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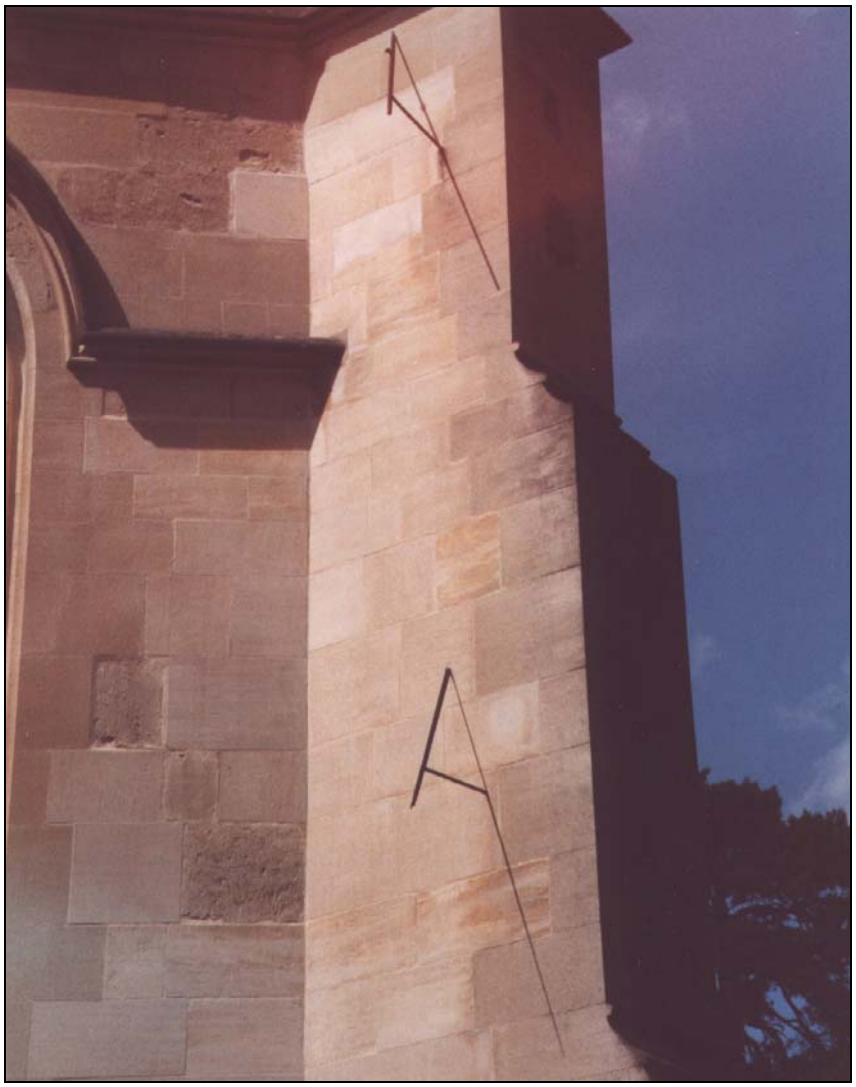
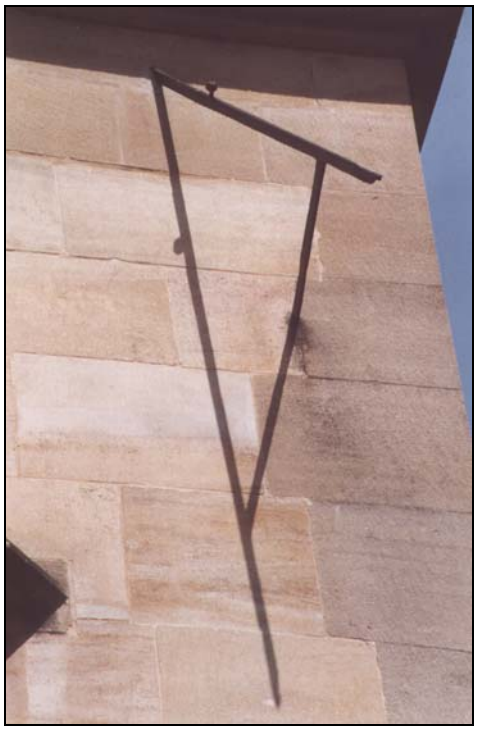
The Sundials at Wadham College, Oxford



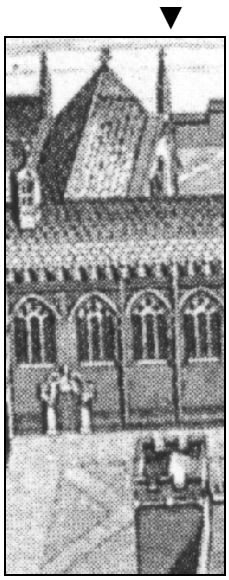
by
Harriet James



The authorities at Wadham College are are considering whether to restore the two sundials on the south-west wall of the chapel. This article is the result of my search, as a sundial restorer, for evidence of the original date and appearance of the dials. My investigations have revealed a wealth of dialling activity at Wadham College in the seventeenth and eighteenth centuries.

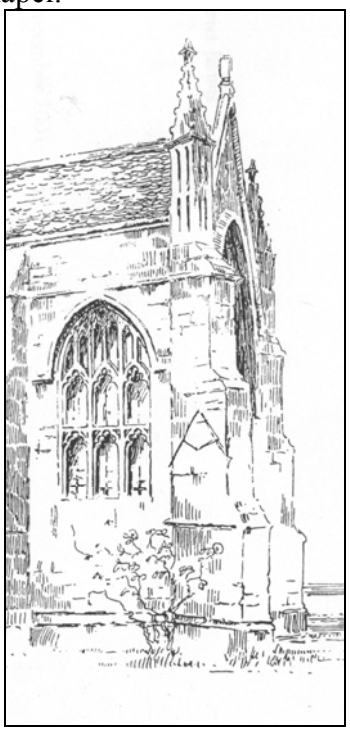
For pictorial evidence I looked at David Loggan's *Oxonia Illustrata* (1675). Several of his plates of Oxford colleges show sundials. The detail of the Wadham plate is very fine and one can imagine that the chapel gnomons are shown in miniature. R. T. Gunther in his *Early Science in Oxford* ii (1923) has no doubts: 'Loggan is celebrated for the accuracy of his plates and for his remarkable powers of observation. In the case of one of these dials he has surpassed himself, for though the dial would not be visible from the point of view from which his drawing was made, yet he has indicated its position by showing the gnomon by the faintest possible scratch that might pass for a slip of the graver was it not more likely to escape observation altogether; as indeed it has been by the College historian and architect, Mr. T.G. Jackson, in his history of the College.'

One cannot detect the gnomons in the engraving of the college by William Williams of 1732, but it is possible that a small mark in the view by Vertue for the University Almanack of 1738 does show a gnomon.



Gnomon possibly visible on the chapel buttress from Vertue's University Almanack, 1738

A search of the Wadham archives produced a sketch by Edwin Glasgow of 1900 which shows the lower gnomon in position. There is no sign of the upper gnomon or of any markings on the stone of the chapel.



Part of Edwin Glasgow's sketch of the Chapel from Sketches of Wadham College (1900)

Early pictorial evidence of the gnomons may be scarce because the part of the college grounds where they are was originally a graveyard. It was converted into a garden for the Warden and Fellows in 1777 (T.G.Jackson *History of Wadham College* (1893)). There was an entrance to the college through the nearby garden wall shown in the seventeenth and eighteenth century prints mentioned above, but it seems to have been very much the back door of the college. Views of the college were usually drawn from the front.

Written evidence for the sundials is also scarce. Mrs Gatty in her *Book of Sundials* (Ed. Eden & Lloyd) (1900)) writes "When Loggan took his views of Oxford, published 1688, there were several dials on the colleges, but most of these are gone. He shows them at Exeter, St. John's, Trinity, Wadham, Brasenose, Christchurch, All Souls, Magdalen, and St. Mary Hall, besides pedestal dials at Queen's, Balliol, and Pembroke, and a tall pillar in New College gardens. Of these there remains the great dial at All Souls, and one in Brasenose quadrangle: a [sic] gnomon on the south-east buttress of Wadham Chapel, possibly placed there by Dr. Wilkins…'

R.T.Gunther also thinks that the dials were put there by Wilkins : 'The gnomons of the two south dials are *in situ* on the south side of the south-eastern buttress of the Chapel, but the faces of the dials have perished. The lower and probably older one may be contemporaneous with the Chapel (1612): the other, possibly a more accurate time-indicator, may have been added in the scientific days of Warden Wilkins (1648-59).'

Dr. Wilkins became Warden of Wadham after the Civil War. A shrewd politician, he married Cromwell's sister, yet became a bishop in later life. During his time at Wadham the college became a focus of scientific experiment.

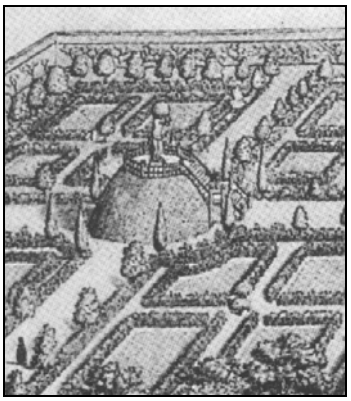
Neither Mrs Gatty nor Gunther says what evidence they have for thinking the dials may have been erected by Wilkins. As Mrs Gatty and Glasgow record only a single gnomon in 1900, whereas Gunther records two in 1923, it is possible that the upper gnomon fell off before 1900 and was replaced between 1900 and 1923. *Oxford Stone Restored: The Work of the Oxford Historic Buildings Fund 1957-1974* (Ed. W. Oakeshott) says of Wadham 'Very few alterations had been made in the buildings which were substantially in Headington stone, nearly 350 years old….Between 1920 and 1930 a programme of piecemeal repairs had been undertaken'. In 1935 'the stone work of the east and south faces of the chapel was repaired', in the 1950's the buttresses of the chapel were restored. In the 1980's the gnomons were removed, the rustier parts replaced with stainless steel, repainted and reset. So it seems that the gnomons and surrounding stonework have been disturbed several times in the twentieth century.

Although there is no direct evidence, it is likely that at least one of the dials dates from the heyday of sundialling or *gnomonics* in the 17th century. The early members of the Royal Society met at Wadham and certainly had an interest in dialling and clocks. When one of them, the young Christopher Wren, went to Wadham in 1650, he was already interested in gnomonics. At the age of fifteen he wrote a treatise on dialling entitled *Sciotercion Catholicum* and a year later translated William Oughtred's Latin treatise *The Art of Dialling (Parentalia* (1741)). As a boy he made 'curious dialls' at Bletchingdon where his sister and her husband lived, and when he arrived at Wadham he made a reflecting dial on the ceiling of his room. I know of two dials still in existence which have been attributed to Wren: the vertical decliner at All Souls, Oxford and a horizontal dial at Amen Court, St. Paul's Cathedral, London.

William Oughtred's son-in-law, Christopher Brooke, was appointed Manciple of Wadham in Wilkins's time. He was an instrument maker and is known to have made double horizontal sundials, an invention of Oughtred's. His position as Manciple (an officer responsible for profiding the provisions of a college) would have given him an income to subsidise his scientific activities, so it is possible he had some connection with the sundials on the chapel.

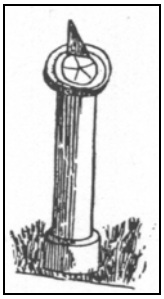
In 1654 Evelyn visited Warden Wilkins's lodgings and recorded in his diary: 'Wilkins showed me transparent aparies…these were adorned with a variety of dials, little statues, vanes…. (*Diary*, i. p.271)

Wilkins was responsible for setting up a statue of Atlas at Wadham which was also a sundial. This is shown in the Loggan and Williams engravings of 1675 and 1732 respectively. Pointer describes the statue in his *History of Oxford* ((1749), p.106): 'In the Gardens, is a Mount, with a Summer-House under it, and the statue of Atlas upon it, upholding the World curiously gilded. A Poetical Emblem, to express the vast Comprehension he [Dr Wilkins] had in inventing Astronomy. The Globe is an entire Dial without a Gnomon."



The statue of Atlas shown in Loggan's Oxonia Illustrata of 1675

Gunther says that Williams' *Oxonia depicta* engraving of 1733 shows a horizontal dial on a column near the north wall of the Fellows' Garden but 'as it is not shown by Loggan we conclude that it was erected after 1688 – perhaps just before 1730 when "causeless and expensive alteracons in ye Garden" were made (Wadham College, Convention Book 1730)'



Gunther's copy of a detail from Loggan's plate showing a horizontal dial at Wadham in the late 17th century

Vertue's 1738 engraving of the college shows Seth Ward holding a horizontal sundial.

Left to right: Sprat, Ward and Wren from Vertue's engraving of 1738

Of course, Wadham was not the only college in the seventeenth and eighteenth centuries with sundials - as Williams' and Loggan's engravings show. One senses a rivalry between colleges. Certainly the question of accuracy in time-keeping had become much more critical with the advances in clock- and watch-making. Challenges such as the search for an accurate method of measuring longitude at sea interested Wren and others from the early days of the Royal Society.

After Wren had left Wadham for All Souls in 1653, he designed a grand sundial for the All Souls chapel. He contrived it 'so that one may see to a minute what it is a clock, the minutes being depicted on the sides of the rays, viz., 15 on each side, and divided into fives by a different character from the rest' (R. Plot *Natural History of Oxfordshire* (1677)).

Wren also presented Wadham with a pendulum clock c. 1670. This clock had an early 'seconds' pendulum. The clock face is still in its original position over the west door of the chapel at Wadham. The original mechanism is now kept in the Museum of the History of Science in Oxford. It may be that one or both of the sundials on Wadham's chapel were used to regulate Wren's clock. The clock mechanism was inside the chapel, through two doors and round a corner from the sundials. Some sort of signal may have been used to let the keeper of the clock know the time. Alternatively it is possible that the dials were used to set a watch which was then taken to the clock. Thomas Sprat's *History of the Royal Society* (1667) mentions Fellows' experiments with 'several new kinds of Pendulum watches for the Pocket, wherein the motion is regulated, by Springs, or Weights, or Loadstones, or Flies moving very exactly regular.'

Another possibility is that Wren's clock at Wadham was set to sidereal time using direct star observations. An observatory was set up at Wadham over the entrance tower by Seth Ward. This observatory was regularly used by Wren during the mid-1650s, and was equipped with telescopes of 6, 12 and 22 feet. (A. Tinniswood *His Invention so Fertile* (2001)).

The upper gnomon on the chapel has an ellipsoid mounted on a stalk which holds it above the style. This means that the ellipsoid sits on a second, virtual gnomon parallel to the style. The shadow of the ellipsoid would not have related to the hour lines which would have been read with the shadow of the style. Sometimes part of the ellipsoid's shadow is obscured by the shadow of the style suggesting that the ellipsoid, as a mathematical conceit, might have been designed to show a circular shadow when the sun is in a particular point in the sky, or it may have been used to determine the date with a set of declination lines.

It is easier for the eye to determine the centre of an elliptical shadow than to gauge the edge of a shadow made by a straight style. The early members of the Royal Society were well aware of the problems of a shadow's fuzzy penumbra. Thomas Sprat says that the Fellows invented 'An Instrument for finding a second of Time by the Sun: - A new kind of Back-staff for taking the Sun's altitude by the Shadow, and Horizon which is so contrived, that though the shadow be at three foot distance, or as much as is desired, yet there shall not be the least Penumbra: and the shadow may be easily distinguished to the fourth part of a minute.'

It is also possible that the shadow of the ellipsoid was used to track an analemma – a 'figure-of-eight' shaped plot of the Equation of Time on one axis and the sun's declination on the other, though I have not been able to determine when this device first appeared on sundials. Flamsteed published his Equation of Time tables in 1675, and Christian Huygens published his in the Netherlands a few years earlier; so from then on the difference between mean time and solar time became more significant. Before Flamsteed's publication of the tables, clocks would have been set to local solar time with errors of as much as fifteen minutes creeping in.

In their present position the gnomons are set at different angles. This may be because they have been disturbed, or it may be that one was meant to correct the other. The latter seems to be the case for two old vertical dials at the church of St. Mary the Virgin at Broughton Gifford Church, Wiltshire. Set one above the other, the upper dial's motto reads 'Hodie Vive' [Live this day] and the lower one's reads 'Umbra Nuget Umbram' [This shadow makes the other foolish].

There was no fixed Prime Meridian until 1884. The Greenwich Meridian was not established at its current position until 1850 and before that it was sited further west. The angles of the Wadham gnomons should have been been the same whether the dials were designed to tell local solar or the time of the Prime Meridian, but the hour lines would have been differently spaced.

In April this year a close examination of the gnomons from a scaffolding showed that the stone on the buttress around the gnomons has been replaced leaving no trace of the original dials. The roots of both gnomons have been repaired with stainless steel bar and reset at angles incorrect for the declination of the buttress. The lower gnomon seems to be older, made of thin and pitted iron bar. The upper gnomon is sturdier and wedge-shaped in section, 10mm wide on the upper edge of the bar, tapering to 7mm. The axes of the ellipsoid nodus measure 27.2 x 21.5mm, its centre lying 27.5 mm above the top edge of the style. The tips of both gnomons end in an ornamental 'finger' shape.

If one or both the dials were made in the seventeenth century, it is possible they were executed by a mason called William Byrd (sometimes spelled 'Bird') who became Wadham's mason in or before 1656. The dials may have been painted onto the stone, or carved into it. Byrd was a letter-cutter and was also skilled at paint effects such as marbling. He had his yard between Wadham and All Souls. His name appears in the All Souls *Acta in Capitulis* recording a payment of £32.11.6d on 23rd November 1658 to be made to 'Mr Bird for the diall in the Quadrangle lately erected' (J.S.G.Simmons *Wren's dial remov'd* (2000)), ' the 'diall' being Wren's vertical dial mentioned above, moved from its original position in 1877 and mounted on the Codrington library. Byrd's name appears in the Wadham accounts in 1656, 1657, 1661-4 and 1669-75 but there is no specific reference to a dial. He appears again in the New College accounts in the Bursar's long book of 1676 'Sol. to Mr Bird for mending ye diall ut per billam £1/2/0.'

Byrd later worked with Wren at Winchester. Mrs J.C. Cole reported that his lettering can be seen on the Fettiplace monument at Swinbrook Church, Oxfordshire, and in the churches at Lydiard Tregoze, and Pewsey in Wiltshire amongst others. (Mrs. J.C Cole 'William Byrd, stone-cutter and mason', *Oxoniensia* xiv. (1949)). The monuments at Pewsey and Lydiard Tregoze are still there. I have not checked the others.

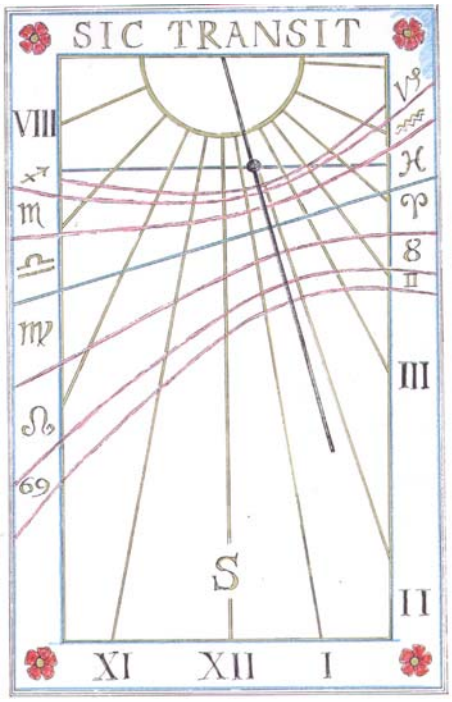
I have now produced to sets of designs for a pair of replacement sundials. The sundials would be carved in stone and painted and gilded. I have used the lettering style and colour schemes from other existing 17th century sundials. Signs of the zodiac are included, as well as declination curves which indicate the height of the sun and therefore the time of year – a common device on 17th century sundials (e.g. on the sundials at Merton College, Oxford and Queens' College, Cambridge). Declination curves for the saint's days of St. Nicholas (6th December) and St. Dorothy (6th Febraury) could be included as the college was founded by Dorothy Wadham and her husband Nicholas. The chapel is dedicated to St. Nicholas.

Decorative features on the new designs include symbols taken from the arms of the college and ornamental scrolls from Wren's clock in the quad. I have suggested mottos which could be divided between the upper and lower sundials; 'Sic transit gloria mundi' and 'Omnibus do lucem calorem motum', the latter being taken from the title page of Wilkins's *Discourse concerning a new world* (1640).

Design proposals for new sundials at Wadham College

Set 1

Upper dial Lower dial



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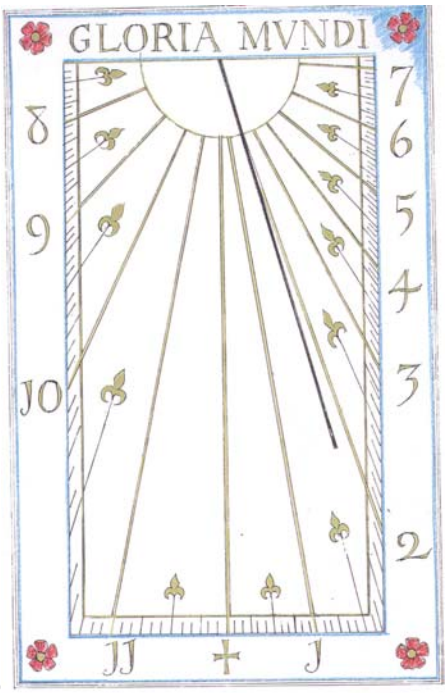
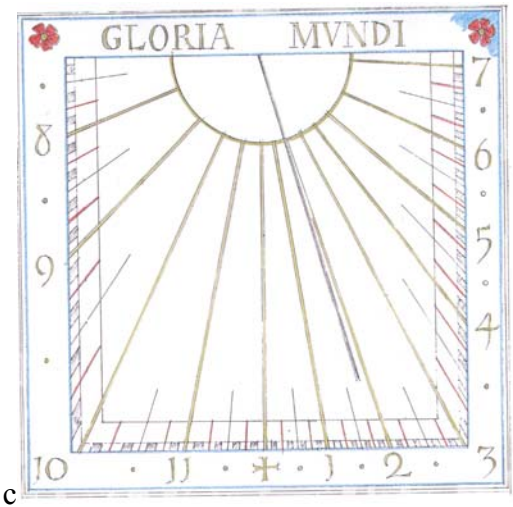


1b

Alternative for lower dial



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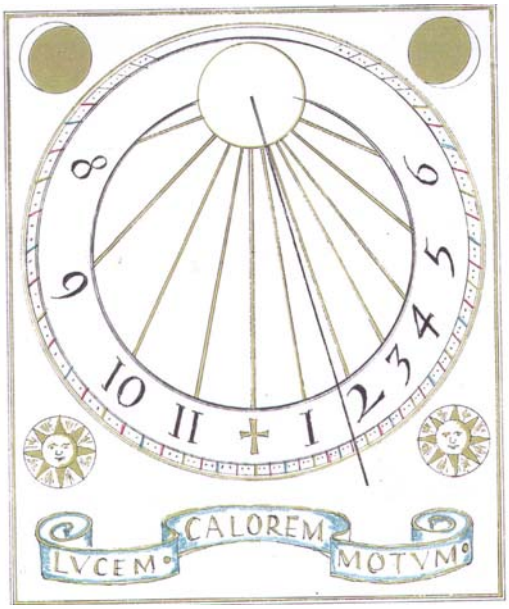
Design proposals for sundials at Wadham College

Set 2

Upper sundial

Lower sundial

2a 

2b 

Acknowledgements

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