



YORK ARCHAEOLOGICAL TRUST
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Corbels at DIG: a Resilience Year 2 Project

An Insight Report

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Aims

The project aims to record in detail and contextualise the ten reset medieval corbels currently positioned inside the tower at DIG (formerly St Saviour's, York), and to make them more accessible to DIG visitors.

Methods

Archival research has been used to

- situate them within their art historical context;
- elucidate the history of the corbels within the context of their architectural setting(s).

Digital imaging has been used to

- capture high-resolution images of each corbel;
- produce 3D image files of the corbels.

3D printing has been used to

- explore options for making the imagery of the corbels more accessible to DIG visitors.

In addition, traces of paintwork still adhering to the corbels have been examined, with a number of samples collected for analysis at a future date. Research of this kind may help to a) establish what materials were used to colour the stones; b) suggest a date for when the colours were applied, and c) provide evidence for the historical appearance of the stones.

Phase 1: Archival research and fieldwork

The corbels have been dated on stylistic grounds to an earlier period (the 12th century) than the remainder of the church's standing medieval fabric (15th century), and may have been retained from an earlier stone church; the earliest documentary references to an *ecclesia Sancti Salvatoris in Marisco* date from the last quarter of the 11th century (a document of 1088-93 confirms William I's gift of the church to St Mary's Abbey), so there is every likelihood that a church in the local Romanesque style once occupied the same site.¹

Several bequests make mention of rebuilding in the later medieval period: the most significant for the history of the corbels is probably that of Richard Wartre, a mercer of York who served two terms as mayor, and in 1458 'left £11 and more' for roof lead, and '£10 for the building of the tower'.² Subsequent records for work on the tower are patchy; the local antiquarian Francis Drake remarks in his *Eboracum* of 1736 on the church's 'handsome tower steeple with a large wooden cross on the

¹ Barbara Wilson and Frances Mee, *The Medieval Parish Churches of York: the Pictorial Evidence* (York: Council for British Archaeology, 1998), p. 151.

² Angelo Raine, *Medieval York: A Topographic Survey Based on Original Sources* (London: John Murray, 1955), p. 77.

top of it';³ a cross appears in a drawing of the church made c. 1843, surmounting a saddle-back roof (the steeple having been blown down in 1822).⁴ The tower appears to have been largely untouched in R. H. Sharp's restoration of 1844-45. A report on the work issued after a meeting on 13th April 1846 includes the following:

'The committee are aware that the tower and the east wall of the chancel of the church both much need a careful restoration, and they are glad to find that Mr Sharp's attention has been directed to these portions of this beautiful fabric. They are not prepared at this time to recommend any further appeal to the public for raising the sum necessary for these works...'

An appendix to the same report adds:

'To complete the perfect restoration of the church, there remains only the tower, some parts of which are in a state of rapid decay. To remove the unsightly roof, to repair the mouldering stone work, to renew the dilapidated windows, would be a most desirable thing...'⁵

It is possible, therefore, that the corbels have remained largely undisturbed since the mid 15th century, and that the abundant fragments of paintwork on and around the corbels also date from this time. Scientific analysis may help to establish whether any of the layers of paint surviving inside the tower are indeed this old; there are references to life-sized medieval wall paintings of prophets and saints in the spandrels of the nave arcading in 1730 and again in 1840, but the fate of these after this date is unknown.⁶ It is also perhaps worthy of note that the reds and greens observed in the old paintwork on the corbels are mirrored in the current colours of the roof timbers over the nave, evidence, perhaps, for the repeated application of a scheme that originated in much earlier times.

Nearby churches which also retain decorative 12th-century fabric include St Margaret (now the Centre for Early Music), Walmgate (whose 12th-century south doorway comes from the vanished church of St Nicholas); and St Lawrence, Lawrence Street (the east doorway in the 12th-century tower). St Denys, Walmgate, has a reset 12th-century doorway and four reset corbels of the same period. As at St Saviour's, these corbels are now inside the building, positioned high up on the south side of the south nave arcade (see figure 1). It has been suggested that a corbel acquired by the Yorkshire Museum in 1913 from excavations in Piccadilly may have belonged to the same group. None of these corbels is strikingly similar to any of the examples from St Saviour's in subject or treatment; this is true for the other half-dozen or so isolated examples of extant 12th-century corbels in York.

³ Francis Drake, *Eboracum, or the History and Antiquities of the City of York* (London: William Bowyer, 1736), p. 310.

⁴ Wilson and Mee, p. 153.

⁵ The report appears in the vestry minutes for the church, held at the Borthwick Institute, York (Y/SAV 23, pp. 72 – 86).

⁶ Wilson and Mee, p. 151.



Figure 1: the corbels at St Denys



Figure 2: a 12th-century 'muzzled bear' corbel found by YAT in excavations at Clementhorpe, York, in 1977.

More closely comparable corbels may be sought in the wider Yorkshire region. The only published description of the corbels appears on p. 242 of *Romanesque Yorkshire* by Rita Wood, in which she mentions 'standard designs, with both single heads and pairs of gazing men's heads, cat-like masks, and a beaked mask with a gag [...] The men's heads are slightly differentiated by their hair styles, and some recall carvings at Alne or Harswell'. She remarks that the paired heads (recorded here as S5 and N5) 'were placed at the ends of the rows: in undisturbed exterior corbel tables this type is usually at the end of the wall'.⁷ Locally this is best exemplified in the paired-head corbels at the east and west ends of the church's north wall at St John the Baptist, Healaugh (see figures 3 and 4). In addition, in her entry for Harswell in the *Corpus of Romanesque Sculpture in Britain and Ireland*, Wood remarks on the appearance of paired heads at Kirkburn and Fangfoss (see figures 6 - 7), as well as at Healaugh.⁸ In none of these instances is one of the heads inverted as in S5 at St Saviour. Wood was only able to view the corbels at DIG from the mezzanine floor below, so the project at hand presents an opportunity for a closer inspection than has been possible before now.

The precise meaning of much of the imagery employed in the 12th-century corbels of York and its environs is elusive, becoming more so when individual corbels are considered in isolation or alienated from their original architectural settings, but Wood identifies a tendency to position more threatening imagery in corbel tables than would normally feature, for instance, in portals or in

⁷ Rita Wood, *Romanesque Yorkshire* (Leeds: Yorkshire Archaeological Society, 2012), p. 242.

⁸ crsbi.ac.uk/site/2849, accessed 14th September 2017.

chancel arches; the sculptors' concern in these more prominent spots, she argues, is to 'promote thoughts of Heaven and Paradise [...] if evil forces are represented, they are shown tamed or defeated: damnation is sidelined by the extensive and prominent expressions of glory and desirability of Heaven.' The corbels and their subjects, she goes on, 'are there to nag and worry, not to overawe or to colour the whole experience'.⁹ The paired heads, in Wood's reading of the iconography, express vigilance, with particular regard to the Day of Judgement: positioning them at the end of a wall allowed one to see around its corner, to 'make sure they didn't miss the first signs of the Coming'.¹⁰



3a.



3b.

Figure 3a: detail of the paired-head corbel at the west end of the north wall at St John the Baptist, Healaugh, and (3b) its position within the corbel table.



Figure 4: paired-head corbel at the east end of the north wall at St John the Baptist, Healaugh.

⁹ Rita Wood, *Paradise: the World of Romanesque Sculpture* (York: Theophilus Publishing, 2017), p. 22.

¹⁰ Wood, *Romanesque Yorkshire*, p. 242.



5a.

5b.

Figure 5: triple (5a) and paired (5b) heads at St Mary, Alne. Human heads appear here in combination with monstrous heads. The triple-head corbel has suffered damage since it was photographed for the Romanesque Yorkshire publication, when the monstrous head was flanked on each side by a human head: only one of these now survives.



Figure 6: reset paired-head corbel above the south doorway inside St Peter, Harswell.



Figure 7: paired human- and animal-head corbels on the north wall at St Mary, Kirkburn.



8a.

8b.

8c.

Figure 8: paired-head corbels at St Martin, Fangfoss, on the north (8a) and south walls (8b and c).

Phase 2: Recording the corbels

Recording work began on 29th August 2017. A local supplier constructed a 'birdcage' access scaffold to allow inspection of the corbels: it was built in three lifts, with the top lift only boarded at an approximate distance of 1.8m from the ceiling. This provided access for Chris Tuckley to carry out a preliminary visual inspection and collect paint samples, and for Adam Raw-Mackenzie to take a series of high resolution images of the stonework, for processing with Agisoft Photoscan to generate a 3D model of each corbel.

Each of the corbels was assigned an identifying number, with S1 – S5 running from east to west along the south wall of the tower, and N1 – N5 running from east to west along the north wall.

On close inspection it was seen that the paintwork adhering to the corbels is in generally poor condition and liable to flake off in large pieces at the lightest touch. The degree of variety in the

colour spectrum is limited: only two (possibly three) colours were observed: a rust-coloured red and a mint green, darkening to a near-black in places. In places, the red was seen to constitute a layer below a green / dark green layer, which may suggest an undercoat (or overpainting of an earlier colour scheme). Paintwork in the same colours was observed elsewhere in the tower, apparently on plaster that adheres in patches on the walls. Small flakes of paint were taken for analysis, although the type of analysis to be used has yet to be determined: PLM (polarising light microscopy) has been suggested as a useful first step to identify the pigment particles present.

The following short descriptions have been produced as a guide to the iconography of the corbels, and may be refined when a full set of 3D models becomes available. All (to a greater or lesser extent) retain traces of paintwork.

S1: Unbearded human face. Drilled pupils. Plain band across brow.

S2: Beast head.

S3: Unbearded human face. Drilled pupils. Small mouth / no mouth. Plain band across brow.

S4: Beast head (skewed to right, proper). Drilled pupils.

S5: Two human heads. One (nearest west wall) inverted.

N1: Bearded and moustached human face with squared-off chin (tool marks on underside) and wide nose / flaring nostrils. Drilled pupils. Plain band across brow.

N2: Cat-like beast head biting down on gag. Drilled pupils.

N3: Bearded human face. Carved hair details: curls forming a fringe. 1 drilled pupil (right, proper).

N4: Beast head. Drilled pupils. Treatment of ears different in this than in S2/4 and N2 (where they are small, pointed and forward-facing). N4 has ears that are long and flattened against the head.

N5: Two human heads. Drilled pupils (where visible).

Figure 9: Corbels S1 – 5 and N1 – 5.



S1

S2

S3



S4

S5



N1

N2

N3



N4

N5

Phase 3: Image Processing

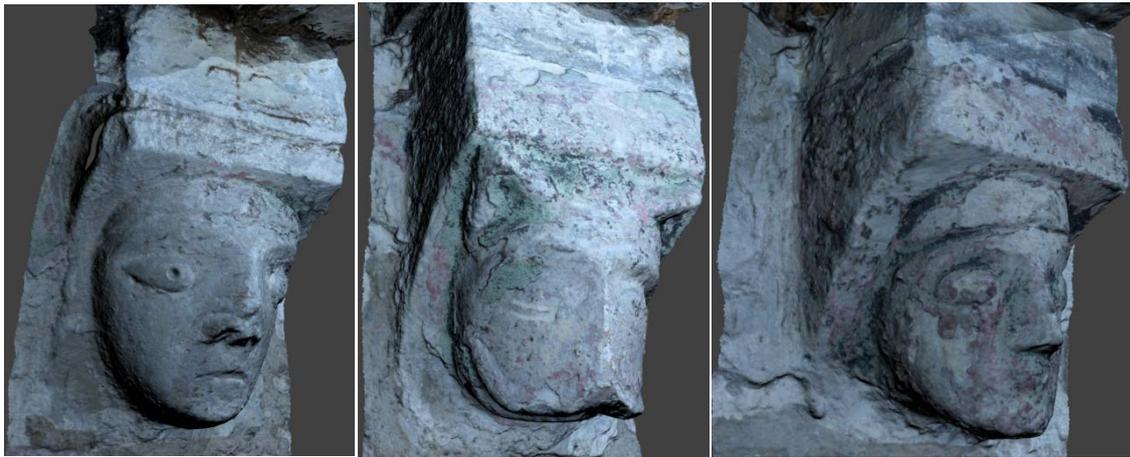
Around 400 photographs of the corbels were taken on the day. These photographs were taken at a constant shutter speed (1/60), ISO (400), and aperture (f5.6) to ensure consistency. A 50mm fixed focal length lens was used on an APS-C sensor, with an effective focal length of around 80mm. The images were captured on a Canon 750D in a RAW format (.CR2). These were converted to TIFF files using Adobe Lightroom 4.4. No colour correction or sharpening effects were applied. Between 20 and 60 images were captured per corbel. Four corbels could not be fully covered due to their position and proximity to the perpendicular wall. Two calibration cards were placed 25cm apart and placed in an area that would be present in shot.

A first pass was made at the 3D models using Agisoft Photoscan Standard. First, the software was used to align the images and create a sparse cloud of points in 3D space (see figure 10). Depending on the quality and number of images captured, the number of points varied from between around 30,000 to 60,000. A dense cloud of points could then be calculated, taking the total number of coordinates to between 6 to 12 million. A 3D mesh was then constructed from these points (see figure 11) and a texture created. The finished model was exported as an .OBJ file that could then be imported into other programs for editing.

A second pass was attempted using Agisoft Photoscan Professional. Similar steps were followed to the workflow above, with a number of additional steps that improved the quality of the sparse cloud by removing points whose locations were uncertain beyond a given threshold. The calibration cards were also used to scale the model, although this only worked for eight of the ten corbels. On one corbel the cards were left out by mistake and on another there were not enough good quality images of the scale cards for the software to automatically calculate the scale in other images.

In future, better-quality lighting and colour calibration could be used to increase the quality of the image, which in turn would improve the 3D model and the final image texture. More powerful lighting would allow a higher shutter speed to be used, lower ISO, and higher depth-of-field to be used, meaning sharper images could be captured initially. The natural light entering the tower through the large west window could perhaps have been blocked out using a large sheet. This would

Figure 12: 3D digital models of all ten corbels.



S1

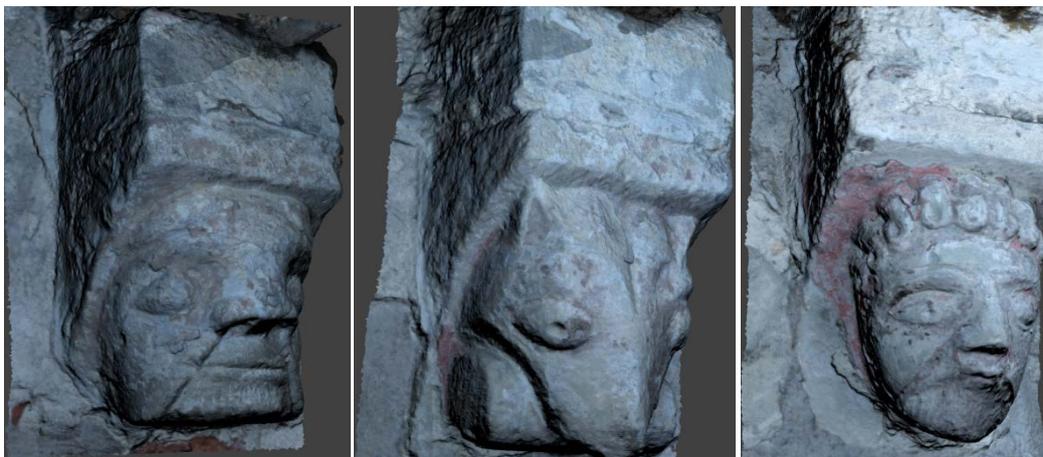
S2

S3



S4

S5



N1

N2

N3



N4

N5

Phase 4: 3D Printing

A 3D model was printed using a Wanhao i3 Plus 3D printer and Cura slicing software. The model was printed at half scale, creating an object around 10cm x 15cm x 7cm. The first pass failed, printing only the model support and a small number of surface features. Upon inspecting the printing code, the IT department discovered that the instructions sent to the printer had been incorrect. After troubleshooting the 3D model, it was discovered that the fault had been caused by the model being an open mesh, as opposed to an enclosed, solid 3D model. Once the mesh's border was extruded and enclosed, creating a solid object, the 3D print ran successfully, taking approximately 30 hours to print with a 0.1mm layer height and a 50mm/s.

The 3D print could be improved by reducing the layer height used and by upping the face count on the original 3D mesh. The output is about as good as can be expected with the hardware available.

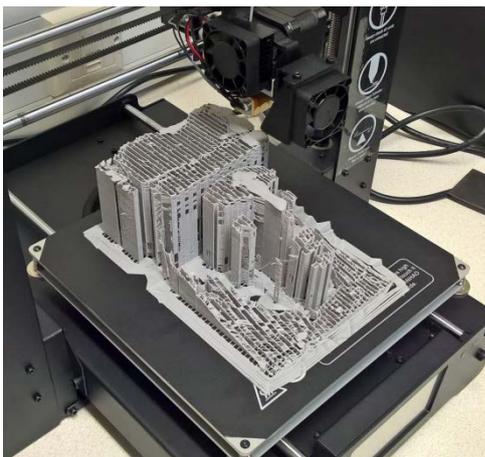


Figure 13: the results of the first attempt to print.



Figure 14: the second, successful attempt, which produced a model of corbel S1.

Next Steps

The project team plans to produce 3D printouts of all ten corbels, for eventual display in the foyer of the DIG attraction. The feasibility of paintwork analysis (to be carried out by an external supplier) is currently being assessed: any report arising from analysis of this kind will be published alongside this document on the project web page.

Acknowledgements

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This series of *Insights* has been contributed by York Archaeological Trust staff members and external specialists for Finding the Future. They aim to frame an understanding of aspects of the Trust's collection of artefacts and their archaeological context; and also to enhance staff involvement. The authors represent a broad range of experience and knowledge.

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