



A geological review of some early churches in the Northamptonshire area

by

JOHN F POTTER

SUMMARY

The importance of geology, stone emplacement and bedding orientation, in six churches in the area of Northamptonshire is examined. These churches, on architectural evidence, have long been recognised as having Anglo-Saxon origins. The examples reveal in all instances the typical Anglo-Saxon, 'Patterned' style, which includes the use of vertically-bedded stone orientation in definitive patterns. The detail of the stonework and its bedding orientation provides a significant and further means of identification for work of this period.

INTRODUCTION

In recent years the present author has examined the majority of the earliest churches in the British Isles. An aspect of these studies has revealed that Anglo-Saxon stonemasons in England resorted to different patterns for the emplacement of their stonework in comparison to either earlier Roman masons or those of post-Anglo-Saxon periods (Potter 2005a; 2006a). The diagnostic 'Patterned' styles of stone insertion of the Anglo-Saxons in England (Potter 2006a; 2009; and in press) appear to be repeated at much the same time both in Scotland (Potter 2006b) and elsewhere, such as in Ireland and the Isle of Man.

Certain characteristics of the Anglo-Saxon styles of building in England have been long recognized. Double-played windows, pilaster strips, 'long and short' quoins and 'Escomb-style' arch jambs, each provide examples. Taylor and Taylor (1965, 1-15) summarized both these and other features. Customarily, however, in many structural aspects of their church walls, the craftsmen of this period also chose to use stones with their bedding laminations placed vertically. Almost certainly this was completed for decorative purposes (Potter 2005a; 2009). Together with other features referred to in this paper, this practice provides a further important means of identifying Anglo-Saxon or 'Patterned' workmanship.

Stonemasons throughout the ages have typically placed hewn stone blocks in their walls with the stone bedding (stratification) approximately horizontal, that is, as the sedimentary rock was initially deposited. In this situation, the rock is normally less susceptible to weathering and more able to withstand the vertical wall pressures. In choosing to insert many stones in structures like quoins, pilasters and arch jambs with the bedding orientation vertical, the Anglo-Saxons had to be both knowledgeable and carefully selective in their choice of stone.

STONE ORIENTATION

In order to describe in simple terms the orientation of stones in wall structures, a newly devised nomenclature has been established (Fig 1 and Potter 2005a):

Quoins, Fig 1a

- BH (Bedding Horizontal) stone placed in a wall in the orthodox manner, with the bedding traces horizontal
- BVFR (Bedding Vertical Face Right) the face of the bedding may be on the right in quoins where in Anglo-Saxon style the bedding laminations may be placed vertically, or
- BVFL (Bedding Vertical Face Left) to the left, as the quoin is viewed from the exterior.

This terminology can be applied to stones regardless of the shape or size of the block, whereas a terminology proposed by Gilbert (1946), using terms like 'side' and 'face-alternate', related to the block shape.

Pilaster strips, Fig 1b

- BVFB (Bedding Vertical Face Bedded) stones with vertically orientated bedding, ie bedding face parallel to the wall face, or
- BVEB (Bedding Vertical Edge Bedded), edge bedded.

The terms 'face bedded' and 'edge bedded' are used by modern stonemasons to describe atypical occasions of vertically-bedded stones within a wall.

Arch or window jambs, Fig 1c

- BVFIA (Bedding Vertical Face Into Arch), placed with the face of the bedding into the arch, or
- BVEIA (Bedding Vertical Edge Into Arch) with the bedding traces parallel to the vertical joints on the inside of the arch.

Significantly, although many Anglo-Saxon arch structures involve BVFIA stones, as for instance, the 'Escomb fashion' jambs (Brown 1925, 54-5), none have been observed involving BVEIA stones. BVEIA stone emplacement becomes more typical of Norman arches, as may be observed in the Norman tympanum.

The distinctive disposition of stones just described would no doubt have been observed by earlier church historians but for the millennium of grime, together with lichen and moss growth externally, which tend to obscure the stone detail in church wall structures. Bedding trace



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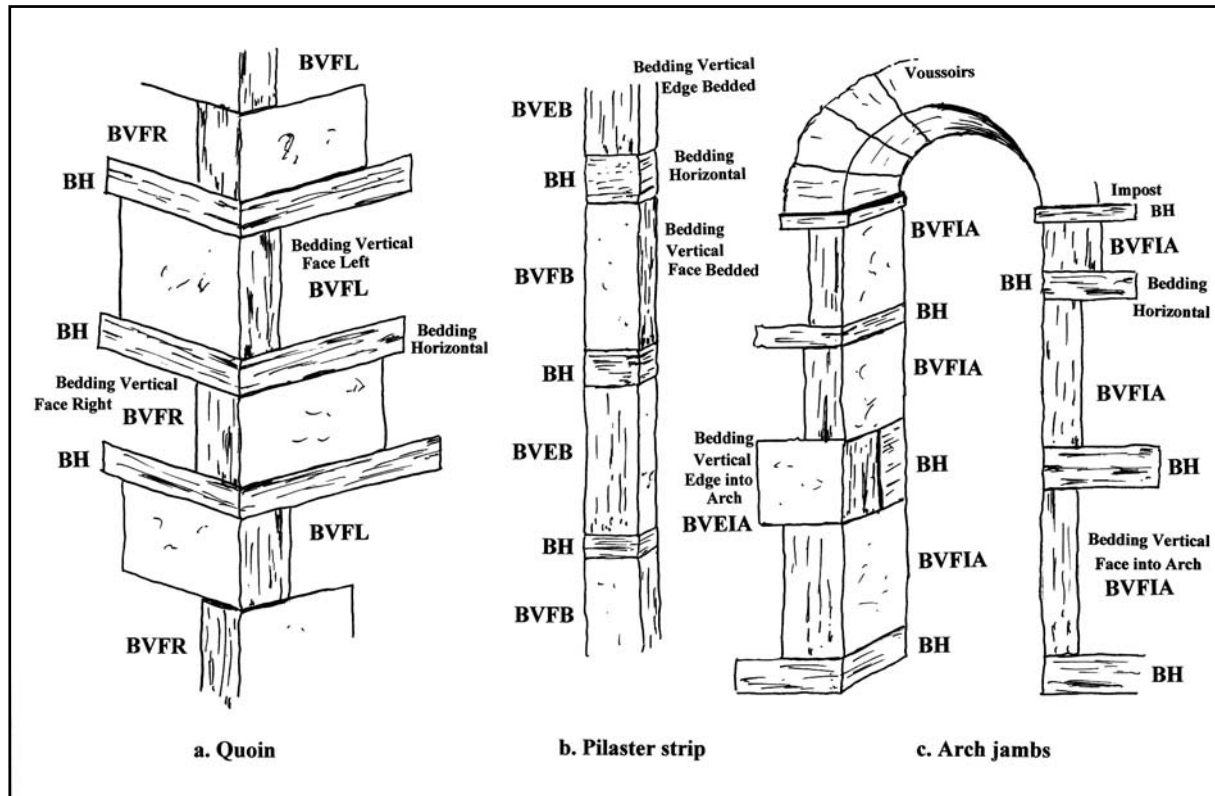


Fig 1 Possible stone bedding orientations of Anglo-Saxon 'Patterned' work

(It should be noted that bedding in stone is rarely as pronounced in appearance as is shown in the figure)
 (The BVEIA stone in the left arch jamb shares its position with a BH stone and would in this instance probably be a replacement stone dating from Post-Conquest times, as Anglo-Saxon arch jamb stones are normally through stones)

orientations, as well as rock identifications, are frequently also obliterated by renders, washes and cement coverings applied both internally and externally in the name of protection. Strong, oblique lighting and a powerful hand lens may assist in interpretation. As stonemasons generally, and Anglo-Saxon masons in particular, at the time of building structures like quoins, rarely employed more than one type of stone, rock identification plays an important part in interpretation. The existence of more than one type of rock in a church structural feature generally suggests that replacements of stone have proved necessary. In the descriptions that follow, stones are identified 1, 2, 3, 4,.... from ground level to as high as identification can be determined.

Figure 2 illustrates the geographical position of each of the six churches described. Each church is situated geologically on rocks of lithologies of the Middle Jurassic and the detail of this rock succession is given in Table 1.

**ST JOHN THE BAPTIST, BARNACK
 TF 079 050**

The village of Barnack, City of Peterborough, is renowned in ecclesiastical terms both for its early church and also for its ancient quarries, some traces of which still remain (Fig 2, Ba). From the quarries, the widely used Barnack Stone, from the Middle Jurassic Inferior

Oolite Group (Table 1), was worked in Roman times and perhaps then continuously until the late 15th century (Syers 1895-6; VCH 1906, 293-4; Jope 1964; Sutherland 2003, 80). It provides a hard, competent limestone rich in fragmentary fossils and these help to create distinguishable, stratigraphical bedding layers which relatively clearly delineate the rock orientation. Barnack church is built, as might be expected, almost entirely of Barnack Stone; not necessarily from the famous 'Hills and Holes' quarries to the west of the village, for there are signs of possible early workings very close to the north of the church.

The church and, in particular, its tower has attracted much attention (Fig 3), with complete or partial descriptions provided by Rickman (1817, 162; 1836, 34); Wright (1845); Syers (1895-6; 1899); Micklethwaite (1896, 336); VCH (1906, 468-71); Brown (1903, 205-7; 1925, 443); Clapham (1930, 103-4); Fletcher and Jackson (1945); Jackson and Fletcher (1949, 103); Taylor and Taylor (1965, 43-7); Pevsner (1968, 207-10; Rivoira (1975, 194); Fernie (1983, 139-41); Goodwin (1990) and Potter (2005; 2006, 73). The most comprehensive accounts are those provided by Syers (1895-6), VCH (1906), the Taylors (1965) and Goodwin (1990). Although the Barnack Stone and the 'long and short' style of the tower quoins and pilasters have been referred to in these descriptions, on no occasion has the revealing detail of the stonework been described.

A GEOLOGICAL REVIEW OF SOME EARLY CHURCHES IN THE NORTHAMPTONSHIRE AREA

Table 1: The Middle Jurassic rocks of the Northamptonshire area (partly after the British Geological Survey) (Note that the Blisworth Limestone Formation has recently been renamed the White Limestone Formation but that this new name does not appear to have been fully defined in Northamptonshire)

Stage	Formation	Member, Detail of Lithologies, Thickness	Group
Upper Jurassic			
Oxfordian			
Callovian	Oxford Clay (part)		Ancholme
	Kellaways	Kellaways Sand, 3-4.5m Kellaways Clay, 1.5-2.5m	
	Cornbrash	Upper Cornbrash, Bioclastic and 0- Lower Cornbrash, shelly limestone 3.3m	
Bathonian	Blisworth Clay	Mottled mudstone 0-7.5m	Great Oolite
	Blisworth Limestone	Ooidal, bioclastic, limestone and mudstone 4-9m	
	Rutland	Mudstone, limestone, sandstone 0-7m	
Bajocian	Wellingborough Limestone, Stamford, sandstone, mudstone	0-3m 0-6m	Inferior Oolite
	--- <i>U n c o n f o r m i t y</i> ---		
Aalenian	Lincolnshire Limestone	Ooidal limestones 0-12m	Inferior Oolite
	Northampton Sand	Ironstones, ooidal and ferruginous sandstones 0-15m	
--- <i>U n c o n f o r m i t y</i> ---			
Lower Jurassic			
Toarcian			
			Lias

Taylor and Taylor (1965, 43) advised that the 'Anglo-Saxon period is represented by the western angles of the nave and by the lower two stages of the tower'. This statement can now be modified, for although the original

detail may have been Anglo-Saxon much has been rebuilt since that period. Four quoins, those on the western faces of the nave and the tower, may still be examined; and their detail is represented in Table 2 below:

Table 2: Barnack church, quoin orientation, north-west and south-west nave, north-west and south-west tower

Stone	NW nave	Stone	SW nave	Stone	NW tower	Stone	SW tower
					<i>Second stage</i>		
40	?	24	BH		Too high to read	11	Too high to read
39	BH	23	BVFR			10	Too high to read
38	?BVFL	22	BH			9	Too high to read
37	BH	21	BVFR			8	BH
36	?BVFR	20	BH			7	BVFR
		19	BH			6	BH
		18	?BVFR		<i>First stage</i>	5	?
24-35	BH small	17	BH small	26-top	Too high to read	4	BH
23	BVFL	16	BVFL broken	25	BH	3	BVFR
		14-15	BH small	24	BVFR	2	BH
		13	BVFR small	23	BH	1	BVFR
				22	BVFR		<i>First stage</i>
7-22	BH small	9-12	BH small	21	BH		
6	BH brown oolite	8	BVFL small	20	BVFL		All but 3 stones
				19	BH		BH
lower	BH small	lower	BH small	lower	BH		small and replaced



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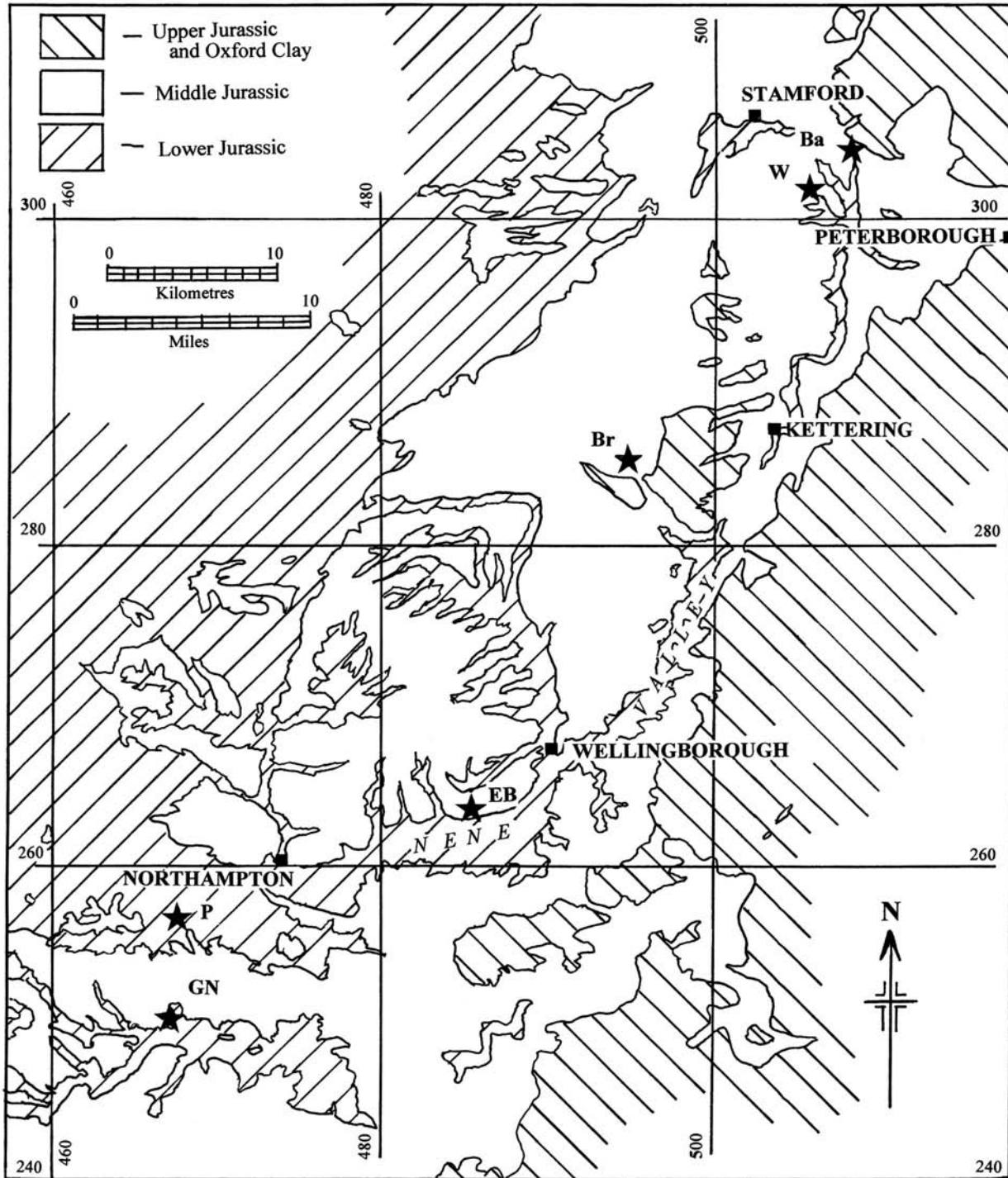


Fig 2 Map of the Jurassic rocks in the neighbourhood of Northampton (Churches are marked with a star: GN = Green's Norton, P = Pattishall, EB = Earls Barton, Br = Brigstock, W = Wittering and Ba = Barnack)

All the stones described as small, with one BH exception, appear to have been replaced; stone 6 in the NW nave quoin being replaced in more recent times with a rock of a different lithology. Even with the use of high power binoculars, the light at the time of inspections was too poor to read the orientation of the bedding in the highest stones, as in the second stage of the tower quoins. The nave quoins terminate at the roof lines of their respective

aisles. In the second stage of the tower, the SE and NE quoins are visible above the aisle roof lines, but these stones were also too high for interpretation. That many of the quoin stones in the first stage of the western angles of the tower were not original (Fig 4), failed to be noted by Jackson and Fletcher (1949) when they chose these as an exemplar of their 'Type 3 quoins', an error which has been discussed in Potter (2006a).





Fig 3 View of Barnack church, showing the Anglo-Saxon tower (photograph, A Chapman)

The pilasters of the tower have suffered far less modification proportionately with time than its quoins. From ground level, it is possible to read the orientation of the lowest portions of the pilasters in the first stage, and their detail is provided in Tables 3 and 4:

Table 3: Barnack church, pilaster orientation, north face of tower

Stone	NE pilaster	central pilaster	NW pilaster
15	BH	-	-
14	BVEB (L)*	-	-
13	BH*	Orientation uncertain	-
12	BVEB (L)*	BVEB (L)	-
11	BH*	BH	-
10	BVEB (L)*	BVEB (L)	Orientation uncertain
9	BH*	BH	BH*
8	BVFB (L)	BVEB (L)	Orientation uncertain
7	BH	BH	BH
6	BVEB (L)	BVEB (L)	BVEB (L)
5	BH	BH	BH
4	BVEB (L)	BVFB (L)	BVFB (L)
3	BH	BH*	BH*
2	BVEB (L)	BVFB (L)	BVFB (L)*
Pedestal	BH	BH	BH

The lower portion of the NE pilaster in the tower north face is figured (Fig 5).

Small stones inserted in orthodox pattern with their bedding horizontal, without any vertically bedded stones between, clearly emphasise the evidence of later repairs both in the quoins and the pilasters: furthermore, they draw attention to areas of wall fabric surrounding them which have also on occasions been repaired. In suitable lighting, this is particularly evident on the south face of the tower.

Stone orientation in the jambs of the various windows and doorways in the tower also assists in determining which of these represents unaltered Anglo-Saxon or 'Patterned' work. In the lower first stage of the tower, the impressive 'Escomb fashion' south doorway was apparently blocked until 1855 (Syers 1895-6, 145). It displays stone orientations in both the door jambs and outlining strip-work set in typical Anglo-Saxon style of BVFIA and BH (Fig 6), a number of the stones exhibiting cut backs (certain stones may, however, have been replaced in its arch). The window beneath the early sundial in the same wall possesses similar jambs. Likewise, the triangular-headed window in the west face and the round-headed window in the north face of the tower's lower stage are constructed with early BVFIA and BH jambs. A small replacement stone has been added, nevertheless, to the sill of the triangular west face window.



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Fig 4 The north-west tower quoin of St John the Baptist, Barnack clearly displays the change in the Barnack Stone bedding orientation in its first stage (The lowest stones (below stone 19, stone 20 BVFL) bedded BH are later replacements)



Fig 5 In the north face of the tower at Barnack church the north-east pilaster displays the frequency with which the long stones, in particular, are orientated BVEB

Table 4: Barnack church, pilaster orientation, west and south face of tower

Stone	West face of tower			South face of tower		
	North-west	Central	South-west	South-west	Central	South-east
14	-	-	-	BH*	-	BH
13	-	window	-	BVEB (L)	-	BVEB (L)
12	-	?	uncertain	BH	uncertain	BH
11	-	BH	BVEB (L)	BVEB (L)*	BH	BVEB (L)
10	uncertain	BVEB (L)	BH	?small+	BVEB (L)	BH
9	BH	BH*	BVEB (L)	?small+	BH*	BVEB (L)
8	BVEB (L)	BVEB (L)	(Many	?small+	BVFB (L)	BH
7	BH	BH	small	?small+	BH	BVEB
6	BVEB (L)	BVFB (L)	stones	?small+	-	BVFB
5	BH	BH	set	?small+	-	?small+
4	BVEB (L)	BVEB (L)	BH)	BH	-	?small+
3	BH	BH	BVFB	BH offset	door	BH
2	BVEB (L)	BVFB (L)	BVFB (L)	BVFB (L)	-	BVFB (L)
Pedestal	BH	BH	BH	BH	-	BH
Plinth	BH	BH	BH	BH	-	BH

Key for Tower Pilaster records (Tables 3 and 4):

L Long stones in 'long and short' work, see Potter (2006a)

* stones showing obvious evidence of typical Anglo-Saxon style cutbacks (Potter 2006a)

? or uncertain orientation of bedding not determined with certainty (also includes unrecorded higher stones)

Small rebuilt areas of small stones; oolitic biomicritic (not Barnack Stone) marked +



Fig 6 The south doorway of Barnack church has its vertically orientated stones set in Anglo-Saxon style (BVFIA and BH)

In contrast, in the tower second stage most of the openings have been renovated, each exhibiting jambs built only of later conventionally emplaced BH stones. Syers (1899) advised that at his time the majority of the windows were blocked. In the west wall it is known that all the openings in this stage were restored in 1936 (Taylor and Taylor 1965, 45). The jambs of the triangular-headed belfry window with a ribbon-work *transenna* above the clock in the south face, as well as the windows in a similar position on the three other tower faces clearly show evidence of rebuilding. Indeed, only the west window in the south wall and the east and the west windows in the north wall appear to still preserve their original jambs. The east face of the tower, which carries three pilasters high in the second stage of the tower, possesses a lower doorway which once entered an upper level of the nave. From below, in each of these features the stone orientation is difficult to determine.

It proves impossible to read most of the stone orientat-

ions beneath the now lightly plastered and once painted tower arch (although the lowest four through stones in either jamb are set BH, BVFIA, BH, BVFIA; Fig 7). Similarly, it is difficult to currently read the orientations in the stone seat set within the tower (in which the arching stones appear to have been replaced). Both structures appear to be constructed in Anglo-Saxon style (Taylor and Taylor 1965, 46). Syers (1895-6, 145) reported that the seat, together with others, was discovered on excavation below the mid-19th-century, then existing, tower floor. Taylor and Taylor also discussed the eastern extent of the nave. They, and other authors, described the many further interesting features of this church.

The tower of Barnack church, despite later alterations particularly in its interior, exhibits many aspects of late Anglo-Saxon craftsmanship. Goodwin (1990) inferred that the nave is likely to have been erected at some period prior to the tower. The failure of the tower's north and south walls to align vertically with the respective



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Fig 7 The tower arch of Barnack church is built in Anglo-Saxon style and the lowest readable jamb stones are orientated in the fashion of the period (BVFIA and BH)

nave quoins provides further slight evidence in support of the proposal. Heavy pointing covers the external contacts between the tower and nave, making their full relationship impossible to determine.

ALL SAINTS, WITTERING TF 056 020

Wittering church (Fig 8), within the boundaries of the City of Peterborough, is only about 3km from Barnack, on the opposite, western, side of the Roman Ermine Street (Fig 2). The body of the church is constructed of Barnack Stone, but of a lithology slightly at variance with this stone, suggesting an origin that might have been closer to Wittering. The nave and chancel provide an exemplar of many features of unaltered Anglo-Saxon or 'Patterned' workmanship. Despite this, the church has received less attention than many other churches of this period, with descriptions of variable quality appearing in Freeman (1849, 209); Sutton (1895-6, 85-7); VCH (1906, 540-1); Brown (1903, 107-9; 1925); Keyser (1917); Clapham (1930, 108, 111); Jackson and Fletcher (1949); Taylor and Taylor (1965, 678-80); Pevsner (1968, 367); Fernie (1983, 165) and Potter (2005a; 2006a).

The quoins of the nave and chancel very clearly display the manner of their construction as has been illustrated in Potter (2006a, 72, 78-9). The stone detail, omitted from that paper is given in Table 5 below.

Each of the long stones in the quoins is orientated with its bedding vertical and the explanation as to why this should be so is given in Potter (2005a, 180-1). As detailed in Potter (2006a, 78-9), the Anglo-Saxon



Fig 8 View of Wittering church, showing the Anglo-Saxon chancel and the later raised roof line (photograph, A Chapman)

Table 5: Wittering church, quoin orientation, nave and chancel

Stone	NW nave	SW nave	NE nave internal	SE nave	NE chancel	SE chancel
13				eaves	?	?
12	eaves	eaves		BH	?	
11	replaced	BH	?	BH	BH	BH
10	?BVFL	BVFL	?	BVFL	BVFR	BVFR
9	BH	BH	BH	BH	BH	BH
8	BVFR	BVFL	?	BVFL	BVFL	BVFR
7	BH	BH	BH	BH	BH	BH
6	BVFL	BVFR	?	BVFL	BVFL	BVFR
5	BH	BH	BH	BH	BH	BH
4	BVFR	BVFL	BVFL	BVFR	BVFL	BVFR
3	BH	BH	BH	BH	BH	BH
2	BVFR	BVFR	BVFR	BVFR	BVFL	BVFL
pedestal	BH	BH	?	BH	BH	?covered
plinth	BH	BH	?	BH	?covered	?covered

masons extracting the stone from the original quarry face appreciated that this stone possessed only moderate incipient bedding planes. More especially Barnack Stone is frequently current-bedded (see for instance Sutherland 2003, fig 9.1a), which may result in a quarried block not



Fig 9 The stones in the north-east chancel quoin at Wittering church are set in Anglo-Saxon style; above the pedestal, stones 3, 4 and 5 have been cut back and stone 4 (BVFL) might be described as 'pear-shaped', and the quoin does not sit squarely on the plinth

having parallel sides. The blocks of stone were obviously delivered to the church site in this state. Placed in a quoin with two external faces at right angles and to stand with their bedding planes vertical, greatest stability would be gained by standing each on its larger end face (Fig 9). The blocks in the quoins might then appear 'pear-shaped' (a term used by Jackson and Fletcher 1949, 10). With the quoin erected and set in the wall, the Anglo-Saxon masons could then trim and cut back the stones decoratively to the width of the narrowest stone, against a plumb-line suspended from the top of the quoin. Because the stones were not perfectly square in cross-section in most quoins the width of the raised decorative band in the different quoin faces can be seen to be at variance. Largely for the same reason the stones of the quoin do not sit squarely or centrally on their respective pedestals. (These pedestals are described by Taylor and Taylor 1965, 678, as 'square bases'.)

The narrowest stone in each of the visible quoins which determined stone alignment and controlled the amount of cut back in each quoin may be listed as:

- NW nave quoin; west face, ?BVFL stone 10; north face, possibly BVFR stone 8
- SW nave quoin; west face, not determinable; south face, top of BVFL stone 4
- NE nave quoin; east face only partially visible
- SE nave quoin; east face, BVFL stone 6, south face, BVFR stone 4
- NE chancel quoin; east face only visible, BVFL stone 2 and BVFR stone 10 (which is slightly narrower).
- SE chancel quoin: east face, BVFL stone 2 and BVFR stone 8, south face, stones 4, 6, 8, and 10. Stone 4 is slightly wider than others on the south face.

Taylor and Taylor (1965, 678), noted a feature that proves to be more common than they seemed to have envisaged throughout churches of Anglo-Saxon or 'Patterned' style (Potter in press). They described an element of decoration in the insertion of horizontal bands of broader stone in both the nave and chancel of the BH emplaced rubble walls of Wittering church.



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Although the south doorway to the nave reveals none of its early origins and has been rebuilt; the chancel arch has been described as ‘of massive grandeur unequalled in any other of the smaller Anglo-Saxon churches’ (Taylor and Taylor 1965, 679). Perhaps originally true and well described architecturally by these authors, a detailed examination of the stonework reveals significant rebuilding. Possibly, much of the replacement was undertaken at the same time as the building of the Early English tower, both being of a similar Barnack-type Stone (although some of the still later ‘rebuilding’ appears to be of hard plaster). The opening is ornamented with a nearly rectangular pilaster-strip which is carried over the arch on the nave side. This decoration is absent on the east side. This both tapers, to the face, and upwards as it ascends the arch jambs. It is difficult to assess just how much of the archwork is original, for plaster and wash cover, and shadow on the south side, hide any bedding

lineations from view. On the north side the larger stones in the pilaster-strip are clearly placed BVFIA and some of the stones in the jamb itself although set with their bedding horizontal (BH) are through stones and probably original (Fig 10). Examination of the lowest stone of this jamb reveals that these original complex archwork carvings were all completed within individual large through stones. Although the dedication date for the church is recorded as 981, it is thought that such multifaceted workmanship, presumably completed on site, is likely to have been completed nearer to the end of the Anglo-Saxon period.

The church roof is covered with fissile, slightly micaceous, thin sandy limestone flags, often incorrectly referred to as slates, probably obtained from Collyweston. The deposit occurs in the Lower Lincolnshire Limestone Formation of the Inferior Oolite (Table 1).



Fig 10 The north jamb of the chancel arch at Wittering, which is here viewed from the nave, exhibits typical Anglo-Saxon characteristics; however, many stones have been replaced, but the original through stone at its foot reveals that the complex carvings were created from a single stone.



**ST BARTHOLOMEW, GREEN'S NORTON
SP 669 499**

Moving into Northamptonshire and south-west of Northampton, Green's Norton is situated only about a kilometre to the west of the Roman Watling Street (Fig 2). The early Anglo-Saxon church is today enclosed within the later medieval walls of the tower, aisles and chancel. The principal stone used in these enclosing buildings is the brownish Northamptonshire 'Ironstone': more strictly, the Northampton Sand Formation, a rock of very variable character, again from the Inferior Oolite Group (Table 1). Varieties may be calcareous with or without oolites, speckled dark green with the iron silicate chamosite if unweathered, or simply sandy limestones. In the medieval walls there is some evidence that the different varieties were used at dissimilar times. Whether these were extracted from diverse localities or different beds from the same locality is unknown. The modern vestry (built 1923) and its later supplementary buildings at the north-west end of the church, for instance, are of a finer grained sandy variety.

Aspects of the church have been described, amongst



Fig 11 Three types of stone are visible in this view of the foot of the south-west nave quoin of Green's Norton church. The darker (brown) stone in the tower (left) and aisle (right) is from the Northampton Sand Formation; Anglo-Saxon stonework is represented by white limestone rubble in the nave wall, probably of local Blisworth Limestone, and its dressings in the Barnack-like Stone of the quoin, set BVFR, BH, BVFL

others, by Anon (1891-2); Brown (1903, 338; 1925, 454-5); Jackson and Fletcher (1949); Pevsner and Cherry (1973, 239-40) and Potter (2005a). Taylor and Taylor (1965) described the manner in which the quoins of the original Anglo-Saxon church nave appeared to the immediate north and south of the later west tower. Only at the higher and newer levels is the tower bonded into the nave. The 'Patterned' character of the early quoins is revealed in their long and short style. In typical Anglo-Saxon fashion the quoin stones are of a different, contrasting, and durable rock type; one more suitable for the creation of three-dimensional blocks than was the rubble limestone wall fabric of the early nave (which may be observed more clearly inside the church). The quoin stones are of a shelly, moderately oolitic limestone very similar to the Barnack Stone of the Inferior Oolite, and thus obtained from near Peterborough.

The bedding orientations in successive stones can be viewed most readily in the SW nave quoin, where they clearly display the workmanship of Anglo-Saxon masons and can be analysed from ground level as follows: BH, BVFR, BH, BVFL, BH, BVFL, BH, BVFR, BH, BVFL, BH, BVFR, BH, BVFR, BH, higher stones uncertain (Fig 11). The vestry in front of the north-west nave quoin prevents its structure being properly determined.

Entering the church the dimensions of the early Anglo-Saxon nave can be seen, for the eastern quoins are present. They exhibit a long and short disposition on the south-east side, but it is generally too dark to read the stone orientations. The original nave walls are thin, about 780mm. They are constructed of a biomicritic limestone, in which the fossil fragments are very small. This limestone is likely to have been quarried from a local small outcrop of the Middle Jurassic, Great Oolite. Above both the arcades, the early nave wall preserves limited traces of windows, the best preserved of these being the round arch stones of a blocked window at the western end of the north arcade. The 14th-century medieval aisle walls pass eastwards, beyond the east wall of the original nave to create an ambulatory. The chancel was probably widened to the width of the nave in more regular courses of thinner pieces of what is probably Blisworth Limestone, and a new chancel arch of Early English style inserted prior to this extension. Above the chancel arch, a blocked, triangular-headed doorway with typical Anglo-Saxon sloping jambs remains.

Several other interesting rock types may be observed in the church monuments. In the north aisle, apart from an alabaster tomb more recently set on an Inferior Oolite bioturbated sandstone base, they include a further tomb to the Greene family made of *Viviparus* limestone ('Purbeck Marble') from Purbeck; these materials indicating significant wealth (Potter 2004). At the entrance to the south porch, the relatively recent paving utilizes Bunter cobbles from the Triassic, Sherwood Sandstone Group.

**HOLY CROSS, PATTISHALL
SP 671 572**

Pattishall church displays many similarities with Green's Norton church. First described by Brown (1903, 77) who noted a Domesday reference to the church, the Anglo-



Fig 12 The north-west quoin of Pattishall church has been rebuilt to include stones of Middle Jurassic oolite to help to tie the aisle (left) to the original Anglo-Saxon nave

Saxon characteristics are referred to again by Brereton (1903-4); Brown (1925, 475); Taylor and Taylor (1965); Pevsner and Cherry (1973, 370-1) and Potter (2005a). Only a few kilometres north of and close to, but on the east side of Watling Street (Fig 2); like Green's Norton church, Pattishall church envelops an earlier Anglo-Saxon building. Again, brown Northamptonshire Sand Formation rocks predominate in the enveloping church walls. These are of various lithologies, some tending to be rather more calcareous. The original Anglo-Saxon stone dressings were once more of Barnack Stone and these remain well-exposed in the largely rebuilt NW nave quoin (Fig 12). The stone orientations support an Anglo-Saxon or 'Patterned' origin and from the base read as follows: BH, BVFR, BH, BVFL, BH, thin tie stone (BH), BVFL, thin tie stone (BH), while others rising to above the tower string course are of similar orientation but this is difficult to confirm from a distance. Although the whole has a long and short appearance, the tie stones are not of Barnack Stone or of Anglo-Saxon age (as suggested by Taylor and Taylor, 1965, 483): they are of a less shelly Middle Jurassic oolite and were presumably inserted at the time of erection of the north aisle. The NE nave quoin, seen only above the north vestry is also of Barnack Stone and of long and short style; internally, in the vestry, its lower portion is hidden by plaster. The SE quoin is largely rebuilt and that at the SW, cement rendered.

The blocked north doorway to the north aisle has clearly been reset in this position and it is much modified. The larger Barnack Stone blocks in the jambs, externally, are set in 'Patterned' style with their bedding faces directed into the arch, BVFIA. These stones have been chamfered, probably at the time of the doorway's insertion into the aisle. Internally, nothing of the early structure of the doorway is visible. The equivalent south aisle doorway fails to oppose that in the north aisle and it is of Early English style. The south porch appears to possess reset Anglo-Saxon 'Escomb fashion' jambs at its entrance. However, the blocks are not of Barnack Stone but of a Northamptonshire sandy ironstone and close examination reveals that, doubtfully, only one, possibly two, stones may be set BVFIA. Slate inserts have occasionally been placed in the mortar to level the stones and it must be concluded that the whole structure is relatively modern.

Reference should be made to the west tower in that its very lowest courses are again of Barnack Stone. Here, the stone appears to have been used for its properties of strength and durability. Other aspects of the tower; as its west doorway, and higher, its partial construction with a cream, shelly oolite, thought to be White Limestone (until recently known as Blisworth Limestone, Table 1) from local small outcrops of the Great Oolite; clearly indicate that it is not of Anglo-Saxon origin.

Inside the church, the doorway from the nave to the tower has been described as looking 'early in character' (Taylor and Taylor 1965, 484). However, none of its stonework exhibits a vertically bedded style and it is more probably of 13th-century origin. Similarly, the chancel arch possesses certain Anglo-Saxon characteristics in its simplicity and style of ornament, but its stonework of Middle Jurassic oolite is not of stone from Barnack and many of the stones seem to have been sawn, with others inserted in Norman style (BVEIA), leaving its origins uncertain but more probably of early Post-Conquest age.

ALL SAINTS, EARLS BARTON SP 852 638

The west tower at Earls Barton church is probably the most frequently illustrated example of Anglo-Saxon architecture in England. First described by Rickman (1817; 1836); the works of Wright (1845); Waller (1846); Freeman (1849, 212-3); Micklethwaite (1896; 1898); Brown (1903, 184-90; 1925, 452-3); Clapham (1930, 109); VCH (1937, 116-22); Fletcher and Jackson (1945); Jackson and Fletcher (1949); Radford (1953); Fisher (1962, 214-20); Taylor and Taylor (1965, 222-6); Pevsner and Cherry (1973, 195-6); Rivoira (1975, 200); RCHME (1979, 40); Audouy (1981); Fernie (1983, 143-4); Audouy *et al* (1995); Potter (2005a; 2006a) and Hart (2006) are some of the many adding to the literature on the church. Although there is much else to view in the church, this paper will only touch upon certain aspects of the Anglo-Saxon tower.

Each of the tower's quoins is built in long and short style and preserved almost to the tower's full height (Fig 13). They are constructed of Barnack Stone which generally



Fig 13 The south face of the Earls Barton, tower; note that the quoin stones are of variable width

displays the bedding orientations with reasonable clarity. For example:

NW quoin the successive stones read:

First Stage; BVFR, BH, BVFR, BH, BVFR, BH, BVFR, BH, BVFL, BH, BVFL, BH, BVFR, string course (BH, cut back on underside);

Second Stage; BVFR, BH, BVFR, BH, BVFR, BH, BVFR, BH; second string course (BH), etc.

SW quoin; BVFR, BH, BVFR, BH, BVFL, BH, BVFL, BH, BVFR, BH, BVFR, BH, etc.

Between the quoins, the faces of the tower are decorated with pilasters which are again of Barnack Stone. Each pilaster rises from a pedestal or corbel, those rising from ground level being, in turn, on the plinth which supports the tower. Rather than provide a lengthy list of the orientations of those pilaster stones in which the bedding orientation can be read, it is more appropriate to here offer certain conclusions regarding their emplacement.

The longer stones are placed with their bedding orientated vertically in all determinable instances, either edge-bedded (BVEB) or face-bedded (BVFB). It is noticeable that the majority are edge-bedded or BVEB (refer also to Fig 5). It seems likely that the pilaster stones were generally split to the requisite pilaster face width within the quarry, and there can be observed to be some variation in the level of accuracy to which this was acceptably completed. In working the rock with a chisel it is simpler to follow the bedding, stratification or 'grain' of the rock. A mason in a quarry is, therefore, more likely to work a stratified rock from its edge to obtain a required thickness, which at Earls Barton for the pilaster stones was about 120mm. In many Anglo-Saxon churches it proved necessary to cut back part of particular stones to achieve such an equal ornamental width. The cutting back process, was generally best undertaken where the stone involved was held securely within a wall, as at Wittering. The practice was discussed also at some length in Potter (2006a).



The tower at Earls Barton is often cited as an example of proof of Anglo-Saxon use of render. Certainly, the tower faces have been infilled with render (in places at least three layers are present, but these would appear to be 'modern', the last application mainly to the upper parts occurred in 1992 (Audouy *et al* 1995) and both pilasters and quoins stand proud of the render. Brown (1903, 88) appears to have been the first author to describe cut backs in stonework and he argued that their purpose was to provide 'a stop for plaster', a view that has subsequently prevailed. Fletcher and Jackson (1945) further made the case that pilaster strips were inserted to subdivide and strengthen these areas of Anglo-Saxon plaster, and in a later paper classified the different styles of this provision (Jackson and Fletcher 1949). At Earls Barton, it has been argued that the necessary cut backs are today successfully hidden beneath the visible render or 'plaster'. Although not identified as such, some of the ornamental pilaster stones may show possible evidence of cut backs in the photographs of others (see both Audouy *et al* 1995, illus. 9 and 11 and Sutherland 2003, 79, Plate 9.2). As illustrated, however, these 'cut backs' could equally well be infilling pointing. The lack of equality of widths in the proud faces of all the quoin stones (Fig 13) strongly suggests that cut backs are not present in these stones. More extensive arguments against the Anglo-Saxon use of render are presented elsewhere (Potter 2009).

Although the Earls Barton tower has been described as the 'most noteworthy architectural monument of its period in England' (Brown 1925, 283), and it is of delightful appearance, several aspects of the workmanship lack precision. Rivoira (1975, 200) went as far as describing the tower as 'the swan's song of Anglo-Saxon architecture'. Quoins and pilasters have been built of the same Barnack Stone but no attempt to match the pattern of their insertion is evident. This is a feature of the work at certain Anglo-Saxon churches such as Bracebridge in Lincolnshire. It is also unusual for the tower to have a different number of pilasters on each face.

In 2006 (2006a, 75), the present author interpreted an illustration in Clapham (1930, Plate 40), together with visual observations from ground level, of the tower's string-course between the first and second stages as unexpectedly including a number of stones cut back on their lower side. Examination of many further photographs suggests that this provides a rare instance of cut backs on horizontal stonework.

Taylor and Taylor (1965, 223) described the west door of the tower as 'an outstanding example of monumental stone-work'. Both the door jamb stones and the surrounding pilaster strips exemplify quality Anglo-Saxon or 'Patterned' workmanship with the stones set either BVFIA or BH (Fig 14), and minor later repairs have only proved necessary to the south pilaster strip. The other openings in the tower have been well described by Taylor and Taylor (1965). In the west face the first stage double window, of which internally some evidence remains, has been replaced by a single window constructed at least in part with a limestone that is not Barnack Stone. The door that passed originally between the east face and the upper chamber of the nave would appear to have its jamb stones placed BH and would seem to be later or replaced.



Fig 14 The stone orientations in the west doorway of Earls Barton tower support its Anglo-Saxon origin

Otherwise, although a number of the openings have been altered with time, in contrast to Barnack church, the stones remaining in these structures appear to be largely original with many jamb stones orientated with their bedding vertical.

The tower walls may be observed where the render has fallen. They are built of fragments of white limestone laid largely as tidy, horizontally-laid rubble. The limestone was almost certainly quarried locally from a local outcrop of the Wellingborough Limestone (Table 1).

Inside the church, the tower's eastern quoins are preserved although most of their bedding cannot be examined under the plaster cover. They are normally believed to be original. It is generally assumed that this is correct, and because they remain unaltered they were initially constructed to be visible. Any original building to the east would then have been required to be narrower than the tower: an example of such a form being the early church of St Peter at Restenneth, Angus, in Scotland. An opportunity to examine the detail of these quoin stones would, therefore, be advantageous. The tower arch provides no clues for it has been widened and altered.

ST ANDREW THE APOSTLE, BRIGSTOCK SP 946 852

The Anglo-Saxon aspects of Brigstock church were first noted by Rickman (1836) and subsequently they have



Fig 15 View of the Anglo-Saxon tower at Brigstock church, abutted by the circular stair turret, left, and a later aisle, right, (Photograph, A Chapman)

attracted considerable attention (as Carpenter 1865-6; Keyser 1920; Brown 1903, 336; 1925, 445; Clapham 1933; Fletcher and Jackson 1945; Jackson and Fletcher 1949; Taylor and Taylor 1965, 100-5; Pevsner and Cherry 1973, 122-3; Fernie 1983, 138-9; Howe 1999 and Potter 2005a, 190). Those portions of the church to be typically identified as of early pre-Conquest fabric are the tower (below the Decorated higher portion and spire) together with its western stair turret, and the remnants of the original nave (Figs 2 and 15).

The church tower most readily reveals Anglo-Saxon features, its principal fabric is of a rubble of Blisworth Limestone (the 14th-century upper portions being of Stanion Stone). The dressings are of a harder, biomicritic, oolitic and pellety limestone, which is probably a local variety of Stanion Stone (Table 1), a rock somewhat similar in lithology to Barnack Stone. The western quoins of the tower are well exposed. Inside the church, the western quoins of the nave are rather less well displayed. The higher stones in the nave quoins above the aisles have been, at least in part, replaced. Stone orientations of these four quoins are given below (Table 6).

This analysis indicates a limited level of stone replacement, as for instance stones 5 to 7 in the NW tower quoin. There has also been minor patching with later infills. Although the majority of the stones in the western nave quoins appear to only abut the tower, three stones (indicated 'into tower') are shaped into its south face. Taylor and Taylor (1965, 104) have sketched the SW tower quoin and, of the four quoins, it most typically

displays long-and-short style. A small portion of the SE nave quoin is visible inside the church and in it two BVFL stones can be identified. Adjacent to this quoin and in the east wall, there is evidence that the chancel arch was once wider than the present 15th-century arch.

The tower possesses a number of fine Anglo-Saxon openings on its ground floor. Details of the tower arch, for simplicity, are tabulated below (Table 7).

It should be noted that a number of stones in the pilaster strips have been cut back (marked where clearly evident with an asterisk). The strip voussoirs are similarly cut back to provide the strip with a constant proud face width of $c195\text{mm}$. In contrast the jamb stones to the arch retain variable widths. The bold rectangular impostes are shared by the arch jambs and their respective strips, with the number of stones beneath the impost varying according to stone size.

On the occasion of recent visits to view the tower structures the lighting had significantly improved. It is now possible to rectify the present author's previous conclusions with regard to the tower arch. In 2005 the cut backs, now visible, were omitted from a larger countrywide analysis (Potter 2006a). Furthermore, Carpenter's detailed sketch (of 1875-6), is now believed to portray considerable artistic licence. Although a number of the stones have been modified, few of the stones (if any) appear to have been completely replaced (see Potter 2005a).

Taylor and Taylor (1985, 103) argued that the round-headed doorway in the north wall of the tower was a



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Table 6: Brigstock church, quoin orientation, tower

Stone	NW tower quoin	SW tower quoin	NW nave quoin	SW nave quoin
-	newer work	newer work	-	-
string-course	string-course	string and infill	-	-
20	replaced	BH	-	-
19	BVFR	BVFL	-	-
18	BH	BH	-	-
17	BVFL	BVFR	-	-
16	BH	BH	-	-
15	?BVFR	BVFL	-	-
14	BH aisle roof	BH	-	-
13	BVFR	BH	aisle roof	-
12	BH	BVFL aisle roof	replaced	aisle roof
11	BVFR	?	?	-
10	BH	?	?	?
9	BVFR	?BVFL	?	BH
8	BH	BH	BH	?
7	BH	BH	BH	BH into tower
6	BH	BVFR	BH	?
5	BH	BH	?	?
4	BH	BVFL	BH into tower	BVFL
3	BVFL	BH	BH	BH into tower
2	BH	BVFL	BVFL	BVFR
Pedestal	BH	BH	3 x BH	3 x BH broken
Plinth	BH	BH	-	-

Table 7: Brigstock church, pilaster orientation and jambs, tower arch

Stone	Pilaster strip south side	Jamb south side	Jamb north side	Pilaster strip north side
Impost	BH	BH	BH	BH
8	?	-	?	-
7	?	-	?	?
6	BVFIA	BVFIA	?	?*
5	BVFIA	BH	BH	?*
4	BH *	BVFIA	BVFIA	?*
3	BVFIA	BH	BH	?*
2	Pedestal BH	BVFIA	BVFIA	Broken pedestal
1	Gap below 2	BH 'plinth'	BH 'plinth'	Gap below 2

* pilaster strip with cut back

Norman insertion. Viewed with improved lighting from its south side the right (east) jamb in particular shows its Anglo-Saxon origins. Although the lowest stone has been replaced, those above are placed BVFIA (through stone), BH, BVFIA (through stone) in true Anglo-Saxon style. One of the large BVFIA through stones remains on the west jamb. The doorway, seen from the north, certainly shows extensive alteration. Anglo-Saxon doorways in this position are undoubtedly not unknown, as for example at Old Shoreham in Sussex.

The assessment by Taylor and Taylor (1985, 103) that the triangular-headed doorway in the west wall is contemporary with the tower is surely correct. The large, through stones of the jambs are set BVFIA and the

only modifications are the later steps to the stair turret and added chamfers to the east side of the jambs for a door fitting. This west doorway leads to the stair turret and it is easy to attribute it incorrectly to the turret (as Carpenter 1875-6, 240). The evidence suggests that the turret is in fact a more recent addition to the tower, how much so is difficult to assess. The two small rectangular turret windows 'have no very characteristic features to fix their date' (Taylor and Taylor 1965, 101). They could well have been constructed in the 17th or 18th centuries. The turret plinth, although similar in shape and style to that of the tower, abuts against the tower plinth (visible north side). The turret incorporates many burnt stones in its fabric and is composed of a rubble of mixed local



Fig 16 From the external view, the double-splayed window on the northern wall of the tower at Brigstock church shows evidence of having been replaced; note that the jamb stones (all BH), fit irregularly into the wall and that the sill stone is new

DISCUSSION: RESERVATIONS AND CONCLUSIONS

This analysis of the stonework of six early Northamptonshire area churches (the first two associated with Peterborough) was selected largely on the facility of parking and ease of access. The churches figured in recent visits of national parties conducted by the author. The present work is intended only to draw attention to the importance of careful scrutiny and record of ecclesiastical stonework and the descriptions offered here must be supplemented in all instances by the cited work of others.

In recent years the author has provided similar analyses for churches elsewhere in Britain (Potter 2005a; 2005b; 2005c; 2006b; 2006c; 2006d; 2007; 2009). In all instances, the Anglo-Saxon or 'Patterned' use of stone has been both distinctive and diagnostic, irrespective of the rock type involved or the individual stone's geometrical shape when used. Furthermore, and perhaps regrettably, it has not been confined to churches of any particular period of construction of post-Roman and pre-Conquest age. It is absent only in areas where the local stone has proved unsuitable for structural or decorative purposes, as in the Chalk, flint areas of East Anglia. No other region of Britain is perhaps more fortunate than Northamptonshire in the provision of stone that can be both relatively easily hewn to shape and yet possess qualities of strength, durability and competence. Certain Middle Jurassic limestones, such as Barnack Stone, are even superior to the Norman, and later, imported Caen Stone in the provision of these properties (see Potter 2005d). For this reason the Anglo-Saxon long-and-short and Escomb styles are universally in evidence in the churches of the period in the region. Elongated blocks of Barnack and similar stone could be readily quarried to meet the style requirements. Because of this the determination of stone bedding orientation in the region is somewhat less discerning, for it is likely to parallel the block shape. Despite this, from the randomly chosen selection of early churches, certain pieces of additional information have been determined using the properties afforded by particular stone bedding orientations.

Several aspects of ecclesiastical geology have been stressed in this work in the belief that they can prove as of much interpretive value to church historians as architectural, archaeological or documentary evidence. The interpretation of stone bedding orientation in emplaced stones can prove invaluable and examples of this importance, such as in the determination of Brigstock's tower north doorway being Anglo-Saxon, can be cited. Studies at Wittering church provided evidence as to the manner of quoin construction and the purpose of cut back stones. At Pattishall, for example, the importance of correctly identifying differences in rock types and lithologies was stressed, for there it enabled the later tie stones to be distinguished.

Two specific points with regard to stone bedding orientation should be recorded. There are many instances where the orientations in structures are at the present unreadable, this may be because they are too high, too dirty or poorly lit, or covered in render, wash or plaster. At the time of the erection of scaffolding, cleaning, or

limestones, one of which is described by Carpenter (1875-6) as from Little Oakley.

The windows in the north and south walls of the tower are single-splayed and their jambs are characteristically set BVFIA as viewed from the respective aisles. The visible double-splayed window in the north wall of the upper floor of the tower, viewed from inside the bell chamber is plaster-covered and externally appears to have been much altered (Fig 16). Taylor and Taylor (1965) believed this window to be of later Anglo-Saxon date, supporting this argument on a change in wall fabric in the higher portion of the Anglo-Saxon section of the tower. This is not the view apparently held by the Royal Commission (Howe 1999) or the present author and there is little evidence visible for such a change in wall fabric.

There is a change in wall fabric, however, created at the time of the raising of the clerestory walls above the nave, probably in the 14th century. In the north nave wall, above the Transitional arcade, the remains of the blocked early window occur but leave insufficient evidence to give detail of stone orientations.

of the removal of surface coverings, attempts should be made to examine and record the stonework for any stone lineations that might be revealed. In certain aspects of stonework the Normans as well as the Anglo-Saxons used stones in specific orientations (Potter 2006a). Secondly, great care is required in the replacement or re-insertion of individual stones. Stones re-inserted should be placed in the original bedding orientation. Stones being replaced can generally be distinguished, for their lithologies are unlikely to be identical to the original stones (the quarries for the original stones no longer being known or available). However, with replacement a modern BH orientation should be encouraged to prevent misinterpretation of the date of insertion.

The approach to church interpretation described in this paper, involving geology and stone bedding orientation in particular, can be utilized, with equal success, on all early churches in the region. As far as can be deduced, just two churches nationally fail to abide by the practices of Anglo-Saxon or 'Patterned' bedding orientation, one of these, Brixworth, occurs within Northamptonshire. That the foundations of Brixworth church, with their confirmed northern *porticus* are Anglo-Saxon, is not in doubt. Structural stonework that should exhibit Anglo-Saxon bedding orientations, but fails to do so, for example, occurs in the tower, its ground floor (porch) south doorway jambs, its first floor east windows into the nave, and in the north-east chancel quoin. That the church has been extensively rebuilt is not in question, rather, precisely when this occurred requires further critical analysis.

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