

PETERBOROUGH CATHEDRAL

AN ARCHAEOLOGICAL ASSESSMENT OF THE ROOF OF THE NAVE AND THE PAINTED CEILING

The Roof

The nave of the cathedral was probably built during the third quarter of the 12th century (Pevsner and Metcalf, 1985). It was therefore completed rather more than half a century after the nave of nearby Ely cathedral. That, we know, had a low-pitched roof made up of a series of tie-beam trusses which carried central, king-struts and shorter, raking-struts supporting the rafters. These rose from the ends of the massive 46ft (14m) long tie-beams, which spanned the tops of the walls, so that the roof had no gutters or parapets (fig. 1).

It is probable that the 12th. century roofs of Peterborough were originally of this type. The ceiling of St Michael's church at Hildesheim in Germany, with which Peterborough's ceilings are most often compared, is flat and fastened to the soffits of the tie-beams (Cartwright, 1969,7). The transept ceilings at Peterborough have apparently always been of this type but the nave ceiling differs in that its central part is higher than the sides. At some time soon after the transept and nave roofs were completed the tops of the walls were probably raised, without necessarily altering the roof structure, as at Wells cathedral (Colchester, 1987, 56), in order to provide them with gutters and parapets. By this process the eaves of the roofs became incorporated in the new masonry. The restoration works directed by Leslie Moore (1923, pl. 5) strengthened the tops of these walls by taking out the remains of this old, decaying timber and filling up the cavities. The clearest visible evidence that the tops of the walls of the nave have been rebuilt at least once are the cusped, wavy, linear motifs of the second quarter of the 14th. century (information, Dr Jenny Alexander) which decorate the parapets.

Since my first visit to the cathedral's roofs in 1988 a cross-section of the nave drawn in the early years of the 19th. century has come to light (Ware, 1809, Pl. 18 - see Fig 2). This shows the form of the medieval roof to which the painted ceiling was fastened before the present roof of imported pine was built by Edward Blore c1830 (Winkle, 1838, II, 77). My own attempt (Simpson, 1989) to reconstruct the design of the medieval roof from the little evidence that still survives has proved to be invalid and it can now be seen that Blore followed the medieval design quite closely. The only published illustration of his roof is that of Ruprich-Robert (1881- see Fig.3).

Unfortunately neither of these 19th. century drawings are accurate in all particulars. Ruprich-Robert's section does not show the gutters and parapet walls but otherwise seems to be substantially correct. This was presumably a careless omission made because the drawing was intended to illustrate the timber framing of the roof rather than structural details of the masonry. Ware's drawing shows the gutters and the parapets correctly but the feet of the rafters are set right on the inner edges of the walls, the feet of the scissor arms which carry the sides of the ceiling are too short and the internal wall faces immediately below have mouldings which do not exist. In making his survey Ware would have had access to the parapets and gutters of the roof and would have been able to take external measurements, however, the internal structure would have been completely dark and possibly dangerous to enter. It would anyway have been impossible to measure the width across the base of the roof and his observations were probably largely confined to what he could see from the doors into the roof at either end. The ceiling and profile of the lower part of the roof are therefore shown foreshortened, much as appears to anyone standing on the floor of the nave.

Ware's drawing shows a scissor-braced roof with a pitch of about 50%.

The arms of the scissors would have been half-lapped across the two collar beams which were linked by a short post. It is surprising that this did not extend as a king-strut up to the apex of the rafters but it has parallels elsewhere, for example, the late 12th. century high roof of the nave of Wells cathedral (Hewett, 1985, 11). A unique feature of the roof was the relative positions of the feet of the scissor arms and the rafters, the former just in front of the latter (on sole pieces presumably) at the tops of the wall. Usually the feet of the scissor arms are joined to the rafters at a height of 4-5ft (1-2m). This feature and the lack of any evidence that the roof ever had tie-beams indicate that the roof was designed for the present ceiling.

In fact enough of the medieval roof still survives attached to the boards of the ceiling for it to be possible, with the help of Ware's drawing, to make a fairly complete and accurate reconstruction on paper. The structural elements which survive are the lower collar beams up to and including the lower portions of the scissor arms below them. The distance between these collars, and therefore between the medieval trusses, is about 2-3ft (0.6 - 1m). At the centre of each the bed for the lap-dovetail joint at the base of the post between the collars can still be seen. There are battens running east-west and often recessed in trenches, attached to the soffits of the collar beams. They are irregularly spaced and measure about 2 by 3 inches (5 x 8cms) in cross-section. They served the dual purpose of holding the boards in place with nails and providing a means of levelling the ceiling from one truss to the next. In some places the boards are nailed directly to the collars. It is possible that some parts of the upper roof structure also survive among short lengths of old timber reused as battens by Blore in his new roof. .

The present roof of the nave is much as depicted by Ruprich-Robert (1881 - see Fig. 3). The presence of clasped purlins on all three of its collars is a wise precaution against racking (ie twisting or tilting) of the trusses which was often a problem in medieval roofs of the kind formerly at Peterborough. Iron straps reinforce the joints of the lower collar beams with the rafters and the intersection of the scissor arms and the king-strut. The ceiling is suspended from the roof by bolts through the old collar beams and such additional timbers as were subsequently inserted for the purpose (Moore, 1923). Moore completely recovered the roof in 1926 and also treated it with preservative, constructed a new gangway and improved the lighting by the introduction of electricity and by the addition of windows above the eaves. He also covered all the extrados of the ceiling with canvas which is glued to the boards to maintain their cohesion.

The Ceiling

The canvas obscures details of the carpentry when the ceiling is viewed from above. However, when seen from the scaffold below, it is clear that the medieval boards are of cleft oak. They are arranged overlapping, clinker style, in panels the shapes of which are reflected in the design of the painted decoration. The method of construction is surprising. Radially cleft boards have a long, triangular cross-section and usually in medieval carpentry the feather-edge of one was secured in a V-groove cut along the thick edge of the next, which is the earliest form of tongue and groove jointing.

On architectural considerations the nave is likely to have been roofed in the late 1170s (Pevsner and Metcalf, 1985). Winkles (1838) said that Blore, who had examined the ceiling two or three years earlier had pronounced it to be 'coeval with the walls on which it rests'. If this was so then why was the ceiling not flat like those of the transept? It is usually dated to before 1238, when the church was dedicated, and more precisely on art-historical considerations to c.1220 (Cartwright, 1969, 7). Current opinion would, therefore, suggest a 40-60 year interval between the completion of the building and the painting of the ceiling.

Dendrochronology has shown that the original Norman roof of Ely cathedral was replaced by a new scissor-braced roof 120 years later. Possibly much the same happened at Peterborough, but the apparently shorter time interval makes it less likely. The unique form of the roof with the feet of the scissor arms on top of the walls, in front of the feet of the rafters suggests that it was indeed designed specially to take the painted ceiling. It has been suggested (Cave and Borenius, 1937; Cartwright, 1969) that the ceiling was originally flat and was later raised up to its present canted form when the east and west arches of the tower were altered from round, Romanesque to pointed, Gothic c.1325. A flat ceiling would have been quite in keeping with the former but would have truncated the apex of the latter. This idea has not been generally accepted for, it is argued, it would have been necessary to increase the width of the ceiling and there is no evidence of that. Certainly, if it has been moved or changed from its original form some archaeological evidence of it should still be apparent. The fact that the parapets of the roof and the axial arches of the former tower are very close in date otherwise makes this an attractive theory. It should also be noted that the west wall of the nave over the arch rises no higher than a level cornice as would be appropriate for a flat ceiling (Pevsner and Metcalf, 1985, 277 - see Fig. 4).

It was possible to examine the eastern bay of the painted ceiling from scaffolding during a visit to the cathedral on 27th. April, 1995. This showed that it had been much patched with new boards of (sawn) oak, pine and, apparently, mahogany. There are also old painted boards, reused in new locations and overpainted. At least two different types of nails were noted and many of the boards are perforated by the tips of screws which presumably secure recently inserted battens above. Some of the boards and nails were insecure. Eve Baker in her report (1977) on the ceiling noted that its condition was worst at the east end, probably as a result of Pearson's rebuilding of the tower in the 1880s (Pevsner and Metcalf, 1985). It was also here that the worst of the repainting was found. The boards at the sides of the ceiling are placed horizontally. They are in much better condition and may be pine. Certainly, they are later than those of the central part of the ceiling and may replace original boards which had become rotted and decayed through contact with damp in the feet of the rafters and the tops of the walls. Baker suggested from the style of the painting that this work might be 17th. century but it is perhaps more likely to belong to the first recorded repainting of the ceiling c.1745. This would also better accord with the use of pine rather than oak. That the roof was in a bad state of repair at this time is recorded by Browne Willis (1742, III,504) who said that 'the Boards of the Roof of the middle Isle or nave....are several of them damaged and broken'.

The Painted Decoration

The only record of this restoration is by Governor Pownall who published (1789) useful information about its condition, the nature of the paint and particulars of the work that was done. The ceiling was restored again c.1834 by Charles Layton for £30 immediately following Blore's rebuilding of the roof, presumably. Clearly both restorers were local men without any particular skill for the work and Baker considered that 'the scheme as a whole has certainly suffered considerably' at their hands.

Pownall's learned article discusses technical aspects of the painting. He corresponded with Rev. J. Bentham of Ely who sent him transcripts of the Sacrist Rolls (Chapman, 1907) concerning the purchase of materials and payments made for the decoration of the Octagon and the Lady Chapel at Ely in the late 1330s and 1340s. These list paints (azure, vermilion and orpiment - gold paint made from yellow arsenic) and raw materials for their manufacture red and white lead, verdigris - basic acetate of copper for green or deep blue - and cinnibar - mercuric sulphide for vermilion) as well as gold and silver leaf. These were bought at Cambridge, London and Kings Lynn. Two types of varnish are also mentioned as well as many flasks of oil and an earthenware vessel in which to store it (Chapman, II,83). In one account the oil is said to be for tempering the colour (*pro colore temperando*)

Chapman II, 98). This would be an air-drying oil probably made from flax (linseed). Aglionby (1685) says 'the secret of oyl painting consists in using colours that are ground with oyl of nut or linseed'. There is also a purchase of four bushels of leather off-cuts for making size Item in *iiiij buss. de scrowes empt. pro cole indefaciend* - Chapman, II,99). Among payments made for labour is one for piece work to Nicholas Pictor for whitening the new vault (*pro volta nova dealbanda* Chapman, II,83). This was probably an undercoat, for William Schank is paid £10 later in the same account for painting the said vault and gilding the dome(?) and boss in fulfilment of his contract *pro dict. volt. depingend. cum le chapitral et bocis deaurand. ex convencione in grosso* Chapman, II,83). Randolph le Gold beter was paid for making goldleaf from coins supplied by the sacrist (*Item solut. pro foliis auri fabricand. de floren. dni.* Chapman, II, 83; Kirby, 2000, 20).

Although the painting of the Peterborough ceiling must have been completed over a century before the vault of Ely's Octagon it seems very likely that much of the information about the work contained in the Ely Sacrist Rolls must also be relevant to Peterborough. Its significance is greatly increased if major work, which might have included repainting, was done on the ceiling when the tower arches were altered and the parapets built in the early 14th. century. The entries in the Ely Sacrist Rolls would seem to leave no doubt that oil was usually mixed with the colours by the Ely painters and that varnish was also used. Pownall's account of the c.1745 restoration is, however, rather ambiguous on this point. It is said that parts of the painting were sufficiently robust to be wiped clean with a sponge without suffering damage but elsewhere the painting was in distemper and it 'came clean off the wainscot'. Recent opinion seems to favour the latter assessment (Cave and Borenius, 1937; Baker, 1977). Perhaps a more realistic hypothesis might be that the original work was in distemper and that later restoration or repainting involved the use of varnish and/or oil.

The Transept Roofs

Before ending this report it would seem useful briefly to outline the history of the transept roofs and to compare what is known of their ceilings with that of the nave. It would seem likely that the original roofs remained until Dean Monk's restorations in the 1820s. They could have been demolished completely without disturbing the tie-beams to which their flat ceilings were fastened so their rebuilding would not have involved such engineering problems as the nave roof. The ceilings seem to have remained more or less intact and to have retained much of their original colour scheme, as early photographs show (see fig. 5) until the central tower was rebuilt in 1882-5. 'In 1886 the south transept ceiling was taken down for repair. All unsound wood was replaced by good oak. The diamond shapes are still to be seen but the black, white and brown patterns have disappeared - similar work in the north transept was undertaken later.' (Cobb, 1980, 99). Moore (1923) undertook further repairs to the south transept roof in the early 1920s at a cost of about £1,500. He noted that seven of the old tie-beams were retained in the 1886 restoration. He recommended that these be treated with preservative but that much other old oak that was there should be removed and/or replaced (see above).

Finally, it only remains to draw attention to the similarities which are apparent between the nave and transept ceilings. Both are composed of boards arranged in diamond patterns which are further accentuated by their painted decoration (fig. 5). How the boards of the transept ceilings are/were fitted together is not entirely clear but I have only come across the 'clinker' construction of the nave roof before in the 13th century nave ceiling of Warmington, Hunts., parish church. It is possibly an earlier panelling technique than the tongue and groove technique which may only appear with the importation of large quantities of riven oak boards from the Baltic from the later 13th. century.

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PETERBOROUGH CATHEDRAL

Nave Roof and Ceiling: recommendations concerning further research

Over six years have passed since I wrote my first report (Simpson, 1989) on the nave roof and ceiling. The intervening period has allowed me to reflect upon the archaeological and documentary evidence and also to find new material. The most valuable results of this have been the discovery of Wade's engraving of a medieval roof truss, a better understanding of the character of the transept ceilings and the realisation of the significance of the early 14th. century parapets. However, it is not intended that the attached report should be accepted as 'gospel'. It is intended to present the evidence and thereby indicate what "may" have been the history of the roof and ceiling. The outcome is that a radical reappraisal seems justified and the archaeological/architectural evidence raises serious doubts about the art-historical date proposed for the ceiling. Fortunately this hypothesis can be tested by the methods outlined below and conclusive evidence obtained either to support or reject it.

Dendrochronology

Dendrochronology or tree-ring dating involves taking samples and measuring the annual ring-widths of oak timbers which it is desired to date. Tree-ring sequences are rather like the bar-codes on the products at the local supermarket except that the information they encode is not about prices but about the period of time that the trees were growing. To make sure that we recover sufficient data to be statistically significant it is usually necessary to sample 6 to 8 timbers to determine when a building, or a phase of a building was constructed.

Samples from beams (joists, rafters etc) are usually taken by means of a coring device attached to a Black and Decker-type hand-drill. The sample extracted is a little thicker than a pencil and the hole left in the timber about 1cm. Core-holes are usually plugged with dowelling. Boards cannot be sampled in this way. The alternative method(s) used are either to cut a cross-section off the end of a board and take it away to the laboratory so that the tree-rings can be polished up and measured under the microscope in the normal way or to polish up the end of a board and measure the tree-rings with a pocket lense *in situ*.

It is proposed to take three series of eight samples from the Peterborough roof and ceiling. These should date the boards of the painted ceiling, the timbers of the medieval roof and boards which have been used to make later repairs to the ceiling.

Archaeological Survey

One object of this would be to examine all the surviving timbers of the medieval roof and to draw and measure those of them that are significant for making a scale reconstruction of the plan and elevation of the roof.

The Ruprich-Robert drawing of one of Blore's pine roof trusses is inaccurate in various ways. A new, accurate scale drawing of a typical truss should be made.

An archaeological survey of the ceiling boards is also most important to determine whether it has ever been substantially altered and which areas have been repaired and/or repainted. How this work will be accomplished is obviously very much dependent upon how the Surveyor to

the Fabric and the painting conservator propose to restore/conservate the ceiling. Having examined the eastern (worst) bay of the ceiling closely it was my opinion that the best means of tackling it would be to take it down and clean, sort, examine, restore and replace each board individually. However, such a radical restoration might not be necessary throughout the ceiling. A full photogrammetric coverage, perhaps followed by scale drawings would seem to be essential working tool(s). These documents would be used to record archaeological information about the fabric as well as conservatorial information about the paintings - eg. various types of nail used, boards which have been repaired/replaced and in what timber, parts of the ceiling that have been repainted in 14th(?), 18th, 19th centuries, etc.

This would require that the conservation and the archaeological teams work closely together and interdisciplinary co-operation should be of great benefit to the project. Obviously this aspect of the forward planning and the agreeing of budgets will require further discussions among the parties concerned.

Documentary Research

My documentary research on the ceiling/nave roof and reading on the cathedral and its history is not exhaustive but any further work at the moment is unlikely to be very rewarding. However, the dendrochronology will give precise dates for two or three phases of work on the roof/ceiling. It will then be possible to return to the documentary sources and by focussing attention on these particular years it should at least be possible to learn more about the monastery/cathedral at those times and about those who commissioned the work.

Estimates of the Cost of the Work

Estimates for the cost of the dendrochronological dating, the archaeological survey of the roof timbers and further documentary research are attached; also a provisional estimate (dependent on further clarification of the work required on the ceiling) for a final report.

W.G.Simpson

20th. May, 1995

Illustrations:

Fig. 1 Reconstruction of one of the original Norman roof trusses over the nave of Ely Cathedral. It has been dated by dendrochronology to c.1120.

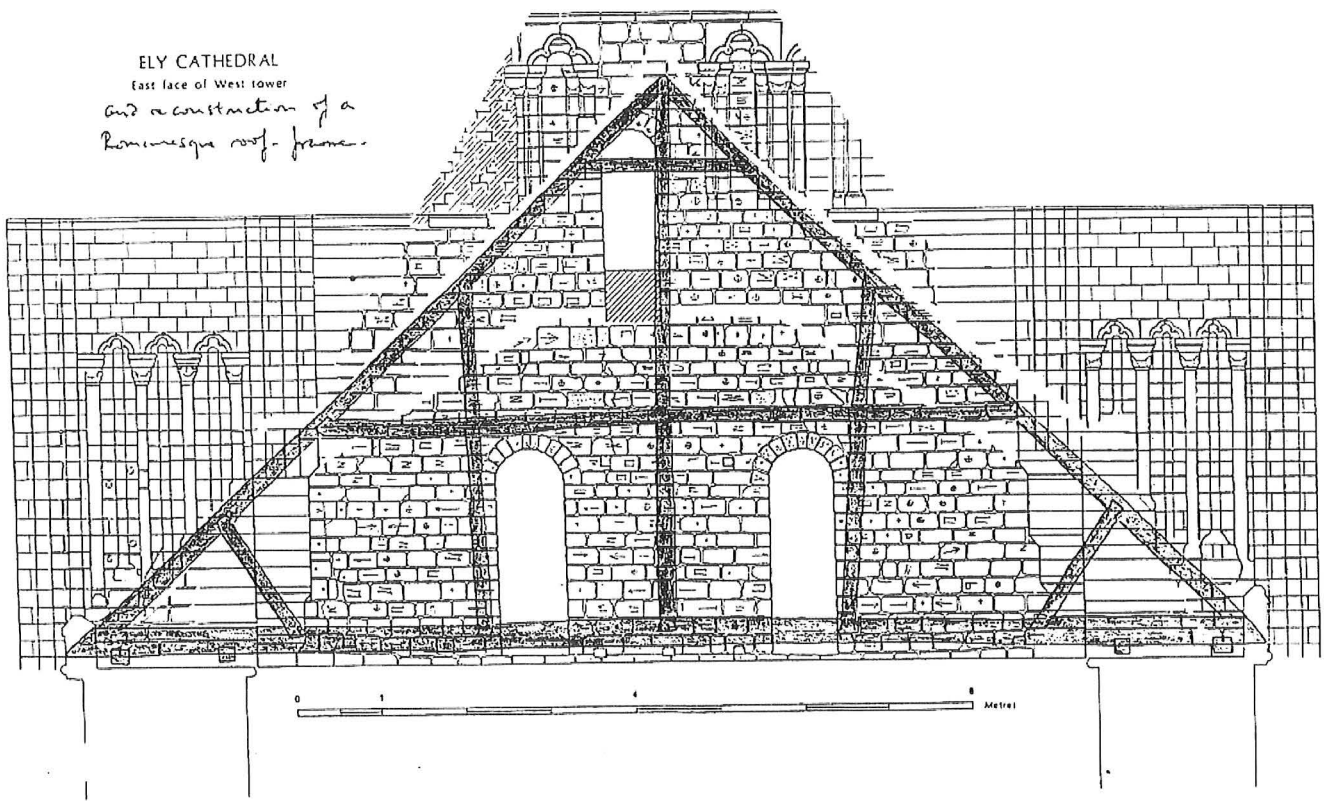
Fig. 2 Cross-section of the nave of Peterborough Cathedral drawn by Samuel Ware c.1805.

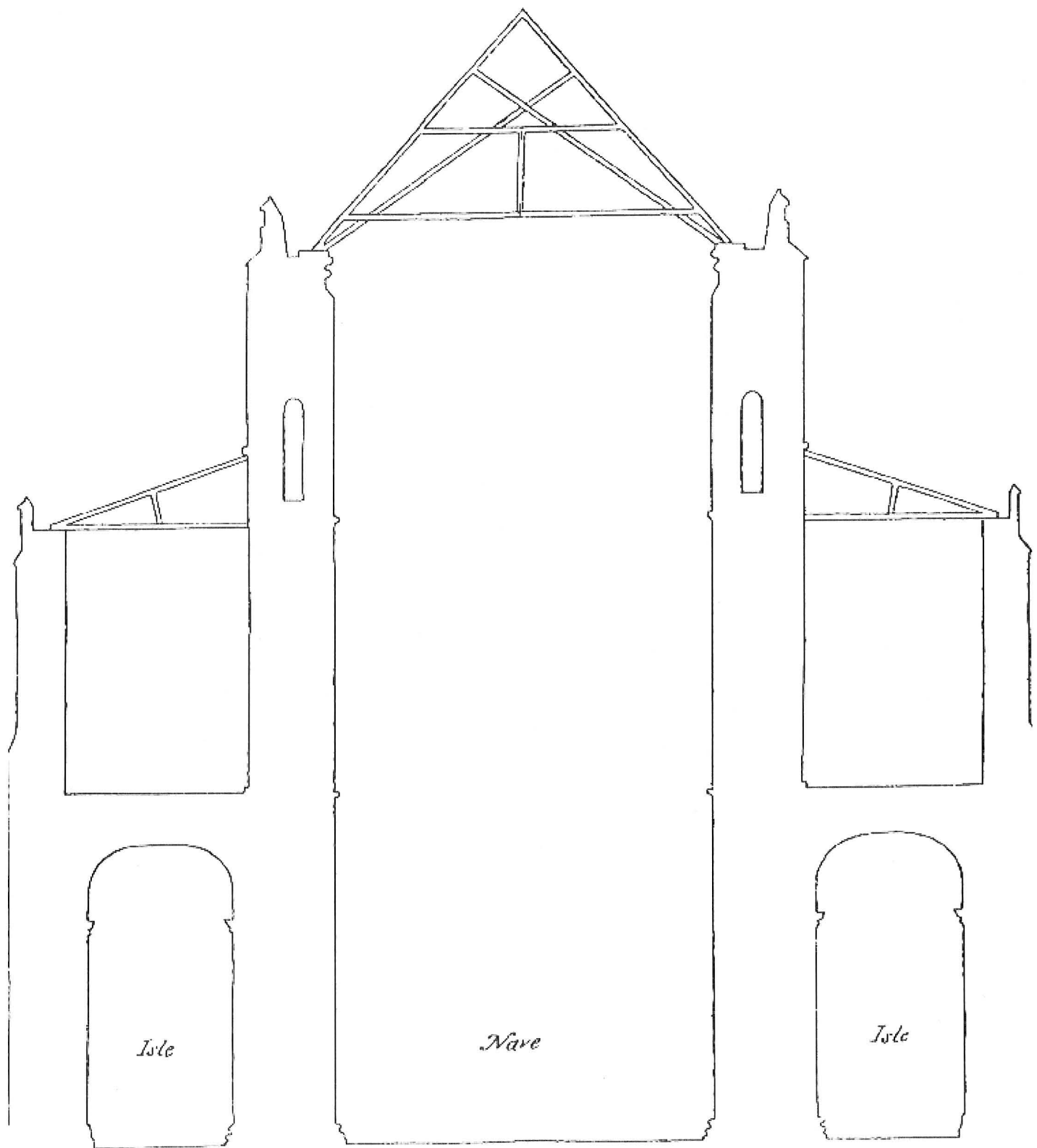
Fig. 3 Drawing of one of the principal trusses of the present roof of the nave, Peterborough Cathedral built by Edward Blore c.1830. (After V. Ruprich-Robert, 1881).

Fig. 4 Three views of the nave, Peterborough Cathedral, looking west showing the vacant space above the end wall between the cornice and the ceiling.

Fig. 5 Photograph of the north transept, Peterborough Cathedral, taken before Pearson's rebuilding of the tower (1882-85), showing part of its original painted ceiling.

Fig. 1 Reconstruction of one of the original Norman roof trusses over the nave of Ely Cathedral. It has been dated by dendrochronology to c.1120.





Section of Peterborough Cathedral



Fig. 2 Cross-section of the nave of Peterborough Cathedral drawn by Samuel Ware c.1805.

Fig. 3 Drawing of one of the principal trusses of the present roof of the nave, Peterborough Cathedral built by Edward Blore c.1830. (After V. Ruprich-Robert, 1881).

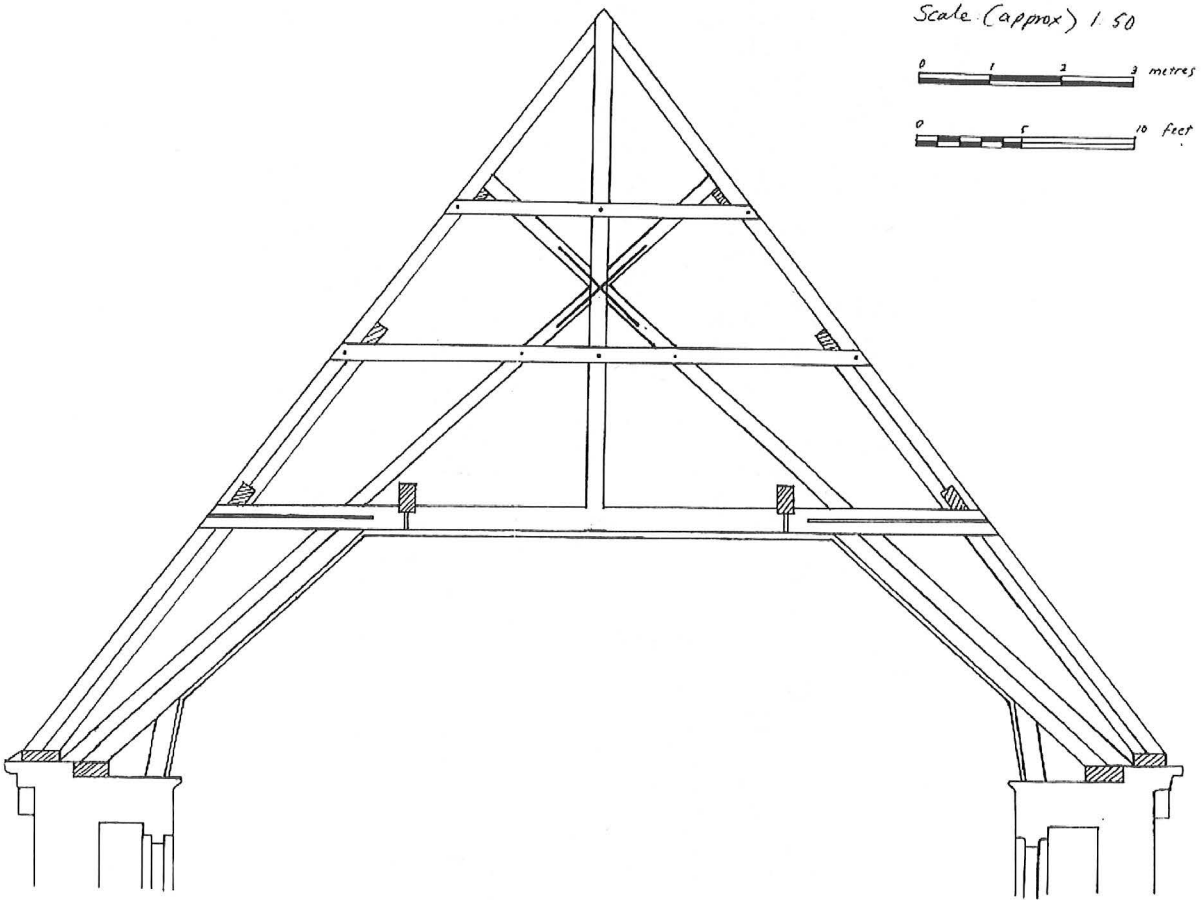
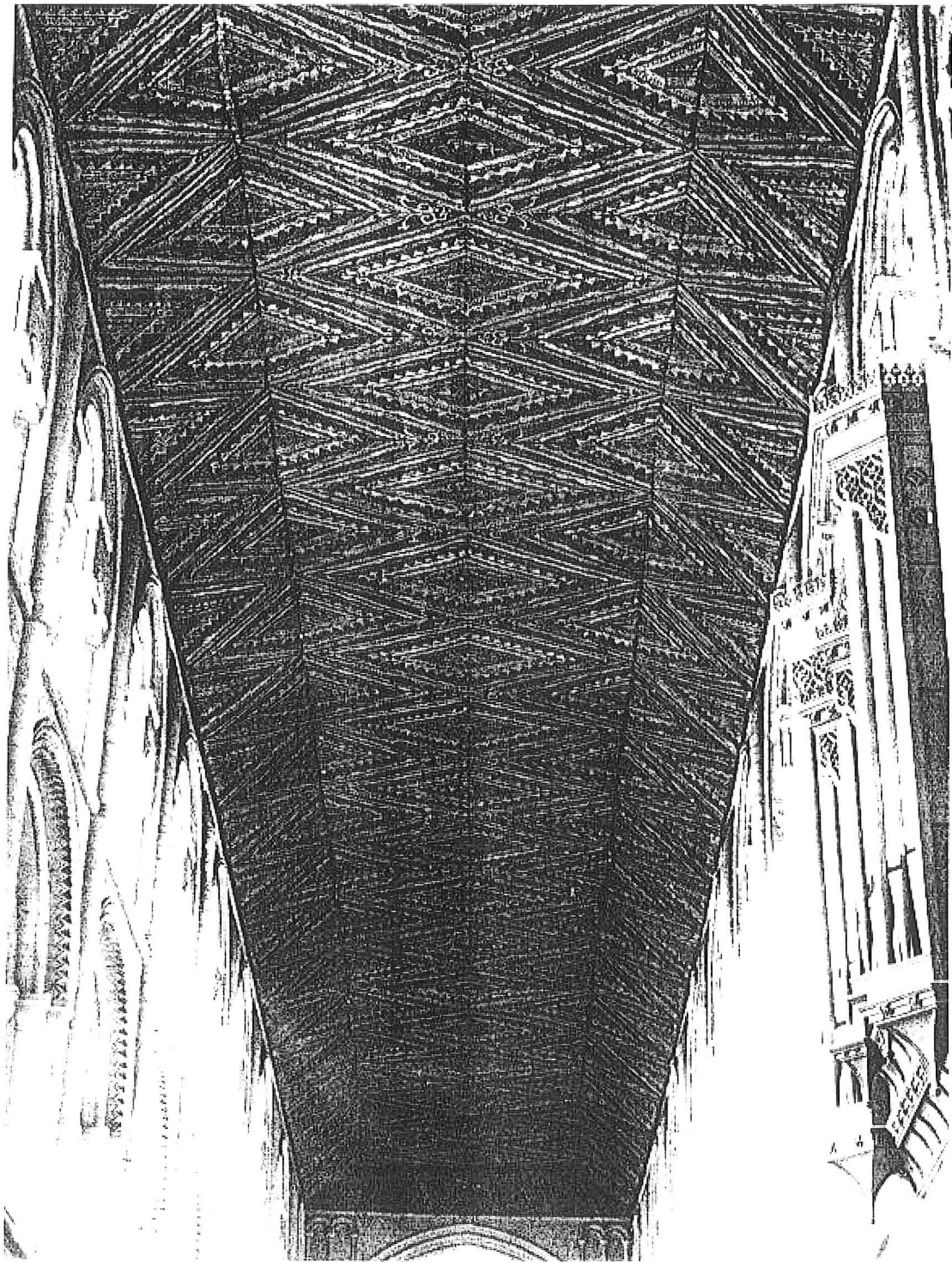
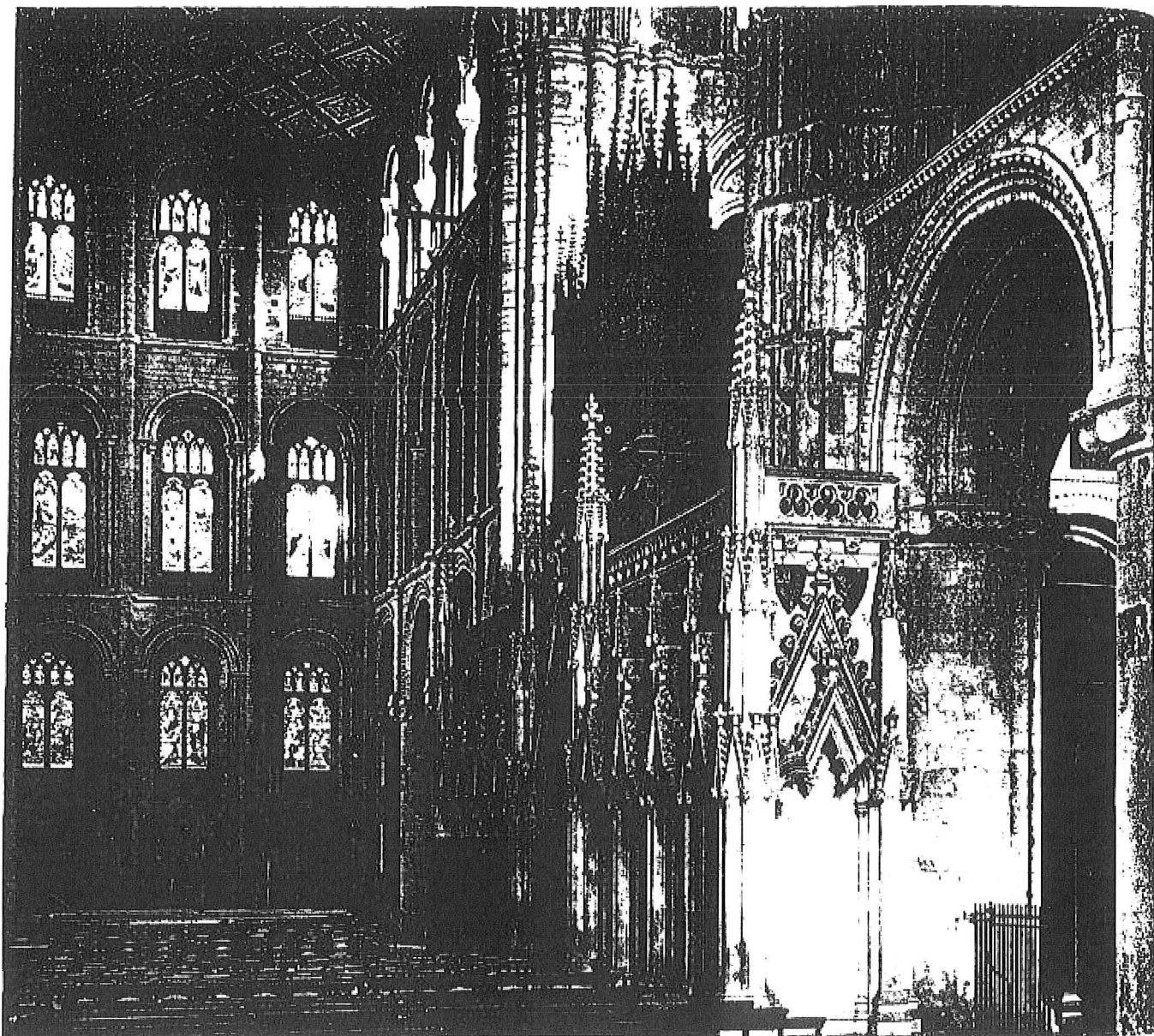


Fig. 4 Three views of the nave, Peterborough Cathedral, looking west showing the vacant space above the end wall between the cornice and the ceiling.



The ceiling of the nave of Peterborough Cathedral

Peterborough: the crossing



158. The crossing from the south transept, some time between 1873 and 1884. The nearest pier is the one strengthened with iron clamps.

From Cobb 1980

Fig. 5 Photograph of the north transept, Peterborough Cathedral, taken before Pearson's rebuilding of the tower (1882-85), showing part of its original painted ceiling.

W.G.Simpson

26th May,1995

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27th. May,1995

Mr J. Limentani, B Sc, RIBA

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Dear Mr Limentani,

Peterborough Cathedral - Nave roof and ceiling

My apologies for the delay in sending you the enclosed report on the nave roof and ceiling and the estimate for carrying out further work, including tree-ring dating. In fact my previous work at Peterborough has largely been concerned with the roofs but now, having done further work, and having considered the ceiling and the documentary evidence concerning it, I developed doubts about everything dating to c.1220. Briefly, it seems very likely that some major works were done on the roof about a century later. Well, this seemed to be a kite worth flying and, fortunately, with dendrochronology and archaeological survey it will be possible to test the hypothesis and to date roof, ceiling and later repairs conclusively.

If I remember correctly, you asked me to send you anything that I thought relevant to the history of the roof/ceiling. I have therefore included a fairly full bibliography. Most of these works will no doubt be available at Peterborough, or can be obtained through a good library. However, I did just wonder about the "Archaeologia" articles, so I have enclosed photocopies of that part of Pownall's article which deals with Peterborough and the article by Cave and Borenius. I have also reviewed what Pownall had to say about the decoration of the Ely Octagon in the mid-14th century, which I am sure will prove to be very relevant to the Peterborough work, and I hope helpful for Liz Hirst.

I know that there are things which I have not seen - you mentioned a collection of photographs at Peterborough. I doubt if they could contribute much at this stage but obviously I would hope to cast my net wider before writing the final report. I wonder how you will tackle the conservation of the ceiling and the painting - please let me know if I can be of further assistance.

Yours sincerely,

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