The British Sundial Society

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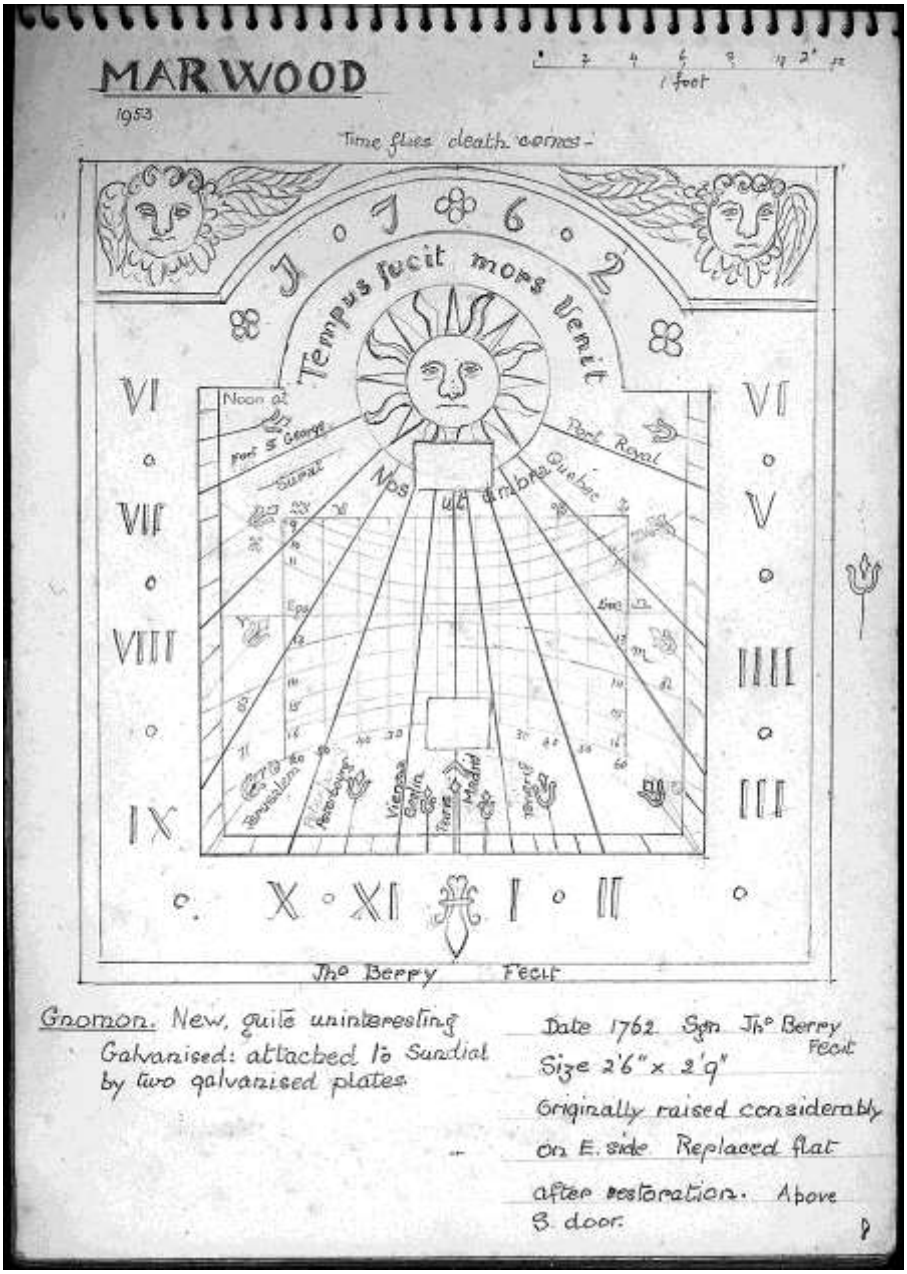

A page from Mrs Crowley's first Devon sketchbook, depicting the dial at St Michael and All Angels, Marwood (SRN 0081). Jeanie Crowley is the subject of John Lester's article on pages 10–11.

> *This dial has been described as Jno Berry's masterpiece… [It] not only has a set of declination lines drawn to show the number of hours of daylight by means of Arabic numerals and, less precisely, the signs of the zodiac, but it also shows the time of noon at eleven different places around the world in relation to local solar time. Of the more obscure ones, Fort St George and Surat are on the east and west sides of India while Port Royal was the original name of Kingston, Jamaica. As if this were not enough, the dial also shows, by means of a set of straight vertical lines numbered along the bottom, the bearing, in degrees east or west of due south, from which the sun is shining.*

Transcribed from Mrs Crowley's Sundial Sketchbooks of Devon & Cornwall*, edited by John Lester, British Sundial Society and Antiquarian Horological Society (2008).*

***Front cover**: The sundial at West Park, Long Eaton; Stuart Allan tells the story of its construction on pages 6–8. Photo: Stuart Allan.*

***Back cover**: The south east face of an unusual pillar dial, described by Mike Cowham in his article on the portable vertical dial on pages 42–4.*

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Christine Northeast and David Brown

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CONTENTS

EDITORIAL

It has been quite some time since advertisements last appeared in the *Bulletin* so it is a pleasure to report that in this issue we have two full-page advertisements from organisations well known to many readers.

On pages 10 and 11, John Lester gives us more insights into the life of Mrs Crowley. We might mention here that his book *Mrs Crowley's Sundial Sketchbooks of Devon & Cornwall*, which is a joint publication by the BSS and the Antiquarian Horological Society, is available (along with most of our publications) from Elspeth Hill whose contact details are given in the inside back cover.

Another of our publications which may be obtained from Elspeth Hill is Monograph 11 and a review of this new monograph features on page 41. This contains a remarkable collection of photographs of mass dials in Somerset, all taken by Dom Ethelbert Horne 100 years ago. The quality of the photographs is astonishing especially when one considers not only the equipment available at the time but also that we are seeing copies of copies. Anyone who wants to see at a glance just how much mass dials can vary in appearance need look no further than this monograph.

The Newbury Meeting in September is fully reported in this issue and two of the talks are amplified elsewhere in these pages. We hope to be able to expand on some of the other talks in due course. The Editorial Team welcomes articles from readers on any sundial-related topic.

Finally, we wish all our readers a Happy Christmas and good sundial sighting in the New Year.

Frank King

AN ITALIAN CRUCIFORM DIAL

MIKE COWHAM

Since June 2013, when I published an article in the *BSS Bulletin* entitled 'The cross or crucifix dial',[1] another, completely different, cross dial (Figs 1 and 2) has come to my attention, made by Padre D. Bartoli of Bologna in 1667 (Fig. 3). It was exhibited in Paris by the Galerie Delalande between December 2013 and January 2014. Dominique and Eric Delalande wrote about this exhibition in the December 2013 issue of the *Bulletin*.[2]

The calibrations on this dial at first confused me, but I was determined to work out what they were trying to say. This took some time but hopefully I have now deciphered them all.

In an attempt to do this, the photographs from the Exhibition Catalogue shown in Figs 1 and 2 were scanned, then rotated and twisted to give fairly good rectified images of each of the dial faces, such as Figs 4 and 5. These show the hour lines for a vertical amplitude dial, the months being indicated by letters, being the start of each month in Italian.

For reference, the Italian months are:

Gennaio	*Febbraio*	*Marzo*	*Aprile*
Maggio	*Giugno*	*Luglio*	*Agosto*
Settembre	*Ottobre*	*Novembre*	*Dicembre*

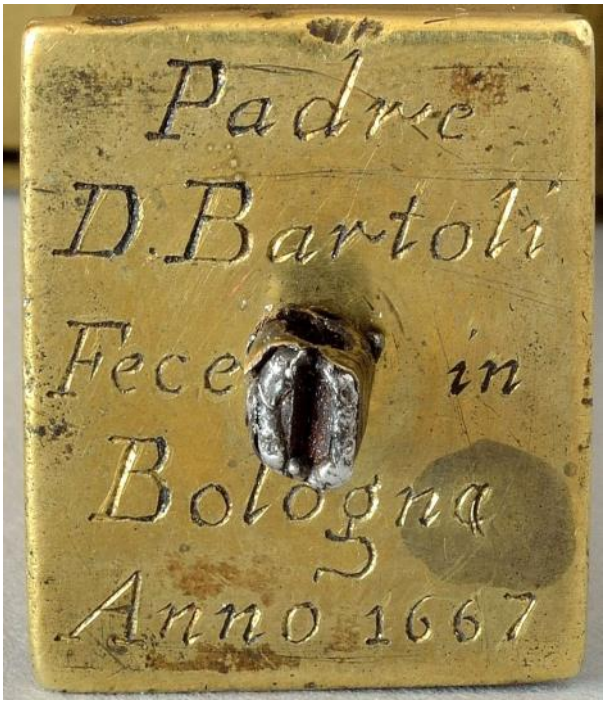
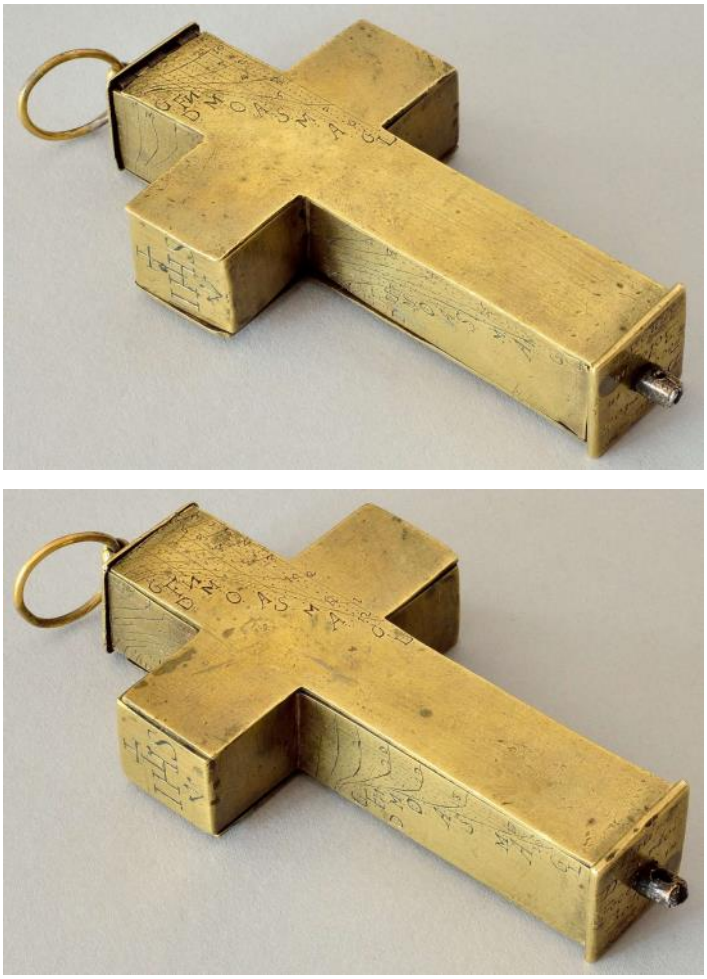


Fig. 3. Inscription on base of the dial.
© Galerie Delalande.



Figs 1 and 2. Images of both sides of the cruciform dial.
© Galerie Delalande.

(Note, on the dial itself, the uncommon reversal of N for *Novembre*.)

In order for these dials to operate a shadow caster is required. They almost certainly used the lid of the dial for this purpose which will overhang by the same amount as the thickness of the cross, or for the lower side dials, the length of overhang of the cross bar. Naturally the cross would need to be placed vertically with the appropriate dial face towards the sun. The cross has a small steel pin at the bottom, probably to fit into some type of stand.

The dial in Fig. 4 is therefore a standard altitude dial, calibrated for a latitude of about 44°, presumably that of Bologna. The dial in Fig. 5 is not quite so obvious, the hours starting at 2 and ending at 11. As the hour lines are complete for each month it became obvious that this was a

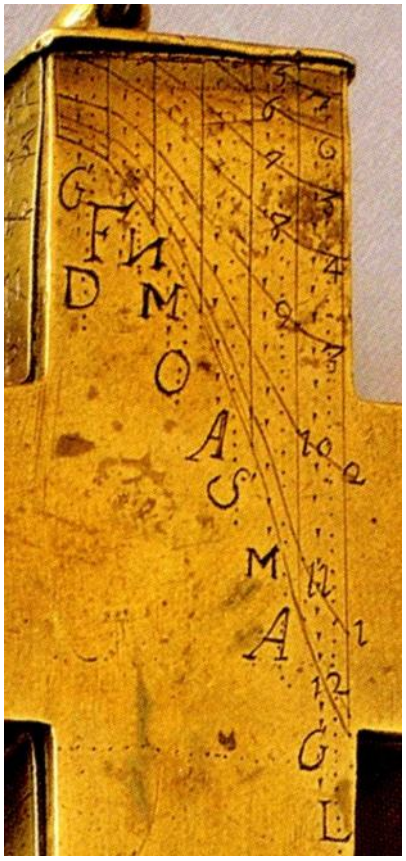


Fig. 4. The front face of the cross. © Galerie Delalande.

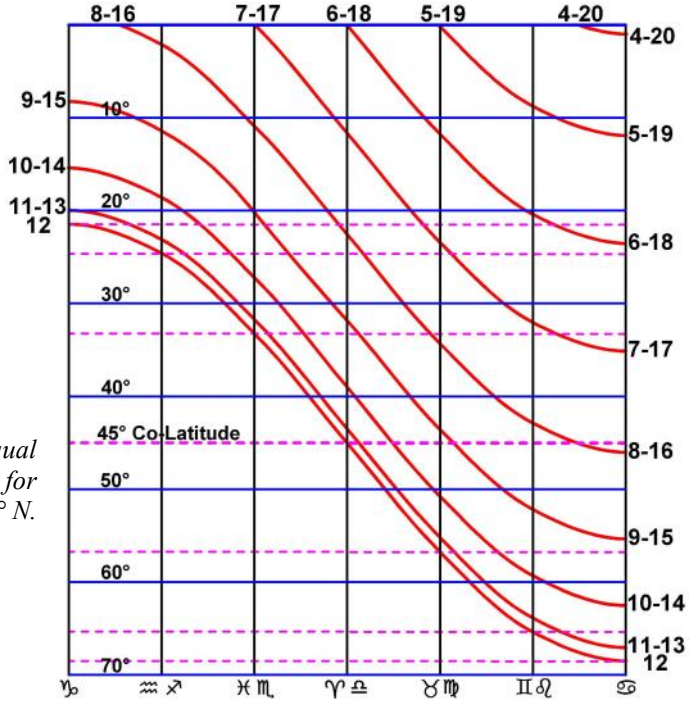


Fig. 6. Equal hour dial for 45° N.

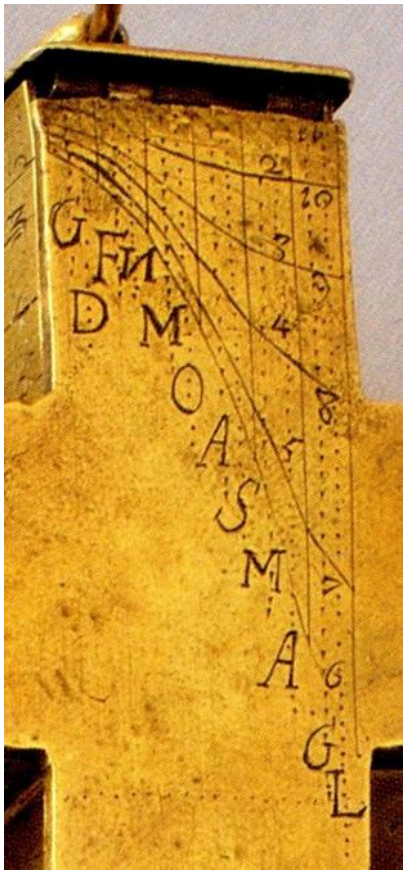


Fig. 5. The back face of the cross. © Galerie Delalande.

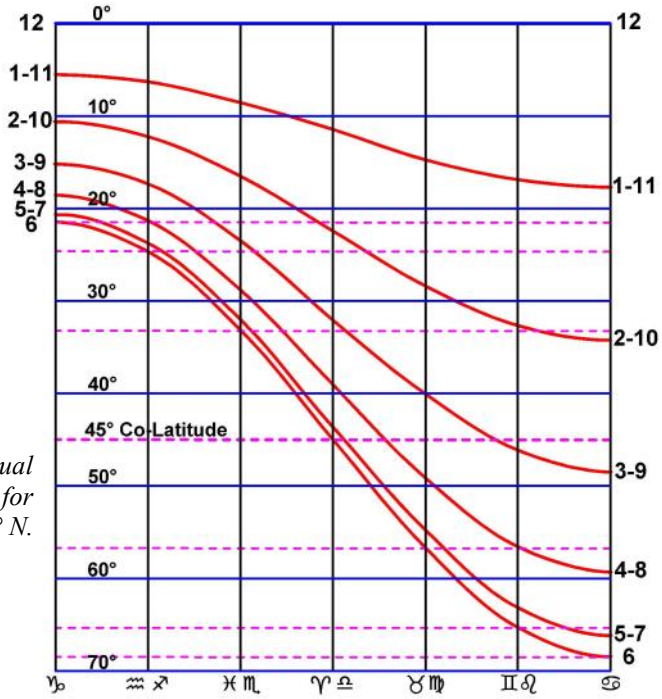


Fig. 7. Unequal hour dial for 45° N.

dial of unequal hours with sunrise as 0, noon as 6 and sunset as 12 hours. Plots were made of each of these scales to confirm that these are correct. These were done for a latitude of 45° N as I was unsure of the actual latitude of the original dial. The plots obtained are shown in Figs 6 and 7.

So far, the scales used were fairly easy to determine. So, what of the scales on each side of the dial (Figs 8 and 9)? A first guess was that they were of Italian hours, which are equal hours starting at sunset. Therefore sunrise could be anywhere in the range of 8 to 16 hours and noon at 16 to 20 hours. In order to determine this, a similar calibration was attempted and the results were surprisingly close to those seen on the dial sides, the gnomon being the cross bar above. This confirmed my guess of Italian hours. One side (Fig. 8) shows morning hours and the other (Fig. 9) the afternoon hours. This separation of the two scales avoids the confusion that can occur with both sets of hours crossing each other. These scales are shown in Figs 10 and 11.

Perhaps the most puzzling feature is to be seen at noon where there is a continuous line reading from 16 through to 20 hours. Furthermore, this line is not straight but consists of a series of small curves. This is because it is *not noon* but represents several hour markings, each of which does actually contact the noon line but may differ from it by up to half an hour.

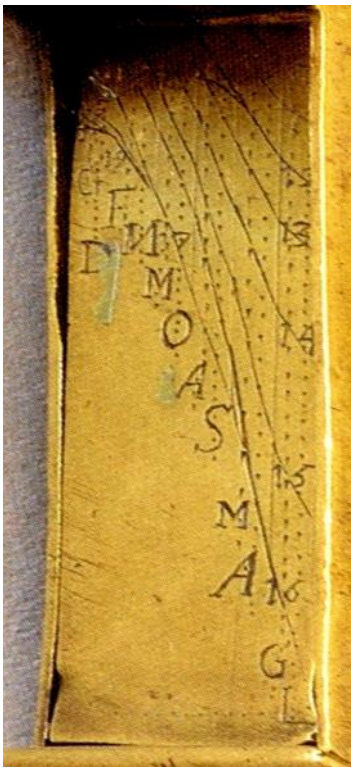


Fig. 8. Lower side face of the cross (morning). © Galerie Delalande.

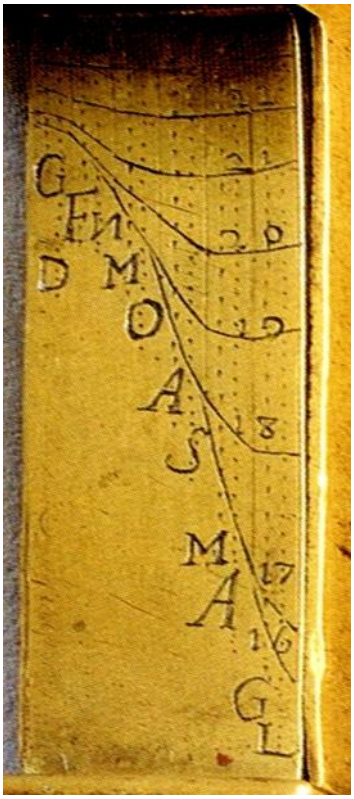


Fig. 9. Lower side face of the cross (afternoon). © Galerie Delalande.

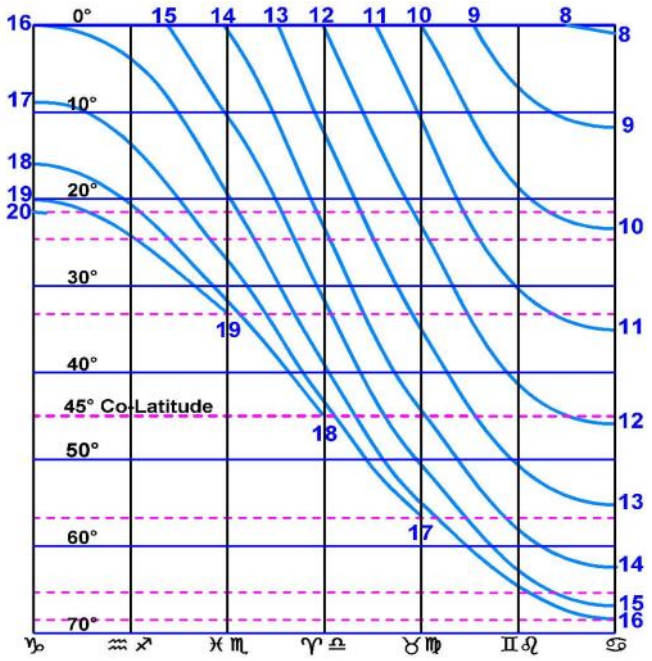


Fig. 10. Italian hour dial for 45° N, morning hours.

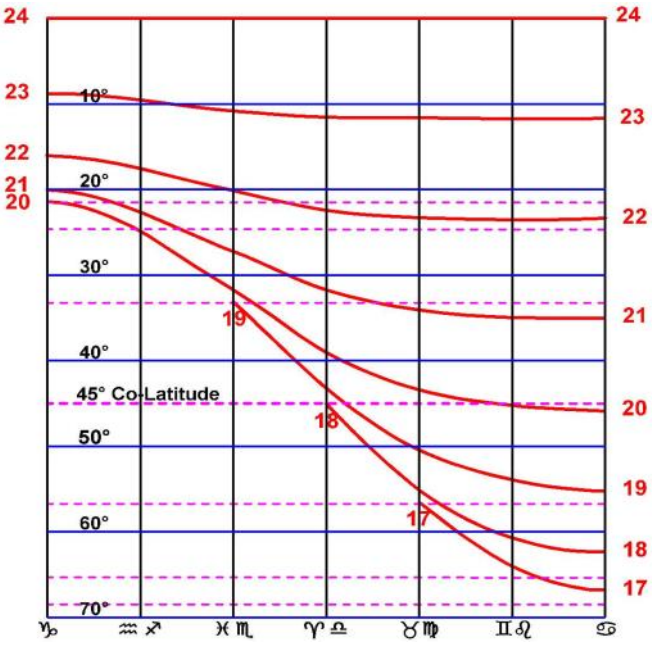


Fig. 11. Italian hour dial for 45° N, afternoon hours.

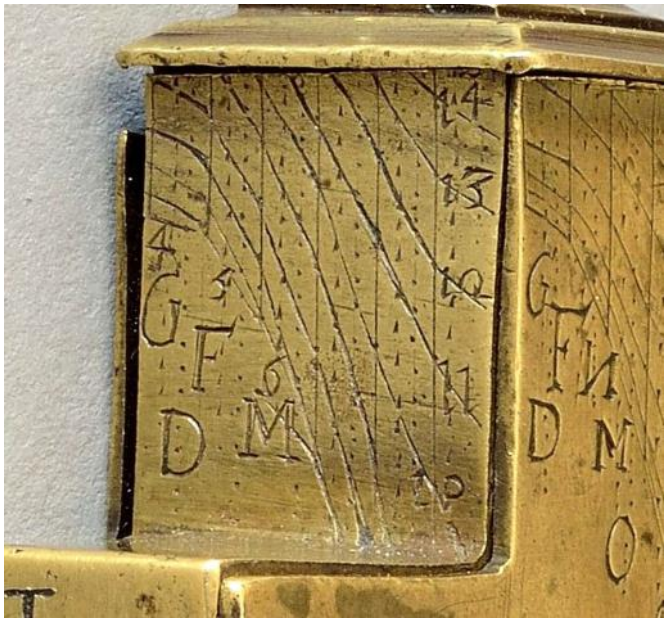
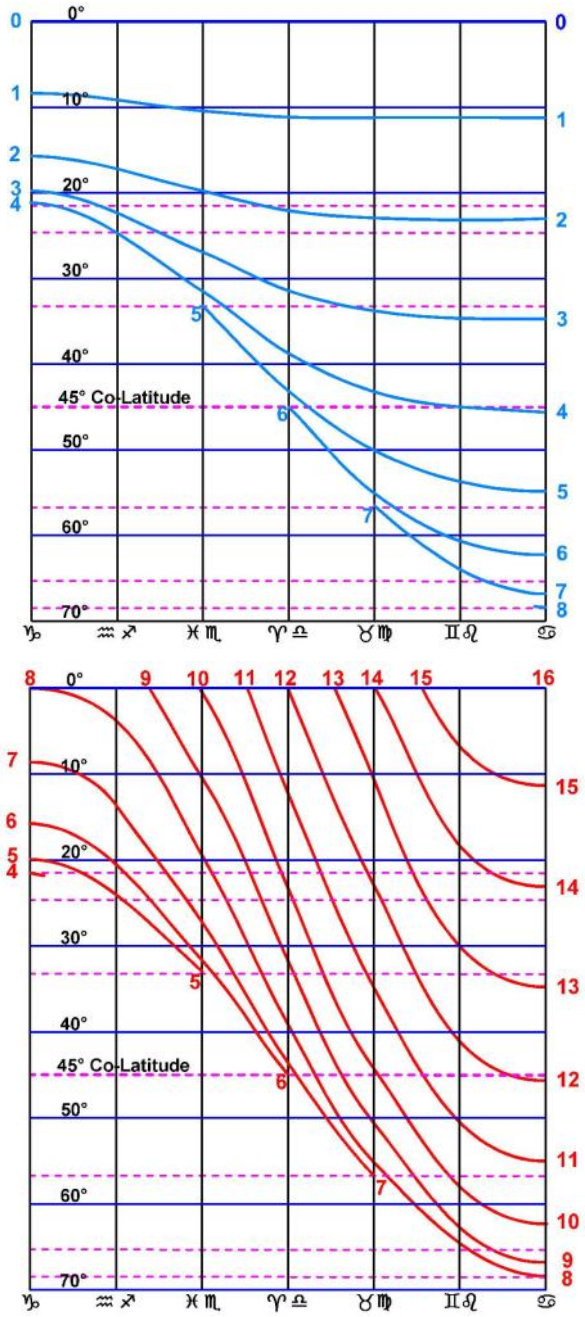


Fig. 12. Dial markings on the upper section of the cross. © Galerie Delalande.

Fig. 13. Babylonian hour afternoon markings on the upper two faces. © Galerie Delalande.

On the upper section of the dial are further scales, as shown in Figs 12 and 13. At first these look like repeats of the Italian hour scales but with different numerals. When inspected closely they seem to be of Babylonian hours, which are 24 equal hours starting at sunrise. These pictures therefore show afternoon hours. On the opposite side (not illustrated) will be the morning hours.

Babylonian hours are actually a fairly faithful mirror image of Italian hours. Figs 14 and 15 show how they compare. These hours also run onto the top of the cross arms. The gnomon again must be the top plate somehow swung out above the scales. Although the top is hinged to the body it was not possible to open it, so the hollow interior may have held the actual gnomons for each of the dials.



Figs 14 and 15. Babylonian hour dial for 45° N, morning hours (above) and afternoon hours (below).

ACKNOWLEDGEMENTS

I would like to thank Galerie Delalande for letting me use their photographs and for supplying some extra pictures to those in their Exhibition Catalogue.

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1. M. Cowham: 'The cross or crucifix dial', *BSS Bulletin* 25(ii), 23–27 (June 2013).
2. D. and E. Delalande: 'Portable sundials at the Galerie Delalande', *BSS Bulletin* 25(iv), 52–56 (December 2013).

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CONSTRUCTING THE SUNDIAL AND PLANET GARDEN AT WEST PARK, LONG EATON

STUART ALLAN

The 127-acre West Park is the gem in the crown of Long Eaton. The town is a large conurbation midway between Nottingham and Derby, made wealthy in Victorian times by the lace trade. The huge Harrington mill (1885) stands next to the park, as does the Erewash canal (1779).

Erewash Borough Council asked the Friends of West Park to redevelop the old putting green, an area 150 metres E–W by 82 metres N–S, in an interesting manner. A giant sundial was proposed, with planet flower beds in an ellipse around the sundial; later the planets evolved into a spiral around the dial, with Mercury the closest and Pluto the furthest away. From the outset it was designed as a unique garden for park users and keen horticulturalists, with a wide variety of perennials, shrubs and grasses, but it was also intended to fire the interest of youngsters in the solar system, with a bit of Stonehenge mixed in. The park staff worked hard constructing the project and keeping it up to scratch.

We decided to place the sundial in the plot midway east to west but biased towards the northern boundary. At our site the altitude of the sun is just under 14 degrees at noon on the winter solstice; there are trees on the southern boundary but they are deciduous and lose their leaves for several months.

Having no experience to draw on, a simple rod gnomon seemed logical; AGA Rangemaster enabled the project to start by making the gnomon at their Long Eaton factory free of charge. Rangemaster is the largest UK producer of stainless steel sinks, with the entire production carried out by robots. When they found they had no workers with the skills to weld the gnomon or to give it the brushed finish, they brought back retirees for the project. The gnomon was made from 100 mm stainless steel tube and the internal angle between the gnomon and the horizontal tie was set to 52.9°, the latitude of our site (Fig. 1).

Fig. 1. The gnomon in the factory, assembled but awaiting the brushed finish. The gnomon makes an angle of 52.9° to the horizontal tie which will be buried in the concrete base.

We established the north–south line for the alignment of the gnomon by using the shadow of the sun. A nail was hammered into the end of a length of straight 50 × 50 mm timber and guy ropes tied to the nail. The pole was erected vertically and we recorded the position of the shadow at noon GMT, adjusted for our longitude of 1.27° W and the Equation of Time, and marked this using pegs and string.

Fig. 2. The anchor rods in position.

Substantial concrete footings were put in place by our installation engineer; he used a template to position four pairs of threaded anchor rods (Fig. 2). Timber formwork was added to mould the arrow-shaped base (Fig. 3). At this stage the gnomon was aligned accurately in three dimensions, along the N–S line using the pegs and vertically using metal shims under the four anchoring points. The gnomon was permanently set in position by concreting the base.

After the base had set, a 6-metre circle was excavated around the sundial, with an edging of 12 lengths of tantalised timber. Aggregate and the concrete hour markers

Fig. 3. Formwork for the concrete base.

Fig. 4. Aggregate and the hour markers within the timber edging.

Fig. 5. The completed dial, showing the mosaic hour markers.

(each cast in an inverted washing-up bowl with the base cut out) were then put in place (Fig. 4). I wished the sundial to be child friendly so the hours are indicated not by Roman numerals, but by black mosaic tesserae representing GMT, with additional yellow tesserae for BST (Fig. 5). Cost limitations dictated the finish.

The local monumental mason made the noon stone which also has a line calibrated to the shadow of the tip of the gnomon at the summer solstice (Fig. 6), and the winter solstice pyramid was cast in formwork made by myself (Fig. 7). At sunrise and sunset at the equinoxes, an arch

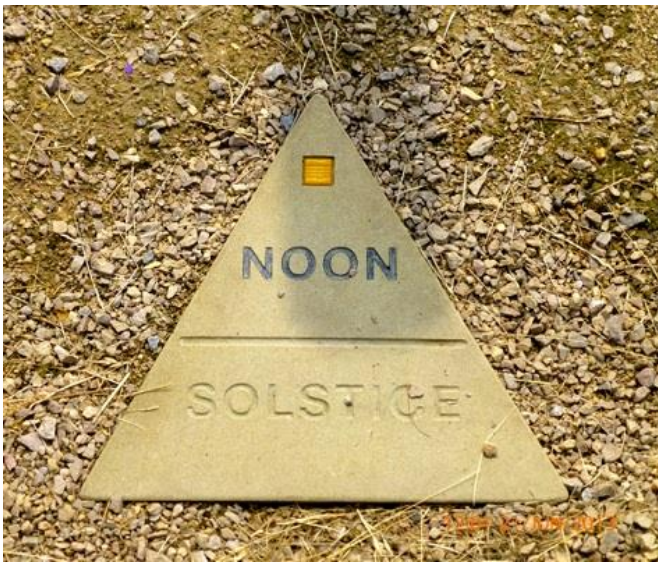


Fig. 6. Noon stone with summer solstice line.
Photo © David Lally and licensed for reuse under a Creative Commons Licence.

Fig. 7. The winter solstice pyramid.

Fig. 8. The equinox arch.

Fig. 9. Four of the planet beds that surround the sundial. Left: Mercury with Venus behind, centre: Earth, right: Mars.

frames the extensive views east and west (Fig. 8). A plaque to the south of the gnomon documents the technical details with an EoT graph whilst an interpretation board stands nearby.

Some 15 companies, individuals, East Midlands Airport provided money, services or materials for the project, all at the request of the Friends of West Park. The planets (Fig. 9) are colour themed and the wide range of plants was specified by the Long Eaton and District Horticultural Society. A montage of these plus botanical names can be found on the sundial's website.[1] I initially designed Jupiter as a child's maze; they would find their way to the centre and then on to the 'red spot', but this was vetoed by the council.

The project has taken five years, including a year when the ground was too waterlogged to create the planets. I committed £1201 to Groundwork Derby, the horticulture training organisation, to plant three planets. Just weeks later they went into administration. Small creditors expected about 50% returned when buildings were sold but Vince Cable's government department took everything as the preferred creditor.

As local children get older and become students at Long Eaton school they can study the heavens in a purpose-built observatory; only two schools in the UK have one so sophisticated. The three-storey purpose-built observatory block has a large revolving dome housing a 16-inch diameter Meade telescope.

ACKNOWLEDGEMENT

Paul Coleman, of London, was an invaluable source of sundial advice.

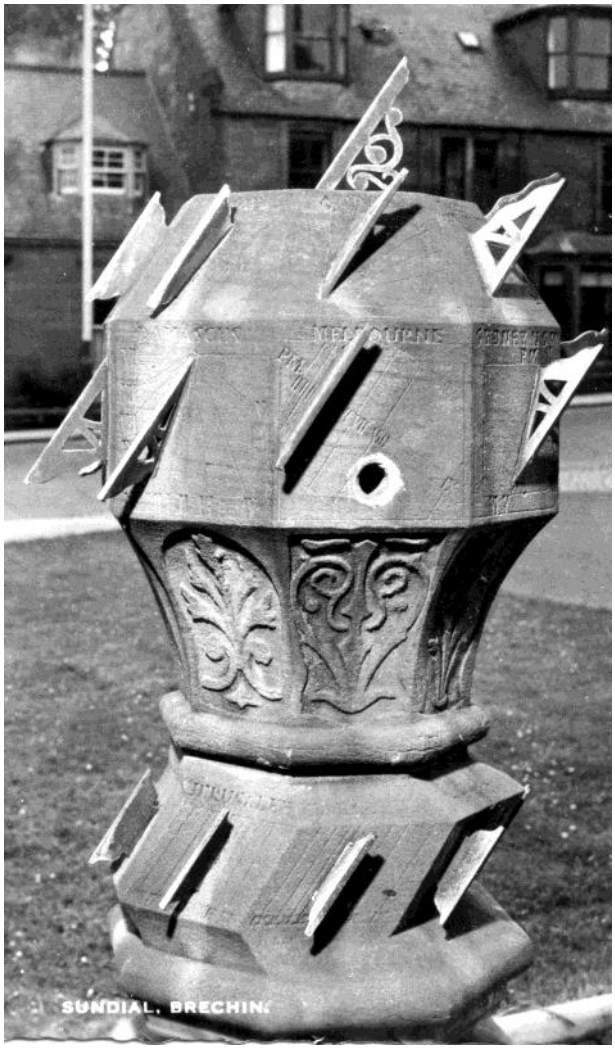
REFERENCE

1. *www.westparksundial.com*

teleconsultancy@btinternet.com

Postcard Potpourri 37
Town Square, Brechin

Peter Ransom



This excellent dial is listed in the BSS Register as SRN 1480 where it is described as being made of sandstone. The picture in the Register shows a broken gnomon on the horizontal dial, so old postcards such as this can help if a restoration is ever needed. It is a multi-faceted sundial with 25 faces each named with a different city including Brechin, Rome, Cairo, New York, Chicago, Melbourne, Sydney, New Orleans, Berlin, Quito, Rio de Janeiro and many more. The maker was James Tosh, a local sculptor and mason. It was probably made around the start of the 20th century. The dial was originally sited in Edinburgh and was gifted to Brechin in 1961.

The postcard is not dated though on the back it mentions 'M and L National Series'. This identifies it as the Millar & Lang Art Publishing Co. that was in existence 1903–1941 based at Glasgow and London.

pransom@btinternet.com

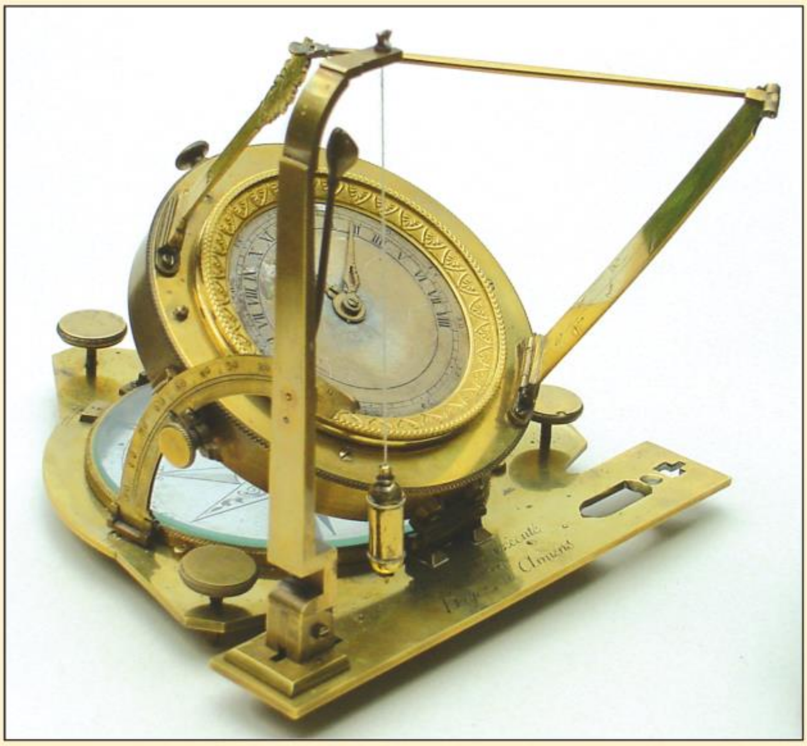






















WHO WAS JEANIE CROWLEY?

JOHN LESTER

This article is based on a presentation made at the 2015 BSS Nottingham Conference.

It would be interesting to know much more about this lady whose West Country sundial drawings are a unique phenomenon.[1,2] Little of what we think we know is supported by documentary evidence but is based on a small number of reminiscences by people who were her neighbours.

A few things are certain. She was born Jeanie Margaret Currey in Kensington on 17 May 1885, her father John Currey being a solicitor. In June 1919 she married Cuthbert Crowley who is described on the marriage certificate as the son of a clerk in holy orders resident in Albury, Surrey. A Cuthbert Crowley is also recorded as being a patient in the Canadian Casualty Assembly Centre. We can make a conjecture, based on the memories of a neighbour, that Jeanie worked as a V.A.D. nurse and that her husband had lost a limb, that she may have married one of her patients. We do know that when Jeanie began her series of drawings in 1953 she and her husband were living at Forda House in Georgeham, Devon (Figs 1 and 2). They had two children, Philippa (b. 1925) and John (b. 1927). Jeanie published papers in the *Transactions of the Devonshire Association for the Advancement of Science, Literature and Art* in 1952, 1957 and 1961 as well as a paper in *Cornish Archaeology* in 1963.

We have absolutely no idea where the Crowleys' income came from. Forda House is a pleasant and substantial residence which could not be maintained cheaply. Was Cuthbert able to work in spite of his injury and, if so, what did he do? Memories suggest that the couple were involved in village activities (Cuthbert acting as Treasurer for the local church), were keen gardeners and, having an interest in antiquities, were supporters of organisations such as the National Trust. It is known that they left Georgeham in 1962 and moved to Braunton. Jeanie died aged 79 in 1965 and her ashes were buried in the churchyard at Georgeham. Cuthbert is said to have died about two years later.

There is nothing to tell us what sparked Jeanie's interest in sundials and started her on an eleven-year project during which she drew or described 216 sundials having visited 543 churches in order to find them. She should be regarded

Fig. 1. The dial at St George's Church, Georgeham (SRN 0116), in the village that was Jeanie Crowley's home when she began her sundial drawings.

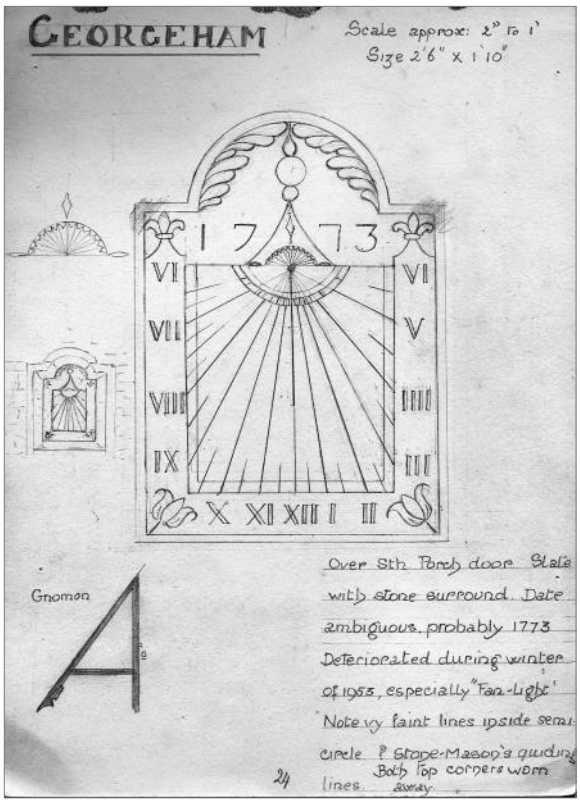


Fig. 2. Mrs Crowley's drawing of the Georgeham dial, no. 24 in the first of her five Devon sketchbooks.

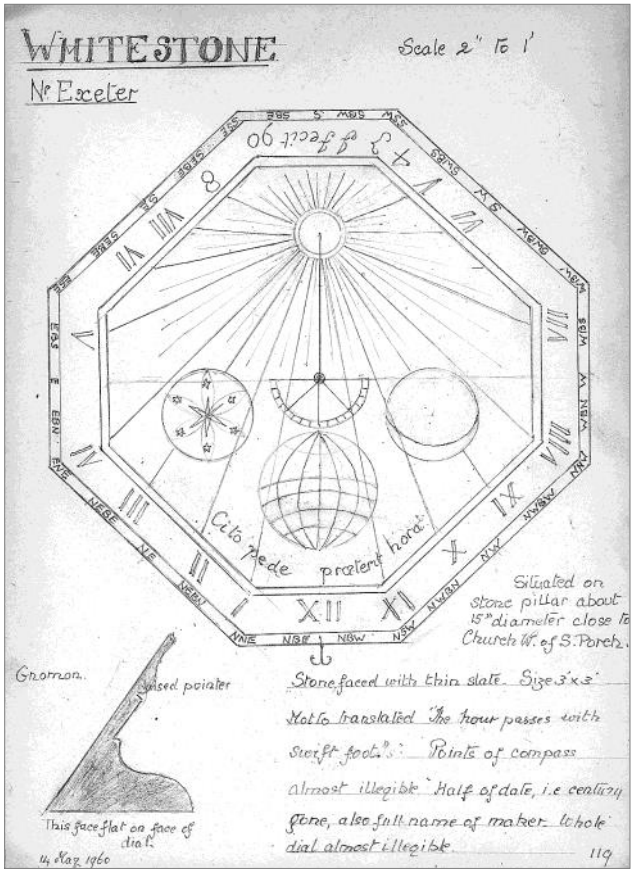


Fig. 3. Whitestone (SRN 1033), the only horizontal dial drawn by Mrs Crowley, from the fifth Devon sketchbook.

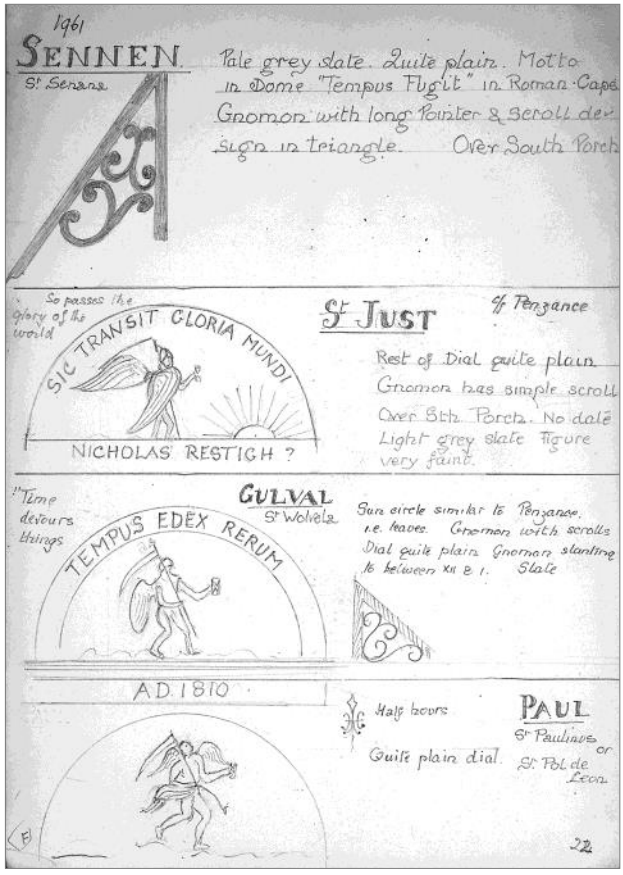


Fig. 4. A page of partial drawings from the first Cornwall sketchbook.

as a draughtsman rather than an artist since her drawings are mostly plain and accurate representations of her subjects and are frequently drawn to scale. No drawings by her of anything but dials have yet been found.

It is possible to make informed guesses about her methods. She travelled round Devon and Cornwall in her car and apart from her drawing materials she certainly took measuring rods and field glasses and may have also used a small pair of steps to obtain better access to dials. Apart from one large horizontal dial (Whitestone, Fig. 3), the remains of a 24-hour clock (St Austell), a cube dial (Forde House, Bampton) and four mass dials (Bampton, Littleham, Widworthy, Michaelstowe), all the dials she drew or described were vertical dials. A considerable number of dials were described but no drawings made. Perhaps she considered these to be of poor quality but some of her decisions are surprising. The fine dial at Harberton is dismissed as "complicated and uninteresting". It is neither. Some drawings were probably completed after she left the site and this may account for some of the few errors she made. She seldom drew dials near the centre of towns and you will find, for example, no dials drawn in Exeter, Torquay or Truro. This is probably because she disliked people watching her while she worked and preferred the isolation of small villages.

An examination of the eight sketchbooks (five for Devon and three for Cornwall) reveals frequent muddled numbering systems on the covers. Her drawings vary in quality and she would sometimes draw just a single feature of a dial (Fig. 4). Most of the drawings show the dial plate and a separate sketch of the gnomon. Holes in the paper indicate that Jeanie used a pair of compasses to draw circular features on dials and she may well have used a ruler to draw straight lines. She makes notes on the drawings which are a valuable addition though some of these seem to suggest that her knowledge of the workings of a sundial was incomplete. Even so, she was familiar with the work of Mrs Gatty, Leybourne's book on dialling and Cole's work on mass dials.

It is well worth while making Mrs Crowley's acquaintance and with the help of her drawings a pleasant West Country holiday spent following in her footsteps could be devised. As always, further research is needed and anybody looking for a dialling project would find that further investigation into her life would prove a fascinating exercise.

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1. J. Lester (ed.): *Mrs Crowley's Sundial Sketchbooks of Devon & Cornwall* (2008). Jointly published by the BSS and the Antiquarian Horological Society, who own the original notebooks.
2. M. Isaacs: Book Review, *BSS Bulletin* 20(ii), 83 (June 2008).

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JOSHUA SPRINGER OF BRISTOL
An Eighteenth-Century Provincial Dialmaker

JOHN DAVIS

Joshua Springer of Bristol (1732–1812) was one of a small but growing group of mathematical instrument makers who worked in provincial towns and cities at the end of the 18th century. Bristol, having been a port since Tudor times, always required navigational instruments and its growing wealth as England's second city, fuelled partly by the slave trade, meant that there were numerous prosperous clients for philosophical instruments. Springer styled himself as a mathematical, philosophical, optical and musical instrument maker and established a good living for himself. As well as the sundial shown in Fig. 1 (discussed in detail below), numerous other instruments by him are known including portable dials, compasses, barometers and so on.[1]

Although some brass horizontal dials had been made in Bristol at the beginning of the 18th century – for example, the dials made by the 'schoolteacher' Robert Spurrell, one of which is dated 1715[2] – it was not until the middle of the century that there were professional instrument makers there.

Fig. 1. A horizontal dial by Joshua Springer, c. 1800 or slightly earlier.

Biographical

Joshua Springer's early life is not recorded. The first that is known about him is that in 1759, aged 30, he took over the shop at the sign of Hadley's Quadrant in St Stephen's Lane, Bristol, previously run by John Wright from 1756.[3] John Wright had served his apprenticeship in London under Benjamin Cole, successor to Thomas Wright (fl. 1718–47) who was Instrument Maker to His Majesty the King (George I).[4] It seems likely that Springer learned his trade in John Wright's shop and thus became the inheritor of the 'London style' of instrument making. That this was not a formal apprenticeship can be surmised from the fact that when he faced local competition in 1774 from Henry Edgeworth, the latter referred to himself as the only person in the city to have served a regular apprenticeship in instrument making – a rather sly aspersion on Springer's training.[5] Despite this competition, there is ample evidence that Springer prospered.

In 1774, Springer moved his flourishing business to newly-built premises at 2 Clare Street, in the Easton region of the city. He remained here until his death, when the premises (and the goodwill) were taken over by R & C Beilby who continued to produce a wide variety of high-quality instruments.[6] After them, their foreman John King continued at the premises until at least the Great Exhibition of 1851. Thus Springer was an important part of a long tradition of instrument making in Bristol.

Less well recorded is the fact that Springer rose to be a pillar of Bristol society. From the transactions of the local masonic lodge, we learn

> Bro. Springer was for many years the Deputy Provincial Grand Master of Bristol and the most prominent local Mason. He was an optical and mathematical instrument-maker, and his identity is shown by various records of purchases and repairs for the Lodge, though his Christian name is never once mentioned.

Elsewhere in the transactions, we read that he was the most knowledgeable member on the subject of masonic procedure and that he had

> … Chambers at the Hotwells [a spa in Bristol, demolished in 1822, which competed with Bath's Pump Room] for medical Electricity, a remedy much in fashion in his day. As he went down in a Number Coach he always worked a lecture to himself, and in that way became perfect…[7]

The reference to "medical Electricity", a growing fashion in the late 18th century, shows that Springer was keen to

explore scientific developments, probably for both their commercial opportunities and their philosophical aspects.

Another area that he became involved with, if only briefly and rather unsuccessfully, was the new craze of ballooning. The history of ballooning in the region says[8]

> Young Deeker's aerial voyage [the 18-year-old Joseph Deeker had made a rather hazardous flight in front of a large audience from a field outside Bristol of 26 miles in 32 minutes on 18 April 1785, landing near Chippenham] certainly fired the imagination of local people, and several put forward plans to construct not only bigger, but scientifically equipped balloons. In Bristol on April 23rd 1785, John Weeks of the Bush Tavern together with Joshua Springer, a mathematical, philosophical, optical, and musical instrument maker of Clare Street advertised a proposed scientific ascent in a 100ft circumference three man balloon, providing £300 could be raised by public subscription. These funds, however, were not forthcoming, in spite of two further advertisements in the local press, and the project never left the drawing board.

The balloon flight would clearly have given Springer the opportunity to supply novel types of scientific instruments and also to take part in cutting-edge meteorological research.

The list of services which Springer offered includes musical instruments as well as the various scientific ones. This is most unusual and no London mathematical instrument maker crossed over into the musical field although Henry Edgeworth, Springer's local rival, also sometimes included it in his list of services.[9] It indicates, perhaps, a need for provincial makers to spread across many fields in order to secure a living. There is not much evidence of Springer's activities in musical instruments but one rather whimsical online posting has him delivering 7,368 musical triangles to the colonies in America, though I have been unable to confirm this.[10] It is possible that it derives from an incorrect oblique reference to the 'triangle trade' of ships sailing between England, West Africa and the American colonies, carrying manufactured goods, slaves and tobacco respectively on each leg of the highly profitable journey. We know that Springer took advantage of this trade and that he was wealthy enough to have owned at least one slave himself as, in *Sarah Farley's Bristol Journal* for 9 January 1768 (quite early in Springer's career) there was an advertisement:[11]

> To be sold, a healthy Negro Slave, named Prince, 17 years of age, 6 feet 10 inches high [!], and extremely well grown. Enquire of Joshua Springer, in St. Stephen's Lane.

We do not know whether the slave was for domestic duties or in Springer's workshops, though the former seems more likely.

Overall, the picture of Springer is of a prosperous businessman with many connections to local society and a strong interest in all the technical developments of the time.

When he died in 1812, aged 80, his death was recorded in *The Gentleman's Magazine and Historical Chronicle*[12] as "At Upper Easton, aged 80, Mr. Joshua Springer, late of Bristol." and a similar announcement giving the Clare Street address was in *The Monthly Magazine*.[13] By this time, there were several other instrument makers in Bristol (as well as Henry Edgeworth): the 1775 *Bristol Directory* records another Springer, William (surely a relative?) working at 24 Charles Street, and a Walter Chandler making surgeon's instruments.

A Horizontal Dial

The horizontal dial of Fig. 1 is signed simply "*J. Springer. BRISTOL.*" (Fig. 2). It is 249 mm (9¾″ nominal) in diameter, around an eighth of an inch thick, weighs 1.47 kg and has a rather worn surface which has probably been (chemically?) cleaned of a thick patina at some stage. A very similar dial, both in size and design but retaining a patina, was sold by Christies in 2013 at a rather inflated price.[14] Its layout is simple and quite standard, generally following the form of a 'London' dial from earlier in the century, as shown by the general features such as the compass rose and the borders. There are some individual touches though, such as the borders with a floral/leaf decoration rather than the stylised wheat-ear (or oak-leaf) pattern used by most London mathematical instrument makers, and the floral infill to the points of the compass rose, rather than the alternating 'feather' and parallel line pattern used in London (Fig. 3).

Fig. 2. Signature of the Springer dial.

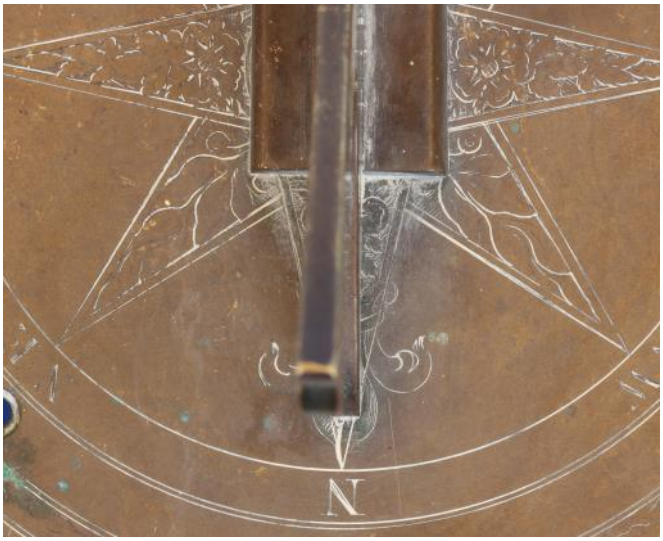

Fig. 3. Close-up of compass rose by Joshua Springer.

Fig. 4. Compass by Springer. Note the fleur-de-lys and the pencilled date 1790 (enlarged below) on the inside wall.
© National Museums Scotland.

Another feature of the compass is the fleur-de-lys decoration on the North point. This is quite often seen on navigational compasses, including ones made by Springer himself (Fig. 4) but is relatively rare on dials. Springer used the same design on the compasses of his portable dials as well, such as the one illustrated by Cowham.[15]

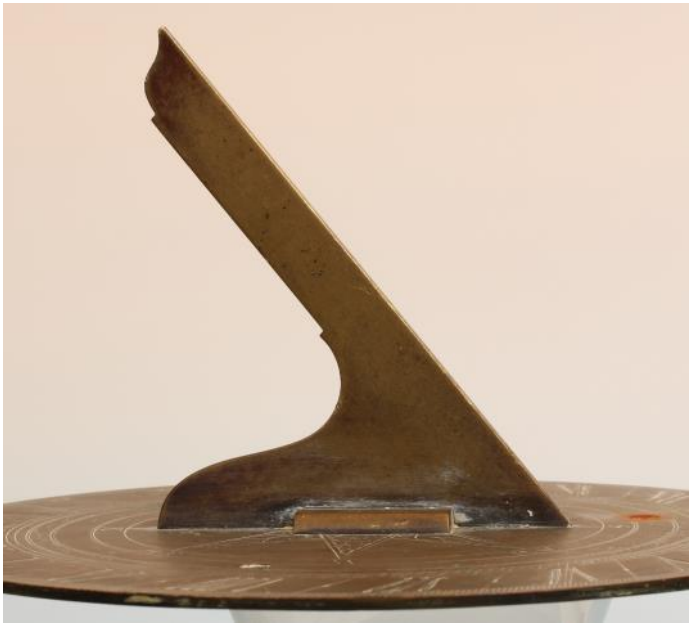

Fig. 5. Gnomon profile of the Springer dial.

The gnomon has an angle of 51.5° which would suit both Bristol and London. Its profile (Fig. 5) harks back to the style used by Thomas Wright[16] especially in the shape of the tip and the step in the shaft, another indication of the long-lasting influence of the London style through several generations of makers. This is also seen by the inward orientation of the main Roman numerals: whereas most London makers had started to use the more practical outward-facing style in the first quarter of the 18th century, Thomas Wright was extremely reluctant to change and provincial makers, even at the end of the century, even more so.

Metallurgy

The metallurgy of the Springer dial is of particular interest because it is highly probable that it was made from locally-produced brass – the brass works of Baptist Mills on the River Frome were only a couple of miles away and used copper ores from Cornwall. The Avon valley had been the leading English producer of brass and brassware since the beginning of the 18th century, when the Quaker Abraham Darby I (1678–1717; later to become justly famous for his development of coal-fired iron works at Ironbridge in Coalbrookdale) established works just outside Bristol, together with Neremiah Champion. It is worth pointing out that his large facilities were financed by local businessmen who were looking for a suitable investment vehicle for the money they had made in the slave trade.[17] Many technical developments to the brass-making method came from this area, including the setting up of what might be termed the first metallurgical laboratory where William Champion (son of Neremiah III) developed and patented (1738) an extension to the cementation technique involving the use of granulated copper to produce brasses with higher zinc concentrations than had previously been obtainable.[18]

X-ray fluorescence (XRF) analysis of the dial (Table 1) shows that the plate is made of a leaded brass and that the zinc concentration is at the high end of the medium range (i.e., around 20%) rather than in the >30% range that would result from the enhanced Champion process. This indicates that the new process was only adopted slowly for material used for dial-making. The difference in zinc concentration on the back of the dial between a freshly-cleaned area and the weathered area elsewhere shows the 'dezincification' to be expected after extended weathering. The front of the dial, in contrast, shows an enhanced zinc level and it is thought that this might be due to preferential loss of copper during a chemical process to remove the patination. The brass used for the gnomon is of a generally similar alloy but with a slightly higher lead concentration, probably as it was used to provide higher fluidity for casting the gnomon with its integral feet. The general background levels of a little tin, Sn, and relatively low amounts of iron, Fe, indicate likely Cornish origin of the copper and that the smelting process was well under control.

Location	Cu	Zn	Sn	Pb	Fe	As	Others/comments
Back, cleaned	76.4	20.6	0.4	2.1	0.5	nd	Mechanically cleaned
Back, uncleaned	79.2	17.8	0.4	2.0	0.7	nd	Weathered
Front, uncleaned	70.7	25.8	0.6	2.7	0.3	nd	Patina stripped
Gnomon, E	72.4	23.4	0.6	3.3	0.3	nd	Patina stripped
Gnomon, W	72.8	22.7	0.6	3.6	0.2	nd	Patina stripped

Table 1. Alloy compositions of the components of the Springer dial (in wt%, rounded to one place of decimals) as measured by XRF by the author using an Olympus Innov-X Alpha 2000 analyser with a 60-second sampling time and used in its 'Analytical' mode. The instrument was cross-calibrated against a set of CHARM (Cultural Heritage Alloy Reference Materials) test specimens with a representative range of trace elements in a copper-alloy matrix.[21] *nd = not detected.*

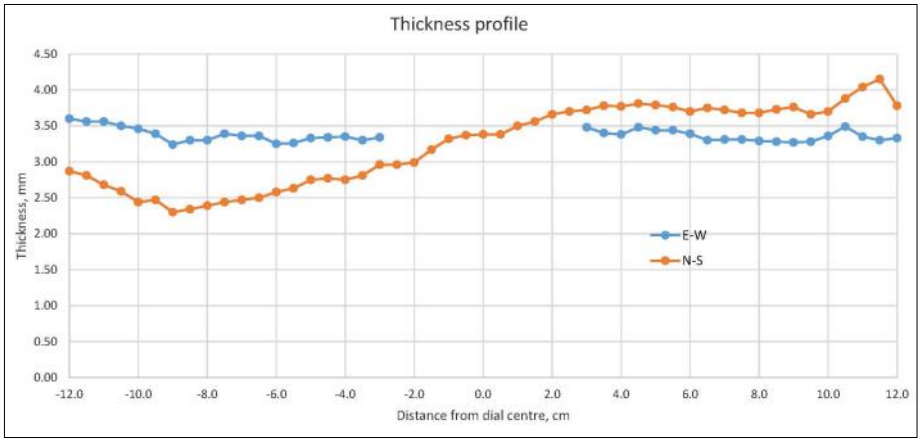

Fig. 6. Thickness profile of the Joshua Springer dial-plate, measured at half-centimetre intervals with a digital thickness gauge. Gaps in the profile are due to obstruction by the gnomon.

The brass alloys of the Springer dial can be compared to those of two dials by the Davis dynasty described recently.[19] Those dials were made by provincial makers at another Midlands centre (Derby/Leeds) about half a century later and although the general composition is similar, there are enough differences to confirm that they are unlikely to have come from the same Bristol source – by this time, Birmingham had taken over as the major supplier.

The thickness profile of the Springer dial-plate is shown in Fig. 6. The profile across the E–W diameter is quite uniform but there is a slight taper in the N–S direction. It does not show the circularly-symmetrical shape of the thick cast plate by Gabriel Davis or the very uniform thin one of Davis Derby.[20] It might have resulted from a very early use of a rolling mill but the general appearance of the back of the dial suggests that it was a very well-controlled casting with some mechanical scraping (but not hammering) afterwards.

Conclusions

Joseph Springer may be a little-known mathematical instrument maker but research into one of his dials has led to a better understanding of how the craft was developing in the industrial revolution outside London.

ACKNOWLEDGEMENTS

I am grateful to Alison Morrison-Low for help on the compass of Fig. 4.

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VERTICAL DIAL, CHÂTEAU DE CHILLON, MONTREUX

Doug Bateman

On our travels we visited the charming mediaeval castle Château de Chillon near Montreux (Fig. 1) and there spotted the nicely restored west-declining dial in Fig. 2.

Fig. 1. Château de Chillon. Wikimedia Commons. Copyright Benjamin Gimmel BenHur, licensed for reuse under a Creative Commons Licence.[2]

The Château is particularly well known because of its association with the poet Lord Byron (1788–1824). The castle held many prisoners, and its most famous prisoner was probably François de Bonivard, a Genevois monk, a prior and politician, who was imprisoned there in 1530 for defending his homeland from the dukes of Savoy. The monk was chained to a pillar for several years, and the event inspired Byron to write the poem *The Prisoner of Chillon* in 1816.

Fig. 2. Vertical west-facing dial at the Château de Chillon.

Byron also carved his name very visibly on a pillar of the dungeon, now covered with a transparent protective cover.

On making enquiries (hoping that the dial will have been seen by Byron), I was informed by the Exhibition manager and Scientific collaborator, Maud Jenni Hédiguer, that it was designed in 1905 by the first cantonal archaeologist, Albert Naef (Canton de Vaud).

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A SOLSTICE SUNDIAL

JACKIE JONES

Earlier this year a group of us went on holiday to South Wales; as the period covered the summer solstice, we decided it should be celebrated in some form. Following the experience of the sundial on Crosby Beach just before the BSS Conference in Liverpool in April 2016,[1] I decided another seaside sundial would be appropriate.

As with that event, planning the dial and exactly where it will be, in advance, is essential. With the aid of maps and Google Earth we located a south-facing sandy beach just a few minutes' walk from where we were staying. The latitude of the bay is 51° 34′ north and we agreed to construct a solar-time horizontal dial using only natural materials found nearby. Before leaving home, I drew out on metre-wide paper the layout of the afternoon hour lines for that latitude; it could be turned over for the morning ones. The mathematics for the gnomon was also calculated to ensure it would be at the correct angle, i.e. the horizontal distance along the north–south line from the root and the vertical height from there to the stick that would be the gnomon.

Fig. 1. Establishing the north–south line and laying out the paper plan.

It being Wales, one is never sure about the weather, so we prepared for different methods of establishing the north–south line. In the hope of a sunny day and being able to draw a line from the shadow of a vertical pole, we calculated how solar noon would relate to watch time. Taking into account the longitude, which was 4° west equalling 16 minutes; equation of time, dial slow by 1 minute 42 seconds and the one hour for British Summer Time gave us a watch time of 13:17:42 – probably a bit over-accurate for our needs. We also planned to have a compass, knowing the correction from magnetic to true north.

On a coastal walk a few days before the solstice, we found the perfect long sticks needed for the gnomon and supports; we were then fully prepared. Solstice morning, we selected a part of the beach just above the high tide line, made it as near level as possible, then established north–south using a compass and an occasional burst of sunshine (Fig. 1).

The gnomon was set into the sand and held in place by a number of heavy stones; after careful measuring, the top end was tied to a vertical stick which we had pushed as far as possible into the ground. We then laid out the paper plan matching the noon and south lines and placed pebbles at the end of the hour lines, left a noon gap and repeated for the morning hours (Fig. 2). The beach has a wonderful collection of coloured pebbles, so we selected black ones for the 6, 3, 9 and 12 o'clock lines and red for the rest; collected the best ones and completed the hour lines (Fig. 3). Larger stones were used as markers at the end of

Fig. 2. Fixing the gnomon and marking the position of the hour lines.

Fig. 3. Completing the hour lines in coloured pebbles.

Fig. 4. Larger stones were used to mark the end of the lines.

Fig. 5. Small pebbles were placed on the end markers to indicate the hour. Photo: Steve Chapman.

each line and on them we placed a number of small pebbles equal to the hour (Figs 4 and 5). In case anyone wondered what it all was, we wrote "SUNDIAL" in pebbles on its south side (Fig. 6).

It was then finished; Fig. 7 shows the sundial from the café on the coastal path above the beach. We had had the beach pretty much to ourselves for most of the day, but come late

Fig. 6. The finished sundial. Photo: Steve Chapman.

Fig. 7. Looking down at the dial from the coast path. Photo: Steve Chapman.

afternoon, it filled up with children on their way home from school and many regulars who swim there daily. By now it was hot and sunny, just as it should be to show off and explain a sundial. People were really interested; we told them how it worked and the difference between solar time and mean time. One man sent a photograph of it to the local television station; I'm not sure whether it made the news.

In 2016, the summer solstice coincided with a full moon, an event which is, apparently, not as frequent as I thought. The last time was in 1967 and will not occur again until 2062. We had hoped to go back to the beach later in the evening to see the dial by the light of the full moon, but in typical Welsh fashion, the weather changed and it was too cloudy.

I don't know how long the dial lasted; it was gone by the next week. I don't mind, it is a busy beach and there was some terrible weather just after the solstice. It was great fun doing it and many visitors learnt something new; it remains in photographs and memories.

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A HISTORIC SUNDIAL IN OLD HASTINGS

A Recent Rediscovery

BOB WILCOCK

Researching into my family history my wife and I discovered that my five times great-grandfather, Joseph Wakeham Carswell, had worked on a sundial in Hastings, East Sussex. Enquiries within in the BSS suggested that it was completely unknown. This article summarises our discoveries, and we hope it will inspire others to do further researches to uncover the answers to some of the unanswered questions.

We have found that there was a sundial in Hastings, by the Stonebeach, for several hundred years. There are many questions:

- When was the first sundial erected?
- What form did it take? Was it vertical or horizontal, metal, wood or stone?
- We know there was a repair or replacement mid-18th century. Which was it, and how did it change the sundial?
- When was it finally dismantled or removed?

These are pretty basic questions, because in our researches relatively little has emerged. The earliest mention is in the Hastings Corporation Chamberlains' Accounts for 1642[1] which record payments to:

Richard Pecke for keeping the town's dyal	6s
Thomas Haines for keeping the town's clock	15s
(amount difficult to read)	

Richard Peck(e) was a glazier by trade,[2] and paid his 'scot' to the corporation accordingly. He was elected Bailiff of the Bourne for 1650–52, responsible for good management of the river that flows through the centre of the town (now culverted under the main road, Bourne Street) and coming out near the sundial. The early records are frustratingly difficult to read, and we have not identified any further payment to him in respect of the sundial, but in subsequent years he was paid for keeping the town's watch, which he will have reset using the sundial. In 1654 Richard Peck was paid for mending the town horn, and in 1658 for glazing the court hall windows. Thomas Haines (or Haynes) was a teacher, and Chamberlain in 1653–54.[3,4] It is worth adding that nothing has emerged about the town clock and watch beyond references to payments for maintaining them and from time to time repairing them.

There are references to the sundial in relation to proclamations and punishments. The proclamation of Charles II in 1660 was read by the common clerk at the market place, the fish market and the sundial. In 1778, for stealing various pieces of gold and silver jewellery, Elizabeth Sargent was ordered

"*to be stripped from the Waist upward and ty'd to a Cart's Tail and Whip'd and at the following places vizt. the Old Market Place, the Fish Market and at the Sundial and then discharged.*" [5]

Where exactly was the sundial? It was by the Stonebeach apparently for the benefit of the fishermen. There is very clear evidence in documents in the Milward family archive in the East Sussex Record Office. Series MIL 2/2 refers to "three houses near the sundial", the first of which is described in 1676 as

"*a shop lately built outside the town wall and adjoining and annexed to it, on the Stonebeach near the Gut's Mouth in Hastings All Saints (N: the town wall; E: a twitten between the shop and another shop late* [blank] *Woodford; W: another narrow twitten between the shop and the deeze or storehouse of Thomas Carleton, jurat; S: the Stonebeach); 23 feet N–S, 17 feet E–W.*"

In 1768 the will of Thomas Morphee, mariner, bequeaths "two shops with buildings and appurtenances near the sundial in Hastings All Saints, bought of the heirs of the late Mrs Boys, deceased and occupied by John Sargent and Robert Moore".[6]

From this we can deduce that the sundial was a stand-alone monument, and not on a wall. We can gather a little more: The Pier Wardens' Accounts with the Hastings Chamberlains' Accounts audited in November 1746[7] include the following payments:

To Ben. Carswell a bill of Carriage to the Sundiall	5s 0d
To Jo^{s}. Carswell for a New Cock to the Sundiall	3s 0d

These entries are tantalizingly ambiguous. My ancestor Joseph Carswell was Hastings' first recorded clockmaker, having paid his fine to trade in 1714, and the annual scot from 1718. Records do not survive to indicate when he took over responsibility for maintaining the town clock, but from 1742 he was paid £1.10s a year for looking after the clock, with additional sums for repairs from time to time. The sundial is not separately mentioned, but it seems probable that his responsibilities included keeping an eye on the sundial (it is reported that his successor, William Gill, also a clockmaker, was responsible for clock and sundial). Joseph continued trading as a clocksmith until

1782, when he was 87, and his last invoice for "repairing and look after ye hall clock, £3.6s 0d" was paid in March of that year.[8] He was also paid annually for beating the town drum, no doubt including summoning the populace to the sundial (and Market Place and Fish Market).

So in 1746 Joseph made a new cock for the sundial. This was presumably a new gnomon, and Joseph will have used his clockmaking skills to make this of brass in his workshop (believed to have been in Hastings High Street). A cock would not have needed carriage and given that carriage (by Joseph's brother or his son) cost more than the cock, it seems likely that it was the sundial itself that was carried. Was the existing sundial carried to Joseph's workshop for renovation, or was in fact a new sundial brought in, with metal-work by Joseph? In 1750/51 he had to repair the sundial again, and was paid 2s 6d by the Pier Wardens.[9] No carriage was involved this time.

There are numerous copies of engravings of the seashore available on-line, but so far not one showing the sundial has come to light. In 1843 Joseph Planta MP of Fairlight Place near Hastings wrote to the Hastings Improvement Commissioners offering a sundial for the eastern end of the extension of the Parade.[10] It was reportedly made of Portland stone and erected there in 1851.[11] The Parade ends near the original site. Whether this was in addition to the historic sundial, or was a replacement is not apparent. It may be easier to find a description and an image of that dial.

If you find any additional information or any other image, please forward details to the Editor, with a copy to the author. And of course there is the bigger question: if Hastings' historic sundial was unknown, how many other ancient town sundials remain to be rediscovered?

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Bob Wilcock is a retired civil servant who spends his time researching and writing on his various interests, from Olympic philately to contemporary glass, and in-depth family history. He has self-published two books on Olympic philately, edited *The Glass Cone* for the Glass Association, and regularly contributes to commercial and society publications. The present article arose from his researches into the fascinating lives of his ancestors. Whilst much of the research is conducted on-line, he spends a lot of time visiting record offices and archives, and exchanging information with other researchers. He can be contacted at *bob@towlard.freeserve.co.uk*

An Ancient Dial Fragment in Hastings

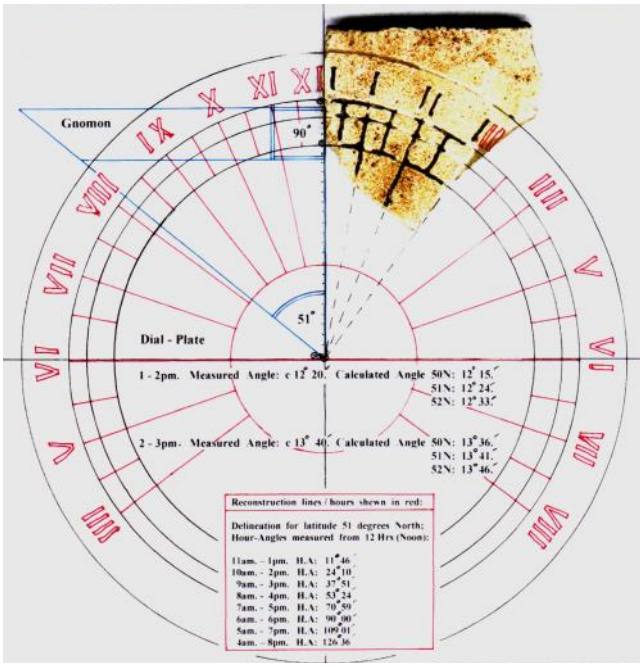

Fig. 1. Reconstruction by Christopher Daniel from a dial fragment unearthed during an archaeological dig in Hastings.

Amongst the list of Hastings dials in the BSS Register is a reconstruction by Christopher Daniel of an ancient dial (SRN 7171, Fig. 1). Could this be the one that is the subject of the foregoing article, we wondered? The fragment upon which his reconstruction was based was discovered by Dr Peter Marsden, FSA, during an archaeological dig in the garden of a house in High Street, Hastings. It can be seen that the hour numerals are read from the inside, and Christopher Daniel thought that it appeared to be an early seventeenth- (or possibly a late-sixteenth-century) horizontal dial, which at first sight seemed to make it a likely candidate.

Dr Marsden was recently contacted to see whether he could supply any additional information. He could: disappointingly, he told us that the fragment had been found in a pit of the 1660s, which meant that it could not have been part of the Stonebeach dial.

Acknowledgements

With thanks for their help to BSS President Christopher Daniel, Registrar John Foad and Dr Peter Marsden.

CHN

IN THE FOOTSTEPS OF THOMAS ROSS

Part 17: Some Sundials of East Fife

DENNIS COWAN

The eastern part of the region of Fife is located between the Firth of Forth and the Firth of Tay, more or less between Edinburgh and Perth, and east of the M90 motorway which runs between these two cities. In volume 5 of *The Castellated and Domestic Architecture of Scotland*,[1] Thomas Ross mentions a number of dials in this area, and six of them will be covered in this article.

Setting off along the north shore of the Firth of Forth and heading east, we come to Kirkcaldy, once famous for the manufacture of linoleum. Ross makes a brief mention of a dial at Dunnikier House, "a mansion at the eastern end of the town". He says:

"The dial on this house [Fig. 1] *is similar to the one just described.*[2] *The house faces the road, on the top of the hill at the east end of Kirkcaldy, and is dated 1692."*

The present Dunnikier House is a hotel to the north of Kirkcaldy, and a visit there confirmed my suspicions that it was not the building with the sundial. However, by a lucky chance, when just passing one day several months later, driving east out of Kirkcaldy, I noticed a sundial on the corner of a building (Fig. 2) known as Path House.

Although not immediately recognised as one of Ross's dials, when I returned home and looked at my photographs, even though the photograph and sketch are from different angles, there was no doubt that Path House and Ross's Dunnikier House were the one and same. Ross did not provide a detail sketch of the dial but the dial today showing both the south-east and south-west faces is shown at Fig. 3.

Fig. 1. Ross's sketch of Dunnikier House with the dial at the left of the sketch.

Fig. 2. Dunnikier House today, now known as Path House.

Fig. 3. Detail of the Dunnikier House / Path House dial.

Further east along the coast, the seaside villages of Earlsferry and Elie lie side by side without any gap between them and Ross identifies dials in both places. Firstly, of the dial in Earlsferry (Fig. 4), Ross says only that it "is neat and graceful in design".

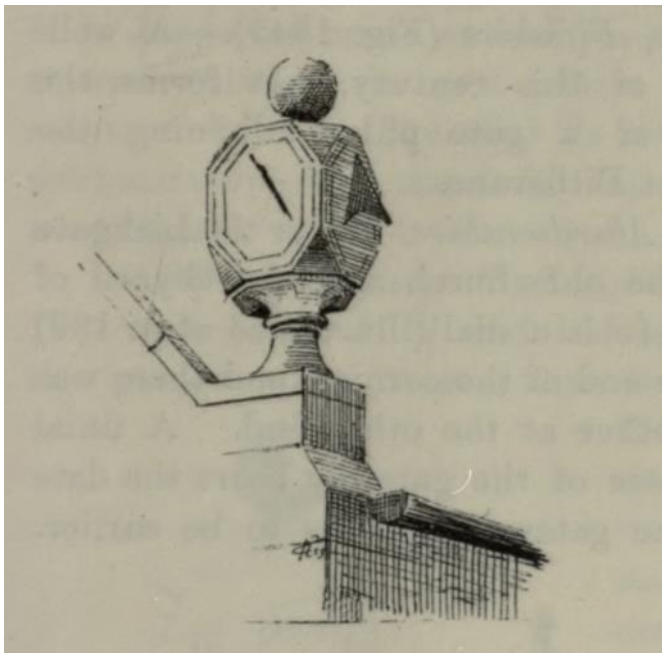

Fig. 4. Ross's sketch of the Earlsferry dial.

Fig. 5. The Earlsferry dial today.

Fig. 6. The Earlsferry dial showing its position on the gable.

As can be seen from Fig. 5, it is a stone cube with octagonal dials on the south-east and south-west faces, but a comparison between Fig. 4 and Fig. 6 shows that the dial now appears to be in a different position to where it was in Ross's day, as it is now half-way up the gable as opposed to the gable foot.

Moving along to Elie, Ross has this to say:

"Elie, like most of the Fife towns bordering the Frith[3] *of Forth, seems at one time to have contained a great many stately old Scottish houses, of which the Muckle Yett* [Fig. 7] *may be taken as an example; but the hand of the philistine has been laid heavily on them, and Elie has now become a commonplace, modern, seaside resort, with whatever of architectural or historical interest it ever had almost crushed out of it."*

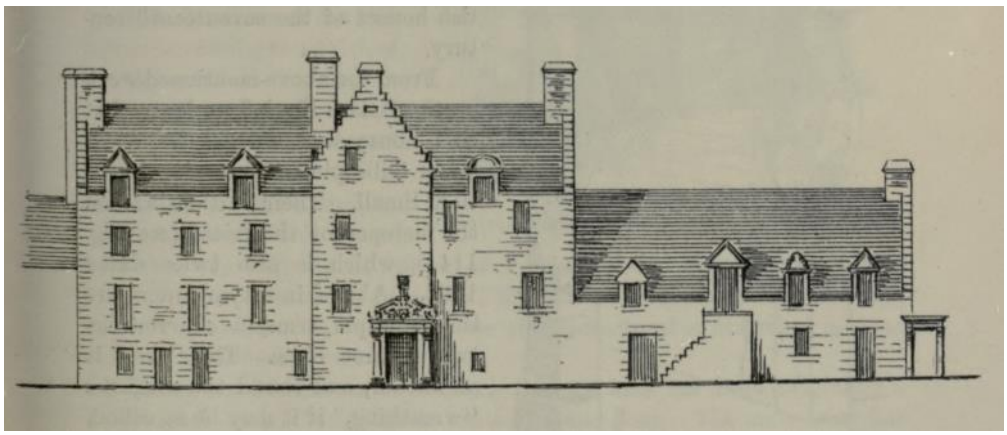

Fig. 7. The Muckle Yett prior to its demolition in the middle of the 19th century. The dials sit above the elaborate doorway.

Elie wasn't his favourite place, then! He goes on to say:

The Muckle Yett [English – Big Gate or Door] *was a fine old Scottish house in Elie, which, as it projected some 10 or 12 feet into the street, had to be taken down about thirty years ago. On the projecting part there was an elaborate doorway which contained a curious terminal dial, of which a drawing is shown at* [Fig. 8]. *The dial and doorway are still preserved. The former unites some of the peculiarities of the unattached dials with those of its own class, such as proclining and hollow cup-dials with upright ones. On the doorway is the date 1682, and the initials of Alexander Gillespie, and his wife, Christian Small."*

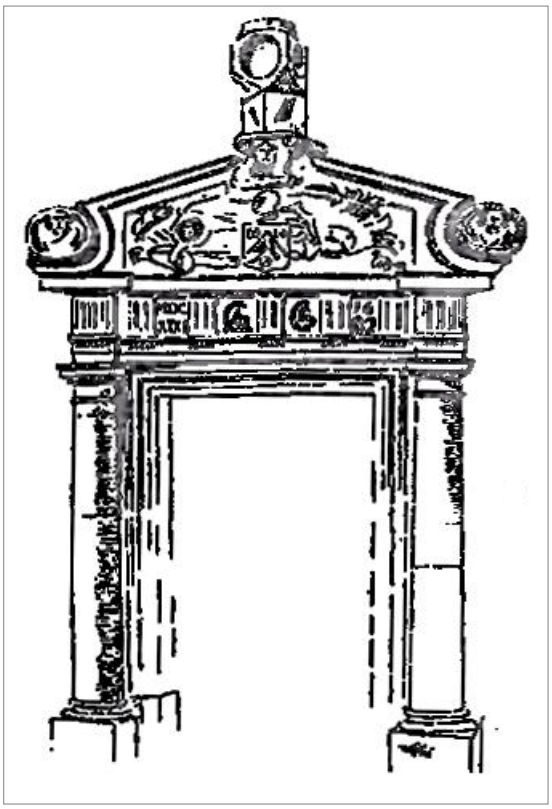

Fig. 8. Ross's sketch of the Muckle Yett doorway and the sundial above.

Fig. 9. The top of the Muckle Yett doorway today.

Fig. 10. Detail of the Muckle Yett dial showing four of the seven dial faces.

The doorway (Fig. 9) and its dials (Fig. 10) are today located rather anonymously in their new location in South Street. The dial has seven dial faces in total, two of which, like the previous two dials discussed, are vertical and south-east and south-west facing. This is quite a common configuration in Scottish sundials. There are three cup hollow (scaphe) dials above these two dials, facing east, south and west. In addition, there are two triangular proclining dials again facing south-east and south-west. It has to be said that the whole is in a rather poor condition.

A few miles north-east of Elie but lying inland is Kellie Castle, a National Trust for Scotland property. Ross merely directs us to Volume 2 by saying:

"A sketch is given in Vol. II. p. 127 of a square dial at Kelly Castle,[4] *with an ogee top, which serves to mark one of the corners of the garden wall."*

He provides no detail sketch of the dial, but it can be seen on the wall at the lower right-hand side of his sketch of the castle at Fig. 11. This cube dial, which is dated 1722, now

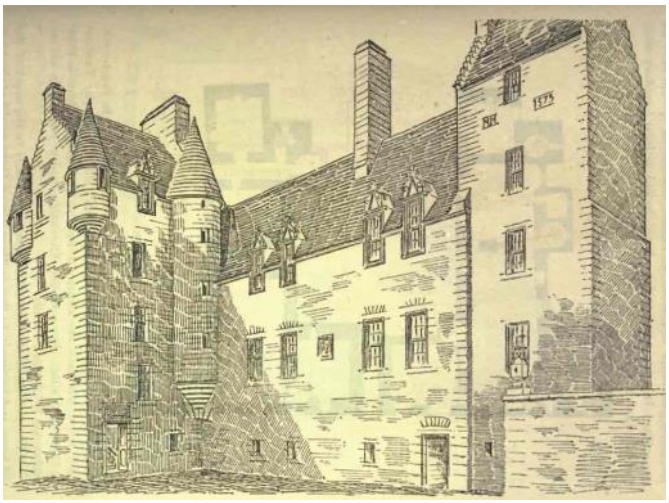

Fig. 11. Ross's sketch of Kellie Castle showing the dial on the wall at the lower right.

sits on top of the doocot (English – dovecote) in roughly the same position (Fig. 12) although it has lost its ogee top. Detail of the south and east faces is shown at Fig. 13 and the north and west faces at Fig. 14.

Fig. 12. Kellie Castle dial sitting on top of the doocot.

Fig. 13. South and east faces of the Kellie Castle dial.

Fig. 14. North and west faces of the Kellie Castle dial showing the date of 1722.

Back to the coast and just a few miles or so north-east of Crail is Balcomie Castle, said to be haunted by a boy playing a tin whistle. Of the dial here, Ross notes that:

"This is a very modest dial, hardly seen beside the rich heraldic carving which fills the three adjoining panels over the entrance gateway. The initials on it are those of John Learmonth of Balcomie, and his wife, Elizabeth Myreton of Randerston, whose arms occupy the panels. On the frieze above the panels is the inscription (EXCEPT) THE LORD BVLD THE HOUSE THEY LABOVR IN VAINE THAT BUILD IT. The date of the gateway, which faces the south, is 1660."

His sketch is shown at Fig. 15; again there is no detail sketch, but it can be seen from Fig. 16 that it is very much in the same position today. However, Ross's comment that the gateway faces south is puzzling as the gatehouse today faces just slightly north of east, and the clearly east-facing sundial today (Fig. 17) reflects that by being canted slightly. There is no evidence that the gateway has been

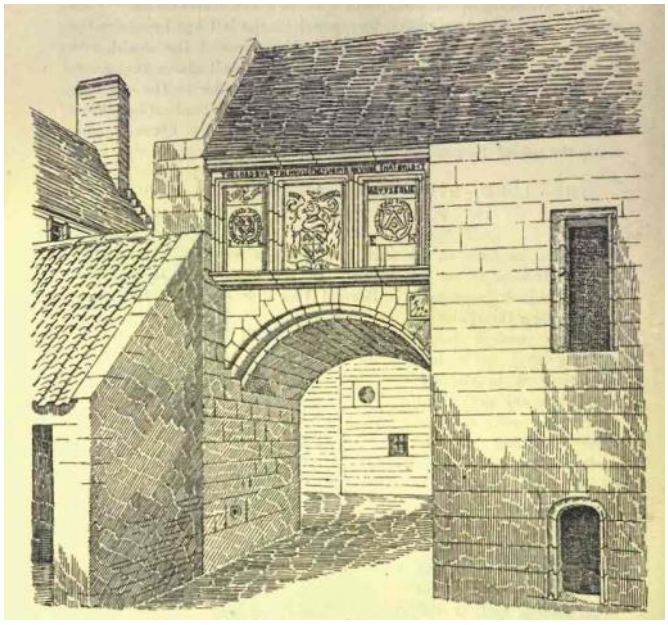

Fig. 15. Ross's sketch of Balcomie Castle gateway with the dial visible under the right-hand panel.

Fig. 16. Balcomie Castle gateway today.

Fig. 17. Detail of the Balcomie Castle dial.

moved, certainly not since Ross's time. Looking at the very small image of the dial in Ross's sketch in Fig. 15 it does look to be canted, but does not appear to be delineated in the manner of the current dial. My guess is that it is an artistic impression rather than an accurate reflection of the dial, but I cannot explain Ross's comment that it faces south.

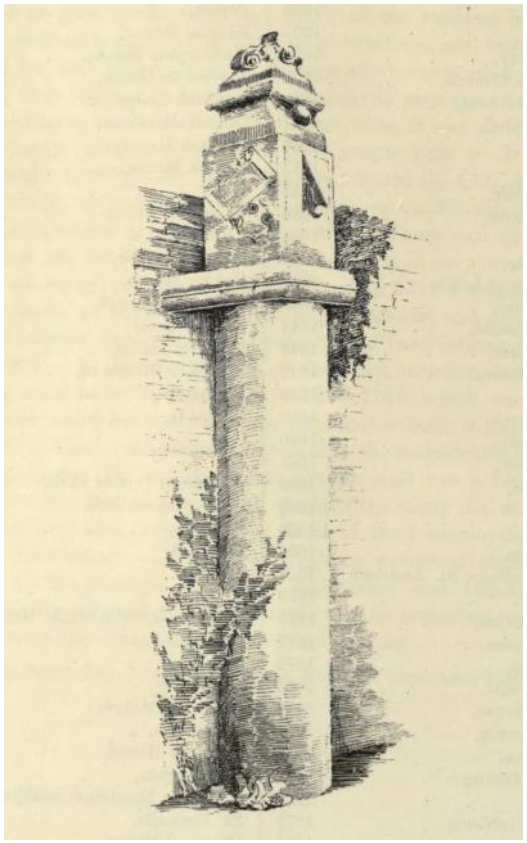

Fig. 18. Ross's sketch of the St Mary's College dial.

Fig. 19. The St Mary's College dial today in its position on a lawn.

Following the coast, the next place we come to is the university town of St Andrews and it is the dial in St Mary's College quadrangle that interests us. St Mary's College is the home of the Faculty and School of Divinity

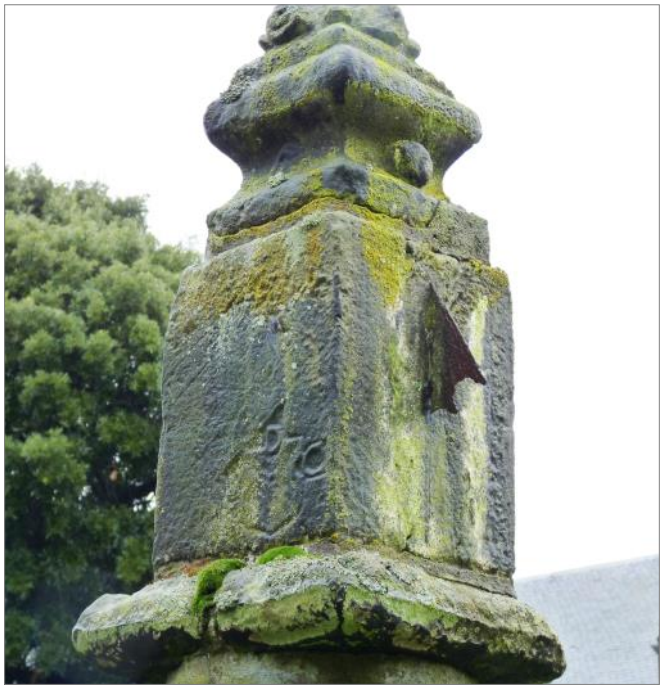

Fig. 20. Detail of the south and west faces of the St Mary's College dial.

within the University of St Andrews and students have attended there since 1579.

Strangely, Ross makes no mention of this dial at all, other than including a sketch of it (Fig. 18) on the very last page of the section of his work on sundials where it sits against a wall. The sundial today is on a lawn (Fig. 19) and is a stone cube with four vertical faces on top of a circular shaft. It is dated 1664 and carries the initials of Dr Walter Comrie (Fig. 20) who was Principal of the College at that time. It too is in a very poor condition with no hour lines or clear numerals visible, with the W of DWC (Dr Comrie's initials) also missing.

REFERENCES and NOTES

1. D. MacGibbon and T. Ross: *The Castellated and Domestic Architecture of Scotland,* David Douglas, Edinburgh (1892).
2. The dial that Ross says was "just described", is at Fountainhall in East Lothian and will be covered in a future article.
3. In Victorian times, it was common to use the term "Frith of Forth" rather than "Firth of Forth".
4. Ross interchangeably used the spellings "Kelly" and "Kellie" throughout his work.

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HOW TO MEASURE THE DECLINATION OF A WALL

A Beginner's Guide

J. MIKE SHAW

This article is based on a talk given by the author at the 2016 Newbury Meeting.

It all started with an email one morning from our Chairman, Frank King. He had been contacted by one of the Trustees, Louise Smail, of the Old Parsonage in Didsbury, South Manchester. The Old Parsonage, a Grade II listed building, was left to the City of Manchester by Alderman Fletcher Moss in 1919.[1] The trustees had discovered that one of the bay windows had originally held a stained glass sundial and they were proposing to install a replacement to the same design as the original of which they had an old photograph (Fig. 1).[2] John Carmichael had been contacted for assistance with the design as John has expertise with stained glass sundials; indeed, he has made and installed one for his own house.[3] The problem was that John lives in Tucson, Arizona and needed to know the declination, or precise direction, that the window faced. Could I please visit the building and measure it for him? While I had measured the declination of my own house previously, I had never done so for a remote location; Didsbury is about 50 miles from where I live.

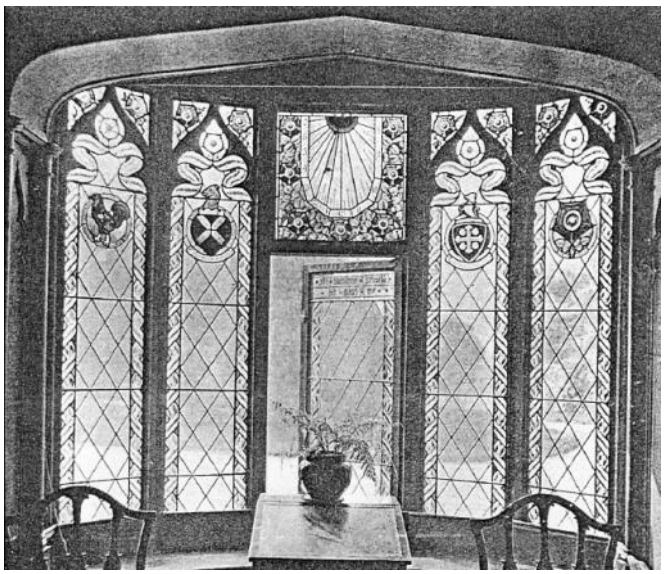

Fig. 1. The old sundial. Photograph reproduced courtesy of the Didsbury Parsonage Trustees.

For the dial to be accurate to a minute of time, its declination needs to be known to about a quarter of a degree of azimuth. I had tried various methods for measuring my own wall's declination in the past and found that the easiest method was to use a plumb line and flat-backed mirror to determine when the sun was at right angles to the plane of the dial's proposed position. Walls are rarely flat so it is important to attach a temporary board to the wall in the position that the sundial is to be sited before taking the measurements.

The method is as follows: having attached a temporary board to the wall, set up a plumb line at a distance from the wall so that the shadow of the string is clearly visible in sunshine, about 8 to 12 inches; the actual distance is not critical. To prevent the line from swinging in the wind, immerse the plumb bob in water. Place a flat-backed mirror on the board and if you then move your line of sight so that the plumb line string is in line with its own reflection, your eye is then directly perpendicular to the wall. Then, watch the shadow of the string and note the date and precise time that the string, the reflection of the string and the shadow of the string all coincide. I found that the time could be determined to within about a 10-second window. Knowing the site's latitude and longitude, the sun's azimuth can be calculated and that is the same as the wall's declination. More of that later.

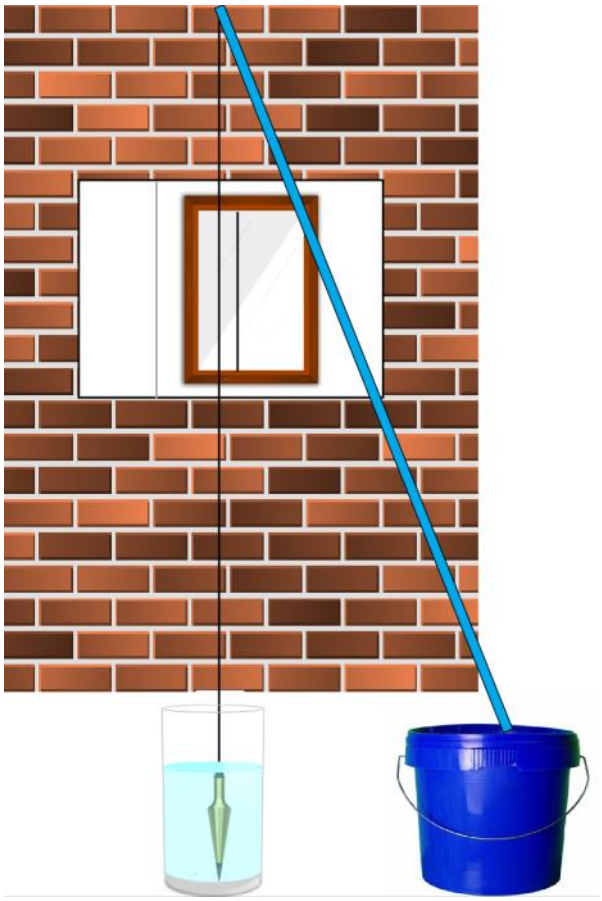

Fig. 2. Equipment setup.

So, I had my method, but what did I need to take with me? The Old Parsonage is a listed building so they may not be very keen on me attaching a plumb line to it. I took one of those extending metal poles to which you can attach a paint roller when you are painting the ceiling. I could then attach a plumb line to the top and extend the pole to the necessary height. A bucket of sand was then needed to act as a firm base into which I could bury the end of the pole to keep it stable. I didn't know if there would be a water supply there, so I took a small bucket and a large screw-topped bottle filled with water. A large piece of stiff white cardboard to act as a board and a good surface on which to view the string's shadow plus a small flat-backed mirror completed my kit (Fig. 2). But then I had the thought, "What if the sun goes behind a cloud at the critical moment?" A fall-back was needed. I downloaded a large protractor available from Françoise Blateyron's 'Shadows' programme[4] and attached it to a suitable board. With the board held horizontally against the wall, I could use the protractor to find the angle that the string's shadow made with the wall at any time that the sun was actually shining. I would just have to site the board so that the plumb line's shadow fell on the protractor's origin and read off the angle that the sun was making to the wall.

Before travelling, I needed to know at what approximate time the sun would be at right angles to the plane of the dial. I looked at the building in plan view in Google Earth. Using 'Tools', 'Ruler' I drew a line along the image of the roofline, which told me that the building was orientated about 20° west of south (Fig. 3). I estimated that the sun would be in the desired position at somewhere between 14:00 and 14:30 BST. As a bonus, Google Earth also gave me the latitude and longitude of the site, 53° 24′ 39″ North, 2° 13′ 54″ West.

All that was now needed was a favourable weather forecast – Manchester is well known for its rain! After a few days, the prospects seemed good and I packed all my equipment

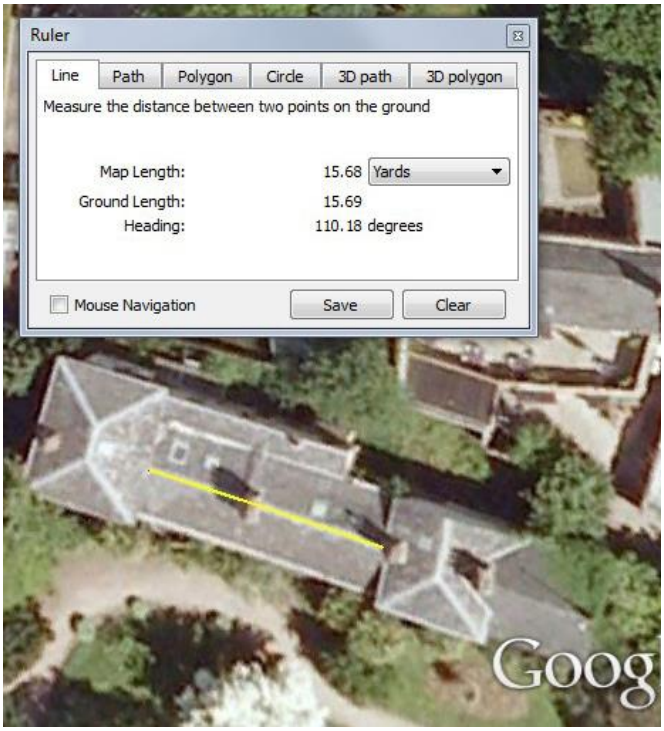

Fig. 3. Google Earth.

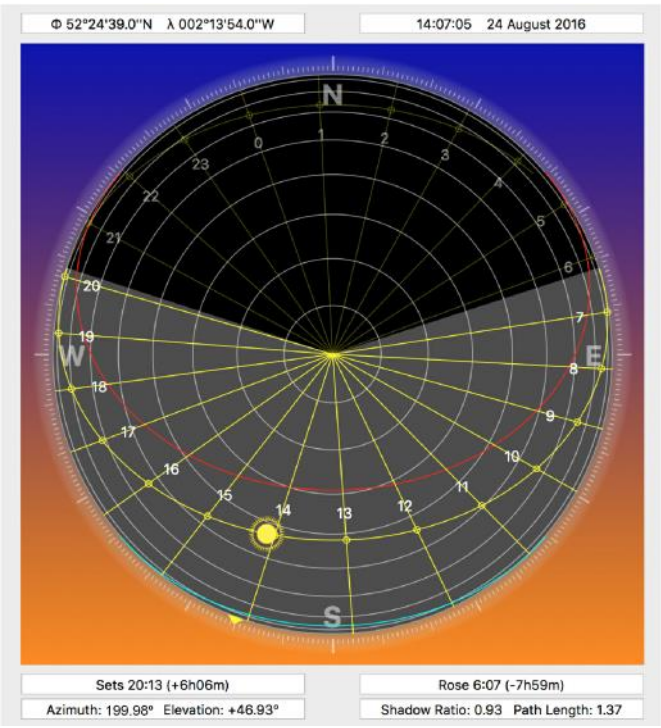

Fig. 4. Sun Seeker.[5]

and arranged to arrive at the site with plenty of time to spare. The whole operation was trouble free; the sun shone throughout. My only problem was that the window I had to measure was (non-sundial) stained glass. Therefore it was not flat as the lead cames protruded, making the surface uneven. I therefore determined the declination of the window frame in which it was situated.

The string, the reflection of the string and the shadow of the string coincided between 14:07:00 and 14:07:10 British Summer Time on 24 August. All that was now needed was to calculate the sun's azimuth. Well, you can do it the hard way if you wish using all those equations, but I used a very useful application called 'Sun Seeker'[5] which is available for both Apple and Android devices. When launched, the application picks up the device's current location and gives a graphical representation of the sun's current position plus digital readings of its azimuth and altitude, which are continually updated (Fig. 4). However, it also has the facility to allow the manual setting of any latitude, longitude, date and time and then display the information for that place and time. This gave me an azimuth of 199.98° for the window frame so I was able to report an accurate declination of 20.0° west of south.

ACKNOWLEDGEMENT

Sun Seeker reproduced and referenced with permission of Ajnaware Pty Ltd.

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1. *http://www.didsburyparsonagetrust.org.uk*
2. R. Bowling: 'Two Manchester glass dials', *BSS Bulletin*, 21(iii), 32–33 (September 2011).
3. *http://www.sundialsculptures.com/*
4. *http://www.shadowspro.com/en/download-shadows.html*
5. *www.ajnaware.com*

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NEWBURY ONE-DAY MEETING

24 September 2016

On a lovely sunny day members of the Society met once again at Sutton Hall, Stockcross near Newbury for the annual one-day meeting, splendidly organised by David Pawley. Wendy again kept us all supplied with plentiful tea and biscuits.

Morning

Energetic early arrivers helped set out the chairs and tables for exhibits. Others concentrated on the exhibits and the plethora of items that were on sale.

Peter Ransom, our regular Master of Ceremonies, welcomed us all at 10 am and introduced our first speaker...

Ian Butson: *A John Bird Sundial – Investigated*

On recent dialling travels, an interesting sundial was located at St Nicholas Church, at Haxey, Linconshire. Although the large horizontal dial is heavily oxidised, the marking of EoT correction rings are visible, although none of the details are visible in the minutes/days/months or clock fast/slow scales. However, a maker's name, *J Bird, London* can be seen, and also an inscription with a name. Reference to the *Biographical Index of British Sundial Makers* reveals J Bird as an important mathematical instrument maker, renowned for providing instruments of the highest precision to the Royal Greenwich Observatory. He worked in London from 1745, and died in 1776. To date, only one other sundial by John Bird has been recorded by the BSS. The challenge in this case was to establish whether this dial could be dated, from the Equation of Time correction markings, to the pre- or post-1752 calendar change period.

Using current correction values, a basic EoT template was constructed showing typical relationships for the Clock Faster/Clock Slower bands as found on similar dials, with division markers for Month/Date/Minutes of Correction that could be compared to those found on this dial. By stepping the dates back by 11 days another was made for the pre-1752 Julian calendar, but subsequently not needed. Close-up images taken in sequence around the dial had been made, and by examining the photographs showing the various dividing lines visible within the bands, and highlighting them, it was possible to fit these markings against those typified on the EoT template, to the post-1752 era. Owing to the amount of corrosion it was not possible to identify any of the actual 'correction minutes' numerals or lettering, but the zero minutes 'cross-over' points and those of 'maximum correction value' were located at their respective dates.

With the inscription, the name William (Calton?) appears. A Dr William Cotton was vicar here from 1754 to 1762, so perhaps this dial was a parting gift, with his advice to "Watch for ye know not the hour." Haxey is in a very rural area, although the industrial East Midlands areas, South Yorkshire power stations and the Lincolnshire steel works are nearby. Perhaps industrial atmospheric fall-out from these sites in the past has produced the heavy corrosion now on the dial.

Louise Smail: *Old Parsonage Didsbury: a stained glass sundial restoration project*

The Didsbury Parsonage (The Old Parsonage) is a Grade II listed building situated opposite St James' Church,

adjacent to the original village green of Didsbury, Manchester. The building and gardens were left to the citizens of the City of Manchester by Alderman Fletcher Moss in his will following his death in 1919. Whilst hunting for old photographs a couple of articles were found on stained glass sundials and showing the library room in the old parsonage as having one of these. Although this window no longer exists, several neighbouring windows include original features that were also on the stained glass sundial, including lettering and roses. There is also a stained glass front door designed by Fletcher Moss which provides further information on the colouring and detail of the stained glass for the sundial (the door was originally installed to be viewed from the outside).

The enthusiasm for restoring the window and the work that has been put in by Frank King, John Davis, John Carmichael and Mike Shaw has been invaluable to the project. Mike Shaw travelled from the Wirral to measure the declination of the building – a technique which he explained in the following talk. The next step is to apply for listed building consent and raise funds to restore the window. The building is open to the public seven days a week (not Christmas and Boxing Day), the downstairs rooms have classes during the week and there may be a wedding on a Saturday – but on Sunday all of the rooms and the current art exhibition may be viewed. The old Parsonage website is: *http://www.didsburyparsonagetrust.org.uk*

Mike Shaw: *The Old Parsonage, Didsbury: an unexpected mini adventure*

Mike Shaw's talk covered the method he used to tackle the problem of determining the declination of a proposed stained glass sundial on a listed building sited some 50 miles away from his home. His chosen method was to find the precise time that the sun was exactly at right angles to the plane of the dial. He first used Google Earth to determine the approximate orientation of the building and hence was able to estimate the time that this would take place. He then chose a day when the weather forecast suggested that the sun would shine and he arrived on site in good time. He set up a string plumb line perpendicular to the dial's chosen position. He immersed the plumb bob in water to minimise any wind effects. He placed a flat mirror on the window and then noted the time that the string, the shadow of the string and the reflection of the string coincided. He found that the time could be determined to within about 10 seconds.

Mike then demonstrated the free mobile phone application 'Sun Seeker' which, in addition to giving live information for its current position, could be manually set for any location, date and time and give the details of the sun's azimuth and altitude, so obviating the need for lengthy calculations.

John Foad: *The Wenger Sundial*

John showed a dial made by Daniel Wenger. It is a glass sphere about a foot in diameter engraved with a world map, with the installation location at the top of the globe. Equator and Tropic lines are marked, and analemma curves for each hour. If a pointer is used to cast the sun's shadow on a small ball in the centre of the sphere, the time can be read on the analemmas, and the pointer shows where in the world the sun is directly overhead. The times of sunrise and sunset can also be read by following the pointer's location around the globe parallel to the equator.

Daniel made the dial for the BSS at no charge in 1999, on condition that it would be displayed at the Cirencester Conference, and thereafter kept at some nominated place for public view. Council agreed on the Horniman Museum and the dial is delineated for that latitude. Unfortunately the dials are not made for outdoor use as they would mist up, and the Horniman Museum decided that they did not want an indoor one. As a consequence, though the dial was indeed shown at Cirencester, it has been left under the custodianship of David Young ever since. It would be good if we could find a place for it where members at least could see it.

John Foad demonstrates the Wenger sundial during the lunch break.

Thoughts raised at Newbury were to display it in the Bromley House Library in Nottingham or the Royal Astronomical Society's premises at Burlington House in London, or to approach the Horniman Museum again and encourage them to add it to their existing wide range of sundials. It would also be nice to have it on display at some future Conferences, possibly starting with Oxford next year, and John offered to arrange transport if that was felt to be a good idea.

Frank King: *Lunacy for Beginners – yet another approach to moon dials*

Frank began by showing us a photograph of a direct west-facing sundial by David Brown. The client had asked for a moon dial and David had provided a chart which enables time by the moon to be converted to time by the sun. Different ages of the moon were represented by

Photo: Mike Shaw.

a sequence of waxing and waning shapes and with each shape there was an associated correction. Frank was happy about the shapes and happy about the corrections but was unconvinced by the associations! He described an alternative approach where all the corrections were whole numbers of hours, from 0 to 24. He explained how to determine, for each such correction, the most appropriate shape for the moon. He showed us the 24 shapes that he had derived using his method. He concluded by remarking that an equivalent set of shapes had been determined by Hermann Egger of Zurich in 1957 but noted that the Egger shapes were a little different from his!

Peter Ransom: *Binding the Bulletin and the Compendium*

For many years (June 1993 to April 1997) Ian Wootton was the Registrar to whom we sent our dial records. He was an amateur bookbinder who bound all the *BSS Bulletins* and correspondence as well as the Fixed-Dial Register every five years. When Peter collected his bound copy of the 2010 Register in 2011 from Ian, he mentioned that he was interested in bookbinding and would be prepared to bind future copies of the *Bulletin* and *Compendium*. Peter visited Ian a few months later when he went through the procedure.

Newly-bound volumes of the BSS Bulletin and NASS Compendium.

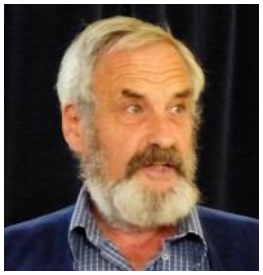
Commercially-made stove (left) that turned out to have insufficient supports for all the lettering tools and Peter's improved version (right).

In 2012 Peter made up two text blocks, but got no further. This year he decided to blitz the *Bulletin* as he then had five years of *Bulletins* and *Compendia*, so was feeling the pressure. Although he had the lettering tools he didn't have a stove so made one. Then came the sweaty bit: getting the lettering right – mind your ps and qs – as an error cannot be changed! Anyway, the lettering got done and at the end of February five volumes of the *BSS Bulletin* and five volumes of the NASS *Compendium* winged their way to the BSS Library.

Martin Jenkins: *Mojoptix Digital Sundial*

Martin's first talk, just before the lunch break, was about the manufacture of a Mojoptix Digital Sundial using a RepRapPro tabletop 3D printing machine. One of Martin's former postgraduate students, Dr Neil Sewell, was given the challenge of making one as a result of an article on digital sundials by Robert Kellogg in the NASS *Compendium* of March 2016.

In October 2015, Frenchman Julien Coyne created a digital gnomon sundial using 3-D technology (Additive Layer Manufacture). The dial shows 20-minute time intervals from 10.00 to 16.00. The design and production software programme was made available to the general public using OpenSCAD. The presentation explained the principle of the desktop RepRapPro 3D machine, how the software was used, the on-screen proving of the design before production, and brief video clips of the build process.



Just before the break for lunch, the Chairman, Frank King, presented a certificate to Sue Manston, the only member to have submitted a complete solution to the crossword compiled by John Lester that had been published in the June 2016 *Bulletin*.

Sue Manston with her certificate.

Lunchtime

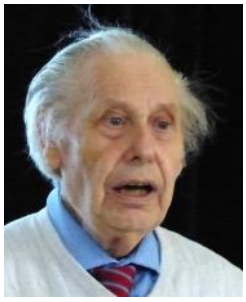
One of the entertainments on offer during the break for lunch was Peter Ransom's workshop inside the hall: 'Gold Foil Your Name'; four people used the tools successfully to print their names. Outside, in the sunshine, many dials were exhibited and demonstrated, including the Wenger dial, a finished Mojoptix sundial, and the Kinimatoskopio dial from Martin Jenkins' garden in Devon (described later).

We were all lined up for the group photograph by Mike Shaw who was again our official photographer.

Afternoon

David Young: *The Easton Lodge Shrubbery Sundial*

David explained that he had received a request from the owner of what is still extant of Easton Lodge, a large house and estate of about 600 acres near Great Dunmow in Essex. The owner wanted



help with the construction of a millennium sundial to be a replica of a shrubbery dial in a distant corner of the estate that had been constructed towards the end of the 19th century. When David called in to discuss the problem he was told that the then owner, Daisy Maitland ("My Darling Daisy", as the eldest son of Queen Victoria called her) had commissioned this dial. Having been shown an old photograph of the dial long since buried under a Second World War airfield, David promised the owner, Brian Creasey, that the Society would help. He contacted his nearest sundial friend, John Moir at Wanstead, and together they started on the job.

The talk described some of the problems to be overcome and ended with a final picture taken earlier this year of John and David standing proudly by the yew gnomon that had just reached the top of its frame after 16 years.

Martin Jenkins: *Sundials in Athens*

In his second presentation, Martin reminded listeners that in the *BSS Bulletin* 27(iii) of September 2015 an article had been published about a Greek sundial designed and made by Andreas Galanakis. Martin described a recent visit to Athens to meet Andreas and illustrated the sundials seen on that trip. Various dials made by Andreas were shown, including the one commissioned for the Athens Planetarium and a polar dial in the rooftop garden of a centre for adult education. In terms of historical dials, a Roman dial in the Archaeological Museum of Pireaus was shown and the sundials on the famous Tower of the Winds were illustrated and discussed.

One of Andreas's sundial designs is called Kinimatoskopio, a digital type equatorial dial made in stainless steel. The presentation showed Andreas installing a large version of the dial in the gardens of the Hotel Palma, Corfu in June 2015 and a smaller version brought back to the UK to add to a Devon garden!

Martins Gills: *Challenges of Modern Sundials*

Historically, sundials have the role of telling the time. Not always the hours we use right now, but at least parts of the day, prayer times and the times of the year. Nowadays, when for a couple of centuries we have had mechanical clocks and for about a half century electronic time-keeping devices are being used – what does the general public (those outside the special-interest groups like the BSS) expect from sundials? Martins made the following observations from what he had seen in various countries and through the sundial design inquiries he has received:

- Existing sundials are being preserved in order to maintain the historical

connection, part of heritage site, museum or historical building;

- New sundials are mainly introduced into the landscape of cities in order to ameliorate the environment, to enrich it with a visually appealing object or to bring some message. Those sundials typically are easily visible and serve as local landmarks;
- Sundials can be used for educational purposes – not just for astronomy, but other subjects as well if they have additional informative elements present – names of places, distances etc.;
- A good museum nowadays is not the one with the most of objects on display, but the one addressing multiple senses. For sundials the answer is interactivity. Not only analemmatic sundials are interactive: also ones using human height, a rope, turning handle or requiring a placement of a palm are interactive objects.

Knowledge of gnomonics can be embedded into different forms of art. The passage of light between various elements at certain date and time, or reflections in unexpected circumstances can be used as the form of art.

As timekeeping has not departed from its astronomical origins, sundials still have a place in 21st century. But the play of sunlight and shadow in sundials nowadays is used beyond the traditional scope. Sundials must be original, visible and should let people think.

Patrick Arnold: *Sundials – A Mechanic's Approach*

Patrick's talk was a distillation of the contents of a booklet that he had written with the same title, a copy of which he was donating to the BSS Library. He quoted a letter published in the *Gentleman's Magazine* in 1769. This explained an 'ingenious method' for delineating a sundial on any surface and with arbitrary orientation. For the

benefit of ordinary mortals, Patrick had slightly adapted the somewhat obscure instructions provided in the letter. You begin by drawing the 24 hour lines of an equatorial dial on a plane surface. You label the lines 1 to 12 twice over and you equip the dial with a gnomon perpendicular to the plane surface. This dial plate is horizontal and its gnomon is vertical. You are now expected to know how your intended dial plate is oriented relative to the equatorial plane. You then attach the intended dial plate to the primitive equatorial dial in such a way that its relative orientation is correct and it is arranged so that the gnomon goes through the proposed (gnomonic) centre of the intended dial. As a first example, Patrick supposed that we were designing a regular horizontal dial for some known latitude. In this simple case your intended dial slopes at an angle that matches your co-latitude and the line of intersection with the equatorial dial is parallel to the 6–6 line. Now we have to project the hour lines of the equatorial dial onto the new plane. This is achieved quite literally by means of a lighted candle! Suppose, say, you can arrange for the shadow of the gnomon to fall on the 3 pm hour line on the equatorial dial. You must now hold the candle still and note where the shadow of the gnomon falls on the intended dial. You then mark the intended 3 pm line by drawing along the line of the shadow. Patrick's adapted approach was certainly easier to follow than the original instructions! His explanation extended to vertical dials but he did not show us how to set out the hour lines on a 'concave or ogee' surface which the original letter suggested was achievable!

John Davis: *Restoration of a Horizontal Dial*

John described an ongoing restoration of a rare horizontal dial by the great 17th-century mathematical instrument maker Henry Sutton. This has allowed a detailed study of his skills. An article on the subject is promised for the future so full details will not be reported here.

Martin Jenkins: Sundials on a South American Motorcycle Trip

Martin's third presentation of the day was about sundials seen on a recent motorcycle trip across South America through part of Brazil, Argentina, Chile, Bolivia, and Peru. First to be shown were two dials in the Rio de Janeiro Botanical Gardens, the largest of which was an equatorial digital type commemorating two hundred years of the gardens in 2008. This dial is located just inside the entrance complex of the gardens. The second dial in the presentation is part of the dedication site to Friar Leandro do Sacramento, the first Botanical Director of the gardens from 1824 to 1829. The dial is unfortunately missing its gnomon. The third dial in Rio de Janeiro which was shown was of a large horizontal marble dial in the Military Complex at the foot of the Sugarloaf Mountain. Next stop on this dial tour was Potosí, Bolivia where a dial was discovered in the courtyard of the Old Mint. This dial mounted high on a column looked to be incorrectly orientated and possibly not in its original location. The final dial stop was Machu Picchu in Peru to visit the famous mountaintop dial. So in 7000 km of travel in South America only five dials were found! The presentation concluded with a discussion about a dial known about in Bolivia but unfortunately not visited on this trip. This is a dial dated 1765 at a Jesuit Mission established in 1695 in the Chiquitos region of Bolivia.

Geoff Parsons: *P&G Heliochronometer – Catalogue*

Geoff described various Pilkington and Gibbs designs from their catalogue.

Finally, Peter Ransom proposed a vote of thanks to David Pawley and Wendy for arranging another highly successful Newbury Meeting.

Compiled from reports provided by the speakers.

Speaker photos by Mike Shaw. Additional photos by Peter Ransom, Frank King and Christine Northeast.

Amongst the exhibits in the hall was a fine collection of heliochronometers and sol horometers.

THE 'LOST' SUNDIAL OF HAM HOUSE

GRAHAM STAPLETON

Ham House, originally built in 1610, is a National Trust property on the Surrey bank of the Thames near Richmond. On the wall of a carefully-managed storeroom within is a great decliner sundial (estimated as 16° north of east) that was lost for almost three centuries (SRN 6053). The dial was painted on an external wall early in the life of the house, but some fifty years later it was hidden behind new walls and panelling when the house was extended. Thus it remained until 1965, when it was discovered in the course of restoration works. As the dial has been described elsewhere by Christopher Daniel,[1] the purpose of this article is to outline a possible reconstruction of what is, by any standards, an important 17th-century dial.

Fig. 1. The north-east elevation of Ham House. Copyright Duncan Harris of Nottingham, licensed for reuse under a Creative Commons Licence.[2]

Position on the Building

As no documentation has come to light relating to the dial, an element of speculation enters into all considerations of its creation. The dial is positioned on the north-east side of the house, rather than on the main southerly frontage. While a south-facing dial showing more hours could have been chosen, the vertical distance between the windows of that aspect restricts the overall size possible. To have a similar decorative scheme in the available space would have badly compromised its readability at a distance across the gardens. Seeing the prospect of the north-easterly side (Fig. 1) suggests a rationale for its location. The original house had symmetrical chimneys and the dial is to be envisaged as being painted at first-floor level on a counterpart to the chimney wall visible on the right. In this position, not only is there a good-sized area available to be painted, but it can be seen both from the enclosed garden by the house and from a portion of the open terraces to the south. When the house was extended in 1674, that chimney became an interior wall and the dial was hidden (Fig. 2). At some point after this, the absence of a dial was felt, and a horizontal one on a square baluster pedestal is to be seen in the Cherry Garden, plus another between the house and kitchen gardens.

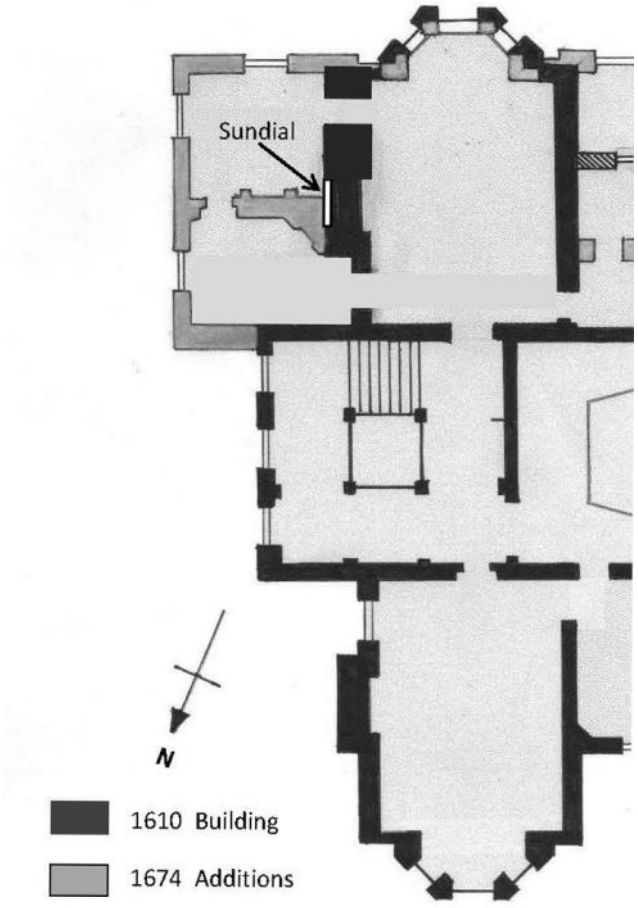
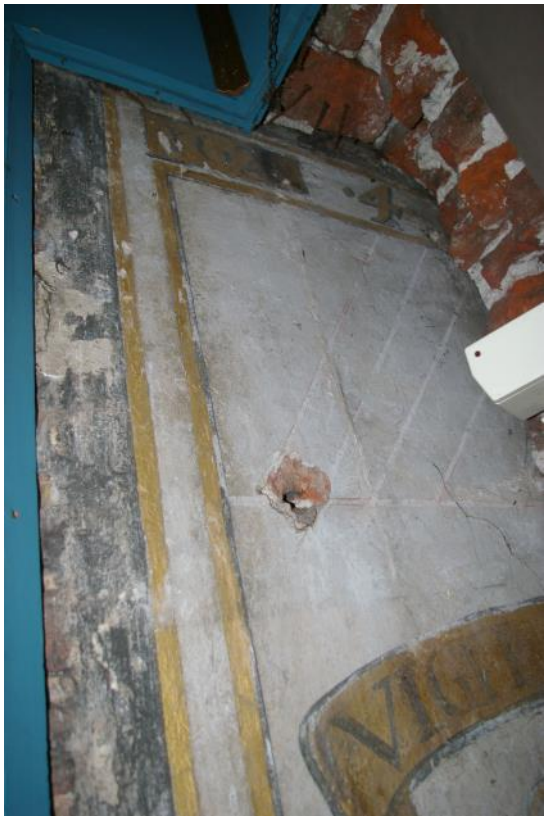


Fig. 2. A plan of Ham House's first floor, showing phases of building and location of sundial.

The Dial's Outline

The surviving dial presents a narrow, vertical rectangle, and what can be seen is just adequate to suggest the possibility that the original shape was also a vertical rectangle (Figs 3 and 4). Such a configuration does, however, mean that much was expended on painting a small dial that was only of significant use in the summer



Figs 3 and 4. The upper (left) and lower (right) parts of the sundial. Author's photographs, by kind permission of Ham House and The National Trust.

months. While possible, this is unlikely: it is far more probable that it was a square shape, or nearly so. Searching for a precedent comparable in age and declination, my first example (Fig. 5) was the Trinity House dial, Newcastle upon Tyne (SRN 1900). While this is informative about the general setting-out of this kind of dial, it could not assist with questions of decorative schemes. My memory was prompted towards the 'Goldfinch dial', a stained-glass dial in the care of the Museum of the History of Science, in Oxford (SRN 0622, Fig. 6). This is both comparable in date (post 1611) and close in declination. Reversing the image to represent the external face provides a persuasive template for a proposed reconstruction.

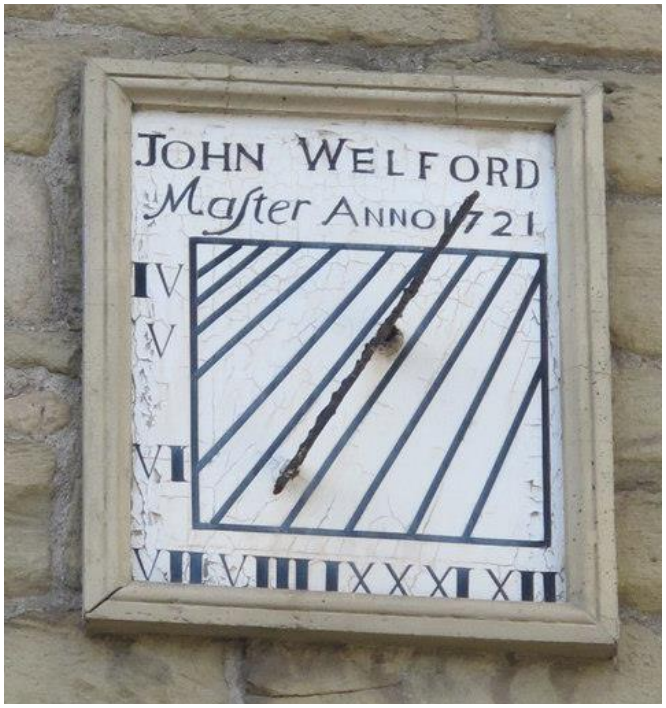


Fig. 5. The sundial at Trinity House, Newcastle upon Tyne. Copyright Mike Quinn, licensed for reuse under a Creative Commons Licence.[3]

Declination and Layout

The dial's declination is described as being some 80° east of true north.[4] Not being in a position to revisit Ham and take measurements, I made use of the excellent 'Where's the Path' Ordnance Survey website.[5] Taking a measurement from the screen[6] and correcting it to true north gave a figure of 16.25° north of east. It is at this stage of

Fig. 6. The 'Goldfinch' stained glass sundial, Museum of the History of Science, Oxford (reversed image). Photo: Ian Butson.

proceedings that it should be remembered that the degree of precision that the original diallist could readily achieve is lower than that available to us now.

This value then had to be compared with the reality on the wall. A difficulty with great decliners is that often neither meridian nor dial centre is represented. The next clearest indication of the declination is the position of the sub-style. To test this, I produced a set of drawings for different declination values, to see which best matched the surviving dial. This process proved troublesome, since while there is a small hole beside the 5 am line at the top – which can reasonably be assumed to be a result of a rod gnomon being removed – the only hole at the bottom of the dial is considerably larger and on the other side of the hour line. The extent of the hole is attributable to the later attachment of panelling when the house was remodelled, but its position implies an offset fixing for the gnomon, for which a precedent has not yet come to light. I have not been able to come to an absolute conclusion, but overall, a value of 16° north of east does provide a satisfactory fit.

The location of the dial centre was also a matter of trial-and-error drawings. Sliding one drawing of the hour lines over a scale drawing of the dial outline produced a tolerable fit with the approximate dimensions available. This produced a point two feet to the side of a six-foot square; such neatness is to be taken with caution, but the convenience of round figures would have been attractive to our forebears. Short of a detailed survey, this workable approximation will have to suffice.

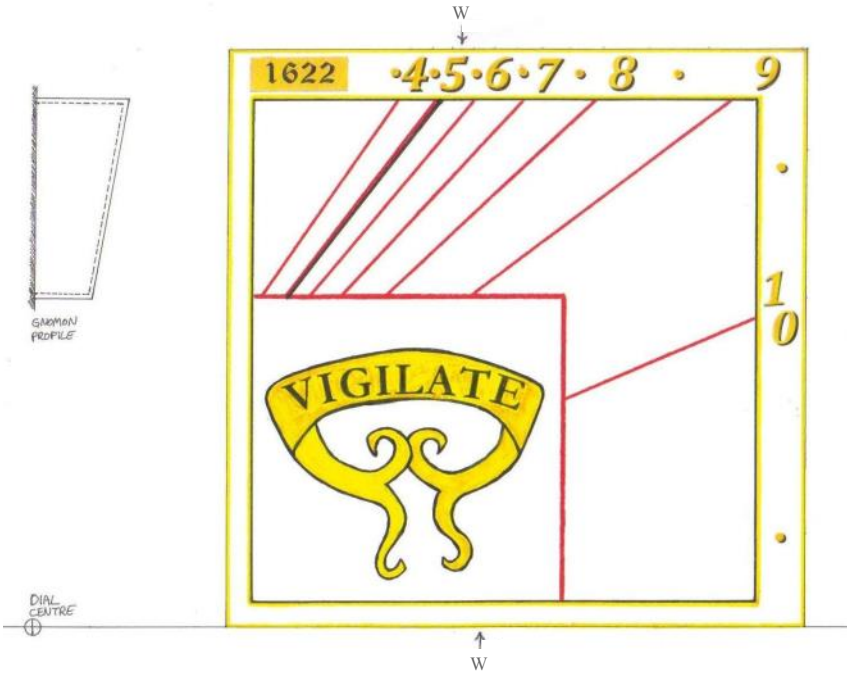


Fig. 7. A hypothetical reconstruction of the dial's original appearance.

Gnomon

I have assumed the gnomon to have been formed from iron rod; this would have been easier to install and casts a shadow less open to misreading. A solid 'blade' cannot be entirely ruled out, but it would have presented quite a surface area to the winds, which would be inadvisable.

Colours

The dial is painted onto a rendered surface, whether as fresco or otherwise I cannot distinguish. Apart from an off-white ground and some black, the dominant colour is yellow. In its present condition it approximates to a deep Naples Yellow; assumedly it was originally somewhat brighter. Pigments vary in their stability, but I understand that such earth colours do not change a great deal. A major uncertainty does lie in the colour of the hour lines; at present they are a pale grey with traces of dark red along their edges. When he inspected the dial, Christopher Daniel's opinion was that they had been gilded, for which there certainly is precedent. It is entirely possible that a red size was used to secure the gold leaf, but in the absence of a paint analysis, I do not feel secure in representing more than seems to be there now.

Motto

The heraldic banner is painted with the single word VIGILATE (watch over, monitor). There is no trace of any other lettering, which suggests the viewer is either to heed the plain injunction, or mentally complete it with … ET ORATE (… and pray). It does not seem to come from the armorial of any of the owners of the era. Neither are there sufficient biographical details of any of them to infer whether it was a conventional piety, or a reflection of the treacherous politics operating in Court circles. Curiously VIGILATE does not appear as a lone word in Gatty, but is found in Cross,[7] which does not give its source.

Date

The surviving numerals in the block at the top left-hand corner read 162–; the final digit seems lost, except perhaps to paint analysis. Otherwise it can only be inferred from the early chronology of the house:[8]

1610 Ham House is built
1620 Thomas Vavasour, builder of Ham House, dies
1621 John Ramsay (the second owner) returns from a two-year self-imposed exile and is granted further titles by James VI and I
1624 John Ramsay marries Martha Cockayne
1626 John Ramsay dies in February
1627 Martha Ramsay (née Cockayne) remarries
1637 William Murray (third owner) commences extensive redecoration

Given these events and the lack of initials or symbols in the decoration, I propose John Ramsay's return and elevation

as the prompt for the dial's creation. The King bestowed the titles on 22 January 1621, assumedly shortly after Ramsay's return. Whilst he could have got the house interior in order without delay, scaffolding for external work would wait until the spring. This work happening after Lady Day (25 March) would by the Old-Style calendar be in 1622.

Conclusion

Given the above, I present my proposal for the original appearance of the Ham mural dial for debate and refinement (Fig. 7). The arrows W–W denote the approximate line of the wall masking the majority of the dial. If it has not already happened, this dial certainly merits professional survey, investigation and conservation. The dial is maintained in stable conditions by the National Trust, but in a location that cannot be made readily accessible to the public. Nonetheless, it would be very good if it were better known and understood.

Christopher Daniel's closing remarks on this dial require no further comment as it being "the best preserved mural dial, as originally painted, of which I know and, as a work of scientific art, I believe it to be unique."

ACKNOWLEDGEMENT

I am indebted to BSS Registrar John Foad for his search of the Register for unusual gnomons and for his Socratic comments.

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2. *https://upload.wikimedia.org/wikipedia/commons/2/21/Flickr_-_Duncan~_-_Ham_House_and_Gardens.jpg*
3. *http://www.geograph.org.uk/photo/4540460*
4. Daniel (ref. 1).
5. *BSS Newsletter* 80 (June 2016). *http://wtp2.appspot.com/wheresthepath.htm*
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Beaconsfield Revisited

Fig. 1. Now you see it ...

Fig. 2. Now you don't.

Readers should quickly recognise the sundial shown in Fig. 1. This sundial in Beaconsfield was the subject of an article by Ian Butson in the September 2016 *Bulletin* 'Come, Light! Visit Me!'. Ian explained that the dial was normally almost completely hidden by foliage but that this had been severely cut back in April so that he was able to photograph the sundial in all its glory.

At the Newbury Meeting, Ian reported that he had returned to the same spot in September and was shocked to see that the offending foliage had grown back and was covering half the dial (Figs 2 and 3).

By chance Frank King was invited to an event in Beaconsfield in September where he met the Mayor. The Mayor knew about the sundial and appreciated that it was now being hidden from view. He also wondered whether the roots might be encroaching on the structure of an important listed building.

Frank King
(photographs by Ian Butson)

Fig. 3. A fuller view of the tree; the dial is the lower half of a sash window.

WHAT IT IS TO BE YOUNG

JENNY BROWN

Creating a sundial is an especial pleasure when it brings you into contact with an interesting event and a fantastic group of people, in this case, the Ferrar family and staff at the school the children attend. Winning the Royal Mail's Young Letter Writers Competition 2015 gave Iris Ferrar, now aged 10, the opportunity to commission an analemmatic sundial for her school, Alleyn's Junior School at Dulwich, with the prize money.

The competition entrants had to write a letter applying for their dream job. Iris wrote to a Mr Gruntspeak at The Extraordinary and Exotic Zoo, offering herself as "your personal animal language decoder" using her invention of the 'Whistleclick Robot'.[1] She won the Under 11 age group. The competition attracted nearly 100,000 entries from one in five UK primary schools, and the prize was split between an element for herself and £1000 to her school. The school accepted Iris's proposal to spend their part of the award on an analemmatic sundial.

Living in Forest Hill, the Ferrar family had often visited the Horniman Museum and Gardens and its Sundial Trail.[2] Iris wanted the school prize money to be spent on an analemmatic sundial because she loved using the 'human' sundial in the Horniman Gardens (Fig. 1) and because she wanted something that "amalgamated maths with art and was also an active piece, not just a bench with a plaque on it".[3] Brilliant reasoning!

Websites are a wonderful thing, and in due course my husband David received an email from Catherine Ferrar, Iris's mother, outlining her win, the prize money and what she wanted to do with it. David, of course, was happy to accept the commission to provide the required sundial, though it was a tight squeeze to fit it all in between the beginning of June and the end of the summer holidays, agreed as the ideal time for the installation. On 8 June he set to work on the planning, liaising with Catherine who was an admirable correspondent and link between Iris, David and all involved at Alleyn's Junior School. Plans were afoot for some of the pupils to fix the north–south line with the help of the good old BSS publication *Make a Sundial* [4] but Iris reported that the end of the summer term felt like being on a roller coaster, so this valuable job was ably accomplished during the summer holiday by Mrs Jane Mines, the School Administrator, who was such a help with all the arrangements and looked after us so well on Installation Day. As usual, the all-important questions of where to site the sundial – away from trees, on grass or pavement, correctly orientated, prominent but not in the way, etc. – proved quite tricky to resolve. Eventually, the Headmaster, Mr Simon Severino, and Iris's class teacher, Mrs Katherine Beith, agreed on a grassy area on one side of the juniors' Adventure Playground, and all hoped the children wouldn't miss losing part of their football kick-about area too much.

Fig. 1. The Human Sundial in the Horniman Museum and Gardens Sundial Trail. Photograph by kind permission of the Horniman Museum.

David proposed that Iris might like to come to Somerset one day in early August to have a go at stone letter-cutting. She could also use a grassy patch in our garden in Somerton to find out how the setting-out of the sundial would be done. Iris was keen, and the visit was arranged to take place on the day that the family would be travelling to Wales for their holiday. I couldn't believe that the whole family would want to be involved so had helpfully prepared a list of local visits and activities that Iris's two brothers, sister and parents (and dog) might enjoy while Iris was busy with the sundial. But I underestimated the Ferrars! Not only did they visit Stonehenge and our local National Trust property, Lytes Cary, on the way (after a very early start from London), but the whole family joined in and enthusiastically took part in everything sundial-related before travelling on to Wales in the early evening (Figs 2, 3 and 4).

On Installation Day (26 August), David and I were on site at Alleyn's Junior School at 10 am. Time was now pressing so we had to go ahead although we knew that Iris was unlikely to be back from her holiday in time to help. We expected to complete the work that day, assisted by Shura, a former pupil and now gap year student, and two fabulous young members of the gardening team, Kelly and Steve

Fig. 2. The Ferrar family being introduced to sundials in Somerset.

Fig. 3. Iris tries her hand at letter-cutting an hour marker.

Fig. 4. Iris helps with the painting of the date scale.

(Fig. 5). Never before have we installed a dial on grass where plentiful fresh soil was brought along and new grass seed sown as each stone was laid! However, the ground was so hard that the recesses for the stone markers could not be cut into it – a combination of the long dry spell and previous use for footie! There was nothing for it but to bring out the watering cans (Fig. 6) and later to turn on the sprinklers and hope that the ground would have softened up in time for a return visit four days later, the day before the start of the new school year.

The sprinklers had only a small effect so it was as well that we had with us on our second visit a hammer drill to penetrate the very compacted stony soil. Iris and her younger brother and sister and father were back to help too (Fig. 7).

Fig. 5. The gardening team.

Fig. 6. Attempting to soften the ground. School Administrator Jane Mines looks on.

Fig. 7. Setting the components with the help of the Ferrar family.

Fig. 8. Iris with the instruction plaque.

We finished the installation by mid-afternoon and left an instruction plaque (Fig. 8) that was later attached to a nearby fence. The sun shone on cue for Iris to test the sundial and proclaim satisfaction and amazement that it told the right time (Fig. 9).

The sundial has a semi-major axis for the winter months of 2.8 metres. The stone is Forest of Dean sandstone 5 cm thick. The incisions are hand-cut, recessed about 2 mm, flat-bottomed and painted with black sign-writer's enamel. The hour points etc. are 20 cm square. Sunrise and sunset markers ('Bailey Points') are included. The winter and summer hour ellipses are indicated with a snowflake and a full sun respectively at beginning and end of the scales. All the stones have been treated with a transparent preservative solution.

Fig. 10. Iris opening the sundial with the Headmaster.
Photograph by kind permission of Alleyn's Junior School.

Iris performed the opening ceremony with the Headmaster Mr Simon Severino at the beginning of term (Fig. 10). This was just one of the events that gave Iris the opportunity to demonstrate the sundial and talk about her exciting year, which she did with aplomb, humour, modesty, grace and the kind of felicitous turn of phrase that helped win her the prize in the first place. For example, earlier in the year on the day that the competition winners were announced (22 March, just before the Easter holidays), Iris toured the

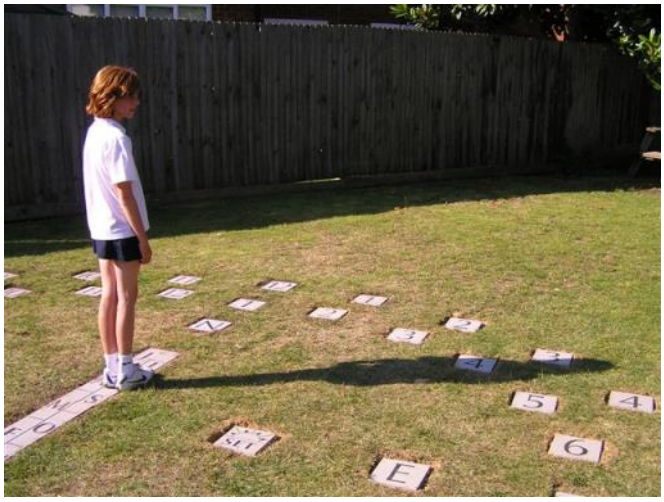

Fig. 9. Iris tests the completed sundial.

London radio (Fig. 11) and TV stations with the winner of the senior section of the competition. She gave 16 interviews in all and "enjoyed thinking of responses to lots of different questions". When she recalled this day in a talk she gave at a school assembly early in the summer term, she explained how she used the broadcast interviews to promote her longing for a hamster, presumably as a step on the road to the dream job she had written about in her prizewinning application: "In the first interview, I began my national campaign for a hamster… After this, I almost always managed to put in a hamster reference." One of her own prizes was a visit to Chessington Zoo where she wished that she had already invented her decoding machine and could converse with the sea lions, lynx, tigers and chimpanzees she saw there. She ended her school talk with a progress report, "Hamster cage has been acquired; hamster to follow shortly."

At the end of September, the sundial was officially on the 'Alleyn's Junior School Tour' for Open Day and Iris, now in year 6, was a tour guide. All this very successful public speaking by Iris led several people to comment that a future in broadcasting could well be in store. Even Iris said in her

Fig. 11. Iris (Junior winner) and Amelia Cunliffe (Senior winner) after receiving their awards from TV presenter Helen Skelton.
Photograph courtesy of Guy Levy/Royal Mail.

assembly talk about her day of interviews, "I think that my new dream job is to work in television and radio, perhaps as a presenter!" BSS members will rejoice that at least one more young person has become interested in sundials and has done a great deal, by commissioning the sundial and talking about it, to generate interest amongst many others, young and old alike.

David and I thoroughly enjoyed the whole experience (despite the time pressure) and also felt privileged to have worked with such fantastic family and staff members on this job. All were so appreciative of what David was able to do and wanted to know so much about the process and background of gnomonics. In retrospect, though, I think the sundial design should have featured a hamster at least!

ACKNOWLEDGEMENTS

Grateful thanks to Helmut Sonderegger whose excellent and free 'Alemma' software was used for the delineation of the sundial.

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1. Extracts from Iris's winning letter.
2. Horniman Museum and Gardens Sundial Trail *http://www.horniman.ac.uk/collections/stories/sundial-trail* The analemmatic sundial was devised by Barry Small in 1992 and installed with the help of former BSS Secretary David Young. David Young was instrumental in the setting up of the Sundial Trail with contributions from many BSS members.
3. Extracts from Iris's talk to the school.
4. Jane Walker, *Make a Sundial*, BSS publication.

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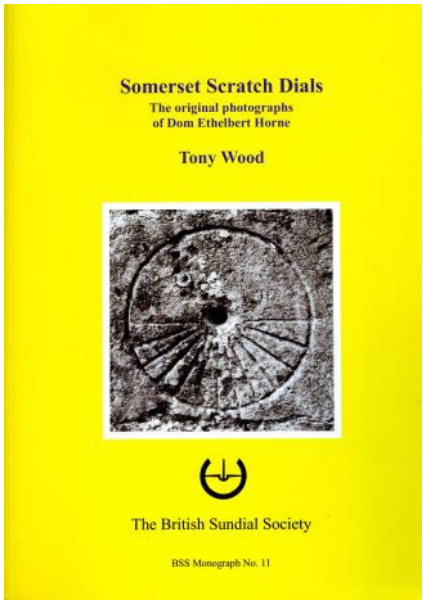
BOOK REVIEW

Somerset Scratch Dials: The original photographs of Dom Ethelbert Horne
by Tony Wood. BSS Monograph 11.

ISBN 978-0-9558872-7-7 (2015).

A4, pp. 64, soft covers.
Price £11 + p&p from BSS Sales.



The words "lavishly illustrated" perfectly describe this most attractive monograph: 53 of its 64 pages are devoted to photographs of scratch dials on Somerset churches taken by Dom Ethelbert Horne, a man described by Tony Wood in his article in the September 2005 *Bulletin*[1] as the "Founding Father of Mass Dial Studies".

Horne (1858–1952) was a member of the Order of St Benedict and for around fifty years from 1891 was parish priest at St Benedict's at Stratton-on-the-Fosse in Somerset. His wide range of interests, mostly antiquarian, were centred around his membership of the Somerset Archaeological and Natural History Society (SANHS), but for diallists his chief claim to fame is as the author of *Primitive Sun Dials or Scratch Dials*,[2] published in 1917, which, Tony Wood tells us, usually now appears as 'ref. 1' in any British publication on mass dials.

In his book, Horne attempted a classification of scratch dials in general, and followed this with a detailed catalogue of scratch dials in Somerset, carefully described and annotated with the dates of his visits, most of which were during the summer months over the years 1911–15. Only fourteen Somerset dials were illustrated, and then merely as representatives of the classes he was proposing. Interesting and detailed as his catalogue may be, it suffers from the paucity of illustrations, but thanks to the kindness of the SANHS, all Horne's photographs of Somerset scratch dials have now been published for the first time in this monograph, and readers can see for themselves that Horne was, indeed, an accomplished photographer as well as a careful recorder.

After a brief introduction, the beautifully clear photographs are arranged, in most cases, four to a page. As in the original publication, the county of Somerset is divided into North and South, each subdivided into districts; within each district the dials appear in alphabetical order of place, with each caption prefixed by Horne's catalogue number.

At the end there is a most useful index for cross-referencing with the original publication. Here all the dials described by Horne are listed in alphabetical order of place name, and, in addition to the catalogue number, a National Grid Reference is provided for each one. Almost all the dials are illustrated in the monograph.

This monograph is a must for anyone who has a copy of the 1917 book, but it is also a most attractive publication in its own right, thanks to John Foad's hard work in editing and producing it.

References

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2. Dom Ethelbert Horne: *Primitive Sun Dials or Scratch Dials – containing a list of those in Somerset*, Barnicott & Pearce, Taunton (1917).

Frank King

THE PORTABLE VERTICAL DIAL

MIKE COWHAM

Portable vertical dials without any other dial attached are not very common. Versions with an attached dial are usually part of a diptych dial, having one horizontal dial and another vertical dial operating from the same string gnomon. Another commonly found vertical dial is the pillar dial. Several other types of altitude dial may be found.

The aim of this article is to show two less usual portable dials that are solely vertical dials.

Vertical South Dial

The first is a plain vertical dial and is possibly German or Czech (Fig. 1). It was probably made around 1600. It is 100 mm wide and 74 mm high. It is in gilt brass with a string gnomon, and it is calibrated for several latitudes. Chapter rings are available for *Graduum* 41°, 44°, 47°, 50° and 53°. These operate with a string gnomon that may be adjusted to each of the latitudes by attaching its lower end onto a supporting leg at the front of the dial with individual slots for each latitude, although, owing to the arm being broken at 47°, some are now missing (Fig. 2). In order to fit into each slot, the top of the string gnomon is connected to a spring on the reverse of the plate (Fig. 3) to take up the slack. All attachments to the main dial plate are able to fold flat for transit or packing.

Fig. 1. Direct vertical dial for five different latitudes.

Fig. 2. Gnomon support arm, here set at 50°.

Fig. 3. The back of the vertical dial.

The dial has no obvious means of setting to face due south, so an external compass would be required. The dial was possibly part of an instrument set in which a compass was provided.

The line at the top appears to read "*Ad Eleuatiouonem Poli*" and lower down is the motto VT VMBRA SIC VITA FVGIT (*as a shadow, so does life fly*).

On its reverse are two rotatable discs or volvelles (Fig. 4). The first, on the left, is rather unusual and seems to be so that if anyone wants to know what time it will be after a certain number of hours, up to 24, a reading may quickly be taken without doing addition. This would possibly be of use to someone who may need to know what time it is at another part of the world.

Fig. 4. The two rotating dials on the back.

The dial on the right is for lunar use. When the day of the lunar cycle (which commences at new moon) is set to the outer scale, the time read on the dial's front face from moonlight is transferred to the next inner scale to show the correct time on the rotating scale.

Also on the back is a folding arm to suspend a plumb line for setting the dial perfectly level.

Square Pillar Dial

The second dial illustrated is quite unusual (Figs 5 and 6). It is relatively small, being just 103 mm high. It seems to be like a pillar dial but it is actually two vertical dials, one declining east by 45° and the other west by 45°. It is unsigned but was probably made by Ulrich Schniep of Munich and would have been constructed around 1567. Two other similar dials are known, one in the British Museum, signed by Ulrich Schniep (1890, 1216.1)[1] and the other in Museo Galileo in Florence (inventory 2534).[2]

Like all good portable dials this has a compass, here set into its lid, aligned about 12° east. It may be seen when the

Fig. 5. Square pillar dial with two gnomons at 45°.

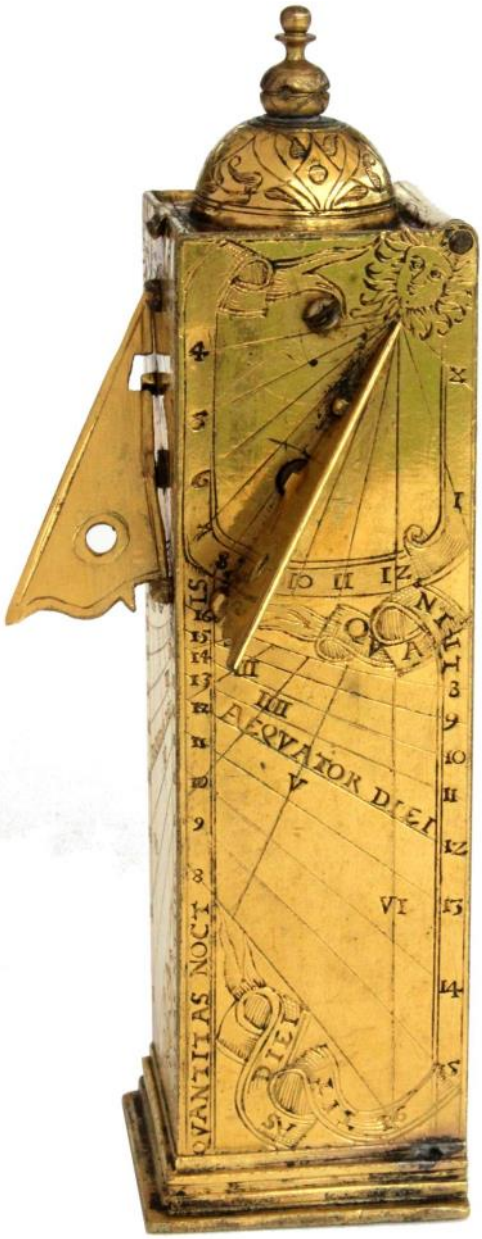

Fig. 6. Detail of the dials on the south-east face.

Fig. 7. The compass set into the lid of the pillar.

lid is opened (Fig. 7) and it is used to set the dial so that the corner of the pillar between the two gnomons faces due south. The two upper dials are standard vertical declining dials but the tips of their gnomons produce shadows that fall on the lower dial scales which give the time in unequal hours with VI at noon. The lengths of day and night QVANTITAS DIEI and QVANTITAS NOCTIS are given in equal hours. Across its centre is the equinox line, AEQVATOR DIEI.

On the NE and NW faces of the dial are detailed tables showing the planetary rulers[3] for each HORA INAEQVALES or unequal hour of the day and night covering every day of the week (Figs 8 and 9). These use the planetary symbols relating to each ruler. These are SOLIS, LVNAE, MARTIS, MERCVRI, IOFIS, VENERIS and SATVRNI.

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Fig. 8. Table of the planetary rulers for the day-time hours.

Fig. 9. Table of the planetary rulers for the night-time hours.

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