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Priory House, 33 High Street South, Dunstable, Bedfordshire

Radiocarbon Dating of Twigs from the Undercroft

Alex Bayliss, Michael Dee, Lucy Allott, Diccon Hart and Maggie Henderson

Scientific dating

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Summary

Radiocarbon dating and chronological modelling suggest that organic material recovered from above the vault cones of the undercroft of Priory House, Dunstable, was deposited in *cal AD 1217–1269 (95% probability)*. This provides independent confirmation of the early/mid-thirteenth century date for the undercroft suggested on stylistic grounds.

Contributors

Alex Bayliss, Michael Dee, Lucy Allott, Diccon Hart and Maggie Henderson

Front Cover Image

General view of the undercroft looking north. Image © HB Archaeology and Conservation Ltd.

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Introduction

Dunstable High Street Heritage Action Zone

Dunstable is one of more than 60 High Street Heritage Action Zones (HSHAZ) established in 2019, which is being delivered by Historic England to unlock the potential of high streets across England, fuelling economic, social, and cultural recovery (https://historicengland.org.uk/services-skills/heritage-action-zones/regenerating-historic-high-streets/). Scientific dating is one of the supporting elements of the HSHAZ programme which aims to improve the understanding of the town centre area to inform and support future planning and improvement decisions. The programme is focussed on Middle Row and the north end of High Street South, the historic core, within the Dunstable Town Centre Conservation Area which includes 11 listed buildings.

Priory House

This building is listed at Grade II* (LEN: 1114593; https://historicengland.org.uk/listing/the-list/list-entry/1114593), and stands just to the south of Dunstable town centre (Fig 1), reputedly on the site of the Augustinian Priory founded here by Henry I in *c.* AD 1130. It incorporates a medieval vaulted undercroft, which has substantial masonry walls continuing upwards to eaves level at least, indicating that the building had probably stood to two-storeys in height from the outset.

Excavation of the vault cones during ongoing repair work has shown them to be backfilled with alternating layers of chalk rubble and organic material (Fig 2), including grass culms, small pieces of roundwood, other herbaceous material and possible moss. This material appears to be coeval with the construction of the vaulting, possibly as part of an attempt to relieve and regulate loading of the vaults.

Radiocarbon dating was undertaken to establish the date at which the vault cones were infilled using organic material and therefore establish the construction date of the vaulted undercroft. This is currently believed to be early/mid-thirteenth century on stylistic grounds.

A programme of tree-ring analysis suggests that five oak timbers from the roof were probably felled in AD 1752–74 (95% probability) but was unable to group or date another five timbers sampled from the basement (Arnold et al. 2022).

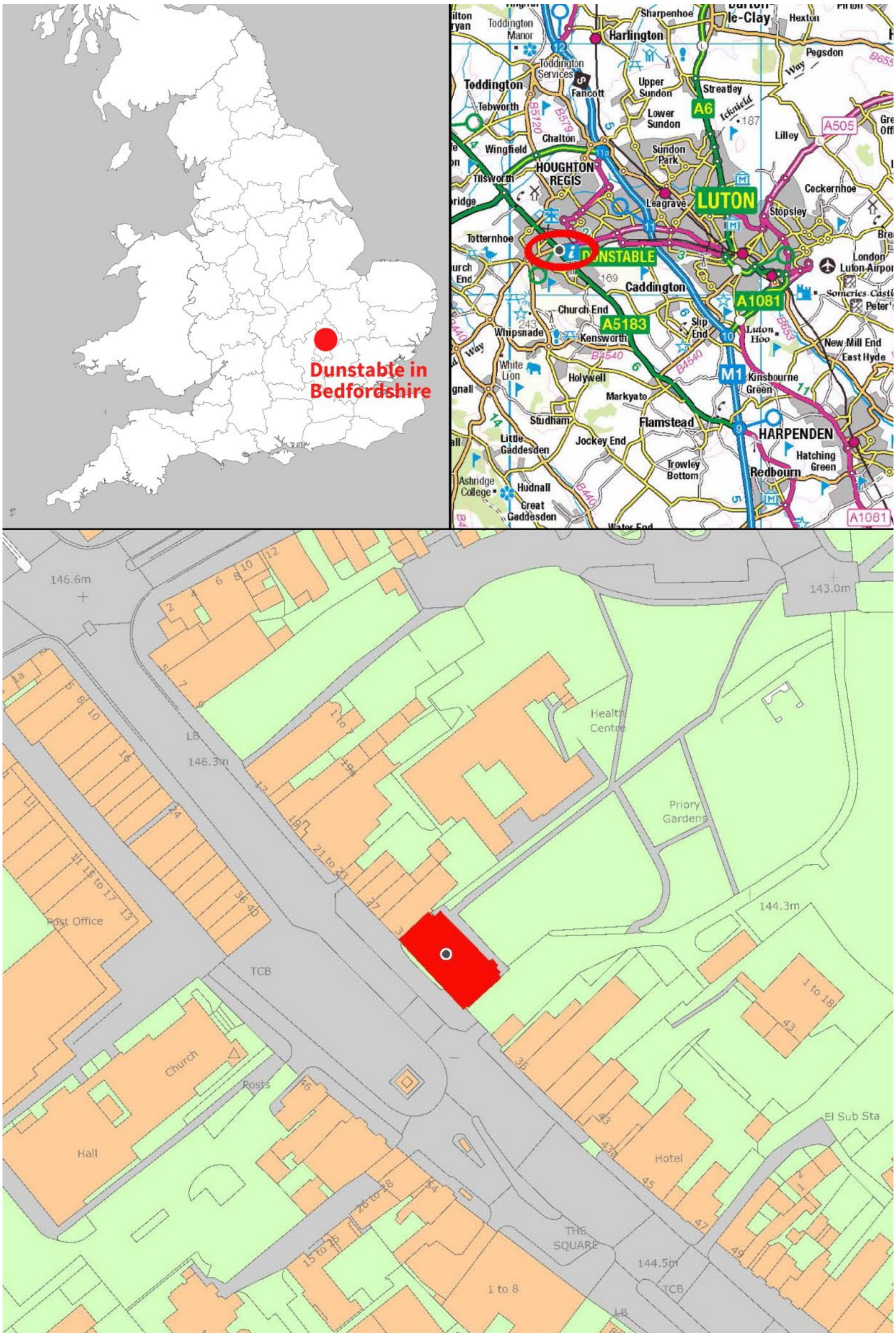

Figure 1. Maps to show the location of Priory House in Dunstable, Bedfordshire marked in red. Scale: top right 1:200,000, bottom 1:1250

Figure 2. General view of Bay 4B under excavation, looking north-west, showing the infilling of the vault cone. Scale: 0.40m (Image © HB Archaeology and Conservation Ltd)

Radiocarbon Dating

Radiocarbon dating is based on the radioactive decay of ^{14}C, which trees and other plants absorb from the atmosphere during photosynthesis and store in their growth-rings. The radiocarbon from each year is stored in a separate annual ring. Once a ring has formed, no more ^{14}C is added to it, and so the proportion of ^{14}C versus other carbon isotopes reduces in the ring through time as the radiocarbon decays. Radiocarbon ages, like those in Table 1, measure the proportion of ^{14}C in a sample and are expressed in radiocarbon years BP (before present, 'present' being a constant, conventional date of AD 1950).

Table 1. Radiocarbon and stable isotope measurements from the Priory House

Laboratory Number	Sample	Radiocarbon Age (BP)	$\delta^{13}C_{IRMS}$ (‰)
GrM-35577	PHD22 (08)<2>a, desiccated twig (*Calluna* sp.) from a layer of brushwood and herbaceous material overlying the webs of the masonry vaulting of the undercroft (from a block-lifted sample over Bay 4).	828±25	−25.04±0.15
GrM-35578	PHD22 (08)<2>a, desiccated twig (*Calluna* sp.) from the same context as GrM-25577.	795±30	−26.33±0.15

Sample Selection and Wood Identification

Initial assessment of the available material revealed that significant quantities of organic remains including grass culms, small pieces of roundwood, and other herbaceous material were preserved. There was no evidence of charring and so the organic material appears to have remained relatively dry. Due to the desiccated nature of the roundwood, which can result in collapse of the wood anatomical structures, it was necessary to attempt to reverse this process prior to identification. The wood was rehydrated by soaking in water with gentle heating before sectioning for wood identification. Material from sample PHD22 (08)<2> was targeting for radiocarbon dating as this had been block-lifted (Fig 3).

Thin sections of wood were taken by hand (under an AmScope stereozoom microscope at 3.5-45x magnifications) using a flexible razor to produce the three plains used for identification; transverse (TS), tangential longitudinal (TLS) and radial longitudinal (RLS). The sections were temporarily mounted on microscope slides for examination under a Microtech RM-1 transmitted light microscope at 50, 100, 200 and 400x magnifications. Anatomical characteristics were recorded and allocation to genus was made with reference to modern comparative specimens, identification keys and the IAWA hardwood identification list (Hather 2000; InsideWood 2004; Wheeler et al. 1989).

The pieces of roundwood comprised very small twigs of up to 6 or 7mm diameter, retaining their bark and often displaying a curved and undulating growth form. All the twigs identified were of *Calluna* sp. (heather), and many contained growth rings that were narrow and difficult to discern. Although it would have been ideal to isolate samples from individual growth rings, the narrow rings and undulating growth form of heather meant this could not be achieved with any certainty of dissecting and isolating material from a single ring. For this reason, two single twigs that retained bark were selected for dating.

Figure 3. Block-lifted sample PHD22 (08)<2> from the vault cone above Bay 4 (Image © HB Archaeology and Conservation Ltd)

Laboratory Methods

Radiocarbon dating was undertaken by the Centre for Isotope Research, University of Groningen (GrM-), the Netherlands in 2024. Each twig was converted to α-cellulose using an intensified aqueous pretreatment (Dee et al. 2020) and combusted in an elemental analyser (IsotopeCube NCS), coupled to an Isotope Ratio Mass Spectrometer (Isoprime 100). The resultant CO_2 was graphitised by hydrogen reduction in the presence of an iron catalyst (Wijma et al. 1996; Aerts-Bijma et al. 1997). The graphite was then pressed into aluminium cathodes and dated by Accelerator Mass Spectrometry (AMS) (Synal et al. 2007; Salehpour et al. 2016).

Data reduction was undertaken as described by Wacker et al. (2010), and the facility maintains a continual programme of quality assurance procedures (Aerts-Bijma et al. 2021), in addition to participation in international inter-comparison exercises (Scott et al. 2017; Wacker et al. 2020). These tests demonstrate the reproducibility and accuracy of these measurements.

The results are conventional radiocarbon ages, corrected for fractionation using $\delta^{13}C$ values measured by Accelerator Mass Spectrometry (Stuiver and Polach 1977; Table 1). The quoted $\delta^{13}C$ values were measured by Isotope Ratio Mass Spectrometry, and more accurately reflect the natural isotopic composition of the sampled wood.

Calibration

Radiocarbon ages are not the same as calendar dates because the concentration of ^{14}C in the atmosphere has fluctuated over time. A radiocarbon measurement has thus to be calibrated against an independent scale to arrive at the corresponding calendar date. That independent scale is the IntCal20 calibration curve (Reimer et al. 2020). For the period covered by this study, this is constructed from radiocarbon measurements on tree-ring samples dated absolutely by dendrochronology. The probability distributions of the calibrated radiocarbon dates from the Priory House, derived from the probability method (Stuiver and Reimer 1993), are shown in outline in Figure 4.

Chronological Modelling

The two radiocarbon results from the layer of organic material above the vault cones at Priory House are statistically indistinguishable at the 5% significance level (T′=0.7, T′(5%)=3.8, ν=1; Ward and Wilson 1978) and so may be of the same actual age. As the two dated samples come from a context that is closely related to the construction of the undercroft but are potential from two different plants, the two radiocarbon dates can be combined after calibration (Bronk Ramsey 1998). This had been implemented using the program OxCal v4.4 (http://c14.arch.ox.ac.uk/oxcal.html; Bronk Ramsey 1995; 2009). The modelled dates are shown in black in Figure 4 and the date range derived from them is quoted in italics in the text.

The Acomb statistic shows how closely the assemblage of calibrated radiocarbon dates as a whole agree with interpretation of the deposit about the vault cones as closely related to the construction event of the undercroft; an acceptable threshold is reached when it is equal to or greater than An (a value based on the number of dates in the model). The A statistic shows how closely an individual calibrated radiocarbon date agrees its position in the sequence (most values in a model should be equal to or greater than 60).

Figure 4 illustrates the chronological model for the organic material above the vault cones of the undercroft at the Priory House, Dunstable. The model has good overall agreement (Acomb: 114.0, An: 50.0, n: 2; Fig 4), with both radiocarbon dates having good individual agreement (A > 60). It suggests that the organic material above the vault cones was deposited in *cal AD 1217–1269 (95% probability; Priory House undercroft*; Fig 4), probably in *cal AD 1221–1233 (24% probability)* or *cal AD 1239–1261 (42% probability)*.

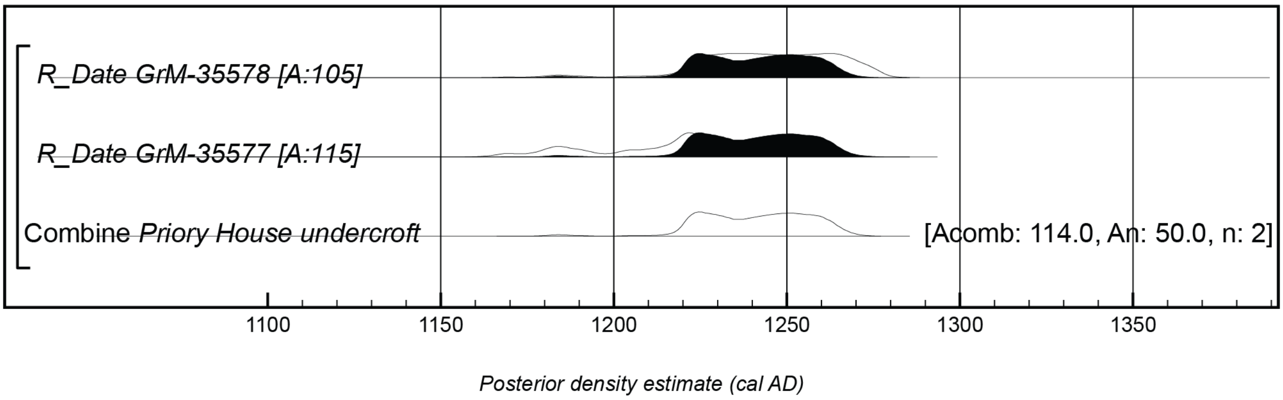

Figure 4. Probability distributions of dates from the Priory House. Each distribution represents the relative probability that an event occurs at a particular time. For each of the dates two distributions have been plotted: one in outline, which is the simple radiocarbon calibration, and a solid one, based on the model used. The large square brackets down the left-hand side along with the OxCal keywords define the overall model exactly.

Discussion

Priory House and its relationship to Dunstable Priory

In many respects, Priory House remains something of an enigma. Despite its name, the origin and function of the building—and indeed its relationship to Dunstable Priory itself—has been the subject of much debate. Its prominent street front location, for example, has led some to speculate an essentially secular function, as a merchant's house or hostelry (e.g. Curran 2008; Pevsner and O'Brien 2014). On the other hand, a strong connection with the Priory is suggested by the fabric and layout of the building itself, being entirely of masonry construction, incorporating a quadripartite rib vault and elements of a floor plan of thirteenth-century origin (see below). These traits set the building apart from the other historic buildings that survive in Dunstable, with of course the exception of the church itself. Further evidence for a close connection to the priory can be seen in the fact that it formed part of land exempted from tithe payments on the basis that they had been gifted to the priory by Henry I.

If Priory House was indeed related to Dunstable Priory, as suggested above, the nature of that relationship remains difficult to establish, not least because the exact limits of the priory precincts remain uncertain. Notwithstanding a lack of any direct evidence for the western boundary of the priory precinct it seems probable, however, that it was delimited by the pre-existing Roman road of Watling Street (corresponding to the course of the present day High Street). This would place Priory House on or close to the western precinct boundary and the outer court, and therefore straddling the boundary between the public and private life of the priory.

The liminal location of Priory House, both within and without the priory complex, would have been well-suited to a range of uses including a guest hall or hospitium, accommodation for a non-religious member of the community such as a lay steward, or as an almonry, providing accommodation for those in receipt of alms in addition to storage facilities and a dispensary for the alms. Of these explanations, an almonry function is perhaps favoured due to the atypical layout of the building, its well-made yet subtle decorative detail, and its peripheral position at the interface between the public and private life of the priory. However, it is important to note that this explanation is far from certain, and other uses remain plausible.

The dating of Priory House and the development of Dunstable Priory

In view of the uncertainties outlined above, the dating of the building takes on additional importance, as a further strand of evidence that can be used to clarify the function of the building as first built, and the role it played in the development of the priory itself.

Documentary evidence indicates that Dunstable Priory was founded by Henry I around AD 1132, with much of the priory complex completed in the early decades of the thirteenth century (the priory church itself was consecrated in AD 1213). Following the death of prior Richard Morins in AD 1242, however, the priory appears to have entered a period of decline. Debts were recorded in AD 1262 when Simon Eton became prior, and further periods of poverty followed, so that by AD 1294 there is reference to *'the usual allowance for one canon* [being] *made to serve two'*. Despite these periods of financial hardship, the priory annals record several building campaigns during the course of the thirteenth century.

On stylistic grounds, the construction of Priory House appears to form part of one of these early building campaigns in the development of the priory, with a range of diagnostic architectural features all indicative of a construction date in the first half of the thirteenth century, prior to a documented period of financial decline. These include the use of the so-called *tas de charge* in combination with dying mouldings and simple chamfered mouldings in the vaulting of the undercroft, all of which are features of twelfth- or thirteenth-century buildings (Jansen 1982).

The radiocarbon dating and chronological modelling that forms the basis of this report provides independent confirmation of the early/mid-thirteenth date suggested on stylistic grounds, suggesting that the organic material recovered from above the vault cones of the undercroft of Priory House, Dunstable, was deposited in *cal AD 1217–1269 (95% probability; Priory House undercroft*; Fig 4).

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