AN UNRECORDED TRANSITIONAL MASS DIAL AT BIXLEY, NORFOLK

JOHN DAVIS

Mass dials,[1] considered individually, rarely tell us anything significant about the development of time-keeping. They are almost impossible to date and their hour-lines tend to be either very simple and geometric or else totally empirical and almost random. The dial which was once at St Wandregesilius's church in Bixley, Norfolk, is something of an exception as it can be partially dated and its numbered hour-lines do provide some clues to the manner in which the equal-hour system came to be introduced in England. The Bixley mass dial has been unrecorded and largely overlooked until recently owing to the chequered history of the church.[2]

Fig. 1. St Wandregesilius's church, Bixley. drawn by Ladbrooke in 1824 (before the Victorian rebuild), now part of the Blomefield collection (BL MS Add 23025, f. 200).[10] *Photographed by the author, with the permission of the Trustees of the British Library.*

St Wandregesilius's Church

Bixley was a small hamlet a couple of miles to the south of the old Norwich city walls; today, it is just a forgotten parish and a name on the OS map.[3] Although it is probable that it had a Saxon church, this was totally removed when it was refounded in 1272 and dedicated to St Wandregesilius, now a unique dedication in Britain. The benefactor for the rebuilding was a certain William de Dunwich (1245–72). The town of Dunwich, just over the border in Suffolk, was at this time the most important port on England's prosperous east coast and had yet to suffer the series of calamitous storms in the 14th century which washed away most of the town and silted-up its port. William de Dunwich was a wealthy draper and trader who had moved to Norwich where he was also a Bailiff of the city. He provided much of the funds for setting up the Great Hospital there, built right beside the Cathedral. In 1272 there was a violent uprising between the cathedral-priory and the townsfolk (involving such feats as monks firing crossbows!) which eventually led to the intervention of the king who took the matter to the Pope, resulting in the excommunication of the whole of the city. William de Dunwich had been heavily involved, supporting the townspeople, and clearly felt that his soul was imperilled so, as he wrote his will shortly before his death later in that year, he felt the need for more good deeds and the foundation of a new church: the choice of Bixley is explained as lying just outside the excommunicated region.

We know that the church was founded by William de Dunwich because the foundation stone bears the inscription:

> ANIME WILEMI DE DONEWICO FUNDATORIS HUIUS ECCLESIE PROPICIARE DEUS
>
> (Oh God atone for the soul of William of Dunwich, founder of this church)[4]

This stone was incorporated as one of the quoins at the south-east corner of the church with the inscription propitiously facing East: it is especially important to us because on its southern face there is a mass dial of rather better than average quality.

The choice of St Wandregesilius for the dedication is a puzzle. He was a noble member of the Merovingian Court of the seventh century who became a monk and founded his abbey at Fontenelle near Rouen in Normandy, consecrated as St Wandrille in 657 AD. Although the dedication is now unique to Bixley, they were other English churches with this dedication in both the Saxon and Norman periods; some of those churches, like Bixley, professing to have relics of the saint.[5] He is sometimes described as the patron saint of Flemish weavers though I have not found firm evidence of this. If so, and as William de Dunwich had much trade with this area and Norwich's wealth was built on the wool trade, this might possibly account for St Wandregesilius's selection as patron saint.[6]

Bixley church remained largely unchanged for the next five centuries: it is seen in Fig. 1 as it would have looked in the early 19th century. It was part of the pilgrimage route around Norfolk[7] and at one time had a painted and gilded image of St Wando (as his name is sometimes given) as well as one of Henry VI.[8] We owe our detailed knowledge

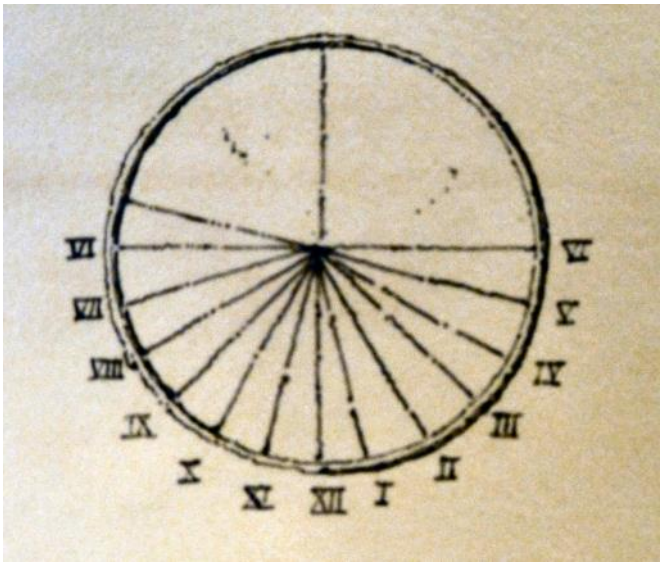

Fig. 2. Drawing of the Bixley mass dial, copied as part of the Blomefield collection (BL MS Add 23025, f. 202)[10] from "the Norris MSS". Photographed by the author, with the permission of the Trustees of the British Library.

Fig. 3. Drawing of the Bixley dedication stone, copied as part of the Blomefield collection (BL MS Add 23025, f. 202)[10] from "the Norris MSS". Photographed by the author, with the permission of the Trustees of the British Library.

Fig. 4. The remains of St Wandregesilius's church in June 2015.

Fig. 5. Some of the pallets with the salvaged monuments and stonework from St Wandregesilius's church, in a dark local barn. It was thought that the foundation stone and mass dial would be amongst this material but the author failed to find them in June 2015.

of the foundation stone and its mass dial to the fact that it was sketched in the mid 18th century by the local antiquarian Anthony Norris and this drawing[9] was later copied by Francis Blomefield when he was preparing material for his *Topographical History of Norfolk*.[10] These copies (Figs 2 and 3) later became part of the Dawson Turner Collection and are now in the British Library.[11]

In 1868, during the Victorian craze for rebuilding churches, it was completely replaced with the exception of the tower (square, unlike the characteristic round towers of many medieval Norfolk churches). The foundation stone was recognised as a rare and important artefact and moved to a place of 'safety', built into an internal wall in the chancel. It survived here until an arsonist torched the church in 2004, using the large gas cylinders providing the church heating (it was completely off the grid) as a fuel source and leaving the building today as a set of walls with some charred rafters at the end of a long, overgrown path (Fig. 4).

After the fire, the calcified monuments from inside the building and some of the decorative stonework were removed and stored in a local barn belonging to Sir Timothy Colman (a member of the famed mustard company family) where they remain, on over twenty pallets (Fig. 5). It was thought that the foundation stone was amongst this stonework but an inspection by the author in June 2015 failed to discover it. Luckily, photographs (Figs 6 & 7) had been taken by Caroline Rawlings[12] soon after the fire and before the stone was removed which show that it had cracked – it is believed that it broke into several pieces on removal. These photographs are the only ones we currently have for comparison with the 18th-century drawings. For the moment, this is the end of the story.

The Bixley Mass Dial

Turning now to the actual dial (Fig. 2), we can see that the basic division is into twelve nominally equal 15° segments in a semicircle below the horizontal together with one line above the horizontal. The lines – not the intervals between them – are numbered with Roman numerals VI–XII–VI. The dial could thus be described as a 'transitional' one, predating the introduction of proper scientific dials with polar-oriented gnomons and showing equal hours – that is, numbered according to this scheme with XII at noon rather than the old unequal hour scheme which has noon as the end of the sixth hour. Some evidence that the gnomon was a normal horizontal one is in the photograph of Fig. 6 and although the possibility of a 'bent rod' emanating from a horizontal hole cannot be entirely ignored, it is extremely unlikely. Of course, equi-spaced 15° lines and a horizontal gnomon cannot display equal hours with anything like accuracy, providing a passable approximation to this only at the equinoxes and getting progressively worse in other parts of the year.

Some comments should be made about the fidelity of the drawing of Fig. 2. The angles are rather variable and the hour-lines seem to have been drawn freehand, by eye. The numerals are all drawn aligned horizontally whereas the photograph of Fig. 6, although not totally clear, seems to show them set radially. Also, the 4 pm line is marked IV which had become standard on clocks by the Victorian period but would certainly have been written as IIII in medieval times. Comparison of the photograph of the inscription on the foundation stone (Fig. 7) with the drawing of it in Fig. 3 also show some inaccuracies. Maybe Norris's original drawings were more accurate: efforts are still in hand to locate them, together with the remnants of the actual stone. Nevertheless, the important basic features of the dial design in Fig. 2 are supported by the photograph.

The key question about the dial is its date. Clearly it cannot be earlier than 1272 and the Norwich Heritage Explorer website[13] rather unhelpfully describes the dial as "later". This is almost certainly true but the question is how much later! Obviously it was an item of some antiquity by the mid 18th century but that does not narrow things down much.

The term 'transitional' for a mass dial does not have a formal definition.[14] It is generally applied to mass dials with lines at a regular 15° spacing and usually reserved for cases where they are numbered, as in the Bixley case. Cole,[15] writing in the 1930s, assumes, on the basis of no evidence whatsoever, that the dials had the gnomon bent downwards into the polar direction, though this is not necessary. Green,[16] a few years earlier, also espoused the idea of bent-rod gnomons, spending two chapters of his book on experiments with modern reproductions but giving almost no evidence that any medieval dial had ever employed them.

Fig. 6. The Bixley mass dial on the side of the dedication stone, photographed inside the church after the 2004 fire. Photo courtesy of Caroline Rawlings.

Fig. 7. The Bixley dedication stone, photographed inside the church after the fire of 2004. Photo courtesy of Caroline Rawlings.

Very early scientific dials, carved directly into church walls and with an inset triangular plate gnomon and geometrically-calculated hour lines, can look very similar to a transitional mass dial and it is tempting, but probably erroneous, to assume that they followed on directly in time. Scientific dials appeared at least by the early 16th century so this hypothesis would put transitional dials in the late-15th century. However, we know that a century earlier, in the 1390s, Robert Stikford in St Albans developed an *accurate* method of displaying equal hours on a vertical dial with a horizontal gnomon (of specified length).[17] This information would have taken time to spread around the country to makers of real dials but it shows that there must already, earlier in the 14th century have been a demand for

dials to show equal hours: the Bixley dial could well be an example of this.

Although transitional mass dials *may* have appeared in the late-15th century there is no reason why they could not have appeared significantly earlier, perhaps as early as the beginning of the 14th century. Clocks which showed equal hours,[18] at least approximately, started to appear at the end of the 13th century and there would have been some pressure for sundials to have the hours numbered in the same way (i.e., with XII for noon), even if the 'hours' they indicated were not actually the same.[19] Astrolabes, too, often had a 2×12 hour timescale running round the limb. Norwich had a clock in the cathedral at least by 1291 (when it is recorded that it was being repaired) and by 1322, when a more advanced astronomical clock was being built to replace it, the earlier one was referred to as an "*antiquum horologium*".[20] Thus, when Bixley church was still newly-built, there could easily have been a desire to give it timekeeping facilities in line with those at the mother cathedral.

Mass dials with numbered hour-lines are rare in England but one example which has appeared in the *Bulletin*[21] is on a buttress of St Andrew's church, Wickhampton, just 10 miles east of Bixley. The church actually has three mass dials but the one which is of interest here (Fig. 8) is delineated around the full circle with midnight at the top and noon at the bottom, both marked by a cross. The Roman numerals, which are not all clear, have been described as being in 'secretary hand' but, with only 'X's and 'I's, the evidence is very slim and almost any medieval style would fit. The 2×12 hour marking is immediately reminiscent of the early astronomical clock dials and might suggest a link to the nearby Norwich Cathedral clock(s).

Fig. 8. The 'transitional' mass dial at St Andrew's church, Wickhampton, Norfolk. The church is built mainly of flint so the dial is on a buttress.

St Andrew's church is best-known for containing "what are among the best 14th century wall paintings in England"[22] and although this does not necessarily mean that the mass dial is also from the 14th century, it does indicate that it was an active period for developing the church.

It is perhaps not entirely coincidental that Bixley lies only a very few miles away from several other sites with medieval horological connections, including the *horologium* found near Shotesham,[23] the quadrant found in the parish of Cantley,[24] the village of Stoke Holy Cross, thought to be the home of Roger and Lawrence of Stoke, clockmakers associated with the astronomical clocks of both Norwich and St Albans, and other unpublished finds. In addition, an astrolabe was made for Norwich in the 1320s;[25] the navicula now in the National Maritime Museum was found at Sibton Abbey, just over the border in North Suffolk,[26] and several other medieval timekeeping instruments (including a simple nocturnal) have all been found within a 20 mile radius. Although these finds are not exactly dated, they are all late-medieval and show that there was a significant interest in timekeeping in south Norfolk at this time: the Bixley mass dial would easily fit in with that tradition.

ACKNOWLEGEMENTS

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REFERENCES and NOTES

1. The term 'mass dial' might be considered inappropriate for cases where the dial attempts to show the time in hours, rather than indicating the occasions of mass. Nevertheless, the term is in such widespread use to indicate any dial of the later Middle Ages inscribed directly into the building stonework that it will be used here.
2. The dial does get a brief mention in the addendum of the 4th edition of Mrs Gatty's *Book of Sun-Dials* (the Eden and Lloyd edition).
3. OS Grid reference TG 2585 0496. The BSS Mass Dial Registrar noted that Bixley does not appear in his AA Gazetteer and the dial was not recorded in the Register.
4. Translation kindly provided by Frank King and Max Drinkwater (Cambridge University).
5. Nun Macrina (transl.): *The Vita Prima of St Wandregesilius*, Mettingham College Series No. 2 (2011). The historical foreword contains some information on his life and veneration.
6. C. Reeve: *Norwich: the biography*, Amberley (2014). See especially pp. 47–54.
7. Francis Blomefield: *An Essay Towards A Topographical History of the County of Norfolk:* Vol. 5, pp. 447–55, 'Hundred of Henstede: Bixley' (London, 1806) quotes "in

1478, Alice Cooke of Horsted, wife of R. Cooke of Crostwheyt, by will in Regr. Castone, fo. 71, orders thus, 'Item, I wyll have a man to go a pilgrimage to St. *Wandrede* of Biskeley'," Available online at *www.british-history.ac.uk/topographical-hist-norfolk/vol5/pp447-455* [accessed 29 June 2015].

8. *The Antiquities of the County of Norfolk*, Vol. VII, Norfolk & Norwich Archaeological Soc., p. 239 (1872).
9. Anthony Norris (1711–86) was the son of a local parson and educated at Gonville & Caius College, Cambridge. His biography is in the *Dictionary of National Biography*. Most of his original manuscripts are in the Norwich Record Office as part of the Rye Collection: Rye 6, volumes 3 (p. 247) & 6 (p. 261) contain details of Bixley written in the 1730s (particularly the coats of arms in the church) but although the dedication stone is described it is not drawn there. The drawing which Blomefield copied must be elsewhere.
10. Francis Blomefield: *An Essay Towards A Topographical History of the County of Norfolk:* ref 7 above. Blomefield (1705–52) was another Norfolk antiquary with a biography in the DNB and who was educated at Caius College: his researches on the county are highly regarded.
11. British Library MS Add 23025, ff. 200–202 (part of the Dawson Turner Collection).
12. Caroline Rawlings is Church Development Officer (and Assistant DAC Secretary) of the Diocese of Norwich and Bishop's Furnishing Officer.
13. *www.heritage.norfolk.gov.uk* and search for Bixley church.
14. T. Wood: 'Erratic Numerals', *BSS Bull*., 25(ii), 42–43 (June 2013) mentions that the term covers "quite a few dials of 'in-between' status".
15. T.W. Cole: *Origin and use of church scratch dials*, self-published (1935). Facsimile by Pierhead Publications, Herne Bay (2001).
16. A.R. Green: *Sundials – incised dials or mass clocks*, Society for promoting Christian knowledge (1926). See particularly chapters 4–6.
17. J. Davis: 'Robert Stikford's "*De Umbris Versis et Extensis*"', *BSS Bull*., 23(iv), 24–28 (Dec 2011).
18. It has been argued (see H.G. Hammond: 'The foliot and the natural day', *J. Antiquarian Horological Soc.*, 12/2, 154–157 (1980)) that the earliest simple tower clocks, regulated by a foliot, were adjusted twice a day to show seasonal (unequal) hours. Whilst this is possible, there is much evidence that astronomical clocks of the period showed equal hours.
19. See for example, the inner dial of the Wells Cathedral clock (dated originally to the 1380s; image on Wikipedia) which, although a later reconstruction, shows the 2×12 hour format.
20. For the Norwich Cathedral clock, see I. Atherton, E. Fernie, C. Harper-Bill & H. Smith: *Norwich Cathedral: Church, City and Diocese, 1096-1996*, Hambledon Continuum, see pp. 441–2 (1996) and J.D. North: *God's Clockmaker – Richard of Wallingford and the invention of time*, Hambledon & London (2005). See pp.141–3 for references to Roger and Laurence of Stoke's input to clockbuilding.
21. T. Wood and Finola O'Carroll: 'A Celtic Quartet', *BSS Bull*., 20(ii), 84–87 (June 2008). The Wickhampton dial is shown as Fig. 6.
22. *www.norfolkchurches.co.uk/wichampton/wickhampton.htm*
23. J. Davis: 'A portable horologium', *BSS Bull*., 24(i), 17–22 (March 2012).
24. J. Davis: 'A medieval Gunter's quadrant?', *BSS Bull.*, 23(iii), 2–7 (Sept 2011). See also the appendix of J. Davis: 'The Chetwode Quadrant – a medieval unequal hour instrument', *BSS Bull*., 27(ii) 2–6 (June 2015).
25. J. Davis and M. Lowne: 'An Early English Astrolabe at Gonville & Caius College, Cambridge, and Walter of Elveden's *Kalendarium*', *J. History Astronomy,* 46(3), 257–290, (August 2015). DOI: 10.1177/0021828615590336.
26. NMM, Greenwich, AST 1146.

john.davis@btinternet.com