Megalithic art on the Great Circle at Newgrange and the implications for chronology

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The recent discovery that several of the large standing stones outside the passage tomb at Newgrange were carved with megalithic art raises new questions about the chronology of the monument. A review of the published literature and unpublished archives has provided informative results which suggest that the standing stones were erected during the construction or use of the passage tomb rather than during the Bronze Age. Recent advances in dating for the earliest stone circles in Britain and Ireland offer additional support for this conclusion. A complete listing of sites with comparable features has yet to be drawn up, but details of notable sites in Britain and Ireland are presented here for comparative purposes.

INTRODUCTION

Aubrey Burl (2000, 282) described the arc of standing stones outside the kerb at Newgrange, commonly known as 'the Great Circle' (O'Kelly 1982, 79), as 'one of the most controversial of all stone circles'. The claim is undoubtedly warranted, since disagreement has persisted over whether it was ever a complete circle, and whether it was later than or contemporary with the tomb or perhaps pre-dated it (*ibid*., 280). It remains uncertain whether the circle was ever a complete ring (*ibid*., 79). Owing to the irregular spacing between many of the stones, O'Kelly's reports (*ibid*.; O'Kelly *et al*. 1983), which detailed the large-scale excavations at Newgrange between 1962 and 1975, use a numbering system to accommodate the possibility that stones had once existed in the wider spaces, e.g. between GC3 and GC5 (O'Kelly 1982, 79). In this system, the stones are divided by their position east or west of the entrance. Those placed west of the entrance are numbered clockwise from GC1 to GC17, while those situated east of the entrance are numbered anticlockwise with a minus prefix, from GC-1 to GC-10 (Fig. 1). This numbering system is retained throughout this article. If the spacing between GC1, GC-1 and GC-2 is taken as a guide to the spacing of a complete circle, it may have consisted of between 35 and 38 stones (*ibid*.).

O'Kelly's results were essentially in agreement with those previously reported by Ó Ríordáin and Ó hEochaidhe (1956, 55–6), which suggested that the Great Circle pre-dated the settlement activity at the site and the collapse of the passage tomb cairn. O'Kelly's excavations produced radiocarbon dates and diagnostic material which dated the settlement to the Late Neolithic/Beaker period, 500 years after the reported radiocarbon dates for the tomb. O'Kelly reported that in every case the excavated standing stones were in place before the settlement began. He argued that the Great Circle was not later than the Late Neolithic/Beaker period occupation and may be earlier than or contemporary with the construction of the tomb (1982, 74–5, 82).

Subsequent excavations at the site in the 1980s directed by Sweetman (1985; Sweetman *et al*. 1987) transformed our understanding of post-passage tomb ritual activity at Newgrange (Mount 1994). In particular, it was recognised that an arc of large pits previously discovered by O'Kelly (1982, 80; O'Kelly *et al*. 1983, 16–21) belonged to a major pit circle monument built to the south-east of the passage tomb monument (Sweetman 1985), as tentatively suggested by O'Kelly *et al*. (1983, 18). O'Kelly (*ibid*.) estimated that its outer diameter would be about 82m, while Sweetman (1985, 213) suggested that it would have been closer to *c*. 90m. A smaller circular timber structure was also discovered on the western side of the mound (Sweetman *et al*. 1987).

Following re-excavation of a limited area surrounding stone GC-2, a revised chronology that placed the building of the Great Circle after the pit circle was proposed, with the latter interpreted as belonging to the Beaker period. Sweetman (1985, 208, 214–15) expressed considerable doubt about O'Kelly's interpretation of the Late Neolithic/Beaker period sequence at the site. However, the argument that the Great Circle was a final phase of monumental construction depended in no small part on the acceptance of O'Kelly's earlier interpretation of the relationship between a subsurface trench feature and the cairn slip above it (*ibid*., 208). These contradictory findings have led to considerable debate (O'Kelly 1989, 141; Bradley 1998a, 104–6; 1998b, 4–5; Stout and Stout 2008, 84; Smyth 2009, 38). It has more recently been recognised that the pit circle was not a first phase of

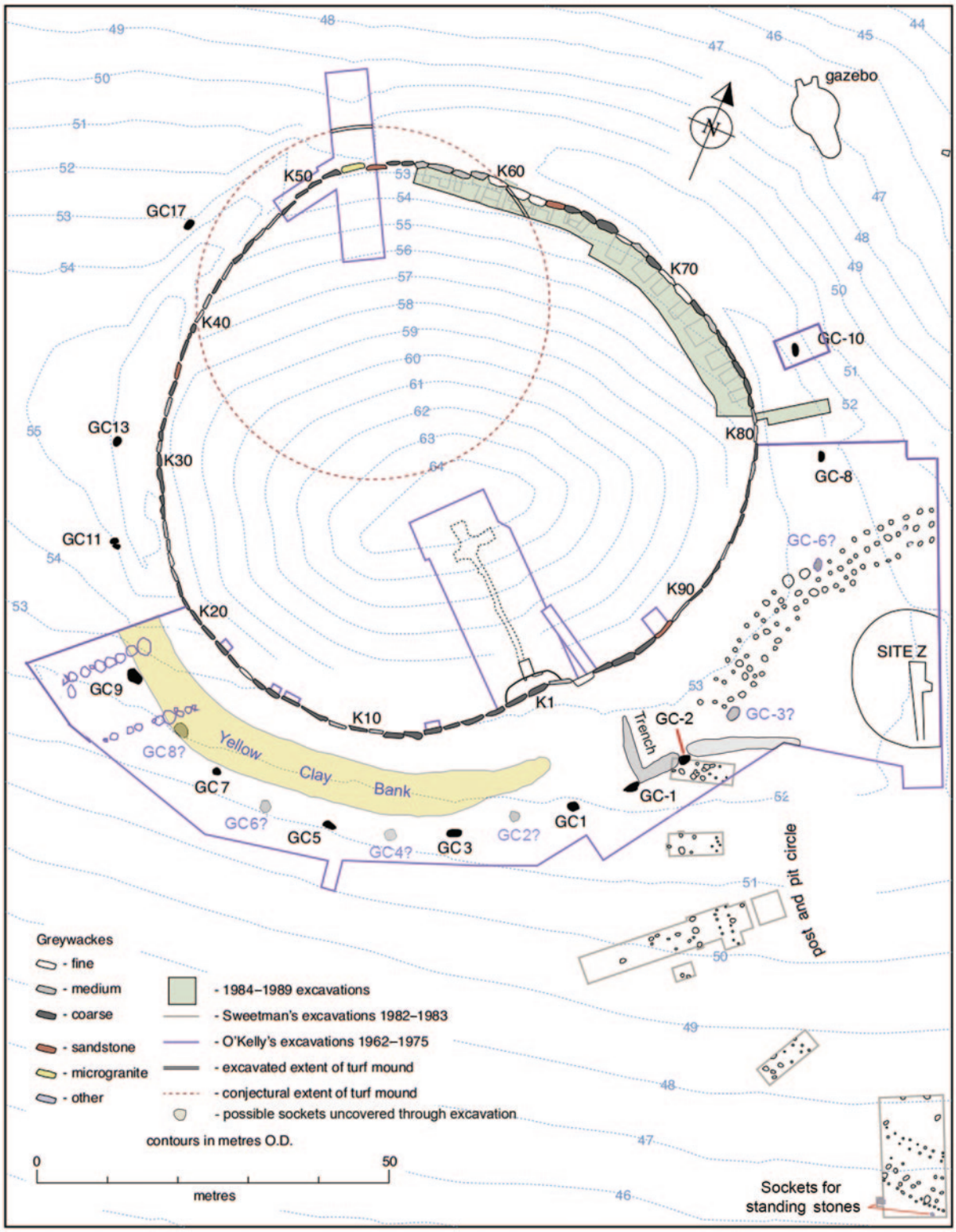


Fig. 1—Plan of Newgrange and excavations since the 1960s (after O'Kelly *et al.* 1983 and Lynch 2014, with additions and corrections).

Beaker period activity (after Sweetman 1985, 215) but was instead associated with the use of Grooved Ware outside the passage tomb (Cleary 2015, 66; Carlin 2017, 15).

The Brú na Bóinne World Heritage Site Research Framework highlights in Objectives 2, 4 and 8 that the unresolved question of the chronology between the passage tomb and the Great Circle is a key issue that needs to be further addressed (Smyth 2009, 38, 65, 94). Its recommendation for small-scale excavations and the use of radiocarbon or OSL dating techniques has yet to be carried out, but non-invasive recording methods also have the potential to yield significant findings. The chance discovery by the author of picking on stone GC-10 in 2020 led to a more detailed recording campaign using photogrammetry and oblique lighting. This has produced significant evidence for similar picking and carving on several other stones in the Great Circle, which are directly comparable to those on the structural stones of the tomb.

Viewed in conjunction with other evidence, the presence of carving strongly suggests that the Great Circle was built during the construction or use of the tomb. In recent decades there has been increased recognition of the use of standing stones both inside and outside passage tombs during the Neolithic (Cooney 1996; O'Sullivan and Downey 2020, 29; Shee Twohig 2022c, 305). This interpretation is supported by the published and unpublished excavation records and through comparison with similar features built outside many broadly contemporary passage tombs across Ireland and Britain, particularly at Knowth (Eogan and Cleary 2017, 216, 218, fig. 2.51), Loughcrew (Shee Twohig 1981, 207; Cooney 1996), Banagher (Cody 2002), Millin Bay (Collins and Waterman 1955) and Bryn Celli Ddu (Hemp 1930; Burrow 2010).

The Great Circle shares little in common with the well-defined and distinct Middle to Late Bronze Age stone circles and complexes found mainly in the northern and south-western counties of Ireland (Ó Nualláin 1995; O'Brien 2004). Typical Bronze Age stone circles in Ireland are significantly smaller, both in diameter and in the size of the stones of which they are composed (Davies 1939, 2; Ó Nualláin 1984, 3), with the two large portal stones at the stone circle at Bohonagh being a notable exception. The largest stone circle in the Cork–Kerry group of sites is just 17m in diameter, at Kenmare (Ó Nualláin 1984, 3). The stone circles of the northern counties are equally small, with the larger circles in County Fermanagh having an average diameter of just 13.9m (Burl 2000, 137). A small number of anomalously large stone circles in Ireland, more likely dating from the Neolithic, are discussed below. The largest of these, 45.7m in diameter at Grange, Co. Limerick (Cleary 2015, 51), is less than half the diameter of the Great Circle.

On the other hand, the building of stone circles or peristaliths around megalithic tombs appears to be a very long-lived tradition. Passage tombs at Clava, Scotland, are surrounded by contemporary stone circles and appear to date from the Bronze Age, *c.* 1950–1870 BC (Bradley 2000, 81, 160).

THE GREAT CIRCLE

Today, the Great Circle consists of twelve stones (Fig. 1) (O'Kelly 1982, 79). Nine are shown on the first illustration of the exterior of the passage tomb, attributed to Antis but more likely created by Lhwyd with his draftsman (Herity 1967, 137–8) shortly after the discovery of the passage in 1699 (Scott 1895; BM Stowe MS 1024, f. 126). The drawing is reproduced by Ó Ríordáin and Daniel (1964, fig. 9). That Lhwyd missed three stones is not surprising, since GC-10 had fallen in prehistory (Ó Ríordáin and Ó hEochaidhe 1956, 56), while GC7 was broken away at the base (O'Kelly 1982, fig. 11f). GC13 barely protrudes from the cairn slip, and even today remains inconspicuous (Candon and O'Kelly 1984, 26). Some possible sockets were discovered during extensive excavation of the area around the front of the tomb by O'Kelly between 1962 and 1975. Aware that these might become fixed in the public mind as more certain than the evidence suggested, their positions were left unmarked (O'Kelly 1982, 83). The position of the possible sockets, based on the published excavation plans, is indicated on Fig. 1.

Lhywd (1710) also noted a single 'lesser' standing stone on the summit of the monument, although no subsequent writers observed it. In 1844 Newenham recorded the presence of a standing stone on top of the monument, shown in an illustration found in the Gilbert Manuscripts (Gilbert MS 241, Dublin City Library). The handwritten caption states, however, that this stone had been 'thrown down the mound', which makes it unlikely that Newenham saw a stone on the summit firsthand (Herity 1967, 137).

Attention has also been drawn to the possible presence of a triangular-shaped stone standing between the Great Circle and the entrance stone, Kerbstone 1 (Stout 1993). This is depicted in an illustration published by Vallancey (1786, pl. III, fig. II). It is difficult to accept that the written antiquarian accounts, including that of Vallancey himself, would neglect to mention the presence of such a distinctively shaped stone in this prominent position. A drawing published by Ledwich (1790, pl. 1) not long after Vallancey's drawing also shows this stone, but one drawing is clearly copied loosely from the other, as they both depict the monument from an identical angle, with the

spacing of other details of the landscape matching closely, despite additional foreground elements shown in the Ledwich drawing. Ledwich's other illustrations of Newgrange (1790, pl. II) are copied directly from Pownall's plan and section drawings (1773, pls XX, XXI), and his account of the monument is taken entirely from the observations of others. Significantly, both drawings fail to show the large and prominent stone GC3. This stone would have been in direct line of sight and no obstacles are shown which could have concealed it. This omission, along with the depiction of two fallen pillars not mentioned in any other account, casts serious doubt on their accuracy. Herity (1967, 134) has already drawn attention to the inaccuracies in another of Vallency's drawings of the passage. It should be noted that the plan of the tomb included on the same plate (Vallancey 1768, pl. III, fig. I) showing the 'triangle stone' is also highly stylised and unclear in the number of stones shown for the chamber and passage. It would therefore be unsafe to place too much weight on these two drawings, and it seems unlikely that this stone existed at that time, if ever.

Following the publication of O'Kelly's excavation reports, a nineteenth-century account by O'Reilly was discovered which claimed that the Great Circle was composed of fifteen stones. The lack of corroborating accounts led this to be dismissed as an overestimation, perhaps owing to debris from clearance being carried out (Candon and O'Kelly 1984, 26).

Three of the largest standing stones, GC1, GC-1 and GC-2, averaging 2.5m in height, are arranged in a flattened arc that emphasises the front of the tomb (Smyth 2009, 38), echoing the use of particularly massive kerbstones (K97 and K2) on either side of the entrance. With the notable exception of GC-10, at 2m high and 1.75m wide, the remaining stones at the back and around the sides of the tomb are smaller. Several have been broken, although the remaining stumps show that they were not as substantial as those at the tomb entrance. Both the circle and the tomb are similarly shaped: a flattened ovoid. Both the tomb and the Great Circle make use of large blocks of greywacke (GC3, GC11, GC17, GC-8, GC-10), most likely transported from the coast at Clogherhead, 20km away (Phillips *et al.* 2001, 4–5).

The shadow-casting phenomenon of the Great Circle towards the kerbstones, documented by Prendergast (1991), is best understood as an integration

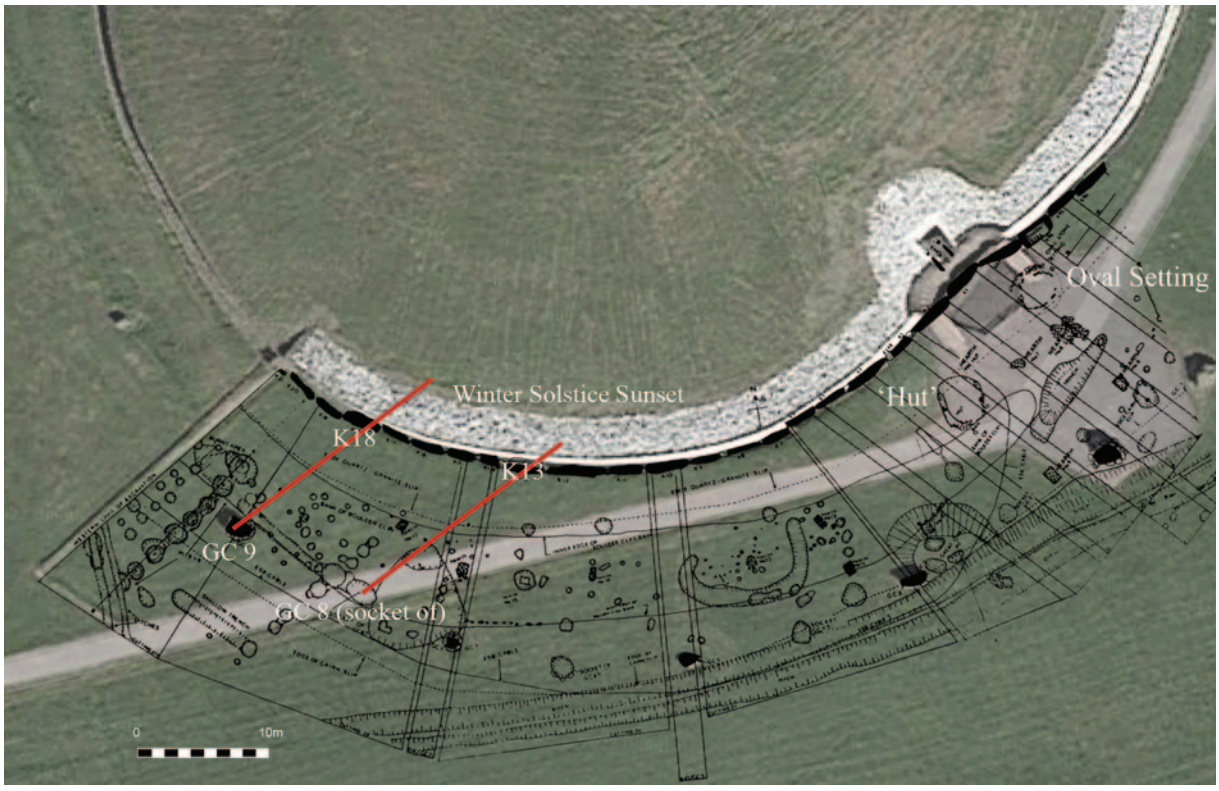


Fig. 2—The current direction of winter solstice sunset towards the two most prolifically carved kerbstones: at solstice sunset the shadow cast by GC9 falls on the highly decorated Kerbstone 18, while a stone in the presumed socket of GC8 would have cast a shadow in the direction of the highly decorated Kerbstone 13. In the Neolithic, the shadows would have been cast *c.* 40cm to the north of those indicated (Frank Prendergast, pers. comm.) (after O'Kelly *et al.* 1983, figs 8, 10, 12, overlaid on Google Earth satellite image at 53°41'39.6"N 6°28'32.1"W; imagery copyright CNES/Airbus, Maxar Technologies; map data copyright Google 2022).

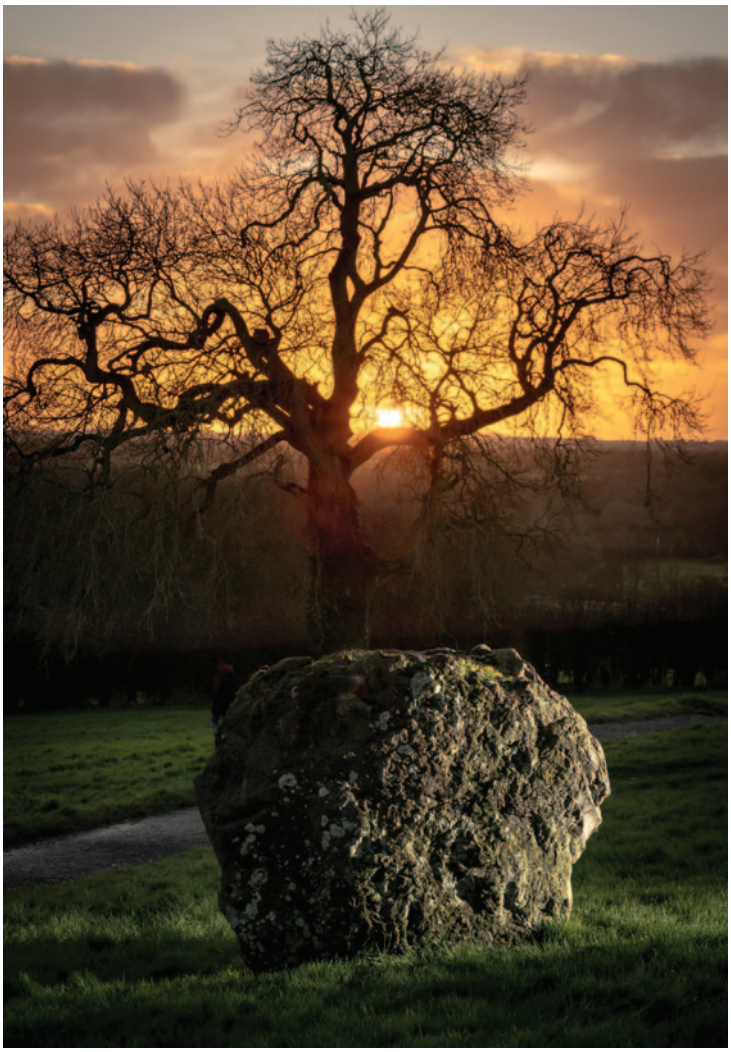


Fig. 3—Sunset behind GC9, viewed from Kerbstone 18, 23 December 2021, 15:59:14 (Ken Williams).

of the architecture of the standing stones and passage tomb, since the kerbstones appear to have first been partly concealed by the wedge of fallen quartz from the facing of the tomb, and finally completely hidden as the earth/stone layer of slip accumulated during the Late Neolithic and into the Bronze Age (O'Kelly 1982, 72–3). At dawn on the winter solstice, the shadow of GC1 tracks across the face of Kerbstone 1, crossing the triple-spiral motif and egressing beneath the central line (Prendergast 1991, fig. 5). The two primary features outside the passage tomb entrance, i.e. the circular stone setting and the 'hut' foundation (O'Kelly 1982, 75–7), are both placed in gaps between stones of the Great Circle and so would not have obstructed the shadow-casting at winter solstice sunrise.

Although the original calculations relating to the change in the angle of sunrise in the millennia since the construction of the circle were based on a postulated construction date of *c.* 2500 BC for the Great Circle (Prendergast 1991, fig. 5), adjusting the findings to the approximate date of construction for the passage tomb, *c.* 3100–2900 BC, does not significantly alter the results (Frank Prendergast, pers. comm.). Recent observations by the author have shown that at sunset on the winter solstice GC9 casts a shadow on Kerbstone 18, one of two known kerbstones profusely decorated on their back, or hidden, faces (Fig. 2) (O'Kelly 1982, fig. 27). In other words, at winter solstice the sun sets behind GC9 when viewed from the position of Kerbstone 18 (Fig. 3). The decoration in this instance is on the reverse side of the stone and was completely hidden once the cairn was complete. If the nearby possible socket for GC8 identified by O'Kelly is accepted, this stone, depending on its original height, may also have cast a shadow towards Kerbstone 13 at winter solstice sunset. Kerbstone 13 is the second of the two kerbstones most profusely decorated on their hidden surfaces (*ibid.*, fig. 26). It is not suggested here that a high degree of precision is evident or was intended relating to these phenomena. Such observations may arise purely by coincidence and, even if direct observations of shadows falling on

these kerbstones was not a factor in their placement, the possibility remains that they could mark positions previously used as markers to orientate the passage tomb. Isolating the day of solstice in winter weather would have been achieved more efficiently if the position of the setting sun were used in conjunction with that of its rising. It has been suggested that the standing stones outside the entrances to Knowth's eastern and western passages also cast shadows on the entrance stones around the equinox (Eogan and Cleary 2017, 223). As discussed below, Burrow (2010) has suggested that the standing stones surrounding the passage tomb at Bryn Celli Ddu in Wales were used to orientate the passage towards the summer solstice sunrise.

HISTORY OF EXCAVATION

The first modern excavation of one of the stones of the Great Circle was carried out by Praeger and Macalister in the 1930s during works aimed at exposing the kerb of the passage tomb. A pit was dug beneath the fallen stone GC-10; this work was not published, and the related documentation accessed by Ó Ríordáin and Ó hEochaidhe (1956, 53) was apparently missing before the 1960s excavation campaign began (O'Kelly 1982, 23). Works conducted to install electrical lighting in the passage tomb in the early 1950s passed near the area where the presumed socket of missing stone GC2 would have been. A stone adze and worked flints were found in a shallow pit adjacent to the presumed socket (Hartnett 1954, 182). Excavations in the early 1950s and 1960s (Ó Ríordáin and Ó hEochaidhe 1956, 55–6; O'Kelly 1982; O'Kelly *et al.* 1983) demonstrated that, where stones had been placed in sockets, these had been cut directly into the old ground surface and not through the cairn slip. As Bradley (2007, 113) observed, the published section drawings suggest that the sockets were cut from a level associated with Grooved Ware and Beaker sherds, although prior and extensive turf-stripping of the area presumably removed any artefacts pre-dating or contemporary with the construction of the tomb (O'Kelly *et al.* 1983, 74).

Stone GC-2 had no socket but was balanced on smaller stones (O'Kelly 1982, 81). Previous excavations at the presumed location of a missing stone (GC2) revealed that it too had no socket (Ó Ríordáin and Ó hEochaidhe 1956, 57, fig. 2). If there had been a stone in this position it must have been placed in a shallow hollow in the old ground surface, balanced on large stones which were found *in situ*. The excavation report makes the important observation that the lowermost occupation layer, which was observed in both areas excavated, was thicker in the hollow where missing stone GC2 would have been. This suggests that the occupation began after the stone was removed. Had the occupation preceded the placement of the stone it might be expected to have been cut through, cleared away or compressed under the stone's weight. The occupation layer also appears to overlie some of the stones presumed to have been used to balance GC2 (*ibid.,* fig. 3).

Ó Ríordáin and Ó hEochaidhe (1956) also excavated two stones that had been placed in sockets: GC3 and GC-10. Charcoal and other evidence for occupation surrounded the socket of fallen stone GC-10 but none was found in its fill. Instead, the packing stones and fill of the socket were directly overlain by cairn collapse, which had mounded against the exposed end of the fallen stone (*ibid*., 56, fig. 2, pl. III). They tentatively suggested, therefore, that the erection of this stone pre-dated the occupation layer and added that it was certain that the stone had been erected before the collapse of the tomb.

During O'Kelly's excavations, evidence for Late Neolithic/Beaker period settlement was shown to have overlain the fill of the socket of stone GC-8. In addition, the fill inside the presumed socket for missing stone GC8, on the western side of the mound, was overlain by both the Late Neolithic/Beaker period settlement and a bank of stoneless yellow clay (O'Kelly 1982, 80, fig. 11b; O'Kelly *et al.* 1983, fig. 5). This bank had Late Neolithic/Beaker period material stratified both above and below it and was thus dated to the Beaker period. Some small boulders, presumably packing stones, were found in the pit. If this socket had indeed once held a stone, then it had been removed and its socket refilled before the main phases of post-passage tomb settlement (O'Kelly 1982, 78, 80). Therefore the proposition that the circle was once complete and consisted of 35–38 stones is incompatible with its also being later than the Late Neolithic/Beaker period settlement.

In the extreme western area of the excavation, close to GC9, two rows of parallel pits were found running on either side of the stone. The pits may have held wooden posts and the western row showed evidence of possible wattlework. These features were interpreted as possibly belonging to a building 10.5m wide (O'Kelly *et al.* 1983, 35, fig. 12). It may be significant, however, that the eastern row is broadly aligned with the setting sun on winter solstice (Fig. 2), while the western row was slightly misaligned. There was clear evidence that the western row had been destroyed in a major fire which had oxidised the soil in the surrounding area; in some areas the effects of heat were found 50cm below the surface. This fire also appears to have damaged the surface of GC8, but all surface evidence for burning had been concealed by the Beaker period yellow clay

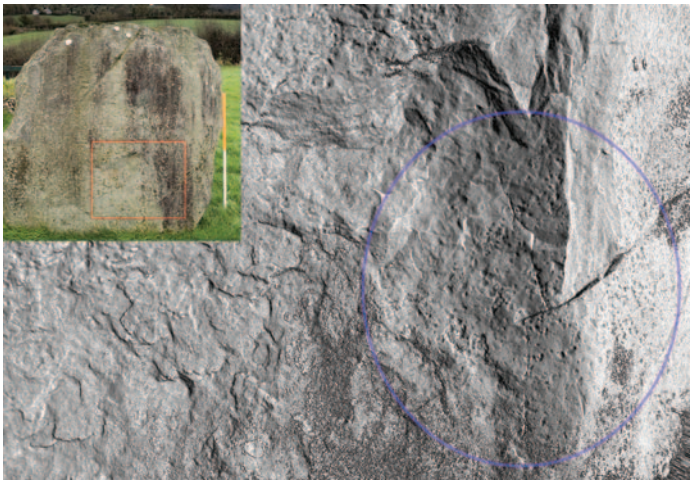
bank (*ibid*.). While not conclusive, this adds to the weight of evidence for an earlier date for the Great Circle.

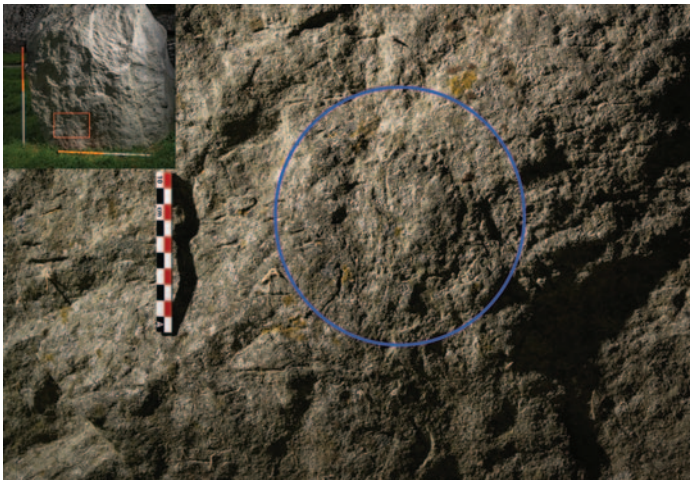
Following re-excavation of a limited area around GC-2 in the early 1980s, Sweetman reported possible evidence that it had been placed there after the collapse of the cairn. It was interpreted as later than the construction of a large pit circle associated with Grooved Ware (Sweetman 1985, 208; Cleary 2015, 66), but considerable uncertainty surrounding the sequence has remained (e.g. O'Kelly 1989, 141; Bradley 1998a, 102–4; 1998b, 4–6; Smyth 2009, 38).

MEGALITHIC ART ON STONES OF THE GREAT CIRCLE

To date, megalithic art in the form of 'Dispersed Picking' or 'Close Area-picking' (Shee Twohig 2022a, 71, 72) has been observed on four stones of the Great Circle (GC-10, GC-8, GC3 and GC17). A very lightly picked penannular circle appears to be present on the outer surface of GC-8, close to the ground (Fig. 5). The close area and dispersed picking on the stones of the Great Circle is similar in technique and application to that recorded on many of the kerbstones and structural stones of the passage tomb (*ibid*.; O'Kelly 1982, 146; Eogan 1986, 149).

Dispersed picking is visible on both faces of GC-8 (Figs 4 and 5), particularly on the lower right of the inner face and more centrally on the outer face. On the side facing the passage tomb, the picking seems to cluster into two very roughly laid-out arcs. Dispersed picking is also visible on the left side of the outer face of GC3 (Fig. 6). GC-10, on the other hand, features close area-picking, mainly on the right side of the outer face, close to the edge (Figs 7 and 8). GC-10 had fallen over onto its outer face early in the





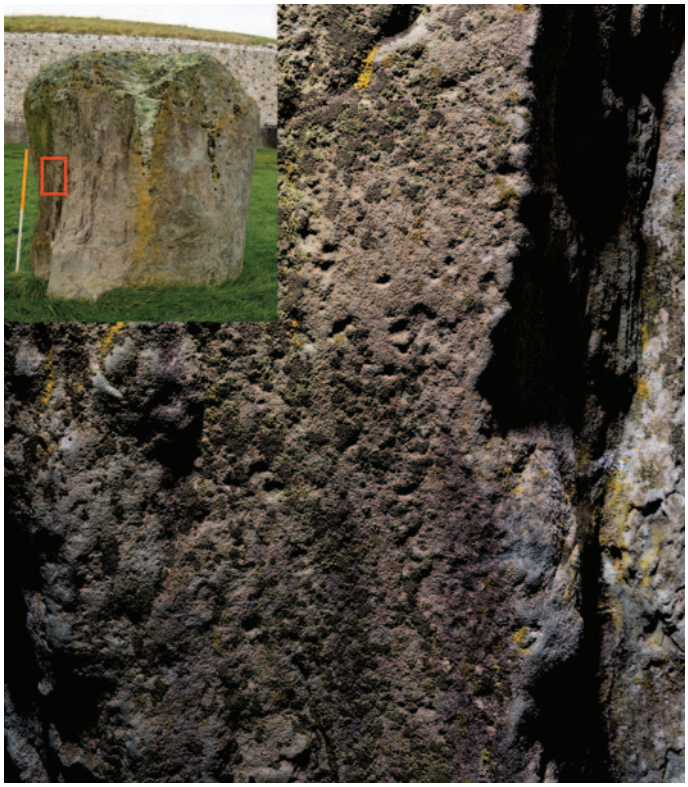


Fig. 4 (top)—Picking on two planes of the inner face of GC-8, recorded using photogrammetry (Ken Williams).
Fig. 5 (middle)—The very lightly picked penannular ring on the outside face of GC-8 (Ken Williams).
Fig. 6 (bottom)—Dispersed picking, partly concealed by lichen, on the outer face of GC3. The area immediately to the right of the picking appears to have been broken away (Ken Williams).

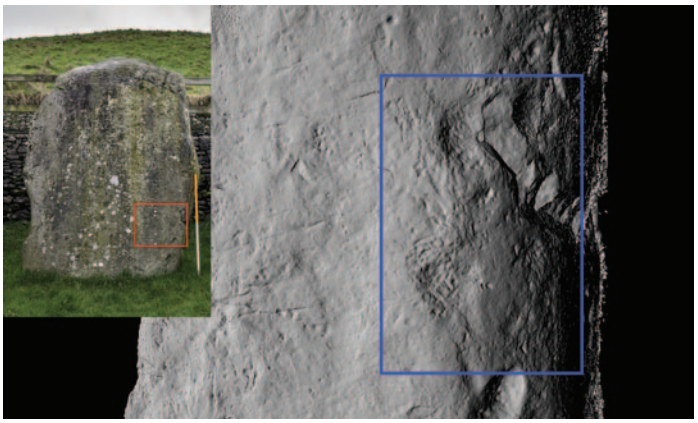


Fig. 7 (top)—Close area-picking near the base on the outer face of GC-10, within natural depressions in the stone and the surrounding surface (Ken Williams).
Fig. 8 (middle)—Close area-picking on the right-hand edge of the outer face of GC-10, recorded in 3D using photogrammetry (Ken Williams).
Fig. 9 (bottom)—Picking on GC17 close to the base and at an angle which would have made it impossible to carry out after the stone was in position (Ken Williams).

monument's history (Ó Ríordáin and Ó hEochaidhe 1956, 56); the picking is therefore quite well preserved and must be considered as original. Several cases of picking within and around natural dished areas of the stones have been recorded on GC-8 and GC-10 (e.g. Figs 5 and 6). This is very typical of the megalithic art of the Boyne Valley, especially on kerbstones at Newgrange and Knowth (O'Kelly 1982, 146; O'Sullivan and O'Connor 2009, 19). Picking has also been observed on the oblique faces close to the base of GC-8, which would have been very difficult to apply after the stone was erected. The picking close to the base on the eastern side of GC17 must have been done before the stone was put in place (Fig. 9).

O'Sullivan (2006, 674) has argued that this form of art has historically been somewhat overlooked, particularly at Newgrange, where, in the main, it was considered a form of dressing to improve the appearance or shape of the stone (O'Kelly 1982, 150). As a result, such forms were only published in reports when 'they are integral to the ornament, as in L19, or where they partially obliterate it, as in R8' (*ibid*., 153). Eogan and Aboud (1990, 136), however, identified it as 'clearly a form of art in its own right, and not a structural device for dressing the surface of the stones'. Although close area-picking has sometimes been considered a final phase in the application of megalithic art, it was also being practised during the construction of Newgrange (*ibid*., 136–7). The recent discovery by the author and Elizabeth Shee Twohig that the outside edge of one of the roof slabs above the junction of the passage and chamber floor (RS16) was extensively covered with close area-picking provides clear evidence that it was being practised at an early stage as the tomb was built (Shee Twohig 2022b, 168). The face of this roof slab can now be seen only via the modern purpose-built tunnel over the passage; it had originally been sealed by a thick deposit of burnt sand and covered by the cairn (O'Kelly 1982, fig. 13). The newly identified carving on the stones of the Great Circle is currently being studied as part of a recording and documentation project for the art at Newgrange by Shee Twohig and the author. A full report on the results of that work is in the course of preparation.

In addition to the presence of megalithic art, it also appears that two of the greywacke stones, GC3 and GC-8, may have been shaped so that the upper edge is regular and curved on each

side, while GC-10 may have been either shaped or chosen as it has a similar shape naturally (Figs 4, 6 and 7). The greywacke 'door stone' found at the entrance of the tomb was also shaped to have a very similar profile (Fig. 10).

LITHOLOGY OF THE GREAT CIRCLE

The use of 'exotic stone', i.e. stone that is not derived from the underlying geology or glacial erratics, is one of the defining characteristics of the Boyne Valley passage tombs (Corcoran and Sevastopulo 2017, 505). The lithology of the Great Circle is entirely consistent with the sourcing of exotic stone practised by the tomb-builders, and five of the standing stones are of greywacke, a type of stone preferentially sourced by them (*ibid*., 560). This may not have been seen as particularly noteworthy when the main excavation reports were published in the 1980s, as it was assumed that most of the large stones used in constructing the tombs were glacial erratics found in the surrounding landscape (O'Kelly 1982, 117). Subsequent research has shown that the greywacke stones were likely quarried or collected from specific locations in the coastal area around Clogherhead, 20km to the east (Phillips *et al*. 2001, 4–5). Glacial transport to the Brú na Bóinne area was also ruled out (*ibid*.; Corcoran and Sevastopulo 2017, 507). The use of greywacke for the Great Circle is consistent with the large-scale transport of this type of stone to build passage tombs in the Neolithic. A similar view has been taken with respect to the large greywacke standing stones found at the mouth of the Boyne at Baltray, and on the lower terraces below Newgrange (Phillips *et al*. 2001, 5; Corcoran and Sevastopulo 2017, 563).

In the light of this, it is worth considering whether the stones could have been removed from dismantled passage tombs and reused to build the Great Circle. As O'Kelly (1982, 82–3) points out, however, most of the stones are too large or bulky to have been used in tomb construction. None of the structural stones or kerbstones of the main passage tomb of Newgrange are missing. Clearly, several of the stones of the Great Circle are far larger than those used in the ruined satellite tombs, and no sockets have been identified which could have contained stones as large as GC-10 or GC3. In addition, GC17 is a large, rounded boulder which would not have been suitable for use in passage tomb construction (O'Kelly *et al*. 1978, figs 4, 13, 16; O'Kelly 1982, 83).

The other stones of the Great Circle show a great

Fig. 10—Newgrange entrance: Kerbstone 1 and the door stone of the tomb fixed to the reconstructed façade (Ken Williams).

variety in their lithology, and all are distinct from the underlying geology, which consists of Carboniferous shale and siltstone, with limestone to the south and west (Williams and Jenkins 2012, 26–7; Corcoran and Sevastopulo 2017). Apart from GC3, GC13, GC17, GC-10 and GC-8, which are greywacke, six other types of stones were arranged around the southern side of the mound. These have been identified as dolerite (GC1), basalt (GC5), limestone (GC7), volcanic breccia (GC9), spilite (GC-1) and epiclastic conglomerate (GC-2) (Phillips *et al*. 2001; 2002). GC11 is grey sandstone. This arrangement of stones with distinctive shapes, contrasting colours and textures outside the front area of the tomb echoes how 'exotic stones' of quartz and granite were used on either side of the passage tomb entrance (O'Kelly 1982, 70–1). As with the quartz and granite, on present evidence it appears that these distinctive stones were only used in the area around the front of the monument.

The use of varied lithology around the entrance is also consistent with the arrangement outside the eastern and western passages at Knowth. Outside the eastern entrance, a standing stone composed of limestone with a rectangular cross-section and a distinctive vein of chert is set in line with the central vertical line carved into the entrance stone, Kerbstone 11. At the western entrance, a tall standing stone of exotic sandstone, whose source is presently unknown, stands in line with a vertical line carved on the entrance kerbstone (Corcoran and Sevastopulo 2017, 558–9). This stone is set in line with sixteen stones of varied lithology arranged in a flattened arc. While some were placed flat, the majority were upright (Eogan and Cleary 2017, 216, 218, fig. 2.51). The tall sandstone pillar bears traces of megalithic art which had been erased and smoothed over, with pick-dressing evident on the top and edges (Shee Twohig 2022a, 93). Shee Twohig has also drawn attention to the possible significance of the placement of non-greywacke kerbstones in the kerb of the main tomb at Knowth, specifically in the areas where the small tombs are close to the kerb (*ibid*., 91–2).

The arc of standing and recumbent stones outside the western entrance of the main Knowth passage tomb is much smaller than the area enclosed by the Great Circle at Newgrange. It has been argued, however, that at Knowth the close proximity of the many satellite tombs appears to create an inner 'directed space' around the focal monument (McCormack and Bergh 2019, 588–92). At Newgrange it could be argued that the same effect may instead have been achieved through the building of the Great Circle (O'Sullivan 2006, 671). The wider space outside the tomb entrance could be considered a 'forecourt' in which greater participation in ritual activity could be accommodated, probably involving activities at the oval setting and hut (Fig. 11; O'Kelly 1982, 75–7; Bradley 1998a, 109). It may be of significance, then, that despite extensive excavations outside the tomb all of the seventeen Late Neolithic/Beaker period hearths discovered were situated within the perimeter of the Great Circle (O'Kelly *et al*. 1983, figs 4, 8, 10, 12).

THE RELATIONSHIP BETWEEN GC-2 AND THE FOUNDATION TRENCHES

O'Kelly's excavation revealed two trenches running east and west towards the base of GC-2 (Fig. 1; O'Kelly *et al*. 1983, 23, fig. 8). The eastern trench terminated just north of its socket and was outside the area re-excavated by Sweetman. The western trench ran from the socket of GC-2 towards the socket of GC-1, where it then turned sharply north, towards the kerb of the passage tomb (Fig. 11). At the end closest to the passage tomb, the trench became progressively narrower and shallower, which was attributed to its being cut into the deeper slope of cairn slip (*ibid*.).

Sweetman's excavation exposed a small part of the trench at the western edge of GC-2. There was evidence to suggest that the trench ran under GC-2, which, by inference, would suggest that the stone had been placed there after the cairn slip had accumulated, but it was not possible to say how far this evidence extended beneath the base of the stone (Sweetman 1985, 208, fig. 8). The photographs and drawings in the O'Kelly Archive depict the flat base of the trench ending *c*. 30cm from, and sloping up towards, the base of both GC-1 and GC-2 (Figs 11 and 13). Moreover, O'Kelly *et al*.'s (1983, 23) suggestion that part of the trench was cut through cairn slip was an assumption based on its reduction in depth and width as it ran north. No direct evidence for the trench was found in the overlying cairn slip itself, which, owing to its stony nature, may have concealed its presence. Lynch (2014, 39) reported a similar difficulty in reading the horizontal stratification of the lower levels of the stony cairn slip during the excavation of an area outside the north-eastern side of the cairn.

A review of the O'Kelly Archive has shown that the low, dry-built stone wall illustrated as running inside this trench appears to have been built directly against the side of GC-2 (Figs 12 and 13). On the plan of the central area (O'Kelly *et al*. 1983, fig. 8) the wall is shown spanning the length of the trench, terminating at the sockets of GC-1 and GC-2 (see Fig. 11), and was interpreted as being the packing for one side of a wooden building, possibly built of upright planks. The profile drawing on the west side of cutting 17 shows the dry walling in the trench as being three courses

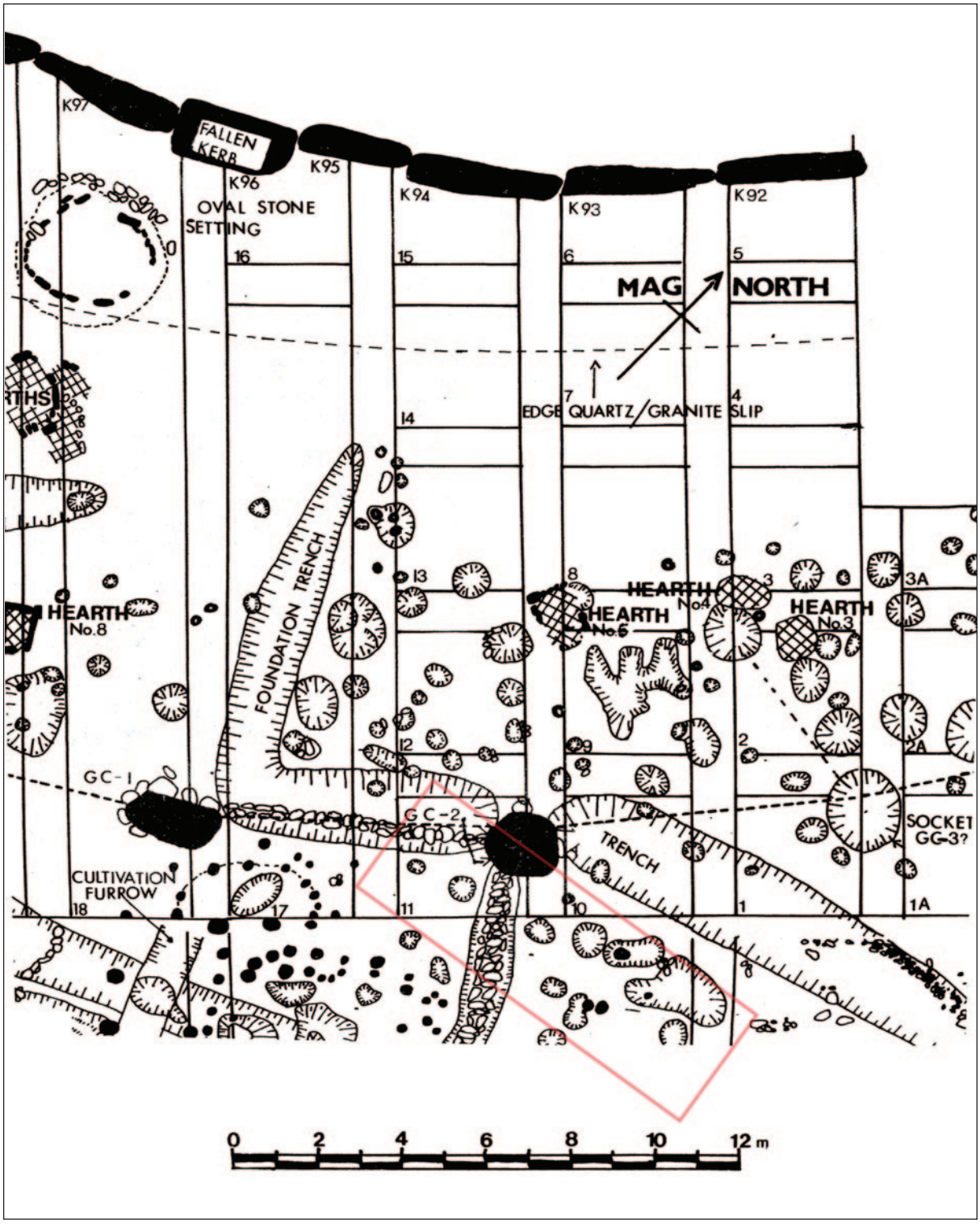


Fig. 11—The central area of O'Kelly's excavation outside the front of the main passage tomb at Newgrange. GC-1, GC-2, the 'L'-shaped trench and the drystone wall within it can be seen at the bottom. The area outlined in red indicates the extent of Sweetman's re-excavation of this area (after O'Kelly *et al.* 1983, fig. 8, with overlay based on Sweetman 1985, fig. 5).

Fig. 12—A photograph taken at an early stage of the excavation around GC-2 in 1962. The upper course of the drystone wall built against GC-2 is visible between the red bars (© National Monuments Service, Department of Housing, Local Government and Heritage; reproduced with permission).

high (*ibid.*, 24, fig. 3). The packing stones clearly stood proud of the surrounding ground level (see Fig. 13).

Remarkably, a video recording of the first season of excavation by state broadcaster RTÉ clearly shows the stone wall leaning against the side of GC-2 (Egan 1962, 09:10). It is difficult to envisage how stones as heavy and bulky as GC-1 and GC-2 could have been manoeuvred into position without causing significant damage or deformation to this insubstantial stone wall. The wall and the trench in which it sits are therefore more likely to post-date the placement of GC-2 and are thus unrelated to the feature found by Sweetman. This relationship is also suggested by the fact that the trench turns sharply north immediately at the foot of GC-1 (Fig. 11) and does not appear to have been affected by the cutting of the socket. In any event, it is clear from Sweetman's report (1985, 208) that the relationship between stone GC-2 and the trench still remained uncertain: 'even if the material underneath GC-2 is not part of the foundation trenches it is still humic and not boulder clay and must be from pre-stone circle activity'.

Photographs of the base of GC-2 along its southern edge appear to show that the standing stone sat above

Fig. 13—GC-2 from the west, under excavation by O'Kelly. Visible is the drystone wall built within the trench and against the side of the stone. Note that from this angle the base of GC-2 does not appear to be stratified above the pits to the north behind it (left of photo) (© National Monuments Service, Department of Housing, Local Government and Heritage; reproduced with permission).

the level of the rims of nearby pits. The interpretation of this is not straightforward, however, owing to the base of the stone on this side being supported by smaller stones placed underneath it (O'Kelly 1982, 81, fig. 11; Sweetman 1985, 208–9, pl. IV). In contrast, unpublished photographs in the O'Kelly Archive showing the northern side of the stone, which was outside the area excavated by Sweetman, appear to show that the bottom edge on this side was slightly below the level of the pits to its north (Fig. 13). The stratification across the entire area south of the kerb of the large tomb is further complicated by at least two episodes of extensive turf-stripping (O'Kelly 1982, 127–8) which exposed the subsoil surface. This would have reduced the ground level around any existing upstanding features, such as standing stones, and removed the tops of any pre-existing pits. As a consequence, if the placement of GC-2, which had no socket, pre-dated episodes of turf-stripping around it, it would appear to be on an island of higher ground, above any surrounding features cut into the stripped surface at a later date. At least one of these episodes of turf-stripping pre-dated the construction of satellite tomb Z but post-dated the large passage tomb kerb, as

the original turf layer remained beneath it (*ibid*.).

Sweetman (1985, 208–9) suggested, based on O'Kelly's published reports, that the socket for the 'missing' stone (GC-3) appeared to have been placed over a pre-existing pit of the pit circle. The grounds for this are not stated explicitly, however, and are not evident in the published section drawing of this pit (O'Kelly 1982, fig. 11c). The excavation archive photographs show that the appearance of the proposed socket of GC-3 in the photograph cited by Sweetman (O'Kelly *et al*. 1983, pl. 10) is due to the outline of the pit having been excavated to a depth of about 10cm before a section was cut through it (see Fig. 14). Photographs in the archive show that the section cut through the possible socket remained in place for a long period of time, probably to allow it to be directly compared with the many other pits which emerged around it.

While the observation that a hearth of Late Neolithic/Beaker period date was stratified above a pit of the pit circle is generally accepted, other instances of Beaker material overlying sockets of the Great Circle may have been overlooked. As previously mentioned, the socket of GC-8 is one example (O'Kelly *et al*. 1983, fig. 5). The profile drawing shows that the socket of this stone was cut through the boulder clay but not through the Late Neolithic/Beaker horizon that overlay its fill (see Fig. 15). At the western end of the excavations, the supposed socket of 'missing' stone GC8 had become backfilled before Late Neolithic/Beaker habitation accumulated above it (O'Kelly 1982, fig. 11b). Eventually the socket was partly overlain by a low, wide bank of mainly stoneless yellow clay which had Late Neolithic/Beaker material both underneath and above it (*ibid*., 82).

THE POSITION OF THE POST/PIT CIRCLE RELATIVE TO THE GREAT CIRCLE

During O'Kelly's excavations, it was found that the arc of great pits intersected with the supposed line of the Great Circle. Among the 70 or so pits of the post/pit circle were two possible sockets with packing stones in the expected positions of GC-3 and GC-6 (O'Kelly *et al*. 1983, 10). From these observations, Sweetman (1985, 216) argued that 'five stones of the great stone circle would have had to be removed or incorporated

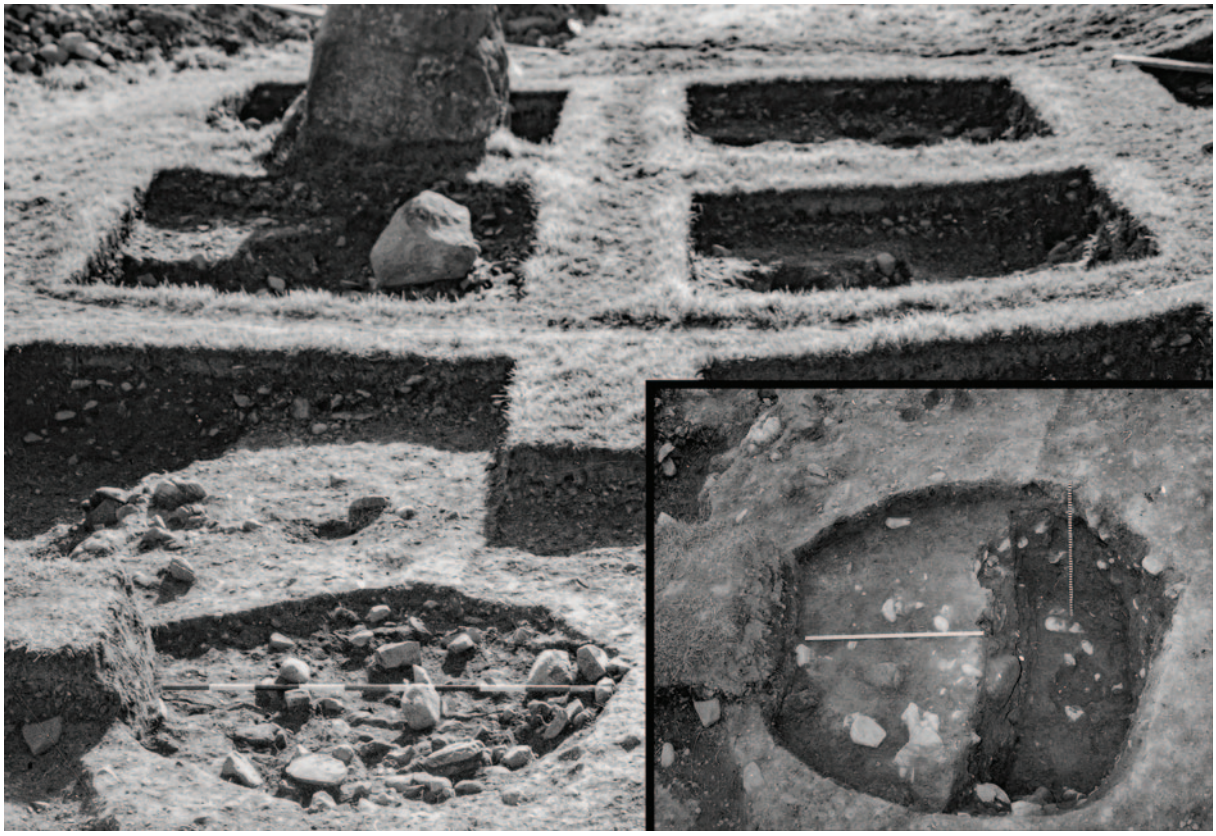


Fig. 14—Previously unpublished photographs of the presumed socket of GC-3 during excavation by O'Kelly (bottom left) and of the pit following section (inset). There is little to indicate that the socket of a stone from the Great Circle was placed on top of a pre-existing pit. This pit was outside the area excavated during Sweetman's campaign (© National Monuments Service, Department of Housing, Local Government and Heritage; reproduced with permission).

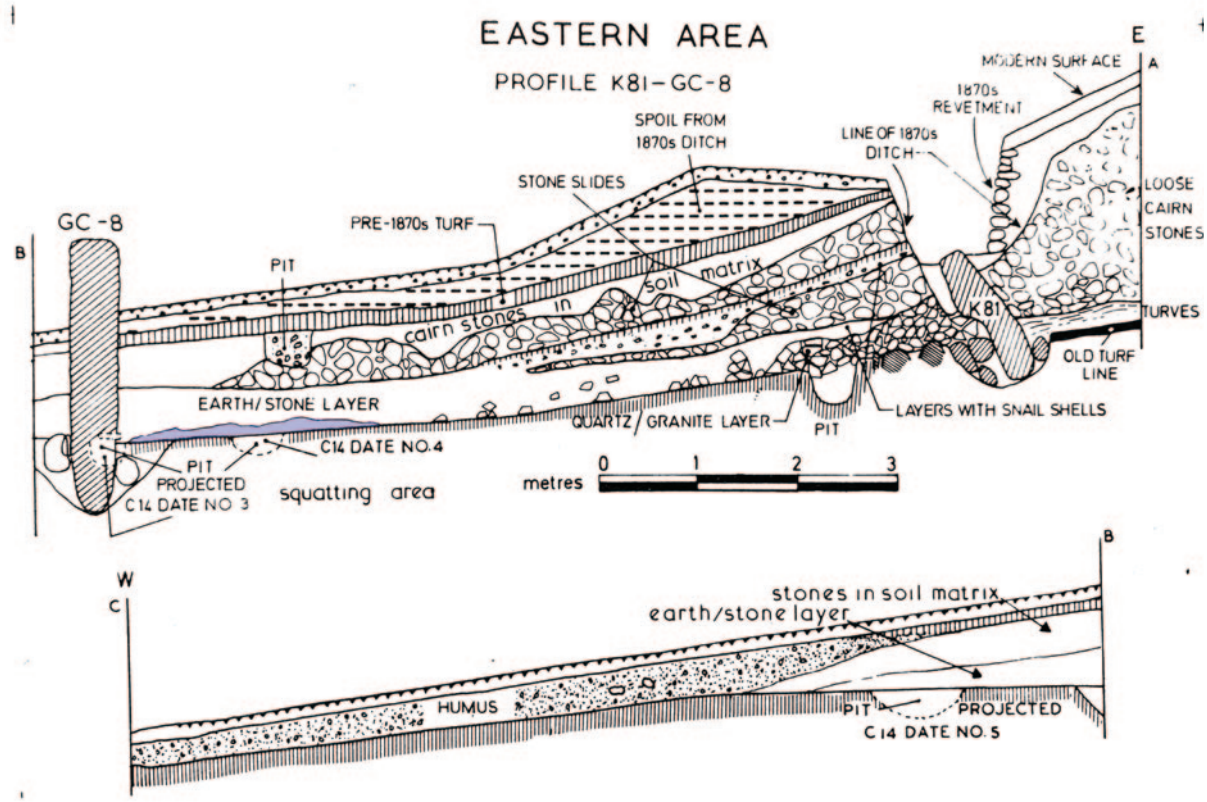


Fig. 15—Section through cairn slip, showing late Neolithic/Beaker period settlement, indicated in blue, extending over the socket of GC-8 (after O'Kelly *et al.* 1983, fig. 5; reproduced with permission).

into the pit and post circle if the latter was constructed after the former' and, therefore, '… if the stone circle existed at the time of the commencement of the building of the pit circle, the builders of the latter would have moved their monument further south to avoid the pre-existing site. Since this is not the case, the great stone circle must be later than the post and pit monument.' The absence of any surviving Great Circle stones to the east of GC-2 in the path of the pit circle diminishes the strength of this argument.

The limited area available between the large passage tomb, the Great Circle and the small tomb, Site Z, is also relevant (see Fig. 1). If a monument of the same width as the pit circle had been built outside the line of stones of the Great Circle, it would have likely encroached on the mound of Site Z. It seems more likely that the pit circle was placed in such a way as to enclose the mound of Site Z, with the passage tomb sited roughly symmetrically in its north-western arc (Sweetman 1985, pl. V). Similar acts of enclosure are visible around the mounds of Site A (O'Kelly 1982, pl. 1), Site B1 and LP1 on the lower valley slopes beneath Newgrange, all probable passage tombs (Davis *et al.* 2013, 231–2). Within the pit circle is a large semicircular feature of pits, which were stated to be 'very similar in every respect to those of the arc' (O'Kelly *et al.* 1983, 21, figs 4a, b). Brindley (1999, 33) has suggested that this arc of pits is composed of two concentric circles, intersecting at their north-west with the large pit circle.

If this arc of pits was contemporary with or earlier than the rest of the pit circle, then it may have been an additional factor in placing the post/pit circle across the path of the Great Circle. The removal of several standing stones would be relatively straightforward compared to removing part of the kerb and mound of Site Z or choosing a different location for the pit circle so that it did not enclose the smaller passage tomb. At least three of the possible five stones which would have had to be removed—GC-2, GC-4 and GC-5—appear not to have been embedded in sockets, which would make the task easier.

The position of GC-2 is of interest in this regard. As can be seen in the excavation plans by O'Kelly and Sweetman (see Fig. 1), this stone would in fact have been within or just outside the outer row of the post/pit circle and could therefore have been integrated into it. Indeed, evidence for two other

previously unknown standing stones close to the periphery of the pit circle had actually been found during Sweetman's excavations of the post-pit circle in its south-west quadrant (1985, 204–5, fig. 3; see Fig. 1, bottom right), and it remains a possibility that more standing stones were placed around the periphery of the post-pit circle in the unexcavated areas.

THE YELLOW CLAY BANK

During O'Kelly's excavations, a bank of stoneless yellow clay was discovered in the lower layers of cairn slip, running from the passage tomb entrance along the south-west side of the tomb and presumably continuing into the unexcavated area (see Fig. 1; O'Kelly 1982, 78; O'Kelly *et al.* 1983, 26–9). Where the Great Circle is at a greater distance from the kerb, i.e. opposite the tomb entrance, the bank was placed further from the tomb entrance. Towards the west of the mound, however, the Great Circle was built closer to the passage tomb. It appears that the yellow clay bank respects the distance between the passage tomb kerb and the Great Circle, in both width and distance from the two monuments. It does not seem likely that the shape of the Great Circle was designed to follow the course of the yellow clay bank, since the bank is entirely absent on the south-east side of the passage tomb. Section drawings also show that the bank was wedge-shaped in section, petering out to a thin edge on its southern extremities, which would have been practically imperceptible once a natural turf layer had formed over it (O'Kelly *et al.* 1983, figs 9, 11, 13). As previously mentioned, the presumed socket of a 'missing' stone of the Great Circle, GC8, had become filled before the bank was built, or slumped, over it (O'Kelly 1982, 82, fig. 11b). Even if this was not the socket for GC8, the bank noticeably bulges southwards in the gap between GC7 and GC9, suggesting that the Great Circle pre-dated the bank. The specific date of the yellow clay bank is uncertain, since Late Neolithic/Beaker period material was said to have been found both underneath and above it (O'Kelly *et al.* 1983, figs 9, 11, 13).

PERISTALITHS AND STONE SETTINGS ASSOCIATED WITH PASSAGE TOMBS IN IRELAND, BRITAIN AND FRANCE

Peristaliths and settings of standing stones directly comparable to those at Newgrange are found at passage tombs and related sites across Ireland and Britain. Although the dating evidence for the external features—and, indeed, for many of the monuments themselves—is often based on typological characteristics rather than direct dating, the number and the wide geographical distribution of such sites suggest that at least some are primary features. For example, the Bryn Celli Ddu and Millin Bay sites are clear examples where arcs of standing stones formed an integral part of these Neolithic monuments. It is no longer persuasive nor necessary, therefore, to consider the Great Circle as a later addition to a ruinous passage tomb.

The largest collection of Neolithic passage tombs that consistently feature peristaliths are those surveyed extensively on the Outer Hebrides in Scotland, where Henshall (1972, 14) has suggested that the rings of standing stones outside these passage tombs may have been a later addition. Cummings and Richards (2013, 191, 193) have pointed out, however, that while some passage tomb cairns were later extended to round, long or square forms, the peristaliths are always round, reflecting the original shape of the cairns, and that standing stones around Neolithic tombs are the most accessible source for building material in later periods. They are also the most easily disposed of element of chambered tombs when clearing land for agricultural use. The original number of examples may therefore have been higher.

The closest example to Newgrange, just 1.2km away, the settings of standing stones outside the entrances at Knowth, has already been mentioned. Surrounding the anomalous megalithic chamber at Millin Bay, Co. Down, is an arc of eleven stones, possibly the remnants of a full circle, which the excavators suggest was contemporary with the central long cist (Collins and Waterman 1955, 26). Megalithic art was found on some of the standing stones of the outer arc, and Cooney (2000, 122–4) argues that this supports the view that the outer arc is contemporary with the long cist; he has more recently (2017, 405) reaffirmed this view based on new, contemporary radiocarbon dates from both the central long cist and a cremation in one of the smaller 'satellite' cists. The long cist contained typical passage tomb Carrowkeel Ware pottery (Collins and Waterman 1955). It is notable that one of the inhumations from Millin Bay (MB6) has been shown to have genetic links with a burial excavated inside Newgrange (NG10) (Cassidy *et al.* 2020, fig. 2). The radiocarbon dates for these two burials are also in a very similar range: MB6, UBA-35071, 4548±51 BP, 3495–3040 cal. BC; NG10, OxA-36079, 4473±29 BP, 3338–3028 cal. BC (*ibid.*).

At Carrowmore, Co. Sligo, Burl argued that some of the monuments on the periphery of the complex show a development from simple passage tombs to true free-standing stone circles within the passage tomb cemetery. Regarding Carrowmore 9, he notes: 'In any

other county or country this setting would be recognised as a stone circle' (2000, 82). Early accounts of the Listoghil monument, the focal tomb of the complex, describe an outer circle of stones at a distance from its kerb, only four of which remained when seen by Petrie (Petrie and O'Connor 1837; Kitchin 1983, 165). Today only one outlying stone is visible on the outer edge of the platform.

When Macalister investigated the passage tombs at Carrowkeel, he described Cairn H as having an inner kerb of contiguous large stones and an outer ring of *c.* 40 smaller boulders spaced an average of 1.4m apart (Macalister *et al.* 1912, 329, pl. XXII). Cassidy *et al.* (2020) note that 'samples from Newgrange, Carrowkeel and Millin Bay form a distinct cluster that is split from a larger British and Irish grouping'. In the context of this discussion, it is significant that these monuments, i.e. Newgrange, Millin Bay, Carrowkeel and Carrowmore, are also linked by having settings of standing stones in either arcs or circles outside the kerbs of the monuments themselves.

At Loughcrew at least three cairns have standing stones outside and concentric with their kerbs (Fig. 16). On Carnbane West, Cairn F has three standing stones placed concentrically with its kerb, two on the northern side, where the low horizontal slabs of its kerb are also visible (Shee Twohig 1981, 207). There is another conspicuous standing stone on its southern side. Outside the kerb of Cairn I, one low boulder and two prostrate stones (now mostly covered with turf) around its northern kerb and one outside its southern kerb may also be the remains of a surrounding circle or arc. Cairn V, on Carnbane East, has one broad standing stone just outside, and standing parallel to, the line of the kerb (Cooney 1996).

North of Loughcrew, at Banagher, Co. Cavan, a passage tomb which has at least one stone decorated with megalithic art has the remains of two concentric kerbs and a surrounding stone circle. Beside the passage tomb is a henge-like monument (Cody 2002). Herity (1974, 12–13) has drawn attention to an antiquarian drawing of a probable passage tomb near Temple Patrick, Co. Down, with three standing stones, 'the remains of a peristalith like that of New Grange surrounding the tumulus'. Eochy's Cairn (MA117-042001-), a very large cairn in County Mayo which has several large kerbstones visible around its base, is likely to contain a passage tomb (Harbison 1970, 172). The cairn was surrounded by a large, oval ditch and bank, most of which remain today. Within the remaining arc of the enclosure, five distantly spaced stones of a possible circle or arc of small standing stones remain.

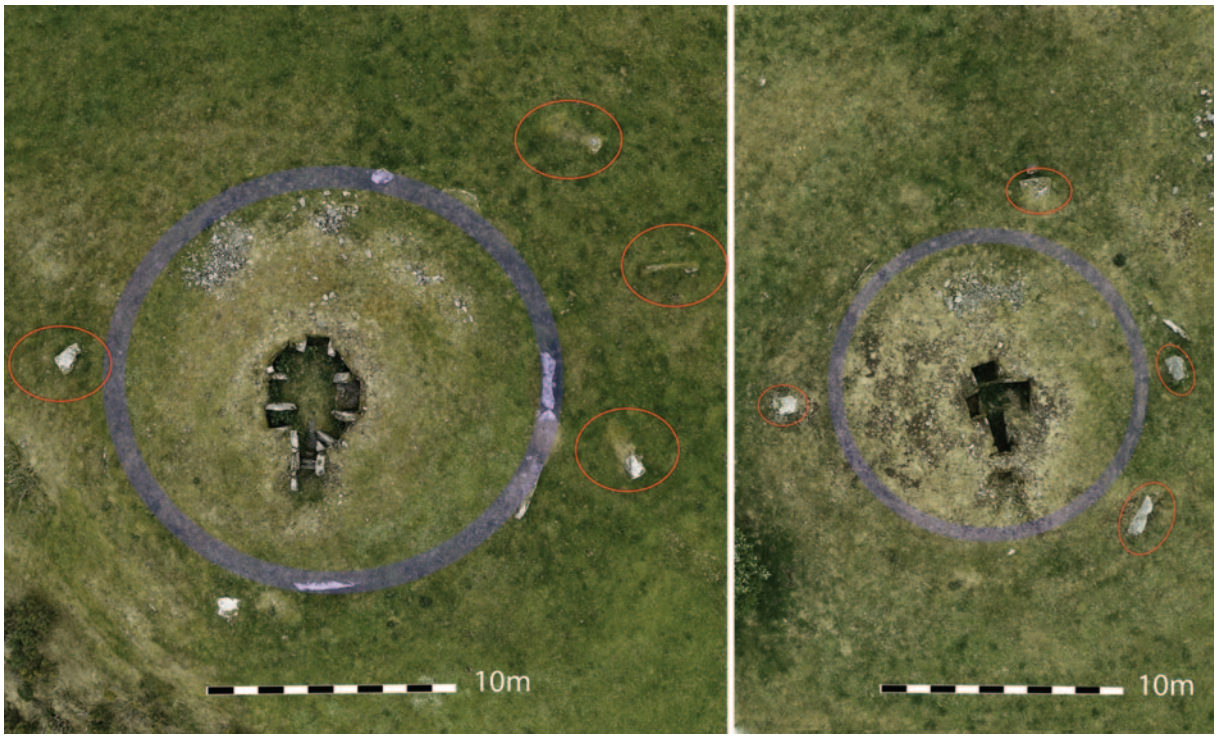


Fig. 16—Cairn I (left) and Cairn F (right) at Carnbane West, Loughcrew, Co. Meath. The standing stones around Cairn F are clearly distinct from the inner kerb of low, horizontal stones which are visible in places (indicated with blue circle). Just visible through the grass around Cairn I is a group of three pillar-like stones, circled in red, which possibly once stood outside the kerb (blue circle). The stone to the left is also outside the line of the kerb and is now leaning at an angle (Ken Williams).

An unusual collection of monuments, some now destroyed, has been described at Kiltierney, Co. Fermanagh (Daniells *et al*. 1977). A mound believed to be a ruined passage tomb was associated with two stones decorated with megalithic art (Shee Twohig 1981, 224). Another monument 250m from the probable passage tomb appeared to consist of an embanked stone circle. At the centre of the circle, a large cremation deposit was found to contain Carrowkeel Ware and hammer pendants typical of passage tomb burials (Daniells *et al*. 1977, 38). The monument is difficult to interpret; the excavators draw comparisons with other embanked stone circles.

At Bryn Celli Ddu in Wales an arc of standing stones was found beneath the mound of the passage tomb chamber built within it (Hemp 1930). A re-analysis of the excavation archive (Burrow 2010) supports the conclusion that the arc of standing stones pre-dated or was contemporary with the passage tomb. Some of the stones may even have been used to guide the alignment of the passage tomb towards the rising sun on the summer solstice (*ibid*., 258–60, fig. 9). A human bone deposit under 'Stone I' of the arc returned a calibrated radiocarbon date of 3500–3100 cal. BC (UB-7116; 4573±40 BP), and the passage tomb itself has now been dated to between 3045–2978 cal. BC at 1σ and 3074–2956 cal. BC at 2σ (*ibid*., table 2, 262–3). Intriguingly, early antiquarian accounts of the monument describe another, larger circle of stones outside the ditch that surrounded the passage tomb (Hemp 1930, 183). A drawing by Rowlands (1993 [1766], pl. VII, figs 3, 4) shows a largely intact cairn at the monument itself and two standing stones, labelled 'the columns'.

At Maeshowe in Orkney, limited excavations outside the tomb revealed the socket of a missing standing stone. Challands *et al*. (2005, 229) suggest that this may be the remains of a stone circle which was dismantled to create the passage tomb. Several long, thin stones, very similar to those used in the nearby stone circle at Stenness, were incorporated into the passage tomb design within. These stand vertically in each corner of the chamber and lay horizontally along the passage. The size and shape of these stones are anomalous when compared to the smaller orthostatic and drystone walling technique used in other passage tombs on Orkney (Garrow *et al*. 2005, 251). Eogan (1992) discussed the similarity between the pick-dressing on stones inside Maeshowe and pick-dressing in the Boyne Valley. Detailed recording has shown that many of the stones inside Maeshowe feature pick-dressing in both dispersed and close area forms (Phillips and Bradley 2000); Thomas (2016, 62) has drawn attention to the similarity in the use of pick-dressing and masonry techniques between Maeshowe and the Ness of Brodgar, arguing that the pick-dressing at the two sites is broadly contemporary.

The passage tomb of Mané er Groez (also known as Kercado), at Carnac in Brittany, has often been compared with Newgrange, as it has a very similar arrangement of standing stones around the mound and a single one on its summit (e.g. Cassen *et al*. 2018). This arrangement is very close to how Newgrange was first described by Lhywd in 1699 (O'Kelly 1982).

Neolithic stone circles

Some of the most imposing stone circles in Ireland have been the subject of debate as to whether they should be categorised as Neolithic or Bronze Age. Given recent advances in dating in Britain (e.g. Gibson 2011; Frodsham 2021), it seems possible that both Beltany Tops, Co. Donegal (DG070-026001-), and Ballynoe, Co. Down (Groenman-van Waateringe and Butler 1976), were Neolithic megalithic rings that may have seen reuse and adaptation over the later Neolithic and Bronze Age (Burl 2000, 84). Old accounts referred to in the OS Memoirs (1836) suggest that there had been a 'vast heap of stones' within the circle at Beltany Tops. Cody (1982, 215) quotes Thomas Fagan, who recounted stories of 'sepulchral graves' found inside it. Burl (2000, 84) suggests that it may date from before 3000 BC, based on its close similarity to the platform and kerb arrangement of the Carrowmore passage tombs in Sligo.

The stone circle at Stenness, mentioned above, has been dated to the third millennium BC on the basis of radiocarbon dates from the surrounding ditch and a central feature (Ritchie and Marwick 1976, 21–2; Burl 2000, 211). Of great interest in the context of the current discussion is the discovery of close area-picking on the inner face of Stone 3 (Phillips and Bradley 2000, 106–7). As the authors note, the faces on this and other stones at Stenness and the nearby Ring of Brodgar have flaked away in large areas, and so further examples of megalithic art on these monuments may have been lost.

Also in Scotland, at Balbirnie a review and radiocarbon dating of cremation deposits found in stone sockets during the original excavation (Ritchie 1974) has shown that this multi-phase monument began as a stone circle, now reliably dated to *c*. 3000 BC (Gibson 2011, 59). Grooved Ware was found in the fill of one socket hole, and in the centre of the monument was a rectangular stone setting remarkably similar to the hearths that surrounded the front of Newgrange (Ritchie 1974). Radiocarbon dating from excavations at Calanais, Lewis, suggests that the stone circle there may date from as early as 2980 BC; it pre-dates a miniature passage tomb built inside it (Ashmore 2016, 949–50). Dates from stone circles in Cumbria, England, now indicate more firmly that some of the very large-

diameter stone circles consisting of twenty or more stones date from the Neolithic, as proposed by Burl (2000, 108, table 10). These circles often have one or more flattened sides and internal or external settings of stones. An excavation at Long Meg has provided dates from the stone circle of between 3340 and 3030 cal. BC (SUERC-64638, GU39505; 4475±30; Frodsham 2021, table 10.1). An earlier excavation of the socket of a mostly destroyed stone circle at Gretna, 40km away, produced a very similar date, albeit from a mixed charcoal sample (*ibid*.).

SUMMARY AND CONCLUSIONS

The discovery of megalithic art on the stones of the Great Circle has shed new light on the sequence of activity at Newgrange. The use of close area and dispersed picking on the stones of the Great Circle is consistent with its being set in place during the construction and use of the passage tomb.

Both the tomb and the Great Circle share a common, loosely defined, flattened ovoid shape, with a shared emphasis on the entrance area of the tomb (see Fig. 1). This is evident in the wider area left between the kerb and the Great Circle and the use of larger stones of distinctive colour and texture. The Great Circle could be seen in terms of the increasing focus on the external areas around passage tombs as rites evolved to include larger groups of people (Cooney 2000, 119; Bradley 2007, 106; Hensey 2015, 96–105). Similarly, the shadow-casting phenomenon between the Great Circle and the kerbstones of the passage tomb suggests contemporaneity, since the cairn slip would have obscured the kerb and distorted or blocked the extent of the shadows. Sourcing five greywacke stones from several kilometres away for use in the Great Circle is also consistent with how stone was sourced and used in the passage tombs. In addition to the greywacke stones, the wide variety of other geologically distinct stones around the front of the tomb reflects the use of distinctively coloured stones in the facing at the front of the tomb.

The presence of similar features of standing stones, stone circles and stone settings outside passage tombs dispersed from the west coast of Ireland to the east coast of Britain suggests that the Great Circle is not a particularly unusual feature within the development of passage tombs in the Neolithic.

Arguments that the Great Circle post-dates the building of the passage tomb on typological grounds have become less persuasive as new evidence for Neolithic stone circles and peristaliths has emerged. If it were to be judged as a separate monument, it is more consistent with the Late Neolithic stone circles. Similarly, the understanding that timber circles were only later replaced with stone circles may be more complex than originally supposed. As the Sanctuary at Stonehenge in England shows, stones and timber posts were sometimes integrated into the same monument (Bradley 2007, fig. 3.17). The emergence of stone circles, henges and the seemingly hybrid monuments known as embanked stone circles may have roots in the increasingly public nature of passage tomb rituals and the growing emphasis on their exterior. This can be seen in the emergence of large-scale kerbstone art, stone settings and standing stones (Shee Twohig 2022c, 305).

POSTSCRIPT

While this paper was in press, it was discovered by the author that a stone built into the bank of Grange Stone Circle, Co. Limerick, has carvings consistent with typical passage tomb art. They most closely resemble the carvings at the passage tomb at Knockroe, Co. Kilkenny. The carvings occur on three faces and appear to continue below present ground level beneath the bank (Williams 2023).

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