

---

## Original Article

# The doocots of Aberdeenshire: An application of 3D scanning technology in the built heritage

Received (in revised form): 19<sup>th</sup> January 2009

## Nick Brown

has been an active member of the Scottish Vernacular Buildings Working Group and has undertaken extensive work recording and detailing doocots and other vernacular buildings in Scotland. In 2000, Nick completed a PhD through the Robert Gordon University concerning the doocots of Moray, and their evolutionary development. He runs an architectural and planning practice, and continues to undertake work concerning the recording, analysis and promotion of studies in the field of vernacular architectural history. Together with the Robert Gordon University, it is intended that the work reported in this paper be extended to encompass doocots from throughout Aberdeenshire.

## Richard Laing

is a Professor at The Robert Gordon University where since 1999 he has led a number of research commissions, including 'Streetscapes' (Scottish Enterprise), 'Greenspace' (ECFP5, Scottish lead) and 'Urban Connections' (Aberdeen City Growth). He has extensive experience of research concerning holistic value assessment in the built environment, including studies on design evaluation, the use of computer games technology in design, building conservation and innovative housing. His research concerning design evaluation has made a significant and innovative use of 3D virtual models to present various designs and environmental scenarios. The research has produced over 50 outputs, including work in international journals and at conference.

## Jonathan Scott

joined The Robert Gordon University (RGU) in 1992 completing an HND and first-class honours degree in Architectural Technology. Except for a short stint in industry, Jonathan has worked in research and teaching for RGU on a variety of projects in the areas of environmental design, energy monitoring, life cycle analysis, social and occupancy evaluation, CAD, surveying technologies and historic conservation. He completed a PhD in 2004 on 'Optimising the Relationship between Passive Solar Design of New Housing and the Economics of Construction and Land Value' and he has since been employed as a Research Fellow and Lecturer at RGU.

**Correspondence:** Richard Laing, The Scott Sutherland School, The Robert Gordon University, Garthdee Road, Aberdeen AB10 7QE, UK  
E-mail: r.laing@rgu.ac.uk

**ABSTRACT** This paper reports on the outcomes from a feasibility study exploring the potential for using a high-definition 3D scanner to improve the efficiency of architectural recording and design in existing environments. The study used examples from the existing built heritage (in this case, historic local doocots) to explore how the technology and associated software can be used to gather information about the surface and appearance of structures, and how this can then be utilised to rapidly develop both a record of the existing situation, while providing a permanent and accurate (to 2 mm) 3D model to be used for reference purposes in design and analysis. Doocots have been selected for a number of key reasons, including the importance of material and detail to their heritage value, and the fact that they are sufficiently small and contained structures to support a full scale recording of manageable size within this study. It is also true that they each represent historic buildings at risk, and that the task undertaken here will be of genuine wider value within conservation studies.

*Journal of Building Appraisal* (2009) 4, 247–254. doi:10.1057/jba.2009.9

**Keywords:** 3D scanning; doocots; built heritage

## INTRODUCTION

This research was a feasibility study to explore the potential for using a high-definition 3D scanner to improve the efficiency of architectural recording and design in existing environments. The study concentrated specifically on the recording of historic local doocots (or 'dovecotes') to explore how the technology and associated software can be used to gather information about the surface and appearance of structures, and how this can then be utilised to rapidly develop both a record of the existing situation, while providing a permanent and accurate (to 2 mm) 3D model. The study follows previous published studies, which recorded doocots elsewhere in Scotland using traditional surveying techniques, together with historical desk study and photography (Brown, 2004; Dunn, 2006; Beaton, 2008).

Dooocots have significant intrinsic value, including the importance of material and detail to the built heritage, and the fact that they are sufficiently small and contained structures to support a full scale recording of manageable size within this study. It is also true that they each represent historic buildings at risk, and that the task undertaken here is of genuine wider value within conservation studies.

## DOOCOTS

There are known to be around 100 historic doocots in the Aberdeenshire area. They vary in size, shape, form and age and reflect a 500-year period of history. For example, the earliest 'beehive' types can be found at Auchmacoy, near Ellon and at Findlater, near Sandend; simple rectangular forms can be seen at Grandholm and Logie near Pitcaple, whereas a few lean-to or 'lectern' types are found at Hatton and Gight Castle; grander examples of circular or hexagonal towers in the landscape are seen at Belhelvie, Montcoffer and at Pitsligo, whereas later examples of doocots incorporated into farm steadings remain at Aden and Meldrum. Dooocots are among the oldest farm buildings in Scotland, originally intended to farm doves for their flesh and early cookbooks contain many recipes for such dishes. Dooocots range from the architecturally significant to simple structures, most reflecting local building characteristics. They survive as prominent features in the landscape in many parts of the country.

Until the introduction of new farming methods, and sometimes concurrently with these improvements well into the nineteenth century, young doves provided a source of delicate meat. In addition, their feathers were used to stuff mattresses and pillows, whereas their droppings were a valuable fertiliser, besides in the production of gunpowder and the tanning of leather. The birds were also believed to have medicinal properties and a rather more suspect use for their droppings was as a cure for gout and baldness! Thus, doocots have considerable significance, not only in terms of their architecture, but also in the wider context of agricultural, economic and social history.

However, as the trend for rearing pigeons for food diminished, so doocots increasingly became redundant across Scotland, with many falling into serious disrepair. As not all doocots will survive long term, it is important to make a comprehensive record of them for future generations and to identify those that are most important to the nation's heritage. In the past, the recording of doocots in Scotland has been spasmodic. Unusually this single type of building offers a wide variety of form, construction period (medieval to twentieth century), material and condition, is of historic interest, and is sometimes known nationally, though usually associated with local estates, families or parishes.

## SCANNING PROCESS

The study used a Leica HDS 3000 laser scanner to undertake the field work. With a high degree of accuracy, this product can render 'space' immediately and into a 3D representation. As such, it has obvious benefits in the surveying field, both externally

and internally, but also can be used for new build and existing. It was specifically hypothesised within this project that the equipment, which has been successfully applied with heavy engineering applications, can be equally useful within architectural and building surveying practice. The central aim was to collect geometrically accurate data pertaining to selected doocots in rural locations in Aberdeenshire. The scanner itself

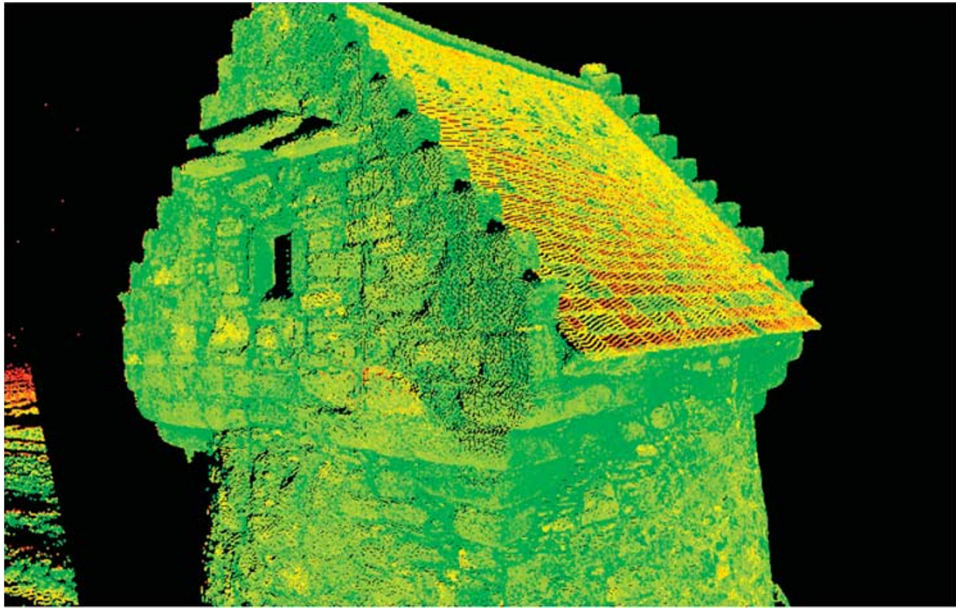


**Figure 1:** Auchmacoy Doocot, with scanner shown in the foreground.

collects a 'point cloud', which is assembled using scans taken from selected locations on site (usually four). The process to be followed is similar to that reported previously in the literature (Barber *et al*, 2006; Arayici, 2007), where a range of techniques have been used to employ the resultant data set within architectural modelling.



**Figure 2:** Interior of Auchmacoy Doocot: Note the stone, slate and lime constructed boxes, the high-level timber alighting ledges and the reconstructed timber roof.



**Figure 3:** Output from the Auchmacoy scan: Note the unusual corbelled, crow stepped roof.

### Study 1

The doocot on the privately owned Auchmacoy Estate near Ellon is the only remaining sixteenth century structure on the estate and is a striking three-staged beehive-style doocot with unusual corbelled roof (Figures 1–3). It is likely that the corbelled roof is a beautifully crafted alteration to a more standard beehive structure. Auchmacoy Doocot is located in an exposed field on the Auchmacoy estate, standing alone facing over the Ythan valley. A Category A-listed building (HB# 9089) dated 1638, it is a circular, pinned split boulder rubble, with a barrel-shaped taper with two pronounced aligning ledges, corbelled to a square upper portion with white granite crow-stepped gables, where access is provided for birds in stonework. Boxes are recessed in the interior walls with ledges at intervals. A frame roof truss, sitting on wallplates, slate roof on sarking. Iron hinges and locks to the door still exist.

The doocot has been repaired recently, with much of the roof new, and evidence of re-pointing. Condition is moderate to good, with evidence of settlement on the southerly elevation and around gable windows. The aligning ledges have deteriorated in places, and there is a possibility that the building was once rendered. The interior also has evidence of repair, and the majority of the boxes are in good condition. From the earth floor the boxes are at head height. Most boxes are at regular intervals, but a small section of boxes are at irregular intervals. On average the interior diameter is around 3 m, with enough space for 34 boxes along circumference (note that because some boxes are irregular and the building tapers, 34 boxes per circumference is an estimation).

### Study 2

Blairs Doocot is on the southerly range of the ancillary buildings (farm and storage) to St Mary's College (Blairs college/museum<sup>1</sup>) (Figures 4–6). Probably late eighteenth century, it is a square plan, squared granite rubble with fine granite pinnings. It is now a roofless ruin, collapse dated 1992. However, the roof has been cleanly removed with very



**Figure 4:** Blairs Doocot: Note that the pyramid roof has been removed.

little detriment to the wall. The ruin is rubble filled and the boxes are formed with bricks (four high with one brick spacer in-between. The boxes evenly distributed in the square plan (8 boxes wide by 7 boxes tall), with two courses of brickwork above uppermost course. Iron holes for a stepladder to the upper opening still evident.

The wall of the doocot is still in good condition, the granite having weathered nicely. With the roof having been removed, it is the interior that has suffered. Doors (off hinges), interior floor (removed) and boxes are showing signs of deterioration. Lower opening has a timber lintel which is showing signs of disrepair. There are strong signs that there once was a floor (joist holders into stonework) and evidence for a ladder to the upper opening as the main access. The lower room may have been used for storage. Access for birds would have been through roof. The boxes, on the whole, are in moderate condition, but the boxes to the right of the upper access have been almost completely removed (only the lowest course of boxes remain).

## **CONCLUDING REMARKS**

The initial work reported here has resulted in the scanning of selected doocots in Aberdeenshire, followed by the preparation, analysis and presentation of 3D electronic and printed output. It is anticipated that the materials and processes followed can be used as a protocol of how such technology can be used by all built environment professionals to work within historic environments. The historic environment poses specific challenges to the designer, as variations in material, surfaces and the surrounding environment are common. Furthermore, recording of the historic environment may be crucial to many design-heritage studies, and it is anticipated the technology will provide a step-change in accuracy and efficiency.

It is intended that this work form part of a national survey of doocots, established by The Scottish Vernacular Buildings Working Group<sup>2</sup> (SVBWG), under the leadership of highly experienced and widely respected architectural historian, Elizabeth Beaton. The SVBWG concept is to produce a series of monographs on doocots in Scotland.

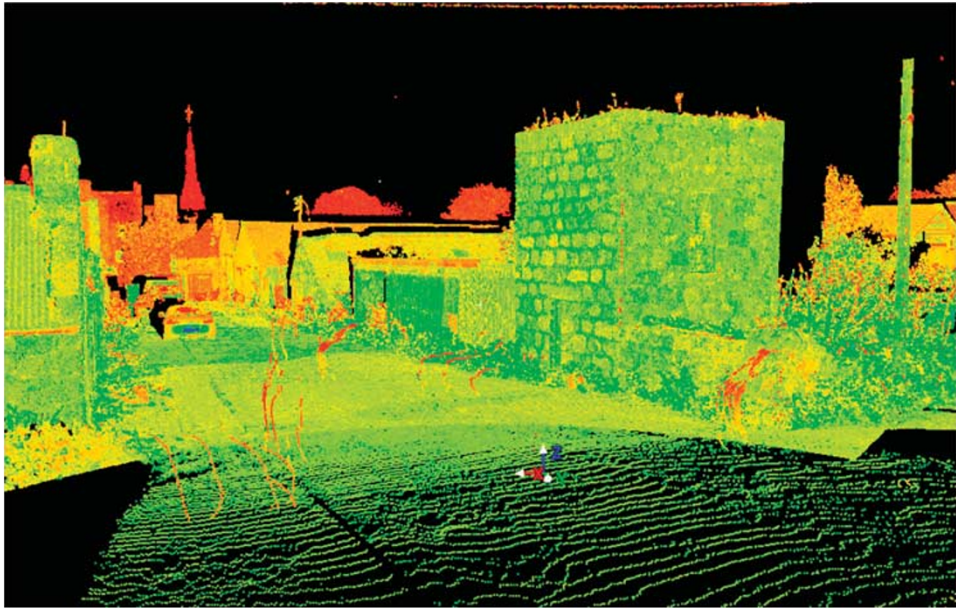
## NOTES

<sup>1</sup> [www.blairsaberdeen.co.uk](http://www.blairsaberdeen.co.uk).

<sup>2</sup> The Scottish Vernacular Building Working Group was set up in 1972 to provide a focus for all those interested in the traditional buildings of Scotland. The subject brings together



**Figure 5:** Interior of Blairs Doocot: Note how the projecting bricks at upper level provide a series of perches for adult birds.



**Figure 6:** Output showing Blairs Doocot and vicinity.

architects, surveyors, archaeologists, historians, geographers, ethnologists and, above all, those who simply want to know how and why the traditional buildings of Scotland have such variety and character.

## REFERENCES

- Arayici, Y. (2007) An approach for real world data modelling with the 3D terrestrial laser scanner for built environment. *Automation in Construction* 16(6): 816–829.
- Barber, D., Ross, W. and Mills, J. (2006) Laser scanning for architectural conservation. *Journal of Architectural Conservation* 12(1): 35–52.
- Beaton, E. (2008) *Doocots of Scotland: Highland, Orkney and Shetland*. Edinburgh: Scottish Vernacular Buildings Working Group.
- Brown, N. (2004) *Doocots of Scotland: Moray*. Edinburgh: Scottish Vernacular Buildings Working Group.
- Dunn, M. (2006) *Doocots of Scotland: Lanarkshire*. Edinburgh: Scottish Vernacular Buildings Working Group.