scotland_ELO	7.51E-01	0.884	0.116	0.043	619372
I2443	BK_England_SOU	2.57E-01	1.000	0.000	0.041	894847
I5382	BK_England_NOR	7.60E-01	0.970	0.030	0.047	321701
I2566	BK_England_SOU	1.20E-01	0.961	0.039	0.042	485091
I2604	England_CA_EBA	2.35E-01	0.950	0.050	0.041	760401
I3256	BK_England_SOU	5.77E-01	0.938	0.062	0.039	843389
I2452	BK_England_SOU	8.19E-01	0.936	0.064	0.039	913255
I2454	BK_England_SOU	7.99E-01	1.023	-0.023	0.040	818929
I5373	England_CA_EBA	2.61E-02	1.071	-0.071	0.046	234326
I7635	England_CA_EBA	8.69E-01	0.993	0.007	0.044	483056
I1767	BK_England_NOR	7.76E-01	0.741	0.259	0.040	729987
I2567	Scotland_CA_EBA	8.27E-02	0.942	0.058	0.038	589224
I3255	BK_England_SOU	8.52E-01	0.999	0.001	0.042	861509
I2618	England_CA_EBA	4.07E-01	0.922	0.078	0.042	643010
I2598	BK_England_SOU	9.16E-01	0.992	0.008	0.062	85900
I7638	England_CA_EBA	1.36E-01	0.922	0.078	0.041	600303
I2569	Scotland_CA_EBA	6.30E-01	0.908	0.092	0.101	23665
I2455	BK_England_SOU	5.62E-01	1.021	-0.021	0.060	120698

I2447	BK_England_SOU	9.66E-01	0.992	0.008	0.039	913061
I2462	England_CA_EBA	5.03E-01	0.646	0.354	0.038	816976
I6679	BK_England_NOR	6.65E-02	0.890	0.110	0.046	186564
I3132	Scotland_CA_EBA	2.70E-01	0.908	0.092	0.039	773258
I1770	BK_England_NOR	3.62E-01	0.884	0.116	0.041	483474
I2460	England_CA_EBA	4.91E-01	1.155	-0.155	0.107	23341
I5515	Scotland_CA_EBA	4.91E-01	0.807	0.193	0.051	169789
I2609	England_CA_EBA	4.15E-01	0.896	0.104	0.044	273312
I2601	England_CA_EBA	4.11E-01	0.857	0.143	0.043	498474
I7639	England_CA_EBA	4.46E-02	1.051	-0.051	0.071	59649
I2421	England_CA_EBA	6.35E-01	0.895	0.105	0.042	393274
I2610	England_CA_EBA	8.67E-01	0.863	0.137	0.065	78777
I2463	England_CA_EBA	5.45E-01	0.935	0.065	0.045	234559
I5441	England_CA_EBA	3.23E-01	0.881	0.119	0.045	215435
I2602	England_CA_EBA	9.41E-01	0.895	0.105	0.040	641305
I5377	England_CA_EBA	5.13E-01	0.863	0.137	0.037	836940
I7630	England_CA_EBA	3.57E-01	0.956	0.044	0.120	17178
I2981	Scotland_CA_EBA	2.30E-03	0.870	0.130	0.041	788384
I6680	England_CA_EBA	3.36E-02	0.888	0.112	0.037	891333
I5516	Scotland_CA_EBA	3.97E-01	0.821	0.179	0.043	246356
I2464	England_CA_EBA	4.93E-01	0.917	0.083	0.075	52649
I1775	Wales_CA_EBA	6.78E-01	0.879	0.121	0.042	410642
I2639	England_MBA	3.92E-01	0.898	0.102	0.039	579584
I3082	England_MBA	2.40E-01	0.840	0.160	0.036	692741
I7568	England_MBA	6.10E-01	0.852	0.148	0.039	770395
I7569	England_MBA	1.82E-01	0.968	0.032	0.076	55240
I7570	England_MBA	1.02E-01	0.875	0.125	0.038	776944
I7571	England_MBA	1.11E-01	0.942	0.058	0.040	772247
I7572	England_MBA	4.16E-02	0.883	0.117	0.039	653822
I7573	England_MBA	1.01E-01	0.899	0.101	0.038	710327
I7574	England_MBA	6.78E-01	0.958	0.042	0.037	789815
I7575	England_MBA	4.37E-01	0.882	0.118	0.039	804626
I7576	England_MBA	4.60E-01	0.804	0.196	0.038	785638
I7577	England_MBA	3.76E-01	0.860	0.140	0.038	779194
I7578	England_MBA	3.98E-01	0.900	0.100	0.039	776322
I7580	England_MBA	2.10E-01	0.972	0.028	0.039	771152
I7626	England_MBA	2.03E-01	0.876	0.124	0.037	768905
I7627	England_MBA	2.18E-02	0.861	0.139	0.039	780543
I7628	England_MBA	5.91E-02	0.841	0.159	0.042	409259
I2573	Scotland_MBA	9.94E-02	0.914	0.086	0.041	611500
I2653	Scotland_MBA	7.35E-01	0.885	0.115	0.039	574585
I2654	Scotland_MBA	1.33E-01	0.996	0.004	0.041	518165
I5364	Wales_MBA	1.28E-01	1.098	-0.098	0.116	27760
I2458	England_MBA	9.81E-01	0.787	0.213	0.038	812721
I7640	England_MBA	3.57E-01	0.928	0.072	0.039	801482
I2655	Scotland_MBA	2.32E-01	0.812	0.188	0.040	835188
I2574	Wales_MBA	3.03E-01	0.849	0.151	0.067	77807
I2656_d	Scotland_LBA	3.98E-01	0.751	0.249	0.111	15271
I5383	England_LBA	8.86E-02	0.941	0.059	0.046	291948
I3130	Scotland_LBA	3.49E-01	0.889	0.111	0.038	811519
I2861	Scotland_LBA	2.73E-01	0.829	0.171	0.039	615178
I2860	Scotland_LBA	2.13E-01	0.863	0.137	0.037	830544
I2859	Scotland_LBA	6.91E-02	0.819	0.181	0.038	810185

CA_EBA combined (including Beaker- associated)	1.79E-01	0.951	0.049	0.016
MBA combined	8.49E-02	0.892	0.108	0.016
LBA combined	3.72E-01	0.857	0.143	0.022

Table S11. Modelling Copper Age and Bronze Age individuals from Britain (including Beaker-associated) as a mixture of BK_Netherlands_Tui and Scotland_N. Table shows *qpADM* mixture proportions for each source population with standard errors, and P-values evaluating the fit of the model.

Individual	Label	P-value	Mixture proportions			SNPs covered
			BK_Netherlands Tui	Scotland_N	SE	
I5379	BK_England_SOU	2.31E-02	0.801	0.199	0.039	700532
I2612	England_CA_EBA	6.45E-01	0.968	0.032	0.075	55173
I2416	BK_England_SOUout	9.99E-01	0.595	0.405	0.050	136956
I2450	BK_England_SOU	6.19E-01	1.052	-0.052	0.039	904314
I2417	BK_England_SOU	6.43E-02	1.183	-0.183	0.041	829575
I2418	BK_England_SOU	5.95E-01	1.001	-0.001	0.039	656573
I2461	England_CA_EBA	5.77E-01	0.970	0.030	0.040	771469
I2565	BK_England_SOU	4.33E-01	0.948	0.052	0.128	14794
I5367	BK_Scotland_Sor	3.04E-01	0.899	0.101	0.043	750069
I5385	BK_Scotland_Ach	1.74E-01	1.046	-0.046	0.040	543435
I2459	BK_England_SOU	6.10E-01	1.066	-0.066	0.041	519046
I4950	BK_England_SOU	8.56E-01	1.087	-0.087	0.040	777787
I4951	BK_England_SOU	2.90E-01	1.063	-0.063	0.050	181249
I5376	BK_England_SOU	4.52E-01	1.139	-0.139	0.058	142558
I5512	BK_England_SOU	9.08E-01	0.973	0.027	0.042	863895
I5513	BK_England_SOU	6.12E-01	1.003	-0.003	0.040	816408
I2446	BK_England_SOU	4.52E-02	0.912	0.088	0.063	97727
I2457	England_CA_EBA	8.16E-01	0.956	0.044	0.041	718630
I6774	BK_England_SOU	3.87E-01	1.084	-0.084	0.041	597958
I6775	BK_England_SOU	8.20E-01	0.966	0.034	0.041	670798
I6777	BK_England_SOU	5.71E-02	1.027	-0.027	0.040	783327
I6778	BK_England_SOU	4.84E-01	0.999	0.001	0.042	580860
I1765_d	BK_England_NOR	6.61E-01	0.949	0.051	0.143	13484
I2453	BK_England_SOU	3.59E-01	1.002	-0.002	0.040	610725
I2445	BK_England_SOU	6.62E-01	0.895	0.105	0.039	854563
I2568	BK_Scotland_ELO	1.07E-01	0.759	0.241	0.039	570382
I2597	England_CA_EBA	4.58E-01	0.991	0.009	0.041	824991
I5471	BK_Scotland_ELO	7.66E-01	0.883	0.117	0.043	619372
I2443	BK_England_SOU	2.59E-01	1.006	-0.006	0.040	894847
I5382	BK_England_NOR	7.61E-01	0.969	0.031	0.047	321701
I2566	BK_England_SOU	1.20E-01	0.960	0.040	0.043	485091
I2604	England_CA_EBA	2.26E-01	0.953	0.047	0.040	760401
I3256	BK_England_SOU	5.87E-01	0.937	0.063	0.039	843389
I2452	BK_England_SOU	8.09E-01	0.937	0.063	0.039	913255
I2454	BK_England_SOU	7.98E-01	1.022	-0.022	0.039	818929
I5373	England_CA_EBA	2.33E-02	1.065	-0.065	0.046	234326
I7635	England_CA_EBA	8.70E-01	0.992	0.008	0.044	483056
I1767	BK_England_NOR	7.48E-01	0.742	0.258	0.040	729987
I2567	Scotland_CA_EBA	7.59E-02	0.945	0.055	0.038	589224
I3255	BK_England_SOU	8.52E-01	0.997	0.003	0.041	861509
I2618	England_CA_EBA	4.16E-01	0.921	0.079	0.042	643010
I2598	BK_England_SOU	9.17E-01	0.988	0.012	0.062	85900
I7638	England_CA_EBA	1.35E-01	0.922	0.078	0.041	600303
I2569	Scotland_CA_EBA	6.22E-01	0.912	0.088	0.102	23665
I2455	BK_England_SOU	5.66E-01	1.023	-0.023	0.058	120698

I2447	BK_England_SOU	9.65E-01	0.992	0.008	0.039	913061
I2462	England_CA_EBA	3.33E-01	0.648	0.352	0.039	816976
I6679	BK_England_NOR	6.20E-02	0.892	0.108	0.046	186564
I3132	Scotland_CA_EBA	2.64E-01	0.908	0.092	0.039	773258
I1770	BK_England_NOR	3.73E-01	0.883	0.117	0.041	483474
I2460	England_CA_EBA	4.66E-01	1.151	-0.151	0.112	23341
I5515	Scotland_CA_EBA	4.46E-01	0.812	0.188	0.050	169789
I2609	England_CA_EBA	3.92E-01	0.897	0.103	0.044	273312
I2601	England_CA_EBA	4.04E-01	0.857	0.143	0.043	498474
I7639	England_CA_EBA	4.46E-02	1.052	-0.052	0.072	59649
I2421	England_CA_EBA	6.18E-01	0.898	0.102	0.041	393274
I2610	England_CA_EBA	8.65E-01	0.864	0.136	0.065	78777
I2463	England_CA_EBA	5.61E-01	0.932	0.068	0.045	234559
I5441	England_CA_EBA	3.10E-01	0.882	0.118	0.045	215435
I2602	England_CA_EBA	9.30E-01	0.897	0.103	0.040	641305
I5377	England_CA_EBA	4.73E-01	0.864	0.136	0.037	836940
I7630	England_CA_EBA	3.46E-01	0.995	0.005	0.120	17178
I2981	Scotland_CA_EBA	2.33E-03	0.871	0.129	0.040	788384
I6680	England_CA_EBA	3.12E-02	0.890	0.110	0.037	891333
I5516	Scotland_CA_EBA	4.03E-01	0.822	0.178	0.043	246356
I2464	England_CA_EBA	4.91E-01	0.918	0.082	0.075	52649
I1775	Wales_CA_EBA	6.59E-01	0.881	0.119	0.041	410642
I2639	England_MBA	3.68E-01	0.899	0.101	0.039	579584
I3082	England_MBA	2.20E-01	0.841	0.159	0.036	692741
I7568	England_MBA	6.08E-01	0.853	0.147	0.038	770395
I7569	England_MBA	1.81E-01	0.969	0.031	0.077	55240
I7570	England_MBA	8.76E-02	0.879	0.121	0.038	776944
I7571	England_MBA	1.07E-01	0.944	0.056	0.039	772247
I7572	England_MBA	3.81E-02	0.885	0.115	0.038	653822
I7573	England_MBA	1.01E-01	0.899	0.101	0.038	710327
I7574	England_MBA	6.72E-01	0.959	0.041	0.037	789815
I7575	England_MBA	3.94E-01	0.886	0.114	0.039	804626
I7576	England_MBA	3.99E-01	0.805	0.195	0.039	785638
I7577	England_MBA	4.19E-01	0.856	0.144	0.039	779194
I7578	England_MBA	3.94E-01	0.901	0.099	0.039	776322
I7580	England_MBA	2.13E-01	0.970	0.030	0.039	771152
I7626	England_MBA	1.77E-01	0.878	0.122	0.038	768905
I7627	England_MBA	1.90E-02	0.864	0.136	0.039	780543
I7628	England_MBA	6.79E-02	0.838	0.162	0.043	409259
I2573	Scotland_MBA	9.60E-02	0.916	0.084	0.040	611500
I2653	Scotland_MBA	7.39E-01	0.886	0.114	0.039	574585
I2654	Scotland_MBA	1.32E-01	0.998	0.002	0.041	518165
I5364	Wales_MBA	1.04E-01	1.046	-0.046	0.105	27760
I2458	England_MBA	9.84E-01	0.787	0.213	0.038	812721
I7640	England_MBA	3.47E-01	0.929	0.071	0.039	801482
I2655	Scotland_MBA	1.92E-01	0.817	0.183	0.040	835188
I2574	Wales_MBA	2.62E-01	0.861	0.139	0.065	77807
I2656_d	Scotland_LBA	3.47E-01	0.770	0.230	0.109	15271
I5383	England_LBA	8.32E-02	0.945	0.055	0.045	291948
I3130	Scotland_LBA	3.54E-01	0.889	0.111	0.038	811519
I2861	Scotland_LBA	2.13E-01	0.831	0.169	0.039	615178
I2860	Scotland_LBA	2.10E-01	0.862	0.138	0.038	830544
I2859	Scotland_LBA	7.38E-02	0.819	0.181	0.038	810185

CA_EBA combined (including Beaker- associated)	1.57E-01	0.953	0.047	0.015
MBA combined	6.46E-02	0.897	0.103	0.016
LBA combined	3.60E-01	0.857	0.143	0.022

Table S12. P-values evaluating the fit of models testing whether Neolithic individuals from Britain are consistent with being a clade with the British Neolithic population (including all the British Neolithic individuals except the one being tested). For the three individuals with a poor fit, we provide P-values obtained when WHG is added to the model.

Ind	P-value	P-value when WHG is added to the model
I0518	3.37E-02	
I0519	7.96E-01	
I0520	9.00E-01	
I2605	6.07E-02	
I2606	5.45E-01	
I2629	3.10E-01	
I2630	7.62E-01	
I2631	4.43E-02	
I2634	3.96E-01	
I2635	6.85E-01	
I2636	3.71E-01	
I2637	7.30E-01	
I2650	4.30E-01	
I2651	7.03E-01	
I2657	4.31E-01	
I2659	8.01E-02	
I2660	2.49E-01	
I2691	1.33E-06	1.93E-01
I2796	5.56E-01	
I2932	2.84E-01	
I2933	2.04E-01	
I2934	9.76E-02	
I2935	6.20E-01	
I2977	1.57E-01	
I2978	5.54E-02	
I2979	7.69E-01	
I2980	3.24E-01	
I2988	7.06E-01	
I3041	3.39E-03	5.00E-01
I3068	6.94E-01	
I3085	8.04E-01	
I3133	6.93E-02	
I3134	1.96E-01	

I3135	1.20E-09	1.22E-01
I3136	1.45E-01	
I3137	7.44E-01	
I3138	8.15E-01	
I4949	6.70E-01	
I5358	1.69E-01	
I5359	4.10E-01	
I5366	4.73E-01	
I5370	1.55E-01	
I5371	7.98E-01	
I5374	9.94E-01	
I6750	7.78E-01	
I6751	8.16E-01	
I6759	7.40E-01	
I6761	9.14E-01	
I6762	2.66E-01	
I7554	2.32E-01	

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