

Do Chancels Weep?

Does the often noticed difference between the alignments of nave and chancel actually mean anything?

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The possibility that the difference between the alignments of church nave and chancel had any meaning has been dismissed by writers in the past, but without any real data. Here, the results of a survey of almost 1000 medieval rural churches provide the opportunity to assess on a large scale whether there was any reason for these observed differences. The results demonstrate that differences in alignment are not random, but show 'intent'. Even though half of the misalignments are to the left and half to the right, the further the alignment of the nave is away from east, the more likely it is that the misaligned chancel will be closer to east than the nave. Similarly, the more modern the chancel, the greater the likelihood that it will be correcting the earlier 'error' in alignment. Even where naves and chancels appear to have been built at the same time, some chancels show alignment 'improvement', where the chancel is closer to east than the nave.

Introduction

The variation in alignment of nave and chancel of some churches has given rise to the folk tale, known as 'weeping chancels'^{1,2}, which holds that, particularly in cruciform churches, when viewed from above 'chancels align to the left (more northerly) of naves, where the nave represents the body of Jesus on the Cross, with his head, the chancel, inclined to the left'.

This subject has rarely been mentioned by most serious writers, except dismissively. It has normally been seen as the preserve of the less academic part of the sector, often on a par with ley-lines.

Thompson, in the early years of the last century, refers to the 'popular explanation' of the symbolism of the cross, commenting on the 'general' northward inclination of chancels of churches where the axis of nave and chancel were

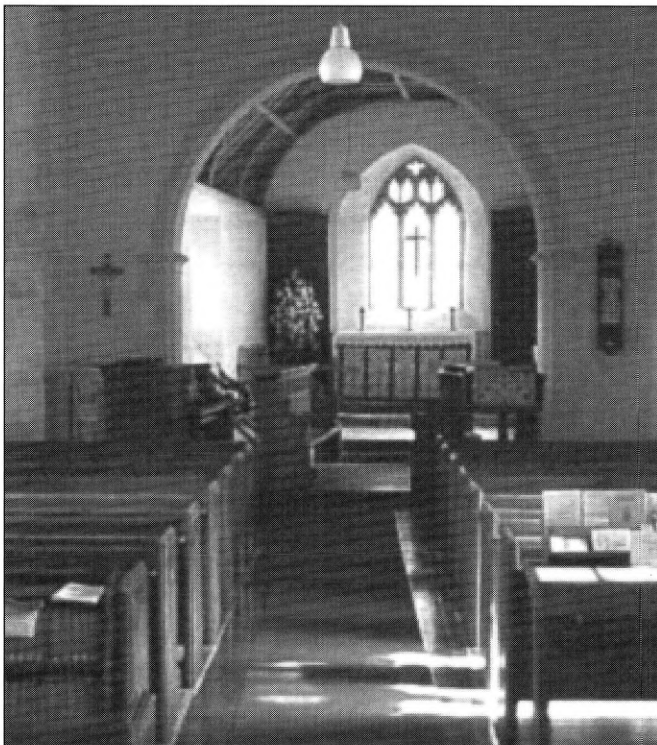


Plate 1 – St Ervan, Cornwall – chancel misaligned right (not weeping) by 7°, improving the alignment from 81° to 88° True

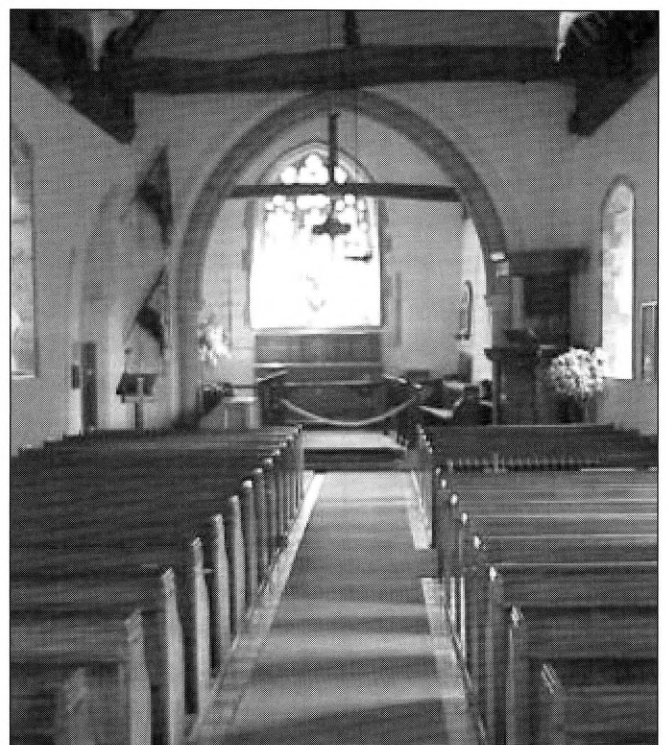


Plate 2 – St Simon, East Dean, East Sussex – with a short chancel, 'weeping' by 14 degrees, but also improving the alignment from 104° to 90° True

different³. He goes on to say that *'like most symbolical explanations, this is founded entirely on fancy'* and notes that the phenomenon was not limited to churches with cross plans. According to Thompson, *'others'* had sought to explain the subject by suggesting the orientation of the chancel followed the direction of sunrise on the morning of the Patronal feast. He also cites examples of realignments on sloping sites, where *'masons kept as high on the slope as they could, so twisting the axis of the chancel'*. Each of these issues will be considered using the results from this survey.

Bond, writing at a similar time, refers to the same general issues, but points out that misalignment, as ecclesiastical symbolism, *'had escaped the notice of the ancient liturgists.'*⁴ He also points out the images of Christ on the Cross were usually represented with his body and head in a straight line *'until the twelfth century or later'*⁵ effectively excluding this as an image that might have been copied for churches set out before this. He makes two other points which concern large and urban churches, which are not included in this survey. Firstly, he cites many examples of large churches where the choir was rebuilt encasing the earlier choir making it *'impossible to see whether the axis of the new choir was being set out precisely in the line of the old nave'*⁶, and secondly, mentions the possibility of site restrictions in urban situations as a potential cause for misalignment. Neither of these really apply in the case of the small rural churches of this survey, although proximity to the churchyard boundary will be considered later.

Cave⁷, in his pre-war survey, concluded that the small percentage of 'skewed chancels' (16%), and the way that the numbers fell off as the skew became larger, indicated accidental faults in setting out. What he did not do, was to compare the differences in alignment with the actual alignment of the nave, to see if there had been some attempt to align the skewed chancels closer to East.

More recently, Rodwell refers to *'setting out errors which equate to the thickness of one side wall, a very commonly found fault'*⁸ as an explanation for many of the strange shapes that church floorplans take. As far as the issue of alignment differences between nave and chancel is concerned, it will be shown here that the majority of these errors appear not to be random.

Diagram 1 illustrates the four possible situations involving churches where the nave and chancel have different alignments, demonstrating that chancels that are aligned left of their nave (Cases 1 and 3 - 'weeping') can also be 'improving' the alignment towards east where the nave is aligned south of east (Case 3).

Fieldwork - sites, dates and methods

The results used here form part of a larger survey structured for other reasons to cover specific areas of the country - North Suffolk / South Norfolk, North Cambridgeshire, Shropshire, East Kent, East Sussex, North Somerset, East Riding of Yorkshire and Cumbria. All the rural medieval churches in these areas, described by the relevant volume of Pevsner's 'Buildings of England', were surveyed on the ground, except those described as having had their naves rebuilt. The exclusion of churches with a rebuilt nave was to ensure that a post-medieval, especially Victorian, rebuild had not altered the alignment of the nave.

The fieldwork was undertaken during the summer and autumn of 1999, February, May, July and December 2000, February and summer 2001, May and June 2002. In order to assist in standardising readings, especially on undulating walls, or those built of cobble flint, they were taken with a Silva Type 15 compass fixed to a piece of wood 75 cm long (with brass screws!). Where possible, readings were taken inside the church, two on each side of the nave and chancel. If external readings were required, three readings were taken on both the north and south sides of the chancel, and of the nave, an attempt to remove anomalies caused either by the local magnetic variations caused by iron in, or near, the walls, or caused by north and south walls which were not exactly parallel. If there were differences of more than 1 degree between the readings for either part of the building, they were retaken at different places. A mean was taken of the results, to provide a single reading each for the nave and the chancel.

This type of compass can be read to an accuracy of 1°, therefore any churches with a difference of 1° between the mean readings of nave and chancel have been omitted from this analysis, to exclude the possibility of opposing reading errors on the nave and chancel of a non-misaligned church being included. Although readily visible from inside the church, a real difference in alignment of a single degree between nave and chancel can be difficult to detect when readings are taken outside the church. Finally, the magnetic compass readings were adjusted to True readings by deducting the current magnetic declination (the difference

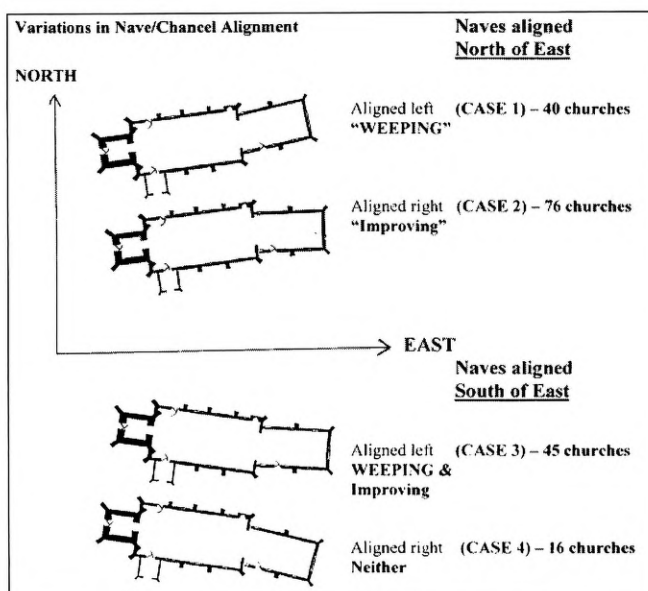


Diagram 1

between Magnetic North and True North - discussed later) in the area⁹, listed in Appendix 1.

Since the analysis here is concerned with the relative alignment of nave and chancel, the absolute accuracy and 'statistical significance' of a particular measurement or group of measurements is not relevant. Throughout this piece, summary tables have been placed in the text, the full table with the same table number is shown in Appendix 2.

Accidental or intentional alignments

Were the different alignments of chancels relative to their naves a result of accidental errors, or a result of intentional misalignment or re-alignment? Although on the surface it appears that the errors are random, with almost half of the chancels misaligned left and half of them to the right, several factors point to this having been deliberate, or at least non-accidental.

Firstly, it would have been easier, and neater, to follow a single alignment either when originally setting out or rebuilding part of a church building. The eye is offended by a deviation from a straight line in a wall. It goes against the natural sense of order.

Secondly, an error, even as little as 2°, would have been noticeable very early in the process and could have been rectified at trench or footings stage.

Thirdly, it would have been easy to set out lines parallel to an existing nave for a new or extended chancel to enable them to be aligned the same way, even with the most basic of equipment, even just two pieces of string. For some reason, these were not set out that way.

Fourthly, the number of churches involved. Why should easily avoided setting out errors have been so widespread?

Lastly, and most importantly, if the errors were random, or consisted merely of setting out errors, then it would be expected that the errors would be the same through all the ranges of nave alignment. If the numbers of chancels misaligned left (north) and right (south) were distributed equally throughout the whole range of nave alignments, then the numbers improving the alignment towards east would be the same as those worsening the alignment. This is definitely not the case, as the results in Table 1 and the diagrams below show. An extremely marked element of improvement of the original alignment of the nave towards east is apparent, in other words chancels are aligned closer to east than their naves regardless of the naves original alignment. In a church with a nave aligned north of east, a chancel aligned left (weeping- **Case 1**) would be compounding the alignment error of the nave from east. Table 1 shows that of churches with naves aligned north of east (naves less than 88° True), only 45 of 135 chancels (33%) were weeping. Of these, the most extreme nave alignments (less than 73° True), only 5 of 19 (26%) were weeping. Conversely, chancels which are misaligned right (**Case 2**) tend to improve the earlier alignment error. This is

the case for 90 of the 135 (67%) churches with naves aligned north of east in this study.

Nave alignment	Total	% improving	% not improving	% left (weeping)	% right (not weeping)
North of East					
Less than 73°	19	74	26	26	74
All less than 88°	116	67	33	33	67
88-92°	41	22	78	71	29
South of East					
All more than 92°	61	74	26	74	26
More than 102°	17	82	18	82	18
Total	218	60	40	52	48
Total (exc 88-92°)		% improving	% not improving	% left (weeping)	% right (not weeping)
	177	68	32	48	52

Of the churches with naves aligned south of east (naves more than 92° True), 45 of 61 (74%) have weeping chancels (**Case 3**) which are closer to east. Of the most extremely aligned churches (naves at more than 102° True), 14 of 17 (82%) have weeping chancels. In other words four fifths of these chancels are improving the nave's alignment error. These proportions are shown pictorially in Diagram 2 below. The left diagram shows plainly that the majority of churches with naves north of east are misaligned right, therefore correcting the alignment (33 left : 67 right), and the majority of those with naves aligned south of east have chancels that are misaligned left, in other words they are both weeping and correcting the alignment (74:26) (centre diagram). Taken overall, as the right-hand diagram shows, for all misaligned churches, those misaligned left (weeping) are almost exactly balanced by those misaligned right, 52:48.

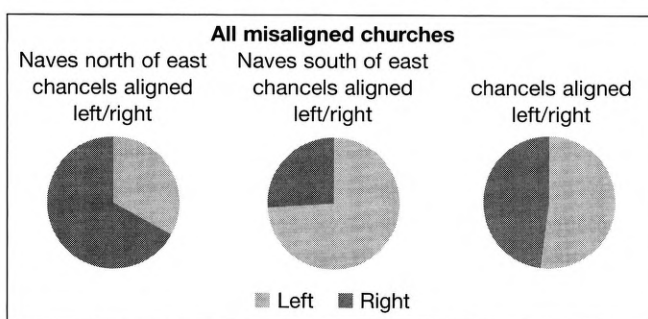


Diagram 2 – Comparative alignment of chancels of all misaligned churches, when nave is aligned north or south of east

If there was no particular reason for the misalignment, then it would be expected that the balance shown in these overall figures would be mirrored in the two groups that make it up.

Forty one naves of misaligned churches are aligned very close to east (within 2° - the 88-92° group in the table above) and present a confused picture, often with naves aligned one side of east and chancels the other. When these churches are removed from the table above, the overall proportion of chancels improving the nave alignment increases to 68%,

whilst still leaving the balance between left and right (weeping/non weeping) roughly even at 48% and 52%.

The improvement of alignment can be seen in the graph in Diagram 3. The results have been smoothed using a rolling 5 average. Overall, the chancels of the 218 churches are closer to 90° (east) than their naves, demonstrated both by the taller peak of the 'chancel' curve close to 90°, and its narrower shape overall.

Realignment during rebuilding

Many chancels were extended or completely rebuilt during the late 13th and early 14th centuries for liturgical and space reasons. Were they realigned at this stage? Due to the problems of dating the earliest parts of church fabric, and for the sake of consistency, the assessments of period have been taken from the relevant 'Pevsner' and the results shown in Table 2.

Of the 218 churches in this analysis, Pevsner considers 60 chancels to be later than their nave, seven naves to be later than their chancel, 93 naves and chancels to be of the same period, and no comment is made on the period of either the nave or the chancel for 56 churches. This last group is shown separately in the table but is exactly divided between weeping and non-weeping, and also exactly divided between improving and non-improving. Therefore they do not affect the proportions other than to dilute the impact of the groups that do show 'improvement'.

The chancels of three quarters of the 60 churches with later chancels are realigned closer to east, but are almost equally divided between those that are misaligned left and those misaligned right (52:48), weeping and non-weeping respectively. When the churches with naves aligned close to east are excluded (in Table 4), the proportion of chancels

All misaligned churches	Total	% improving	% not improving	% left (weeping)	% right (not weeping)
Churches with later chancels	60	75	25	52	48
Other Churches	158	54	46	53	47
Total	218	60	40	52	48

realigned closer to east increases to 84%, whilst the ratio of weeping to non-weeping remains close to even, at 46:54.

Within this group, the proportions of post-medieval chancels that are realigned closer to east are marginally higher in both instances, but the samples are small - 18 and 16 respectively. (shown in the full version of Table 4 in Appendix 2). This leaves the question of the churches with different nave/chancel alignments which have apparently never had any rebuilding. Taken with churches where either nave or chancel is of unknown age they are classed as 'Other churches' in Table 3. Those with chancels closer to east than their nave amount to only 54%, close to what might be expected for random errors. 53% of these chancels are aligned left (weeping), compared with 47% aligned right.

Rebuilding of chancels resulting in different nave/chancel alignments was not restricted to churches with their naves aligned furthest from east. Throughout the range of nave alignments the proportion of rebuilt chancels is almost exactly the same, shown in the last column of Table 4. With exceptions in two of the smallest groups, shown in the full Table 4 in Appendix 2, the proportion is very close to 28% of each alignment group.

Churches with rebuilt chancels that have naves aligned north of east have a greater bias towards realignment to the right (Case 2) (19:81). Similarly, those with naves aligned

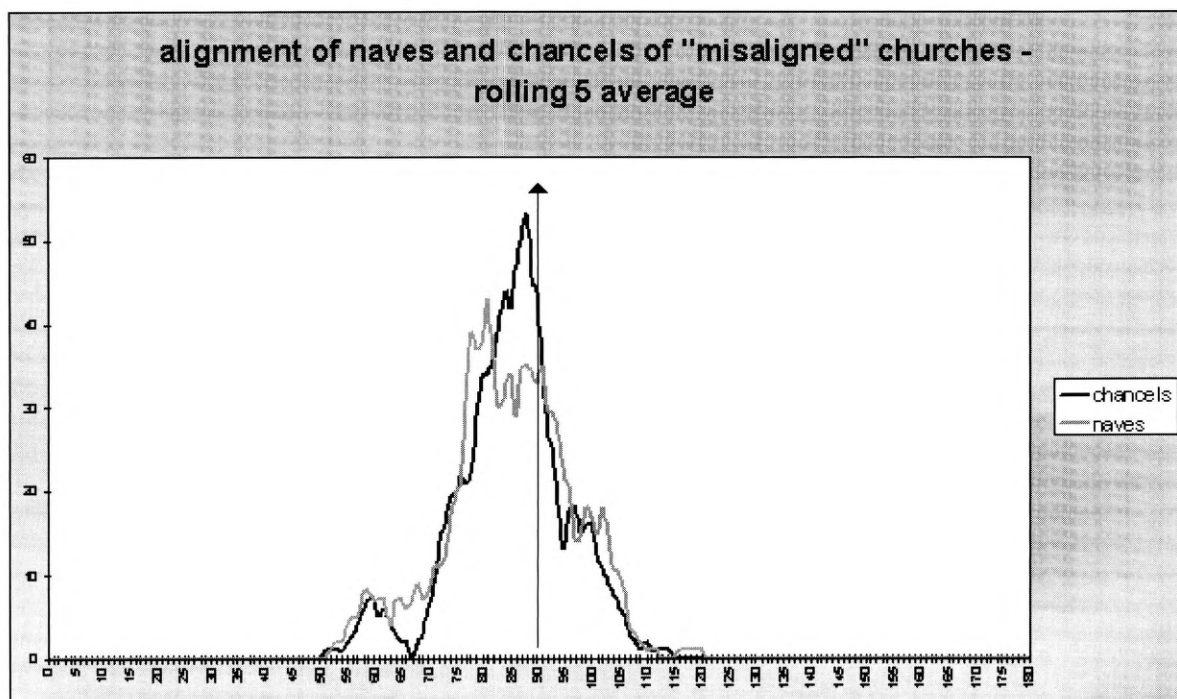


Diagram 3 – Alignments of naves and chancels – demonstrating the improvement in alignment, with chancels close to 90°

Table 3 – Alignments by relative dates of naves and chancels (excluding naves aligned between 88 & 92°)

Excluding churches 88-92°	Total	% improving	% not improving	% left (weeping)	% right (not weeping)
Churches with later chancels	52	84	16	46	54
Other Churches	125	62	38	49	51
Total	177	68	32	48	52

Table 4 – Comparison of Misaligned and Rebuilt Chancels

Nave alignment	Total misaligned	% of misaligned	Rebuilt chancels	% of rebuilt chancels	Rebuilt as % of misaligned
Less than 88°	116	53	31	50	26
88-92°	41	19	8	13	20
More than 92°	61	28	21	35	34
Total	218	100	60	100	28

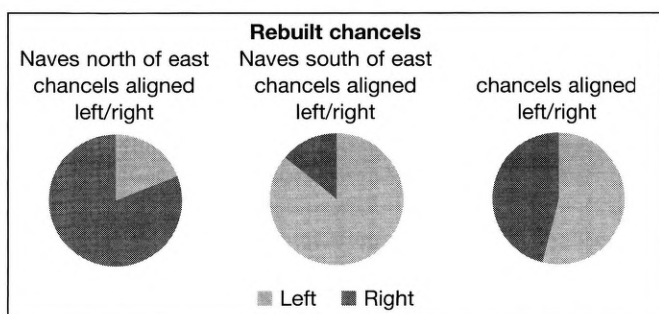


Diagram 4– Comparative alignment of chancel in churches with rebuilt chancels, when nave is aligned north or south of east.

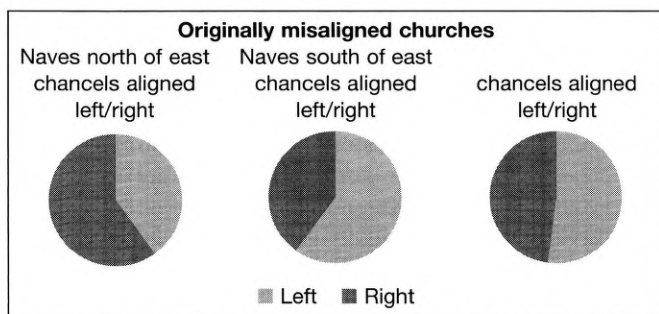


Diagram 5 – Comparative alignment of chancels in churches where nave and chancel are of the same 'period', when nave is aligned north or south of east

south of east have rebuilt chancels that are aligned left (Case 3) (86:14). When taken together, however, these concentrations all but cancel each other out. The right hand diagram above shows how, overall, the proportions of those misaligned left (weeping) are almost balanced by those misaligned right, 52:48. The variation in figures becomes more marked when those churches with naves aligned close to east (between 88 and 92°) are excluded, rising to 83% improving the alignment (83:17), whilst the overall situation is still almost balanced at 46% aligned left (weeping) and 54% right (46:54).

When considering churches that do not appear to have rebuilt chancels, it must be assumed that they were originally built misaligned. The results are illustrated in Diagram 5. When those churches with naves aligned close to east are excluded, the misalignment left: right proportions of 49:51 demonstrate that this is likely to be random, but the proportions of cases

Table 5 – Churches with Rebuilt Chancels by alignment of nave

Nave Alignment	Total	% improving	% not improving	% left (weeping)	% right (not weeping)
Less than 88°	31	81	19	19	81
88-92°	8	25	75	88	12
More than 92°	21	86	14	86	14
Total	60	75	25	52	48
Total (exc 88-92°)	52	83	17	46	54

Table 6 – Churches originally misaligned, by alignment of nave

Nave Alignment	Total	% improving	% not improving	% left (weeping)	% right (not weeping)
Less than 88°	85	60	40	40	60
88-92°	33	21	79	67	33
More than 92°	40	68	32	68	32
Total	158	58	42	53	47
Total (exc 88-92°)	125	62	38	49	51

improving the alignment compared with those worsening it is 62:38 - not random in a sample of this size.

It is possible that some of the churches included in this table, with naves and chancels of apparently the same age, or where the age of one or the other is unknown, may in reality have had their chancels rebuilt and realigned, and that these are confusing the picture, and should therefore be included in the 'rebuilt' table. Establishing if this is the case without the deconstruction of every church will be difficult. It is also possible that all these churches were actually originally built misaligned with the specific aim of aligning the chancel more closely to east, although this leaves the question of why was the whole building was not aligned more 'correctly'. A series of simple setting out errors would produce a random result, not one where almost two thirds of the chancels are aligned closer to east than their naves.

In summary, rebuilt chancels are aligned closer to east than their naves in over 80% of cases. This level of improvement is even higher for chancels rebuilt during the post-medieval period. Churches with rebuilt chancels have the same nave alignment profile as the group as a whole, ie their naves face a similar range of directions in relation to east. Naves in each alignment group, however far from east, had a similar proportion of chancels realigned. This confirms that the degree of error in original alignment was not a factor in the decision to rebuild the chancel.

The manner in which realignment was achieved

It has been shown that rebuilt and realigned chancels improve the alignment of the churches towards east, but this poses several further questions. Was the new alignment closer to True East or to Magnetic East at the time of the realignment, or was it realigned closer to the position of sunrise on the Patronal Saint's day? If a compass was used to

set out the new alignment, then the chancel would have been realigned towards magnetic east rather than True East. Where was magnetic east when the church was realigned? The east-west difference between a magnetic direction and the true direction is known as magnetic declination. It was first measured in London in 1576¹⁰, and has been projected backwards in time by using datable objects which have thermo-remnant magnetism¹¹, enabling a graph of the movement of the magnetic pole to be plotted. Diagram 6 shows the author's extract of the declination from Merrill's combined declination and inclination plot¹².

During the medieval era, apart from a 50 year period between approximately 1325 and 1375, magnetic east was always south of True East, being approximately 20° south of

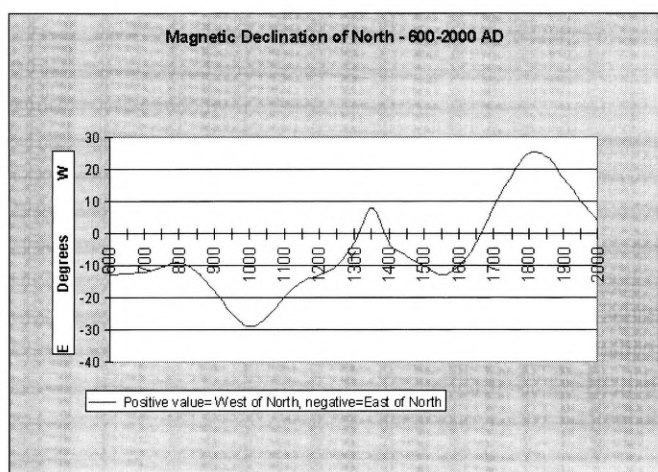


Diagram 6 – Magnetic declination of North between 600 and 2000AD (Author's extract of declination from combined plot of magnetic declination and inclination, after Clark et al p659)

True East in 1100, 15° in 1200 and 7° in 1300, 7° in 1400 and 14° in 1500, resulting in magnetic easts in these years of 110°, 105°, 97° and 104°, compared with True East (90°). Therefore any realignment using a compass before this date would have been made towards magnetic east, ie towards 100° True or more, rather than to True East at 90°.

Fewer churches are realigned closer to Magnetic East (approx 100°T), than are align closer to True East (90° T) - a reduction in the numbers of those 'improving' alignment to 48% (from 60%) for all the misaligned churches. These figures are shown in Table 7.

The same figures for churches with a later, but still medieval, chancel, show an even greater bias towards True East, with 74% aligned closer to True East and 26% further away, compared with 55% realigned closer to Magnetic East at the time and 45% further away. This indicates that realignment was made towards True East, rather than magnetic east, thereby effectively excluding the compass as the method at this time.

Post-medieval rebuilding of chancels, often a Georgian exercise, would have taken place in a period when magnetic north was west of true north. In 1800, magnetic north was

approximately 25° west of north, meaning that magnetic east at that time was 65° True. If a compass was used without adjustment for declination, it would result in alignments for east of 65°T.

Of the 18 churches in this survey with chancels rebuilt in the post medieval period, nine are realigned closer to Magnetic East (65°) and nine are aligned further away. Since

All misaligned churches		
	% improving	% not improving
Chancels aligned closer to Magnetic East than nave	48	52
Chancels aligned closer to True East than nave	60	40
Churches with later, but medieval chancels		
	% improving	% not improving
Chancels re-aligned closer to Magnetic East	55	45
Chancels re-aligned closer to True East	74	26

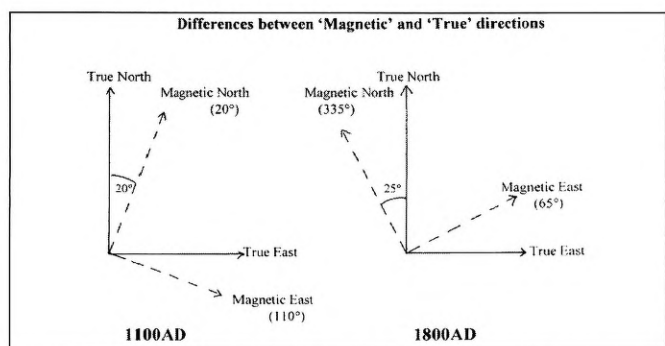


Diagram 7 – Variations between Magnetic and True directions

it was shown earlier that 16 of these churches were aligned closer to True East (90°) and only two further away, either a compass was not used, or appropriate adjustments were made to the readings to take declination into account.

The question as to whether realignment was towards the Patronal Saint's sunrise

It is thought that the concept of alignment towards sunrise on the day of the Patronal Saint may have originated as a Masonic tradition. It is quoted in 1859 in the History of Freemasonry¹³, but uses William Wordsworth's earlier reference in a poem in 1823¹⁴ as corroboration. In his poem, he refers to a vigil on the site on the night before the dedication of the church, and the fixing of the sunrise point the next morning. Earlier references to the idea date back to the 17th century¹⁵ and the words quoted are very similar to those used in Wordsworth's poem, indicating that the 19th century references were merely repeats of a much earlier idea.

Whether the whole church faces this sunrise, or not, has been researched many times over the years, with different conclusions. Here, the issue is whether the chancel of

misaligned churches is closer to Patronal Saint's sunrise than the nave. There are two particular problems affecting this part of the analysis. The first involves church re-dedications, either at a change of ownership in early times¹⁶, or as part of the later religious upheaval in the 16th and 17th centuries, when many dedications were altered to one of the Biblical Saints or to 'All Saints', to have a less idolatrous feel¹⁷. Re-dedication would hide the fact that a church may have been correctly aligned to its original dedication. The second concerns multiple festivals for the same Saint, which may be far apart in the calendar with consequently very different sunrise times, therefore positions of the sun on the horizon. Despite the variation in sunrise positions of the various Saint's days (between 46° and 116°), virtually half of all chancels, irrespective of the dedication of the church, are re-aligned closer to their sunrise and half are re-aligned further away, demonstrating that sunrise on that day played no part in the ultimate alignment of the chancel (Table 8).

Where there are two feast dates for a particular dedication, the alignment figures in brackets refer to the sunrise position in brackets.

The effect of slope on misalignments

As Thompson noted, misalignment may have been to compensate for, or take into account, the slope of the churchyard. Building involving a slope is generally easier if the axis of the building runs directly down or directly across the slope. The stresses involved are simpler to deal with if only one wall requires buttressing, however, this is not the case for the churches here.

In order to test whether the slope of the site was a factor in either the misalignment or re-alignment of chancels, the proportions of misaligned churches and of all churches on sloping sites must be compared. If slope had been a problem, then a greater proportion of misaligned churches would appear on sloping sites. Table 9 shows that 61 of 218 (28%) of misaligned churches in this survey are built on a slope of more than 2% (a slope of 1:50), while the equivalent figure for all the churches in the survey is 25% - confirming that the slope itself was not a determining factor in the misalignment. In addition, the direction of the misalignment would also play a part. If slope had been a problem, misalignment would be more likely to be closer to the

direction of the slope to ease the stresses to the building. Of these 61 churches, 28 (46%) of the misaligned chancels are closer to the direction of the slope (or closer to 90° to (across) the slope) and for the remaining 33, the misalignment of the chancel is further from the direction of the slope (or across it), indicating that the fact that the church was built on a slope played no part in the misalignment of the chancel.

An opportunity to deal with slope related problems would have occurred when chancels were rebuilt, when they could have been realigned to compensate. Of the 60 churches that

Table 9 – Effect of slope on churches

Churchyard slope	All Churches		All misaligned churches		Rebuilt (later) chancels	
	No	%	No	%	No	%
Flat or slope less than 2%	694	75	157	72	46	77
Slope more than >2%	227	25	61	28	14	23
Total	921	100	218	100	60	100

Pevsner identifies as having later chancels, which were examined earlier, 14 (23%) are built on slopes of more than 2%, repeating the proportion of churches on sloping sites in the whole survey, re-emphasising the fact that the slope in itself was not a factor in the re-alignment. Of these 14 churches, eight (57%) were re-aligned closer to the direction of the slope (or across it) and six (43%) were re-aligned further from the slope, indicating that slope does not appear to have been the determining factor to rebuild. Slope therefore appears not to have played any part either in the building of churches that were originally misaligned or those that were realigned when chancels were rebuilt.

The effect of site restrictions on misalignments

One final consideration is that restrictions of the churchyard may have caused the church to have been built misaligned in an attempt to align the church towards east on a site with insufficient space to align the whole church the same way. This analysis is complicated by the fact that the churchyard boundaries will probably have changed over the years, although rural churchyards in general are more likely to have expanded, to deal with the pressure of extra burials, than contracted.

Those churches that are still close to one of their

boundaries show no increased likelihood of being misaligned. As Table 10 shows, similar proportions of churches are misaligned (around a quarter), whether they are in restricted churchyards, as indicated by the distance of the closest boundary, or located in larger yards. This confirms that site restriction has not played a part

Table 8 – Alignment of chancels in misaligned churches in relation to Patronal Saint's day sunrise

	Sunrise position	Number of churches	Alignment -		Degrees from sunrise:-	
			improving	further away	of nave	of chancel
All Saints	105°	28	14	14	-10 to -42	-11 to -44
St Andrew	116°	11	4	7	-10 to -44	-8 to -40
St John	(46) 78°	9	(5) 6	(3) 4		
St Margaret	(58) 64°	10	(4) 5	(6) 5	-4 to +39	0 to +42
St Mary	too many dates					
St Michael	92 (98)°	13	7 (8)	6 (5)	-32 to +13	-34 to +8
St Peter	too many dates					
Total		71	36 (35)	36 (35)		

in the fact that these churches are misaligned. Neither does site restriction appear to have played a part during the rebuilding of chancels. The 60 churches with rebuilt chancels have the same profile of proximity to their boundaries as does the whole survey sample.

Characteristics of churches with misaligned chancels

In order to validate the sample, Table 11 compares the characteristics of the churches with misaligned chancels with the characteristics of the churches in the survey as a whole.

Apart from the difference in nave/chancel alignment, there appears to be little other difference between this group of churches and those with a single alignment constituting the remainder of the survey sample. Their distribution between the counties surveyed as shown in Table 12 in Appendix 2 is fairly consistent, and when analysed against other factors, for example, size, floor plan, tower type and dedication, the proportions in each category are remarkably similar. They cover the full range of sizes, from the smallest to the largest; they have similar floor plans in terms of the number of aisles, they have similar tower types and they are dedicated to a similar range of Saints (see Appendix 3).

The column on the right of Table 11 shows that an almost identical proportion of each group of churches are misaligned,

for example, 25% of those with two aisles, 22% of those of less than 190 square metres in area, 23% of those with a round tower, compared with the average of 24% of all churches, indicating no bias in the types of church involved.

Finally, as a group, they are aligned exactly the same way as the overall sample, the mean alignment of the nave of this group, and the survey as a whole being 86°. This appears to point to a random sample, which would be expected if random setting out errors were the cause of the misalignment. But that ignores the undeniable fact that in the majority of the misaligned churches, chancels face closer to east than their naves.

Conclusions

In answer to the two questions posed in the title, firstly, do chancels weep? Yes, half of all chancels that are aligned differently from their nave are aligned to the left of the nave and therefore do weep, but this is what would be expected of a sample of this size if the distribution were just random. The answer to the second question, 'does the misalignment actually mean anything?', is obviously yes, in the majority of cases. Since churches are almost equally split between left and right misalignments, it is obvious that there was no intention to represent an image of the Crucifixion, but churches with misaligned chancels fall into two groups.

Firstly, those that had their chancels rebuilt, of which over 80% were realigned closer to east probably as part of this process. The improvement of alignment during rebuilding, even though it is usually only by a few degrees, is further emphasised by the fact that the later the rebuilding of the chancel, the more likely there is to be an improvement in alignment towards east.

Secondly, those that were misaligned when they were first built. At first sight these appear to present an almost random variation of 54% closer to east and 46% further from east, but which increases to 62:38 when naves aligned very close to east are excluded. This appears to reduce the possibility of random setting out errors and shows that there

was intent even here - almost two thirds of these churches have a chancel aligned closer to east. This is supported by the fact that in the more extreme alignment groups, as the nave is aligned further from the east, higher proportions of chancels align more closely with east, even if apparently built at the same time as the nave. This poses the unanswerable question of 'why wasn't the church originally built straight?' Overall, however, these results strongly suggest that misalignment was not an accident of setting out, and was involved with alignment towards east. Any realignment where chancels are more modern than the naves tends to be towards True East, rather than magnetic east - demonstrating that the

Table 10 – Effect of proximity of churchyard boundaries on churches

Closest churchyard boundary	All Churches		Misaligned churches		As % of All	Rebuilt chancels	
	No	%	No	%		No	%
Less than 2 metres	49	5	11	5	22%	2	3
2-4 metres	179	23	49	19	27%	14	23
5-9 metres	283	27	59	31	21%	29	25
10 metres or more	410	45	98	45	24%	29	48
Total	921	100	218	100	24%	60	100

Table 11 – Comparison of misaligned churches with all churches in the survey

Category	Misaligned Churches		All Churches in Survey		% that misaligned churches form of 'all churches' in the same category
	Number	%	Number	%	
No Aisles	82	38	376	41	22
One Aisle	57	26	228	25	25
Two Aisles	78	36	317	34	25
	218	100	921	100	24
Church <190 sq m	72	33	335	36	21
190-300 sq m	96	44	339	37	28
>300 sq m	49	23	247	27	20
	218	100	921	100	24
No tower	26	12	120	13	22
Round tower	15	7	65	7	23
Square buttressed	111	51	527	57	21
Square unbuttressed	66	30	209	23	32
	218	100	921	100	24
Mean Alignment	86°		86°		

compass was not used for rebuilding before the late 16th century when magnetic declination was first measured. It may have been used during 18th century rebuilding and appropriate adjustments made.

Finally, neither sunrise on Patronal Saint's day, nor sloping sites, nor site restriction appear to have been factors in misalignment or realignment. Analysis by Patronal Saints day sunrise showed half the chancels closer to and half further from the relevant sunrise position. Similarly, half of chancels appear to align closer to the axis of the slope of the churchyard and half further away. In the first two cases, half

of the chancels are closer and half further away. Churches in more restricted churchyards are no more likely to be misaligned than those in large yards.

In general, it seems reasonable to conclude that churches were originally vaguely aligned eastwards, but for some reason, a more accurate orientation became increasingly important over time, which was realised when the opportunity arose through rebuilding. Did the intention change from a sunrise alignment to one aligned more generally towards east - or did developing technology allow a more accurate realisation of an original intention to align eastwards?

Appendix 1 - Calculations of Magnetic Declination for 1999 - 2002

Calculated by the Canadian Geological Service: http://www.geolab.nrcan.gc.ca/cgi_bin/geomag/MIRP/run_mirp - April 2000, July 2001, April 2002

Survey Areas	Lat	Long	1999	2000	2001	2002	Applied
North Cambridge	52° 55'N	0°		3° 20'w	3° 12'w		3° 16'w (3.3°)
Cumbria	54° 30'N	3° 05'W		5° 5'w	4° 55'w	4° 46'w	4° 56'w (4.9°)
North Somerset	51° 15'N	2° 30'W			3° 58'w		3° 58'w (4.0°)
Shropshire	52° 45'N	2° 45'W				4° 14'w	4° 14'w (4.2°)
East Sussex	51° 00'N	0°		3° 5'w	2° 57'w		3° 01'w (3.0°)
S Norfolk/N Suffolk	52° 30'N	1° 35'E	2° 48'w		2° 33'w		2° 40'w (2.7°)
East Yorkshire	53° 55'N	1° 05'W		4° 5'w	3° 56'w		4° 01'w (4.0°)
East Kent	51° 25'N	1° 20'E				2° 22'w	2° 22'w (2.4°)

The 'applied' figure in the right hand column was subtracted from the mean figure for each area to provide an overall True figure.

Appendix 2 - Full tables

Table 1 - All Churches with Misaligned Chancels - by alignment of nave

Nave alignment	Total	Improving alignment	Not improving	% improving	Left - weeping	Right - not weeping	% weeping
48-52°	0						
53-57°	4	3	1	75	1	3	25
58-62°	5	4	1	80	1	4	20
63-67°	3	1	2	33	2	1	67
68-72°	7	6	1	86	1	6	14
73-77°	22	15	7	68	7	15	32
78-82°	40	26	14	65	14	26	35
83-87°	35	21	14	60	14	21	40
Subtotal <88°	116	76	40	67	40	76	33
88-92°	41	9	32	22	29	12	71
Subtotal >92°	61	45	16	74	45	16	74
93-97°	26	19	7	73	19	7	73
98-102°	18	12	6	67	12	6	67
103-107°	13	11	2	85	11	2	85
108-112°	3	2	1	67	2	1	67
113-117°	0	-	-		-	-	
118-122°	1	1	-	100	1	-	100
123-127°	0						
Total	218	130	88	60	114	104	52
%		60	40		52	48	

Table 2 - Alignments by relative dates of naves and chancels

	Numbers					Percentages			
	Improving	Not improving	Left - weeping	Not weeping	Total	Improving	Not improving	Left - weeping	Right - not weeping
All misaligned churches									
Post-med chancels	14	4	8	10	18	78	22	44	56
Medieval chancels	31	11	23	19	42	74	26	55	45
Sub total-later chancels	45	15	31	29	60	75	25	52	48
Same period	51	42	50	43	93	56	44	54	46
Older chancel	6	3	5	4	9	67	33	56	44
Date of either unknown	28	28	28	28	56	50	50	50	50
Sub total	85	73	83	75	158	54	46	53	47
Total	130	88	114	104	218	60	40	52	48

Table 3 – Alignments by relative dates of naves and chancels (excluding naves aligned between 88 & 92°)

	Numbers					Percentages			
	Improving	Not improving	Left - weeping	Not weeping	Total	Improving	Not improving	Left - weeping	Right - not weeping
Excluding churches 88-92°									
Post-med chancels	14	2	6	10	16	88	12	38	62
Medieval chancels	29	7	18	18	36	81	19	50	50
Sub total-later chancels	43	9	24	28	52	84	16	46	54
Same period	46	27	35	38	73	63	37	48	52
Older chancel	6	1	4	3	7	86	14	57	43
Date of either unknown	26	19	22	23	45	58	42	48	52
Sub total	78	47	61	64	125	62	38	49	51
Total	121	56	85	92	177	68	32	48	52

Table 4 – Comparison of Misaligned and Rebuilt Chancels

Nave Alignment	Total Misaligned	% of misaligned	Rebuilt Chancels	% of rebuilt chancels	Rebuilt as % of misaligned
48-52°	0		0		
53-57°	4	2	0		
58-62°	5	2	1	2	20
63-67°	3	1	0		
68-72°	7	3	2	3	31
73-77°	22	10	7	12	32
78-82°	40	18	10	17	25
83-87°	35	16	10	17	29
Subtotal <88°	116	53	30	50	26
88-92°	41	19	8	13	20
Subtotal >92°	61	28	21	35	
93-97°	26	12	9	15	35
98-102°	18	8	5	8	28
103-107°	13	6	7	12	54
108-112°	3	1	0		
113-117°	0		0		
118-122°	1	0	1	2	100
123-127°	0		0		
Total	218	100	60	100	28

Table 5 – Churches with Rebuilt Chancels – by alignment of nave

Nave Alignment	Total	Improving alignment	Not improving	% improving	Left - weeping	Right - not weeping	% weeping
48-52°	-						
53-57°	-						
58-62°	1	1	0	100	0	1	0
63-67°	-	-	-				
68-72°	2	2	0	100	0	2	0
73-77°	7	4	3	57	3	4	43
78-82°	11	10	1	91	1	10	9
83-87°	10	8	2	80	2	8	20
Subtotal <88°	31	25	6	81	6	25	19
88-92°	8	2	6	25	7	1	88
Subtotal >92°	21	18	3	86	18	3	86
93-97°	9	7	2	78	7	2	78
98-102°	5	4	1	80	4	1	80
103-107°	6	6	0	100	6	0	100
108-112°	-	-	-				
113-117°	-	-	-				
118-122°	1	1	0	100	1	0	100
123-127°	-						
Total	60	45	15	75	31	29	52
%		75	25		52	48	
Total (exc 88-92°)	52	43	9	83	24	28	54
%		83	17		46	54	

Table 6 – Churches originally misaligned – by alignment of nave

Nave Alignment	Total	Improving alignment	Not improving	% improving	Left - weeping	Right - not weeping	% weeping
48-52°	-						
53-57°	4	3	1	75	1	2	25
58-62°	4	3	1	75	1	4	25
63-67°	3	1	2	33	2	1	67
68-72°	5	4	1	80	1	4	20
Subtotal <73°	16	11	5	69	5	11	41
73-77°	15	17	4	73	4	11	27
78-82°	29	16	13	55	13	16	45
83-87°	25	13	12	52	12	13	48
Subtotal <88°	85	51	34	60	34	51	40
88-92°	33	7	26	21	22	11	67
Subtotal >92°	40	27	13	68	27	13	68
93-97°	17	12	5	70	12	5	37
98-102°	13	8	5	62	8	5	29
103-107°	7	5	2	71	5	2	75
108-112°	3	2	1	67	2	1	67
113-117°	-	-	-	-	-	-	-
118-122°	-	-	-	-	-	-	-
123-127°	-	-	-	-	-	-	-
Subtotal >102°	10	7	3	70	7	3	70
Total	158	85	73	58	83	75	53
%		58	42		53	47	
Total (exc 88-92°)	125	78	47	62	61	64	49
%		62	38		49	51	

Table 7 – Realignment of churches – towards Magnetic or True East?

All Misaligned churches

Realignment towards	Magnetic East		True East	
	Number	%	Number	%
Improving only (Case 2)	93		78	
Improving and Weeping (Case 3)	11		52	
Total IMPROVING	104	48	130	60
Weeping only (Case 1)	103		62	
Total WEEPING	114	52	114	52
Neither (Case 4)	10		26	
TOTAL	218		218	

Table 8 – Churches with later, but medieval chancels

Realignment towards	Magnetic East		True East	
	Number	%	Number	%
Improving only (Case 2)	19		16	
Improving and Weeping (Case 3)	4		15	
Total IMPROVING	23	55	31	74
Weeping only (Case 1)	19		8	
Total WEEPING	23	55	23	55
Neither (Case 4)	0		3	
TOTAL	42		42	

Table 9 – Incidence of misaligned chancels by County

	Total surveyed	Number misaligned	%	Improving alignment	Not Improving	Left - weeping	Right - not weeping
S Norfolk/N Suffolk	223	46	20.6	27 (59%)	19 (41%)	27 (59%)	19 (41%)
Cumbria	74	16	22.4	9 (56%)	7 (44%)	7 (44%)	9 (56%)
N Cambridge	123	24	19.5	13 (54%)	11 (46%)	12 (50%)	12 (50%)
East Kent	92	22	24.0	13 (59%)	9 (41%)	14 (63%)	8 (37%)
N Somerset	91	17	18.7	8 (47%)	9 (53%)	10 (59%)	7 (41%)
E Sussex	104	37	35.6	23 (62%)	14 (38%)	22 (59%)	15 (41%)
Shropshire	104	25	24.0	17 (68%)	8 (32%)	11 (44%)	14 (56%)
E Yorkshire	110	31	28.2	20 (65%)	11 (35%)	11 (35%)	20 (65%)
Total	921	218	23.7	130 (60%)	88 (40%)	114 (52%)	104 (48%)

Appendix 3 - Dedications of churches in this survey

NON-MISALIGNED			MISALIGNED			
	Number	% of total		Number	% of total	% of dedication
All Hallows	2	0.3	All Saints	28	12.8	23.7
All Saints	90	13.0	Holy Cross	1	0.5	33.3
Holy Cross	2	0.3	Holy Saviour	1	0.5	100.0
Holy Innocents	1	0.1	Holy Trinity	3	1.4	15.8
Holy Trinity	16	2.3	NK	7	3.2	46.7
NK	8	1.2	St Andrew	11	5.0	17.7
St Aldhelm	1	0.1	St Bartholomew	6	2.8	42.9
St Andrew	51	7.4	St Botolph	2	0.9	50.0
St Anthony	1	0.1	St Bridget	1	0.5	25.0
St Augustine	6	0.9	St Calixtus	1	0.5	100.0
St Bartholomew	8	1.2	St Catherine	4	0.6	
St Benedict	1	0.1	St Chad	1	0.1	
St Botolph	2	0.3	St Christopher	1	0.1	
St Bridget	3	0.4	St Clement	2	0.3	
St Catherine	4	0.6	St Congar	1	0.1	
St Chad	1	0.1	St Cosmas	1	0.1	
St Christopher	1	0.1	St Cuthbert	6	0.9	
St Clement	2	0.3	St Cyriac	1	0.1	
St Colomba	1	0.5	St Denys	1	0.1	
St Cuthbert	5	2.3	St Dunstan	1	0.1	
St Eata	1	0.5	St Eanswith	1	0.1	
St Edith	1	0.1	St Edith	1	0.1	
St Edmund	4	0.6	St Edmund	4	0.6	
St Elgin	1	0.1	St Elgin	1	0.1	
St Ethelbert	2	0.3	St Ethelbert	2	0.3	
St Ethelburga	1	0.1	St Ethelburga	1	0.1	
St George	9	1.3	St George	2	0.9	18.2
St Giles	8	1.2	St Giles	3	1.4	27.3
St Gregory	1	0.1	St Gregory	2	0.9	66.7
St Helen	5	0.7	St Hilda	1	0.5	100.0
St James	10	1.4	St James	6	2.8	37.5
St John	16	2.3	St John	6	2.8	27.3
St John Baptist	21	3.0	St John Baptist	5	2.3	19.2
St Kentigern	4	0.6	St Lau(w)rence	6	2.8	27.3
St Kyneburga	1	0.1	St Leonard	2	0.9	12.5
St Lau(w)rence	16	2.3	St Margaret	10	4.6	23.3
St Leonard	14	2.0	St Martin	3	1.4	33.3
St Lucy	1	0.1	St Mary	40	18.3	20.2
St Luke	2	0.3	St Matthew	1	0.5	100.0
St Margaret	33	4.8	St Matthias	1	0.5	100.0
St Mark	1	0.1	St Michael	13	6.0	19.4
St Martin	6	0.9	St Nicholas	8	3.7	29.6
St Mary	158	22.9	St Oswald	1	0.5	14.3
St Michael	54	7.8	St Pancras	1	0.5	33.3
St Milburgh	1	0.1	St Paul	1	0.5	100.0
St Mildred	1	0.1	St Pega	1	0.5	100.0
St Mungo	2	0.3	St Peter	25	11.5	34.2
St Nicholas	19	2.7	SS Peter & Paul	8	3.7	34.8
St Oswald	6	0.9	St Remigius	1	0.5	33.3
St Paet	1	0.1	St Simon	1	0.5	100.0
St Pancras	2	0.3	St Stephen	2	0.3	
St Patrick	1	0.1	St Swithin	2	0.3	
St Peter	48	6.9	St Thomas	1	0.1	
SS Peter & Paul	15	2.2	St Vigor	1	0.1	
St Remigius	2	0.3	St Vincent	1	0.1	
St Stephen	2	0.3	St Wandregesilius	1	0.1	
St Swithin	2	0.3	St Wendreda	1	0.1	
St Thomas	1	0.1	St Wilfrid	1	0.1	
St Vigor	1	0.1	St Wulfran	1	0.1	
St Vincent	1	0.1	Transfiguration	1	0.1	
St Wandregesilius	1	0.1	Total	703	100	23.7
St Wendreda	1	0.1				
St Wilfrid	1	0.1				
St Wulfran	1	0.1				
Transfiguration	1	0.1				

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