

Inchinnan 5: the discovery and reconstruction of an early medieval carved stone

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ABSTRACT

The site of All Hallows Church in Inchinnan, Renfrewshire, had its foundations in the early medieval period, an interpretation supported by the identification of four carved stones from the site that date between the 9th and 11th centuries AD. Thanks to a recent community project ‘597 AD St Conval to All Hallows: 1420 Years and Counting’, led by Heather James of Calluna Archaeology and the members of the Inchinnan Historical Interest Group with Spectrum Heritage, a fifth carved stone has been discovered. Inspection of the photogrammetric three-dimensional models and the Reflectance Transformation Imaging (RTI) files of the late medieval recumbent monuments at the site, produced by Spectrum Heritage, revealed that one worn specimen was originally an early medieval recumbent cross slab conforming to the ‘Govan School’ of carving. After identifying the remnants of carving and applying a novel digital analysis technique, it was possible to recover and identify many of the worn decorative motifs from Inchinnan 5. This reconstruction allows for Inchinnan 5 to be compared with other stones from the Govan School, especially those found at Govan and St Blane’s, Bute.

INTRODUCTION

As a result of the archaeological community project at the site of All Hallows Church in Inchinnan, Renfrewshire (Canmore ID 43063), in May 2017, a previously unrecorded early medieval carved stone was discovered. The stone is severely worn and was displayed among the later medieval ‘Templar Stones’ due to its subsequent reuse, but its earlier origins were identified after photogrammetry revealed several features that indicated the stone was carved in the style of the Govan School. This article begins with a brief discussion of Inchinnan’s early medieval origins, its carved stones and a description of the traits they share with the Govan School. This is followed by an overview of the community project that led to the stone’s discovery. An explanation of the digital imaging techniques applied to this stone and a discussion of the methodology used to recover worn carved details are given. The reconstruction

of Inchinnan 5 allows for it to be compared with similar material from the Govan School, especially Govan and St Blane’s, Bute. From this analysis, it is clear that photogrammetry and Reflectance Transformation Imaging (RTI) have significant research applications, especially in the study of worn carved stone.

BACKGROUND

The site of All Hallows Church in Inchinnan, Renfrewshire, had its foundations in the early medieval period. It is reputed to be the burial place of the early Christian saint, St Conval. While physical evidence for an early medieval church has not yet been found at the site, its collection of early medieval stones and a historical record of David I’s gift of the church to the Knights Templar in 1153 strongly suggest the presence of one. At least three church buildings have been recorded at the site: the earliest was

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medieval in date and is recorded in an illustration kept in the current parish church; the medieval church was demolished and replaced in 1828 by the second church building, which is visible on the first OS map; the second church was demolished and replaced in 1904 by the most recent church building, which was designed by Rowand Anderson (James 2018: 6–10). When the most recent church building was demolished in 1965 for the extension of the runway at Glasgow Airport, the three early medieval stones and ten later medieval stones kept at All Hallows Church were moved to the new Inchinnan parish church (Radford 1967: 181; Márkus 2018: 32–3; James 2018: 3).

Inchinnan's early medieval phase has been associated with Govan, largely due to the similarities in the design of the carved stones from these sites (Radford 1967; Driscoll et al 2005). Three early medieval carved stones dating between the 9th and 11th centuries were originally recorded at Inchinnan (Stuart 1856, vol 1: 38, pl LXXV–LXXVI; Allen & Anderson 1903, vol 2: 456–9) and have been most recently described by Anna Ritchie as a part of Canmore's 'Early Medieval Carved Stones Project' (2017). As indicated above, the Inchinnan stones belong to what is known as the 'Govan School', a term used to describe early medieval carved stones in Strathclyde that share several features, including the recumbent cross-slab monument type, some of which exhibit angle-knobs, and median-incised interlace patterns (Bailey 1994: 113–14; Driscoll et al 2005: 141–2).

In this article, decorative motifs will be described using the pattern's closest likeness in Allen and Anderson's numbering system, though after their initial introduction these will be referred to by simplified colloquial terms that Allen

used in his descriptions and have since been employed by art historians (Cramp 1984; Bailey 1994). While there are issues with Allen's pattern categories, as argued by both Michael Brennan (2011: 3–4) and Cynthia Thickpenney (2019: 106–7), it is useful to describe patterns in terms of a family or genus of pattern (Brennan 2011: 19).

In the Govan School, patterns such as plaits, Stafford knots (Allen & Anderson 1903, vol 1: 231–4, pattern no. 214) and free-rings (Allen & Anderson 1903, vol. 1: 222–4, pattern no. 574) are especially prevalent (Bailey 1994: 117). Three of the early medieval stones from Inchinnan are depicted below in Illus 1. Inchinnan 1 is a recumbent cross slab decorated with a plain cross and interlace patterns, including a Stafford knot-related pattern (Allen & Anderson 1903, vol 1: 240–1, pattern no. 215). Inchinnan 2 is part of a cross shaft decorated with free-ring interlace and plait that has had one broad face shorn away. Inchinnan 3 is a recumbent monument that



ILLUS 1 Unaltered images of the three-dimensional models of Inchinnan 1, 2 and 3 created by Spectrum Heritage (2017) as part of this community project

exhibits prominent angle-knobs and is decorated with a plain cross, a multitude of beasts and simple knots and twists on five faces. Due to its ornate design and its prominent angle-knobs, this recumbent monument is often described as a shrine cover or sarcophagus lid (see Radford 1967: 182; Craig 1994: 77). A fourth fragment, Inchinnan 4, was discovered near the All Hallows site on the river bank in 2009; it is currently thought to have come from the top edge of a recumbent cross slab (Borland 2009).

In May 2017, an archaeological community project entitled ‘597 AD St Conval to All Hallows: 1420 Years and Counting’ was led by Heather James of Calluna Archaeology and the members of the Inchinnan Historical Interest Group. The focus of the project was to determine whether early medieval deposits survived beneath or near the site of the All Hallows Church. The comprehensive programme aimed to engage volunteers and school groups with geophysical survey, archaeological excavation and the recording of both ancient and modern gravestones. The results of the project have been recently published by James (2018). Gilbert Márkus was commissioned to revisit Inchinnan’s association with the cult of St Conval through the place-name, historical and hagiographical evidence (2018). Spectrum Heritage was contracted to introduce photogrammetry and RTI to the volunteers and to create three-dimensional models of the three early medieval carved stones and the ten medieval stones, which date broadly between the 12th and 17th centuries and are known colloquially as the ‘Templar stones’, which are all kept at the site of the new parish church. It is the digital imaging element of the project that has led to the discovery of a previously unidentified early medieval monument among the medieval ‘Templar stones’.

DIGITAL IMAGING TECHNIQUES

Photogrammetry is a digital imaging technique that creates a three-dimensional model of an object through the strategic capture of many overlapping photographs taken from different positions around the monument. By including

approximately 60% overlap between adjacent images, the software (in this case the software used by Spectrum Heritage was Agisoft Photoscan) identifies points and features that are shared between the photographs and calculates and records the geometry of the object in the form of a three-dimensional model. In a way, the 3D model can be thought of as a ‘digital cast’ of the object, without requiring contact with, and potentially damaging, the stone surface. The 3D model can either have a photorealistic render, or the colour (texture) can be removed to show the underlying geometry of the monument. Photogrammetry is one of the digital imaging techniques that lends itself particularly well to the recording and analysis of carved stone (as highlighted by ScARF (2012)), as well as to community engagement projects as shown by the ACCORD project and others (Jones et al 2017).

RTI is a digital imaging technique where the camera remains stationary in front of an object. In each photograph, a light source is moved to a new position to create various angles of raking light across the surface of the object. By including a reflective ball in the frame of the photograph, the position and angle of the light is recorded. The freely available software, RTIBuilder, then compiles the photographs and refers to this reflective sphere to determine how each pixel of each photograph reacts to different angles of light (Malzbender et al 2001; Malzbender & Gelb 2001; Gabov & Bevan 2011). The result is an interactive file where any angle of light can be simulated on the monument; this can highlight faint areas of carving that might go unnoticed when simply looking at the 3D model. This technique, like photogrammetry, is an accessible imaging method that has been implemented in many community projects, like ACCORD, as above, and OuRTI (Beale & Beale 2015; Jones et al 2017). While RTI is often carried out physically in the presence of the monument, Spectrum Heritage used what is called ‘Digital RTI’. In this case, the 3D model was taken into a digital space and a virtual dome of 93 lighting positions were applied. An image was produced from each of these lighting positions, the results of which were used to create an RTI file for Inchinnan 5 (for

more information on the application of Digital RTI, see Lymer 2015).

After the digital files produced by Spectrum Heritage were reviewed, the author discovered that one of the medieval ‘Templar stones’ was actually a reused early medieval recumbent cross slab. The removal of the photorealistic texture

from the three-dimensional model of this stone revealed the remnants of unmistakable features that are shared with the Govan School’s style of carving. These features included a cross with an incised border, flanked by panels of significantly worn interlace, which filled the top half of the stone. The lower half of the stone surface was



ILLUS 2 Unaltered image of the three-dimensional model of Inchinnan 5 made by Spectrum Heritage. The left image retains its texture, while the image on the right has had its texture removed, revealing the structure of the remnants of carving

divided into two large panels which exhibit different decorative motifs (Illus 2). While the details of the ornament were unclear at the time of discovery, it was evident that Inchinnan's collection of early medieval carved stones had increased from four to five (Márkus 2018: 7).

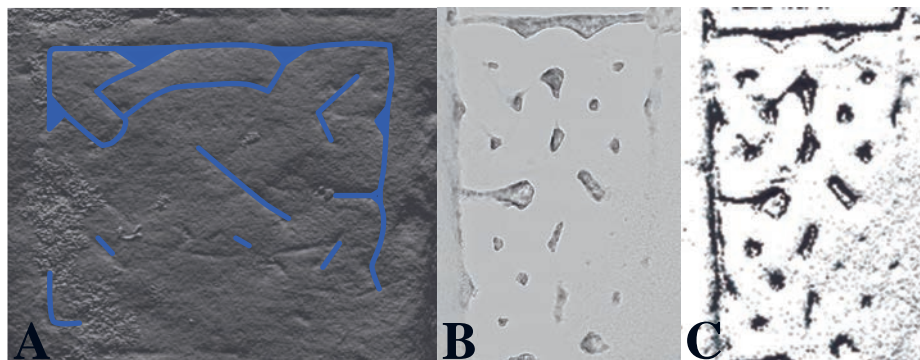
DIGITALLY ENHANCED ANALYSIS

To identify the worn patterns on Inchinnan 5, this study applied a methodology recently developed by the author from analysis of the early medieval carved stones at Govan (Kasten 2019; in press). In essence, this method relies on the use of RTI to identify and highlight the remnants of decoration on the worn carved stone. Once these are recorded on a separate image, copies of the three-dimensional models of well-preserved stones in the same style of carving (from Govan, in this case) are digitally 'worn' to produce a comparative collection of known worn patterns. The remnants of these are then highlighted and compared to the unknown patterns in question, in this case those found on Inchinnan 5, to identify which it most closely resembles. Once a match has been made, the proposed pattern is imposed on the remnants via an image editing software to determine how well it 'fits' the remnants. This method, using digitally worn patterns from the author's current

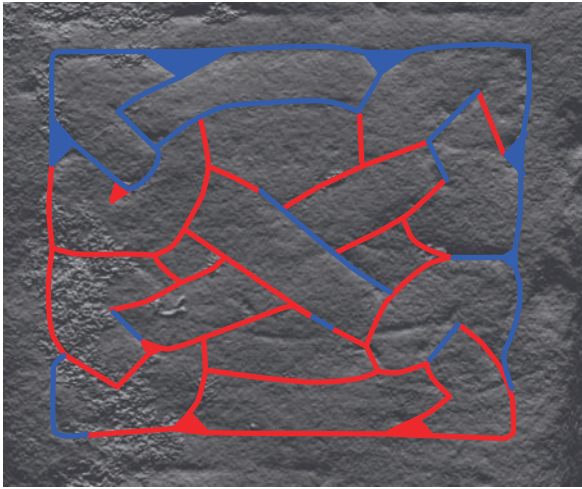
research at Govan (Kasten 2019), was applied to the newly discovered Inchinnan 5.

In the following sections, the stones from Govan will be referred to by the numbers assigned by Stirling Maxwell (1899) followed by the appropriate *Early Christian Monuments of Scotland* number (ECMS #) (Allen & Anderson 1903, vol 2). The illustrations of the reconstructed pattern utilise two colours: the areas highlighted in blue are areas of carving that are clear in both the 3D model and the RTI, while the areas in red are less apparent in the RTI and have been informed by the digitally worn comparative collection.

The RTI revealed that the panel located just below the cross was the best preserved. After highlighting the remnants (Illus 3A), it became apparent that units of this panel closely resembled the Stafford knot patterns that cover one of Govan's recumbent cross slabs, Govan 28 (ECMS 28; Illus 3B–C). The reconstruction of this panel revealed four outward-facing Stafford knots arranged in a larger knot (Allen & Anderson 1903, vol 1: 233, pattern no. 601) (Illus 4). While Stafford knots and closely related patterns are prevalent in the Govan School, the use of four units to create a circular knot in this manner is rare in the region, apart from the inward-facing arrangement reconstructed from a panel of the Capelrig cross (Macquarrie 2006: 15).

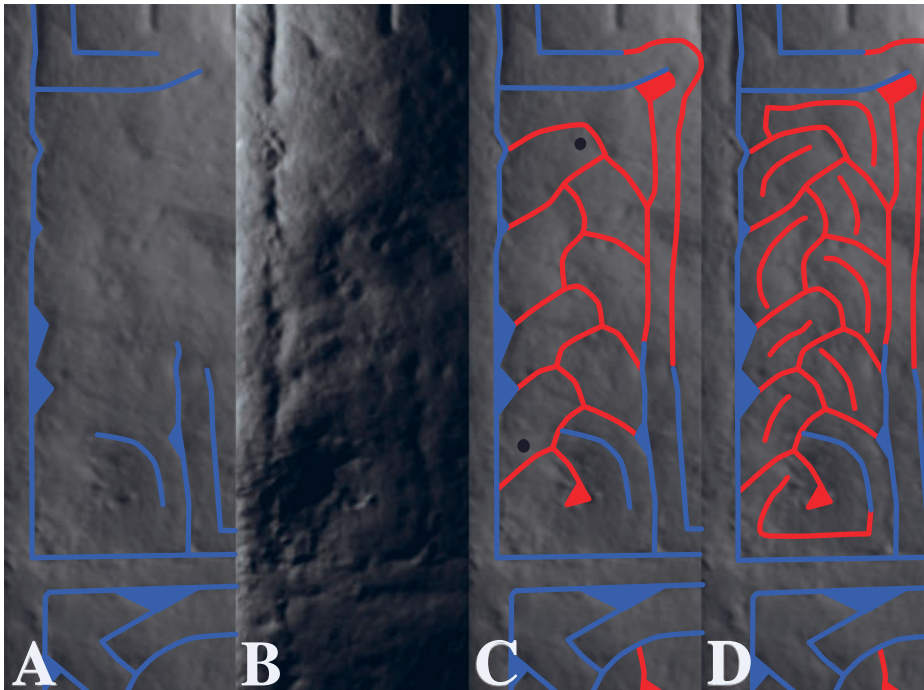


ILLUS 3 (A) The remnants from Inchinnan 5's central panel highlighted and compared to the truncated pattern of Stafford knots from Govan 28; (B) Image of the digitally worn 3D model of Govan 28's Stafford knots; and (C) Image of the unworn 3D model of Govan 28's Stafford knots



ILLUS 4 Stafford knot pattern recovered and imposed on Inchinnan 5's central panel

The rest of the stone is more significantly worn. Unfortunately, the two panels above the cross arms have been obliterated by weathering and the later medieval reuse of the monument; this has left these patterns unrecoverable through the present method. The panels adjacent to the cross shaft required additional close examination because their top halves were also impacted. The panel to the left of the shaft retains more of its carving, though faint remnants of the median-incised strands combined with the growth of moss and lichen on this part of the monument muddy its interpretation. Reliance on the analysis of the RTI alone was found to be most useful in this process due to the irregularity of the



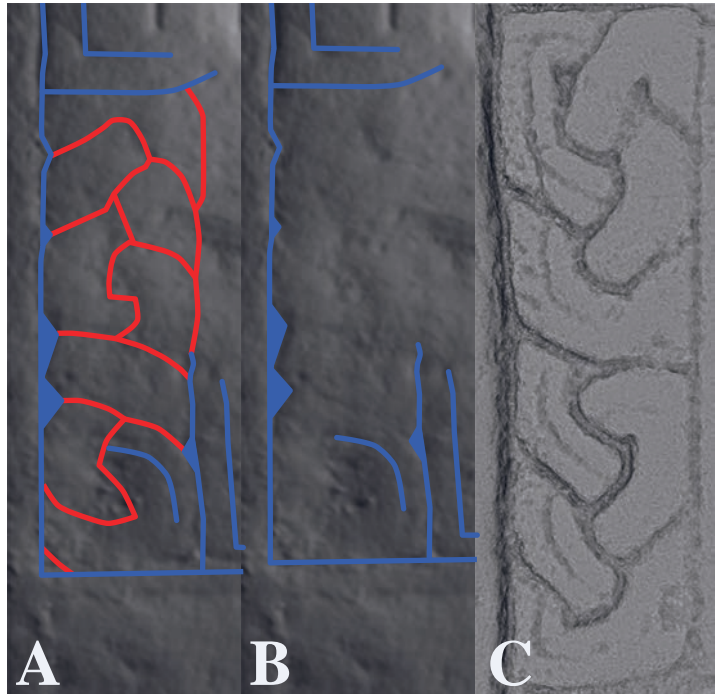
ILLUS 5 The left panel adjacent to the cross shaft of Inchinnan 5: (A) The image shows the highlighted remnants of carving identified from examination of the 3D model and RTI; (B) An image from the RTI file provided by Spectrum Heritage which uses specular enhancement to show this in more detail; (C) The proposed reconstruction of the pattern without median-incised strands, with black dots marking the loose ends of the braided strand; and (D) The proposed reconstruction with median-incised strands



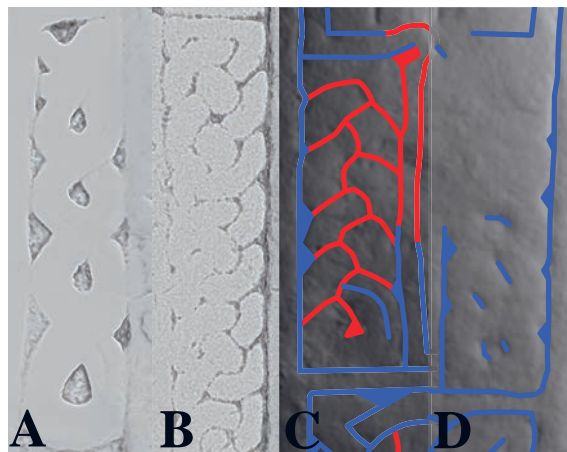
ILLUS 6 A diagram of the 'irregular' plait of Govan 26 (ECMS 21); the red strand has been braided into the plait, and the loose ends are marked with black dots

pattern, as will be demonstrated below. Based on these remnants and the spacing of the triangular notches along the edges of the panels (Illus 5A–B) (where strands of interlace have bent and come into contact with an adjacent strand) the following pattern was postulated (Illus 5C–D). This appears to be a plait similar to several found at Govan – it is a sort of three-cord plait constructed from a twist (two-cord plait) with an additional loose strand incorporated into the pattern. The open ends of this strand are 'tucked' into or behind the twist to disguise their free endpoints, which have been marked with black dots in Illus 5C. 'Irregular' plait such as this is not uncommon, as noted by both Brennan (2011: 3) and Thickpenny (2019: 145), especially in the Viking Age. Brennan has developed an innovative approach to interlace that takes these creative actions of the carver into account; he has described the treatment of this strand as 'braiding' (2011: 66). Braided loose strands have also been

found in plaits on the sculpture at Govan, like the example from Govan 26 (ECMS 21; Illus 6). While the reconstruction in Illus 5 seems to be the most likely interpretation for this panel, a



ILLUS 7 (A) An alternative, though less likely, possible interpretation of the left panel; (B) The unaltered remnants of the left panel; (C) The interpretation in (A) is based on similar Stafford-knot related patterns used in the decoration of Govan 12 shown here



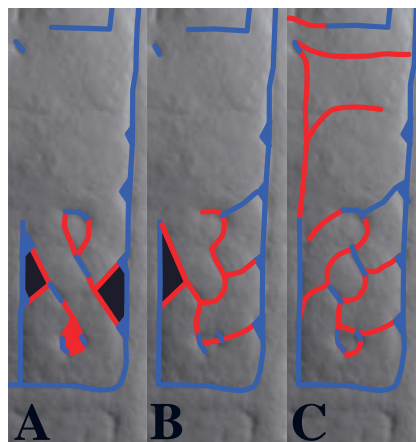
ILLUS 8 (A) A worn twist from the 3D model of Govan 8 (ECMS 4); (B) A worn panel of free-ring interlace from the 3D model of Govan 17 (ECMS 35); (C) The proposed three-cord plait from the panel to the left of Inchinnan 5's cross shaft; and (D) The remnants of the panel to the right of the cross shaft of Inchinnan 5

less likely option is depicted in Illus 7A, which is more similar to the patterns found on both Govan 12 (ECMS 13) and Inchinnan 1 (Illus 7C). However, the amount of moss occupying this particular junction makes it difficult to be absolutely certain.

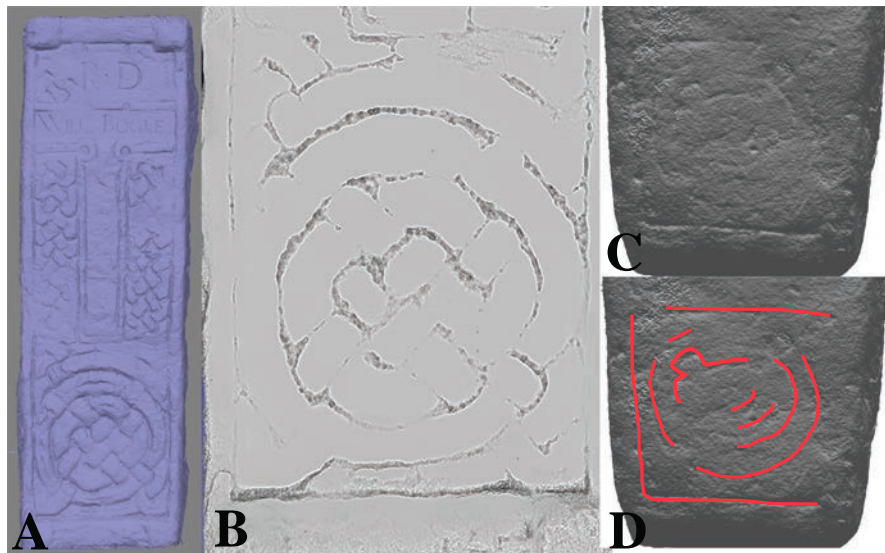
The pattern to the right of the cross shaft has experienced a similar degree of wear; the top half is nearly effaced, and only the triangular indents along the edge and a few prominent remnants remain (Illus 8D). Several options were considered for comparison with the carvings – a twist, as found on Govan 8 (ECMS 4; Illus 8A), free-ring interlace (ECMS 35; Illus 8B), or a plait, possibly similar to that found on the left side of the shaft on Inchinnan 5 (Illus 8C). An attempt was made to apply each of these patterns to the remnants (Illus 9). As can be seen, despite the large depression in the lower section of the panel, a twist did not fit the remnants (Illus 9A). Adding a strand to form a three-cord plait did not remedy these discrepancies (Illus 9B). The two distinct parallel lines above the small recess allow for only one pattern to fit this panel: free-ring interlace. Considering the number of triangular indents surviving along the

right edge of the panel, it seems likely that two free-rings formed the design (Illus 9C).

The final pattern analysed here is that found in the panel forming the bottom section of the stone surface. From the three-dimensional model, the remnants of several concentric circles are visible. Of the patterns found in the Govan School, only free-ring knots fit this description (Allen & Anderson 1903, vol 1: 297, pattern no. 768). Its closest parallel can be seen on Govan 18 (ECMS 7; Illus 10A–B). While some segments of the interlacing strands can be identified, this panel of Inchinnan 5 is too worn to positively identify the rest of the pattern (Illus 10C–D). An attempt at applying an idealised ring-knot to the remnants of pattern is illustrated below (Illus 11). However, even Govan 18's ring knot is 'imperfect' because the outermost 'rings' are incomplete. The idealised pattern applied in Illus 11 is not necessarily representative of the actual pattern on Inchinnan 5, as additional incomplete rings could have been added by the carver to fill the surrounding empty space.



ILLUS 9 (A) Shows the application of a twist pattern to the remnants, but the area in black indicates where this pattern does not fit the remnants of carving; (B) Shows the application of a plait to the remnants, highlighting in black where the pattern does not fit the worn remnants; (C) The application of free-ring pattern to the remnants fits as shown



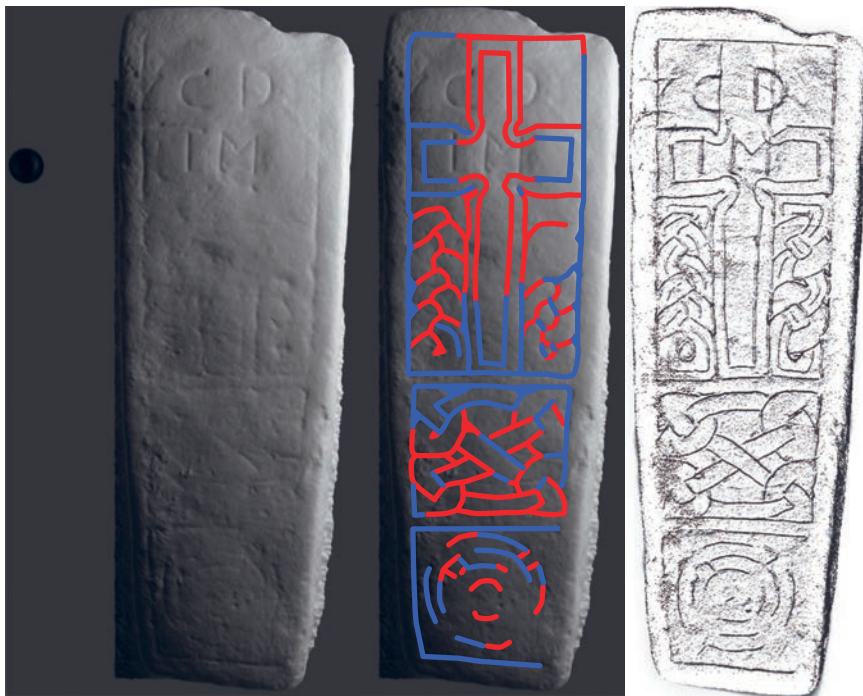
ILLUS 10 (A) The intact 3D model of Govan 18; (B) The digitally worn ring-knot panel from Govan 18; (C) The unaltered lowest panel of Inchinnan 5 (produced by Spectrum Heritage); (D) Same as (C), but with the remnants of concentric circles highlighted (interpretation by the author)

THE STONE'S NEW CONTEXT

The final proposed reconstruction of Inchinnan 5 is provided below (Illus 12A–C). Illus 12C depicts the 3D model of the stone ‘re-carved’; this is done to test the interpretation and to better understand how the pattern would actually ‘fit’ the remnants of carving in three dimensions. The stone’s layout differs from most of the stones in the Govan School because it incorporates two separate panels below the cross; most exhibit only a single separate panel, or no separation at all so that the pattern is continuous with the panels adjacent to the cross. The only other recumbent cross slab from the region around Glasgow that had a similar layout to Inchinnan 5 was stone no. 4 from St Blane’s, Bute (Allen & Anderson 1903, vol 2: 408–9), which has unfortunately



ILLUS 11 Potential interpretation of Inchinnan 5’s bottom panel (base image provided by Spectrum Heritage, interpretation by the author)



ILLUS 12 (A) Image of the unaltered 3D model of Inchinnan 5; (B) A complete 2D reconstruction of Inchinnan 5 based on the results of the Reflectance Transformation Imaging and comparison to digitally worn patterns; (C) The image on the right is the result of these patterns digitally 'carved' by the author into the 3D model kindly provided by Spectrum Heritage. The application of the pattern in 3D allows for a truer 'test' of the recovered patterns



ILLUS 13 (A) Image of a now lost recumbent cross slab from St Blane's, Bute (reproduced from Anderson 1900: figure 29); (B) The digitally recarved interpretation of Inchinnan 5 from Illus 12 above; and (C) Image of the 3D model of Govan 18, as above in Illus 10

gone missing. (A comparison of the stone from St Blane's, Inchinnan 5 and Govan 18 is provided in Illus 13.) The discovery of this stone is then a testament to the creativity of the early medieval carvers and highlights the additional information we could be missing due to the subsequent reuse or disappearance of these stones.

In conclusion, the reconstruction of the newly discovered early medieval stone from Inchinnan allows for additional connections to be made between the stones belonging to the Govan School, especially in the case of Govan and St Blane's, Bute. Recurrences of known features and patterns, like the cross with an incised boundary and the free-ring panels, highlight the consistency of the carvers employing the Govan School style. However, the re-emergence of pattern arrangements and structural layouts that are otherwise rare in the region accentuate how much we may be missing from our understanding of the material. This discovery also emphasises the research benefits of applying digital imaging techniques to the worn, unassuming monuments in a site's collection, not just focusing on the best-preserved monuments. The digital approaches incorporated in Inchinnan's comprehensive community heritage project have led to the identification of a new recumbent cross slab which can now be brought into future discussions on the early medieval carved stones of Strathclyde.

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