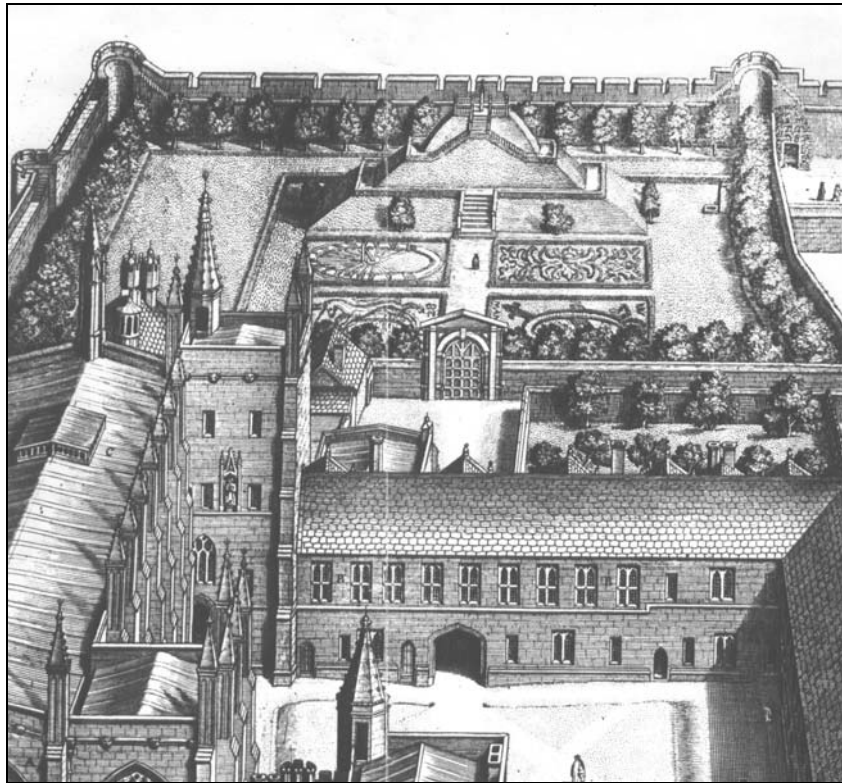


SUNDIALS AT NEW COLLEGE, OXFORD

There is a long history of sundials in Oxford with many splendid examples, old and new, in college gardens and on college buildings. The Museum of the History of Science in Broad Street has a fine collection of portable sundials.

At New College (founded in 1379, and not at all new) there has been a tradition of dialling on a grand scale. After a day rummaging in the college library and in oak chests in the medieval Muniment Tower I found a print of the 1670's showing a large horizontal dial planted out as part of a knot garden in the college grounds. I estimate it must have been 30ft in diameter.



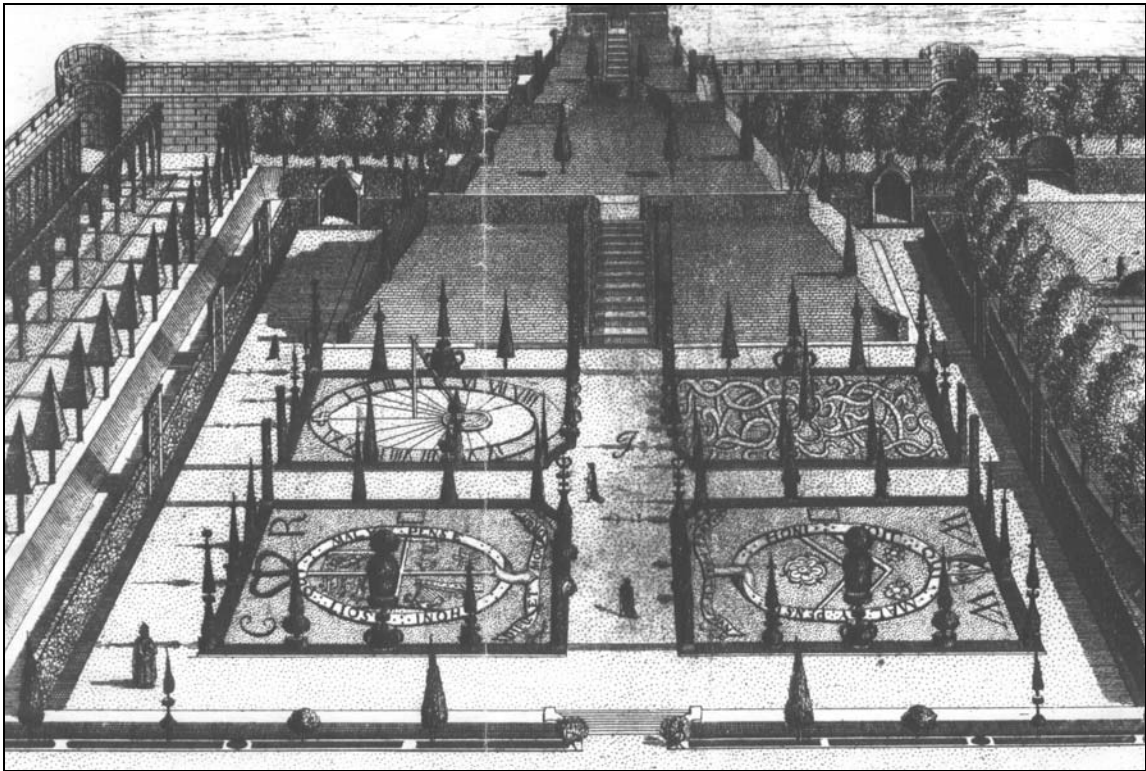
*Fig.1. A print of the 1670s showing a large horizontal sundial in the knot garden.*

Marvell's poem *The Garden*, published in 1680, describes something similar:

*How well the skilful Gard'ner drew  
Of flow'rs and herbes this Dial new;  
Where from above the milder sun  
Does Through a fragrant Zodiack run;  
And, as it works, th'industrious Bee  
Computes its time as well as we.*

The gnomon in the print appears to have been a simple pole. The dial shows the hours 4am to 8pm. In another quadrant of the knot garden Charles I's arms are laid out with '28' visible in the lower right hand corner – presumably 1628.

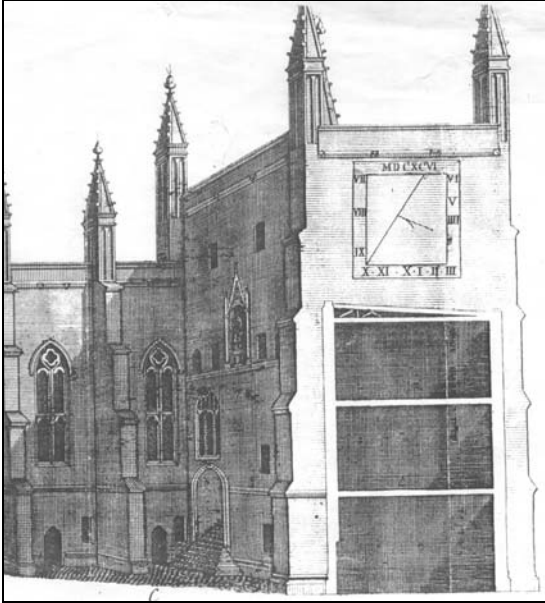
William Williams' print of the garden in 1732 shows the dial again, unchanged except that 4am is written as IV instead of IIII. Now Charles II's coat of arms are next to it and the date has disappeared. The other quadrants of the knot garden appear to have been redesigned, so one might conclude that the garden fell into disrepair during the Commonwealth, and was replanted in Charles II's reign.



*Fig.2 A print of 1732 showing a redesigned knot garden still with sundial*

The knot garden dial is mentioned by William Gilpin in a letter of 1742, but I have found no later record.

A vertical south sundial on the Muniment Tower first appears in another print by William Williams of 1733. The dial bears the date 1696.



*Fig.3. A print of 1733. The earliest evidence of a sundial on the Muniment Tower with '1696' written on it.*

It is shown again in prints of the 1770's, 1820 and 1850. There is also mention of a dial in the accounts for buildings in the Bursar's long book of 1676, though it is not clear which one:

*Sol. To Mr Bird for mending ye diall ut per billam £1/2/0*

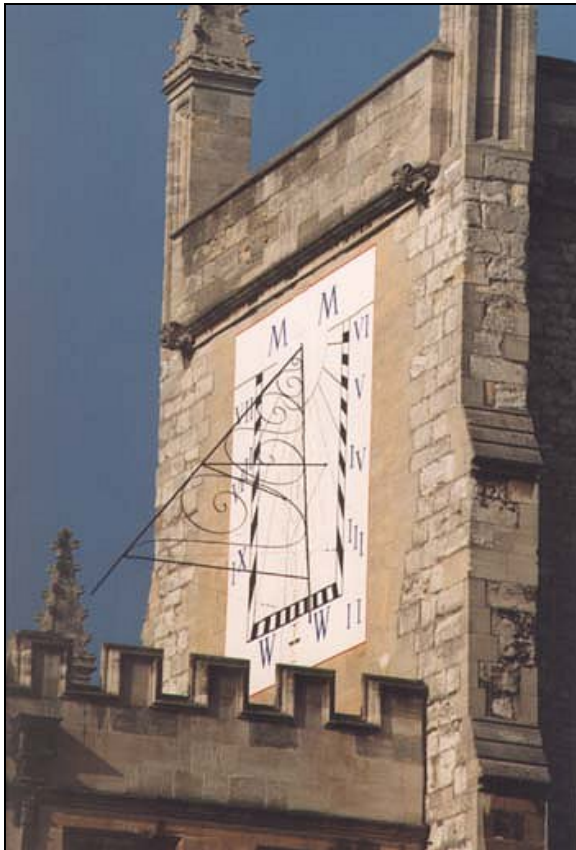
An additional storey to the building adjoining the Muniment Tower was built in 1674. It would have made the high south face of the tower wall more accessible for the construction of a dial. In any case, we can be certain that there was a dial in that position from 1696 to about 1850.

The south wall of the tower was mostly refaced at the turn of the 20th century when much restoration was overseen by the architect Champneys. He produced a design drawing for a stone horizontal dial for the college in 1899, perhaps after having the remains of the tower dial dismantled.

The present Warden and Fellows of New College were keen to have a dial again and commissioned me to make a replacement. I made the design as simple and as large as possible because the site is 40-50ft above the ground and can only be viewed from the ground. The dial measures 15ft x 17ft and is carved directly into the tower. The numerals are a foot high. 'MM' for 2000 is inverted to give 'WW' for William of Wyckham, founder of the college.



*Fig. 4. The new sundial on completion in September, 1999*



*Fig. 5. The new sundial viewed from the college gardens*

The gnomon is 15' 6" long and was made by Iron Awe of Garsington, Oxford from 1" stainless tube with supporting stainless scroll-work, all painted black. The scrollwork is supposed to echo scrollwork on the iron railings of the college garden below, and it also copies some wonderful gnomons on a 17<sup>th</sup> century cube dial at Steeple Ashton, Wiltshire.

The diameter of the gnomon tube was determined very unscientifically by one person holding up different thicknesses of wood while the other looked up from the quad. This was done in bright Spring sunshine when one could easily see a shadow from a 1" diameter piece of wood, but with hindsight I think something thicker would have made the dial easier for the uninitiated to read. On this dial the time is read from the middle of the shadow of the tube, not the leading edge.

After much discussion it was decided gnomon should have a wall plate running along the substyle line bolted into the wall with expanding rawl bolts, and two pairs of braces to make quite sure it could not come adrift in a high wind. This design copied a gnomon shown in one of the 19<sup>th</sup> century prints of the original dial, but it was a big mistake because as soon as it was mounted one could see that the shadows of the braces combined with the shadows of the scrollwork were appallingly confusing. *Moral – always make a model, even of the gnomon!* The gnomon was taken down and one set of braces replaced with stainless yacht cables which are invisible from the ground – my thanks to BSS member Tony Moss for suggesting this. The remaining braces are quite useful for indicating where the gnomon bar is as their shadows point from either side towards the bar's shadow between 11am and 3pm. They also provide essential support for the weight of metal. The gnomon needed three men to carry it into the college and seven to heave it up to the tower using a pulley.



Fig.6. The arrival of the gnomon

Before carving straight into the wall of a listed building I had to make sure I had the declination of the wall right! I am grateful to another BSS member, John Ingram, for his help. He measured the declination with the horizontal board with vertical string method, while I used a pin in a vertical board (both methods described by Waugh) and I also borrowed Piers Nicholson's meridian alidade which can be used for declination measurement as well as for laying out meridians. The results were disconcertingly varied and I came to the conclusion that although the wall was plumb (a credit to medieval craftsmen) it had a horizontal wave in it. I settled on a declination of  $10^\circ$  west of south and made a model. All along I was worried about accuracy because any error would be greatly scaled-up on the full-size dial.

Once a scaffold was erected I marked out the dial using a grid and a chalk line. This was a very laborious task. John Davis had just made a much larger version of his laser trigon (*Bull. BSS* **99.3** 144-146 (1999)) for marking out dials. This was exactly what was needed. He kindly came to try it out but found he had made the mounting so precisely to fit a 1" stainless style tube that it would not fit over the additional three coats of paint which had been added.

The gnomon was put up again by the long-suffering men of the maintenance department at the college and I was horrified to discover that the dial was four minutes slow. After much debate and a little help from Pythagoras, it turned out that the gnomon angle was incorrect. Iron Awe adjusted the angle. The gnomon was put up again, this time with another invention of John Davis' attached - a laser attached to the style pointing downwards along its length to a plane mirror on an equatorial mount on a tripod stationed below the tip of the gnomon. The mirror was accurately positioned to be perpendicular to the polar axis (and to the gnomon when in its correct position). The laser beam was reflected back up the gnomon and onto a sighting screen surrounding the laser. A theodolite, co-mounted on a purpose-built jig, was used to position the mirror at the correct angle using the sun's position.



Fig. 7. John Davis' invention for aligning the gnomon

The gnomon was aligned to the pole and now tells local apparent time to within 20 seconds of time. Some readers may think this is not precise enough, but considering the problems involved I am quite pleased with this, and one can certainly not see any error from the ground. There is a plate mounted at ground level to explain the differences between 'clock' and 'dial' time.

The carving, painting and gilding of the dial took about six weeks. The white background and chequered border showing quarter hours are painted in masonry paint, the numerals in signwriter's enamel. The hour lines and noon cross are gilded.

If one climbs the tower of St. Mary's Church in the High Street there is a fine view of three dials in a row - this new dial and the vertical south dials at All Souls College and Brazenose College. My thanks to all BSS members who gave me advice and support for the project.

*Harriet James*

#### REFERENCES

Dr. J. Davis: 'A lightweight laser trigon for lay-out of sundial lines' *Bull.BSS* **99.3** 144-146 (1999).

John Buxton: '*New College, Oxford. A Note on the Garden*' Oxonian Rewley Press, Oxford, 1976.

David Sturdy: '*Twelve Oxford Gardens*' Ark Press, London (date not known).