BULLETIN
OF THE BRITISH SUNDIAL SOCIETY

ISSN 0958-4315

VOLUME 33(ii) - June 2021

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EDITORIAL

This time last year we were in peak lockdown. We had been unable to run our York Conference so there were no associated talks or outings to write about. This year we were unable to run our Exeter Conference but we hosted a Zoom event in its place with three noted sundial speakers giving talks: Roger Bailey, Woody Sullivan and Fred Sawyer. A full account is given in this issue of the *Bulletin*.

John Davis investigates a fascinating brass sundial with an earlier engraving on its hidden side.

It is always good to receive an article from a new author and Michael Johnston recounts a remarkable story of a sundial which spent many years immersed in the River Liffey.

Dennis Cowan has written another article in his Thomas Ross series; this time he describes some 'modern dials', which means dials that are now around 200 years old!

Sue Manston describes a dial with a most unusual appearance which was sent to the Help and Advice Service.

Alastair Hunter has written a most engaging interpretation of the Latin scroll on the Drummond Castle obelisk sundial. There will surely be readers who have additional thoughts on this astonishing collection of dials.

Several pages are given over to recording the entries for the Society's sixth sundial award scheme. The entries include a splendid restoration by David Brown and a remarkable replacement stained glass sundial which had substantial input from John Carmichael. A contender for the most spectacular new sundial is surely the entry from Malaysia.

David Brown recalls a mini-safari in West Somerset made in the 1990s with photographs of the dials encountered, and text by a late friend of his, Hilary Binding.

Finally, I was very sorry to learn of the recent death of the great Italian *gnomonista*, Mario Catamo. With his co-author Cesare Lucarini, he wrote what is arguably the most beautifully presented book ever written about a single sundial: *Il Cielo in Basilica*, about the *meridiana* in the basilica of Santa Maria degli Angeli e dei Martiri in Rome. As Cesare Lucarini puts it: "*Ciao Mario, ci mancherai*".

Frank King

A PALIMPSEST HORIZONTAL DIAL

JOHN DAVIS

Palimpsest sundials (ones made on the backs of re-used sheets of brass) are very rare – in three of the five cases described in the *Bulletin*, it is only the gnomon that employs re-used material.[1,2,3] For the others, one uses the reverse of the chapter ring from a longcase clock[4] and the fifth is a square plate with horizontal dials engraved on both sides.[5] For the case described here and shown in Fig. 1, the gnomon is lost and it is the dial plate itself which has part of an earlier engraved pattern on the back. The dial was auctioned recently by a seller who lives in West Sussex and described it as "certainly from the 1850s" which is quite wrong. He said that he had obtained it from a dealer who comes from Staffordshire but works mainly in London: its provenance is thus unknowable. It is a fascinating object worthy of further investigation.

The plate is 124 mm square (a nominal 5″) and around 2 mm thick. It has a dark patina on both sides. The dial (on the 'front' side) is a fairly conventional one and the 'back' has part of a figure and a scroll with a small amount of text and can thus be identified as part of an earlier memorial brass, originally much larger, which would have been attached to a stone memorial or tomb, most probably in a church. Four corner holes show where the dial would have been attached to a pedestal and a pair of slots near the centre would have held the tenons of a gnomon. The two sides can be considered separately.

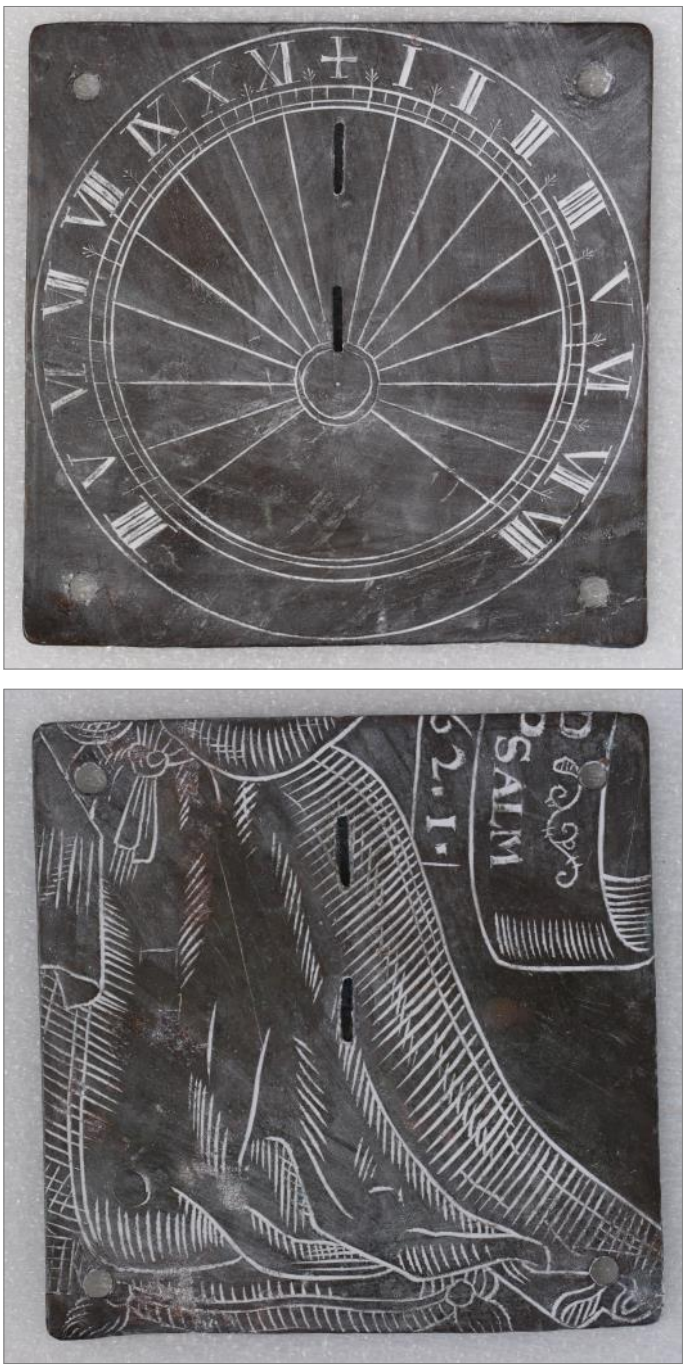


Fig. 1. The palimpsest sundial from the front and the back, with the engraving highlighted by talc.

The Dial

The horizontal dial is entirely conventional and quite nicely engraved although the two circles around the toe of the gnomon are rather wobbly. There is a single centre of delineation marked by a punched dot and there is no noon gap. This implies the use of a knife-edge gnomon, a fact that is confirmed (Fig. 2) by the impression it has left in the patina: the angle of the edge is a fairly sharp ~22.5° (but with a slightly rounded edge) which would have allowed it to operate accurately quite close to noon. The two rectangular slots for the gnomon tenons have a width of around 1.9 mm so it is possible that the missing gnomon was made of brass from the same recycled source as the plate.

Other impressions in the patina around some of the corner holes, particularly the one in the NW corner (Fig. 3), indicate that the dial has at some stage been held onto a pedestal by hand-cut iron nails – the impressions are roughly rectangular and there are traces of surface iron corrosion. The pedestal may have been made of wood or, more probably, it was of stone but with wooden plugs positioned to accept the nails.

The centre of delineation is offset to the south of the physical centre of the actual plate by 10 mm which is approximately 16.5% of the radius of the perimeter circle.

Fig. 2. Close-up of the centre of delineation showing the impression of the knife-edge gnomon in the patina. The contrast has been enhanced and the colour balance altered.

Fig. 3. Close-up of the hole in the NW corner of the dial plate showing the impression of a nail head. The contrast has been enhanced and the colour balance altered.

This is quite a small amount compared to typical dials from the late 17th century whereas 16th century dials usually have zero offset. This gives a clue that the dial may have been made in the first quarter of the 17th century. This impression is bolstered both by the knife-edge gnomon and by the fact that the dial is delineated only with hours, halves and quarters rather than with smaller divisions (either half-quarters or 5-minutes) employed as the century progressed. Further evidence is the use of a cross pattée to mark noon and the relatively wide included angles of the Vs and Xs. Naturally, the main Roman numerals are orientated to be read from the centre of the dial. The half hour lines are indicated by a small 'Christmas tree' symbol which I cannot recall having seen before.

Close observation shows that there is a filled circular hole around 7 mm in diameter in the plate in the chapter ring at the VII:30 pm mark (Fig. 4). The surface has been finely smoothed on the front but it is more obvious on the back. The half-hour line is engraved over it so clearly it was inserted to fill a hole in the original recycled plate before the dial was engraved.

The angles that the hour and half-hour lines make with the noon line were measured by importing a precisely square-on photograph into a CAD program. These were compared

Fig. 4. The filled rivet hole in the plate (between the VII and VIII), viewed from the front (above) and the back (below).

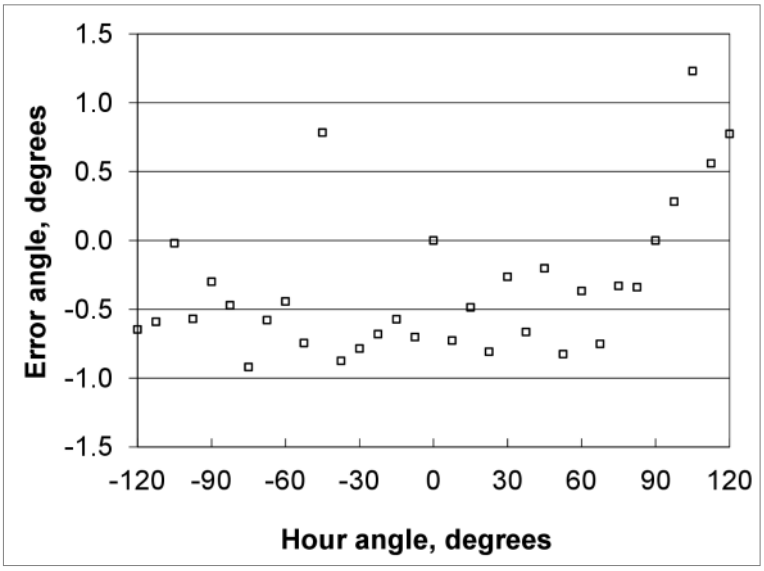


Fig. 5. Error profile of the measured hour line angles for the dial with an assumed design latitude of 51.5° N.

Fig. 6. Memorial to John Shelley III (d. 1592), and wife Elinor, son and daughter from St Mary the Virgin, Clapham, West Sussex with, below left, an expanded image of the kneeling lady with strong similarities to the sundial figure: note especially the details of the cushion. Photo courtesy of Martin Stuchfield.

with calculated values for a range of assumed design latitudes: the differences for the optimum latitude of 51.5° ± 0.2° N shown in Fig. 5. The plot shows that the errors are generally within ±0.5° but with an offset of around –0.5° indicating perhaps that a template was used to mark out the lines, but it was slightly rotated relative to the noon line (which is accurately perpendicular to the E-W line). This level of accuracy is quite acceptable for the period but not quite up to that of the very best London mathematical instrument makers.

The Memorial Brass

The design on the back of the dial incorporates a small amount of text on a scroll: it is incomplete but it is possible to read

….D
…Psalm 62.1.

This is clearly a bible reference to Psalm 62 v.1 which reads

TRULY MY SOUL WAITETH UPON GOD:
FROM HIM COMETH MY SALVATION

It can be seen that only the final 'D' of the first line has remained on the panel. The quotation is actually quite apt for a sundial but as it predates the dial this is clearly just coincidence. The style of the lettering, especially the use of Arabic-Hindu numerals, compares well with that found on mathematical instruments from the later 16th or early 17th centuries rather than the medieval Gothic or Black Letter forms found on the backs of the palimpsest gnomons referred to earlier.

As the panel was originally a memorial, I made contact with the Memorial Brass Society (MBS)[6] where its President and Conservation Officer, Martin Stuchfield, kindly identified the image as that of a lady kneeling at a prayer desk and he put the date as c.1600, in agreement with my assessment but surprisingly close to that of the dial on the other side. This led to a search for other memorials with comparable images and one article by Jon Bayliss, on 'The Southwark Workshops, 1585–1605' was particularly enlightening.[7] It describes three substantial workshops set up in the mid 1500s by three immigrants from The Netherlands. These were, firstly, William Cure who was brought to England to work on Henry VIII's Nonsuch Palace in the early 1540s and was a resident in the parish of St Thomas the Apostle in Southwark from 1559 until his death in 1579 when the workshop continued under his son Cornelius. The second workshop was that of Garret (sometimes Garat) Johnson and the third was a Richard Stevens who died in 1592. The reason that Southwark was chosen for the workshops is likely to be that, being south of the River Thames, it was outside the City of London where the local guilds prohibited work by immigrants. On the other hand, it was sufficiently near to London for reaching

customers and for the supply of materials, some of which would have been imported through the docks.

These three workshops had a large output of memorials with both brass and stonework. Their styles tend to be quite similar, and identifying a particular memorial to an individual is difficult and will be left to MBS experts. They clearly had templates and standard designs as starting points so that a number of the examples in the Bayliss article feature kneeling ladies. One example, reproduced in Fig. 6, shows the memorial to John Shelley III (d. 1592) and his wife Elinor, with their son and daughter: it is at St Mary the Virgin church, Clapham, West Sussex. It shows them kneeling on either side of a desk and the depiction of Elinor, on the right, has many similarities with the one on the dial though it is far from identical. In particular, the memorial has no scroll. There are a number of other memorials featuring similar kneeling couples with small stylistic differences such as a tiled floor or the underskirt of the lady with elaborate patterning whereas on the dial image it is plain.[8] Other details, though, are common, such as the way in which the cushion on which she is kneeling is depicted. There can be little doubt that the two images share a common source though whether this is just the drawn pattern or an actual workshop or engraver is unclear.

The closeness in dates of the memorial and sundial needs to be considered. The MBS recognise three types of palimpsests:[9]

1. Retroscriptive = where the brass has been turned over and re-engraved usually from monastic spoil. Most brasses typically date from 1535–85;
2. Adaptive = existing brasses that have been adapted to form the memorial for a much later commemoration (e.g. the brass depicting a civilian, dated c.1360, upon which an inscription to Ad. Dyxon was engraved in 1570 at Hampsthswaite, Yorkshire; and
3. Waster = where the engraver has made an error resulting in the plate being discarded and reused for an alternative memorial or purpose. Brasses in this category are invariably closely dated.

Of these, it is clear that the sundial would be classed as a 'waster' although there is no indication on the extant fragment why the original memorial was scrapped. This identification leads to the intriguing possibilities that the original workshop, probably in Southwark, either engraved the dial themselves or, possibly more likely, sold the scrap metal to a local instrument maker or perhaps clockmaker. Note that the latitude of Southwark is 51.5° N which matches the design latitude of the dial. The fact that the dial is unsigned indicates that it was made outside the City of London, where only Freemen of one of the Guilds could sell mathematical instruments and they had to sign their work, suggesting that it was indeed made locally.[10]

Metallurgy

The metallurgy of the plate was investigated by X-ray fluorescence (XRF) using the same Niton instrument employed in other recent sundial investigations.[11] The analyser has an internal algorithm for extracting the percentages of the constituent elements in the target from the secondary X-ray spectra in real time. Although the algorithm is carefully calibrated for heritage copper alloys (as described previously), for the highest possible sensitivity and comparability with results from other instruments, it is also possible to download the raw spectra for batch post-processing using a more sophisticated algorithm to deconvolve *all* the peaks allowing constituents previously listed as 'below the limit of detection' to be quantified.[12] The procedure known as "CHARMed PyMCA" has been used previously on medieval astrolabes[13] and was used here.

The plate was quite heavily patinated with mixed oxides, carbonates, sulphates etc. of copper, so to obtain a fully quantified analysis of the bulk (sub-surface) composition, it was necessary to clean off an area of approximately 10 mm diameter to expose the underlying metallic ('brassy') material. Usually, I would clean an area on the back of a sundial where it would be generally unseen, but in this case it was judged that it was more important to keep the appearance of the memorial in the as-found condition, so a circular spot was cleaned in the unengraved area to the south of the dial on the basis that it could if necessary be chemically patinated later to tone in with the rest of the dial. (The cleaning was done after the photographs of Fig. 1 were taken.)

The results showing the most important ten elements are displayed in Table 1 where only the first line gives fully quantitative results for the bulk material – the other areas are semi-quantitative and exhibit significant levels of dezincification (loss of zinc near the surface) and increases of some trace elements incorporated into the patina. The first point which is clear is that the basic plate is of a leaded brass (rather than a quaternary 'latten') with a very high zinc concentration for the cementation smelting technique in use at the time.

The top line of Table 1 indicates that the alloy used for the sundial is a very rare one indeed for English sundials, more like that found in mid-16th century astrolabes from the Louvain workshops of Arsenius and Mercator[14] but also, exceptionally, used by Elias Allen for his double horizontal sundials at about the same period as the palimpsest dial.[15] It is characterised, firstly, by a very high zinc concentration, at or slightly above that which is thermodynamically achievable with the cementation (solid-state diffusion) process which was the only method in general use in the West at that time.[16] Only by the use of granulated copper (a process only patented in England by Nehemiah Champion III in 1723[17]) could these levels be approached. Zinc as a metal was unknown in Europe at that time

Area	Cu	Zn	Sn	Pb	Ag	Ni	Fe	As	Sb	Bi	Comments/ Others
Front (cleaned area)	65.99	33.09	0.010	1.29	0.030	0.29	0.13	0.06	0.01	nd	unengraved area at S
Front (uncleaned area)	72.1	26.52	0.015	1.64	0.030	0.23	0.28	0.10	0.016	nd	adjacent area to above
Back (uncleaned area)	71.79	25.92	0.013	2.44	0.036	0.22	0.31	0.06	0.01	nd	unengraved area
Back (filled hole, uncleaned)	74.91	17.35	2.13	3.42	0.123	0.13	1.88	0.231	0.07	0.012	3 mm dia area

Table 1. Alloy compositions of the components of the dial (in wt.%, rounded to two or three places of decimals) as measured by XRF by the author using a Thermo-Scientific Niton XL3t analyser with a 90 second sampling time, a 40 kV primary beam and a Peltier-cooled silicon drift detector. The raw spectra from the instrument were analysed off-line using the CHARMed PyMCA procedure.[22] nd = not detected.

although it had existed in China for a considerable period and importation of ingots to the Netherlands were just beginning. It is likely that the alloy was achieved by very well-controlled non-oxidising conditions in which the zinc vapour which sublimed in the cooler parts of the crucible were scraped back into the mixture towards the end of the sequence. One of the characteristics of brass which is determined mainly by the zinc concentration but which is sometimes overlooked is its colour: a 'golden' hue was, and is, much prized and can be compared to the reddish tinge of copper or bronze.[18]

The other striking points about the alloy are the virtual absence of any tin (Sn) which is always characteristic of copper ores mined in England, and also the very low levels of silver (Ag) combined with significant amounts of nickel (Ni). These characteristics are typical of those found in the Mansfield mines at the southern end of the Harz mountains. Although it could have been imported to England as copper ingots for conversion to brass sheet in a local battery mill, it is much more likely that the material was imported as sheet brass that was produced by the battery works in the Aachen area where Mansfield copper was much preferred as its low impurity levels made it very suitable for cold working without cracking.[19]

The second and third lines of Table 1 indicate predominantly the effects of the weathering and patination process on the surface composition with a large loss of zinc and a mild build-up of tin and lead (Pb) in the patina.

The bottom line of Table 1 used the 'small spot' (3 mm) capability of the analyser to select only the small circular plug filling the old rivet hole: it is seen to be a completely different alloy. Even allowing for the dezincification, the zinc levels are much lower than the rest of the plate and there is now a significant tin component together with the more typical silver and nickel levels seen in other English sundials of the era. (The enhanced iron, Fe, level is due to the corrosion products from the iron fixing nails which are visually apparent across the surface.) Although England did not possess any brass smelting abilities up until the latter Tudor period, some mills had begun to appear by the early 17th century, for example at Isleworth[20] on the Thames, only about 15 miles upriver from the Southwark work-shops. The composition of the plug could be compatible with local production using smelting of arsenic-rich ores from Cornwall. It is interesting that a different material has been selected to repair the hole when it must be assumed that there were plenty of offcuts from the re-used memorial to hand. A possible reason for this is that a thicker slug of metal was needed so that it could be hammered into the hole and then smoothed off afterwards.

Conclusions

The discovery of a well-made horizontal dial as a palimpsest on a 'waster' from a memorial brass of only a few years earlier throws light on workshop processes for both memorials and mathematical instruments. The use of imported brass sheet from the same area of the Continent as the immigrants who started the Southwark workshops indicates the way in which the supply process worked. In addition, the unusual alloy that Elias Allen was able to use for his dials, virtually uniquely in his generation of instrument makers, is perhaps explained.[21]

ACKNOWLEDGEMENTS

I am grateful to Phillip Andrew for information on the recent history of the dial. Martin Stuchfield and also Michael Harris of the Monumental Brass Society provided much useful information on their aspects of the device. Arlen Heginbotham (J. Paul Getty Museum, Los Angeles) supplied the PyMCA software and kindly helped with the processing of the XRF spectra. Arie Pappot (Rijksmuseum, Amsterdam) provided the background information on the Mansfield copper mining history and composition.

REFERENCES and NOTES

1. Andrew James: 'A Happy Ending: The Preston Gubbals Sundial', *BSS Bull.*, 20(iii), 144-147 (September 2008).
2. John Davis: 'A Palimpsest Gnomon', *BSS Bull.*, 25(i), 28-29 (March 2013).
3. Dennis Cowan: 'The Glassmount Sundials (and a palimpsest gnomon)', *BSS Bull.*, 25(ii), 35-36 (June 2013).
4. Jill Wilson and Christine Northeast: 'Square and Compasses', *BSS Bull.*, 33(i), 23–30 (March 2021).
5. C. St J.H. Daniel: 'The Dinton Church Sundial', *BSS Bull.*, 14(iv), 150–154 (December 2002). I have a resin replica of this plate.
6. *https://www.mbs-brasses.co.uk/*

7. Jon Bayliss: 'The Southwark Workshops, 1585–1605', *Trans. Monumental Brass Soc.,* Vol. XIX, Pt 2, 111-130 (2015).
8. See, for example, the memorial to William Dunche, d. 1597, and his wife Marie in Little Wittenham, Berks., online at *http://www.berkshirehistory.com/churches/littlewittenham_dunch_brass.html*
9. Martin Stuchfield, personal communication, 5 January 2021.
10. There are exceptions where workmen left instruments unsigned but Guild council members are recorded as inspecting premises and physically destroying faulty or unsigned instruments.
11. See, for example, J. Davis: 'John Wright of London and Bristol. The beginning of the scientific instrument trade in Bristol', *BSS Bull*., 30(iii), 28-32 (September 2018) or J. Davis: 'William Lumb of Swillington. Schoolmaster, land surveyor and dial designer' *BSS Bull*., 29(iv), 15-18 (December 2017).
12. A. Heginbotham and V. A. Solé, 'Charmed Pymca, Part I: A Protocol for Improved Inter-Laboratory Reproducibility in the Quantitative ED-XRF Analysis of Copper Alloys', *Archaeometry*, 59(4), pp. 714-730 (2017). Also A. Heginbotham et al, 'CHARMed PyMca Part II: An Evaluation of Inter-laboratory Reproducibility for ED-XRF analysis of Copper Alloys' (October 2018).
13. J. Davis, B. Degenaar, A. de Ruiter, R. van Gent, A. Pappot and A. Agostino: 'A Previously Unrecorded Medieval Latin Astrolabe and Evidence for a Mid-fourteenth Century Instrument Workshop', *Bulletin of the Scientific Instrument Society*, 146, pp. 6-23 (September 2020).
14. For a study of 16th century mathematical instrument metallurgy, especially the significance of the nickel concentration and the high zinc levels, see A. Mark Pollard and Carl Heron: *Archaeological Chemistry*, 2nd edition, RSC Publishing (2008), Chapter 6, 'The chemical study of metals the medieval and later brass industry in Europe', pp.193-234.
15. J. Davis and M. Lowne: *The Double Horizontal Dial and associated instruments*, BSS Monograph No. 5 (2005) lists ten double horizontal dials plus a horizontal instrument by Elias Allen and since its publication a further eight have been discovered. A total of eight of these have been analysed by XRF and all show an unusually high zinc level. Perhaps surprisingly, a DH dial by Elias's apprentice John Allen does not use this hi-Zn brass (unpublished data).
16. The maximum percentage of zinc achievable by the cementation technique is generally believed to be around 30 to 32 wt.% although modern experimental methods have achieved higher levels than that in exceptional circumstances, see Brian D. Newbury, Michael R. Notis and Dale E. Newbury: 'Revisiting the zinc composition limit of cementation brass', *Historical Metallurgy*, 39(2), 75-81 (2005).
17. UK Patent No. 454 of 1723.
18. Jui-Lien Fang and Gerry McDonnell: 'The colour of copper alloys', *Historical Metallurgy*, 45(1), 52-61 (2011). Oliver Cooke: *Feasibility Study for the in-house manufacturing of cast brass*, unpublished West Dean College (2006) considered the subject of colour-matching clock wheels for restorations.
19. Personal communication, Arie Pappot (Rijksmuseum, Amsterdam) 18 February 2021.
20. Vanda Morton: *Brass from the Past. Brass made, used and traded from prehistoric times to 1800*, Archaeopress Publishing, pp. 125-7 (2019).
21. It is quite possible that earlier makers in the same master–apprentice line as Allen also used this relatively unusual (for England) high-zinc brass. In particular, Thomas Gemini (another Low Countries immigrant) may possibly be the original source of its importation.
22. A. Heginbotham and V.A. Solé, note 12.

john.davis51@btopenworld.com

Postcard Potpourri 55
Franco-British Exhibition 1908

Peter Ransom

No problem dating this card! It features a stunning statue of a lady holding the gnomon, which perhaps has a ball nodus near its extremity. Unfortunately, it is not possible to make out any time indications. The only information on the dial I could find was the following:

"A very beautiful illustration of the plaster modeller's work is the central figure of the floral sundial in the Garden of Progress, facing the Pavilion of the Collectivité Delieux. This sundial is one of the most graceful features of the Exhibition."

This comes from the full text of *The Franco-British Exhibition illustrated review 1908*, edited by F.G. Dumas and published by Chatto & Windus.

The card itself mentions that it is part of Valentine's X L Series, Real Photo Cards, printed in Great Britain. Judging by the number of postcards showing general views of the Franco-British Exhibition that are for sale, they are not rare, but I have not found another copy of this card. Perhaps it was a bit risky to be seen with it.

The exhibition was a large public fair held in London between 14 May and 31 October 1908. It attracted 8 million visitors and celebrated the Entente Cordiale signed in 1904 by the United Kingdom and France. The chief architect of the buildings was

John Belcher. It was held in an area of west London near Shepherd's Bush which is now called White City. This name comes from the fact that the exhibition buildings were all painted white. More details about the exhibition can be found at *https://en.wikipedia.org/wiki/Franco-British_Exhibition*

ransompeter687@gmail.com

A SUNDIAL WITH A STORY TO TELL

The Liffey Sundial by Henry Sutton

MICHAEL JOHNSTON

Covid lockdown brings about new focus on our surroundings and nothing is safe when my wife starts de-cluttering. When I had to justify why we had a blackened old sundial on our kitchen ornament shelf I wasn't too surprised. "That's a family heirloom!" I told her. My dad, who died last year, had given it to me a few years previously and had said it was "the oldest sundial in Ireland". I realised this did not really make sense, but I quoted this back to her anyway. She merely raised her eyebrows. Despite her cynicism, I set off on a voyage of discovery to find out more about this sundial and sundials in general…

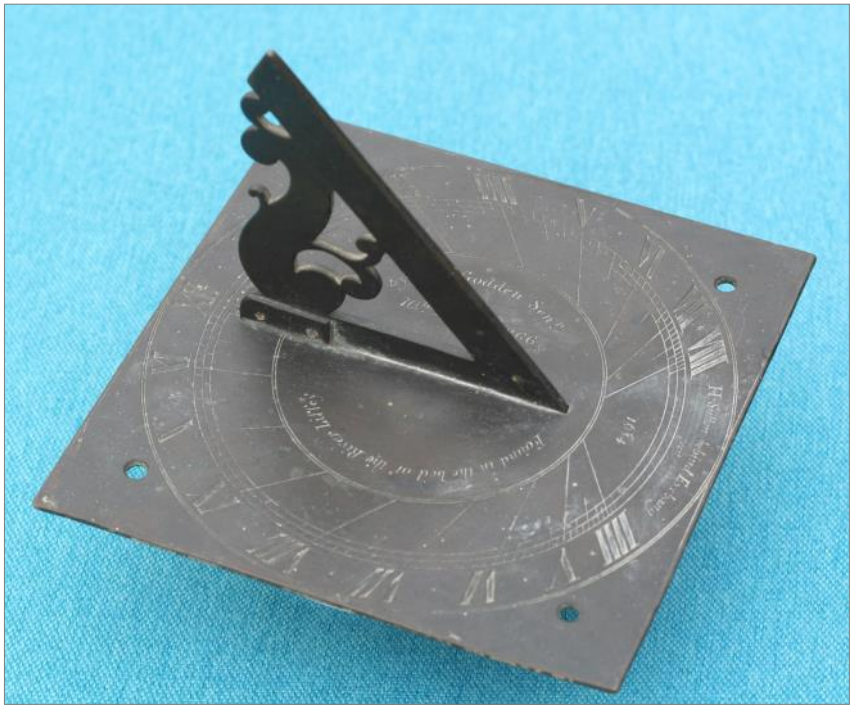


Fig. 1. General view of the Liffey sundial.

The Liffey Sundial

This horizontal sundial measures 152 mm square and has a very dark, almost black, patina (Fig. 1). With the exception of the slightly fancy scrolled design of gnomon, the design is quite plain. It does not have a compass rose or any other dial furniture. It just features a chapter ring marked in Roman numerals between 4 am and 8 pm, with hours split into 1/8 hours (7.5 mins). What immediately draws the eye is the clear, neat, engraved inscription around the inner ring which reads: "Found in the bed of the River Liffey by Geo. Godden Sen^{r} 10th March 1866" (the Liffey is the river that flows through Dublin).

Fig. 2. Signature on the Liffey sundial.

At the southern edge of the dial, in fainter engraving, and spread across three lines (Fig. 2) are the words:

H:Sutton behind Exchang (*sic*)
fecit
1654

The first piece of information I found out was that the oldest sundial in Ireland was actually the sundial Stone at Knowth Passage Tomb in the Boyne Valley and that it is 5,000 years old. This is only 30 km from where I live. I kept this information to myself.

My next port of call was to find out who H Sutton was. A quick Google search brought up the article by John Davis[1] entitled 'The Restoration of a Horizontal Sundial by Henry Sutton'. In it he opens with a description of Henry Sutton, beginning with the exciting words: "Henry Sutton (c.1624–1665) was the leading English mathematical instrument maker in the middle of the 17th century".

Could my dial be by the esteemed Henry Sutton? If so, he would have been 30 years old when he made it. That seemed to fit.

The signature gave me cause for concern though, as the one on my dial said "H Sutton" and while the "S" was very similar, with a serif at the top and a ball terminal at the

Fig. 3. Signature on the dial restored by John Davis.[1] *Photo: John Davis.*

bottom, the "H" was very different and much plainer than that of the dial that was restored by John Davis (Fig. 3).

I also came across Michael Harley's excellent website *www.sundials-ireland.com.* I now had two email addresses of people who might be able to assist me in my quest for knowledge. I rattled off an email to both of them on Sunday 10 January at 3:00 pm and thought I would give it a week before trying somebody else. To my delight, I got this response from Michael Harley later that evening:

> *Hello Michael*
>
> *Thank you for sharing your dial with me which I find most interesting.*
>
> *First of all a caveat. The late 1800s and early 1900s saw a lot of forgeries of genuine old dials from previous eras. We must always be on our guard against same as some of them were of high quality. That said I see nothing in the photo you sent me to suggest that this is a forgery.*
>
> *To help me confirm this I would like you to take some hi-res photos and send them to me for inspection. These should include a close overhead shot looking straight down from above, a close-up of the signature, a side view of the gnomon and finally the underside of the dial.*
>
> *You mention that you inherited it. Are you a descendant of the Geo Godden who found it? and have you started researching Sutton and Petty?*
>
> *Best regards from a wet North of Ireland now that the snow and frost have gone from Derry City where I live.*
>
> *Michael*

We were off! What followed was a daily exchange of emails with requests for photographs, measurements of gnomon style angle, and rubbings of the dial plate lines, sprinkling the dial with talc in an attempt to make the signature more legible.

After a lot of exciting to-ing and fro-ing of emails comparing the calculated angle of the hour lines with the measured angles, I got this one from Michael Harley on 15 January:

> *Hello Michael*
>
> *I return your spreadsheet with my calcs and explain I included London just in case Sutton was selling his stock plate design with a variety of gnomons (I think I just heard him turn in his grave). Not so.*
>
> *Research shows that 53D 20M was the recognised Lat. For Dublin in the mid 17th c. and look at that result!*
>
> *Having gone this far I decided it was time to call in the Big Guns of the British Sundial Society (BSS) for their opinions (referring to Sue Manston and John Davis)…*

Wow, The Big Guns! Things were hotting up! I sent an overhead photo from my camera-phone which John was able to analyse by stretching the image to its correct aspect ratio and measuring the angles of the hour lines in a CAD application and then comparing the measured values with theoretical ones for a range of possible design latitudes (Fig. 4). A few days later I was able to follow with an accurate bird's eye view taken with the camera accurately centred over the chapter ring and parallel to it. John repeated the analysis and the results for the optimum latitude of 53.35° N are shown in Fig. 5, indicating very

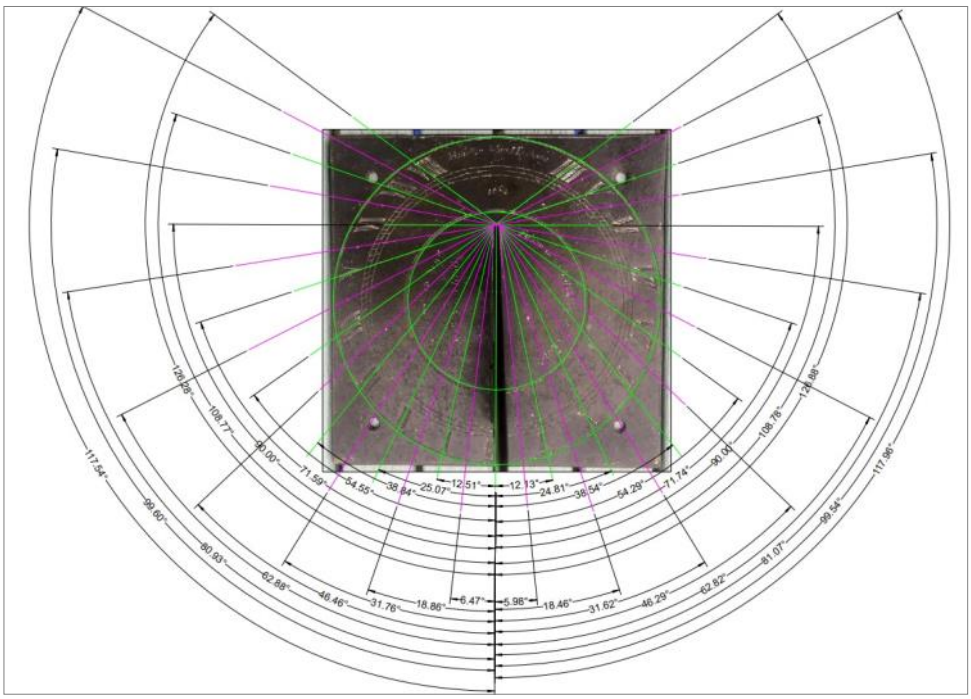


Fig. 4. Measurement of engraved angles. Courtesy of John Davis.

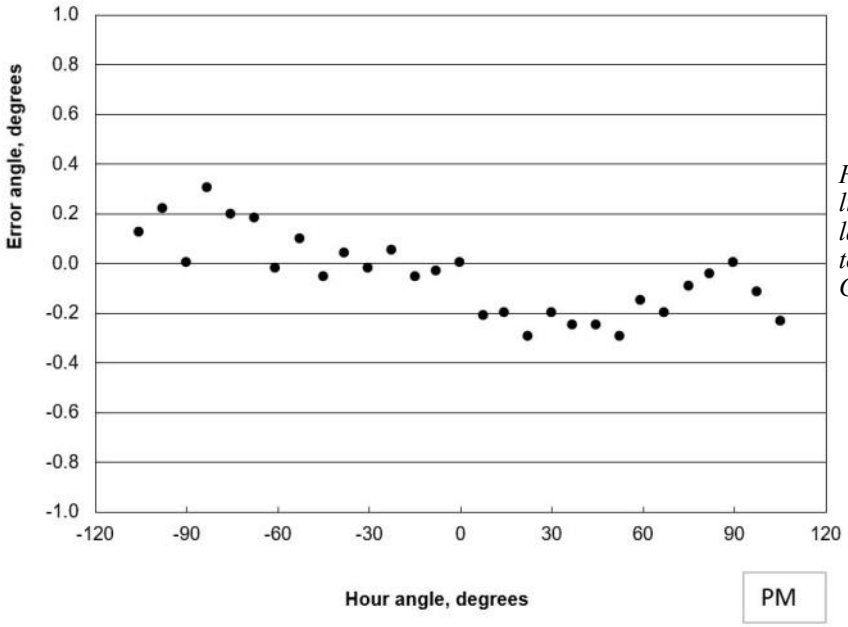


Fig. 5. Error angles for the hour and half-hour lines compared to the theoretical values for a latitude of 53.35° N, which gives the optimum fit to the measured ones.
Courtesy of John Davis.

good agreement. This is the latitude for Dublin so John concluded "I would have no hesitation in declaring the dial genuine."

I sank into my chair with relief on reading this. My Dad had been right! This was one special sundial, although perhaps not the oldest in Ireland! Nobody was going to let it slip away from the family (not even my wife, Marie, in her eternal quest for a clutter-free living environment).

Some Other Details of the Dial

On the half hours, on the chapter rings are little six pointed stars, a detail found in Henry Sutton's work.

By means of vernier callipers I took readings of the plate and gnomon thickness.

The gnomon is a couple of degrees off the vertical (Fig. 6). The actual angular offset is hard to measure as the plate is very slightly buckled and the thickness of the gnomon is less at its tip where it measures 2.7 mm compared with 3.1 mm at the base.

There is a slight variation in the plate thickness, particularly in the east–west direction. The thickness at each corner and the centre of each side is shown in Table 1.

Some of this variation may be due to the manufacturing process which involved hammering out sheets of brass by hand, but erosion and abrasion could also have played their part during the sundial's time on the bed of the River Liffey. It is not known how many years it spent here. The worst-case scenario would be 212 years if it went missing in its year of manufacture!

NW Corner	2.2	Mid N Edge	2.3	NE Corner	2.8
Mid W Edge	2.5			Mid E Edge	2.4
SW Corner	2.1	Mid S Edge	2.0	SE Corner	2.7

Table 1. The plate thickness (mm) at the corners and centre of the sides.

Fig. 6. Gnomon verticality.

Repair

At the northern end of the base of the gnomon two plates of 1.4 mm thickness, each 26 mm long and 9 mm high, have been added (Figs 7 and 8). This is because one of the three tenons which secure the gnomon to the base plate had fractured. It is hard to imagine how this occurred without causing further damage.

According to John Davis this repair is likely to have been effected by a clockmaker after the sundial was recovered since the plates are secured by two steel pins. Steel would have been used by clockmakers as corrosion would not be a concern because the workings of clocks were usually well oiled. The level of corrosion of the pins does not suggest that they spent any time underwater.

On the underside, the plates extend through the enlarged mortise and have been splayed outwards.

Fig. 7. Underside of dial showing two good tenons and one repaired.

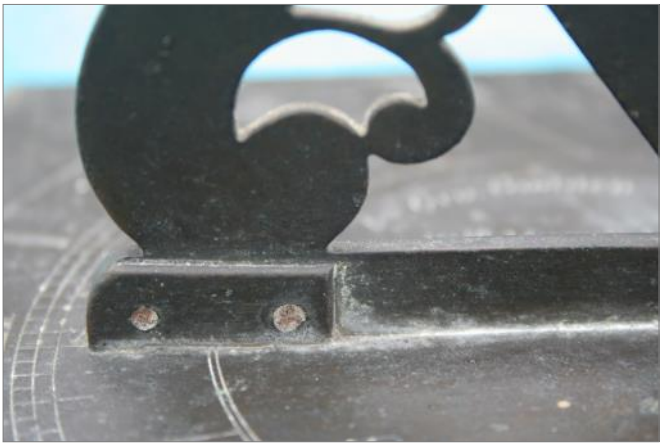


Fig. 8. Repair detail.

How Sutton Signed his Work

Henry Sutton often signed his work as "Henricus Sutton", "Henry Sutton" and "H: Sutton"[2,3,4] (and probably in other ways).

The small pocket quadrant held by the Whipple Museum appears to have been signed in a way and style very similar to the Liffey sundial with an "H" followed by a colon rather than by a full stop (Fig. 9).

- The style of script matches perfectly.
- In the year, the larger digit "6" and the distinctive digit 5 are a good match.

I have yet to see the words "behind the exchang" on another Sutton instrument but this is where his workshop was located in London, in Threadneedle Street. The misspelling is not significant as spelling rules had not settled down at that time and in fact, according to John Davis, spelling has been seen to vary on the makers' names.

Family Connection

The dial came into my family from the Angus family in Howth. John Angus, who was the Coxswain of the RNLI Lifeboat for over 35 years (Fig. 10), passed it on to my paternal grandfather and in turn it was passed to my father, who died 18 months ago. He gave it to me a few years back as I am the only one of his four children living in Dublin, at the latitude the dial was designed for.

I am still looking for a connection to George Godden who found the dial in the bed of the river Liffey in 1866 and I have established two links: John Angus's mother was Elizabeth Godden (b. 1839) and John's brother, George, appears (coincidentally?) to have married a Rebecca Alice Godden (b. 1880). Fig. 11 traces the family tree. It is therefore likely to be a brother or an uncle of Elizabeth Godden who found the dial. I have found a George Godden from Portsea who was born in 1795 and who was in the Navy, but I have been unable to find a tie with Ireland. There is also a George Godden from Dublin born around 1846 who would have been 20 years old when the dial was found. I have more following up to do here.

Original Owner of the Dial

As for the previous 212 years of the dial's life story – that is anybody's guess right now but here are some possibilities:

As Sutton was London-based, it is possible that the dial was commissioned by somebody (an English aristocrat?) who visited Dublin regularly.[7]

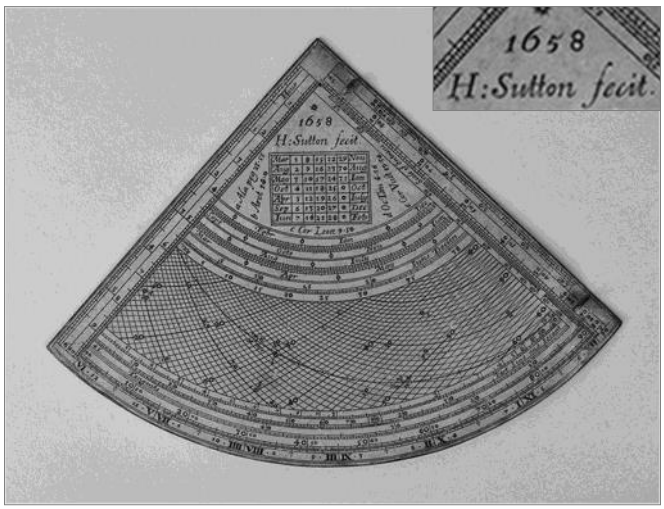


Fig. 9. The 'small pocket quadrant'. Courtesy of the Whipple Museum, Cambridge.[5]

Fig. 10. John Angus. Photo: RNLI Lifeboat magazine.[6]

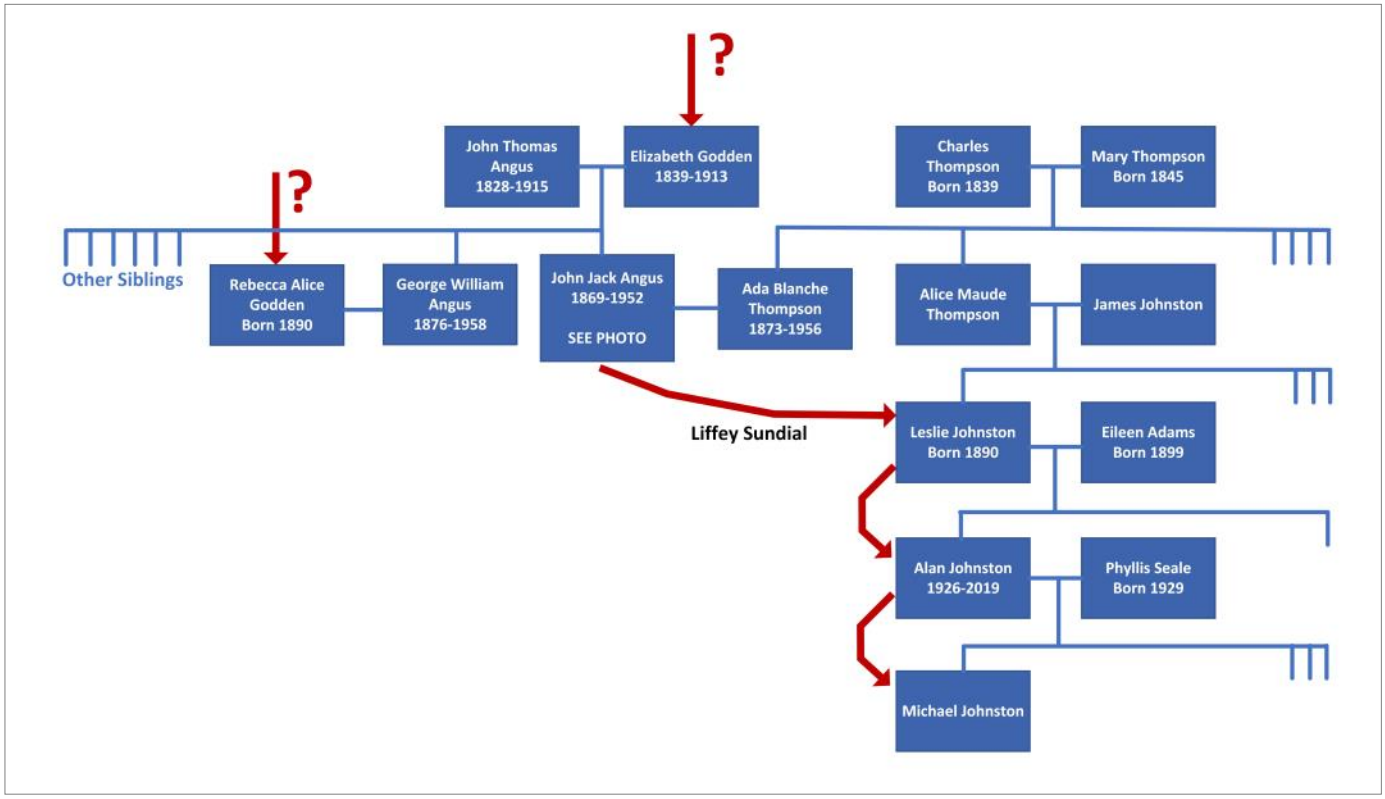


Fig. 11. Family tree showing inheritance path of the Liffey sundial.

Another suggestion[8] is that the dial could have been made for the 1655-56 Down Survey of Ireland conducted by English scientist Sir William Petty. This was the first British imperial survey of an entire conquered nation and the first survey of land on a national scale anywhere in the world. It set out to measure, using the latest surveying techniques and equipment, all the land confiscated from the Catholic Irish land owners which was then distributed to Cromwell's merchant adventurers and English soldiers.[9] Petty does not name the London suppliers of the mathematical instruments which he employed but some of his squared-paper original plottings which survived until the mid 19th century bore the date 1654 and the name H. Sutton.[10]

ACKNOWLEDGEMENTS

Many thanks to Michael J. Harley, John Davis and Sue Manston for all their time providing technical assistance and their great enthusiasm when authenticating the sundial. The excitement of the barrage of emails flying around was something else! Michael and I even discovered that our paths had nearly crossed in the past when we both worked in the same industrial estate in Derry, but not at the same time.

REFERENCES

1. John Davis: 'The restoration of a horizontal dial by Henry Sutton', *BSS Bulletin*, 29(i), 2-8 (March 2017).
2. Whipple Museum *https://www.whipplemuseum.cam.ac.uk/explore-whipple-collections/astronomy/incomparable-mr-sutton*
3. The Science Museum *https://collection.sciencemuseumgroup.org.uk/objects/co55538/magnetic-compass-and-sundial-by-henry-sutton-magnetic-compass-sundial*
4. The British Museum *https://www.britishmuseum.org/collection/term/BIOG47802*
5. J. Bennett: 'That Incomparable Instrument Maker': The Reputation of Henry Sutton. In J. Nall, L. Taub & F. Willmoth (Eds.), *The Whipple Museum of the History of Science: Objects and Investigations, to Celebrate the 75th Anniversary of R. S. Whipple's Gift to the University of Cambridge* (pp. 83-100). Cambridge: Cambridge University Press (2019). doi:10.1017/9781108633628.005 *https://www.cambridge.org/core/books/whipple-museum-of-the-history-of-science/that-incomparable-instrument-maker-the-reputation-of-henry-sutton/684FCD8C8D8DF94C96D95E5B33C3E824/core-reader*
6. *The Life-Boat: The Journal of the Royal National Life-boat Institution*, Vol. XXIX, no. 315 (September 1933).
7. John Davis: personal communication.
8. Michael J. Harley: personal communication.
9. Wikipedia on the Down Survey: *https://en.wikipedia.org/wiki/Down_Survey*
10. J.E. Burnett and A.D. Morrison-Low: *Vulgar and Mechanick: Scientific Instrument Trade in Ireland, 1650-1921*, National Museums of Scotland and Royal Dublin Society (1989), pp.12-13.

Michael Johnston lives in North County Dublin with his wife and daughter. He has spent most of his career implementing continuous improvement projects in manufacturing, and in the last eight years he has worked in IT. He is a year-round sea swimmer and enjoys cruiser sailing and club racing when Covid restrictions permit. He can be contacted at *michaeljorama@gmail.com*

IN THE FOOTSTEPS OF THOMAS ROSS
Part 35: The Modern Dials

DENNIS COWAN

In volume 5 of *The Castellated and Domestic Architecture of Scotland*[1] Thomas Ross devotes one whole section to the modern dials. They were modern to him, but to us of course they are now almost 200 years old.

He describes five sundials, but unfortunately these modern dials proved very difficult to find today and not all were successfully located. The first one that he mentions is at The Haining, a stately home near Selkirk in the Scottish Borders. The current house is a Palladian mansion built at the end of the 18th century and extensively re-modelled around 25 years later. In 2009 the house and grounds were bequeathed to the people of Selkirkshire and are now run by The Haining Charitable Trust.

Of the sundial Ross says:

"*This is a singular modern example* [Fig. 1]*, and may be well called a masonic dial, since it contains various symbols of the craft – an arch springing from Ionic columns enclosing the all-seeing eye within a wreath, the compass, square, and triangle, and various other figures. The dial is the work of a hewer who was employed at The Haining in 1817, the date on the dial. We are indebted for this example to Mr. Anderson, architect.*"

Unfortunately this sundial is now missing and the Trust have no knowledge of it. In *The Ancient Sundials of Scotland*,[2] Andrew Somerville, who describes it as a lectern sundial, states that the then owner remembered it and that it was destroyed, but with no explanation of how that happened. I can see why Somerville listed it as a lectern sundial due to its overall shape, but it is a somewhat simplified version.

The next item in Ross's list of modern sundials was at Amisfield Castle (Fig. 2) near Dumfries. Amisfield is a Scottish tower house dating from around 1600 and has been described as the finest tower house in southern Scotland. Ross says:

"*Mr. Roberton, Glasgow, has drawn our attention to a neat modern horizontal dial at Amisfield Castle. The plate contains the inscription "THIS DIAL BELONGS TO AND. COWAN* [no relation I presume]*, J. W. FECIT 1825", together with the motto "DAY GIVES PLACE TO NIGHT, LIFE SOON ENDS IN DEATH, AND TIME WILL BE SWALLOWED UP IN VAST ETERNITY." The dial tells the hours at various towns throughout the world.*"

A rather sombre motto. Ross did not provide a sketch of this sundial, and unfortunately the current owner, Jane Johnstone, advised me that there was no sundial at Amisfield. She also said that she receives many enquiries from researchers, but mine was her first regarding a sundial! It is a great pity that my enquiry did not bear fruit.

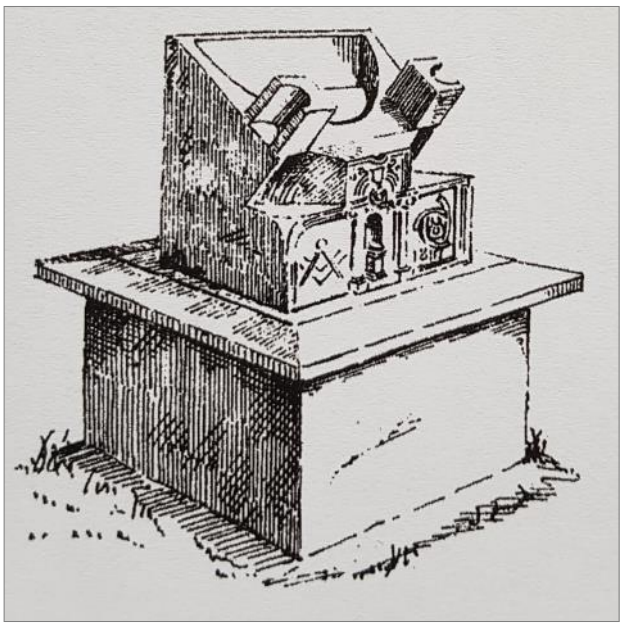


Fig. 1. Ross's sketch of the missing Haining sundial.

Fig. 2. Ross's sketch of Amisfield Castle.

Fig. 3. Ross's sketch of the Newhall sundial.

The following sundial at Newhall was described previously in this series of articles,[3] but for completeness in this section of modern sundials, I have included it again but with more of Ross's text this time, as follows:

"*This dial* [Fig. 3]*, which may be regarded as a monument to Allan Ramsay,*[4] *stands in front of the mansion-house of Newhall. Its appearance will be easily understood from the sketch. The following information regarding the dial was supplied by Mr. John J. Wilson, banker, Penicuik. There are eight panels on the square tapering shaft, on one of which there is the following inscription:–*

HERE ALEXANDER PENICUIK OF NEWHALL, M.D., IS SAID TO HAVE GIVEN ALLAN RAMSAY THE PLOT OF HIS CELEBRATED PASTORAL COMEDY OF THE "GENTLE SHEPHERD."

This explains the contents of the six remaining panels, which refer to the well-known play viz:
(1) a design consisting of a shepherd's crook and other pastoral implements;
(2) Habbie's Howe and Mause's cottage;
(3) the washing-green and Symon's house;
(4) the Craigy bield and Glaud's onstead;
(5) a ship enclosed in an oval margin;
(6) "HERE ALLAN RAMSAY RECITED TO HIS DISTINGUISHED AND LITERARY PATRONS, AS HE PROCEEDED WITH THEM, THE SCENES OF HIS UNEQUALLED PASTORAL COMEDY, AMID THE OBJECTS AND CHARACTERS INTRODUCED INTO IT."

The last panel contains the motto–

OBSERVE HOW FAST, TIME HURRIES PAST,
THEN USE EACH HOUR, WHILE IN YOUR POWER,
FOR COMES THE SUN, BUT TIME FLIES ON,
PROCEEDING EVER, RETURNING NEVER

R. B. 1810."

Newhall lies about four miles north-east of West Linton in the Scottish Borders and this elaborate multi-faceted sundial sits adjacent to the house. There is not a great deal of opportunity to see it as the grounds are currently open only very rarely under Scotland's Garden Scheme and in any case it is in a private part of the garden. It has eight

Fig. 4. The Newhall sundial today.

octagonal shaped dial faces on a tall slender square shaft (Fig. 4) and has eight cherub heads above the dials (Fig. 5). There is a very ornate finial but it is difficult to determine what it represents. The dial faces have a mixture of Arabic and Roman numerals and are in reasonable condition, albeit very heavily encrusted with lichen.

Fig. 5. Detail of the Newhall sundial showing the heavily lichen encrusted dials, cherub heads and ornate finial.

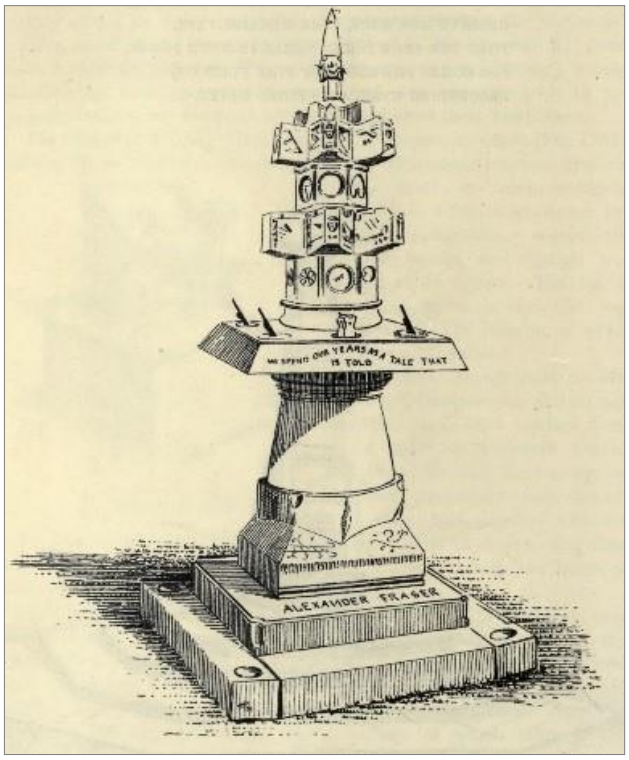


Fig. 6. Ross's sketch of the missing Bredisholm sundial.

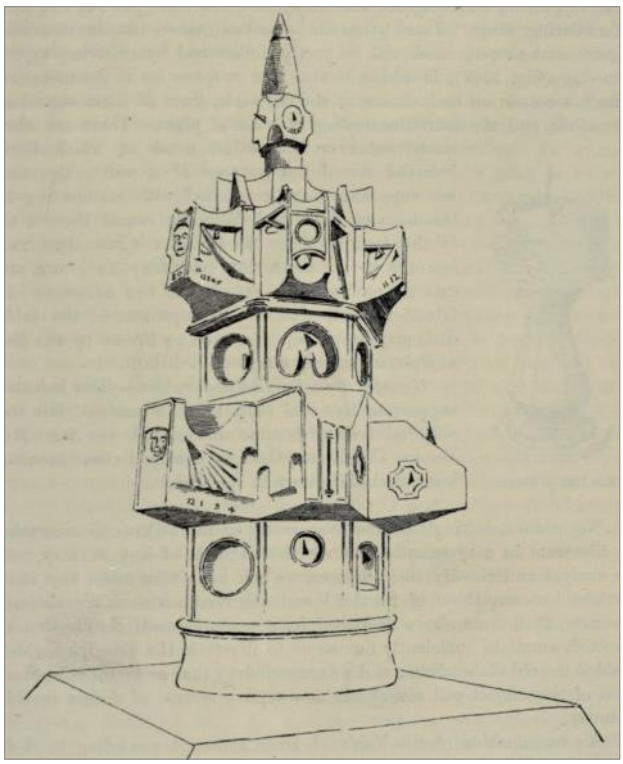


Fig. 7. Ross's sketch of the detail of the Bredisholm sundial where the thermometer can be seen just right of centre on the second level of dials from the bottom.

Next Ross takes us to Bredisholm in Glasgow and he tells us that:

"*In the gardens here there is a dial* [Fig. 6] *erected in 1840, not unworthy to be classed with the ancient examples. It is entirely the work, both in design and execution, of Alexander Fraser, a north country working mason. The Rev. Mr. M'Millan, Baillieston, having made diligent inquiry, has communicated the following notes, containing all that can now be gathered regarding Fraser. He rented an orchard adjoining Bredisholm House, and built a cottage for himself, where he lived quite alone. Having no knowledge of horticulture, the management of an orchard proved an unsuccessful undertaking. He devoted a considerable portion of his time to dial-making, and in one instance, for a very simple dial, he is known to have received £2. During his residence here, which lasted for a few years, he erected the above dial in his orchard. Removing to Shettlestone, he again built a house for himself, and embarked in the speculation of building a tenement adjoining Camlachie Parish Church, but evidently with little profit to himself. For many years he wrought most of the tombstones and sculpture work required in the locality, and was often seen, Mr. M'Millan says, by the people of Old Monkland passing their doors on his way to the churchyard – a modern "Old Mortality." Whatever his occupation for the time may have been, he appears always to have had a dial on hand. He died about 1870. When Fraser executed this dial, the art as it was understood in olden times may be said to have been extinct, only the commonest horizontal dials being occasionally set up. All the traditions which guided the men who erected the "obelisks," the "lecterns," or "facet-headed" dials were lost, so that we are not surprised to find that this dial is based on altogether different lines. It may be described as a massive horizontal dial supporting an octagonal column from which there jut out two tiers of radiating wings. These wings are carved and sliced into innumerable figures and shapes, which will be partly understood by referring to the drawing* [Fig. 7], *in which is also seen a space for a thermometer. There are dials on each corner of the flat table, three of them carved on the stone, and the fourth consisting of a metal plate. There are other contrivances on the table, some of which it is believed served the purpose of a rain-gauge, and are supposed to be connected with an opening in the base of the dial. Winding round these dials is the inscription IT IS A LIGHT THING FOR THE SHADOW TO GO DOWN TEN DEGREES; NAY, BUT LET THE SHADOW RETURN BACKWARDS TEN DEGREES. It is not unlikely that the arrangement of the table dials may have been suggested to Fraser by the dial at Polmaddie, only a few miles distant.*

Bredisholm House was a fine building thought to date from around 1710 but at some point it was sold, and by 1908 it was in use as a golf clubhouse. The golf club fell into financial difficulties at the end of the First World War and was eventually wound up in 1923. The house fell into disrepair and was demolished in 1980, and the M8 and M73 motorways now almost surround the site, of which nothing remains today. Like the main house, Fraser's cottage has not survived and unfortunately it is not known what became of his significant and unique sundial.

As Ross hinted at, the great days of monumental Scottish sundials were gone and by the 19th century had largely moved on to much simpler designs. This example was presumably an effort to return to the days of complex structures. As well as many dial faces in every available space, it even had a thermometer and possibly a rain gauge. All it needed was an anemometer and it would have been a Victorian version of a modern weather station. Has no one thought of that today? Are any of our current sundial makers willing to take on such a challenge?

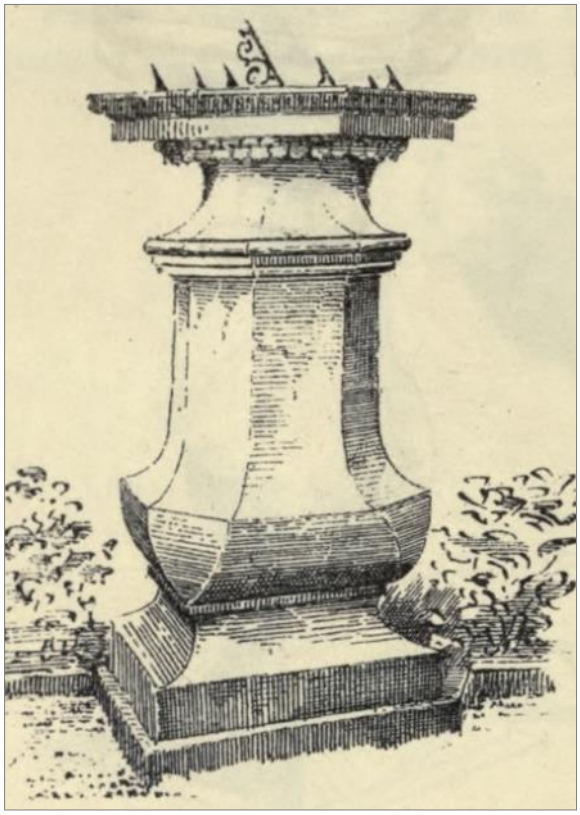


Fig. 8. Ross's sketch of the missing Polmadie sundial.

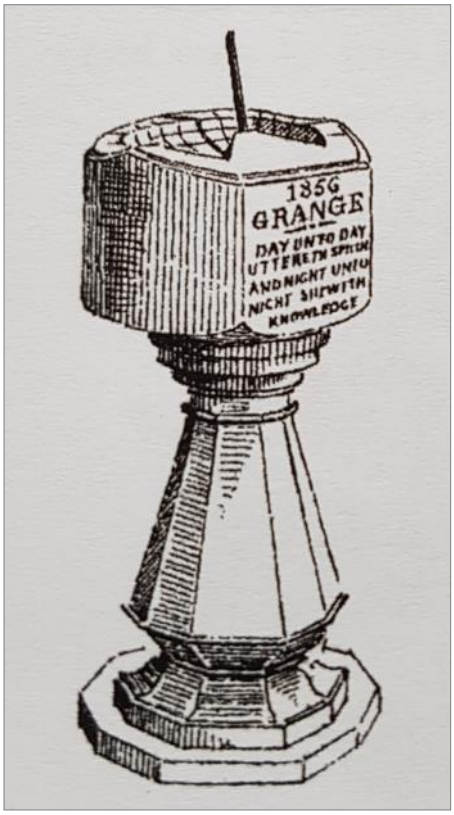


Fig. 9. Ross's sketch of the peculiar Grange sundial.

Ross likened the table of the above sundial to the one at Polmadie (today's spelling) in Glasgow and he had the following to say of it:

"*The following interesting account, accompanied by a photograph of this dial, from which* [Fig. 8] *was made, was kindly communicated by Mr. John Parker, accountant, Glasgow. The pillar and table are of freestone, and in the table a square cavity is cut, in which is inserted a square cube of hard slate on which nine dials are cut. The centre one is for Glasgow alone. Smaller dials at the four corners show the hours at different places, corresponding to the hour at Glasgow. Thus, when the shadow indicates noon at Glasgow, the stile on the upper left-hand circle gives an hour in the morning at Boston or Charlestown, not the same in each, but both morning, while that on the upper right-hand corner gives an evening hour at Alexandria or the Cape of Good Hope. Between these corner dials at each side there are three smaller dials recording the time at only one place each.*"

This description and sketch sounds and looks very much like the many sundials made by Richard Melville, an Irishman working out of Glasgow during the 1830s and 1840s, so it could well be one of his. However, another maker, Samuel Higginbotham, although not nearly so prolific, was also working from Glasgow around this time and making similar sundials.

Although not included within this modern section, given its likely date, perhaps this example from Polmadie should have been. Unfortunately this sundial too has disappeared as I can find no reference anywhere to any sundial at Polmadie today.

Finally, Ross refers to the last sundial in his modern dial section by saying:

"*The baluster supporting this dial* [Fig. 9] *is ancient, but the old dial having become dilapidated, the late Mr. Henry Cadell of Grange designed the peculiar horizontal dial shown in the sketch.*"

The Grange referred to was in Bo'ness in what was then the old county of Linlithgowshire, but finding it gave me some trouble. My initial research found that the house known as Grange was demolished in 1906 so I figured that the sundial had long gone and was now lost to me. I put it to one side but when I returned to my research several years later, I found that there was not one, but two houses called Grange in or near Bo'ness! The first one that I looked at

Fig. 10. The Grange today.

Fig. 11. The Grange cube sundial standing on its square tapering column.

Fig. 12. The south face of the Grange cube with the heads apparently intact.

turned out to be a Victorian house in Bo'ness that was now a nursing home. Before I looked into that one any further, I found that the second one called Grange was built in 1907, just a few miles from the Grange that had been demolished! When I found that the family living at this Grange today (Fig. 10) was called Cadell, the same name as the sundial's designer, I felt sure that this had to be the one, and hoped that the sundial had been moved to this new location back in 1907. It was still a long shot, though, as this was well over a hundred years ago.

When I made contact with the owner, Johnny Cadell, he told me that they indeed had not one but two sundials. He was more than happy for me to see them and when I arrived at the Grange few days later, I immediately saw the first sundial.

It was not the one I was looking for! It was, however, a fine cube sundial dating from 1692 sitting on top of a high stone square tapering column (Fig. 11) with dials on the south, east and west faces and with a blank north face. Gnomons, probably replacements, survive on the south and east faces, but the one on the west face is missing. This sundial was in reasonable condition considering its age, but the finial with its four heads was badly damaged with only two and a half of its four heads surviving (Figs 12 and 13), as well as a missing top to the finial.

The whole stone cap, including the finial, sitting on top of the cube looks to be a different stone from the dial cube, with an oval pattern on the west and north sides only (Fig. 14). This suggests that it may once have been the top section of a cube with dials on the SW and SE faces, a

Fig. 13. The east face of the Grange cube with the heads not looking so good.

common configuration in Scotland, and refitted to this dial at some point.

As I moved away from this sundial and headed down the garden, I suddenly came upon another sundial in a small clearing. I knew straight away that this was the sundial that I had come to see (Fig. 15).

Fig. 14. The south and west faces of the Grange cube showing the oval pattern above the west face.

As I got closer, I could see that Ross was correct: this sundial certainly is peculiar – I have never seen another one like it. There is a part globe holding the gnomon and a bowl with a narrow horizontal rim. Ross called it a horizontal sundial, but surely it cannot be classed as such as that term is used where the plane receiving the shadow is horizontal, and in this case most of the shadow is within the bowl. But what is it?

I could see that the sundial was heavily encrusted with lichen, but with permission of the owner, great great grandson of Henry Cadell the designer, I returned two weeks later to give it a bit of a gentle surface clean (Figs 16 and 17) when much of the detail became clearer.

Fig. 15. The Grange sundial today.

Figs 16 and 17. Detail of the Grange sundial before and after gentle cleaning.

So what did it reveal? The sundial is 880 mm high with a diameter of 350 mm. The gnomon is at 56 degrees, which is correct for the location, and has a length of 110 mm. Its width is 8 mm whilst the noon gap is only 6 mm. The rim around the bowl is 34 mm wide and the bowl itself has a drainage hole. The Arabic hour numerals, which are on the rim, run from 4 am to 8 pm with a quarter hour timescale (Fig. 18). The three long arcs on the bowl define the equinoxes and solstices with the horizontal rim defining the cutoffs at sunrise and sunset (Fig. 19). There are no other markings that I could see, apart from the motto on the shaft which reads “Day unto day uttereth speech, and night unto night showeth knowledge” and also the date 1856 and “Grange” (Fig. 20).

The gnomon, which does not have a nodus, sits on the globe, but the globe itself seems to serve no specific purpose. It is quite probable that the gnomon is not original. This is borne out by the difference in width between the gnomon and noon gap. Also the original gnomon would have had a nodus; otherwise there was no reason for the declination lines.

But is it a globe dial or a scaphe dial, or could it be an equatorial dial, which would be extremely unusual for one made of stone? There are some similarities to the Graeco-

Fig. 18. Detail of some of the Arabic numerals and time-scale on the Grange sundial highlighted with soapy water.

Fig. 19. Detail of the declination lines and noon gap on the Grange sundial.

Roman hemicycliums, but then they would not have polar pointing gnomons. Indeed, is it a combination of several types? On balance I think that it is probably an equatorial dial but with a globe for aesthetics. If you have any other ideas, I would be delighted to hear from you.

So who was Henry Cadell the designer of this peculiar and unique sundial? He was born in 1812 and died in 1888. He was a geologist, befitting his occupation and ownership of coal and shale oil mines, and was involved in the iron industry. He seemed to have an inventive and mechanical mind and was at one time President of the Royal Scottish Society of Arts and Vice-President of the Edinburgh Geological Society. As far as I am aware, this was the only sundial that he designed and, I have to say, it is a really fine example. If you are going to design only one sundial, make it truly unique!

ACKNOWLEDGEMENTS

I am grateful to John Davis for his thoughts and words on the Grange sundial and to Johnny Cadell for allowing me to visit to see his unique sundial.

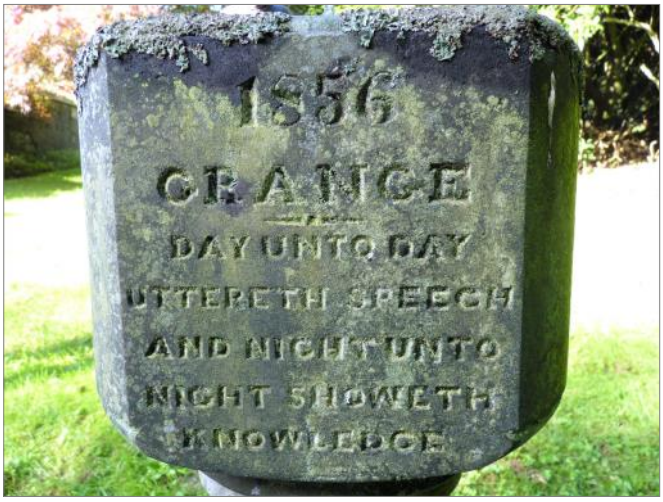


Fig. 20. The motto on the Grange sundial.

REFERENCES

1. D. MacGibbon and T. Ross: *The Castellated and Domestic Architecture of Scotland - Volume 5,* David Douglas, Edinburgh (1892).
2. Andrew R. Somerville: *The Ancient Sundials of Scotland*, Rogers Turner Books (1994).
3. D. Cowan: 'The Sundials of James Gifford', *BSS Bulletin*, 24(iv), 6-9 (December 2012).
4. *https://en.wikipedia.org/wiki/Allan_Ramsay_(poet)*

dennis.cowan@btinternet.com

An Embroidered Quadrant

The *Bulletin* has previously published pictures of sundial cakes and even chocolate sundials but this is the first time we have had an embroidered quadrant. It was made as a lockdown project by Iona Isaac for her eight-month old daughter Elowen – the beads on the plumb-bob are teething-proof. The design is for an equal-hour quadrant based on the instruments associated with Richard II in the British Museum and it is delineated for Cambridge.

JD

ART DECO, ART NOUVEAU OR ANTIQUE?

SUE MANSTON

In February this year, the BSS Help and Advice Service was contacted by Jo Elsworth. Her husband had purchased a sundial in a 'job lot' and they were both very intrigued by it. Nothing is known about the history of the dial and Jo wanted to know if we could tell her anything about it.

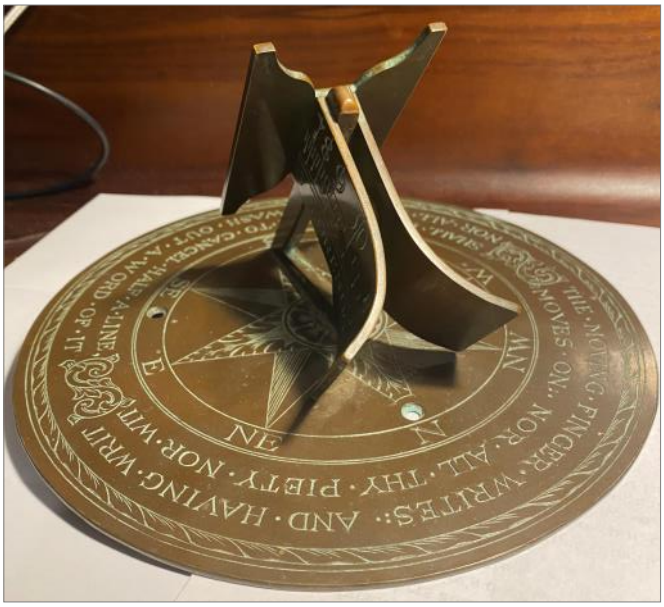


Fig. 2. View of the dial from the North. Photo: Jo Elsworth.

The dial, shown in Figs 1 and 2, comprises a circular plate, 8 inches in diameter, and a standard gnomon with an unusual arrangement of two separate dials attached. The dial plates are essentially direct West (Fig. 3) and direct East (Fig. 4) dials, but with a curve at the end so that the noon shadow does not disappear off to infinity. The small square panel forms two gnomons, one for the West Dial and one for the East dial. It carries the motto "HORA FUGIT" – "the hour (time) flies". The two dial plates and the square panel are attached to the main gnomon which forms an angle of approximately 51 degrees to the circular plate. The whole assembly is about 4 inches high.

The motto on the circular plate is from Edward FitzGerald's translation of the Rubáiyát of Omar Khayyám.

> THE MOVING FINGER WRITES; AND HAVING WRIT,
> MOVES ON: NOR ALL THY PIETY NOR WIT
> SHALL LURE IT BACK TO CANCEL HALF A LINE,
> NOR ALL THY TEARS WASH OUT A WORD OF IT.

Fig. 5 shows the fixing for the main gnomon underneath the base; there appears to be a pin missing. To the North is

Fig. 1. View of the dial from the West. Photo: Jo Elsworth.

a stamped impression from a steel punch (Fig. 6). It appears to be a letter 'S' or possibly a double 'S', with the head of a deer and a staff running diagonally across the 'S' with a pennant at the top right. Such stamps have been seen on the backplates of clocks where they are believed to be foundry marks from whoever supplied the brass. They usually appear in fairly random locations but in this case its position directly North of the gnomon tenon probably indicates the correct orientation for the gnomon, though why it is such an ornate design rather than a simple mark is unexplained.

Fig. 3. West-facing dial plate. Photo: Jo Elsworth.

Fig. 4. East-facing dial plate. Photo: Jo Elsworth.

Fig. 5. The gnomon fixing. Photo: Jo Elsworth.

Fig. 6. The stamped 'S' – a possible foundry mark. Photo: Jo Elsworth.

Making a hardened steel punch is a very skilled and time-consuming task so they were often used for long periods instead of being replaced when worn.

The dial is patinated brass with Arabic numerals; it looks well-made and is very unusual. It is most likely a one-off, made to order, possibly commissioned by the person who designed it. No signature or date could be found on the dial, but it seems to be very reminiscent of Francis Barker's cross dials (SRN 3925 and SRN 7966).

I decided to have a look through the catalogues[1] of Francis Barker & Son – not because I expected such a novel dial to appear in the catalogues, but more in the hope of finding some similarities.

The 'Antique' Dial

Fig. 7 shows a dial from Barker's 1907 catalogue called the 'Antique' dial. The 8 inch version cost £1 12s 0d and a motto was extra. The numerals on this dial appear very similar to those on Jo's dial. In particular, compare the digits '1' and '4'. The motto "HORA FUGIT" is very common and is No. 10 in Barker's list of mottoes.[2]

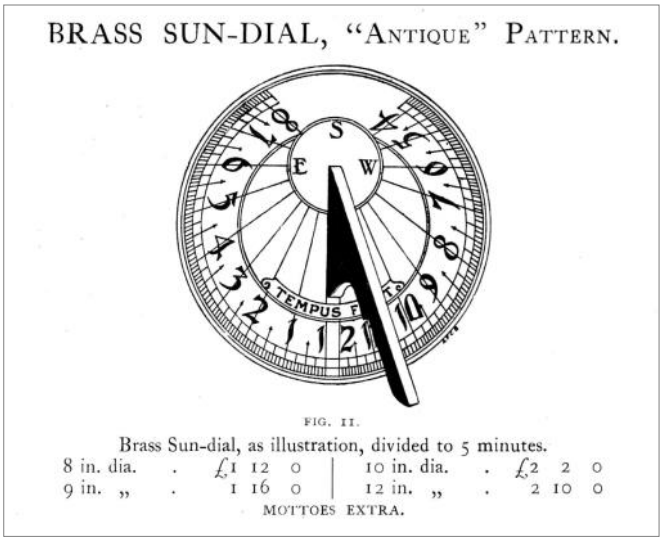

BRASS SUN-DIAL, "ANTIQUE" PATTERN.

FIG. 11.

Brass Sun-dial, as illustration, divided to 5 minutes.

8 in. dia.	£1 12 0		10 in. dia.	£2 2 0
9 in. „	1 16 0		12 in. „	2 10 0

MOTTOES EXTRA.

Fig. 7. The 'Antique' dial from Francis Barker's 1907 catalogue.

This is not conclusive, of course, but it seems quite possible that Jo's dial was made by Francis Barker & Son. They were known to make one-off commissions and often did not sign their dials.

Other 'Antique' Dials

Having found the 'Antique' dial in Barker's 1907–1928 catalogues, it occurred to me that there were similar dials

Fig. 8. SRN 0512. Photo: John Foad.

Fig. 9. SRN 0037. Photo: Robert Sylvester.

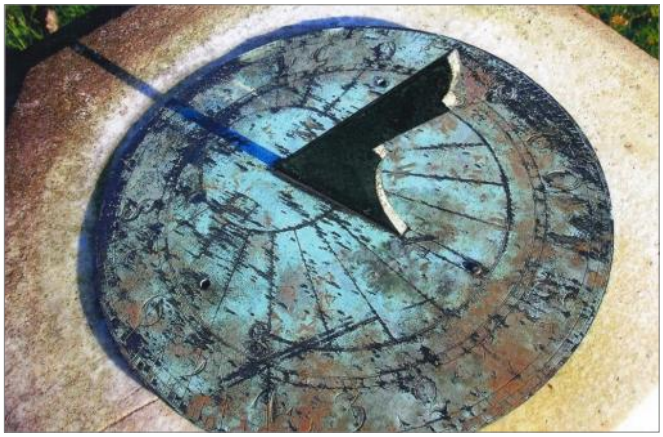


Fig. 10. SRN 7812. Photo: Frank Coe.

Fig. 11. SRN 3608. Photo: Michael J. Harley.

in the BSS Register of Fixed Dials. Two of these dials, SRN 0512 (Fig. 8) and SRN 0037 (Fig. 9) are already attributed to Francis Barker & Son. There are two further dials, SRN 7812 (Fig. 10) and SRN 3608 (Fig. 11), that are not attributed to any maker, but are probable examples of the 'Antique' dial. Similarities include the design of the compass points (N, E, S and W), the hour subdivisions and the arrowed, short half-hour lines. There are different gnomons and slight differences in some of the numerals.

The gnomon on SRN 3608 is inscribed with "Lande & Co." but it is possible they were the retailer of the dial rather than the manufacturer. Barker's business was primarily wholesale and the vast majority of his items were sold unsigned to retailers who then applied their own signatures and sold the items as their own.[1] The motto was probably added by the retailer; it appears to be rather squashed in.

> Serene I stand amongst the flowers
> And only count life's sunny hours
> For me dark days do not exist
> I am a brazen-faced old optimist

Another 'Antique' dial, owned by BSS member Keith Salvesen and sadly missing its gnomon, is shown in Fig. 12. The inscription (Fig. 13) is "Liberty & Co. Ltd" and "London" – another example of a Barker dial being sold by a retailer. Fig. 14 shows the unusual pedestal.

Fig. 12. The Liberty dial. Photo: Keith Salvesen.

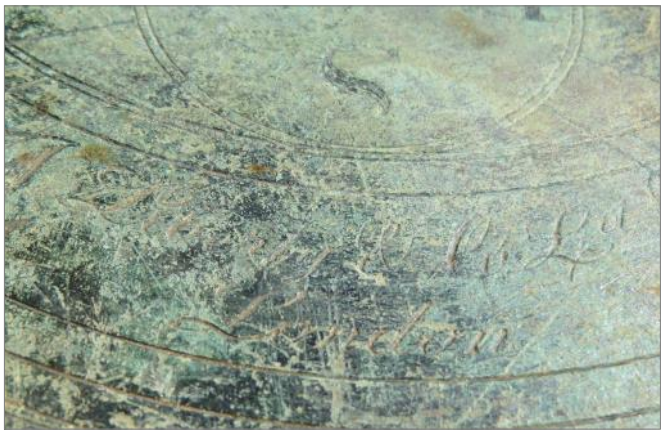


Fig. 13. Liberty & Co. Ltd signature.
Photo: Keith Salvesen.

Fig. 14. The Liberty pedestal. Photo: Keith Salvesen.

Fig. 15. The motto. Photos: Keith Salvesen.

Fig. 16. The 'Classical elements'. Photos: Keith Salvesen.

There is a motto carved around the top (Fig. 15):

I MARK THE PASSING HOUR
AS THE SHADOWS COME AND GO

Each of the four sides carries a picture representing one of the four 'Classical elements' (Fig. 16):

- Birds (AIR signs Gemini, Libra, Aquarius)
- A Sun with rays (FIRE signs Aries, Leo, Sagittarius)
- A sailing ship (WATER signs Cancer, Scorpio, Pisces)
- Leaves and berries (EARTH signs Taurus, Virgo, Capricorn)

Another dial and pedestal, which appears identical to Keith's, was sold by Hill House Antiques (no date or sale price given). It is listed on their website[3] as being c.1900 and illustrated in Liberty's original Garden Pottery catalogue. The pedestal is described as 39½ inches high with a top of 8½ inches, suggesting the dial was the 8 inch version.

Conclusion

Jo is very pleased with the details we have given her and she is planning to set up the dial in her garden which, luckily, is at a latitude of 51.5° N. Her dial is possibly a one-off made by Francis Barker & Son. And three additional dials have been identified as almost certainly Barker 'Antique' dials.

In the Register, SRN 7812 is described as Art Deco in style; certainly, it looks very 'clean' – there are no scrolls, leaves or other ornate decorations. However, the numerals on all these dials have sinuous curves which are more in keeping with the Art Nouveau movement than the geometric style of Art Deco. Art Nouveau was inspired by natural forms, dynamism and movement – like the birds, leaves and berries on the Liberty pedestal – and Liberty was renowned for promoting Art Nouveau designs. Perhaps these dials are a mix of the two styles; both were contemporary with Barker's 1907 catalogue. It is a puzzle why the dial was called 'Antique' when the design looks absolutely up-to-date for the beginning of the 20th century.

ACKNOWLEDGEMENTS

Grateful thanks to Jo Elsworth, Keith Salvesen, John Davis and John Foad.

REFERENCES

1. P. Crespel: *Trade Mark London: the story of Francis Barker and Son, compass and scientific instrument makers*, available for download from *https://www.trademarklondon.com*
2. S. Manston: The 'Large Acres' Sundial, *BSS Bulletin*, 33(i), 31-35 (March 2021).
3. *https://www.hillhouse-antiques.co.uk/en-GB/garden-antiques/liberty-co-four-seasons-motto-sundial/prod_10912#.YENHfy2l1JU*

suemanston@outlook.com

BSS SUNDIAL AWARDS 2016–20

The Society's sixth award scheme for excellent sundials covered the period 2016 to 2020. The primary goal of the scheme is to promote the making of accurate and elegantly designed sundials, and well executed restorations. The 19 entries, described in outline below, all satisfied the criteria and a certificate will be awarded for each. There were 17 new sundials, one replacement sundial and one restoration.

There was again a wide geographical spread, the most distant being a very impressive new sundial in Malaysia. Photographs and full descriptions of all the submissions, as supplied by the submitters, were put on the Society's website and comments invited. Brief summaries are given below, but full descriptions can still be inspected on the BSS website at *https://sundialsoc.org.uk/news/2016-2020-award-scheme-summary-entries/*

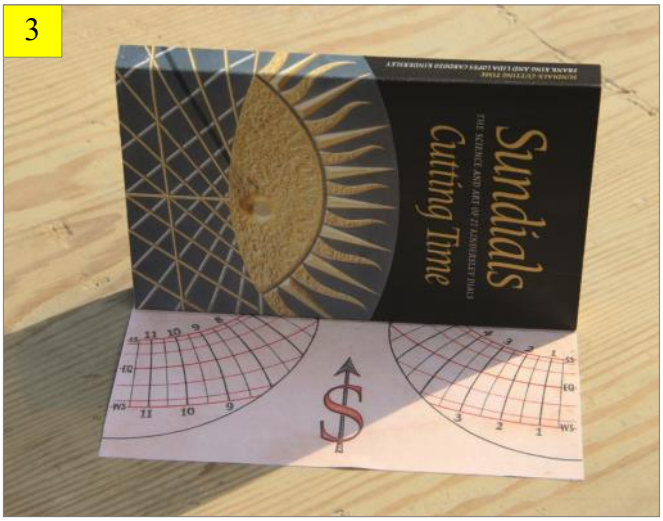
On behalf of the Society the Trustees sincerely thank Doug Bateman for all his administrative input.

1. David Brown: Re-birth of a Large Polyhedral Sundial[1]

This was a monumental restoration project. Before David got his hands on this massive block of sandstone it was in a very sorry state, badly eroded and covered in growth. It was clear that there were originally 25 separate dials and all 25 had missing gnomons. After restoration, all 25 sundials were in full working order and the stone appears almost as good as new. This must rank as one of the most ambitions sundial restorations in recent years.

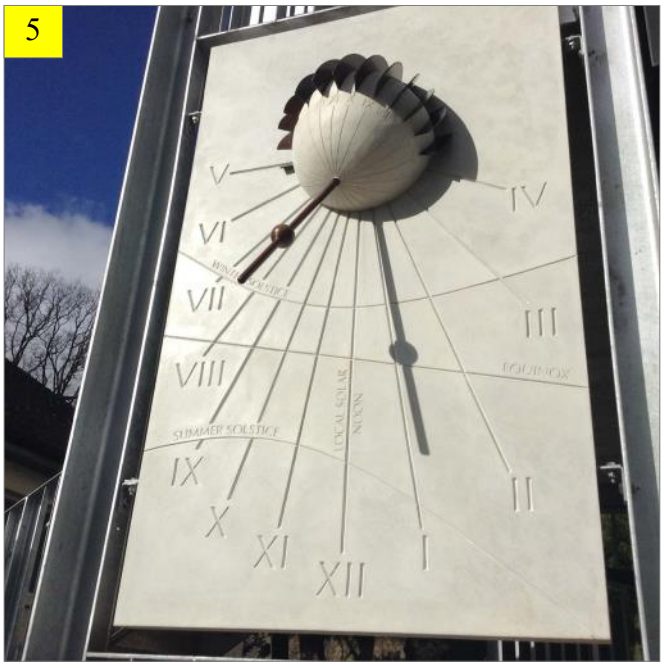
2. The Cardozo Kindersley Workshop, Cambridge: Islamic-Inspired Horizontal Sundial in Jeddah[2]

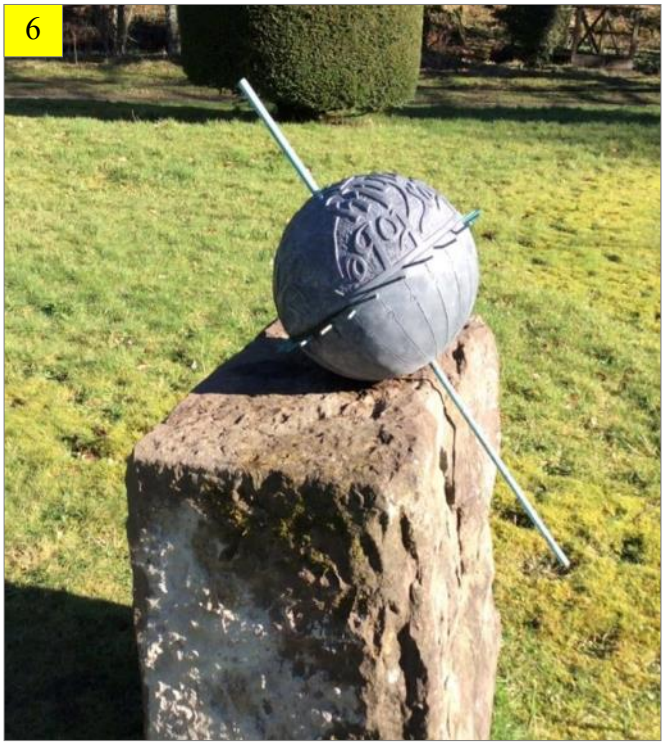
The ornamentation on the circular Carrara marble dial plate reflects Islamic art, and the design of the gnomon support is as seen on ancient Islamic sundials. The Ω shape symbolises a Mihrab and the arrow indicates the direction of the Kaaba in Mecca. The central region shows Babylonian hours from 1 h to 12 h and Italian hours from 12 h to 23 h. The gnomon and its support are gold plated.



3. The Cardozo Kindersley Workshop, Cambridge: Portable Stereographic Sundial on the End-Flap of a Book[3]

The specification was for a working sundial that could be printed on the end flap of a book. When the book is stood upright so that the front cover is vertical and its long outer edge stands on the end flap, the front cover serves as a very fat gnomon; its two short edges serve as separate vertical





styles. The dial plate is printed on the end flap and the entire design can be said to be confined within the noon gap.

4. The Cardozo Kindersley Workshop, Cambridge: Horizontal Garden Sundial in Rutland[4]

This is a fairly straightforward horizontal sundial with a circular slate dial plate. There is an elegant sunburst round the root of the gnomon, and an inscription which consists of someone's initials and the date 2019 in Roman numerals. The year 2019 marked the 40th birthday of the owner of the initials. The gnomon is gold-plated brass but the reflections in its near face give the illusion of the gnomon being transparent.

5. Tim Chalk: Dollar Academy Sundial

This sundial was commissioned by Dollar Academy in Central Scotland to form part of the construction of a new Language building. The dial is intended to be used as a teaching aid to demonstrate the science and mathematics that lie at its heart. The sphere is marked with meridian lines corresponding to the hours, and there are steel fins which cast shadows onto the sphere. At a given hour the shadow of the associated fin has minimum width. The rod forming the sphere's axis serves as the gnomon of the vertical dial plate. The sphere and fins continue on the reverse side, which carries an Equation of Time graph and the geographical coordinates of the location.

6. Tim Chalk: Gleneagles House Sundial

The commissioning of this sundial put right a long-standing omission. Elaborate and complicated sundials have been a particular feature of large Scottish country houses for several centuries and this significant historic house was in want of one. The clients asked for a sundial that would be supported by an existing stone plinth. The sphere in this design has radial rods which cast shadows onto the sphere. At a given hour the shadow of the associated rod has minimum length. A quite separate long rod forms the sphere's axis and the lower end of this rod serves as the gnomon of a vertical dial marked out on the rough surface of the plinth. The shadow follows the undulations on the surface and from most viewpoints appears far from straight. To accentuate this characteristic, the numerals on the face are placed in an apparently random way, though they are actually positioned to register as accurate a reading as possible on the stone. This idea is developed with a John Maynard Keynes quotation on the sphere; "It is better to be roughly right than precisely wrong".

7. Tim Chalk: "A Year in the Life of the Manx Shearwater" Sculptural Sundial

This sundial was commissioned by Scottish Natural Heritage to be sited on the Isle of Rum; it is on a footpath leading to an important Manx Shearwater colony. The intention is to provide interpretive information about the

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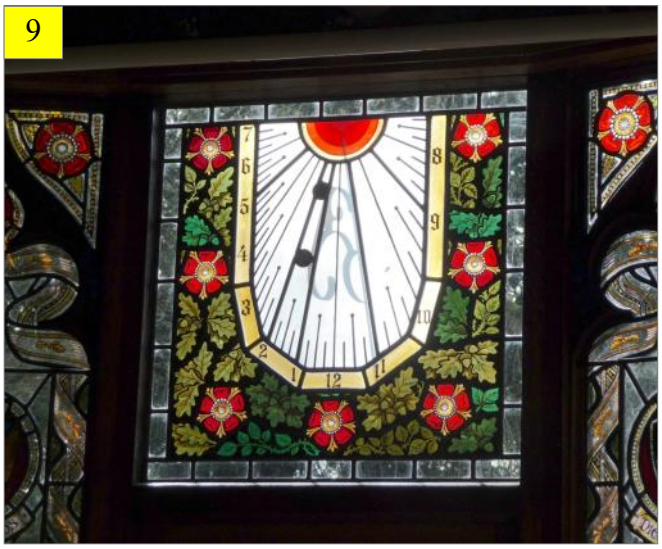
Shearwaters in an interesting and imaginative way and thereby encourage visitors to make the final ascent to the colony itself. The challenge was to design a feature that sensitively blends with the surroundings while also creating enough impact to capture the imagination. When the sun shines, the shadow of the beak of the cast iron Manx Shearwater identifies a spot on the horizontal plate from where one can read information about the bird; in the winter-to-summer half of the year one reads text on the west side and in the summer-to-winter half of the year one reads text on the east side.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8. Tim Chalk: Crieff Hydro Sundial

This sundial was commissioned to sit in a prominent position outside the hotel main entrance to commemorate the 150th anniversary of the hotel as a temperance and hydropathic spa in 1868. The brief was for a sculptural and striking sundial that was recognisably a sundial. The design develops the theme of water and woodland, inspired by the hotel's setting and its history as a hydropathic spa. The dial table features the hotel motto, a quote from the Greek poet Pindar, in English and Greek, and the plinth is decorated with leaf and water motifs in bas relief. The dial itself is a combination of horizontal and equatorial dial. This is a form Tim developed a few years ago, where the centre of the equatorial disc is glazed with etched glass to enable the viewer in the winter months to read the horizontal dial. This form is especially suited to northern latitudes where the underside of an equatorial dial is difficult to read.

9. The Didsbury Parsonage Trust: Replacement Stained Glass Sundial in Didsbury, Manchester[5]

The original stained glass sundial in the Library of the Old Parsonage was designed by the then owner of the Parsonage, Alderman Fletcher Moss. This sundial went missing before the Second World War but by using extensive archive evidence John Carmichael constructed full-size working drawings printed on acrylic. He incorporated his own design of demountable gnomon which is held in place by two magnets. Any accidental knock results in the gnomon falling harmlessly to the ground without damaging the glass. It can be replaced in a matter of seconds. Unlike the original which had white painted glass between the hour lines, the replacement has clear glass that was frosted (sandblasted) on one side. This creates the darkest optimum shadows. Stained glass sundials usually incorporate a fly but, in this case, a worker bee has been included as the symbol of Manchester. The project was overseen by the Didsbury Parsonage Trust.

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10. David Hawker: Ruby Wedding Vertical Sundial in Sutton, Surrey

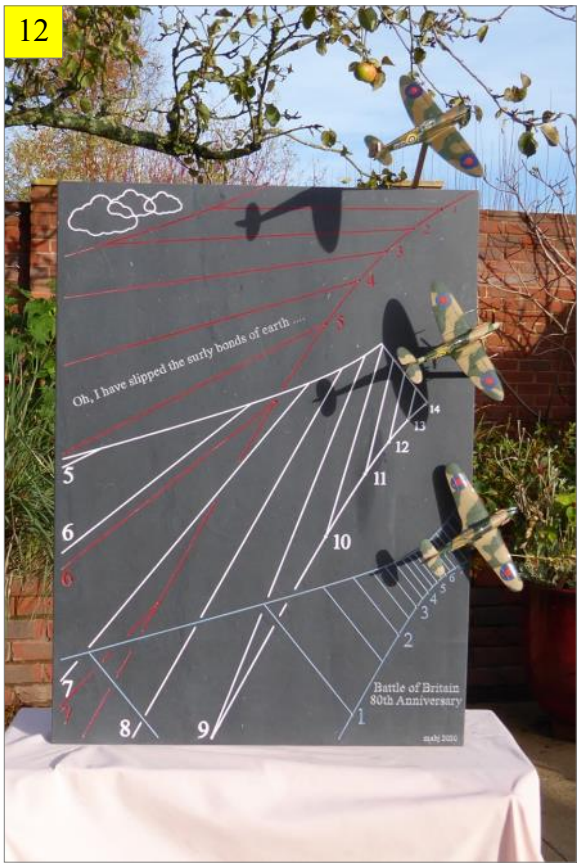
This sundial was made in early 2020 to celebrate a Ruby Wedding for April 2020. It is designed to be mounted on the south facing wall of a house in Sutton, Surrey. The photograph shows the dial prior to installation.

The dial is made from Welsh blue/black slate and is 380 mm high × 254 mm wide × 20 mm thick. Dial furniture includes the names at the top of the dial, "40 Yrs" carved at the bottom of the dial, and a carved date curve for 5 April, the anniversary date. A carved daffodil indicates a springtime anniversary.

The gnomon uses a 5 mm brass rod with a nodus made from an 8 mm rod drilled and soldered to the gnomon. The gnomon is soldered to a brass supporting plate with a tang that is inserted through a slot cut into the slate. The back of the slate is recessed and two brass pins are set through the holes in the tang before being fixed and sealed with two pack epoxy.

11. Inscriptorum of Sundborn, Sweden: Vertical Sundial in South Cambridgeshire[6]

This dial commemorates the silver wedding of the clients. The inscription gives the date of their wedding with their initials on either side. A cockerel stands on the sunrise end of a broken horizon line and an owl stands on the sunset



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end. There is no gnomon, just a ball nodus with a simple nodus support. The nodus and its support are made of brass and gold plated. The material used for the dial plate is Trespa®, a cladding material which is formed from some very durable resin sandwiched between two coloured surface layers. The design life of this material is quoted as 200 years. The design was prepared using Adobe Illustrator and this design was reproduced on a mask. Then, using the mask, the surface of the outer layer was selectively abraded and the design reappeared as exposed resin. The abraded areas were then gilded to complete the fabrication.

12. Martin Jenkins: Battle of Britain 80th Anniversary Sundial

Because of his interest in flying and 2020 being the 80th anniversary of the Battle of Britain, Martin decided to design and make a west facing dial to commemorate the event. The dial is slate, 600 mm × 480 mm × 20 mm thickness. The knowing of time is a very important aspect in flight whether for navigation, fuel management, or coordination between air traffic.

Martin decided that the dial should indicate, from top to bottom, Italian hours (in the mode of hours remaining to sunset and thus flight time remaining for visual flight), Babylonian hours (hours passed since sunrise and first take-off if flying visual), and solar time (the actual time if flying on GMT). The time lines of Italian, Babylonian and solar are painted in red, white and blue respectively, indicative of the RAF. The 'times' are indicated by the shadow cast by the starboard tip of each aeroplane's tailplane.

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The top aeroplane is a Mk1 Spitfire, the middle one is a Mk5 Spitfire, and the bottom aircraft is a Hurricane. Each aeroplane is at a different height perpendicular to the dial plate, to simulate a flight formation just after take-off. The dial is also engraved with the first line of the famous poem 'High Flight' by John Gillespie Magee, a 19 year old Spitfire pilot killed in 1941.

13. Martin Jenkins: Janet's Dial

This dial is a slate ellipse of major axis 600 mm, minor axis 470 mm, thickness 20 mm. It is west facing and indicates the hours remaining for gardening. The furniture consists of a gold-leafed sun, gold-leafed flowers, and gold-leafed bees. The phrase below the flowers states: "Heaven is the sun, flowers, and the buzzing of bees".

The idea behind this dial was to act as a reminder to a very keen gardener just how much time was left before it was time to 'quit', otherwise insufficient time was allocated for clearing-up, putting tools away, and generally completing all gardening tasks before sunset.

The dial is mounted high up on a cast iron decorative post in a prominent position in a boundary flower border. There is thus no excuse for not seeing it!

The dial was engraved, and the bees and flowers carved, using a numerically-controlled machine tool.

14. Martin Jenkins: Rotating Polar Mean Time Dial

The dial plate is slate 500 mm × 240 mm × 20 mm thickness. The supporting frame and rotating mechanism are constructed from brass and stainless steel. From experience these three materials are the most durable in the British climate!

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In order to indicate mean time on a polar dial, it is usual to have either analemmas superimposed on each time line or to incorporate a separate Equation of Time chart. Neither of these approaches appeals; the former leads to a lot of ambiguous clutter on the dial and the latter is difficult to incorporate tidily into a polar dial design.

In order to remove the ambiguity of reading an analemma at each hour line, both sides of the slate are used and thereby separate the analemma curve into two separate periods. This of course necessitated a precise mechanism to ensure that rotation of the dial plate for each calendar period kept the correct latitude setting. The dial's latitude is set using the protractor unit on the end of the dial frame. By pulling out the detent plunger, the dial can be rotated accurately to its new position for any latitude set.

The December to June side carries the phrase "Oh to be in England now that spring is nigh" and the June to December side "The season of summer flowers and mellow fruitfulness". These phrases are picked out in gold leaf.

The dial was engraved using a numerically-controlled machine tool.

15. Martin Jenkins: Socrates Plato Dial

This is a horizontal slate dial of dimensions 600 mm × 600 mm × 20 mm.

The dial's delineation is quite complex to read, given the numerous lines, and it was decided to include four smaller versions of the main dial additions at the bottom of the dial plate indicating Italian hours, Babylonian hours, the sun's azimuth, and the sun's altitude to assist with identifying those points on the main dial. An Equation of Time chart is also included on the dial. The dial is also engraved with a piece of text by Socrates.

The gold-leafed Jenkins coat of arms was added as a piece of whimsy. The motto translates as "Proceed with Caution", very relevant when designing and engraving such a complex dial. Incidentally, the engraving, using a numerically-controlled machine tool, took over 6 hours of continuous machining.

16. Syed Kamarulzaman: Ta Ha Sundial, Sepang, Malaysia

This was undoubtedly the most spectacular sundial that was submitted; it came with the most substantial documentation and some stellar references including one from the late Gianni Ferrari. It attracted the most comments on the BSS website. The dial was made in 2018 and consists of 150° of an equatorial ring and, being less than 3° North of the equator, lies with its outer ends pointing skywards. A large curved structure stands on the south side and the pointed tip of its overhang serves as a nodus. The sundial's footprint is 6.85 × 2.5 metres.

The portion of the equatorial ring resembles the Arabic letter 'Ta' and the overhang resembles the Arabic letter 'Ha'. These are the initial letters of Tabung Haji, the name of the hotel which the dial stands outside.

The dial has hour lines which, at their north ends, are labelled from 9 am to 5 pm and give local apparent time at 120° East, the reference longitude of the relevant time zone. At their south ends they are labelled five hours earlier to indicate local apparent time at 45° East, the reference longitude for the relevant time zone for Mecca.

There are declination lines for the solstices and the equinoxes and two anniversary dates, one for Malaysian Independence Day (31 August 1957) and one for the anniversary date of the founding of Lembaga Tabung Haji (30 September 1963), a body which funds pilgrimages. There are tick marks indicating the first days of the calendar months.

There are lines for Muslim prayer times; these are shown as the actual times for the daytime prayers (zuhr and asr) and as offsets from the other prayer times (maghrib, isha and fajr). The asr prayer line with its prominent cusp can be seen in the photograph.


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The sundial was designed and built by Syed Kamarulzaman bin Syed Kabeer.

17. Frank King: Portable Stereographic Mask Sundial[7]

This azimuthal sundial uses a stereographic projection of the local sky centred on the zenith. The dial was a whimsical attempt to lighten the darkest days of the initial Covid lockdown period in 2020. It has a detachable gnomon (not shown in the photograph) so that if the wearer lies down along a north–south line (with head to the south) then, for a few hours around noon, the dial will give a fair indication of local solar time. The BSS emblem adds a finishing touch.

18. Tool/Toy Project: Circadian Yardstick

The Circadian Yardstick is part of a collection of instruments made by Tool/Toy Project in 2019 for the Oslo Architecture Triennale. The collection consists of a set of objects designed to slow down the daily domestic routine by encouraging regular playful interactions with the sun in the home.

The Yardstick is calibrated for use in Oslo, Norway. It is made from oak and is marked out on both sides; one side is to be used in summer (from the vernal equinox to the autumnal equinox) and the other side is to be used in winter (from the autumnal equinox to the following vernal equinox). The gnomon is formed from a double-headed screw with two countersunk heads; in summer the head on the winter side is pushed flush with the lower oak surface and the raised head on the summer side serves as a nodus.

The shadow of the nodus runs across printed strips and associated yellow bars. Each strip indicates what our bodies are doing according to our circadian rhythms at various times of the day – from peak alertness to an enhanced sense of smell. The lengths of the yellow bars correspond to shadow lengths throughout the day. By intellectually connecting our internal cycles to those of the Sun, the yardstick encourages the user to live in harmony with both.

19. The Voss Obelisk: Pair of Declining Reclining Slate Dials in Cornwall[8]

The Voss Obelisk was designed and delineated by the Society's Patron, Mark Lennox-Boyd. The obelisk, made in 2019, is of Portuguese granite and has a triangular cross-section. The north face incorporates an information slate and each of the other two faces incorporates a slate dial plate, the two forming a pair. The gnomons are made of gold-plated bronze and the dial plates are approximately 40 cm square.

The granite was cut in Portugal and supplied by Lantoom Quarry, Cornwall. Hidden metalwork was by John Huddleston and the cutting was by Ben Jones.

REFERENCES

1. David Brown: 'Time for recreation and re-creation. Part 2: The re-birth of a large polyhedral sundial', *BSS Bulletin*, 33(i), 2-7 (March 2021).
2. Frank King: 'New dials (2): A new Islamic-inspired sundial', *BSS Bulletin*, 28(iii), 21 and front cover (September 2016).
3. Frank King and Lida Lopes Cardozo Kindersley: *Sundials Cutting Time – the science and art of 27 Kindersley dials*, Cardozo Kindersley, Cambridge (2019).
4. Frank King: 'Welcome and Introduction', in 'BSS Zoom Event, 17 April 2021, 16:00 UTC', *BSS Bulletin*, 33(ii), 37-39 (June 2021).
5. Louise Smail: 'The Old Parsonage (glass) sundial restoration' in 'Newbury One-Day Meeting 21 September 2019', *BSS Bulletin*, 31(iv), 39-44 (December 2019).
6. Frank King: 'The practicalities of Trespa® – a novel material for sundials' in 'Newbury One-Day Meeting 22 September 2018', *BSS Bulletin*, 30(iv), 44-47 (December 2018).
7. Frank H. King: 'A sundial face mask', *BSS Bulletin*, 32(iii), 38-40 (September 2020).
8. Mark Lennox-Boyd and Ben Jones: 'The Voss Obelisk – time for evermore', *BSS Bulletin*, 31(iv), 12-16 (December 2019).

The Trustees

Mystery Sundial Location – Update

Sue Manston

The March 2021 issue of the *Bulletin* (p. 42) carried a plea for help to identify the location of a sundial. The original enquiry, sent to the BSS Help and Advice Service, came from a lady who is trying to identify her relatives who were photographed standing next to the dial.

Two replies were received, both confirming that the photographs were taken in Christchurch Park, Ipswich. Fig. 1 shows the sundial in the Lower Arboretum of the park. This picture, a view taken from the north, is thought to date from the 1930s. It clearly shows the armillary sphere and the wooden balustrade of the bridge, both of which are recognisable in the enquirer's family photographs.

John Davis was the first to respond; he remembered the park because a replacement armillary dial, unveiled by the Mayor of Ipswich in January 2017, was the subject of a previous *Bulletin* article.[1] The second response came from Robert Foster[2] who made the replacement sundial. Around a year later this new sundial was stolen, wrenched off its pedestal and probably too badly damaged to be useful; it was most likely sold for scrap. Robert has since made another dial

Fig. 1. The Christchurch Park Sundial. Courtesy of David Miller.

Fig. 2. The new armillary sphere. Photo: Robert Foster.

(Fig. 2), exactly the same as the stolen one and still safely in place at the time of writing.

The enquirer has expressed her thanks for identifying the location, but her investigations to identify her relatives are still on-going. She is having to look further back in her family tree as we now think her photographs date from the 1930s rather than the 1950s as previously stated.

Acknowledgements

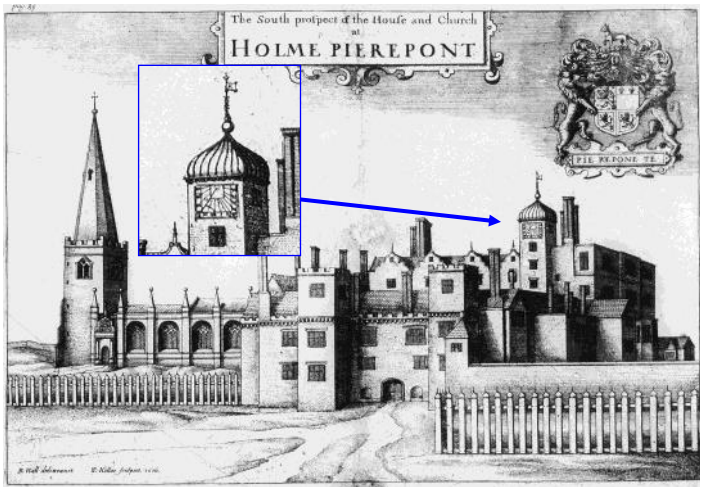
Grateful thanks to John Davis, Robert Foster and David Miller.

References

1. J. Davis: 'A Replacement Armillary Dial for Christchurch Park, Ipswich', *BSS Bulletin*, 29(ii), 32–33 (June 2017).
2. Sundials by Robert Foster, *http://www.sundialsbyrobertfoster.co.uk*

suemanston@outlook.com

Holme Pierrepont Hall



This engraving of Holme Pier(r)epont Hall in Nottinghamshire is signed R. Hall delineavit, W[enceslaus] Hollar sculpsit and is courtesy of the Royal Collections Trust. The Hall is now an upmarket wedding venue and the tower on which a vertical south sundial can be seen seems to have been demolished—certainly, there is no sign of the sundial.

The Hall does have a horizontal sundial in the courtyard which is recorded as SRN 3981 but this is from a TV screen grab in 1999. It looks to be quite a good dial, most probably late 18th or early 19th century, by one of the major London instrument makers. When conditions improve, would someone like to visit and give a full report?

JD

RESTORATION OF THE DRUMMOND CASTLE OBELISK SUNDIAL
Part 3: The Latin Scroll

ALASTAIR HUNTER

History and reinstatement were the subjects of Part 1 of this series of articles about the fine obelisk sundial that stands in the gardens at Drummond Castle near Perth, in Scotland.[1] Restoration and conservation were the new topics for Part 2.[2] This third part covers the Latin scroll, which is a distinctive feature in the form of a carving on the sundial's square stone shaft (Fig. 1). The scroll holds the key to everything about the sundial and is thought to be unique. Certainly there is none other like it, so far as is known. This article describes the Latin scroll and offers an interpretation of how to understand it and why it is there.

Examination of the Scroll

The scroll sits at the bottom of the square shaft, below a single pyramid dial and the coat of arms of the Earl and Countess of Perth on the north side (Fig. 2). Much higher up a small shield shows the sundial's date, 1630. The position of the scroll low down does not diminish its importance, rather it avoids occupying space for dials elsewhere. The south, east and west sides of the shaft, and the facets of the polyhedron and finial stones, are all occupied by dials. The total number of dials is 61.

Fig. 2. The Latin scroll carved at the bottom of the square shaft, below the coat of arms on the north side.

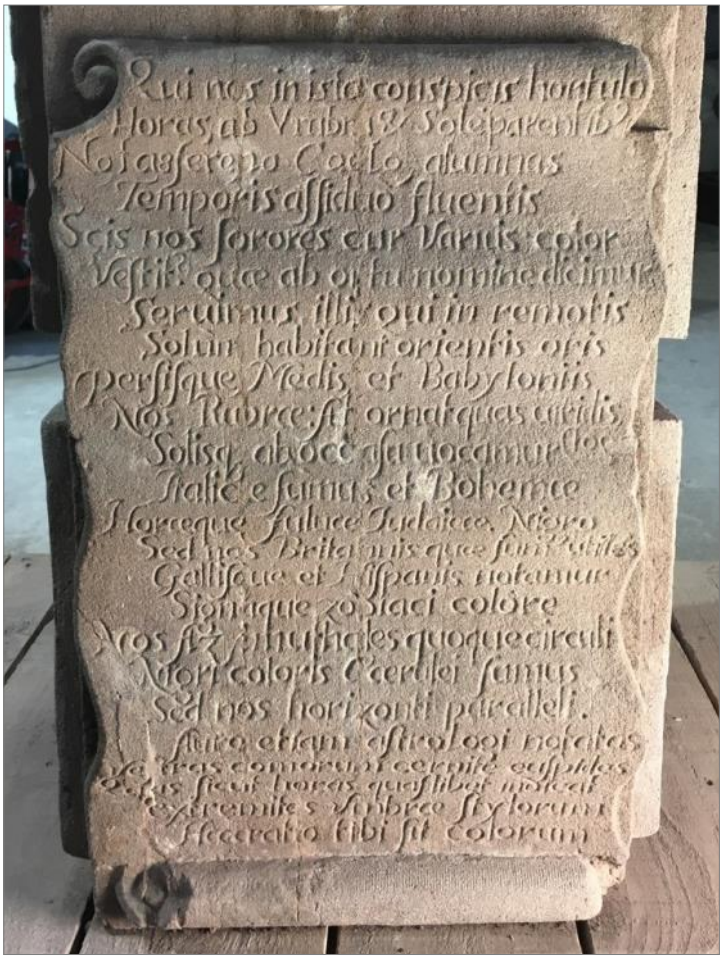


Fig. 1. The Latin scroll showing detail of the inscription. Photo: Graciela Ainsworth Sculpture Conservation.

Initially, while it was outdoors in the castle gardens, many words of the scroll were hard to read. This was partly because of stone deterioration, but was mainly due to discolouration and organic growths on the stone surface that obscured much of the text. Indeed, the 19th century translation of the Latin, which is discussed below, has the comment "*two or three lines at the bottom of pillar illegible*".

By the time the stone was treated in the workshop the text became much clearer. Cleaning amounted to a gentle wash with water, a biocide treatment, and then letting the stone fully dry out. Restoration and conservation work on the stone was done very carefully to avoid losing any details of the inscription, and is now hard to detect. The scroll has an inscription of 24 lines. The language is Latin, which in the early 17th century was the language of education.

In the modern world, understanding the text will not come naturally to everyone, perhaps only to very few. In the past the meaning appears to have been lost and erroneous myths have been repeated about the sundial telling the time for cities round the world. During the present restoration, three strands of good fortune happened to come together. In the workshop the writing was now clear and easy to read, one of the team was an expert in translating Latin, and the author contributed an understanding of gnomonics and research.

Translation of the Latin Text

In 2017, Claudine Tate was the team member who translated the Latin text. Her translation conveys the same poetic description of the sundial, with slight differences of emphasis and wording, as the two others that follow here. It has already been given in full and noted in Part 2 of this article series.[3]

1870 translation

Dr Barrack was Rector of Dollar Academy from 1868 to 1878, an independent school some fifteen miles from Drummond Castle. His translation is quoted verbatim by both Mrs Gatty and Thomas Ross, "*We are the hours on the pillar you see, marked by the hours that ever flee,* [etc]". The full translation is noted at the end of this article.[4] The two writers add their own descriptions of the 1630 sundial and its history. Probably, Gatty never saw the sundial and instead borrowed her information from Ross. She states that the lines are the translation of a Latin inscription, "which we have been unable to obtain". Her interest is in the inscription as a sundial motto. Ross, however, is tasked with recording the architecture of ancient Scottish buildings. He appears to see the scroll simply as a sundial curiosity.[5,6]

1990 translation

Philip Pattenden is the author of two masterly publications on the sundials at Corpus Christi College, Oxford, the same college where in the 1520s Nicolaus Kratzer, horologist to Henry VIII, resided for a short time.[7,8] Dr Pattenden was responsible for restoring the famous 'Pelican' sundial there in 1976, and he joined the BSS as one of its earliest members. In 1990, Anne Somerville asked him for help with translating the Drummond inscription. This may have

Line	Latin text	Translation
1	Qui nos in isto conspicis hortulo	You, who behold us in this garden, as hours
2	Horas, ab Vmbra & Sole parentibus	with shadow and sun for parents, when the sky
3	Notas serena Caelo alumnas	is clear, us visible pupils of ever flowing time,
4	Temporis assiduo fluentis	do you know why we sisters are clothed in
5	Scis nos Sorores cur Varius color	different colours? *[lines 1-6]*
6	Vestit? Quae ab ortu nomine dicimur	Those of us who take our names from the
7	Servimus illis qui in remotis	(sun)rise serve those who live in the land in the
8	Solum habitant orientis oris	remote shores of the east, the Persians, Medes,
9	Persisque, Medis, et Babyloniis	and Babylonians—we are red. *[lines 6-10]*
10	Nos Rubrae: atque ornat quas viridis	And those of us decorated green, we are
11	Solisque ab occasu uocamur nos	named from the setting of the sun—we are
12	Italiae sumus et Bohemae	Italian and Bohemian. *[lines 10-12]*
13	Horaeque fuluae Judaicae. Nigro	The yellow ones are the Jewish hours. *[line 13]*
14	Sed nos Britannis quae sumus utiles	But we who are marked in black colour are
15	Gallisquae et Hispanis notamur	those who are useful to the British and French
16	Signaque zodiaci colore	and Spaniards—also the signs of the Zodiac.
17	Nos Azimuthales quoque circuli	*[lines 13-16]*
18	Nigri coloris Caeruli sumus	We azimuth circles too are of colour dark blue,
19	Sed nos horizonti paralleli	*[lines 17-18]*
20	Auro etiam astrologi notatas	but we parallels to the horizon are in gold, and
21	Vestras domorum cernite cuspides	you also see the hours known as the limits of
22	Quas sicut Horas Quaslibet indicat	the astrologer's houses. *[lines 19-21]*
23	Extremitas Umbrae stylorum	Just as your tips of the shadows of the styles
24	Accuratio tibi sit colorum	mark whatever hours, you take care about the
		colours. *[lines 22-24]*

Table 1. Copy of the inscription in Latin, corrected and translated by Dr Philip Pattenden, Peterhouse, Cambridge, 1990.

been in connection with the new obelisk sundial at Dunphail for which her husband Andrew acted as design consultant.[9,10] In his reply to her, Dr Pattenden explains that he has corrected some errors in the transcription after comparing it with photos of the scroll, and he provides his translation. Then in 2019, almost three decades later, the present author sent him a latest photograph of the scroll in the workshop, and learnt that a few small errors still remained but they did not affect the meaning. The corrected transcription and Pattenden's translation are given in Table 1.

Interpretation of the Text

The text begins with a warm and welcoming invitation. The Hours are speaking to guests and visitors to the sundial: "*You, who behold us* [Hours] *in this garden …*", we can make the mysteries of Time visible to you "*with shadow and sun for parents, when the sky is clear, us visible pupils of ever flowing time …*". And we can show you more: "*Do you know why we sisters* [Hours] *are clothed in different colours?*" It is hard to imagine a more vivid introduction to the fascination of sundials.

The text is written in verse. While it goes on to describe the different hours and their colours, its poetic imagery and form require careful attention. For example, "*Those of us* [Hours] *who take our names from the (sun)rise …*" are recognisable by modern convention as Babylonian hours. These are coloured red. The extra wording, "*remote shores of the east, the Persians, Medes …*", however, is possibly distracting. A description of hours as "*Italian and Bohemian*" is less common now; these are Italian hours, and are coloured green. "*Jewish hours*" are yellow, and are Seasonal hours. The hours "*… who are useful to the British and French and Spaniards*" are Common hours, which are black. In summary, the hours are: Babylonian (red), Italian (green), Seasonal (yellow), and Common (black).

The next verses contain four references, respectively, to: "*signs of the Zodiac*", "*azimuth circles*", "*parallels to the horizon*", and "*limits of the astrologer's houses*". It helps to know where these terms may have come from. David Proctor explains the terms in Chapter Two, 'The Construction and Use of the Astrolabe', in *Astrolabes at Greenwich*.[11] The astrolabe is a portable calculator and observing instrument that represents a model of the heavens on a two-dimensional plane. On an astrolabe, the ecliptic is a circle that represents the apparent annual path of the sun through the heavens. This ecliptic circle is divided into twelve equal sections marked with the Signs of the Zodiac, corresponding to the twelve named Zodiac constellations in the sky. Azimuth lines on the astrolabe correspond to imaginary Azimuth Circles in the heavens. These are vertical circles that indicate the direction of an object in the sky measured from true south. Almucantar lines on the astrolabe correspond to imaginary Parallels to the Horizon in the heavens. These are horizontal circles that indicate the height of an object in the sky measured from the horizon.

Fig. 3. Vertical south dial. Common hour lines and numerals, Babylonian and Italian hour lines.

The names 'Azimuth' and 'Almucantar' are derived from the Arabic. Finally, astrological house boundary lines on the astrolabe correspond to imaginary Limits of the Astrologer's Houses in the heavens. These are the notional boundaries between Zodiac constellations.

Returning then to the sundial, which includes both concave and plane dials so circles may sometimes project as lines, and referring again to the Pattenden translation in Table 1, the expected markings are as follows. Signs of the Zodiac are the relevant symbols, to be marked in black. Azimuth Circles are vertical circles or line projections in dark blue. Parallels to the Horizon are horizontal circles or line projections in gold. Limits to the Astrologer's Houses are Zodiac declination lines, also in gold. The text of the scroll ends with a reminder to take care about the colours of whatever hours when observing the shadows of the gnomons.

Line Markings on the Stone

While the text of the scroll may partly relate to imaginary lines, the real sundial is very clearly marked with real lines. During the restoration work these lines incised in the stone, and clearly visible after nearly four hundred years of exposure outdoors, provided an absolute guide for replacing the gnomons. Examples of dials marked with Babylonian, Italian, Seasonal and Common hours, and Zodiac declination lines, are provided here for illustration (Figs 3, 4, and 5). As the work progressed and all of the 61 dials came to be scrutinised, there was growing confidence that all the incised lines were accurate, all the delineations were correct, and there were no mistakes. Nothing different has been discovered since then.

However, not everything is marked in the stone. For example, only certain dials have hour numerals marked on them, and there are no Zodiac signs. Probably these were added separately by painting. For the precise mathematical delineations the painter would need to follow the incised

Fig. 4. Vertical concave hemisphere. Common hour lines, Seasonal hour lines, Zodiac declination lines.

Fig. 5. Reclining west dial. Common hour lines and numerals, Zodiac declination lines.

lines, but for the numerals and symbols it would not be necessary. These could be painted freehand.

Then the Azimuth Circles and the Parallels to the Horizon were a puzzle. None of the incised lines seemed to fit them. At first, the curved hour lines in concave hemispheres were mistaken for Azimuth Circles, because they are very similar: the difference between vertical circles and circles on a polar axis for latitude 56° is small. But this mistake was recognised and the curved lines were identified correctly as Common hours. The obelisk has twelve concave dials with Common hours.

Two unfortunate misunderstandings persisted. The term Azimuth Circles was assumed to be an unusual way of describing the Common hour curves in the concaves, or perhaps it was correct in mathematics but obscure. And the term Parallels to the Horizon was assumed to refer only to the Horizon, where lines were incised, and not to any parallels. Both these misunderstandings went unchallenged until Frank King came to the rescue and suggested there might be other explanations.

Almost certainly the azimuth curves and the horizon parallels were painted separately, like the hour numerals and Zodiac symbols. In a hemisphere this task is not a difficult one. The azimuths would be great circles probably graduated in 10° intervals from the meridian. The parallels would be small circles graduated in 10° intervals from the horizon. There is no evidence whether this is a true explanation, nor which dials had these circles. The most likely dials would be the three principal hemispheres on the south, east and west sides of the shaft, respectively. This would cover all the azimuth and altitude angles of the sun throughout the year. A summary of the scroll interpretation and dial markings is given in Table 2.

There may be more knowledge and thoughts to add on how the dials were marked. The author will welcome input from readers.

Sundial term	**Scroll text**	**Definition**	**Colour**	**Markings on the stone**
Babylonian hours	*Hours from the sunrise*	Equal hours from sunrise	Red	Incised
Italian hours	*Hours from the setting sun*	Equal hours from sunset	Green	Incised
Seasonal hours	*Jewish hours*	Unequal hours of daylight	Yellow	Incised
Common hours	*Hours useful to the British*	Equal hours from midnight	Black	Incised
Zodiac signs	*Signs of the Zodiac*	Annotation for declination lines	Black	No markings
Sun azimuth	*Azimuth circles*	Sun azimuth direction from south	Dark blue	No markings
Sun altitude	*Parallels to the horizon*	Sun altitude angle from horizontal	Gold	No markings
Sun declination	*Limits of the astrologer's houses*	Zodiac declination lines	Gold	Incised
Hour numerals	*No mention in the text*	Annotation for the hour lines	*No mention*	Incised/Part incised or No markings

Table 2. Summary interpretation of the scroll.

ACKNOWLEDGEMENTS

This article has been prepared with the approval and kind agreement of The Grimsthorpe and Drummond Castle Trust. The author is grateful to Frank King for his perceptive comments.

REFERENCES

1. Alastair Hunter: 'Restoration of the Drummond Castle obelisk sundial Part 1: History and reinstatement ceremony'. *BSS Bulletin*, 32(i), 2-9 (March 2020).
2. James Tate, Graciela Ainsworth and Alastair Hunter: 'Restoration of the Drummond Castle obelisk sundial Part 2: Conservation and restoration techniques'. *BSS Bulletin*, 32(ii), 10-17 (June 2020).
3. See ref. 2, p.17, note 5.
4. Translation by Dr W. Barrack, Rector of Dollar Academy (1868-78):
   Inscription on the dial erected in 1630 in Drummond Castle Gardens

   We are the hours on the pillar you see,
   Marked by the shadows that ever flee,
   And move with the sun in its course on high,
   Noting the time passing swiftly by.

   Sisters are we, then why are we clad
   In joyful robes, and robes that are sad?

   We who have rays from the sun at morn
   Are servants to those in the East who are born,
   Who live in those regions far remote,
   Where the Medes and the Persians round Babylon fought.

   We whose robes are red and bright
   Have our names from the sun's retreating light,
   Italians, Bohemians, all are we,
   And the bright red tints of the West you see.

   We who are dark and dusky in hue
   Mark out the hours on the zodiac blue,
   To the people of France and the people of Spain,
   Who live by the side of the weltering main.

   (There are two or three lines at the bottom of pillar illegible.)
5. Mrs Alfred Gatty, H K F Eden, and Eleanor Lloyd: *The Book of Sundials*, George Bell and Sons, London, p.477 (4th ed., 1900).
6. David MacGibbon and Thomas Ross: *The Castellated and Domestic Architecture of Scotland from the Twelfth to the Eighteenth Century*, Vol. 5, David Douglas, Edinburgh, 417-418 (1892).
7. Philip Pattenden: *Sundials at an Oxford College*, Roman Books, Oxford (1979).
8. Philip Pattenden: *The Pelican Sundial, Description of the Tables*, Corpus Christi College, Oxford (1980).
9. CANMORE, Historic Environment Scotland. *https://canmore.org.uk/site/240001/drummond-castle*, Sundial Collections Manuscripts (2) Dr Andrew R. Somerville.
10. Anne Somerville: 'Dunphail: the making of a sundial'. *BSS Bulletin*, 96.2, 3-8 (June 1996).
11. David Proctor: 'The construction and use of the astrolabe'. In Koenraad van Cleempoel: *Astrolabes at Greenwich*, Oxford University Press and the National Maritime Museum, London, Ch.2, pp.15-22 (2005).

sundials@macmillanhunter.co.uk

VITRUVIUS ON SUNDIALS

JOHN LESTER

Marcus Vitruvius Pollius (ca 80–70 BC to 15 BC), generally known as Vitruvius, was the Roman author of *De Architectura* ("On Architecture"). The work was completed sometime before 27 BC and is divided into ten books which are subdivided into chapters. The work was lost for many years and only rediscovered in the fifteenth century. Vitruvius' attention to detail is impressive and he has done a thorough job.

Although the work purports to deal with architecture it also covers a wide range of other topics.

Among many subjects it describes are engines of war, harmony in music, astronomy, water supplies and sundials. Book IX, Chapter VII is a general dissertation on dialling which is not always easy to understand since no diagrams are supplied. Chapter VIII describes various types of dial, mentioning first of all, Berosus' *Hemicyclium excavatum ex quadrato ad enclimaque succissum Berosus Chaldaeus dicitur invenisse.* (Berosus the Chaldaean is said to have invented the semicircular dial hollowed out of a square block and cut according to the latitude.) Aristarchus of Samos is credited with the Bowl or Hemisphere and the disc on a level surface. Eudoxus, or possibly Apollonius, invented the Spider, while Scopius of Syracuse contrived the *Plinthium* or Ceiling dial. Parmenio produced the Dial for Consultation, Theodosius and Andreas the Dial for all Latitudes. Patroclus designed the Dovetail, Dionysodorus the Cone, and Apollonius, the Quiver. Many have left instructions for making hanging dials for travellers.

Anyone wishing to explore further what Vitruvius has written on the topic will find the best source in the edition of *De Architectura* published by Harvard University Press in their series called the Loeb Classical Library. These include many classical works in Latin and Greek and have the original words on the left hand (*verso*) page and an English translation on the right hand (*recto*) page.

In addition, a translation of *De Architectura* is available online at
https://www.gutenberg.org/ebooks/20239

johnws1@btinternet.com

BSS ZOOM EVENT: 17 April 2021, 16:00 UTC

As a consequence of the Covid-19 pandemic, the Society has been unable to host any conferences or meetings for over 18 months, so we thought we would try our hands at Zoom. Last September, David Pawley proposed hosting a Zoom meeting in lieu of the Newbury meeting. At the time, there was limited interest but two of our long-standing North American members, Roger Bailey and Woody Sullivan, volunteered to give talks.

Fig. 1. Frank King (bottom left) with the three principal speakers: Woody Sullivan and Fred Sawyer (top row), and Roger Bailey (bottom right).

Once it became clear that we would not be able to hold our planned April 2021 conference in Exeter we decided to have another attempt. We checked that Roger and Woody were still interested and sounded out Fred Sawyer to make up a trio of noted speakers. Frank King would welcome the participants, introduce the speakers, and run the question-and-answer sessions.

An early task was to agree a time and date. We chose 17 April because that was due to be the main day of the Exeter Conference. We chose 16:00 UTC as the start time. In April, this would be 09:00 PDT, the time zone of both Roger and Woody who live on Vancouver Island and in Seattle respectively.

We advertised in the December 2020 and March 2021 BSS Newsletters and Fred sounded out the North American Sundial Society membership too. Late on we advertised on the Sundial Mailing List.[1] Expressions of interest trickled in, slowly at first and then more quickly. It became clear that a number of those who signed up were not regulars at sundial meetings but were joining, at least in part, out of curiosity: what is it about sundials that appeals to enthusiasts? Frank decided that this merited extending his proposed welcome message to give a brief explanation of a simple horizontal sundial.

We had a preliminary rehearsal with Bill Visick acting as Zoom host and Frank and Roger as two of the speakers. Christine Northeast served as the representative audience. This was followed later by a second rehearsal which included Woody and Fred too. We ironed out several snags and agreed that we would have breaks after each of the three main talks for questions. The quality of Frank's sound was very poor and he had to have several private rehearsals with Bill to try out different configurations of platform and microphone.

On the day, the number of participants peaked at 143 but several of these were couples so we probably had an audience of around 150 people altogether. The vast majority stayed to the end. We decided to have a Zoom meeting rather than a Zoom webinar so people could see one another. This worked reasonably well but, another time, we shall try using Zoom's webinar features.

It is difficult to simulate an audience of 100+ at a rehearsal and the big unknown was how well the question-time breaks would work. We originally planned to ask people to use the 'raise hand' feature of Zoom or the 'chat' feature. Woody wisely advised using the 'chat' feature alone. On the day, the 'chat box' filled up with far more comments than questions and several of the questions which were asked were answered by other participants. Frank found it much harder to pick out useful questions than he was expecting; the 'Q&A' feature of a Zoom webinar might prove more satisfactory.

A questionnaire was circulated and there were very complimentary responses. About 80% rated the overall meeting Excellent. There were many requests to have more such meetings, perhaps quarterly. A video of the event can be seen at *https://sundialsoc.org.uk/news/update-bss-zoom-event-17-april-2021/*

Reports on the Welcome and Introduction, and on the three main talks, follow.

Frank King: *Welcome and Introduction*

Frank welcomed everyone who had signed on and noted that the participants spanned at least 15 time zones. He also noted that they included a number of beginners (the survey results later confirmed their number as about 10% of the total) so he gave a brief conducted tour of a new horizontal sundial by the Cardozo Kindersley Workshop in Cambridge, England. He

Fig. 2. A horizontal sundial under construction. The sun is falling on the near face of the gnomon and also on the long narrow sloping face of the gnomon.
Photo: Cardozo Kindersley Workshop.

showed a photograph taken on the day it was installed (see entry No. 4 in the account of the BSS Sundial Awards 2016–20[2]).

He also showed Fig. 2, a photograph taken earlier in the construction process. To keep the expert participants interested, he noted that, in this photograph, the sun is reflecting off the near side of the gnomon giving rise to an oblique projection of the gnomon profile on the surface of the dial plate; this appears as a bright patch. He then posed the following four questions:

1. *Why do we not see reflections from the sloping face on the dial plate?*
2. *Is there a time of day when we could see such reflections on the dial plate?*
3. *Would your answers to the first two questions change if this dial were designed for and set up in a location north of the Arctic Circle?*
4. *Is it possible for reflections off the gnomon to give rise to an image of the sun, rather than an oblique projection of a face of the gnomon? The image need not fall on the dial plate but on some other surface in the vicinity.*

Roger Bailey: *A Sundial Tour in the French Alps featuring the historic sundials of G.F. Zarbula and the modern dials of Remi Potey*

Roger began by noting that travel has become very difficult due to the Covid-19 pandemic restrictions and, in his presentation, he supplied an alternative, virtual travel, specifically a Sundial Tour in the French Alps. This tour featured historic sundials created from 1832 to 1872 by Giovanni Francesco Zarbula and then modern sundials painted by Rémi Potey from 1986 to the present day.

Fig. 3. Zarbula dial in Maljasset. Note the square and compass masonic symbol.

The presentation was based on two maps, one showing the locations of the 55 surviving sundials by Zarbula (*bit.ly/ZarbulaDials*) and the second the locations of 58 of the 200 sundials created by Rémi Potey (*bit.ly/2NVsjSN*).

Clicking on any of the placemarks on the map opened a note with a picture of the dial, a description and, generally, a link to *https://www.waymarking.com* for a more detailed description and better pictures. Roger used several examples showing the folk art of Zarbula with exotic birds and animals, religious and masonic symbols (see Fig. 3). These were compared with the artistic paintings of birds, animals and people native to the alpine area by Potey.

Both used fresco techniques with inorganic pigments imbedded in the parging of the wall. Zarbula used the sun to create accurate vertical declining sundials with limited tools and knowledge of the location and declination.

Woody Sullivan: *Furniture Galore: unusual astronomical, historical and personal features on a ceiling reflection sundial*

Woody explained that a small mirror on the sill of a south-facing window brings a beam of sunlight on to the ceiling of his study. The painted dial pattern covers an area of about 5 metres by 3 metres.

Major design goals were that it be both complex and beautiful; true to tradition, yet of the 21st century; personalized, even idiosyncratic; and full of unique features.

Indicated on the dial are the Sun's azimuth, altitude and declination; the date and time of day; zone time (via an analemma using buttons made of the mineral haematite, discovered by the Mars Rover *Spirit* and indicating the presence of warm, liquid H_2O on early Mars); the number of hours until dawn; the meridian-crossing times of the two strong radio sources *Vir* A and *Cas* A; the number of daylight hours (*not* 12 hours on the equinox!); commemorative dates in the history of Woody's family, of the

world, and of baseball; a compass rose indicating great circle directions to important gnomonic and astronomical sites in the world; and finally the current sign of the zodiac. However, the positions of the paintings for these signs have been shifted by two signs from the usual to allow for precession over the past 4000 years; many of them also stand out, such as local sockeye salmon for Pisces, as well as the eponymous cluster of galaxies tattooed on the back of a lovely lady for Virgo. The dial's motto contains a chronogram giving the date of construction: *Vous et moi ne soMMes rien sans la réfleXIon*. Finally, he somewhat extended the custom of painting a realistic fly on 17th century stained-glass windows. Thus, glued to the ceiling, are not just a (real) fly, but also a beetle, a moth, a bee, a butterfly, and other insects.

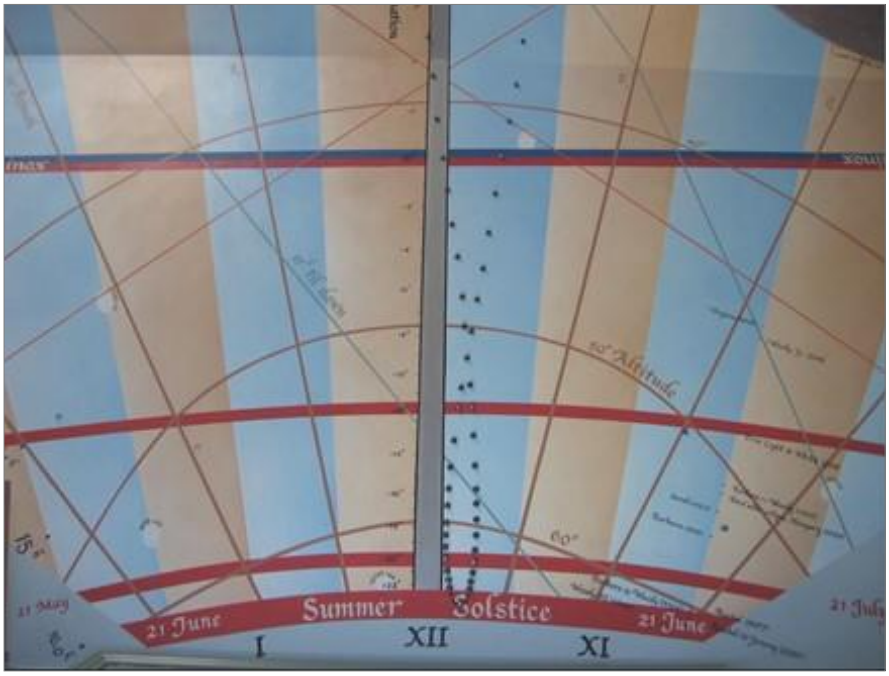


Fig. 4. The central part of the ceiling.

Fred Sawyer: Hybrid Peaucellier Sundials – Dial designs you've never seen before

Fred spoke about seven hybrid Peaucellier sundials. He began by presenting a simple, though unusual, Peaucellier azimuthal dial. Some years ago, Fred had developed the general theory of such dials inspired by an idea by the 19th century French engineer Charles-Nicolas Peaucellier; they are characterized by having completely straight hour and declination lines. For the simple case of an azimuthal dial, Fred was able to derive the basic dial without appealing to the long theoretical development. However, the resulting dial suffered from the strange property of having a large, noticeable gap between the hours of 11 am and 1 pm each day of the year.

To 'mind the gap', Fred hybridized the dial by adopting various strategies to keep it functional during the gap time each day. His first approach was to use reciprocals of hour and declination lines in such a way that the time during the gap could be read from a set of circular arcs which looked somewhat like a flower growing in the gap between the morning and afternoon lines of the basic dial.

For a simpler design, Fred tried joining corresponding declination lines in the morning and afternoon with another straight line. The resulting hour curves proved to be parabolic, but the relevant portions of the curves were close to straight. In fact, in the UK, substituting straight hour lines for the curves would never cause an error in excess of 8 seconds of time.

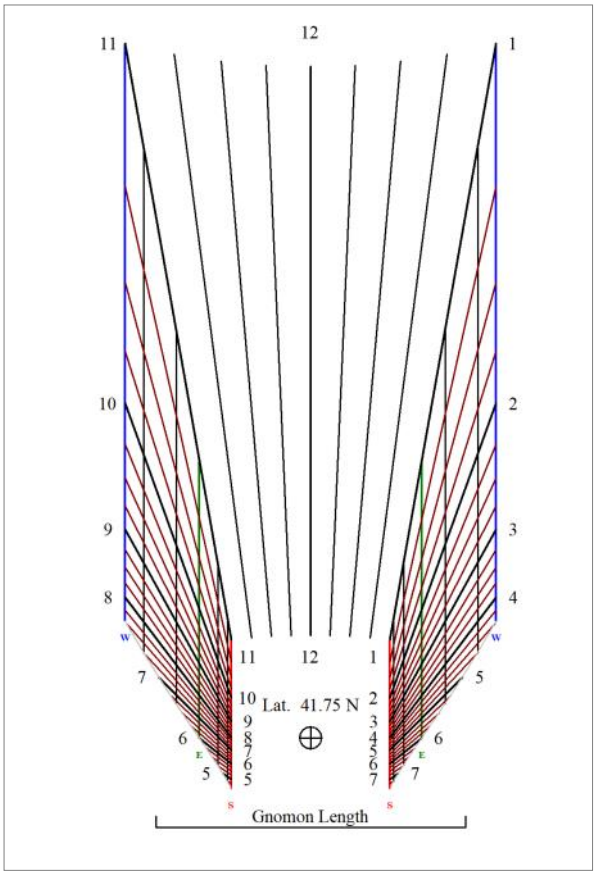


Fig. 5. The 'Goldilocks Design'. This uses a vertical gnomon mounted at the centre of the encircled cross. The gnomon has to have the height shown at the bottom of the figure. From 11 am to 1 pm the tip of the shadow indicates the time. Outside those hours, the point where the shadow of the gnomon intersects the appropriate declination line gives the time.

Fred's later designs included one which featured straight lines that look curved (because of an optical illusion) and curved lines that look straight, as well as one designed specifically for a 'goldilocks' gnomon – the shortest gnomon that suffices for all dates and times on dials of this sort (see Fig. 5).

References

1. *https://lists.uni-koeln.de/mailman/listinfo/sundial*
2. The BSS Trustees: 'BSS Sundial Awards 2016–20', *BSS Bulletin* 33(ii), 24-30 (June 2021).

Frank King, Roger Bailey, Woody Sullivan and Fred Sawyer

CONFESSION TIME

DAVID BROWN

Out of the blue last October came this email to me from BSS member Doug Bateman:

"*Whilst walking in Somerset I came across this dial, as attached. Is this the original location? It seems to be such a smart dial for a fairly humble National Trust location. The monogram is probably yours. JF tells me that you did some restoration in 2015, and it has not been recorded!*"

I am sad to say that Doug was right on every point. Then as if to rub it in, a couple of pictures of the sundial apeared in the next *Bulletin*[1] where JF (John Foad, our Registrar) had allocated a Sundial Register Number to it (SRN 8191) as a Newly Reported Dial. Now my embarrassment was complete, in a pleasant sort of way, but the not-so-gentle nudge prompted me to put matters right and seek absolution for my sin of omission and get a proper record in the post almost thirty years late. Lockdown and uncertain weather have pushed me in the direction of paperwork where, to add to my woes, I came across numerous other dials that have left my workshop which I had intended to report in full but never quite got round to, possibly because of the relaxation and relief of having finished a job, or the pressure of needing to get started with a new one, or just the demands of my full-time teaching. The work of reparation is in full flow, and with the unstinting help of she-who-must-be-obeyed, it appears – somewhat unbelievably – that I have created around 215 sundials since 1990. This discovery forced me to look with even greater urgency for my many failures of formal registration, and now a substantial pile has accumulated which will keep me occupied for some time.

Amongst the papers I unearthed there fell out a pair of short articles written for *The West Somerset Free Press* by a dear friend Hilary Binding who died, sadly, a few years ago. For many years, she had composed a weekly article under the heading 'Notes by the Way' which dealt with matters of local interest in a very accessible manner. In the early 1990s, Hilary, Jen and I all lived in West Somerset and I was getting increasingly involved with all things sundial-related. We decided to go on an Exmoor sundial safari. Hilary's subsequent articles in September 1994 (transcribed below) record that outing. Quite by chance, I read that the last sundial we visited was none other than the one that Doug Bateman had come across (Fig. 1). It was Hilary who had in effect commissioned this sundial on behalf of the National Trust's Minehead and West Somerset Centre, who also funded it.

Fig. 1. Setting up the sundial SRN 8191 in 1994 at Piles Mill, Allerford, near Porlock on the NT Holnicote Estate.

Fig. 2. The underside, horizontal dial and supporting gnomon of the Piles Mill sundial.

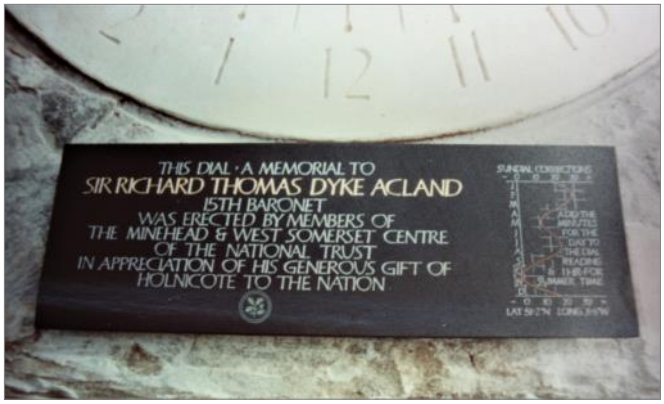


Fig. 3. The dedication plaque and correction curve of the Piles Mill sundial.

It is sited at Piles Mill, near Allerford which is not far from Porlock in West Somerset. It was set up in 1994 to mark the 50th anniversary of the gift by Sir Richard Acland of the 12,500-acre Holnicote Estate to the National Trust in 1944 and was unveiled by his son, Sir John Acland. The sundial takes the form of a double-sided equatorial made from Limpley Stoke limestone fashioned to look like a mill-stone, shaped by the Trust's master-mason John Salter. The top surface carries the Acland armorials. A stainless steel gnomon with an extended style penetrates the centre of the stone and sits on a slate horizontal dial at its base (Fig. 2). A dedication plaque with a correction curve sits below the upper face of the dial (Fig. 3). I did some cleaning of the dial and its surroundings in 2015, but since it is located near to a stream it soon re-acquires moss and algae, with plants growing in the cracks of the surrounding crazy-paving.

Here, then, is Hilary's article which might inspire you to follow in our tracks during your 2021 staycation…

IN SEARCH OF A SUNDIAL

Exploring in this country is becoming an endangered pastime. The fun of devising a route or the serendipitous experience of coming unexpectedly upon some delight or other is rapidly being challenged by the 'brown direction signs' which seem to be springing up everywhere. I recognise their value in pointing out commercial ventures to tourists but, at a time when every ten-year-old is being taught the basics of reading an Ordnance Survey map, I fail to understand why people should be deprived of the pleasure of discovering for themselves.

Happily, there are no signs pointing to 'church with sundial' in the vicinity, so when I set out with friends a few weeks ago in search of Exmoor sundials we had to do our homework first, making a list of recorded dials and working out a route. I am no expert but, with the help of an enthusiastic and knowledgeable friend, I have learned when visiting a church to look for both sundials and the earlier scratch dials and have experienced the pleasure of discovering dials that have not been recorded.

As far as I am aware, no scratch dial has yet been found on any West Somerset church although Dom Ethelbert Horne, writing in 1929, identified fine examples in other parts of the county. These simple medieval dials, often shaped like a semi-sun-burst or a protractor, had a central hole where a shadow peg would have been fixed. They were used to determine the time for the church offices, mass, noon and vespers and, presumably, the church bellringer conveyed the information from the dial to the workers in the fields.

Our first stop was Treborough, the small, grey church that has served this scattered and isolated population on the Brendon Hills for centuries. The sundial above the south porch (Fig. 4) is a simple slate dial with a bronze gnomon

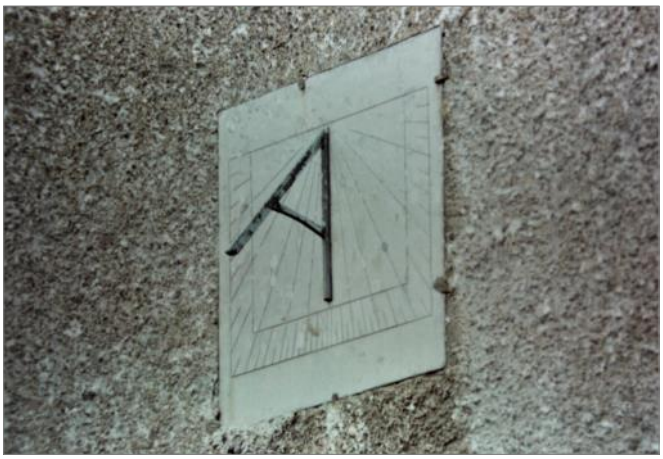


Fig. 4. St Peter's Church, Treborough, West Somerset, SRN 0049.

set slightly skew to face directly south. It shows signs of being worn by the wind and weather and there is no indication of its age or who put it there, though the churchwardens' accounts might give some clue. Once, workers at the nearby slate quarry lived here and gravestones record accidents and early deaths. Maybe the dial was needed to set right clocks and watches for those working at the quarry?

Fig. 5. Wheddon Cross, West Somerset, SRN 0051.

We went on, then, to Wheddon Cross where, on the wall of a house now named 'Sundial Barbers' Shop' is perhaps Exmoor's most magnificent and well-known dial (Fig. 5). Made of a piece of slate about 15 inches square and two inches thick, it has been boldly and beautifully carved by J. Norman of Winsford whose name is set at the foot of the dial. The house on which it is placed was once the premises of Robert Gulliford, postmaster and watch and clockmaker in Cutcombe from 1866 to 1875 and perhaps for longer. He may well have commissioned Mr Norman to make the dial, though perhaps it was Gulliford himself who was responsible for the detailed information carved on the dial, which gives the relevant adjustments for accuracy throughout the year. Mr Gulliford would have needed a sundial to set his clocks accurately, for all clocks were set by the sun to local time until the coming of the railways. Then, the need for 9.30 am at Paddington to be 9.30 am at Bristol and at Exeter if passengers were to catch these new-

fangled trains, led to people all over the country changing to 'London' time. At the top of the Wheddon Cross dial it reads: 'Tempus Edax Rerum' (time the devourer of all things), a motto that is all too relevant in the rush of modern life.

Fig. 6. All Saints' Church, North Molton, Devon, SRN 0071.

From Wheddon Cross, we drove across the moor, bright in purple, gold and brown, to North Molton. Here, the church was full of flower arrangers and last-minute cleaning and decorating. The parish was celebrating the completion and restoration of the church roof with thankfulness and well-justified satisfaction. The sundial over the porch is set on top of an older one (Fig. 6). It is a simple design in slate, rather at odds with the ornate lettering on the stones in the graveyard, some of which looked like advertisements for a Victorian printer showing off his type-faces! At the back of the church stood a clock, built in Barnstaple in 1564 at a cost of £6 13s 4d. It served the parish from the church tower until 1934 when its mechanism ground to a halt and it was replaced. Perhaps the coming of the railway to nearby South Molton in 1873 and the need to keep the old clock up to London time was just too much for it!

My friends and I left North Molton to its celebrations and made for High Bray on the next stage of our sundial safari. The parish church of High Bray stands on a hill, high above the village of Brayford which it serves. A footpath runs straight up the side of the hill from the village to the church, but I imagine that the Nonconformists who built their chapels snugly, cheek by jowl, down in the valley, may sometimes have attracted worshippers for slothful rather than doctrinal reasons. It must have been lot easier to pop round the corner to chapel than trudge the half mile or so up to the church. From High Bray there are wonderful views out towards Exmoor and the sound of the bell, telling the time from sundial to parishioners, must also have wafted out on the wind over great distances. The all-important bellringer is commemorated on the capital of a

Fig. 7. All Saints' Church, High Bray, Devon, SRN 0378.

Fig. 8. St Brendan's Church Brendon, Devon, SRN 0028.

pillar near the font, his bell-rope wrapped round the column itself. The High Bray sundial is dated 1717 and bears the inscription, WB and TS Wardens (Fig. 7). It is delicately carved in slate although the traditional sun, surrounded by beams, bears a face whose narrowed eyes and bulbous nose puts one in mind of someone slightly the worse for drink.

When we reached our next port of call, St Brendan's church at Brendon, we decided at once that the dial there had been made by the same mason who made the one at High Bray. In fact, the design, although very similar, is more crudely executed but it is earlier, 1709, so maybe the craftsman had had time to practise and improve (Fig. 8). There are no initials on the Brendon dial and the face on the sunburst is much more alert with wide open eyes and a mysterious smile. This church was in the process of being lovingly cleaned and the polishers stopped to welcome us and tell us how the building had been moved to its present situation from an earlier site at Cheriton, two miles away, in 1738.

Fig. 9. Doverhay Place, Porlock, West Somerset, vertical, SRN 4341.

Fig. 10. Doverhay Place, Porlock, West Somerset, equatorial, SRN 2132.

That it was moved 'stone by stone', as the story goes, is improbable although some important and valuable items like the font, the sundial and three medieval bells were certainly brought from the old church. With this information in mind, you can imagine my interest when I found in a sketchbook, held at Somerset Record Office and date 1797, a pen and ink drawing of Brendon Church, set in a glade and shored up by tree-trunks. The artist described it as being at Millslade rather than Cheriton. Two figures stand beside the church, one named as Betty Newton, Sexton. A pencilled note refers to Parson Clements who apparently wore a much-darned black handkerchief on Sundays "to safe washing". Quite what this enigmatic remark means is not clear! And did the traveller label his drawing incorrectly? There are several unanswered questions here that need to be followed up.

From Brendon we made our way to Porlock and Doverhay Place,[2] a fine house built before the turn of the century and occupied by Captain Thomas Perkins. (It is now a guest house for Countrywide Holidays.) Here, on the front of the house is a direct south sundial, built out from the wall in a wooden frame to ensure that it faced due south (Fig. 9). It carries the date 1898/9 and is made of slate with an iron gnomon. An inscription in copperplate reads, 'Sol lucet caritas extendit omnibus'. In the garden we found an equatorial dial, its spherical bands forged in iron (Fig. 10). It was set under trees where it could not possibly catch the sun to make a shadow. Had the conifers grown to this height since the dial was put there first or did the abbreviated quotation from Robert Herrick's poem, 'To the Virgins to Make Much of Time', "Gather ye roses while ye may", imply that it had originally been positioned in the centre of the rose garden?

At the National Trust's Piles Mill Study centre at Allerford, we stopped to inspect the modern dial (Fig. 11) made in the shape of a mill-stone and given by the Minehead and West

Fig. 11. The Equatorial and horizontal sundial at Piles Mill, Allerford, near Porlock, West Somerset.

Somerset Centre of the National Trust to commemorate Sir Richard Dyke Acland's gift of the Holnicote estates to the nation in 1944. This dial has been specifically designed for use by students visiting the Study Centre.

It was too late to go on to Timberscombe and Old Cleeve where dials are recorded. They will have to wait for another day. And if anyone knows of other sundials in the Exmoor area, I should be happy to hear about them.

Hilary Binding

REFERENCE and NOTE

1. John Foad: 'Newly reported dials, 2020', *BSS Bulletin*, 33(i), 10-16 (March 2021); the dial is no. 8 on pp. 11-12.
2. In more recent times, Doverhay Place, Porlock has changed hands and is now divided into a number of apartments. It may not be possible to gain access to the grounds, and there is no certainty that the two sundials referred to by Hilary still exist. Perhaps that is another reason for going on safari to keep the BSS Fixed Dial Register up-to-date.

david@davidbrownsundials.com

READER'S LETTER

Does This Count as a Wonky Sundial?

Fig. 1 shows a photograph of a sundial near the Imperial War Museum in London which my stepdaughter Lisa took last year, when she visited the IWM with our two granddaughters in between the lockdowns. Knowing my interest in sundials, they always take pictures of any dials they encounter, for Grandpa. Recently I had another look at this picture.

At first sight, the sundial looks 'wrong'. It took me a while to realise why. The dial consists of lines on the ground, radiating from the gnomon, which then 'climb' up the wall. The shadow of the gnomon 'bends' at the wall although the lines on the wall are vertical. The lines on the wall, if they are intended to be a continuation of the hour lines on the ground, should, of course, come to a point where the gnomon would end if it were long enough to reach the wall. This is a bit like a giant diptych pocket dial! Thus, I at first thought that we had another 'wonky sundial' to add to those about which I have written previously in the *Bulletin*.[1] To test my theory, I made a model of the dial, in true 'Blue Peter' fashion, to see what would happen if I shone a torch to represent the sun (Fig. 2). The shadow on the model looks similar to that on the actual dial (Lisa took the picture facing due north, so the polar-oriented gnomon appears as a vertical line).

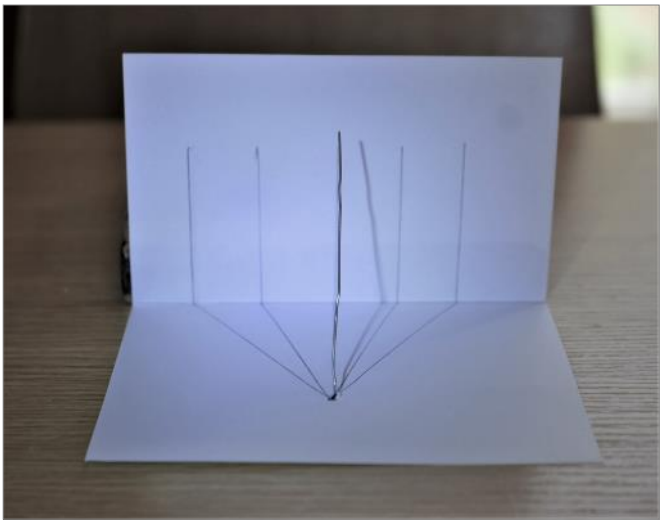


Fig. 2. My model of the sundial.

Fig. 1. The sundial at Geraldine Mary Harmsworth Park, near the Imperial War Museum. Photo: Lisa Chilton.

An alternative hypothesis is that the 'lines' on the wall (actually poles fastened to the wall by some sort of clip) are simply there to mark the ends of the hour lines and are not intended to be used to denote the time.

I looked in the Fixed Dial Register 2020 but could not find the IWM dial. Thinking that I had discovered not only a 'new' sundial, but a wonky one at that, I wrote to John Foad, the BSS Registrar. John very kindly informed me that he had included the dial as No. 18 in a list of newly reported dials in the March 2021 *Bulletin*.[2] Deep embarrassment – I had missed page 14 when reading the Spring *Bulletin*. The dial appears in the Register as SRN 8156 at Geraldine Mary Harmsworth Park, Southwark, the park which surrounds the Museum. So, I was looking in the Register for the wrong location.

REFERENCES

1. John Wilson: 'Wonky sundials. Our heritage – safe in their hands?', *BSS Bulletin,* 32(i), 10-11 (March 2020).
2. John Foad: 'Newly reported dials, 2020', *BSS Bulletin,* 33(i), 10-16 (March 2021).

John Wilson
librarian@sundialsoc.org.uk

Afternote:

Further investigation has revealed that this sundial, which until recently featured in a list of dials known about but not yet described, was in fact first reported in 2001; it appears in the Register as SRN 4743.