

Fig.9.1 View by J C Nattes and J Fittler, 1799 (from Scotia Depicta (1819), plate 10).

THE GREAT HALL AND ROOF OF DARNAWAY CASTLE, MORAY

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In March 1987 it was learnt that 'Randolph's Hall' the great hall of Darnaway Castle, was in the final stages of redecoration, and that the internal scaffolding erected for this purpose would afford a rare opportunity of examining at close quarters the medieval roof over the hall.¹ Accordingly, a detailed survey of the accessible portions of the roof was carried out by the Royal Commission on the Ancient and Historical Monuments of Scotland, while Mike Baillie of the Palaeoeceology Centre, The Queen's University of Belfast, was invited by Moray Estates to carry out a dendrochronological analysis. This paper presents the results of these two surveys.

History

An early royal manor and hunting lodge, Darnaway, though not mentioned by name, was included in Robert Bruce's grant of the regalian earldom of Moray to his trusted nephew, Thomas Randolph, in 1312.² The ownership and building history of Darnaway followed the subsequent descent of the earldom, though the keepership of the castle passed through various hands. The earldom itself was transmitted in reduced extent to the Dunbars through marriage with the daughters of Thomas Randolph, who died in 1332. The male succession of the Dunbars came to an end in 1429, and Elizabeth Dunbar's marriage in 1434 brought it into the orbit of the burgeoning Douglas empire until their forfeiture in 1455. Thereafter, the earldom intermittently became, in the gift of the crown, a royal appanage for the members of the ruling Stewart family, particularly their natural sons, James IV's illegitimate offspring by Janet Kennedy, and James V's by Margaret Erskine, from whom the present Lord Moray is descended.³

The estate was renowned as a vast and nationally important source of building timber, mainly of oak. Darnaway oaks are known to have been used for the roof of the cathedral church of Dornoch in 1291, but most references belong to the later 15th and 16th centuries when the forest of Darnaway was at the crown's disposal and appeared in royal records.⁴ The felling and transport of Darnaway oaks to Leith was a regular and systematic process in this period, some of them possibly going towards the construction of the king's ships including James IV's, 'The Great Michael', others possibly destined for the roofs of the great halls of Edinburgh and Stirling Castles. It is thus appropriate that one of the other very few great medieval timber roofs in Scotland should survive in the heart of this ancient and important forest.

Direct documentary evidence about the use and building history of the castle itself is not plentiful. The first castle and a hall, presumably derived from the royal hunting lodge, is traditionally ascribed to Sir Thomas Randolph himself in the early 14th century. The first documented building episode dates from the middle of the 15th century when Archibald Douglas was reported to have strengthened and extended Darnaway and Lochindorb.⁵ Building works continued under royal auspices in the later 1450s. and again during the reign of James IV.⁶ The subsequent history of the building has not yet been pursued in detail, but, judging simply from later views, it seems reasonably clear that the castle was enlarged and embellished between the 16th and 18th centuries. The view by T Griffin, engraved and published by J Walker in December 1800, for example, shows wall-head and corbelling details that belong to the 16th century. At this date also, as the Statistical Account testifies, the hall still had a balcony, with a music gallery above, extending across the full width of the building.⁷ Bishop Pococke in 1760 'was told that underground rooms had been taken from it [that is, the hall] by raising the floor, and consequently its height is much lessened'. He recorded also that 'To Tarnaway Castle a large house has been built in the castle style, and there are fine woods with ridings in them'.⁸ The view by John Claude Nattes in 1799 (Fig.9.1) shows the relationship of the hall to the later accretions rather more distinctly and in an appropriately wooded setting. Interesting features to note include the large tower with a first-floor entry and squared angle-turrets.

During the twenty years between the drawing of this sketch and its publication in 1819⁹ great changes took place in the appearance and character of the house at the hands of the 9th earl of Moray; in the fashion of the times he was also a great tree planter. Between 1802 and 1812 medieval Darnaway was largely effaced behind the mansion redesigned by the architect, Alexander Laing.¹⁰ (Fig.9.2) Laing, who died in 1823, was an Edinburgh mason turned architect, whose buildings were characterised by what has been described as a plain, masculine Georgian style. Darnaway was one of his biggest undertakings.

Laing had worked on various schemes since at least 1796, all of which, despite the dilapidated condition of some parts of the castle fabric, respected the venerable antiquity of the great hall. In 1794, for example, workmen complained to the earl's agent that 'attempting to repair [the roof of the wardrobe room] or put in any new baulks might bring the whole thing down about their ears'.¹¹ The building accounts show various payments for drawings, including elevations of the great hall; in 1805 Laing designed a new window for the hall, and in 1807 a new doorpiece from the salon, and a new hall fireplace.¹² The *Statistical Account* makes it clear that there had been two large fireplaces, one at the S end, now occupied by a later window, and the other in a side-wall, probably in the position of the existing fireplace.¹³



Fig.9.2 View from NE, 1965.

The foundation stone of the new works was laid on 19 June 1802, and on 2 November 1802 Alexander Stronach, presumably of the famous family of Easter Ross/Moray Firth builders of that name, was paid for taking down the roof of the old hall.¹⁴ If, as this evidence clearly implies, the medieval roof was dismantled and re-assembled on reconstructed walls. it was handled extremely well and re-erected in an authentic manner. There is evidence of later modifications in the N and S end trusses of the existing roof where the reflex curves of the inner braces are the most obvious signs of later renewal: the decorative carvings have also clearly been reworked and the date 1810 incised on the S truss.15 The overall effects of the restoration and reconstruction did not impress all commentators, however. According to William Rhind,¹⁶ 'The present modern mansion was erected by the late Lord Moray but the roof, and all that remained of the ancient hall, was very properly preserved. Unfortunately, the restoration of this magnificent hall has not been conducted on the strictest antiquarian principles,' probably a reference to the removal of the S fireplace and the insertion of the window. 'This hall, no doubt,' he mused, 'often dined several hundred persons; when its floor, according to the times, was strewed with rushes or heather, as many hundreds of plaided warriors and hunters may have soundly slept many a night after the fatigues or revelries of the



Fig.9.3 Great hall from E, 1965.

day.' The idea that great halls served as glorious medieval barrack-blocks dies hard, but it would be churlish to censure the otherwise strict Rhind for allowing his historical imagination to have some freedom.

Structural analysis

As it now stands, the hall is a large rectangular building aligned N-S; at the N end it is attached to the house, and at the S the ground falls away steeply (Fig.9.3) Internally, it measures 26.6m in length by 10.7m transversely within side-walls 1.8m and gable walls no more than 1.5m in thickness. The windows are of arch-pointed, almost rounded, form with simple Y-tracery and a high transom. In addition to the inserted window in the S wall, there are three windows in the E side-wall and two in the W, the fireplace in the W side-wall being set behind a dummy window. The lower roof members (the 'hammer beams') are some 9m above the existing floor-level (which has probably been heightened) and the roof itself is just over 8m in height overall. The floor is about 1.5m above ground-level, so externally, from ground to ridge the hall stands to an impressive 18.5m overall. At the wall-head there is a crenellated parapet, and the roof is covered with sarking boards and slates.



Fig.9.4 Great hall roof, 1965.



Fig.9.5 Great hall roof; annotated sketch by A Leith and G D Hay, 1974.

The roof structure (Figs.9.4, 5 and 6) consists of seven principal roof trusses forming six main bays which vary between about 3.7m and 4m in length and contain six pairs of common rafters. The end-bays, where the trusses have been partly reconstructed, are only 1.2m and 0.7m at N and S ends respectively with, correspondingly, two and one pairs of common rafters. It is possible that the removal of the galleries has involved a foreshortening of each bay, possibly by as much as two or three metres each. In its original form the 8-bay roof may well have been some 6 m longer.

Overall, the trusses form a series of stiffened or braced Gothic arches, pitched at about 53° and with a 10.7m span; uninterrupted with lower tiebeams, they fulfil the purpose but are not of quite the same form as English late medieval hammer-beam roofs. The roof is made up mainly of pegged and tenon-jointed members, but not all the rafter-holes are explicable in terms of the existing jointing. The members are generally of large scantling, the principals being 0.3m by 0.45m at base, the collars 0.3m by 0.2m, and the crown-posts 0.2m square; the principals are thicker at the wall-heads and the collar-beams expand slightly towards their centres. Carpenters'



Fig.9.6 Great hall roof; plan, section and cut-away view by S Scott.



Fig.9.7 Roof-truss 6, main collar and cusped braces.

assembly-marks have been scratched, probably by a race knife, on each face of most of the principal rafters; a sequence of Roman numerals from 2 to 11 is marked on the wind-braces of five central trusses on the W side, and the corresponding marks on the E side have an extra short mark or tail.

Unusually, it is a two-stage or two-tier roof, each truss being formed in two independent halves. The triangular top stage comprises an upper and lower (or sleeper) collar with a vertical crown-post, into which is tenoned a longitudinal butt collar-purlin (or collar-plate) secured by wind-braces. The sleeper collar traps two through-purlins at each side, and the crownpost is tenoned into the top of the upper collar, the pendant-post being a separate member. The purlins are made up of scarf-jointed lengths. The lower stage is a truncated arch-braced collar-beam truss. The arch-braces have angled pendant-posts, but only two of the trusses have central vertical pendant-posts, forming in effect four instead of three broad cusps. The end trusses incorporate later reflex-curved braces.

The lower horizontal members are 'false' hammer-beams, for they lack the essential characteristics of vertical hammer-posts. The wall-head is concealed but may conceivably include a form of wall-post and corbel to



Fig.9.8 Roof-truss 3, E side, carved head.

reinforce the lower brace and 'hammer-beam'. Overall, Darnaway is a hybrid incorporating the traditions and character of hammer-beam roofs, as well as of arch-braced collar-purlin or trussed rafter roofs with single principals.

Carved decoration

Two of the trusses — 3 and 6 (Fig.9.7) — exhibit a greater degree of elaboration at virtually every level. There is cusping around the upper collar, the sleeper collar-purlin is decorated with a row of quatrefoils, and there are traceried cusps formed within the arch-braces. These same trusses extend furthest down the side-walls and have the greater projection on the 'hammer-beam' ends. Different in both emphasis and treatment, they seem



Fig.9.9 Roof-truss 4, E side, carved figures.

to represent the equivalent of ornate spere trusses marking the positions of partitions or screens in an open hall, physically or symbolically demarcating the dais and service areas.

Detailed decoration is not confined to trusses 3 and 6, however, for there is a whole world of human figures, beasts, birds and naturalistic carvings inhabiting this roof. They occur mainly on the projecting ends of the false hammer-beams with others on the inner pendant-posts, some bearing slight traces of colour. Most are of rustic and fantastic inspiration, appropriate to an area of wild forest; at least a couple may be allegorical, but some may be representations of unidentified earls or their royal masters. The absence of carved armorials is somewhat surprising, and makes identification less easy.

The opposed hammer-beam ends of truss 3 have crowned male heads.



Fig.9.10 Roof-truss 5, E side, carved figure.

The one on the W has a neatly trimmed beard and ear-length hair; his crown or coronet is slightly broken. The corresponding head on the E side (Fig.9.8) is beardless with dimpled chin, is more youthful-looking and has longer tresses and a better-defined foliated coronet. It is of slightly cruder execution and there are indications that it has been reworked.

The carved heads on the beam-ends of the two end-trusses are modern. The S truss (7), which is dated 1810 on one of the pendant-posts, has on



Fig.9.11 Roof-truss 4, E side, carved hunting scene.



Fig.9.12 Roof-truss 6, E side, carved birds.



Fig.9.13 Roof-truss 5, E side, carved beast.

the W side, a male head wearing a form of glengarry complete with chequer band and cylindrical tassel; facing him on the E is another male head with a coronet. At the N end, W side, there is a male head wearing a tall riding helmet (cap and visor having been planted on), and on the E is a male head wearing a three-cornered hat.

Genuine medieval figure carving is represented by a cloaked and hooded pair of clerics (truss 4 Fig.9.9); the left-hand of one figure is clasping a spherical object while his right hand is intertwined with his partner's left. On the E side of truss 5 is a kneeling droll and lustful figure (Fig.9.10); he wears a head band, and his hands clutch his stomach above exaggerated genitalia. A short length of vine scroll ornament occurs beneath him. Facing him on the corresponding W beam-end, is an erect sow which has extended hind legs. One forepaw holds its stomach, the other appears to be brushing away a tear from its eye.

Further relief carved decoration occurs on the soffits of the beam-ends, the liveliest of these being a hunting scene (Fig.9.11) under the paired figures on truss 4 (E). The huntsman has one hand on a bow, probably a long bow, though the arrow is bolt-like.¹⁷ The beast is both bear- and wolf-like with a long leonine tail bent along its back. The spirit and character

of this carving, and the paired figures immediately above it, are not unlike some of those on nearby Sueno's Stone, and they might easily be regarded as Pictish derivatives. The subject-matter is appropriate to the context of Darnaway and its forest, and other wildlife is depicted, for example, on the underside of truss 6 (E). Slightly hollowed, it consists of a pair of birds pecking at a central container of fruits (Fig.9.12). Fierce zoomorphic carvings, probably intended to represent beasts of the forest in fearsome pose, are also formed on the ends of the pendant-posts in the central cusps (Fig.9.13). These are generally powerful, square-jawed, thick-set animals with prominent snarling teeth, probably bears. Those with short sharp forepaws convey a dynamic, pouncing image. As elsewhere, these carvings represent a mixture of realism and fantasy.

Dating and comparisons

It has long been recognised that the Darnaway hall and roof are of late medieval origin. The range of suggested dates is wide, however, extending from the time of Thomas Randolph in the early 14th century (hence the popular name of 'Randolph's Hall') through the Douglas era to the period of royal possession after 1455, particularly to the reign of James IV.

But perceptions based on circumstantial and stylistic evidence have now been considerably altered by Dr Baillie's analysis of the dendrochronological or tree-ring evidence. On this analysis, the trees used in the Darnaway roof last grew in 1387 and had been felled in the summer of that year immediately after the production of the spring growth. Given that oak must be worked whilst it is green and before it hardens, the timbers of the Darnaway roof were assembled and placed in position during the last years of John Dunbar, earl of Moray from 1372 to 1392. Younger brother of the earl of Dunbar and second son of Isabella, younger daughter of Sir Thomas Randolph, he was an active national figure who could certainly have had the means and the motive to have erected such a roof, but there is no corroborative surviving evidence which connects him with major building activity at Darnaway.¹⁸

Typologically, the closest surviving parallel in Scotland to the Darnaway roof is that over the Great Hall of Edinburgh Castle. This hall is slightly narrower and shorter than Darnaway, measuring 28.9m by 12.5m externally, and has undergone an even more thorough restoration and reconstruction.¹⁹ Between 1887 and 1891 inserted floors were removed, and the roof was altered, as can be judged by comparing it with a survey done in 1754. As restored, the roof has a similar general appearance to that of Darnaway, largely because of the inserted curved bracket-like lower braces; it is also known that the hammer-beams originally ended in carved beasts. However, the Edinburgh roof incorporates many differences of detail: it was constructed with exposed wall-posts and corbels; both the original and restored versions made greater use of straight braces; it

possesses short but genuine hammer-posts; it has a greater number of trusses — nine — but shorter bay-lengths, comprising four common rafters; and the lower halves of the principals have been doubled with what are usually described as kerb principals. What is not entirely clear is whether the principal rafters are also of two stages. Overall, compared to Darnaway, this is of a more rationalised trussed-rafter and collar-purlin construction but has had to make the best of poor materials; straight braces have been used instead of arched braces, and timber of comparatively slight scantling has been employed throughout.

The building or rebuilding of this hall and roof have been ascribed to the reign of James IV. Numerous payments were recorded between about 1496 and 1511, and James IV's monogram appears on one of the wallpost corbels. On the other hand, it has recently been argued on stylistic grounds that the character and ornament of the scrolled corbels correspond more closely to the French-inspired work of James V, when the same principal carpenter of the King's Works, John Drummond, was operating. It has thus been suggested that there might be two phases in the hall, the latest belonging to the 1530s.²⁰

An early sketch of the original roof over James IV's Great Hall at Stirling Castle suggests that it was similar to that of Edinburgh, but otherwise there is little comparative evidence for the Darnaway roof and for its place in Scottish late medieval carpentry traditions as a whole. A few, more humble Scottish roofs incorporate some of its features. The 15th-century roof over the nave of Holy Rude Church, Stirling, for instance, has distinctive trapped through-purlins, which are also trapped between two framed members of a principal rafter.²¹ The hall roof of a late 15th- or early 16th-century building at Linlithgow demolished in *c*. 1886 incorporated in simpler form and more modest scale the basic elements of an arch-braced roof truss with single principals, double collars, arch-braces, wind-braces and through- or trenched-purlins.²²

In England hammer-beam construction developed from the early 14th century onwards in ways that suggest that it was an alternative means of spanning halls that would otherwise have been aisled.²³ The apogee of the type was the magnificent hammer-beam roof which replaced an earlier roof, possibly aisled, over Westminster Hall, London.²⁴ Originally built by William Rufus at the end of the 11th century, the hall was reconstructed at the end of the 14th century, probably between 1394 and 1402, and probably the brainchild of the master carpenter, Hugh Herland. Although basically of a conventional single hammer-beam type, the structure also makes use of continuous and deep arch-braces rising from the base of the corbelled wall-posts up to the collar, intersecting the hammer-beam and the hammer-posts. There are twelve major bays and two short bays set close to the end-walls. The internal clear span is about 20.55m, almost twice that of Darnaway, and at 73m it is almost three times as long.

Though the Westminster Hall roof remained atypical, the fashion for hammer-beam roofs took firm hold, particularly among the large churches of eastern England. The fashion persisted into the 16th century, one of the last of the kind being the six-truss, seven-bay hammer-beam roof above the Great Hall of Henry VIII's Hampton Court Palace, built between 1531 and 1536.²⁵ Overall, the internal span is 12.19m, only about 1.5m more than Darnaway, and the length, including the screens area, is 29.57m, about 3.9m longer.

Without going into further detail, it is clear that the structural characteristics of the Darnaway roof do not conform readily with those of English hammer-beam roofs, or even with those few later medieval roofs in Scotland about which there is surviving information. Its anomalous position is at once both emphasised and better understood, however, in the light of the revised dating which dendrochronology has now provided. A date of 1387 places Darnaway at least a century earlier than the assumed date of its nearest — and royal — parallels in Scotland; even in England the hammer-beam genre was still not fully developed in 1387.

Hall design

The related questions of the purpose, design and dating of medieval great halls in general, though relevant to an understanding of the Darnaway hall, lies beyond the immediate scope of this paper. They tend to be associated with the major castles of the monarchy and greater nobility, secular and ecclesiastical, and their incidence and character serve as a crude architectural index of medieval power politics.

In medieval castle establishments, the great hall was essentially the principal reception and banqueting room for public and ceremonial purposes, as opposed to lesser halls and chambers for more private domestic use. At one end or in the middle of the hall was the high table set on a low platform or dais, an area usually distinguished by superior windows, fittings and perhaps roof trusses. At the opposite, 'lower', end of the hall was the service area, usually screened in some way and linked to the kitchens, buttery, pantry and other services, the lobby thus formed being known as the screens passage. Although they shared certain common characteristics, halls varied in size and relative importance, and in their relationship to other domestic suites and catering facilities. Internally, some were centred around open hearths or braziers, while others had fireplaces. Usually in Scotland, they were set on the first floor above vaulted or joisted cellarage, but there are known cases of 'laich' or ground-floor halls.²⁶

Elsewhere in Moray, for example, the ruins of at least one great hall are associated with the palace of the medieval bishops of Moray at Spynie. The hall in the N range is probably a second-phase, 15th-century structure for there is what might have been an earlier, 14th-century hall-gatehouse on the S side. Although very ruinous, the N range retains some indications of its former grandeur; above a shouldered window-head there are corbels that were probably associated with the wall-posts of a trussed rafter roof, whilst a lower corbel, carved in the form of a dignified male head, is in a position to have corresponded to a spere truss in front of the probable dais area.

At Darnaway there is still much to be clarified about the internal arrangements, the dais and the screens, and about relationships with the services and private chambers. Further research in the Moray muniments, particularly among the papers relating to the great reconstruction in the late 18th and early 19th centuries, may advance our detailed understanding of this structure. But, whatever the results of further enquiry, the carved details of this remarkable roof will continue to cast a shaft of light on the tough, crude and mysterious world of medieval Darnaway and its dark forests.

Notes

- 1. D MacGibbon and T Ross, *The Castellated and Domestic Architecture of Scotland* (1887) 304-6 and Fig.261; G D Hay 'Some Aspects of Timber Construction in Scotland' in A Fenton *et al.* (edd.) *Building Construction in Scotland, Some Historical and Regional Aspects* (1976) 28-38 and 29.
- 2. Regesta Regum Scottorum V: The Acts of Robert I ed. A A M Duncan (1988) no.389 (see also no.101).
- 3. The Scots Peerage ed. Sir J Balfour Paul (1904-14) vi, 292-330.
- 4. M L Anderson, A History of Scottish Forestry i (1967) 127, 202-3.
- 5. Acts of the Parliaments of Scotland [APS] ii, 76.
- 6. Exchequer Rolls of Scotland vi, 220, 380, 483; ibid., xii, pp.xlv-xlvi, 673; Reg.Mag.Sig. ii, nos.2585-7.
- 7. Stat.Acct. xx (1798) 224.
- Bishop Pocock's Tours in Scotland, 1747-1760 ed. D W Kemp (Scottish History Society 1887) 183.
- 9. J C Nattes and J Fittler, Scotia Depicta (1819) plate 10.
- 10. H M Colvin, A Biographical Dictionary of British Architects 1600-1840 (1978 edn) 499-500.
- Darnaway Castle, Moray Muniments, vol.v, box 11C, estate houses nos.1202 and 1204 (letter of 20 January 1794 from Mr MacGrouther to Mr Maule).
- 12. Ibid., vol.vi, box 18, no.701 (9 July 1805 and 16 June 1807).
- 13. Stat.Acct. loc.cit
- 14. Moray Muniments, vol.vi, box 18, no.701 (2 November 1802).
- 15. The date 1722 was also incised on the E side of truss 2.
- 16. W Rhind, Sketches of the Past and Present State of Moray (1839) 140.
- 17. Cf. J M Gilbert 'Crossbows on Pictish Stones' PSAS. 107 (1975-6) 316-7.
- 18. Scots Peerage vi, 298-301.
- 19. Cast. and Dom. Arch. i, 455-7 and Figs.396-7; RCAHMS, Inventory of Edinburgh (1951) no.1 at p.21; J Gifford et al., Buildings of Scotland, Edinburgh (1984) 95-6.

- 20. Buildings of Scotland, Edinburgh loc.cit.
- RCAHMS, Inventory of Stirlingshire (1963) i, no.131 at p.13, and plates 23A, 25, 26; Stell 'A Note on Medieval Timber Flooring and Roofing' in A C Riches and G P Stell (edd.), Materials and Traditions in Scottish Buildings (1992) 75-80.
- 22. Cast. and Dom. Arch. i, 510, 512-13; Edinburgh Architectural Association Sketch Book 1878-79 ii, plates 35-7 (J Russell Walker); and The Building News 26 February 1886 (Thomas Ross).
- J T Smith 'Medieval Roofs: a Classification' Archaeological Journal 115 (1958) 111-49 at 123-4.
- RCHM, Inventory of London ii West London (excluding Westminster Abbey) (1925) no.24. Thomas Pennant even described 'Randolph's Hall' as being 'timbered at top like Westminster Hall' (Thomas Pennant, A Tour in Scotland; 1769 (1774 edn) 152).
- 25. RCHM, Inventory of Middlesex (1937) no.2 at pp.34-5.
- 26. Eg. RCAHMS, Inventory of Argyll ii (Lorn) no.293 at p.232.

DENDROCHRONOLOGY

General background

In attempting to date the oak timbers from the roof of Randolph's Hall, Darnaway, two questions were being addressed. The first was clearly a question of architectural history — what date is this important roof? The second related to the geographical position of the site. The Darnaway oaks represented the most northerly group of oak timbers so far encountered by dendrochronologists in Britain. Thus the second was a tree-ring question — can timbers from the north of Scotland be dated by dendrochronology?

To set the scene for this discussion it is worth outlining how dendrochronology has developed in the British Isles. In the 1960s there were no reference chronologies and little information on cross-matching between ring patterns. Initial work related to building 'local' chronologies, for example, in the separate chronologies for the north of Ireland, Dublin, south/central Scotland,¹ Sheffield,² south/eastern England³ and western England.⁴

It gradually transpired that significant cross-matching existed between most of these chronologies,⁵ that is, most of the chronologies matched most others. One chronology complex which did not fit into this system, Fletcher's art-historical 'Type A' chronology — constructed using boards from panel paintings — clouded the issue as to whether dating within Britain could always be expected or whether some oak chronologies were mutually exclusive. This problem was eventually resolved when it was shown that the Type A chronologies had in fact derived from the eastern Baltic.⁶ This effectively removed the only significant anomaly in British dendrochronology. Other work, using modern site chronologies from a wide area of northern Europe, suggested that most oak trees were responding to one underlying 'signal', the effects of which were diluted by distance and site factors.⁷ This was very encouraging and confidence began to develop that any replicated site chronology from anywhere in Britain could be expected to cross-date against existing chronologies. The only other factor which would influence the likelihood of success in dating was the length of the available ring-pattern. Although there are no set figures, it is generally recognised that long chronologies are required, a period of over 150 years being desirable and 200-300 being ideal.

Within Scotland a basic medieval chronology was constructed during the 1970s. This used modern (that is, living tree) timbers from Raehills near Dumfries and from the Cadzow estate near Hamilton. These long modern ring-patterns were then extended using samples from Castle of Park, Lincluden College, Caerlaverock Castle and Glasgow Cathedral. The resultant south/central Scottish chronology extended back to AD 946.⁸ It was found that some timbers (for example, samples from Threave and Perth) matched satisfactorily with this chronology, while others (for example, timbers from Dumfries, Midhope and St Andrews) totally failed to match. Clearly, these latter examples raised questions about the ability to date throughout Scotland. In particular, it was not clear whether the failure was due to local factors or due to importation of foreign wood. In the only test involving modern chronologies, it was found that oaks from the River Dee, that is, as far north as Aberdeen, fitted acceptably with an overall European oak master chronology.⁹

Darnaway enquiry

It is against this background that the attempt to date the Darnaway timbers must be viewed. Darnaway lies 100km north-west of the sampling site on the River Dee, 150km north of Perth and some 200-300km north of the main Glasgow/Dumfries sampling areas used in the construction of the Scottish chronology. It was not therefore by any means certain that ring-patterns from Darnaway would be datable against the available chronologies from Scotland, England and Ireland, or indeed against an available British Isles average chronology, produced by averaging all the available precisely dated chronologies.

The stages involved in approaching this dating problem are as follows:

- 1) Are the timbers oak?
- 2) Can samples be acquired?
- 3) Will there be sufficient rings?
- 4) Can a 'site' chronology be constructed?
- 5) Will the timbering represent a single phase?
- 6) Can samples be acquired with sapwood?
- 7) Can the site chronology be placed precisely in time; that is dated?

Item 6 is particularly important for accurate dating. In oak the outer band of rings beneath the bark — the sapwood — is frequently subject to insect damage or removal during woodworking processes.

Since the dendrochronologist wants to provide the date of the final growth ring before felling, that is, the closest possible date to the building process, the presence of complete sapwood is critical. If the sapwood is incomplete, an allowance can be made by adding a range of 15-50 years to the date of the last heartwood ring. This represents a dramatic reduction in dating accuracy. Worse still is the case where the sapwood is completely missing. In this case the sapwood allowance has to be added to the date of the *last existing ring*, the resultant date range forming a *terminus post quem*.

At Darnaway, the availability of access to the roof timbers in March 1987 allowed confirmation that the timbers were oak. The major replacement elements in the end bays of the roof were immediately apparent, the timbers being distinctly different in character. It was also apparent that a number of the original structural elements retained sapwood and in some instances bark. Samples were therefore removed from twelve timbers. Of these, three were thin slices removed from the exposed ends of wind-braces and nine were cores extracted using a 'Henson' type hollow corer powered by electric drill.¹⁰ In three cases the cores were supplemented by small wedges of sapwood to ensure the retrieval of exact felling dates.

For simplicity in description of sample locations the trusses are numbered from N to S as follows:

Truss	Samples	Numbers
1	nil	
2	nil	
3	3	Q6752,Q6753,Q6762
4	1	Q6761
5	1	Q6760
6	5	Q6754-6757,Q6763
7	2	Q6758,Q6759

List of samples.

All samples were taken at the level of the false hammer-beams and were from apparently original roof elements:

Q6752: W side, false hammer-beam

Q6753: W side, S wind-brace

Q6754: W side, decorative feature below false hammer-beam

Q6755: W side, north wind-brace

Q6756: W side, arch-brace

Q6757: W side, false hammer-beam

Q6758: W side, N wind-brace

Q6759: W side, principal rafter

- Q6760: E side, arch-brace below false hammer-beam
- Q6761: E side, arch-brace
- Q6762: E side, arch-brace
- Q6763: E side, decorative feature below false hammer-beam

Of the 12 ring-patterns, three — Q6752, Q6757 and Q6763 — were short with only 34, 30 and 88 rings respectively. These proved to be undatable. The nine other ring-patterns all cross-dated and were formed into a single site chronology. Figure 9.14 illustrates the relative placement of the ringpatterns. It is clear that the main structural elements form a coherent group with the two samples with complete sapwood, Q6760 and Q6761, both ending in the same year. This consistency is backed up by the end years of Q6756 and Q6762, which were both cut from the same tree (correlation value t = 17.3). In the case of these timbers the outer sapwood was not so well preserved, due to insect damage, but could be measured to within one year of the felling date of Q6760/Q6761. The four timbers without sapwood are entirely consistent with the main group. Their staggered placement in time is accounted for by missing heartwood rings as a result of the woodworking process.

The wind-brace, Q6753, where the sapwood appears to be complete, ends five years after the main group and indicates either that the windbraces were an afterthought or that building took several years. Only a more detailed sampling exercise, undertaken with this result in mind, would clarify this question.

Having established site chronology, the total available length of ring pattern was 424 years. This was due to the extreme age of Q6762 which contained 418 rings. Since the purpose of the dating exercise was, at least in part, to ascertain whether oaks from this new area could be dated successfully, it was decided to produce only a replicated master chronology, that is, a chronology which did not depend on a single tree at any point. The resultant replicated Darnaway chronology spanned 262 years ending at the year specified by Q6760/Q6761.

The most obvious chronology with which to compare Darnaway was the south/central Scottish chronology.¹¹ This produced the *highest* correlation value, using the Belfast Cross 84 program,¹² at AD 1387 (t=5.2). This same end-year was indicated by the highest correlation against the Dublin chronology (t=3.5),¹³ and against a generalised British Isles chronology (t=4.5)¹⁴. In addition when compared with the latest Belfast long chronology for the north of Ireland, the Darnaway chronology gave the highest correlation in the last four millennia at AD 1387 (t=4.0).

This suite of correlations, combined with satisfactory visual matching, between both chronologies and individual timbers from various sites, suggests that the Darnaway chronology can be dated against available chronologies and that its end-year is AD 1387. No other consistent correlation position was indicated by the analysis.



Fig.9.14 Great hall roof; relative placement of ring-patterns. The hatching represents sapwood. There is a clear felling phase in AD 1387 with one later wind-brace, Q6753, felled in 1392.

The results can therefore be summarised as follows. The timbers forming two of the main arch-braces of the Darnaway roof, Q6760 and Q6761, were felled in AD 1387. Three other timbers from the roof were highly consistent with this date, namely two other arch-braces, Q6765 and Q6762 from the same original tree, and one principal rafter, Q6759. Three heavily woodworked elements, namely the wind-braces Q6755 and Q6758 and a decorative feature Q6754, are not inconsistent in that they fall well back in time from the proposed felling date. Only the wind-brace, Q6753, is definitely later than the main structural elements and it last grew in 1392 on the assumption that the sapwood, which ends in that year, is complete. It is of interest that the two structural elements, which failed to date, were both false hammer-beams, Q6752 and Q6757. Both of these timbers were fast grown (wide ringed) in contrast with the majority which were very narrow ringed. This may reflect a desire for trees with very straight trunks — for which young fast grown trees would seem ideal — for the straight false hammer-beams. Trees to supply the curved arch-braces might therefore be selected from a different population.

Conclusion

Dendrochronological analysis indicates a clear felling phase in AD 1387 for timbers from the roof of Randolph's Hall, Darnaway. This implies that this new, most northerly, site falls within the same tree-ring remit which operates throughout Britain and Ireland. It reinforces the notion that any well replicated, long, oak site chronology should be datable against existing chronologies and lends hope to further dating exercises from the far north of Scotland.

Notes

- M G L Baillie 'The Belfast Oak Chronology to AD 1001', 'Dublin Medieval Dendrochronology' and 'An Oak Chronology for South Central Scotland' *Tree-Ring Bulletin* 37 (1977) 1-12, 13-20 and 33-44 respectively.
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- 13. Baillie 'Dublin Medieval Dendrochronology'.
- 14. M G L Baillie and J R Pilcher (1982, unpublished).

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