



Report on the Research Excavation at Newgrange Farm 2018

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Introduction

This report discusses the results of a research excavation at Newgrange Farm, Co. Meath, funded by the Royal Irish Academy, which took place over four weeks between 2 July and 27 July 2018 (License no. 18E0369). The main aim of this research excavation was to determine the date and function of a massive, rectilinear, sub-surface feature identified by Joanna Leigh in a geophysical survey undertaken in 2015 (Leigh 2015). Although the extent of this feature was not fully revealed in the geophysical survey, its scale and location within the rich archaeological landscape of the Boyne Valley suggested a site of major significance (Fig. 1).

The geophysical survey (Fig. 2) identified a 45m wide, rectilinear space defined by two ditches 28m apart, with an entrance causeway in the east. It extends at least 101m on an east/west axis. A central pathway formed by two parallel pit/post alignments runs from the entrance causeway for the full length of the enclosed space. These pit/posts are 3–4m apart and each pit is



Figure 1: Location of Newgrange Farm site, south of Newgrange passage tomb. The cursus east of Newgrange is shown at top right (photo: Ian Russell).

1.5–2m in diameter. Either side of the central pathway is a further alignment of larger pits each 2–4m in diameter and 2.5–4m apart.

The site is located in the townland of Newgrange, Co. Meath, 216m south of Newgrange passage tomb (ME019-045) and within the core area of Brú na Bóinne World Heritage Site (Fig. 3). It is situated on the highest, fluvio-glacial terrace above the River Boyne (Lewis et al., 2017, 576) east of Newgrange Farm and 400m north-west of the satellite passage tomb known as ‘Site A’ (ME019-049001). Although the area is best known for its passage tombs, there is also a concentration of henge monuments in the vicinity – defined by earth, pits, stone and timber (Stout 1991; Stout 2002, 33–7; Murphy 2018). There is another cursus nearby, to the east of Newgrange passage tomb (Fig. 11; ME019-044001, Condit 1995; Condit 1997, 26–7) and a pit alignment has been identified extending north-west from the end of the cursus (Fig. 11).

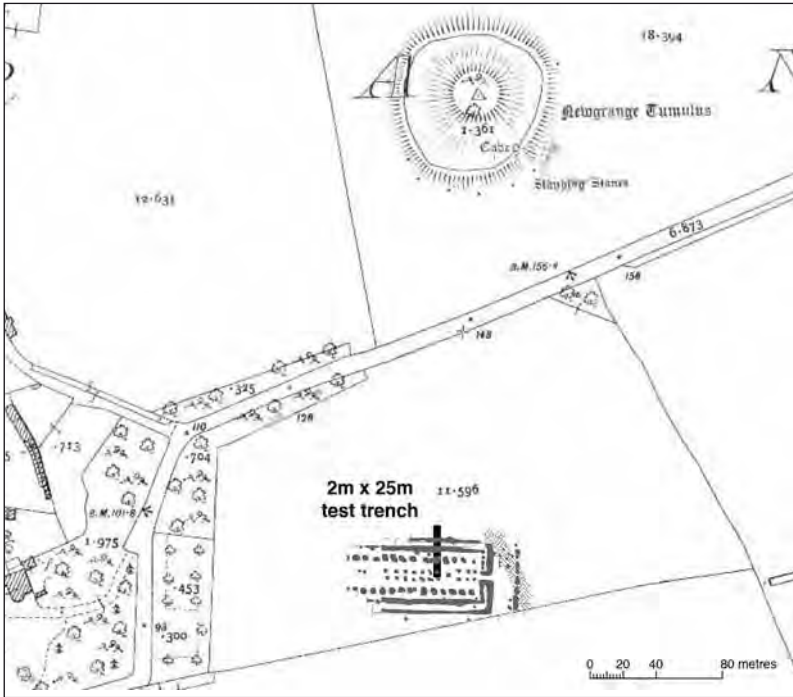


Figure 3: Location of Newgrange Farm site, south of Newgrange passage tomb.

Excavation methodology

A 2m by 25 trench was manually excavated from the top sod to the undisturbed gravels across a representative section of the northern half of the site. The location of the trench was selected to uncover the external ditch-like features and internal pit alignments identified in the geophysical survey (Fig. 2). In order to maximise the recovery of finds, extensive sieving of excavated soil was undertaken during the excavation. Nonetheless, finds were limited in number.¹ A preliminary inspection of the flints by Dr Conor Brady has identified thirty-six flint artefacts, three chert artefacts and one siliceous artefact. Much of the flint is debitage and includes many platform flakes, flake fragments and chunks.² Two pieces of flint are burnt and many are patinated indicating recycling. The artefacts identified include a chert

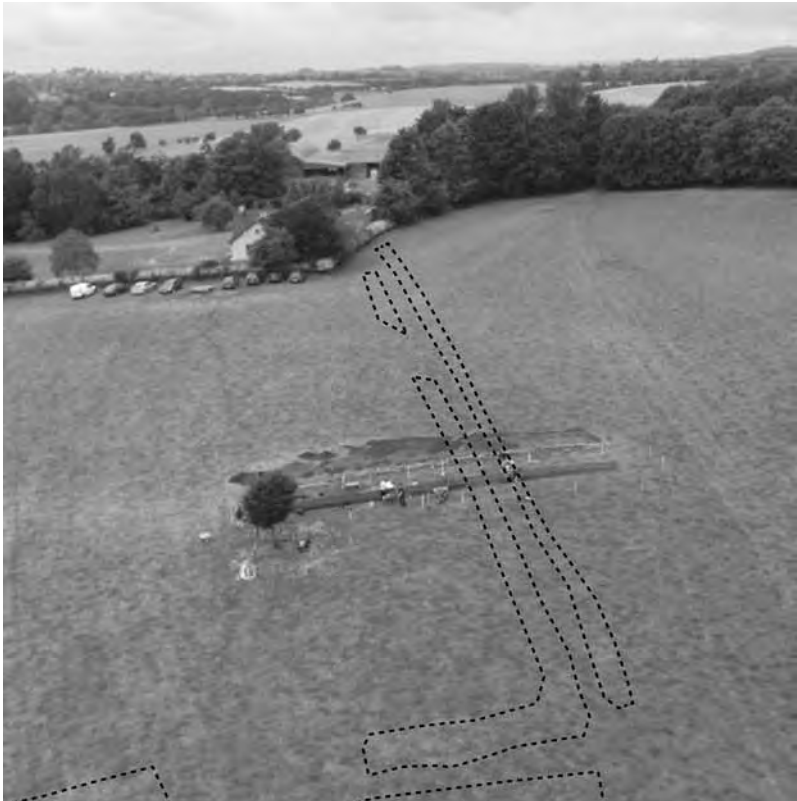


Figure 4: Aerial view of Newgrange Farm excavations from the east. The ditches show up as a continuous crop mark (*photo: Edward Lynch*).

platform core, a possible bipolar core, a scraper fragment and a possible broken barbed and tanged arrowhead.

Stratified sampling of relevant contexts for post-excavation analysis and sieving on-site was carried out and a total of twenty-five bulk soil samples were processed (see appendix 1). No charred seeds were found but there was charcoal in most of the deposits (see appendix 2). A radiocarbon date of a charcoal sample from the basal fill of the outermost ditch was sent to Queens University Belfast, providing a C₁₄ date of between 2632BC and 2472BC.

Results

The excavation confirmed the sub-surface presence of the three key features that had been identified in the geophysical survey (Leigh 2015): 1) external ditches with an associated levelled bank, 2) internal pits, and 3) an axial mound within the interior of the monument that had been identified by Leigh as ‘made ground’.

Topsoil The field below Newgrange passage tomb at Newgrange Farm has been in permanent pasture and has not been ploughed in living memory (pers. comm. David Redhouse). However, plough-marked stones from the topsoil indicate that ploughing had taken place and the geophysical survey identified evidence for historic ridge and furrow cultivation. The topsoil (F001) comprised a light brown gravelly clay with pebbles. This ploughsoil deepens from north to south (0.35m to 0.66m) (Figs 5–6). Unstratified finds from the topsoil included modern potsherds; eighteenth/nineteenth century glass, iron fragments, clay-pipe stems and prehistoric flint, including a Neolithic

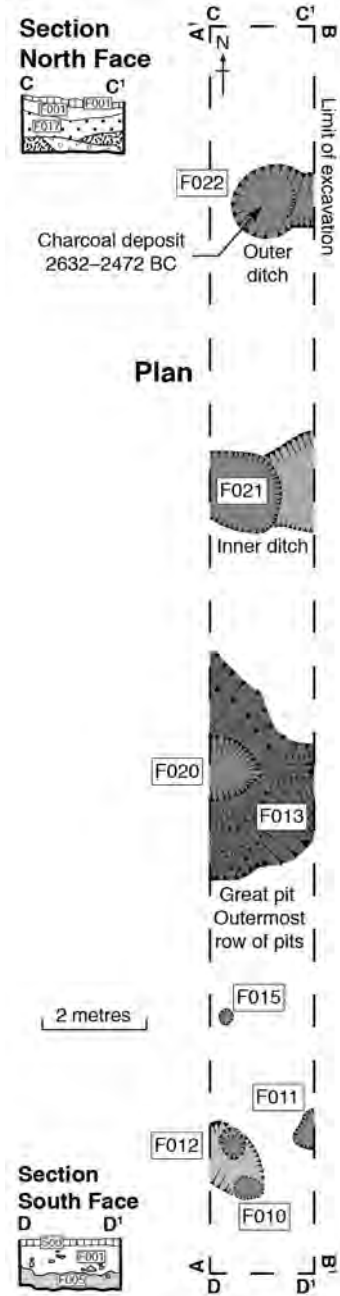


Figure 5: Ground plan and sections C–C' and D–D' showing excavated features.

flint core (6a) and thumbnail scraper of Late Neolithic date (13a) (pers. comm. Dr Conor Brady).

Axial mound: Re-deposited gravels (F005) lay at a depth of 0.40m below the topsoil and comprise a dark grey/brown gravel with occasional boulders (Fig. 6). This deposit was confined to the interior of the monument and was identified as made-up ground in the geophysical survey (Fig. 2). It was 0.45m thick. At least two pits (F011) and (F012) in the south end of the trench were cut through this deposit (Figs 5–6).

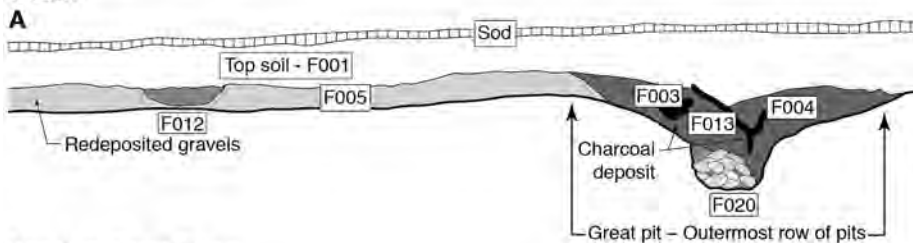
Banks and ditches: The geophysical survey identified the presence of two parallel ditch-like features (Fig. 2) and the excavation uncovered these. The deep topsoil in the north end of the trench overlay an orange/brown, silty, sterile clay (F002), which extended across an outer ditch (Fig. 6). Finds from this deposit include flint and chert. This bank material incorporated a charcoal rich spread (F008, 0.10m thick and 3.30m long) identified at a depth of 0.44m below the sod. It slumped in the middle indicating its position overlying ditch fill. Below F008 was an orange brown silty clay with stones (F017, 1.05m thick) which is greater than 6.10m long as it continues into the north section face. This deposit has been interpreted as spread bank material resulting from historic ploughing.

The upper ditch fill of the inner ditch was uncovered at a depth of 0.65m below the topsoil. A marl-like deposit in the upper fill (F007), incorporating a charcoal deposit (F009), may be the remains of its associated bank pushed into the ditches and spread over the fill as a result of ploughing activity in earlier centuries. This layer produced a bipolar flint core (36). The excavation uncovered two irregular, connecting segments of ditch running east/west for the full width of the trench and cut into re-deposited gravels (F005) (Figs 5–6). It was 1.50–2m in width and 1.20m in depth (Fig. 7). The basal fill contained a charcoal rich-deposit (F021).

A sequence of slumping layers in the north end of the trench indicated the existence of the outer ditch identified in the geophysical survey. This ditch was interrupted and did not run continuously across the excavation trench. It comprised a round-bottomed, sub-circular hollow 1.40m wide narrowing to a width of 1.05m in the east. It was 0.65m deep (Figs 5–6, 8).

Section West Face

South



Section East Face

South

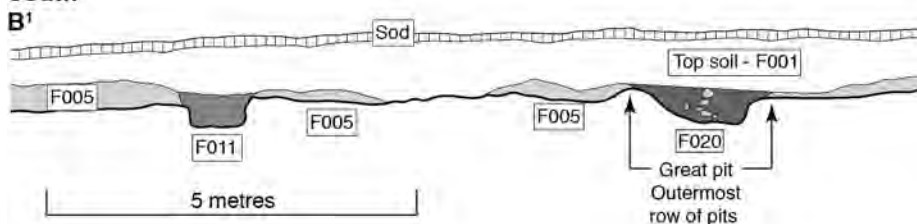
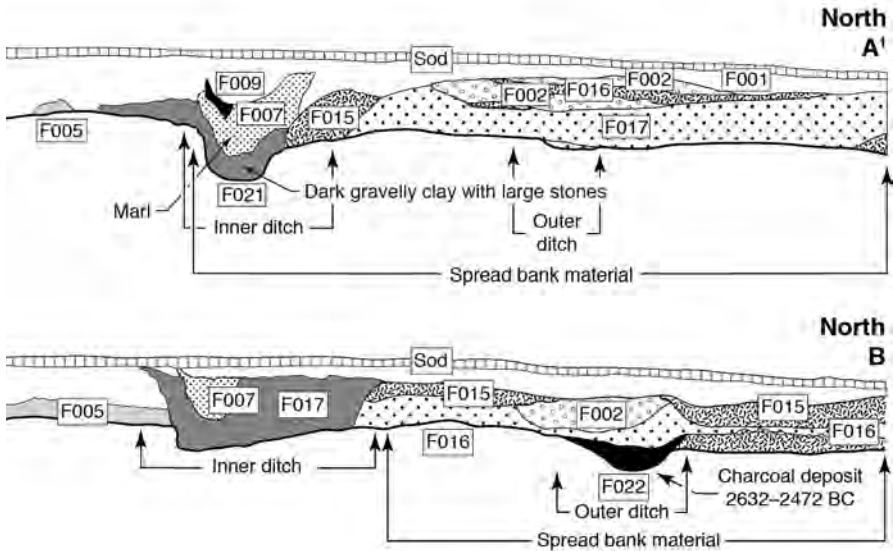


Figure 6: Sections A–A¹ and B–B¹ across excavated features.

The basal fill was dark gravelly clay with boulders (F022). A charcoal sample from this fill produced a C₁₄ date of 2632–2472 BC (calibrated, 95.4% probability).³ This layer also produced a chert platform core (73).

Central Pits: In the southern end of the excavation trench, in the area where the geophysical survey identified two central pit/post alignments, the excavation uncovered a cluster of four small, shallow pits (F010, F011, F012, F015 Figs 5–6, 9) and a great pit (F013/F020, Figs 5–6, 10). Most of the shallow pits were cut into the re-deposited gravels and the natural, undisturbed, grey gravel. In some case there was evidence for water-rolled stones lining their base. They were all truncated and comprise the following: A kidney-shaped pit (F010) with stones lining the base, cut into the natural gravel within the interior of the monument with longest axis east/west (length (L) = 0.95 m, width (W) = 0.60m, depth (D) = 0.30m). A pit in south end of trench (F011) was partially excavated because it ran into the eastern section face (L



0.80m, W 0.30m, D 0.45m). It was filled with dark brown gravelly clay with pebbles. It was cut into the re-deposited gravels (F005). Another partially excavated pit (F012) in the south end of the trench (L 0.60m, W 0.50m, D 0.12m) ran into the eastern section face. It was cut into re-deposited gravels (F005). A small pit (diameter (Diam.) 0.60m, D 0.30m) in the southern end of the trench (F014) lay between pits F011 and F012. A circular pit in the south end of the trench (F015) was uncovered at a depth of 1.05m below sod. This pit was cut into natural gravels (Diam 0.38m, D 0.25m). It was filled with dark brown gravelly clay with pebbles. Water rolled stones lined the base. It was covered by re-deposited gravels (F005).

The Great pit: The great pit (F013, W 4.80m, D 1.65m) was cut into re-deposited gravels (F005). It was partially excavated as it runs into the western section face. Its outer lip was defined by a baked-clay ledge (Figs 5–6, 10). The bottom of the pit lay 2.25 m below the sod and terminated in a



Figure 7: View of excavated inner ditch.



Figure 8: View of excavated outer ditch



Figure 9: General view of small pits in south end of trench

straight-sided base (W 1.75m; D 0.50m). There was a concentration of fire-reddened boulders on its natural gravel base with charcoal and red burnt clay (Fo20) overlying the boulders. This deposit contained burnt animal bone of cattle and possibly pig. Some of the bone had cut marks consistent with filleting of meat from the bone (see appendix 3). A flue-like feature opened into the pit from the east. This was filled with loose stones and was partially defined by a stone laid on its long axis. In the upper fill of this great pit was a sequence of small charcoal-lined pits (Fo03). These comprise a shallow charcoal filled pit (Diam. 0.20m), which was cut by another pit (Diam 0.40m, D 0.80m) that ran into the west section face. This was filled with charcoal and ash and was re-cut by a third charcoal-lined pit (Diam. 0.80m, D 0.60m). It produced burnt flint, chert and quartz fragments. These upper pits produced



Figure 10:
The great pit.

the charred remains of alder and willow derived from small branch wood (see appendix 2). The charcoal which lined these pits may be the burnt remnants of willow baskets. A charcoal deposit (F004) associated with the upper fill activity extended almost to the base of the larger pit. This produced cattle bones and a possible broken barbed and tanged arrowhead (61).

Charcoal samples from the pits and ditches consisted almost entirely of oak; the remains of heartwood from mature trees growing in open clearings. They were free of any insect remains or fungal growth which suggests that the trees were felled and used as green wood, or if seasoned were kept in dry storage (see appendix 2).

Discussion

The excavation at Newgrange Farm has revealed a unique, prehistoric monument in the Boyne valley combining some of the characteristics of the cursus monument tradition with that of pit alignments. The cursus shares its axial form, squared terminal, henge monument association and Late Neolithic dating with sites in Britain. The pit alignment element is similar to that identified running north-west from the terminus of the Newgrange Cursus (Fig. 11) and a pit alignment has also been discovered near Dowth Site Q (pers. comm., Steve Davis, UCD). A further pit alignment is associated with the henge at ‘Giant’s Ring’, Ballynahatty, Co. Down (Hartwell 2002).

The word ‘cursus’ was first used by William Stukeley in the eighteenth century to describe enigmatic Neolithic monuments that he thought were the sites of ancient chariot-racing (Stukeley 1740, 41). It remains the name applied to monuments that are essentially very long and relatively narrow rectangular enclosures, usually with a near continuous boundary of an interior bank and an exterior ditch. The only breaks in this boundary are the

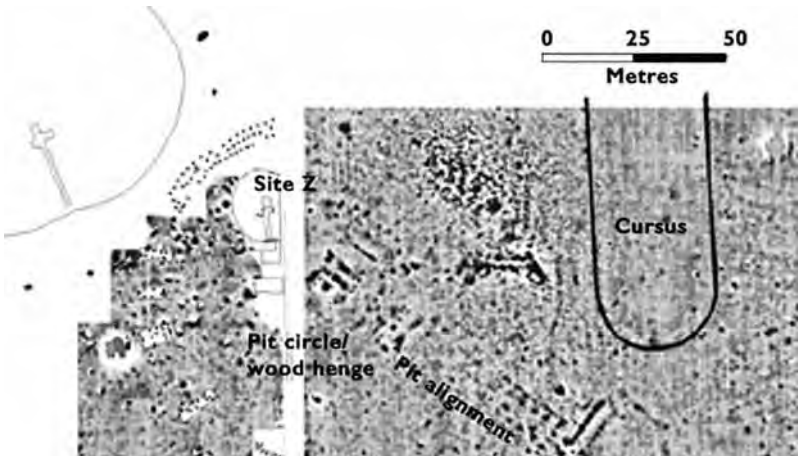


Figure 11: A magnetic gradiometry survey was carried out east of Newgrange passage tomb by Barton, McCarthy, Condit and Buckley. This survey revealed a previously unknown alignment of pits extending north-westwards from the rounded southern terminus of the cursus in the direction of the satellite passage tomb known as Site Z (after Smyth 2009, 22, 30–1).

‘causeways’, or possible entrances. The ends of a cursus are either squared-off or rounded. They are monumental, ceremonial pathways.

There is great variation in the cursus monument tradition in both Ireland and Britain. They can vary in shape, size and form of boundary. In county Meath, for example, the ‘banqueting hall’ at Tara has a hollowed out interior and outer bank, whereas the cursus monument in Ballinvalley, associated with the passage tomb cemetery at Loughcrew, has internal ditches and outer banks (Newman 1995, 21). In Scotland, about half the known sites have a boundary of pits or post-holes. The pits, which held large upright timbers, delineated the cursus instead of earthwork perimeters. Examples of pit-defined sites are Balneaves Cottage and Douglasmuir (Fig. 12) in east Scotland (north-east of Dundee), where there are also ditch-defined and axial-bank barrows (Brophy 1999, 119–29.).

The timber cursus variant is producing the earliest Neolithic dates for cursus monuments in Britain, and the Scottish examples are thought to be the forerunner to the later earthwork cursus monuments (Brophy and Millican 2015, 297–324). These monuments share with Newgrange Farm their overall rectangular form (see, for example, Douglasmuir, Fig. 12), they measure more than 100m in length and are mostly 20m to 35m across. Typically, the cursus has one terminal that can be square- or round-ended. Like Newgrange Farm, British sites also have internal features including pits and post-holes. There were large pits in the cursus at Balneaves Cottage (Angus) (Brophy and Millican 2015, 304).

Extensive excavation has revealed that the wood used in the British examples is oak, as was the case in Newgrange Farm, and there is a consistent absence of artefacts associated with these structures (Brophy and Millican 2015, 307). At Newgrange Farm there were only a few finds in the ditches, which is typical of cursus monuments in Britain. There, excavation usually shows these sites to be very ‘clean’ and they were rarely used for the large-scale deposition of material (Newman 1995, 20). This general lack of finds and absence of lithics within the area immediately around cursuses supports the argument that people were moving through these monuments rather than occupying them (Harding and Barclay 1999, 93).

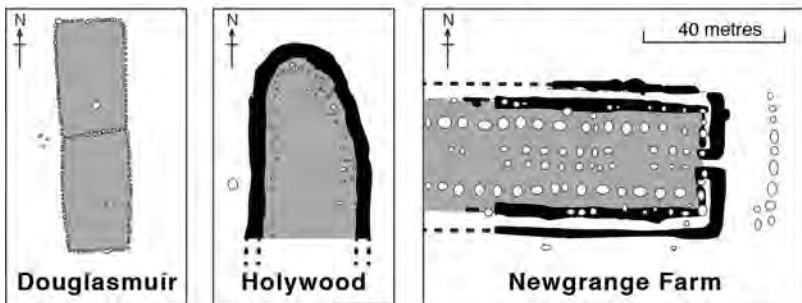
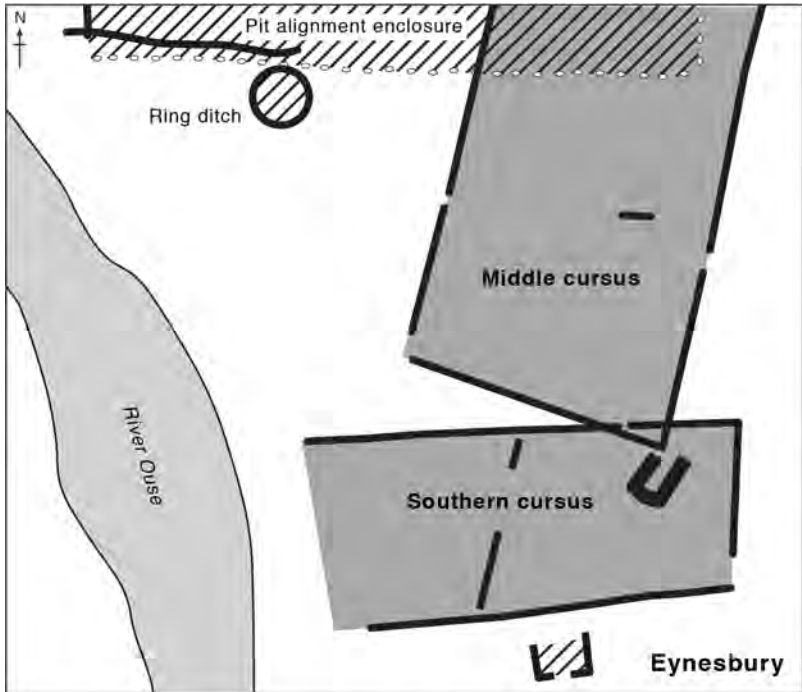


Figure 12: Earthwork complex, Eynesbury, St Neots, Cambridgeshire (after Malim 1999). Excavation plan of the Douglasmuir timber cursus (after Kendrick 1995). Excavation plan of the northern terminus of the Holywood ditched and timber cursus (after Thomas, et al. 1999). Simplified results of the geophysical survey of Newgrange Farm cursus.

The Newgrange Farm site is defined by two ditches and a possible bank. The ditches are segmented and interrupted. The presence of a double-ditch in a cursus-like monument is exceptional in Ireland but has been recognised at sites in Britain such as those at Brampton in Cambridgeshire

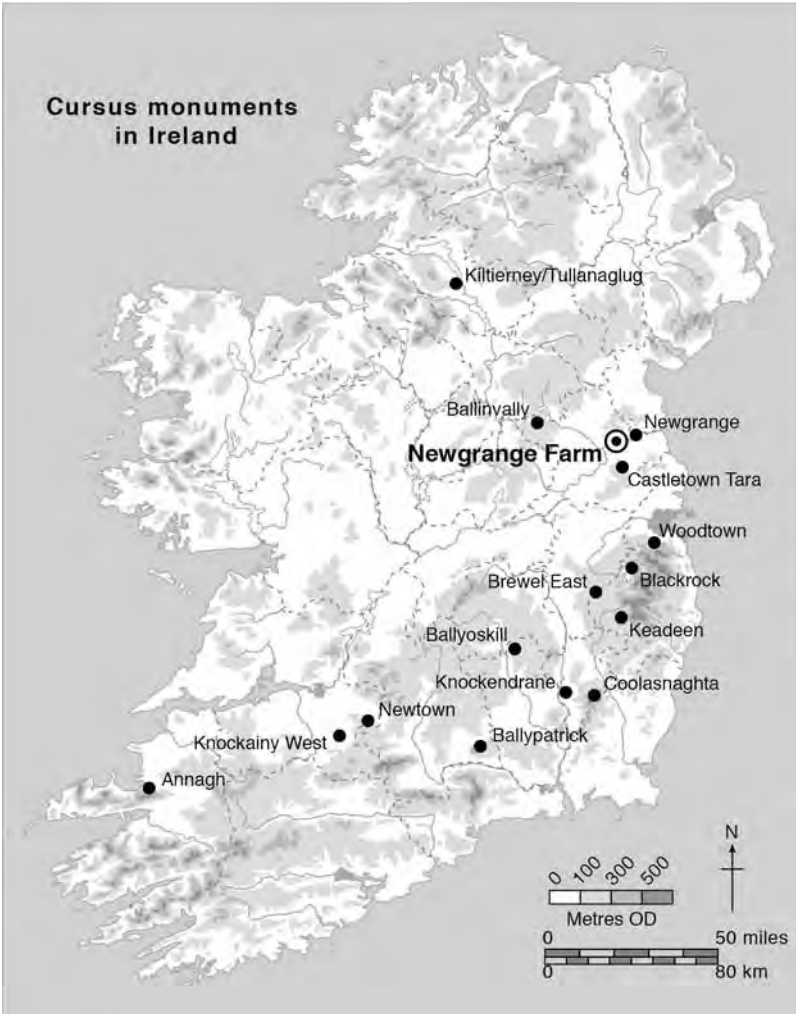


Figure 13: Distribution of cursus monuments in Ireland (based on ASI and NISMR data).

and Scorton in Lancashire (Harding and Barclay 1999, 3). At Brampton, the cursus monument has an inner and outer ditch which excavation indicated were segmented and interrupted (Malim 1999, 80). The Greater Stonehenge cursus excavation also revealed a ditch that was sporadically segmented in construction (Richards 1990, 93).

The ends of cursus monuments are generally defined by squared or rounded terminals and in Newgrange townland there is a combination of both round and squared. The upland cursus at Slievenaman has a squared terminal (Corlett and Kenny 2016). In Britain cursus monuments with squared terminals possess an almost uniform suite of morphological features, including ditches which are extremely regular in their layout and interrupted by offset terminal causeways. For instance, cursus monuments along the River Ouse in Cambridgeshire in the east Midlands at Eynesbury (Fig. 12) have entrance causeways and appear as regular rectangles, the southernmost one is orientated east/west, has an entrance causeway in the east end and is associated with a large pit alignment enclosure (Malim 1999, 80–1).

Newgrange Farm revealed evidence for an internal, axial mound. In Scotland, a few sites have a single mound running along their centre, rather like a bank barrow. For example, excavations at Cleaven Dyke, Perthshire, revealed a pair of widely-spaced parallel ditches flanking a central bank (Barclay and Maxwell 1999, 98).

The Archaeological Surveys of Ireland have identified fifteen cursus monuments (Fig. 13). These are concentrated in the east and south-east. Most of the Wicklow/Leinster mountain sites are in upland settings associated with burial cairns (Kenny 2014, 23). Irish cursuses can vary in length from 600m at Blackrock, Co. Wicklow (W1005-124), to 100m at Newgrange, Co. Meath (ME019-044001), with widths that vary from 90m at Ballypatrick, Co. Tipperary (TS078-078), to just 20m at Newgrange. Their end terminals can be rounded, such as Woodtown, Co. Dublin (DU025-087), or square-ended, as at Newgrange Farm and Knockendrane, Co. Carlow (CW020-026). Many have a change in axis.

Like Newgrange Farm, cursus monuments are generally part of a prehistoric ritual complex of Neolithic monuments in a ceremonial

landscape. Condit has highlighted the prominent vista of monuments that opens up from the end of the cursus monument east of Newgrange (Condit 1997, 26–7). At Loughcrew, Co. Meath, a stone alignment is on the same axis as the cursus (Newman 1995, 19–21; Newman 1999 142–7). The ‘banqueting hall’ at Tara and sites in the Wicklow uplands at Keadeen and Knockieran are associated with passage tombs (Corlett 2014, 24). At Brewel East, Co. Kildare, the cursus is associated with a henge (Corlett 2014). The Boyne valley examples are associated with passage tombs and a concentration of Late Neolithic henge monuments.

Newgrange Farm is located on a flat, gravel-terrace above a major river, a position that is favoured by cursus monuments in Britain (where they are often part of a complex of henges, ring-ditches and cairns (Loveday 1985, 7)). Brophy suggests a connection between cursus monuments and streams and rivers. Many cross, or are crossed by, rivers. Some sites are completely surrounded by waterways, like Maxey Cursus in Cambridgeshire. Other sites may have had seasonally flooded ditches, creating a powerful visual image when sunlight reflected off watery ditches stretching across the landscape (Brophy 2000, 59–70).

The Newgrange Farm excavation results are significant in providing evidence for structured deposition and for ritual feasting on a grand scale. The great pit is one of a series of possible fire pits, which were dug in advance in order to provide receptacles in which to discard waste from ritual feasting. They are associated with depositional practice like those uncovered at henges within the Bend of the Boyne (Sweetman 1985). The combination of pits and post holes at Newgrange Farm also occurs at the Newgrange pit circle (Sweetman 1985). They are all public monuments used in outdoor ceremonial activity; large in scale and involving considerable communal effort in their construction.

The central position of the inner pits/post alignments suggests a corridor or pathway, which marked the route of a ceremonial procession. It has been suggested that cursus monuments represent formalised segments of longer pre-existing routes that guided movement and ritual through ceremonial landscapes (Last 1999, 88; Condit 1997, 26–7). The central pathway at Newgrange Farm, defined by a parallel pit alignment and causewayed

entrance, is aligned at 92 degrees (virtually due east), which correlates with the rising sun on the Spring and Autumn equinoxes (Leigh 2015). From the causewayed entrance, the horizon dips at the point where the equinox sunrises occur. This massive structure, therefore, monumentalises this equinox alignment. Prendergast (2018) has commented that the entrance and passage of buildings intended for religious use are invariably associated with ceremony, processional movement, as well as architectural symmetry along the alignment axis. The geophysical survey of Newgrange Farm also identified a line of pits in front of the entrance to the monument which compares with that found on the northern side of a north/south orientated Scottish *cursus* at Holywood, near Dumfries (Thomas et al. 1999 110, 115). This revealed a post façade across the entrance interpreted as a screen possibly used to control the light entering into the *cursus*. An equinox alignment, like that found in Newgrange Farm, exists at Cairn T at Loughcrew, and also occurs along key stones of the great stone circle surrounding Newgrange (Prendergast 1991).

Conclusions

The discovery of the hybrid *cursus* monument at Newgrange Farm and its subsequent excavation has profound implications for our understanding of Late Neolithic ceremonial activities in the Bend of the Boyne. The monumentality of this ceremony has, until now, been dominated by the remarkable concentration of henge monuments. Newgrange Farm reminds us that procession was an equally important aspect of seasonal ceremonial assembly and that monumental pathways were constructed for this purpose. This hybrid *cursus* monument further highlights the traditions shared between Britain and Ireland in Late Neolithic ceremonial practice and monumentality. This represents a marked shift from the passage tomb-building communities whose strongest links were with the coastal fringes of continental Europe (Stout and Stout 2008, 67–83). The limited excavation accomplished its two-fold purpose: to establish the existence of features identified in the geophysical survey and to get some indication of the date of this unique monument. Further excavations are required if we are to better

understand the ceremony, material culture and economy of the builders of this Late Neolithic hybrid cursus monument.

Acknowledgements

We wish to thank the Royal Irish Academy for funding this research excavation and to thank the Redhouse family of Newgrange Farm for allowing us to excavate on their land. Thanks also to the staff, volunteers and specialists who assisted in the excavation and post-excavation analysis. Dr Penny Johnston wishes to thank Laura Jaervelae for her help in processing the soil samples.

Appendix 1

Assessment of charred environmental material, Newgrange Farm, Co. Meath by Dr Penny Johnston⁴

Introduction and methodology

This report presents an assessment of the environmental material extracted from bulk soil samples taken from the excavation at Newgrange Farm, Co. Meath. Bulk soil samples were taken during excavation and the soil was processed using a bucket flotation method. The volume (in litres) of each sample was recorded prior to processing. The bulk soil was then soaked in water, allowing charred plant material (primarily charcoal) to float to the surface. This floating material ('float') was then poured off through a geological sieve (mesh size 250 microns), with the charred plant material collected in the sieve and transferred to drying trays.

The remaining material from the sample, the non-floating 'retent' was then washed through a larger 1 mm mesh and also transferred to drying trays. Once dry, the retent was sorted by eye, to ensure that small finds (flint, in this case) were all picked out by hand.

The dried flots were stored in sealed plastic bags, suitable for long-term storage. The flots were scanned under a stereoscopic microscope under a low magnification (x 4.8). The frequency of each type of environmental material was recorded using a subjective five-point scale of abundance (DAFOR), where D=Dominant, A=Abundance, F=Frequency, O=Occasional, R=Rare. Where no environmental remains were found they were marked as AB ('Absent'). The charcoal was also assessed to determine whether it was likely to be suitable for radiocarbon dating (with Y indicating 'Yes' and N indicating 'No').

Results

A total of 25 bulk soil samples were processed, with soil volumes ranging from 0.5 to 10 litres. No charred seeds were found but there was charcoal

in most of the samples from the site. However, it was only present in good quantities (noted as ‘Abundant’ or ‘Dominant’) in 12 samples. Snail shells were recovered from the deepest deposit excavated at the site at the base of the great pit.

Charcoal identification should help comparison with the corpus of evidence from other, similar monuments, for example, the timber cursus monuments in Scotland. Brophy and Millican’s (2015) review of the evidence for these sites has noted that, while evidence for material culture is rare, burning and charcoal can be quite frequent and analysis of the charcoal has indicated that oak was a common wood type used in to construct the monuments (Brophy and Millican 2015, 308).

Potential for further work

Samples 16 and 19 were taken from charcoal found in F009, at a place where the shape of the charred material appeared very root-like. This was not associated with other evidence for *in situ* burning (such as baked clay). Examination of the material from these samples, by a charcoal specialist, may be worthwhile in order to determine whether or not this charcoal is actually derived from roots that were burned in the ground (appendix 2).

Appendix 2

Charcoal identification report, Newgrange Farm, Co. Meath

by Dr Susan Lyons⁵

Introduction and sampling strategy

This report presents the charcoal identification analysis of soil samples from archaeological excavations at Newgrange Farm, Co. Meath. The excavations revealed the remains of features associated with a prehistoric cursus. Archaeobotanical and charcoal analysis are an important component of archaeological excavation and post-excavation works. These remains provide valuable information about explicit activities carried out at a site, including the function and nature of certain features, arable agriculture practices, site economy, diet, food processing and how local natural resources were exploited (Murphy and Whitehouse 2007; McClatchie 2007).

Woodland resources, including wood and charcoal, were of enormous importance in the past. Communities during both the prehistoric and historic periods were dependant on woodland resources for everyday living, including construction materials for buildings, manufacture of most implements, firewood and fuel (Kelly 1988; O'Donnell 2007; Stuijts 2007; O'Carroll 2012). Analysis of wood and charcoal remains can provide functional evidence for various activities at a site, as well as insights into cultural, ecological and economic variables. Certain wood species may have been selected for particular uses, such as structural posts, firewood, pyre material, fuel and wattle. Charcoal also provides suitable material for the purpose of obtaining radiocarbon dates. A total of 27 samples from Newgrange Farm were scanned for the presence of suitably identifiable charcoal remains.

Methodology

Bulk dry soil samples were processed by Dr Penny Johnston as part of the on-site excavation using a bucket system of floatation (appendix 1). Flot samples which contained charcoal fragments were submitted for

identification. Charcoal fragments of approximately 3mm in width were selected for identification from all samples. Due to the potential for a very high number of charcoal fragments, a representative sub-sample was randomly chosen from larger samples for identification and assessment. For the purpose of this project, a sub-sample of between 50 and 100 fragments were chosen which is in line with the standard sub-sampling strategy for archaeological charcoal by the National Roads Authority (TII) new palaeo-environmental guidelines (McClatchie, et al., 2015) and current practicing archaeological specialists (Keepax, 1988; O'Donnell, 2011; O'Carroll, 2012).

The wood species identifications were conducted under a binocular microscope using incident light and viewed at magnifications of 100x, 200x and 400x where applicable. Wood species identifications are made using wood reference slides and wood keys (Brazier and Frankiln, 1961; Schweingruber, 1978; Wheeler, Bass and Gasson, 1989; Hather, 2000).

Results

Just three wood species (oak, alder and willow) totalling 567 charcoal identifications and weighting 18.7 grams were recorded from the samples (Figs 14a–b). Oak (*Quercus* sp.) dominated the charcoal assemblage by far accounting for 553 counts (98%) of the remains. Alder (*Alnus glutinosa*) made up just 12 counts (1.5%) of the overall remains, while willow (*Salix* sp.) accounted for 5 counts (0.5%) (Fig. 14c). Two oak species are native to Ireland, pedunculate and sessile oak, however, it is difficult to distinguish

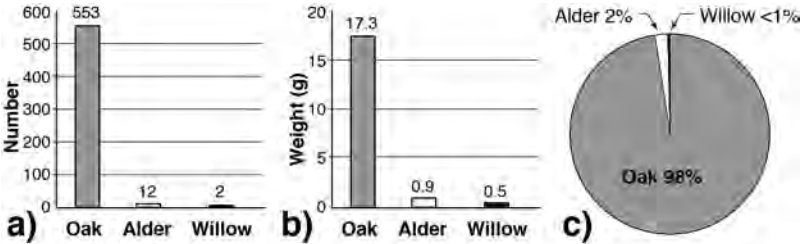


Figure 14: a) number, b) weight and c) percentage of wood taxa identified from a total of 567 charcoal identifications.

between each microscopically and in the absence of buds, back and leaves. Similarly, a number of the willow species also native to Ireland are difficult to identify to species at microscopic level.

The charcoal fragments were largely the remains of heartwood from mature trees, with the exception of the willow charcoal identified from pit Foo3 (Sample 2) which were classified as young branchwood (5 years max.) based on the curvature of the annual growth rings. The annual growth ring width of the oak samples from the majority of the assemblage displayed even and uninterrupted growth with a maximum width of 3mm.

Discussion

Wood charcoal recorded from an archaeological site is generally interpreted as being firewood/fuel from domestic or industrial activities or the remains of a structure that had burnt down. It is also possible that posts were charred prior to deposition to prevent rotting or that the charred tips reflect the felling methods used in timber procurement. Consideration must be given to the nature of charcoal preservation, which impacts on what has survived in context and the processes that influenced survival. These processes are diverse and include; human practices for wood collection and hearth/kiln management; settlement factors; climatic influences; the combustion process itself; depositional and post-depositional processes and analytical sampling and quantification (Théry-Parisot et al. 2010). Species such as oak – which has a high calorific value, and as such survives high temperatures – can often saturate an assemblage due to a range of taphonomic factors.⁶ Oak can become over-represented, which creates a survival bias in the wood samples. It is essential that we remain wary of these potential biases within charcoal analysis when interpreting such assemblages.

The charcoal identified from pit and ditch features excavated at Newgrange Farm, Co. Meath, were comprised almost entirely of oak, with the exception of a very low frequency of alder and willow from pit Foo3 (Sample 2). The oak samples displayed wide (3mm) and evenly spaced annual growth rings, which suggests that the oaks were growing in favourable edaphic conditions, most probably in open clearings. The

absence of any insect channels and fungal spores, both common to oak wood if left discarded, implies that the woods were possibly used fresh, very soon after cutting. Alternatively, if the oak was first seasoned, it was kept in dry storage during the seasoning process.

While the willow fragments were very low in number, it is worth highlighting that they derived from small branchwood, possibly even twigs or naturally coppiced shrubs (5 years max.). Willow has a long tradition in wattling and so this wood could represent the remains of a screen, or small structure, or binding material used between posts. While little can be deduced from the alder and willow charcoal recorded, their presence does provide evidence of other woods brought to the site as firewood or for construction activities. Both are water-tolerant trees that grow in riverine woodland or close to damp areas. Such habitats were located nearby and were undoubtedly exploited.

Interpreting the prehistoric wooded landscape of the Brú na Bóinne complex has to date been difficult, with only a few pollen assessments carried out in the area to aid palaeo-environmental reconstruction (Groenman van Waateringe and Pals 1984; Weir, 1996; Weir, 2012; Smyth (ed.), 2009). A pollen profile at Thomastown Bog, located c.4km south of Newgrange to the west of Duleek, revealed that at the opening of the Neolithic oak along with elm both dominated the local woodland interspersed with alder and hazel (Weir 1996). Woods representing secondary woodland become more prominent in the landscape after the elm decline and episodes of land clearance during the later Neolithic period. This is a trend that was noted at both Thomastown and a series of pollen records from Knowth 1 (Groenman van Waateringe and Pals 1984). Supporting this rise in wood diversity during the later Neolithic period, as seen through the pollen evidence, are local charcoal datasets, particularly charcoal analysed from nearby Knowth (Davis et al. 2017). The increase in charcoal studies in recent years is showing that oak signals are higher in the archaeological record from the early Neolithic period and become diluted towards the later Neolithic phase (O'Donnell 2007; O'Donnell 2011; O'Carroll 2012).

Oak was the main wood used in construction works from contemporary

sites such as an early Neolithic structure at Kilmainham 1C, Co. Meath (O'Donnell 2010a), at Kishoge (O'Donovan et al. 2003–4) and Kilgobbin (O'Carroll 2004), both in Co. Dublin. It was also the dominant taxa recorded from early Neolithic levels at Kilmainham 3, Grange 2 and Gardenrath 2 along the M3 Clonee to Kells North road scheme, Co. Meath (O'Donnell 2010b–d) as well as at Tullahedy, Co. Tipperary (O'Carroll 2011). Therefore, the trend emerging through the Irish charcoal record, supported by the pollen evidence, is that oak woodland was plentiful during the early Neolithic period, and as such was widely used in both construction work and as a fuel source. Oak values decrease towards the later Neolithic period as a result of increased woodland clearance and the emergence of successive wood species, which enter the archaeological record through the charcoal evidence. The dominant oak charcoal from Newgrange Farm therefore seems to fit with an early Neolithic phase of wood use rather than the later Neolithic date produced from the single radio-carbon date produced from the outer ditch of the cursum. Nonetheless, the dominance of oak at Newgrange Farm reveals a low diversity of wood use, suggesting that wood selectivity was a strategic undertaking rather than the result of mere opportunistic collection (Wheeler 2011, 32).

Without being able to fully interpret the features at Newgrange Farm, it is worth mentioning comparable cursum monuments that have been investigated in Britain. Oak charcoal from large post and post-pipe features at various early Neolithic sites (e.g. Douglasmuir and Upper Largie) in Scotland has been interpreted as the main wood used in the construction of these mammoth monuments (Brophy and Millican 2015, 308). It has been surmised, based on their study, that timber cursum monument in Scotland, were constructed as close to or indeed within the woodland that provided the materials that was used to build them. Timber accessed for such activities would have been collected from as close to a site as possible for ease of transport (Shackleton and Prins 1992) and, considering the size of the oaks that were used, local availability would have been a deciding factor in where these structures were built (Shackleton and Prins 1992, 314; Millican 2012). It has also been theorized that the construction and maintenance of such

monuments during the early Neolithic period in Britain had a huge impact on oak woodlands and how the local wooded landscape was modified (Tipping 1994). This shift from dominant oak woodland during the early Neolithic period to a mixed woodland composition in later periods is therefore a feature being presented in both Irish and British palaeo-environmental datasets. The evidence from Newgrange farm seems to run counter to these trends.

Conclusions

The analysis of charcoal remains from a series of pit and ditch features at Newgrange Farm, Co. Meath, provided insights into the wood taxa that was being used at the site. The samples were almost entirely dominated by oak, a wood taxa that is well recorded in the archaeological record from prehistoric structural features, fuel, firewood and other activities. The preponderance of this taxa fits the broader picture of oak wood use in both Ireland and Britain during the early Neolithic period. While oak woodland seems to dominant the immediate landscape at Newgrange, its durability and ease to split and cleave would have made it a very suitable construction material. Alder and willow charcoal, albeit low, are also present from pit Foo3, indicating a damp riverine woodland was also exploited. Their exact use is unknown and may have been brought to the site as firewood, or, in the case of young willow twigs, perhaps used in wattling or binding.

Appendix 3

Preliminary inspection report on faunal material, Newgrange Farm, Co. Meath by Dr Fiona Beglane⁷

Introduction and methodology

This report presents preliminary identifications of bone from the research excavations at Newgrange Farm. Due to the poor condition of most of the bone, the results presented here are from the identification of unwashed samples. Mammalian faunal remains were identified using comparative collections and by reference to Hillson (1992) and Schmid (1972) amongst others. All fragments were identified as fully as possible. Ribs and vertebrae were quantified as number of fragments in categories of large mammal (LM), medium mammal (MM), small mammal (SM) and very small mammal (VSM). In an Irish context these can be equated to animals in the general size ranges of cattle, sheep, cat and mouse respectively. Fusion data was based on Silver (1963) and Reitz and Wing (1999, 76). For cattle and pigs, toothwear was recorded per Grant (1982) and Higham (1967) after Silver (1963). Measurements were carried out to an accuracy of 0.1mm per von den Driesch (1976), Boessneck (1969), Payne and Bull (1988, fig. 1), Payne (1973, 296), and Davis (1992, fig. 2). Evidence for chopping, cutting and sawing were recorded, as was gnawing by canids and rodents. Burnt material was classified as singed for bone with only partial blackening, burnt for blackened bones or calcinated for those bones that were predominantly white/blue-grey in colour. For non-countable fragments these aspects were only recorded where obvious on a cursory inspection. Where pathologies, developmental defects and non-metric traits were identified on bones these were examined and recorded in further detail. Throughout the text the common names for species have been used.

Results

A total of 145 fragments of bone have been assessed. This material came from two contexts: F004 and F020, an upper fill and a basal fill respectively of pit

F013 – the great pit – from the outermost row of pits. Both were dominated by cattle/large mammal, with (probable) pig also identified in F004.

F004 yielded 115 fragments of bone and tooth, including 39 from cattle. The cattle material was dominated by teeth and tooth fragments, however long bone elements were also present. All the bone and tooth fragments appeared to be from adults. None of the bone was burnt although burnt material was present in the soil accompanying this unwashed sample. It is likely that the large, large/medium and unidentified fragments are also mainly from cattle. There were three long bone fragments that were classified as medium mammal on the basis of the radius of curvature and the bone thickness.

F020 yielded 30 fragments of bone, with cattle and (possible) pig identified. The cattle bones included a partly calcinated left humerus broken into four pieces and an unburnt right humerus broken into eight pieces that could be re-joined. A number of other cattle humerus and long bone fragments are likely to have come from these two elements but this could not be confirmed. The two appeared to be different in size, suggesting that they were from separate individuals. One partly calcinated humerus shaft fragment had at least three cut marks running medio-laterally across the line of the bone, consistent with filleting of meat from the bone. One (probable) pig humerus shaft also came from this context. Again, this was partly calcinated and partly unburnt. This had a series of at least eight cut marks on the medial side running diagonally downward from the cranial to the caudal face. Again, this is consistent with filleting meat from the bone.

Conclusions

This preliminary examination of the bone from Newgrange Farm has identified both burnt and unburnt animal bones and teeth. Species represented were cattle and, probably, pig. Bones of both species showed evidence of butchery in the form of filleting.

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2. Debitage is the waste material produced during the manufacture of flint artefacts.
3. Further details about C14 date UBA-38707 are available upon request.
4. Dr Penny Johnston, Archaeobotanist, pennyjohnston@ipean.ie. The full report is available upon request.
5. Dr Susan Lyons, MIAI, Environmental Archaeology Services, lyons.su@gmail.com. The full report is available upon request.
6. Taphonomy is the study of the processes (such as burial, decay, and preservation) that affect animal and plant remains as they become preserved in the archaeological record.
7. Dr Fiona Beglane, Animal bone specialist, fionabeglane@yahoo.com. The full report is available upon request.