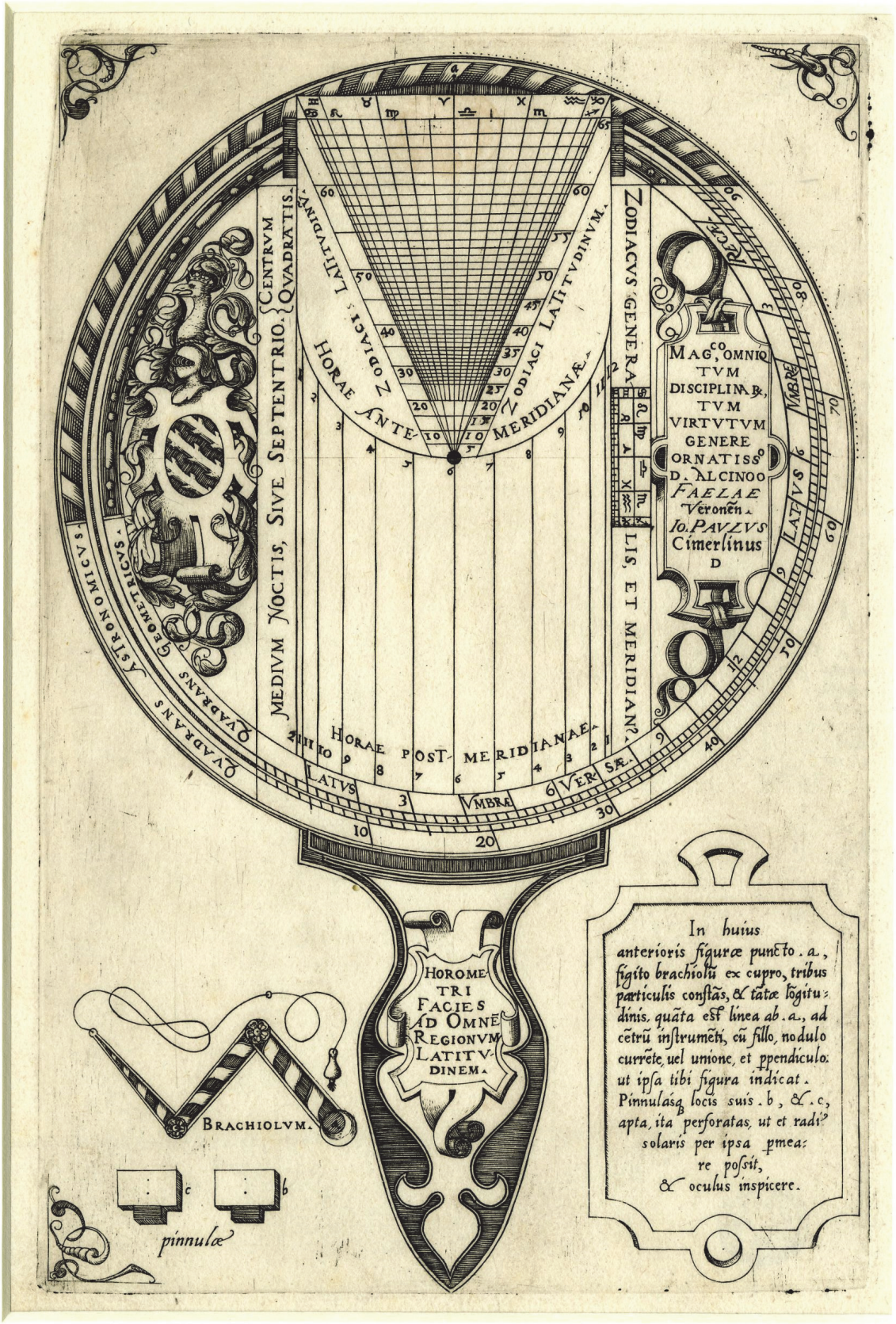
The British Sundial Society
BULLETIN

Silver Jubilee edition

VOLUME 26(ii)
June 2014



A print of a rather decorative Regiomontanus universal altitude dial with a dedication on the right "Magco omniqtum / Aldindo Faelae / Veronen / Io Pavlvs / Cimerlinus". Alcinoo Faella was a prominent Veronese mathematician. Together with a second face featuring a nocturnal, it was published by Bolognino Zaltieri in 1569. The two prints could be cut out and stuck on a board to form a useful, and relatively cheap, working instrument. Courtesy of the Trustees of the British Museum, reg. no. 1912,0319.44.

Front cover: *The reclining/declining dial delineated by John Carmichael for the Innovation Corporate Center just north of Tucson, USA. See the article on page 16 for more details. Photo: Douglas Bateman.*

Back cover: *Part of the scultural sundial sited at the Robert Burns Birthplace Museum, Alloway, by Tim Chalk. The leaning figure of Burns acts as the gnomon and casts his shadow across three link poems. See the article on page 22 for more details. Photo: Tim Chalk.*

Designed by J. Davis. Printed by The Lavenham Press Ltd., Lavenham, 01787 247436

BULLETIN
OF THE BRITISH SUNDIAL SOCIETY

ISDN 0958-4315

VOLUME 26(ii) - June 2014

CONTENTS

EDITORIAL

To celebrate the 25th anniversary of the BSS, this time we have something of a 'special issue' with a general theme of 'decoration on sundials'. Sundials, as we know, combine both the arts and sciences, often in the same dial. For this issue, though, we have banished the equations which lie behind these precision instruments and concentrated on the ways in which they can be made decorative. We thank the busy dialmakers who have taken the time to write up their thoughts on the subject.

Most Enjoyed Article for 2013

The prize for the 'Most Enjoyed Article' for 2013, voted for by the members, has been awarded to Dennis Cowan for his series of articles '*In the footsteps of Thomas Ross*'. In 2012, Dennis finished runner-up by a single vote but this time he won by a clear margin. We thank him for his magnificent photographs, for his dedication in searching out long-lost dials, and for bringing this part of Scotland's unique heritage of dials to our notice. Whichever way September's independence referendum goes, we hope he will continue!

In second place was Roger Bowling's article on Blackamoor supporters, just one point ahead of joint third from Gautschy & Bickel's article on an ancient Egyptian dial and Mike Cowham's piece on Cross dials. All these articles were major pieces involving much background research. But a total of 40 articles (a significant fraction of the total number published) received at least one vote and many of these were quite short items, often of less than a page. Thus it seems that the mix of 'learned journal' articles and more lightweight pieces remains popular.

Articles from all our regular contributors featured well in the list but so did several from first-time writers: I hope this will be an encouragement for more people to make a contribution, even if it is just a photograph with an explanatory caption.

I continue to be surprised at the range of dialling articles!

USE OR ORNAMENT?

HARRIET JAMES

Today's diallists often refer to the functional hour lines on a sundial as 'delineation' and other elements (mottoes, dates *etc*.) as 'furniture'. The etymology of these words may throw some light on the origins of their use in dialling.

'Delineation' (noun) and 'delineate' (verb) appeared in English from c. 1550.[1] They were derived from the Latin '*delineare*' to sketch/draw/mark out. '*Lineare*' means to draw lines and the prefix 'de' can mean 'completely', 'down to the bottom', 'away' or 'from'. Some diallists signed their work with their name followed by '*fecit*' ('made it'), '*sculpsit*' ('carved/engraved/inscribed it'), '*invenit*'('invented/contrived it/found it out') and some used '*delineavit*'('marked it out').

Robert Hegge's essay on dialling written in 1624/5 has a description and drawing of Nicolaus Kratzer's multiple dial (made about 1521) in the orchard at Corpus Christi College, Oxford. Hegge described the dial as a "beautifull Alter (on which Art hath sacrific'd such varietie of invention to the Deitie of the Sun)." He added a Latin inscription to his drawing: "*Hunc Horoscopum Nicolaus Kratcher Collegii Corp. Xri olim socius delineavit.*" ('Nicolaus Kratzer, sometime Fellow of Corpus Christi College, marked out this dial.')[2] Hegge gives a detailed description of the complex dial faces but he does not use the word 'furniture'.

'Furniture' appeared in English from the 15th century and seems to come from the Middle French '*fourniture*', from the verb '*fournir*', to complete, fulfil, or provide. At that time 'to furnish' in English meant to fill, occupy or provision a garrison. The sense of furniture also being chairs, tables *etc*. is peculiar to English from about 1570. Most other European languages derive their words for household items from the Latin 'mobile', meaning 'moveable'.

In the days of typesetting with moveable type, 'furniture' meant pieces of wood placed round or between type to make blank spaces such as margins on the printed page. I have not been able to trace the origins of this use of the word in printing but it is possible that the use of 'furniture' in dialling came from printing since many dial makers and writers on dialling were also printers and engravers.[4] Thomas Fale, one of the earliest diallists writing in English ('*Horologiographia*', 1593) had a co-author Jodocus Hondius who drew diagrams for him. He was a Flemish engraver and cartographer who came to work in London in 1584.

The earliest reference to 'furniture' in an English dialling book that I can find is in John Brown's '*Horologiographia*' (1671). Chapter VIII is entitled "To Furnish any Dial with the usual Mathematical Ornaments by the Triangular Quadrant, as parallels of the Suns [sic] declination, or the Suns place, or the length of the Day, to find the Horizontal and Virtical [sic] Lines, and Points, to draw the Azimuths and Almicanters, the Jewish, Italian & Babylonish Hours, 12 Houses on any Plain before mentioned."

William Leybourn's book '*Dialing*' of 1682 is subtitled '*Plain, Concave, Convex, Projective, Reflective, Refractive SHEWING, How to make such DIALS, and adorn them with all useful FURNITURE,*' Leybourn says in the introduction to this book that he is reusing some material he contributed to Thomas Stirrup's earlier '*Dialing*' (1659) written in English, from Kirkerus (possibly Althanasius Kircher, a Jesuit polymath whose '*Ars Magna Lucis et Umbrae*' (1646) written in Latin contains chapters on dialling) [5] and from a Latin manuscript by Samuel Foster of 1640. It is possible that 'furniture' is a translation of a word used in Latin texts.

Brown and Leybourn clearly thought of 'furniture' as mathematical elements added to the basic equal hour lines of a dial. Leybourn's chapter 'Of the Furniture with which Sundials may be Beautified' describes a set of additions to the basic hour lines, similar to Brown's: "As Lines may be described on all sorts of Plains, which by the shadow of a Stile or Axis will shew up the Dial-Plaine the true Hour of the Day : So also upon such Plains may other Lines be described that have relation to the Sun's Course, which by the shadow of an Apex (or Point in that Axis) shall trace out, and discover upon the Plain, many useful and necessary Conclusions – As to show the Time of the Year – The Rising and the Setting of the Sun – The Length of the Day and Night – The Azimuth or point of the Mariners Compass upon which the Sun at any time of Day is – The Almicanther, or Circle of the Sun's Azimuth whereby the proportion any subject bears to its shadow is discovered – The Babylonish, Italian and Jewish (or Unequal) hours – The Sign of the Zodiac in the Meridian, with those Ascending and Descending – And the Circles of Position, discovering in which of the Twelve Celestial Houses the Sun at any time of Day is in etc." [6]

Leybourn goes on to say, "..the Furniture of dials may be easily inserted… should any man desire it. Though to speak

my own judgement, I think these kind of additions rather for ornament than for use. First because they are in their own nature difficult to describe…Secondly because when they are drawn, every Astrolabe will resolve the problems more truly than they will. I might add a third Reason, because the multitude of Lines often hinders those that are not used to them, to tell the Hours of the day, which is the chief use of Sundials…" [7]

In spite of Leybourn's reservations, dials with such elaborate furniture seem to have stayed in fashion for a while. John Holwell's '*Clavis Horologiae*' (1712) which contains an illustration of "An Horizontall Dial with its Furniture". Here the basic hourline layout is overlaid with a great web of Babylonian and Italian hours and diurnal arches.

A slate dial by Jno. Berry at the church of St Michael & All Angels, Marwood, Devon dated 1762 is an extant example of paper-based dialling theory put into practice. The dial has a set of declination curves ('diurnal arches') to show the number of hours of daylight and the date by zodiac signs – see Fig. 1. It also indicates the time of noon at eleven different places around the world and the azimuth of the sun.

Leybourn makes no mention of adding non-mathematical ornament to a dial face. He says he is not a craftsman. However, in the final chapter of the book his description of the King's glass multiple dial in the Privy Garden at Whitehall (set up in 1669) shows that there was elaborate decoration on sundials. There were gnomons in the shape of a lion's paw or unicorn's horn, and paintings of the King holding a sceptre and the Queen holding a flower inside a glass hemispherical dial.

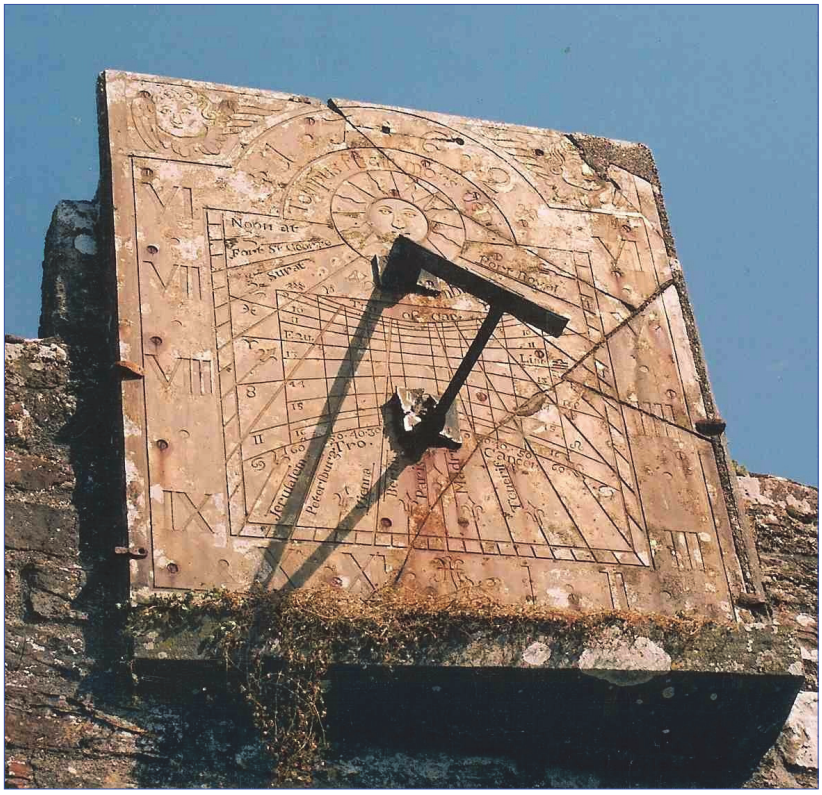


Fig. 1. Jno Berry's dial at Marwood, Devon (1762).

Going back a century, the Pelican multiple dial designed by Charles Turnbull at Corpus Christi Oxford (begun in 1579) is a colourful mixture of furniture and non-functional ornament. Painted, gilded, and partly carved onto a round stone column, it is topped with a rectangular block, a pyramid, a sphere and a Pelican sculpture (symbolic of the College's dedication to the body of Christ). It was probably inspired by an earlier multiple dial also in the form of a column, block and sphere made by Kratzer with a stonemason called William East in 1523. It was put up outside St. Mary's Church in the High Street, Oxford and removed around 1744.[8,9]

The painted furniture common to both dials included Italian and Babylonian hours, seasonal and equinoctial hour lines, lines for the altitude and azimuth of the sun and declination curves to indicate the date. On the Pelican dial parts of the elaborately carved coats of arms form projecting nodi for declination curves on the dials below. (See Fig. 2.) There are four Latin mottoes and a date running round the cornice.

From contemporary descriptions the colours used to paint dials in the 16th and 17th centuries included blues, blacks, greens and reds on a white background. John Smith's '*The Art of Painting*' (1676) and '*The Art of painting in Oyl*' (1687) have detailed instructions for making and applying paint to sundials. He recommends books by Stirrup,

Fig. 2. The Pelican dial at Corpus showing painted furniture and nodi projecting from the bottom of each of the stone carved coats of arms.

Collins and Leybourn for calculating and laying out the dial and details which colours and colour combinations are preferable for painting them. He recommends a basic colour scheme of a white background, black figures and vermillion hour lines but "..if you intend to bestow Curiosity, then you may use such other colours as your fancy shall direct you may be the most suitable to your design for which purpose your care must be to observe the Ornament and Fashion of whatsoever good Dial you meet with, and to register your Observations: This will be a great help to your fancy on all occasions." He suggests black paint made from lamp soot for figures (numerals) and moulding round a dial and Smalt ("A lovely Blew"), Blew Bice (a paler blue) or Crimson lake ("..a Rich Colour…often used in Ornaments of dials") for a background to gold figures in the margin of a dial. Also mentioned are "indico" [sic] (dark blue) and "burnt umber" for making shadows on numerals *etc*., 'verdigrease' (a bluey green) and "pink yellow" for mixing different greens, "yellow oaker" for making gold size (a varnish onto which gold leaf is applied) and "Spanish brown" (for priming wooden dials). He says gold or silver leaf can be applied after painting and the silver overpainted with a varnish to give the effect of gold leaf and prevent tarnishing in the weather. "And if you please in the margin at the top of your Playne you may put the date of the year, your Name or some Divine sentence, as is usual in things of this nature…"

It seems that Smith was trying to bridge the gap between the gentlemen who could calculate and draw a dial and the craftsmen who had the practical skills to make one. In the introduction to '*The Art of painting*' he says, "Dialling being...plainly and familiarly communicated to the world, it's easy for an Industrious and Ingenious spirit to attain the knowledge of it, so far as to be able to draw his draft, but then wanting the knowledge of painting .... he hath learnt but half his Art". He hopes his "work may render our Ingenious Artist a Compleat Diallist...which I have observed not one in twenty that are otherwise knowing in this Art, can do."

Apart from colour, Smith doesn't say much about other possible decorations for sundials. Stained glass sundials of the 16th and 17th centuries are rich in colour, but also in symbolism and non-mathematical ornament. Those of the 16th century are mostly German in origin. In addition to equal hour lines, there is some 'furniture' in Leybourn's sense of the word consisting of declination curves and day and night lengths. Decorative symbols include the creatures of the zodiac, a sun with and without a face at the origin of the hour lines, coats of arms, cherubs and globes. Other non-mathematical decoration includes inscriptions, dates, patterned frames made to look like carved masonry, knotwork, scrollwork and ribbonwork, the latter usually yellow or white, carrying black numerals for the hours. Musical instruments, figures (including the possible self-portrait of one dial maker), landscapes and theatrical scenes are also used.

The extant 17th century stained glass dials are mostly English in origin. Most have a rectangular or round yellow chapter 'ring' with black numerals. Decorative symbols used include complete coats of arms or elements taken from them, houseflies, fruit flies, butterflies, birds, flowers, shells, hourglasses with wings, a skull and crossbones, a bejewelled crown, a map of Europe and North Africa, a figure of Christ, cupid, putti, scenes of the four seasons, old father time, a ship, ribbonwork, scrollwork, volutes, suns, cross pattées marking noon, portraits, busts, dates and mottoes.[10]

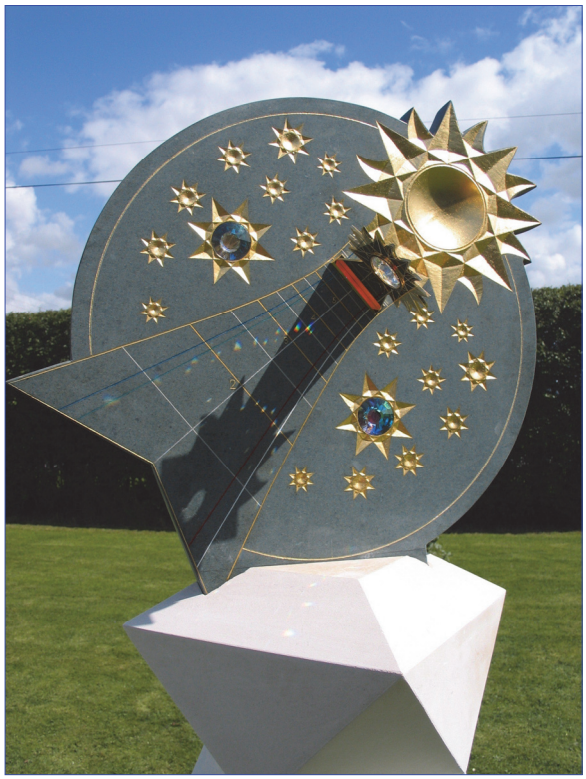


Fig. 3. Prisms on a west-facing dial. The oval spot of light indicates the time.

Fig. 4. The east face is in shadow but the prism is casting spectra into areas of shadow.

More than three centuries on, diallists are still inspired by the past and challenged to find new ways of making dials which combine legible and accurate function with eye-catching design. The great variety of available materials and technologies such as laser and waterjet cutting of materials, computer aided design and 3D printing open up all sorts of new possibilities.

Luckily, I have had the opportunity to make sundials for some clients who are happy to experiment with new ideas, though more often than not it turns out that there is nothing new under the sun.

One customer has prisms hanging in the kitchen window so we decided to add a crystal prism to the gnomons of a sundial with due east and west faces – Figs 3 & 4. The sun shines through a flat circular section of the prism casting a spot of light onto the hourlines and declination curves, as well as producing spectra and areas of reflected light which fall onto areas of shadow on the dial face, column and surrounding grass.

I went on to make a white marble sun/moondial for the same customer which also had prisms set into the crescent-shaped gnomon – Figs 5 & 6. When one looks into the prism by full moonlight an eerie, reddish spectrum is visible.

Fig. 5. Moonlight through trees catches the prisms.

Fig. 6. The shadow of the gnomon shows up on the white marble surface by moonlight.

Fig. 7. Crystals with a reflective backing set into slate.

A third sundial for the same customer is mostly his own design, continuing the prism theme with mirror-backed crystals set into the slate and a prism set into a gilded brass gnomon – Fig. 7. He is pleased with the effect as the mirror-backed crystals flash blue and green across the garden. A visiting male pheasant is also pleased and has been known to display in front of the dial!

Another sun/moondial (Fig. 8a & b) I have made (in collaboration with Malcolm Stevenson of Lynchet Engineering[11]) in etched brass has a central prism set into the gnomon and

Fig. 8a. Sun/moondial made in etched brass inset with glass prisms and spheres.

Fig. 8b. Sun/moondial—close-up of the scales.

Fig. 9. Butterfly gnomon.

Fig. 10. Celebration lunch on installation of the tortoise dial.

Fig. 11 (below). Scale of dates for a children's analemmatic dial.

another on top. The owner lives high on a hill in Gloucestershire looking across a deep valley to some woods on the horizon where she observes the moon rising. The etched detail on the dial celebrates her interest in Welsh mythology, Celtic festivals, herbalism *etc*. The sundial scale is a simple horizontal one with an outer moondial scale and transit table. The etching is filled with a UV paint which glows in the dark so that there are various optical effects to observe depending on the level of light.

Another dial uses a butterfly shape as the gnomon. A 40-year old tortoise called Geraldine from Hampstead is celebrated on another dial – see Figs 9 & 10.

The central date scales on analemmatic 'walk-on' sundials provide a good opportunity for children to help design a decorative sundial for their school (Fig. 11).

In spite of attempts at making something original, I am still following many of the tried and tested painting techniques, colour schemes and materials described by commentators and diallists of the 16th and 17th centuries (Fig. 12). The combined mathematical, engineering, artistic and manual skills so generously shared by members of the BSS and other sundial societies would hopefully satisfy some of John Smith's desire for *Compleat Diallists*.

ACKNOWLEDGEMENTS

Dr & Mrs P. Bristow; John Davis; Eddie Mizzi; Fred Sawyer III; Malcolm Stevenson; Laura Weill (Collection Administrations Assistant, Typography and Graphic Communication, University of Reading).

Fig. 12. A new painted and gilded stone sundial in traditional style and materials.

REFERENCES & NOTES

1. *Etymonline.com*
2. P. Pattenden: *Sundials at an Oxford College*, Roman Books, Oxford (1979) pp. 21–24.
3. Oxford English Dictionary Online and *Encyclopaedia Britannica* 11th Edition (1911)
4. E.C. Bigmore & C.W.H. Wyman (compilers): *Bibliography of Printing,* B. Quaritch, London (1880).
5. An online version of Kircher's '*Ars Magna Lucis et Umbrae*' is available: *http://echo.mpiwg-berlin.mpg.de/ECHOdocuView?mode=imagepath&url=/mpiwg/online/permanent/einstein_exhibition/sources/5G6UYVGT/pageimg&viewMode=images*
6. W. Leybourn: '*Dialling*', London (1682) p. 111.
7. W. Leybourn: '*Dialling*', London (1682) p. 300.
8. P. Pattenden: *Sundials at an Oxford College*, Roman Books, Oxford (1979) pp. 17–20.
9. R.T. Gunther: *Early Science in Oxford Vol II,* facsimile Dawsons, London (1967) p. 103.
10. John Carmichael's photographic archive of stained glass dials is at *www.advanceassociates.com/Sundials/Stained_Glass/sundials_SGS1.html*
11. *www.lynchet.co.uk*

enquiries@sunnydials.co.uk

A DECORATIVE TILE DIAL

No, this isn't an image of the Editor wearing a flowerpot but a pair of tiles with an imaginative image of an ancient Greek astronomer measuring the world! Perhaps it's Eratosthenes or Archimedes? The tiles make up a 12″ square and are nicely drawn and fired.

The dial around the outside is clearly supposed to be a vertical south one but can't possibly be properly delineated as the VI–VI hour-lines droop below the horizontal. This is rather a shame as all the hour-lines do truly point to the origin in the centre of the sun.

The challenge to readers is to think of an orientation of the dial, or an unusual definition of 'hour' which would allow me to declare that the dial was at least approximately right and to give it a place of honour.

The tiles have obviously been used somewhere before – though probably without a gnomon – as they were bought secondhand and have a layer of cement on the back. There is no provenance at all so I don't know where they were made—it has been suggested that they are c. 1880.

The smaller picture shows another pair of tiles clearly from the same source, offered for sale recently. Notice the same delineation and the strange reversal of the broad strokes of the numerals.

John Davis

THE DECORATIVE ARTS OF THE PORTABLE DIALMAKER

MIKE COWHAM

Portable dials are particularly rich in their decoration. Most were made for rich clients who expected a decorative as well as a functional dial. Many were made of precious metals which also enhanced their appearance. In this article I have chosen a few of these dials to show the lengths to which some makers went to make their dials attractive.

Most dials were engraved and the maker would sometimes show off his skills on spare areas of a dial. The first shows the engraving on a quadrant by "Nathanaell Heighemore, A.D. 1633". Here he has filled virtually all of the blank areas of the plate with images. There is probably a story told here but it could just show the hobbies of his customer. He shows (Figs 1 & 2) two hunting scenes, a dog chasing a stag that has an arrow in its side and a dog chasing a rabbit. At the edge is a fleet of ships (Fig. 3). Notice also the border decoration of flowers to the left of the stag. Perhaps the customer was interested in hunting and lived close to the sea? On the other side of the quadrant is a scene (Fig. 4) showing an instrument maker at his workbench, who is probably being asked to sharpen a sword for the soldier who is there. On the other corner (Fig. 5) are some wild animals, a stag, an elephant and a lion. Would the engraver have ever seen a lion or elephant in 1633? In the centre is a woman playing a small harp and on the right is a mermaid playing another musical instrument (perhaps a mandolin?).

Figs. 1 to 3. Scenes engraved on a quadrant.

Figs. 4 & 5. Scenes engraved on a quadrant.

Figs 6 & 7. Decorative lettering by Butterfield.

A different form of decoration on dials that was frequently used was in the engraving of text, particularly names. Figures 6 & 7 show the signature on a dial by Michael Butterfield, an Englishman working in Paris from about 1677. His signature on dials was generally quite decorative but the one shown here is particularly fancy with foliage 'sprouting' from his letters.

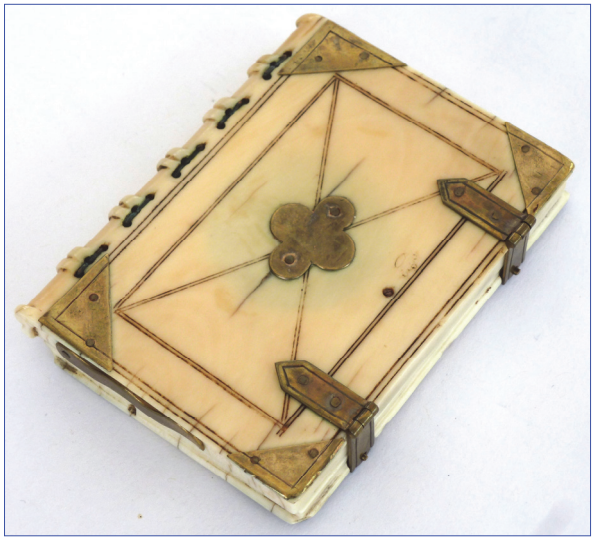
Fig 8. The 'Green Man' above a shield on the Dieppe dial by Nicholas Crucefix.

Fig. 9. An attractive red mottled finish on the inside of the magnetic azimuth dial by Nicholas Crucefix

Engraving was also done on ivory. This was generally quite shallow as deep incisions carried the risk of the ivory chipping, particularly as it dried out with age. Many ivory dials are attractively engraved, much of the engraving being filled with coloured waxes. Usually these colours have deteriorated with age and only give us an idea of how the dials would have originally looked.

The first illustration (Figs 8 & 9) is an ivory dial that is signed "Nicolas Crucefix ADieppe Fecit". He was working around 1670. Its engraving appears to be just filled with black wax. However, the face on it is particularly interesting, appearing to represent some form of 'beast' or more probably 'The Green Man'.[1] On the inside faces of the diptych there is an attractive mottled pattern which is now brown but was probably red when it was first made. This pattern seems to have been made by using an acid, the white areas being protected by being masked with wax, probably splattered on its surface from a stiff bristled brush.

Another form of decoration sometimes used may be seen (Figs 10, 11 & 12) on the Nuremberg ivory diptych dial by



Figs 10 & 11. Book form dial by Paul Reinman and its inside.

Fig 12. Decorative Roman numerals VII, VIII *and* IX *and adjacent delicate patterns on the Reinman dial.*

"PAVLVS REINMAN NORIMBERG 1607". Here he has made the outside of the closed diptych look just like a closed book. Who would ever think that it was the outside of a dial? Its inside, however, is engraved with both vertical and horizontal dials. The Roman numerals on the vertical dial are particularly elaborate and the engraved patterning around both dials is delicately done.

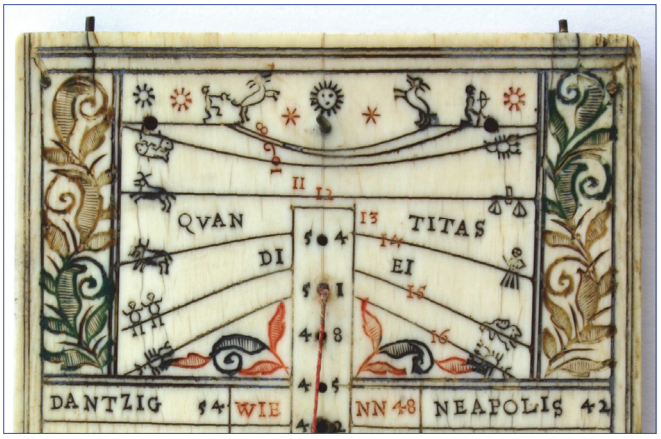


Fig 14. Detail of decoration on the Miller dial.

Often Nuremberg makers added coloured decoration as did Lienhart Miller on the diptych dial shown in Figures 13 & 14. The finest decoration is in the border around the small dial, operating from a small pin gnomon above, showing the various zodiac signs. Here he has used red and green leaves. The zodiac signs too are attractively portrayed.

Some ivory dials had pictures on them. Those illustrated in Figures 15 & 16 have mostly flowers on their lids and similar flowers on their internal vertical faces. Those flowers which are protected on the inside have retained their colours better than those on the lids. These are quite small diptych dials with just a horizontal dial operating from a string gnomon. Although similar in some ways to Nuremberg dials it seems that these probably come from Austria, which is the latitude (46° N) for which they are made. From their

Fig. 13. Ivory diptych dial by Lienhart Miller, 1622.

Fig. 15. Decoration to lids of ivory diptych flower dials.

Fig. 16. Underside of lids of the flower dials in Fig. 15.

compass declinations they may be dated to around 1715. About 15 have so far been seen in various collections but we do not know who made them. Two are known that are signed with initials H*G but this man has yet to be traced. As decorative items they are really attractive and may be dials that have been made for ladies to carry. They are small, simple and have no complicated scales. Although flowers are generally used as their decoration, an antelope, similar to that shown, occurs on the lids of some. One is known that shows a dog.

Figs 17 & 18. Magnetic compass dial by Porter and close-up of its face with 'Old Father Time'.

Another ivory cased magnetic compass dial (Figs 17 & 18), this time English, is signed "S. Porter Fecit, Feb^{y}. 16. 1824". It is in a fairly simple turned case but on its floating compass card is a picture of Old Father Time with his hour glass in one hand and his scythe in the other. All around its outside is a snake devouring its own tail. These symbols are a reminder of the shortness of our lives and showing the importance of time.

A wooden altitude dial in the form of a quadrant (Figs 19, 20 & 21), signed around its outside curved edge, "FAIT LE 19 AVRIL M·DCCXXV P · I · MAYNADIE", is possibly of

Figs 19, 20 & 21. Altitude dial by P.I. Maynadie with a drunken Bacchus (centre) and an angel with a figure in a coffin(?).


Figs 22 & 23. Painted pillar dial by Reiff.

Fig 24. Italian(?) vertical disc dial.

Swiss origin. It too shows some interesting images. On the reverse is a man with a dog and the word BACUS, presumably the god of wine Bacchus.[2] He is perhaps rather drunk, holding a bag in his right hand and is supporting himself against the edge of the lunar volvelle. At the top of the dial the sights are supported on the head and shoulders of an angel. Of particular intrigue is the figure behind the angel which appears to be a person (woman?) in a bed or perhaps in a coffin and the body is covered by a curved metal 'sheet'. These images again must carry hidden meanings.

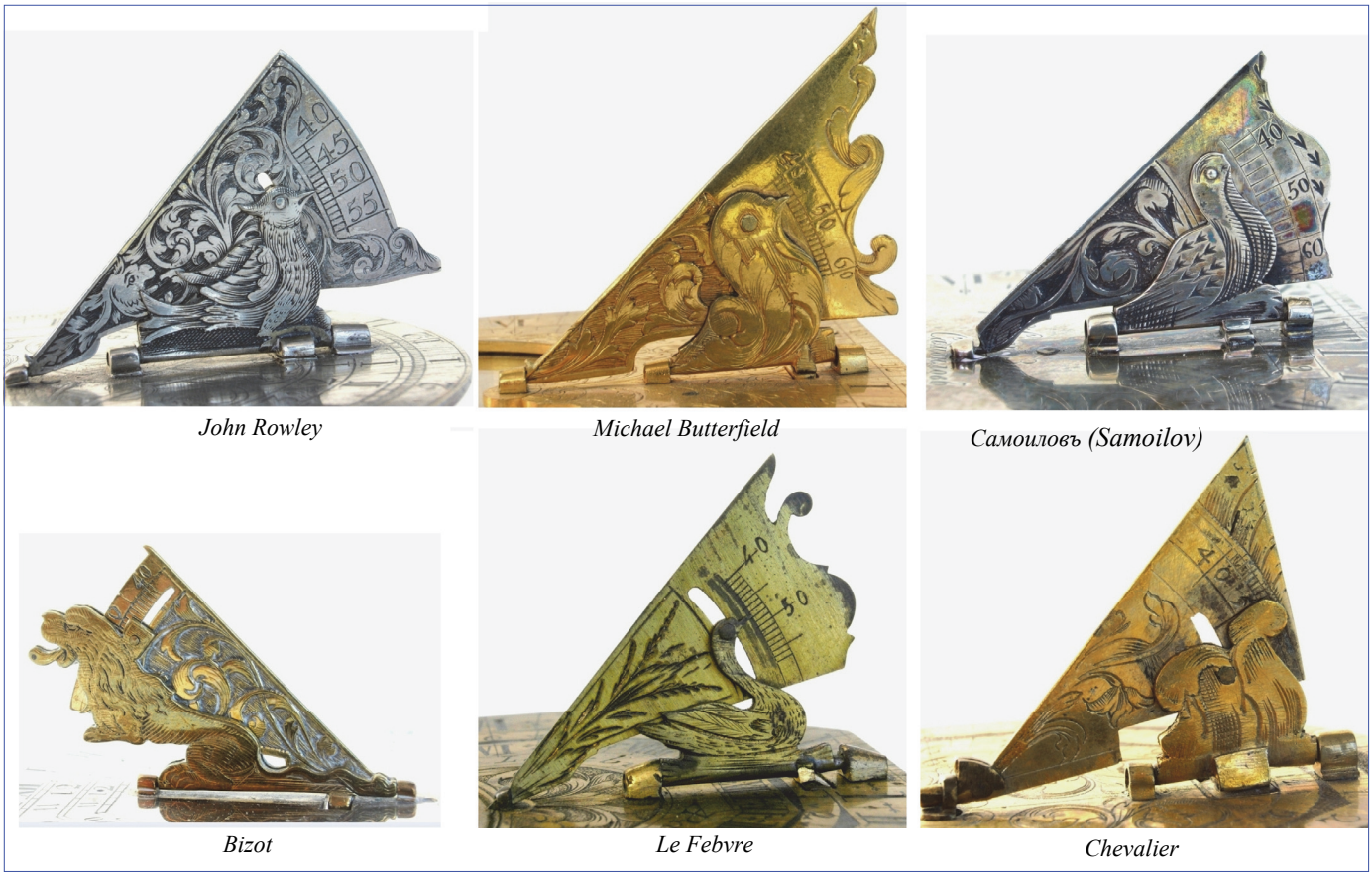


Fig. 25. Gnomons from 'Butterfield' style dials.

Many dials are found that are painted such as the wooden pillar dial signed by *Gottfried Reiff* (Figs 22 & 23). It has an image of what appears to be a courting couple. The various lines, numerals and zodiac sigils are also hand painted.

Another attractively painted dial (Fig. 24), made around 1700, is an unsigned vertical disc dial which shows a large church or cathedral. From its style, the church, and hence the dial, is probably Italian. The church sits close to a river and it could almost certainly be identified today from this image. The scene is reminiscent of Florence, but the buildings and river are not in their correct relative positions.

The dials generally known as 'Butterfield dials' are named after Michael Butterfield. He probably did not make the first of these but he made them in relatively large numbers and so the design became named after him. They are attractive dials, usually octagonal or oval with three or four chapter rings for different latitudes. Many are in silver, some delicately gilt with very few in the more basic metal, brass. Perhaps the most decorative part of these dials are their gnomons – see Fig. 25. These generally have a bird acting as the supporter whose beak is pointing at the latitude scale on the hinged gnomon. Various birds are seen on these dials including a swan on a dial by Le Febvre and even a lion on a dial by Bizot. Dials like that of Chevalier where just a leaf is used are very uncommon. Another attractive feature of many of these Butterfield dials is the engraving applied to the underside of their compass bowl (Figs 26 & 27). This was an ideal place for the maker to show off his engraving skills. On many of these dials this was a place for listing various towns and their latitudes but on some it was just a canvas for decoration. The engraving by John Rowley is of a particularly fine rose pattern; it is typically English.

Figs 26 & 27. Engraving under compass bowls of John Rowley (left) and Michael Butterfield (right).

French dials are generally attractively made but even those from Germany often show many delicate features. The silver gilt dial (Figs 28, 29 & 30) signed S.A.V.Z. 1643 is typically German. This maker has not been traced. On the lid of the dial is a plummet in a box which is protected on each side by a decorative grill. The outside is simply foliate but on the inside is a face, presumably that of 'The Green Man'.[1] Further fretted decoration has been applied around the edge of the horizontal base section and is held in position by small screws.

Figs 28 & 29. S.A.V.Z dial with the 'Green Man'.

Fig. 30. Lid covering the plummet of the S.A.V.Z dial.

Left, top to bottom:
Fig. 31. Crescent dial by Johann Martin.
Fig. 32. Dial by Franz Antoni Knitl of Linz, Austria.
Fig. 33. Family arms engraved on Knitl dial.
Fig. 34. Signature of Franz Antoni Knitl on dial.

Another pretty German dial (Fig. 31) is a double crescent dial by *Johann Martin In Augfspurg*, ca. 1700. Its plummet is held by an attractively fretted stand and its silvered crescent shaped gnomon is beautifully decorated. (It is just the tips that are used for indicating the time.) He has also added some fine foliate patterning to the hinged piece that supports the two semi-circular chapter rings.

The horizontal dial by Franz Antoni Knitl of Linz, Austria, is particularly well decorated (Figs 32, 33 & 34). Unlike the others shown, this is not a pocket dial, but it is still 'portable', measuring 25.7 × 20.2 cm. In its centre is a scene showing a man and a woman by a fountain with a castle in the background. The lady appears to be holding a goat or sheep. The gnomon is simply a short string supported by the bracket at the front, which has at its centre a plummet. Next to the gnomon support are engraved the arms of a family, presumably those for whom it was made. In use, the movable arm, pivoted at the centre of the dial, is rotated until the string's shadow falls onto the line scribed along its centre. The small pointer in the (bottle opener shaped) end points at the time. The signature of Knitl is found in the scrollwork of the two top corners.

Many dials made in Britain were also quite decorative. The one illustrated in Figures 35 & 36, a silver dial signed R. Glynne Fecit, ca. 1710, is a fine example. It is beautifully engraved, particularly in its compass bowl, but perhaps its most interesting feature is its gilt gnomon which depicts a bird, probably the Phoenix,[3] holding an arrow in its beak.

Fig. 35. Silver compass dial by Richard Glynne.

Fig. 36. Finely engraved gnomon on Glynne dial.

Some of the most attractive parts of portable dials are often rather small and somewhat insignificant but they all add to the overall appearance of these pocket treasures.

NOTES

1. The Green Man. A face of a man made entirely of leaves. He was a pagan figure also known for fertility. His image is commonly found across Europe in churches and also in secular places.
2. Bacchus, the Roman name of the Greek god called Dionysus. Bacchus is usually associated with wine and often drunkeness.
3. The Phoenix. A Greek mythical bird that obtains new life by rising from the ashes of its predecessors.

Mike Cowham <mike@brownsover.orangehome.co.uk>

READER'S LETTER

Blue Plaques in Derby

I was interested to see the drawing of the construction method for a horizontal sundial by John Flamsteed (1646–1719) on the inside front cover of a recent issue of the *Bulletin* (25(i), March 2013). The caption states that it is one of several pages on dial design in his personal notebooks, although we know of no actual dials.

However, I was pleased to see him acknowledged on a double horizontal dial I recorded in 2009. The dialplate was seriously corroded and the full inscription was impossible to decipher, but I was just able to read 'Flamsteed', although the image is not good enough to print here. The dial is described in the article on Henry Sephton (*BSS Bull*., 22(iii), Sept 2010) and is DH65 in the BSS monograph on *The Double Horizontal Dial* (2009).

Our Registrar reports that there are no other records of dials in the *Register* with Flamsteed's name on the dialplate. But perhaps readers may recall seeing one, or may now be reminded to look out for it?

Readers may also be interested to know that John Flamsteed has been given recognition in his home town of Derby (now a city), as the first Astronomer Royal. A blue plaque was unveiled in January 2014 and is located on a building close to Derby Cathedral. It jointly commemorates Flamsteed and the painter Joseph Wright (1734–1797). The present building is on the site of a house where Flamsteed lived until he went to London in 1675 and which he inherited from his father in 1688. The house was rebuilt and became the home of Joseph Wright ARA a century later; he lived there from 1793 until his death. Wright is probably best-known to readers as the painter of 'The Orrery' (the full title is 'A Philosopher giving that Lecture on the Orrery, in which a lamp is put in place of the Sun').

Another former resident of Derby with dialling connections has also been honoured with a blue plaque recently. John Whitehurst FRS (1713–88) is best-known as a clockmaker, engineer and geologist. He also made many fine sundials and the sophisticated dial at Eyam (SRN 0486) is sometimes attributed to him. A number of horizontal dials signed and dated by him, and by members of the Whitehurst family who succeeded him, remain in Derbyshire churchyards and country house gardens. Sadly, one of these was reported missing in February 2014, and a few years ago another was stolen from Clumber Park (NT) in Nottinghamshire. Our editor brought a replica of this to one of our Newbury days, and it is now in place at Clumber (SRN 7077). John Whitehurst had made the original for the Duke of Newcastle for his seat at Clumber Park, complete with the Duke's coat of arms.

John Whitehurst's plaque is on the site of the house and workshop he occupied from 1736 to 1764, only about two hundred metres from the Flamsteed plaque. Interestingly, Whitehurst moved from this site in 1764 to the Flamsteed house site. So the latter, now known as 27 Queen Street, was successively occupied by Flamsteed, Whitehurst, Wright and then from 1856 until very recently by John Smith and Sons' clockworks. The connections do not end here because Joseph Wright painted John Whitehurst's portrait in about 1783!

Irene Brightmer
Ashby de la Zouch

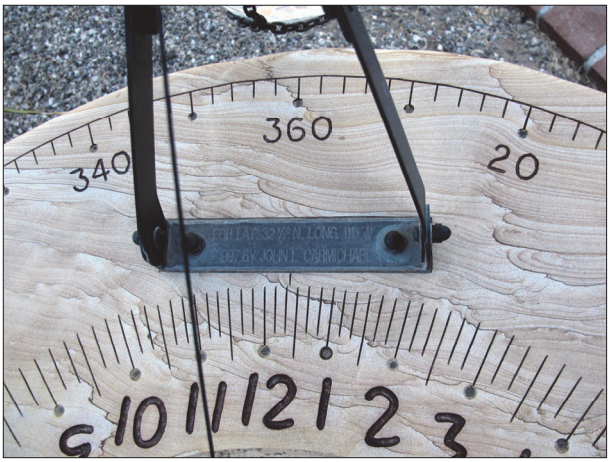
JOHN CARMICHAEL – SUNDIAL MAKER IN ARIZONA

DOUGLAS BATEMAN

What causes a career change? Why has John become such an prolific maker of sundials? Where does he get his energy from? In the space of 20 years John Carmichael has become one of the leading makers and designers of a wide variety of sundials. In addition, he is very well known to sundial enthusiasts – without exaggeration – the world over. Members will remember his lively presence at the York and Oxford conferences. For the latter he brought one of his stained glass sundials as a gift for St Anne's College!

John's original qualification was a degree in ornamental horticulture obtained at the University of Arizona in Tucson followed by eight years of work in horticulture in California. He then moved to Mexico where he set up a large greenhouse facility for the production of poinsettia and other foliage plants. This was very successful and after 12 years the partners bought him out and he returned to Tucson. He was initially without any plans until, in 1992, an artist friend gave him a copy of Mayall and Mayall.[1] He said that "this changed my life". Born into a family of teachers and artists, and interested in astronomy and nature, he was fascinated to find that it was possible to design accurate and beautiful sundials of all shapes and sizes.

Another coincidence was attending, out of interest, an annual gem and geology fair in Tucson. (Arizona is rich in minerals and semi-precious stones.) At this fair he spotted an unusual sandstone from a quarry in Utah, where the stone is streaked with dark brown lines, caused by oxides of iron, giving attractive natural curves and waves. Its popular name is 'picture-book sandstone'. It is worth noting that slate is not readily available in the western United States. Taking a flat slab and the text book, where to begin? John's first task was to take his father's Second World War US Navy log tables and teach himself the necessary trigonometry for calculating, the hard way, the hour angles for given latitudes, *etc*. His first commission was in 1994 for a horizontal sundial with a stranded cable string gnomon and other examples were shown at art fairs and garden centres. He found that what started as a hobby quickly turned into a business.



Figs 1–3. The 'primary' Carmichael design with a taut string gnomon. The dial is enhanced by the natural decorative patterning in the sandstone and is unconventional (to European eyes) in that the noon line is not due south, thus incorporating the longitude correction. The caption on the style brace frame reads: For Lat. 32½°N, Long. 111°W, 1997 John L Carmichael.

John Carmichael

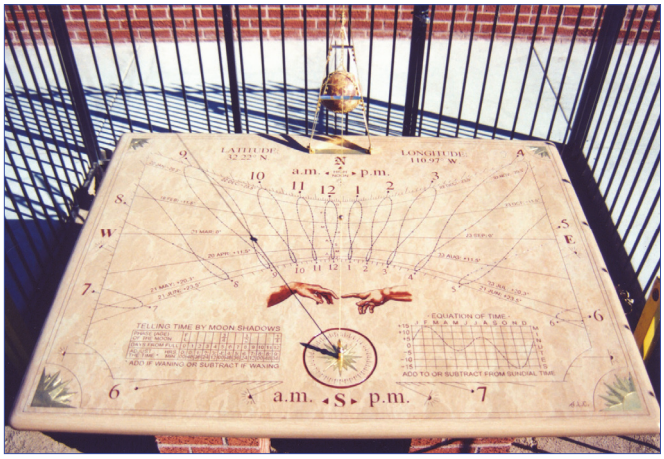


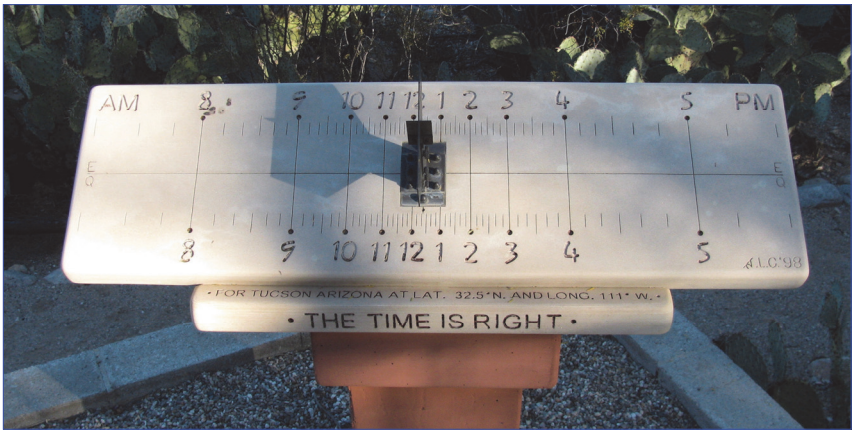
Fig. 4. A horizontal 'heliochronometer' outside the Flandrau Planetarium, Tucson, installed in 2001. Again, the noon line is offset to incorporate the (large) longitude correction.

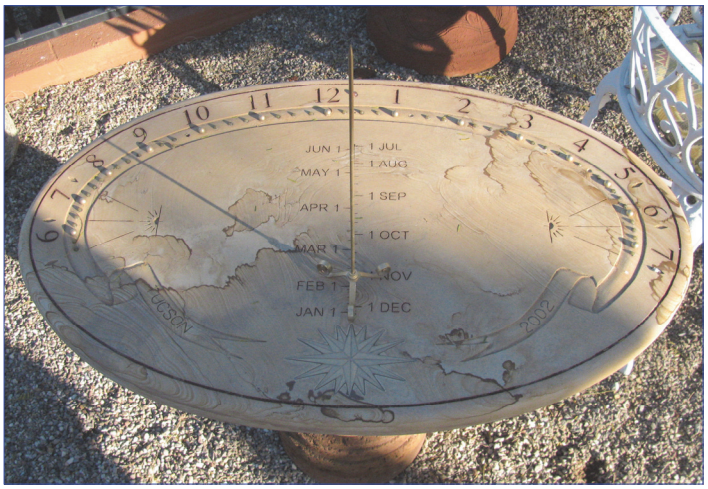
Figures 1–3 show what I would call the primary Carmichael sundial design. The most obvious feature is the 'string' gnomon held at the correct angle with a 'style brace' and counterweight. This enables the whole dial to seen in one piece, without the obstruction caused by a traditional gnomon. Furthermore, the shadow of the 'string' (actually a stranded brass cable) makes it clear where to read the time. The other obvious feature is that the gnomon starts at the geometric centre of the dial plate. One might argue that this is a less efficient use of the plate from a time-telling point of view, but it allows clarity and plenty of room for artwork on the south side of the dial. Such dials are quite large and John usually works to a standard 26 inch diameter. In 1997 he obtained a copyright for this design of gnomon.

The counterweight can be any object chosen by the customer, most commonly a local stone. However, John does not recommend this type of dial where children are around, and on a tour of dials in the Tucson area, we found that one of his dials outside the planetarium appeared to be damaged. On inspection it was obvious that a long arm of a university student had reached through some protective railings and unhooked the counterweight. Although the style frame had collapsed on the dial, it was a simple matter of re-hooking the weight. Figure 4 shows the dial shortly after installation. This dial, with its analemma at each hour, represents a step change in design because Mayall and Mayall does not give sufficient detail to make such a complex dial. In other words, a move forward from the log tables to software that encompasses all manner of dials. The packages used are Shadows Pro by François Blateyron, and ZW2000 (also called Zonwvlak) by Fer J. de Vries. Both are used, one as check against the other – not in case one gives different answers, but a check of inputting the parameters correctly!

The first step in a construction is to prepare the stone dial plate. John is self-taught and uses diamond saws to give the main shape and outline. Water is needed to cool the diamond saw and the porous sandstone absorbs a great deal; the stone is then set on one side to allow it to dry in the hot dry atmosphere of Arizona. Preparation of the design uses modern software to export into DeltaCAD; the artwork may be refined to produce a PDF file for a commercial printer to give a full size prints on paper. The stone is then dressed with a water-soluble adhesive to receive the print ready for engraving through the paper template. The favoured tool for the engraving is a Foredom motor and flexible drive shaft with diamond burrs, see Figs 5 and 6. Once the design has been cut through the stone and surplus paper and adhesive washed off, the stone is dried again. The numerals and markings are painted before sealing with several layers of varnish. Replying to a question about sandstone and possible frost damage, John said that the sealing is designed to prevent water entering cracks, and that dials have been installed in Vermont and Canada with no adverse effects. On another practical matter, John remarked that on early dials the paint was subject to fading in the harsh Arizonan

Figs 5 & 6. Laying out the design in the clean workshop (left) , and work-in-progress in the covered stone work area (right).





Figs 7 & 8. Polar (above) and analemmatic (below) dials.

was the cupola cube dial on the roof of John's house, Fig. 10.

On the other hand, dramatic and colourful examples, such as in Figs 11 & 12, may be seen on the relevant website, more of which later. This particular dial clearly shows the 'displacement' of the numerals to incorporate longitude correction. In the British Isles the majority of the population is never more than a few degrees from the Greenwich meridian and noon on a dial is almost invariably exactly due south, and equation of time graphs usually include the longitude correction. In contrast, in large continents where the population can be spread across a whole time zone of 15°, then even for Tucson, about 111°W, the hour markings may be displaced to incorporate the longitude correction. This avoids having the equation of time graph with significant 'shifts', which for Tucson would be an added 24 minutes. (The centre of the Mountain Central Time zone is 105°W.) It may be a matter of choice of which method to use, and offset numerals are preferred by many of John's customers.

Another change of emphasis giving yet more prospects of artistic dials are stained glass dials. John attended the BSS conference in York in 2001 where we saw two dials by

sunlight and that he has recently located a supplier of a more colour-fast paint. Two more good examples of the stone dials are shown in Figs 7 and 8.

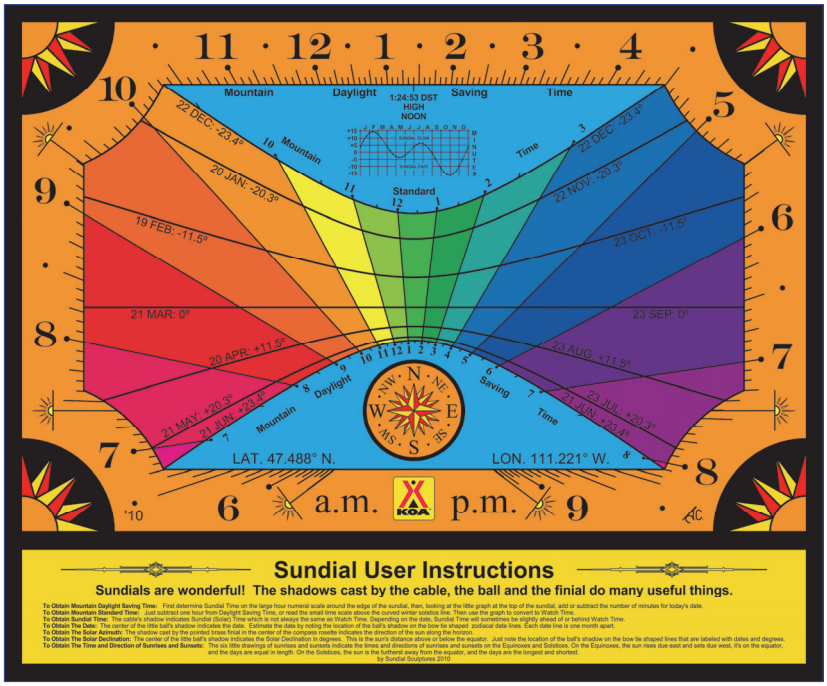
Nevertheless, John has not neglected dials with a conventional gnomon although the gnomons, of necessity, are relatively thick, Fig. 9.

For a really durable dial plate, porcelain enamel fired onto a steel panel (vitreous enamelling) gives a clear and satisfying result. The only example that I could see on my visit

John Carmichael

Fig. 9. Stone gnomons are relatively fragile so the small size helps reduce the risk of breakage. Offsetting it allows much of the dial to be used for commemorative or artistic decoration.

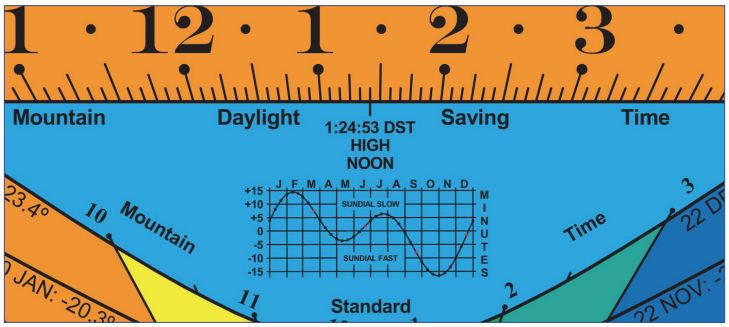
Fig. 10. A roof-top set of dials with durable vitreous enamelled finish.

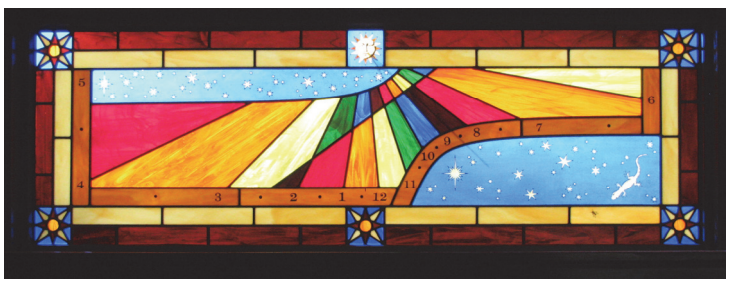


Figs 11 & 12. Showing what can be achieved with vitreous enamel on steel. The detail shows quite clearly the longitude correction. Photos from John Carmichael.

Henry Gyles of the 1670–90 period and the dial designed by Christopher Daniel in the Merchant Adventurers' Hall. John freely acknowledges further inspiration from Christopher who sent documentation and references, and promptly took up studies and manufacture. To complete the link with our conferences as stated earlier, John came to the 2004 event in St Anne's, Oxford, where he turned up with a vertical dial in stained glass as a gift for the college. Figures 13 & 14 show a perfect example of John's flair and versatility with this dial in his home.

An interesting commission was for a very simple vertical dial on a school wall, as in Fig. 15, with Fig. 16 revealing the 'clean' design due to laser cutting from the single sheet. Other commissions





Figs. 13 & 14. The domestic stained glass dial: through the window can be seen a garden of desert cacti. The gnomon shadow can be seen just after 8:30.

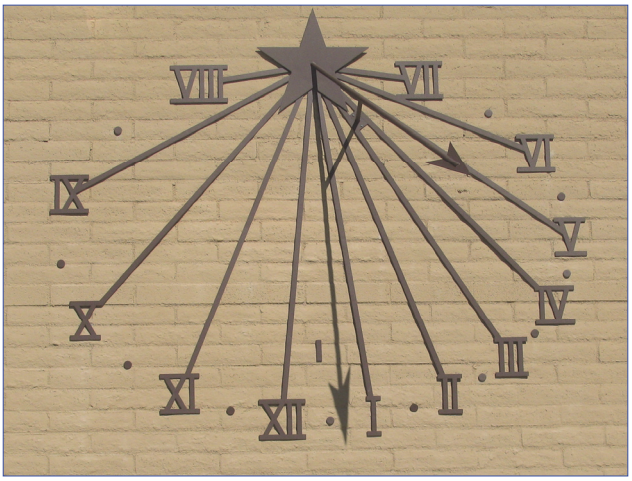


Fig. 15. A vertical dial of apparent simplicity. The numerals and hour markers blend together, being cut from a single sheet. Dials of this type often adopt a rectangular outline, but this has a subtle elliptical form. Note the small vertical line that indicates solar noon.

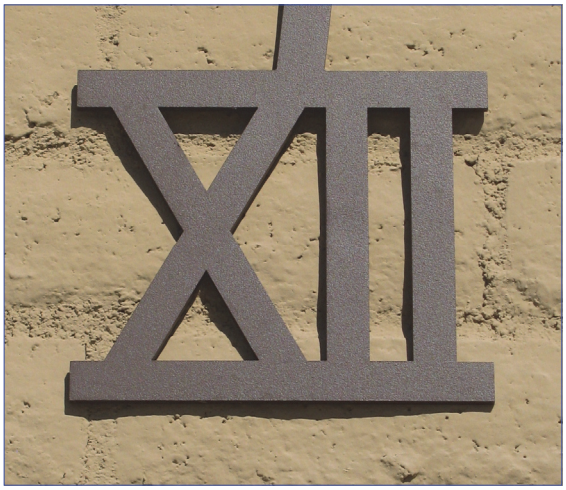


Fig. 16. A detail of a laser-cut numeral.

Fig. 17. The Sawyer Dialing Prize, made by Tony Moss, in a desert setting.

have been to give remote design and consultancy to other states in the USA, and as far afield as Delhi!

Returning to the opening questions about being a prolific maker and where does John's energy come from. The answers must be due to a combination of parental encouragement for early success with horticulture, a combination of technical and artistic temperament, and perhaps an element of luck with home and home life. If dial making (up to 107 stone dials at the current count) wasn't enough, a foray into websites has also led to worldwide recognition. His main site is *www.sundialsculptures.com* which covers a large variety of his dials, ordering information, *etc*. Another site is *www.stainedglasssundials.com* which is a prodigious resource of details of 471 stained glass or ceramic dials throughout the world. Where possible, every dial has a dozen lines of text giving location, maker, type, comments, *etc*. An overlapping 'top level' site is *www.advanceassociates.com*.

Yet more energy was expended on taking a year off from sundials and building a garden model railway with, to my eyes, impressive accuracy and technicality. A flavour of this railway, built on the American tradition of tracks on trestle bridges, can be seen at *www.flickr.com/photos/jlcarmichael/*

Of personal satisfaction, John was awarded the NASS Sawyer Dialing Prize in 2002: "In recognition of John Carmichael's efforts to bring dialing to the high-tech world of a leading solar Observatory (Kitt Peak, Arizona), and his demonstration that it is still possible in the modern world to prosper as a traditional craftsman of high quality heliochronometers." A small equatorial dial accompanied the certificate (Fig. 17).

Figs 18 & 19. A dramatic reclining/declining dial. The 'pencil point' is capable of acting as an altitude dial, and awaits a final plate and equation of time graph. One could hardly think of a better testimonial to John Carmichael's skill as a sundial maker and designer.

For a conclusion, it simply has to be a description of the massive declining/reclining dial on the northern perimeter of Tucson. As part of any development, a certain percentage of the overall cost has to be allocated to art work of some description. The developers, Venture West, who were responsible for creating the Innovation Corporate Center, contacted sculptor Jon Seeman, well known for his steel abstract shapes, often with bright colours. Given the concept of a 24 foot (7.3 metres) bisected ring, John was commissioned to design and delineate a sundial declining southwest and reclining 12°. A Tucson-based engineering company, CAID Industries, constructed the dial and had a large facility for electrostatic powder coating and thermal curing for a durable paint finish, see Figs 18–19.

The original concept was to have two dials in one, where the 'pencil point' towards the rear of the main dial would indicate the date on a separate plate on the ground. This has yet to be installed together with an explanatory panel, credits and an equation of time graph.

On a personal note, John stressed the welcome diallists would have in Tucson, adding that, as we found as visitors, there are many things to see such as Kitt Peak Observatory, copper mines, aircraft museums, and botanic gardens, all to be enjoyed in a clear dry climate.

REFERENCE

1. R Newton Mayall and Margaret W Mayall, *Sundials, how to Know, Use, and Make Them,* Charles T Brandford, Boston (1962).

douglas.bateman@btinternet.com

Lewis Carroll's Sundial

Lewis Carroll (real name Charles Lutwidge Dodgson, 1832–98) was a keen photographer as well as a mathematician, Anglican deacon and writer of children's fantasy stories and nonsense poems. The picture here is of his three youngest (of seven) sisters: Henrietta, b.1843; Margaret, b. 1841 and Louisa, b.1840. It was taken at the family's home of The Rectory, Crofton-on-Tees, probably in the early 1860s as they lived there from 1843 to 1868. Dodgson used the old wet colloidion process. Notice the sundial on the extreme right.

The original sundial still exists, as can be seen in the other two photos. (It is now kept safely indoors.) It is rather strangely corroded, probably due to emanations from the nearby Tees-side chemical works. Most of the fine details have gone but the present owners have read the signature as Thomas Agar of York, not previously recorded as a dial-maker. At least two Thomas Agars, father and son, worked in York as clockmakers, the elder born c. 1757 as the son of another clockmaker, John. There were other members of the family as well so there could be other dials to look out for. Notice the substantial gnomon with its unique(?) pyramid supporters.

Photos from Kevin Karney

PAINTING WITH LIGHT:
A Sculptor's Take On Sundialling

TIM CHALK

This is the story of how, as a sculptor, I was drawn into the world of Sundials, not by an interest in the technicalities of dialling but by their aesthetics and poetry, and how, over the past few years I have adapted my working methods and materials to the challenges of sundialling.

Sitting on a garden bench I am watching one of my sculptures gradually transform as the afternoon sun moves into the evening. Sharp crisp forms are softening and being thrown into deep shadowed relief; what seemed like smooth unblemished surfaces at midday are gradually becoming pitted with dents and dips previously unseen.

It sounds like the most obvious effect in the world, but to a sculptor, used to making solid tangible objects, the first time I registered this process fully when applied to sculpture it came as something of a revelation. I realised that, unlike sculpture viewed in the fixed, controlled light of an interior, outdoor sculpture has no fixed form; it is a constantly changing thing totally dependant on the shifting light of the sun. Many years before becoming seriously involved with sundialling and recognising the significance of this process, I received a commission to make a declining vertical sundial using calculations supplied by the commissioning architect. For this, as if anticipating these thoughts and observations, I chose to use the traditional sundial inscription 'Moved by the Light' (Fig. 1). As you will see I went on to be just that!

Fig. 1. Declining vertical sundial. Keim mineral paints and gold leaf on GRC panel. Painted for a purpose-built niche in newly built sheltered housing; Alloa, Clackmannanshire, 1989.

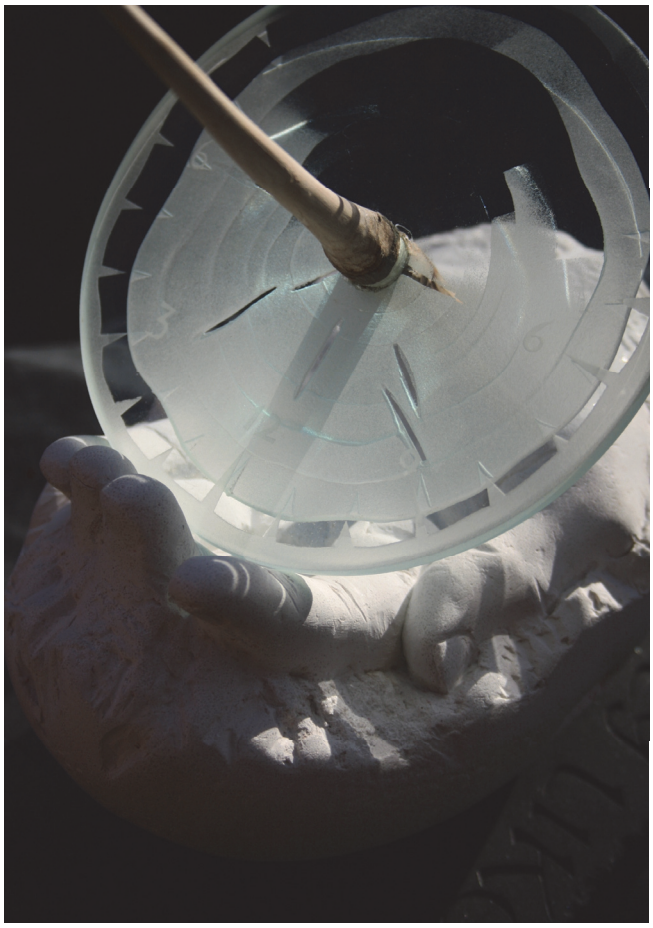
Early pioneers of photography described their new process as "painting with light". It struck me that this is actually a very good description of what sculpture is all about. My perception of it shifted from the fixed, heavy and monumental towards something more temporary and fleeting; a slave to Time and Place, part of something much bigger than itself. A sense of place is created by a mixture of a location's physical features and all sorts of associations and significances accumulated over time, and as an artist specialising in making site specific artworks these twin themes of Time and Place are central to my approach. They also lie at the heart of, and are essential ingredients in, the creation of any sundial whether it is made for sculptural, decorative or practical purposes.

Lured into the world of sundialling for all these aesthetic and poetic reasons, but with little grasp of the technicalities of dialling – indeed positively daunted by them – my first experiment in the field neatly sidestepped the need for any detailed sundialling calculations. A commission for a sculpture depicting the legend of Daedalus and Icarus (Fig. 2) seemed an obvious opportunity to enrol the Sun as an active player in the work. Daedalus, the practical grounded craftsman, sits on a stone making a wing, in contrast to his impulsive son Icarus, the dreamer. Emphasising the wing's fragility, a bird flies down to pluck a feather from it. Frozen in time, the bird serves as a gnomon as its shadow falls sequentially across four relief panels (Fig. 3) depicting the essential elements of the legend; the construction of the wings (Earth), the fateful flight (Air), the catastrophic encounter with the Sun (Fire) and finally the plunge into the sea (Water).

This commission awakened my interest in sundials and my sense of their sculptural possibilities. After a few false starts a little investigation showed that it was fairly easy to get on top of the basics of dialling, and

Fig. 2. Daedalus the wing-maker; Sun sculpture. Cold cure cast bronze. Private commission, Wiltshire. 2002.

Fig. 3 (below). Daedalus the wingmaker; the four narrative images highlighted in sequence by the passing shadow of the bird.



once these were grasped this opened up an enormous range and variety of forms which I explored and experimented with, shamelessly exploiting and combining them for purely sculptural reasons.

A series of experiments followed (Fig. 4), some to commission, some for their own sake, some more accurate than others, one resulting in the accidental discovery (I haven't come across another dial maker using quite this form) of a design with real practical advantages in northern latitudes. This was a combination of a horizontal and equatorial dial with a glass centre to the equatorial disc to allow the winter hours on the horizontal dial (GMT) to be viewed through the disc. With the steeply tilted gnomon of an equatorial sundial in northern latitudes, this avoids the need to bend double to read the shadow on the underside of the disc while comfortably accommodating the marking out of BST on the top surface of the equatorial disc (Fig. 5), easily read in the summertime. I went on to use a variation of this elegant solution on another sundial, commissioned to commemorate a 50th birthday (Fig. 6).

Fig. 4. A table top equatorial sundial with adjustable latitude setting. The passage of time is symbolised by the tree rings sand-blasted into the glass equatorial disc. Cast Jesmonite AC730 with glass and wood. Personal project 2008.

Fig. 5. Combined equatorial and horizontal dial. Cast Jesmonite AC730, bronze and glass. Commissioned by the Museum of the University of St Andrews, 2008.

Fig. 6. Combined equatorial and horizontal dial. Cast Jesmonite AC730, bronze and glass on a carved oak pedestal. Private commission 2009.

At this point, I was realising that as well as relating closely to the significance of the Sundial at a conceptual level, I was finding that my favoured sculptural forms and materials were particularly suited to the making of sundials. As far as my choice of materials goes I'm a bit of a Jack of all trades: I work in a wide range of materials and happily mix and adapt them to suit the project in hand. But most of my work is rooted in modelling and carving, using clay, plaster, and sometimes wood. Moulding and casting are central to my work to achieve my final results and a material that I frequently cast into is a concrete-based casting medium with a stone powder aggregate called Jesmonite AC730, which I will refer to simply as 'Jesmonite' throughout this article. I work extensively in bas relief and I have had a longstanding interest in cut lettering and the inclusion of text in sculpture, all of which fit in well with sundials.

I was already no stranger to care and attention, as the craft of casting and mould-making is one that calls on a fair amount of both, but making sundials set a whole new standard in the degree of precision required. The first time I was commissioned to produce a sundial requiring a fair degree of accuracy, for the St Andrews University Museum, I turned to familiar methods and materials, sculpting in plaster and using wax to model the text, bas relief detail and dial markings, and casting the whole piece into Jesmonite; but I also needed to develop and adapt my casting techniques to meet the challenges of sundialling, for example working out a method for the accurate setting of the gnomon (Fig. 7).

As a designer of sculpture I have been used to the freedom to create forms restricted only by broad considerations such as materials, scale, and subject matter. It was a new experience to have to tailor my design decisions to the technical constrictions of sundialling. As is so often the case with boundaries, however, these limitations actually focussed my thinking and provided interesting starting points which resulted in designs that I might never have come up with otherwise. For example, in response to a commission to create a sundial to sit on a tree stump in Royal Circus Garden, Edinburgh, I chose to take the Scottish Enlightenment as my theme. This seemed particularly appropriate in the context of an Edinburgh New Town garden. For this I revisited and adapted the traditional lectern dial, a form in fairly common use in Scotland at the turn of the 18th and 19th cen-

Fig. 7. Setting the gnomon for the St Andrews University Museum Sundial: first, the bronze rod was set in the wax original to form the gnomon and then, after incorporating the gnomon in the mould, preserving its position exactly, the cast was made round the gnomon, replicating its position in the final result.

Fig. 8. A Sundial for the Scottish Enlightenment. Cast Jesmonite AC730, with cor-ten steel on a tree stump. Commissioned by the Royal Circus Garden Committee, 2010.

Fig. 9. Sphere Sundial. Cast Jesmonite AC730 on carved oak plinth with mild steel bracket. Private commission

turies (Fig. 8). The dial carries the inscription "We find no vestige of a beginning; no prospect of an end". With these words in Edinburgh in 1788 James Hutton announced the arrival of Deep Time. His geological discoveries overturned Bishop Ussher's biblical chronology in which the Earth had been created in 4004 BC, revealing a timeframe too huge for the human mind to grasp. What better subject for a sundial?

Hutton's place at the heart of the Scottish Enlightenment gives his words a special resonance on a sundial sited in Royal Circus, a perfect example of the architecture which expresses the intellectual climate of the time so well. The sundial is positioned at the centre point of the circle which forms the Circus. Royal Circus was designed by one of the leading Scottish architects of his time, William Playfair, whose uncle, the mathematician John Playfair, was a close friend and disciple of James Hutton.

A sundial necessarily reveals the underlying order and geometry of the universe, making it an apt expression of Enlightenment thinking. This sundial takes the form of a rough organic rock sliced open to expose a dark polished surface bearing the inscribed text and sundial markings. Thus a rational and structured explanation of the natural world is revealed at the heart of the apparent disorder of nature in the raw.

The top of the tree stump forming the plinth is capped with a profiled sheet of cor-ten steel, a steel that forms a surface rust without continuing to degrade. The face of the dial is cleft by a wedge of the same material, forming the gnomon. As well as having an intrinsic aesthetic appeal, I felt that rusted steel carried an echo of the intense industrial innovation that coincided with this high point in Scottish intellectual life.

Using a similar combination of materials for a sundial made in response to a commission to mark the retirement of a Cambridge anthropologist, I once again let my design be led by the style of dial I'd chosen to make (Fig. 9). A Jesmonite sphere cast from an original modelled in wax sits on top of a carved oak plinth with a bracket made from mild steel rotating round a central post angled to match the latitude. This bracket is then adjusted to minimise the shadow it casts and a reading can then be taken from the calibrations around the 'equator'.

I was drawn to the spherical form for two reasons. This sundial was to form a pausing point on a meditative walk around the garden and I was reminded of Thomas Jefferson's sphere sundial in his garden at Monticello, Virginia, where such an inventive and perceptive mind must have likewise indulged in so much creative thought. Also, the sphere form was perfect to express the symbolism underlying this dial. The form and imagery are an attempt to encapsulate the nature of the anthropologist's intellectual life and his relationship to the world as a whole. From a sundialling point of view, the sphere represents in micro form the planet Earth, so it seemed natural to continue this analogy into the content of the imagery. The sculpted surface of the sphere represents the physical world (fish, plants, rivers), while by peeling away the top layer a new layer is revealed representing the world of ideas. This is shown by the use of

Fig. 10. "Katie Wearie's Hours"; sculptural sundial and bench. Bronze and cast concrete. The West Port, Linlithgow. Commissioned by the Provost of Linlithgow 2010.

text, exposing the quotation attributed to Einstein; "Make things as simple as possible – but not simpler".

By this time I was eager for a chance to incorporate a sundial into a large scale public work; after all, the Sundial can be seen as the ultimate site-specific artwork, with its configuration and positioning being so precisely determined by its location. In 2010 I got the chance to do this in a commission for the West Lothian town of Linlithgow. This sundial celebrates an apocryphal local character, a 19th-century cattle drover called Katie Wearie, shown resting in her favourite place beneath a tree at the West Port, the site of the sculpture, while a bird sings in the branches above her head (Fig. 10). Returning to an old motif, I once again used the bird to serve as a gnomon, but this time, more confident of my dialling capabilities than when I made my Daedalus piece, I marked out the hours on the ground using granite setts. Sitting on the bench, the passer-by is invited to join Katie Wearie in watching the world pass by while the shadow of the bird moves gradually across the dial.

Fig. 11. "Frae Furrow tae Firmament in Four Lowps; The Fourth Lowp". A sculptural sundial forming the fourth in a series of linked sculptures sited throughout the Robert Burns Birthplace Museum, Alloway. Bronze figures cast from clay originals on cast Jesmonite plinths. Commissioned by the National Trust for Scotland, 2010.

I was struck by how popular the sundialling element of the work was with the general public and what a valuable introduction it provided to the content of the sculpture and its reflection on the passage of time. There were of course familiar issues to be addressed; explanations of GMT versus BST, the equation of time, adjustment for Longitude, tolerance of a less than totally even ground surface; but I realised that the design of a sundial plays a huge part in people's expectations of accuracy. If the overall impression of the work is one of extreme precision then that is what is expected of it; however, if the work is clearly primarily sculptural and the markings broad enough, people readily accept the symbolic nature of the timekeeping. I am certainly not saying that I am happy with inaccuracy, but sometimes what I would rather describe as 'imprecision' is what is appropriate.

Alongside this fairly straightforward sculptural sundial I was also making a sculpture for the new Robert Burns Birthplace Museum in Alloway, Ayrshire. I was interested to see how the sundialling element of this sculpture could be developed away from the simple telling of the hours towards something more narrative without losing the magic of a predictable time-linked result. Here I went back to the idea initiated in my Daedalus piece of using the sun's cycle to add poetry and poignancy to the story telling content of the sculpture. By now my sundialling abilities had developed to enable me to produce a more calculated and resonant result.

The discovery that Burns had received tuition in gnomonics as a young man justified the idea of making a group of sculptural elements linked by the underlying principals of a sundial (Fig. 11). At the centre of the group, a figure of Burns, leaning at an angle of 55.4°, forms the gnomon, casting his shadow across three features each linked to a different poem (Fig. 12). The poem referred to on the corn sheaf with two bronze mice forming the 9am mark is, of course, "To a Mouse", while the wistful girl with the rose on the 1pm mark alludes to "My Love is like a Red Red Rose". Lines from each poem appear on the central plinth, accompanied by a spyhole which is aligned to view details on the markers which fill in the missing words from the lines (Fig. 13).

Finally, at 4pm Burns' shadow moves round to meet the figure of a girl sitting on a plinth, passing across the words "The Lea Rig", fulfilling the wish expressed in the final verse of the poem of the same name:

Fig. 12. Detail of Fig. 11; The Burns Sundial gnomon.

Fig. 13. Details of Fig. 11; The 9am, 1pm and 4pm hour marks and the spy holes on the main plinth with views through them.

Gie me the hour o' gloamin' grey,
It maks my heart sae cheerie-o
to meet thee on the Lea Rig
My ain kind dearie'o

While hopefully working at a purely decorative level, this work is dense with content and requires a fair amount of unravelling. I felt this element of puzzle and enigma was appropriate to the situation and subject matter, and the sundialling aspect of the work fitted into this well. It highlighted for me just how much people love the abstract qualities of sundialling, and how ready they are to accept what could almost be described as a conceptual dimension to sculpture where they might well be put off by this in another situation. When confronted with the arrival of a new sculptural installation the response often seems to run a bit like this; "So what's all this then? ....Oh it's a Sundial!". Suddenly the sculpture has justified its presence!

I would like to finish this tour of sculptural sundials sitting in the full afternoon sun on the side of Ben Lawers in the heart of the Scottish Highlands, beside a group of sculptures incorporating a sundial, commissioned by the National Trust for Scotland (Fig. 14). Here the sundial is used as an interpretive device to convey information about the natural environment. An angled slab behind the vertical dial is marked with the months of the year, and the natural events associated with each one. A circle of light travelling through the face of the dial at noon serves as a solar calendar.

Fig. 14. Interpretive Sculptures in a "Ghost Sheiling" enclosure; incorporating a vertical sundial and solar calendar as part of the overall scheme. Cast concrete, stone and cor-ten steel. Commissioned by the National Trust for Scotland, 2012.

The presence of a sundial in this unexpected situation proves that the sun does sometimes penetrate the clouds even here, justifying the optimism that has lead to so many and varied sundials in Scotland. I hope my contributions will find a place in this rich tradition and help to keep it alive in defiance of our climate.

Tim Chalk is an Edinburgh-based sculptor specialising in public artwork. His work can be seen in many public places, museums and collections throughout Britain. He has worked collaboratively with architects, designers, museum curators and other professionals to produce a wide range of site specific artworks. For the last few years he has had a special interest in sundials and has incorporated this into his wider sculptural practice. For a full picture see *www.chalkworks.com*

SOME KINDERSLEY SUNDIALS

LIDA LOPES CARDOZO KINDERSLEY

The root of the gnomon is our source of creation: the whole design radiates from that point.

Fig. 1. A 1938 dial by David Kindersley.

At the Cardozo Kindersley Workshop in Cambridge we have been designing sundials ever since David Kindersley set up shop in 1946 in the village of Barton, just outside the city. Initially he calculated the angles of the gnomon and the hour-lines himself. He had made one wall-mounted dial in 1938 (Fig. 1) but it did not have any design at the root of the gnomon which sprung coldly from the stone. It does have poetic pleading, as so often, for time to stand still – alas!

The next dial in 1950 (Fig. 2), a horizontal Welsh slate dial, was made for Etretat (France), and the two 6 o'clock hour-lines go right up to the gnomon. The hour numbers are Arabic numerals, unlike the Roman numerals on the 1938 dial.

The 1971 dial for Braughing Church, in Cumbrian green slate (Fig. 3), was a replacement of the 1848 slate that fell down at midnight – MOX NOX indeed! Here the root is a sunburst: this is the most common solution, and very appropriate too. This sun (in gold leaf) is in raised relief, with a blue sky carved deep, and painted. The hour-lines beam

Fig. 2. A Welsh-slate dial for Etretat (1950).

Fig. 3. Braughing Church dial in Cumbrian green slate (1971).

straight out of the rays of the sun. The half-hour lines are arrows pointing at the sunburst; the quarter-hour lines are short and end in a dot.

Differentiation is vital in reading the time. The hours are again in Roman numerals; 4 o'clock is indicated by four old -fashioned and very elegant upright strokes, so often used on sundials instead of IV.

All David's sundials incorporated a polar-oriented gnomon which ensures that the direction of the shadow at any given time of day is independent of the time of year. In 1973 David experimented with designing and making a free-standing dial (Fig. 4). David made the dial of blue frosted glass with the hour-lines deep-etched, to be readable from both sides. The gnomon is a thunderbolt cutting through three diminishing sunbursts and striking towards the centre of the earth.

Fig. 4. Experimental dial of blue frosted glass (1973).

The sunbursts and construction are all in fibreglass; the gnomon is gilded aluminium and is held in position by one single continuous stainless steel wire. We walked to and fro, to thread it through the holes and keep it from buckling. Anybody who has ever worked with stainless steel will appreciate what a struggle such a task is.

In 1976 the classically shaped dial (Fig. 5) for Janet was the last one calculated in the workshop. Again there is a regular sunburst radiating hour-lines, with short half- and quarter-hour lines. Here 4 o'clock is the conventional Roman numeral IV. The elegant George Herbert poem is in italic letters, and painted off-white. This is a memorial on St Anne's Church, Over Haddon, Derbyshire.

A few years later, we were asked to make a dial for a house near Hungerford (Fig. 6). No wall faced south, but one corner of the house was fairly close to being south-pointing. So we asked Dr Frank King to do the precise calculations for two dials whose times would overlap. In fact for much of the day you can read the time on both dials so any difference in indicated time would be noticed!

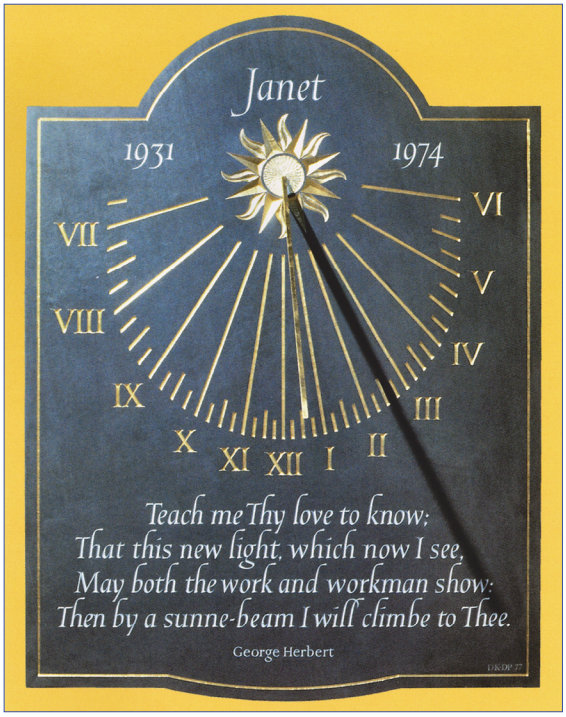
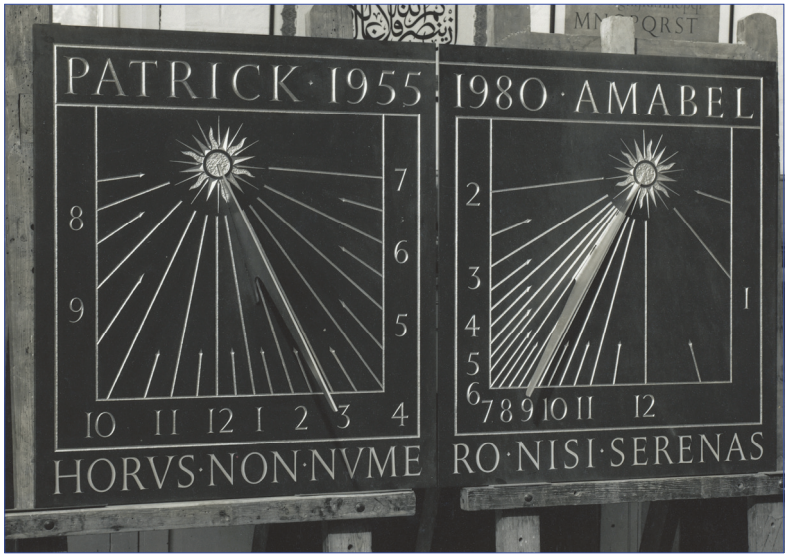


Fig. 5. Memorial dial on Over Haddon Church (1976).

Fig. 6 (below). SE & SW pair of dials for Hungerford.



For us a sundial is a precision instrument that positions us in the universe. So it always has to be correct; but this is beyond us letter-cutters. Frank King came up with long lists of numbers and the precise angles for the gnomons. Two sunbursts! In this case they were required to be silver on slate. We do not use silver leaf on slate as it goes black. So the dial furniture was in platinum leaf – quite awkward to apply as it is heavy, much heavier than gold leaf. Once applied however it gleams with the richness of no other metal.

In 1991 we designed a rectangular Welsh slate dial (Fig. 7)

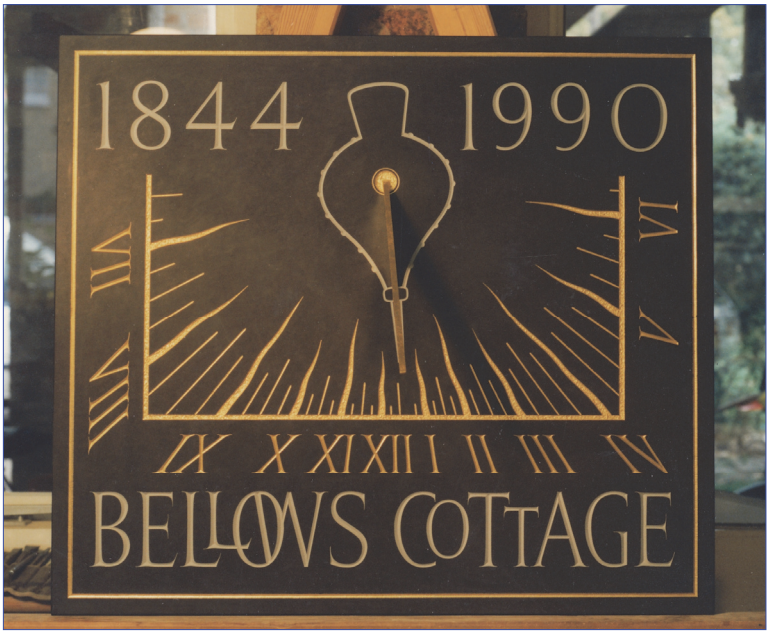


Fig. 7. A prophetic dial for a cottage.

for Bellows Cottage. It was for an old smithy near Oxford which had been lovingly restored. Unfortunately, the effective solution of putting a pair of bellows at the root of the gnomon, awakening the fiery hour-lines, turned out to be prophetic. Bellows Cottage burnt down before we fixed the dial. The house was never rebuilt, and this dial now cheers up a dark corner in our workshop. Still it is a sad sight to have a sundial in the wrong place that never sees the sun.

In 1993, this Cambridge sundial (Fig. 8) was given an extravagant sunburst; but paradoxically the hourlines are off-white and the sun glows between them.

Fig. 8. A Cambridge dial (1993) with sunburst.

Another 1993 sundial (Fig. 9) was commissioned by grateful parents who wanted to celebrate the safe return of their son from military action. Around the modest dial is an alphabet that flourishes into waves and flames symbolic of the Gulf War.

The 1995 dial (Fig. 10) for the south of France has the cockerel proudly announcing the rising sun, when we will want to see the time. It has an extended translation of CARPE DIEM: get up and make the most of the day! A classic shape in limestone – extremely heavy, it is fixed sitting on two corbels.

In the 1996 dial (Fig. 11), Eton lilies spring from the root of the gnomon.

The Pembroke College sundial,[1] cut in 1998 (Fig. 12), is purist – to go with the stark lines of Eric Parry's architecture. The rod-gnomon is cleverly mounted and springs from nowhere. The shadow of the nodus pro-

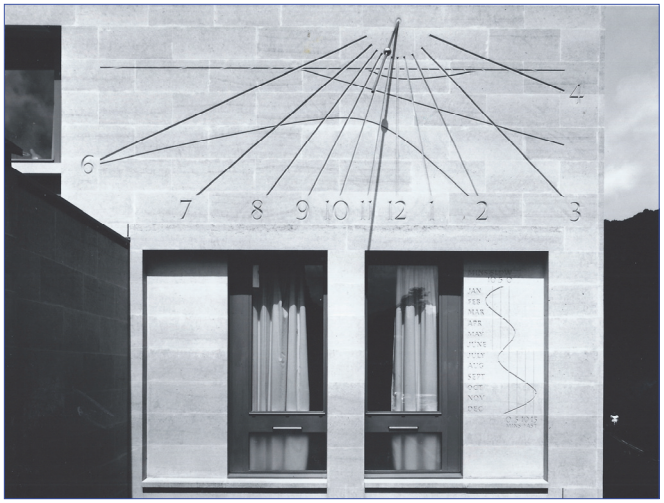
Fig. 9. A celebration sundial (1993).

vides extra information which indicates where we are between the summer and winter solstices. Below it we have carved the equation of time, for those who want to set their watches. The gnomon has a diameter of 25 mm, and the lines were cut to that width. All this was of course carefully and precisely worked out by Frank King. He is seen in Fig. 13 working with an apprentice, setting out dial furniture with a very sharp pencil. The centres of our carved V-cuts were exactly on Frank's pencil lines.

The two-in-one dial we made for Selwyn College in 2010 (Fig. 14) is far too complex for me to explain here; Frank King has written two articles about it for the *Bulletin*.[2] The nodus support is mounted in a rising or setting sun – just which you choose to think of it as depends on which family of hour-lines you are using, Babylonian hours or Italian hours. In the sun it says in Greek KNOW THE TIME. We work hard to

Fig. 13. Frank King and apprentice working on the Pembroke College dial.

Fig. 14. The Selwyn College, Cambridge, dial (2010).



make any sundial an attractive and balanced design – a joy to look at, but not for too long!

The final dial was made in 2013 (Fig. 15) and the rod-gnomon pokes out of a woolsack, the symbol of Staple Inn where this dial was fixed for the Staple Inn Actuarial Society. The owl, painted heraldic red, is sitting on the Actuaries' motto – E PERITIA RATIO – reason from experience. The letters radiate in shape and design, like the sun.

Left, top to bottom:
Fig. 10. A dial in the south of France (1995).
Fig. 11. A 1996 dial with Eton lilies.
Fig. 12. The Pembroke College, Cambridge, dial (1998).

Fig. 15. A 2013 dial for the Staple Inn Actuarial Society.

REFERENCES

1. F.H. King: 'The Pembroke College Wall Dial', *BSS Bull.*, 13(i), pp. 16–21 (March 2001).
2. F.H. King: 'A new Babylonian and Italian hours sundial for Selwyn College, Cambridge', two parts, *BSS Bull.*, 22(iii), pp. 2–8 (Sept. 2010) and 22(iv) pp. 9–11 (Dec. 2010).

Lida Lopes Cardozo Kindersley joined David Kindersley's Workshop in 1976, thereby beginning a partnership which lasted until David's death in 1995. David started his workshop near Cambridge in 1946 and prior to that he had been apprenticed to Eric Gill. The workshop now at 152 Victoria Road in Cambridge is run by Lida, his widow. There are normally three apprentices in the workshop and teaching is regarded as a vital part of workshop life. Since 1946, the workshop has undertaken thousands of commissions, including numerous sundials, of which a selection are described above. The workshop's website is at *www.kindersleyworkshop.co.uk* .

IN THE FOOTSTEPS OF THOMAS ROSS

Part 8: The Haddington Bowl

DENNIS COWAN

This sundial was hard to find. It was described by Thomas Ross in volume 5 of *The Castellated and Domestic Architecture of Scotland* [1] of 1892 as follows:

Fig. 1. Sketch of the Haddington Bowl by Thomas Ross.[1]

"This dial [Fig. 1] *in its general conception is unique, although its parts are to be found in many others; but from its general idea it may be classed as a facet-headed dial. The cup-hollows on each of its octagonal faces are not unlike those found on the horizontal dial at Pinkie; and in the same way as at Pinkie, Newbattle, and other places, certain of the hollows have faces acting as gnomons. Between each of the hollows there is a mask. The peculiarity of this dial consists in its vase form, being hollowed out in the inside, and lineated so as to form a horizontal hollow dial. There is a hole at the bottom of the vase to allow the rain to escape.*

Fig. 2. The dial now, in its damaged and repaired state.

Fig. 3. The west-facing scaphe.

But where was it today? All of my investigations were fruitless until a chance e-mail from David Anderson of East Lothian Museums (Haddington is the main town in East Lothian) with a query relating to Scottish sundials. In my response to him, I took the opportunity to ask if he was aware of the Haddington Bowl or Vase. To my surprise, he advised that it was in the museum's storage facility in Haddington! It certainly hadn't travelled far since Ross's day.

He gave me contact details for Claire Pannell, the museum's Collections Officer and a few weeks later I visited the store. And there it was, on the bottom shelf surrounded by old curling stones and several pieces of old architectural stonework.

Fig. 5. The markings on the inside of the bowl.

Claire appeared with a fork lift and she moved several of the pallets out of the way whilst I shuffled the dial to a position more suitable for photography. It was certainly far too heavy to lift.

It was still as Ross described it, but at some point since Ross's day it had been severely damaged and very poorly restored (Fig. 2), but it is still a fine unusual decorative dial. Two of the cup hollows have faces acting as gnomons as described by Ross (Figs 3 and 4) whilst two of the other six cup hollows have considerable damage. Fig. 5 shows the internal markings of the bowl.

Fig. 4. The east-facing scaphe.

I have never seen an old sundial in this form and I'm sure that it is unique in Scotland at least, and I'm mighty pleased that I was eventually able to locate it.

ACKNOWLEDGEMENTS

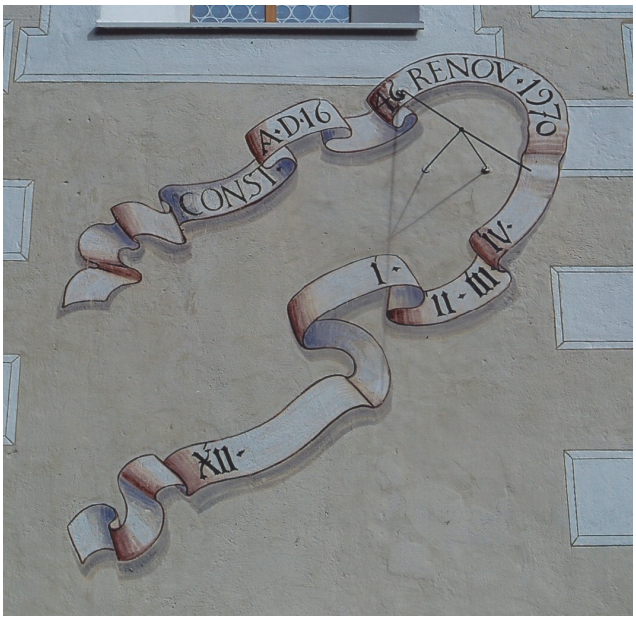
Many thanks to David Anderson and Claire Pannell of East Lothian Museums.

REFERENCES

1. D. MacGibbon and T. Ross: *The Castellated and Domestic Architecture of Scotland,* David Douglas, Edinburgh (1892).

dennis.cowan@btinternet.com

A Decorative Swiss Dial



This is a vertical, west-declining dial on the hexagonal tower of the catholic church in the alpine village of Lumbrein (46° 41' N, 9° 08' E) which lies at an altitude of 1405 m in the area of the headwaters of the Vorderrhein in the Canton Graubünden in east Switzerland. The dial has an original date of 1646 but there is something strange in the delineation – look at the position of the XII in relation to the gnomon root. Picture courtesy of Robin Hoskyn.

SOLAR OBELISKS OF RUSSIA

VALERY DMITRIEV

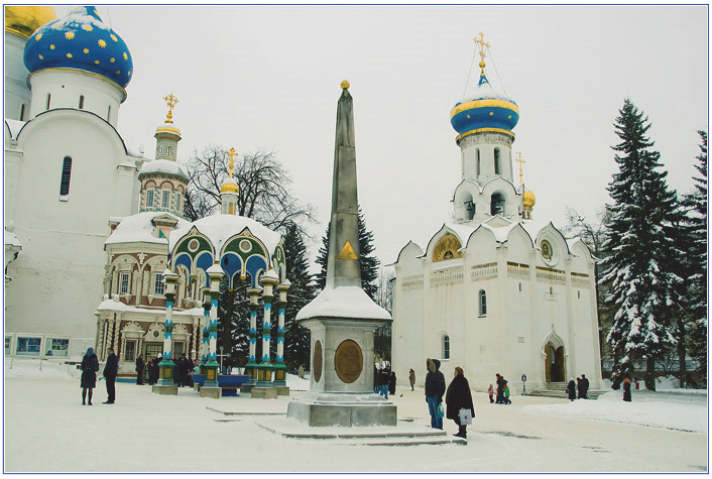
The real history of sundials in Russia began only in the 18th century and thus totals only three centuries. For the occurrence and distribution of sundials we are obliged to the Russian Tsar and reformer Peter the Great. The most popular sundials in Russia became the vertical sundial in civil architecture and the horizontal pedestal sundial in landscape gardening. Among vertical dials, a special place is occupied by solar obelisks. Tragic events in the 20th century have led to the destruction of a large quantity of sundials, especially in gardens.

The occurrence and distribution of memorable obelisks, devoted to important events or to famous people, are often carried in the form of tall tetrahedral pyramids and are linked to the beginning of the 18th century. For three centuries obelisks have remained one of the most popular types of commemorative monument in Russia. Perhaps this is due to their origins being based on ancient Egyptian obelisks and their original 'solar' function, the use of which was later lost, but the power and the perfect shape of an obelisk remains in the unconscious mystique.

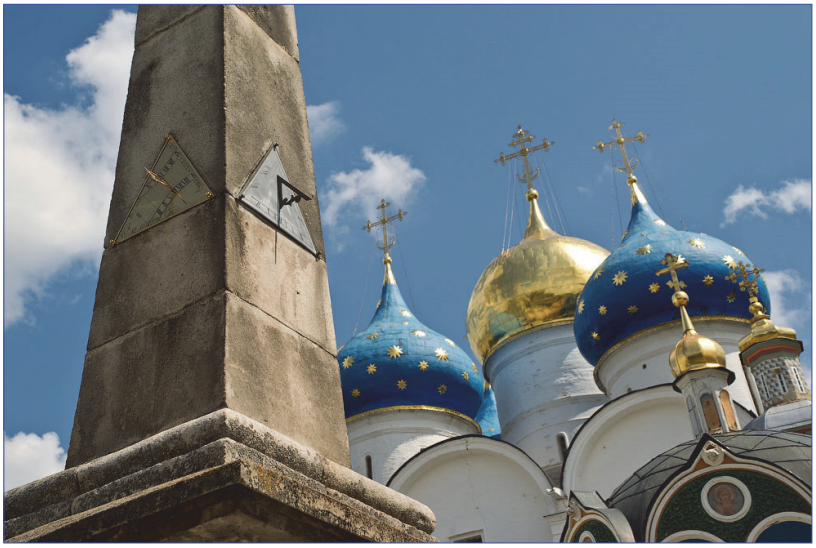
The association of an obelisk with sundials set on two or three sides has led to Russian solar obelisks sometimes being called 'solar pyramids'.

Solar obelisks of the 18th – 20th centuries have been devoted to various events, for example:

- To tragic events in the history of Russia – for example, the memorial obelisk in the Trinity Lavra of St Sergius near Moscow,
- To road-signs directed at imperial residences – for example, milestones in St Petersburg, Tsarskoe Selo and Peterhof,
- To the most catastrophic floods of the northern capital (Neptune Scale in St Petersburg),
- To the symbolic lions guarding a city, for example the stele in the Ural city Magnitogorsk.



One of the most interesting solar obelisks is located in the Trinity Lavra of St Sergius – the spiritual centre of the Russian Orthodox Church and the most important Russian monastery. The monastery was founded by St Sergius Radonezhsky in 1337 and is located 70 km from Moscow in the city of Sergiev Posad.



In the centre of the monastery – in the cathedral-area and surrounded with churches – the memorable obelisk with three sundials from gilt copper was established in 1792. The obelisk was erected in honour of the 400th anniversary of the death of the founder of the monastery, Sergius Radonezhsky, and at the direction of Platon, the Metropolitan Moscow and the Archimandrite of the Trinity Lavra of St Sergius. The name of the designer of the sundial is not recorded.

The top of the stone obelisk, about 10 metres high, is decorated by a gilt-copper sphere. On the four sides of the bottom part of the obelisk there are memorial plates describing the merits of Lavra during historically grievous times for the Russian state *"to preservation and motherland protection"*

It is pleasing to note the increased interest in sundials in Russia over the last few years. It allows us to hope that the 21st century will become a silver age or a century of revival, not only recreating lost or destroyed dials, but also creating new and interesting ones.

Valery Dmitriev *sundials_spb@mail.ru*

LETTERING ON SUNDIALS

BEN JONES

Sundials are places where you can expect to see lettering in some form or other. This outlet for carved letters is what first interested me in sundials.

The point of this piece of writing is to ask you to stop *just* reading lettering for what it says and instead consider the abstract qualities of letters and text: patterns, forms, shapes, textures and spaces. These can make beautiful things that are worth looking at and they can alter the meaning of words too.

Lettering as a subject ranges from individual letter forms to alphabets to words to great long texts, from the purely abstract letter shapes with all their sculptural form to the literal meaning of words.

Tom Perkins (Fig. 1)

Each and every letter carved or written can be a pleasing little sculpture or drawing in its own right. The letter A in Fig. 1 was carved by Tom Perkins, one of the top letter carvers around today. Notice the finely drawn out and honed quality this carving has. Tom's influences include the sculptor Brancusi. The numerals on a dial may have a function but they can also make lovely shapes and patterns.

There are many elements that make a single coherent alphabet from a group of odd and very different letter shapes. There is a geometry working inside an alphabet that relates each letter to the others, but it is a soft geometry, more of a rhythm perhaps.

For instance you can see the width of the A reflected in the V and the M. The width of the M will relate to the width of the O which will in turn determine the width of the C and D and so on. The lower case o can be clearly seen shaping an alphabet in the letters b c d e g h m n p q.

This is all extremely important stuff for making a coherent alphabet and is not to be ignored but don't let it cramp your style should you have just a few numerals or a word or two to set out. Treat your design as a pattern of spaces, lively lines and shapes even if you are basing your letter shapes on a type face.

The worst criticism Dr Wolpe[1] made of his students work was that it was bad but not even bad enough to be interesting. So be bold with your lettering and have fun!

The Shape of Inscriptions (Fig. 2)

Space tends to be regarded as a 'nothing', but just as the spaces between notes shape a piece of music, the spaces within, between and round letters are as important, sometimes more important, than the letters themselves.

The first thing you notice about any inscription is the shape it makes so even if you are no lettering artist you could still

Fig. 1. Letter A by Tom Perkins.

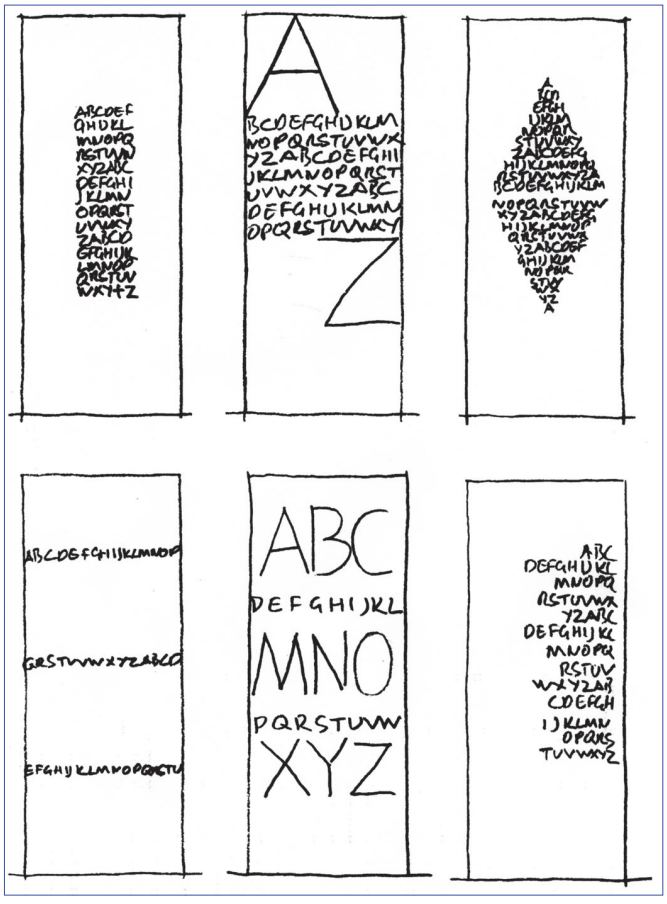


Fig. 2. Various shapes of layouts for a piece of text.

set out the type from your computer in an interesting manner. Concentrate on making a good shape and use pattern, space and texture to the full.

You may actually *read* the motto on your dial occasionally but you will *see* it in all its sculptural glory every time you look at it.

Diamond Dial (Fig. 3)

There are two main ways of carving letters in stone. One is to V-incise the letter forms and the other is to carve the letters in relief. V-incising can produce subtler letter forms while letters carved in relief, known as raised letters, tend to look flatter and chunkier.

The worked stone around raised letters gives plenty of opportunity for making patterns though there is no reason the stone for incised letters has to be smooth. Size for size, raised letters are usually more legible than V-incised ones.

Fig. 3. Raised lettering on the 'Diamond Dial'.

Raised letters are less common, quicker to carve and make a dial unusual straight away. This is why I chose raised letters for the Shaldon Diamond Jubilee dial which had to look as special as possible but had a limited budget.

Incisive Letterwork 1 (Fig. 4)

There are any number of ways of making letters. This is a section of a work entitled: *A lphabet for our Heroes* and it is by Incisive Letterwork who are the most inventive and thoughtful letterers around.

Having asked you to look at letters as abstract patterns it has to be acknowledged that sooner or later, as you start to put your letters together, they begin to make words which inevitably results in things being said.

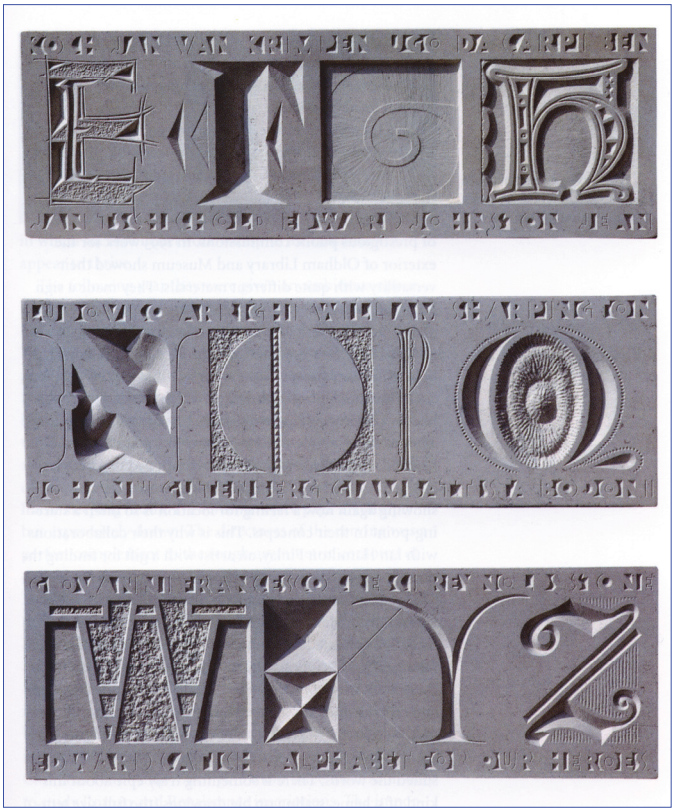


Fig. 4. Examples from Incisive Letterwork.

> Only the road and the dawn, the sun,
> the wind, and the rain,
>
> And the watch fire under the stars,
> and sleep, and the road again.

Fig. 5. A straightforward layout of John Masefield's 'The Searchers'.

Masefield 1 (Fig. 5)

These lines are from a John Masefield poem called The Searchers. I hate the poem[2] but quite like these two lines. Here the words are set out in type as you might expect to see them in a book.

How else could they be set out? Well you might choose a more interesting typeface for a start. You might print them on really nice paper or consider using a calligraphy pen or brush to make your letters more special. But it might also be very useful to look at the visual structure of the words and the patterns they can make.

Masefield 2 & 3 (Fig. 6 & 7)

Here the size of some words has been reduced and others increased. We could go further and remove all the small words.

This is now a pattern of words rather than a proper text. It might be easier for you to construct your own pattern of sundial/time/shadow/light words to decorate your next dial rather than to write a 'proper' verse for it.

ONLY THE
ROAD
AND THE
DAWN
THE
SUN
THE
WIND
AND THE
RAIN
AND THE
WATCH
FIRE
UNDER THE
STARS
AND
SLEEP
AND THE
ROAD
AGAIN

ROAD
DAWN
SUN
WIND
RAIN
STARS
SLEEP
ROAD

Figs 6. An alternative layout for 'The Searchers'.

Fig. 7 (above right). A third layout of Masefield's 'The Searchers'.

Fig. 8. Anagrams of 'Angered'.

Fig. 10. Another example from Incised Letterwork.

One appealing feature of a pattern of words is that while it may convey a meaning, it is not directly telling you something.

Anagrams of Angered (Fig. 8)

Here is a piece of lettering that is not a proper sentence but seems to have meaning. It also has structure. This is brought about by packing the letters into a square, each word being a rearrangement of the same few letters and alternating wide and narrow letters so it is less readable and more of a pattern. There is one more anagram to be found if you are interested.

Ian Hamilton Finlay is one of the few writers who wrote things to be carved. He was a Poet/Artist and he commissioned letterers and sculptors to make the actual pieces for him. He made many sundials because of the chance they gave him to use words.

Some diallists dismiss his work because the dials themselves are not terribly complicated or clever. This is to miss the point that only a very few dials have ever been made *just* to show the time. Most have been made as status symbols, garden ornaments, sculpture, monuments and things to fascinate, astound, inspire or just be beautiful.

Incisive Letterwork 2 The Dead of Night (Fig. 10)

Here is another piece by Incisive Letterwork made of two texts. They are both about the night. One is from Virgil and the other is from the Beatles.

Double texts can tell two stories, opposing or complimentary, at the same time. They also have the effect of reducing any finger wagging didactic character a single statement might have. With them we are inclined to compare and contrast and consider (the spaces between) rather than just agree or disagree. Two, three or more texts could be put together.

Steps (Fig. 11)

The examples so far are all two dimensional. Once we move into three dimensions there are all sorts of possibilities for putting words together with meanings that just cannot be conveyed by using a single flat surface.

These steps were designed for a lettering exhibition at West Dean. The words can be read from the top downwards as on a page. In which case they say: LOOK, LOOK BACK,

Fig. 11. Lettering on a set of steps.

LOOK FORWARD! But they can also be read upwards from the stone nearest to you. In which case they say: LOOK FORWARD, LOOK BACK, LOOK! The result of the physical setting out of the words produces two slightly different meanings because it can be read in two different ways. I know that this text is not profound but perhaps an inventive word smith could use this possibility to great effect on a sundial.

Vicki Feaver (Figs 12 & 13)

This dial was made for an exhibition organised by Gary Breeze where ten poets were paired with ten letter carvers. The poets wrote riddles and the carvers carved them. I was paired with Vicki Feaver as her riddle was TIME.

You live in me
I live in you
In this garden
Bird and tree

Fast as a hare
Slow as a worm
Only still
As a date in stone

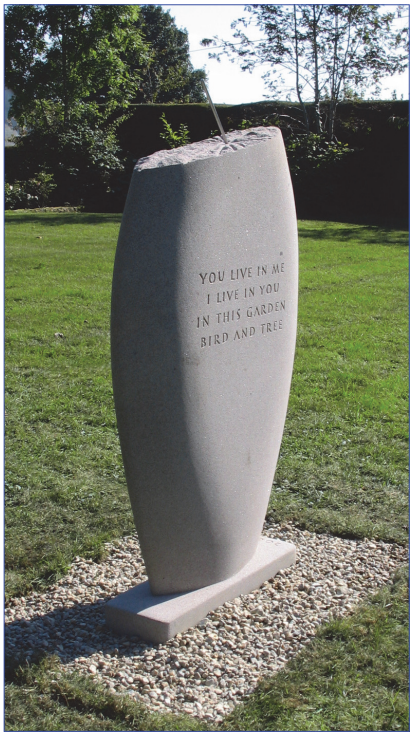
The riddle as she wrote it had a first and a second verse. But set out like this there ceases to be one first and one second verse. You might read either verse first depending on which direction you approach the dial from. Surely this is also a possibility that a writer could put to good use on a sundial.

Light and Shade (Fig. 14)

This is another of my dials. Here the lettering goes round and round: light shade light shade without beginning or end. The implied quality of being without beginning or end cannot be achieved by setting the text out on a flat page.

A good writer could surely come up with something deeper or cleverer but the trouble is most writers construct their texts for speech or the flat page and most carvers are not writers.

Fig. 14. Circular motto on a sundial pedestal.



Figs 12 &13. Two sides of a sundial pedestal with a riddle by Vicki Feaver. Note also the dial inclining towards the path.

I hope the points raised here are interesting and spark some new ideas on how arranging words and the carving of them in stone might make original and intriguing sundial sculpture.

NOTES

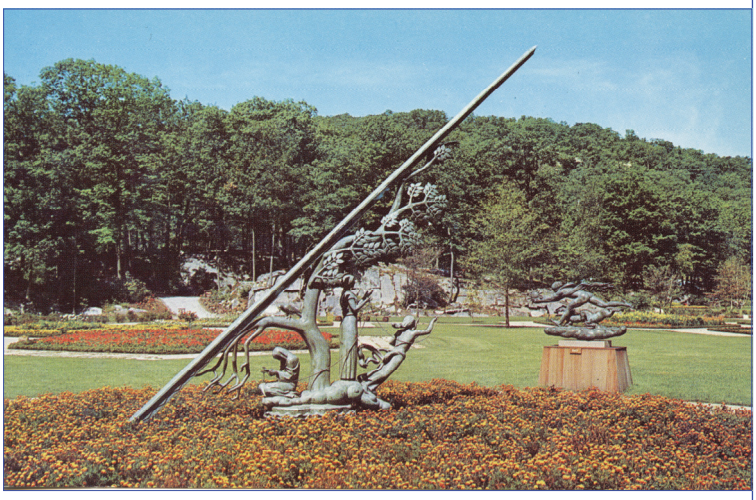
1. Dr Wolpe was a renowned lettering artist and type designer who in the later years of his life taught at the City and Guilds of London Art School.
2. I hate poetry.
3. For a more sculptural and less calligraphic approach to lettering have a look at Jakob and Leicher: *Shrift und Symbol,* published by Calwey who also published *Sonnenuhren* by Heinz Schumacher.
4. Some lettering books worth looking at are: David Harris: *The Art of Calligraphy*, (pub. Dorling Kindersley), Michael Harvey: *Carved Lettering in Stone and Wood,* and Tom Perkins: *The Art of Letter Carving,* (pub. The Crowood Press).
5. Websites: *www.letterexchange.org* and *www.memorialsbyartists.co.uk.*

Ben Jones studied lettering at The City and Guilds of London Art School 1981/84. Since 1989 he has worked as an independent letter carver and sundial maker. He works mainly by himself but has been very glad to work with Sir Mark Lennox-Boyd and Chris Daniel.

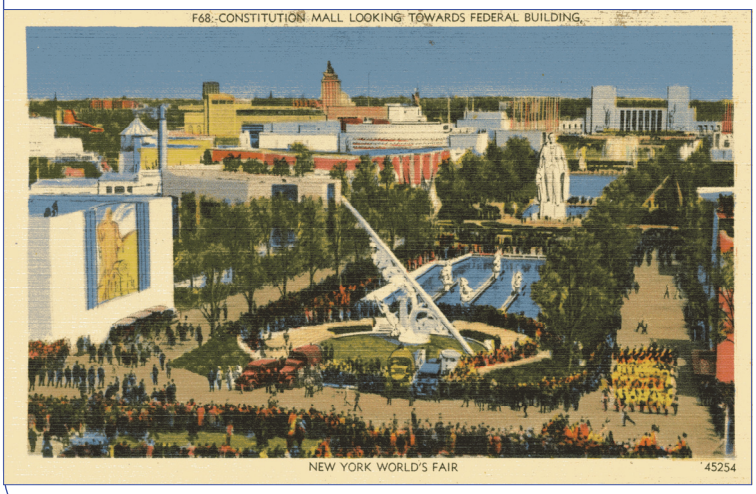
Postcard Potpourri 30
Sterling Forest Gardens, Tuxedo, NY State, USA

Peter Ransom

'Time and The Fates' is the name of this decorative sundial by sculptor Paul Manship featured on a postcard from 1961. The statue in the background symbolises Day. Sterling Forest Gardens opened in 1960 and closed about 1976. The gardens were formally laid out with European-style fountains and statuary – said to be one of the two most outstanding examples of a formal garden in the country. Nowadays the property is the site of a Renaissance Faire.



Paul Manship (1885–1966) did a large version of this dial for the New York World Fair in 1939 when it was considered to be the world's largest sundial. This is illustrated on the other postcard, posted on 11 September 1940. It is believed that this dial was broken up after the event: the current location of the Sterling Forest Gardens dial is unknown.



He also did a large armillary sphere: *The Cycle of Life* in 1924. This sculpture is on the campus of Phillips Academy in Andover, Massachusetts. It shows a man, woman and child representing the cycle of life: they are surrounded by an armillary sphere showing the relationship of the stars and earth. There is a picture of this at *http://en.wikipedia.org/wiki/File:Cycle_of_Life_(Armillary_Sphere).jpg* A smaller gilt-bronze version can be seen at the Speed Art Museum, Louisville, Kentucky.

The New York postcard was produced by the Manhattan Post Card Publishing Co. (1928–1974). The postcard was published by Dexter Press, which was sold in the early 1970s: full details of what happened can be found at *www.worldsfaircommunity.org/topic/1606-dexter-press-inc/*

pransom@btinternet.com

INSPIRATION AND DESIGN OF PORTABLE SUNDIALS

JACKIE JONES

I have been making silver sundials for about 12 years and each one can present a different set of design challenges. From the initial concept to the finished dial, there are sketches, drawings, layouts and metal samples which will eventually be formed into the final plan before making in silver. Sometimes the inspiration may emerge from other drawings – such as a landscape sketch – or come as a brief from a client – such as a Valentine's heart. Either way, the original thoughts have to be translated into an accurate, working dial; this may well involve some compromises.

I originally followed a design course at Art College, training as a jeweller. Although I specialize in silver portable dials, I have also painted a large sundial on the front of my house and have made a number of mosaic garden dials. On all my dials, the aims are similar: to create an accurate dial featuring contemporary styles.

When I first looked in detail at small dials in museums, I realised that they were made using many of the techniques and skills I used to make my jewellery. This opened up to me a new world of gnomonics; no longer was it just jewellery, it had to accurately tell the time. But I wanted to move on from the traditional designs and make them for the present day; they had to be more than just practical and functional but also a piece of contemporary art. This obviously presented challenges, not least in deciding on alternatives to the surface finishes, engraved hour lines and numbers.

The silver dials take a number of forms. The polar dials are designed to place on a desk; they measure about 10 to 12 cm. They have a compass on the stand and can be made adjustable for different latitudes by means of a small screw thread. The necklaces have a gnomon which is hinged, so it can lie flat behind the dial plate when not being used as a sundial. Hanging from a silver chain, it becomes a vertical south-facing dial. For the boxes, which are about the size to hold postage stamps, the dial is on the lid; this is either hinged or removable. Some are just a dial plate with a folding gnomon; this enables it to be flat enough to keep in a pocket.

Fig. 1. Polar dial inspired by original sketches of the South Downs.

Fig. 2. Vertical south dial necklace with amethyst.

I use the shape of the dial plate to reflect and complement the design; for example, the trees and hills landscape in Fig. 1 suits the wider proportions of a polar dial. A necklace dial works better from a practical, wearable perspective as a shape which is more evenly proportioned. For the necklace in Fig. 2, I complemented the circular outer shape with the round amethyst and the spiralling gold and silver hour

Fig. 3. Vertical south dial necklace as a Valentine's present.

granules. The stars, which lie on the hour lines, provide a contrast designed to emphasise different elements of the piece. Figure 3 shows a heart necklace; this was a brief from a customer as a present for his wife. He participated in the design of it; as well as the overall heart shape, he selected the stones (a moonstone, onyx and lapis) and specified that there were not to be any numbers on it. It proved quite difficult to create a visually pleasing design that actually worked as a dial, but when the shadow of the gnomon is on the dial face, it does become clear.

Fig. 4. Pocket dial with cut-out star in gnomon.

I like to incorporate a cut-out design on the gnomon; usually stars, but have also used clouds, geometric lines and even beetles on a dial for a botanist. I use stars frequently; I find them interesting and have often incorporated them into my jewellery designs. They are also relevant to sundials. Stars move, as do these ones. To emphasise movement, they are not regular, evenly shaped stars, but ones with different length points (Fig. 4). As this shape changes, it is important to understand how the shadow of the gnomon will look at different times of day and also the year, so I may use a card one first and experiment.

Fig. 5. Polar dial with 'shooting stars'.

The dial face surface gives scope for a range of design finishes. Obviously a polished silver plate would be useless for showing the shadow of the gnomon, but fortunately there are many more interesting methods of finishing the metal.

I often use steel rolling mills to press a texture into the silver sheet. In Fig. 5 I have used a sheet of sandpaper to create an even, matt, pitted surface. In Fig. 6 the sandpaper had holes made in it with a punch before rolling it through the mills with the silver. This gives a matt surface with raised circles. I then used a round punch to make circular recesses on the silver to complement them. The dial in Figure 1 was inspired by the hills of the South Downs near my home in Brighton. To create this effect, I used two grades of sandpaper with a gap between the curved edges and rolled them together onto the silver. The textures of the ploughed fields in the foreground are made by rolling the 'hook' side of Velcro onto the silver and soldering it on so it is raised slightly above the dial plate to give a sense of depth and distance.

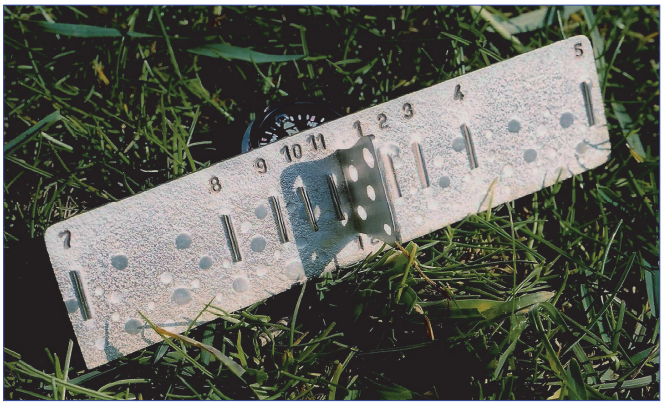


Fig. 6. Polar dial inspired by beach pebbles.

Fig. 7. Necklace dial with 'leather look' surface finish and gold stars.

A different visual effect is achieved by rolling the silver sheet with a layer of wire wool as shown in Fig. 7. The result looks somewhat leather-like and smooth enough not to disrupt the gnomon shadow line. Sometimes I have wanted to have a more dramatic finish and have melted the

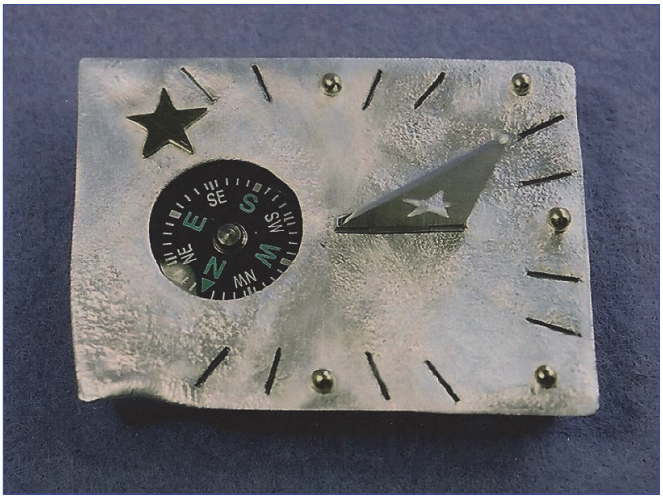


Fig. 8. Hinged box; dial plate surface with melted finish.

surface of the silver (Fig. 8). The result can be difficult to control and may require repeatedly heating to a high temperature and cleaning in acid until the desired finish is reached. If there is to be a lot of detailed work on the plate, as on the box in Fig. 9, I prefer a very simple surface which will not detract from the design. For this I use a brush of fine glass fibres which is rubbed over the metal under running water. A similar effect can also be obtained by sanding with a very fine emery paper. Generally, this surface is completed before anything is attached to the dial.

Fig. 9. Box with blue enamel stars

Numbers and lines can present a challenge in designing a contemporary dial. Whilst appreciating the classically engraved dials, which are beautifully made as well as being clear and functional, I wanted my sundials to incorporate modern design elements. The aim is for the hour indicators to be an integral part of the concept of the whole sundial and although accurate, it can be seen as a piece of designed artwork in its own right. If I use numbers, I generally prefer Roman ones to Arabic. I find them more elegant; their shapes have much more of a sense of unity to them.

For the box dial in Fig. 10, I wanted to spell out some of the hours, so I used a letter punch for the 6, 3, 9 and 12 lines. I used NOON as it can be read from either side. The

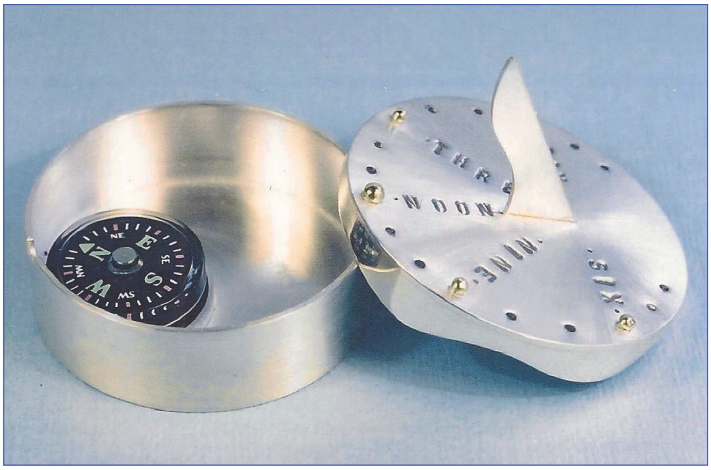


Fig. 10. Box with word hour indicators.

hour-line goes through the centre of the word, leading to a gold granule soldered in position. The intermediate hour-lines are shown by a small round punched recesses, the bases of which have been oxidized to a dark brown with potassium sulphide, as have the letters.

Often the dial plate may have no actual numbers, but different types of features such as granules, punched dots, stars, or lines to indicate where the hour is. The markers on the dial plate in Fig. 11 are intended to look abstract until their function is revealed as the shadow line moves round to join the gold granules which lie along the top or centre line of a star, or on the gold wire. Fig. 8 also has no numbers, but a gold granule for 6, 3, 9 & 12 and punched lines for the other hours.

Fig. 11. Box with motto round the side.

The box shown in Fig. 9 has stars and circles cut out of the dial plate on the hours and also a star on the gnomon. These are filled with transparent blue enamel through which light can shine. To complement the top, there are cut-out stars on the side of the box base to allow light in. As the day progresses, the blue star on the gnomon changes shape within its shadow on the dial plate.

In Fig. 5, the gnomon of which also has cut-out stars, the hour-lines are wires of which the ends have been melted to form a bead, designed to represent shooting stars. The polar dial (Fig. 1) with hills also has trees. These were created by

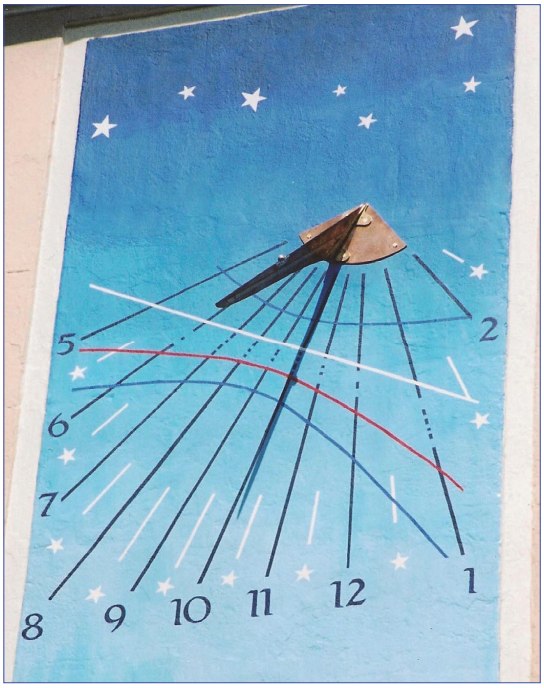


Fig. 12. Painted sundial on the front of my house with Morse code in the hour lines.

melting a large blob on the end of a wire and then hammering it flat with a domed hammer. I have used slightly unevenly punched Roman numbers to fit with the outdoor theme.

A major part of the design is the use of contrasting surface finishes, each intended to complement and provide a contrast to, the rest of the piece. The main dial plates are textured or matt silver, but I often use gold or silver features which are raised from the surface and highly polished as in Figs 2, 7, 8, & 11. Those features that are recessed, such as punched or engraved elements, are normally oxidised. This is designed to create a sense of depth without being an undue obstruction to the hour lines. To the style edge of the gnomon, which is normally about 1 – 1.5 mm thick, I give a polished finish.

I don't normally use a motto on my dials; I find them a distraction to the main design and dislike having to read – it being unavoidable – the same phrase repeatedly. I have used a line from a song (*we are but a moment's sunlight*) on the side of the box in Fig. 11, but it has to be rotated to read it all. The hour-lines, however, can provide a place for a different style of lettering; on the dial on the front of my house (Fig. 12) I broke up the lines using Morse code.

I was brought up in Greenwich and was always aware of sundials but it took being at Art College and my jewellery training to realise the potential of combining these interests to create contemporary versions of the portable sundial.

Jackie Jones studied jewellery at Hornsey College of Art and had her own workshop in London for many years before moving to Brighton. As well as making silver sundials she has also taught jewellery making and exhibited widely. She can be contacted at *jackie@waitrose.com*

Two Decorative Vertical Dials

The dial on the left, declining approximately 50 degrees to the west, is to be found (or actually is difficult to find) on the wall of a private house in Cheadle, to the south of Manchester. The house is estimated to have been built around 1800, in the Georgian period, but the dial is probably a restoration of an earlier, badly weathered dial. It was first reported in 1998 by Aylmer Astbury, and photographed in 2011 by Margaret Ribchester.

The dial above is by Jane and Peter Walker and is on their garage wall. It features a red rose of Lancashire (Peter's birthplace), a white rose of Yorkshire for Jane and a willow leaf for Somerset where they now live.

RESTORATION OF THE SUNDIAL AT ALL SAINTS' CHURCH, ISLEWORTH

PATRICK POWERS

It is always pleasant to be able to record the restoration of a worn dial but it is especially rewarding when the worn dial had previously been incorrectly delineated and wrongly restored. Such a restoration offers the chance to put things right. This was recently the case with the sundial on All Saints' Church in Isleworth.

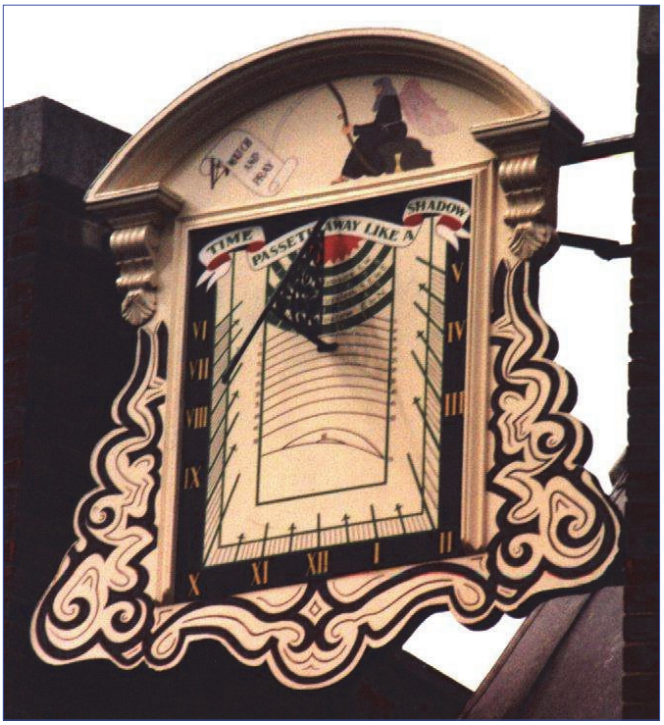


Fig. 1. The Isleworth dial soon after its previous restoration in 1999.

History of the Dial

Shortly after the Norman Conquest, Isleworth was recorded as a well-established riverside settlement on the Middlesex bank of the River Thames. Records indicate that a church has been on this site since AD 695 and the present tower is thought to date from 1398. The church and its monastery have had royal connexions since the time of Henry V but, after the dissolution of the monasteries, the buildings of nearby Syon and the church itself became Crown property and the church is to this day under the patronage of the Royal Chapel, Windsor. The building fabric had fallen into disrepair by the end of the 17th century and completion of a proposed rebuild – designed by Christopher Wren – was delayed by lack of funds until 1706.

The first ornamental sundial at All Saints was erected a year later in 1707. It was dedicated to the memory of Susannah, fourth wife of Colonel Sir Nicholas Lawes. Her father, Thomas Temple, is said to have given Lawes his Temple Hall Estate in Jamaica as a dowry on their marriage in 1698. Sir Nicholas subsequently became Governor of Jamaica from 1718 to 1722 and is credited with introducing coffee growing (what we today know as Blue Mountain coffee) to the island in the 1720s using trees imported from Martinique. He also is credited with setting up the first printing press in Jamaica. It is presumed that he may have been responsible for the erection of the original dial.

Sadly, the church, except for the tower, was destroyed in 1943 by two boys who had set fire to five churches in the area in the course of a few days, completely destroying All Saints' and one other. After years of indecision the desire for a full restoration was finally abandoned on cost grounds and in 1970 a smaller modern brick building was openly linked to the remaining tower. It is this church that continues in use today and the dial was mounted high on the new Lady Chapel of this building.

The Problems

There have been many restorations, repaints and even complete remakes of this dial over the years, not all of them leaving it in a fully working condition. Several of these have been recorded in the church's archives by early b&w photographs, by descriptive detail and even by some tracings. After the 1970 works the dial was repositioned so as to sit high between the angled walls of the new brick Lady Chapel; actually locally named the 'Joshua Chapel' in memory of a young boy who had died in infancy around the time of the chapel's completion. In this position the dial is actually rather too high for easy reading of its scales. Figure 1 shows it as it was in 1999 following a complete remake after the earlier dial had been regarded as irreparable and had been discarded.

The dial furniture of this replacement had been painted on a sheet of plywood set within an ornate and very heavy backing of 2½ inch (63.5 mm) thick ply measuring approximately 1.9 m (H) × 1.7 m (W) overall. The "Sans Retoure" arched pediment contained a seated winged Angel of Death observing a supported parchment carrying the motto

Fig. 2. The 1999 dial as it was in 2013 just before restoration.

"Watch and Pray" together with extensive scrolling around the dialplate. The inner dial plate measured 880 mm wide × 1060 mm high and contained a second motto: "Time Passeth Away Like a Shadow".

By 2010 the dial had seriously deteriorated. The twin views of Fig. 2 show that by then the gnomon was partially detached and in imminent danger of falling onto passing pedestrians, one wooden corbel had fallen away and the fabric of the dial was in an advanced state of decay. Like most Church of England churches, All Saints' is exempt from most listed building control. Alteration, restoration and change are instead regulated by the complicated and quite onerous process of licensing necessary works by means of a Faculty Jurisdiction. A 'Faculty' was therefore duly applied for from the Consistory Court of the Diocese. In view of the length of this procedure, this was done prior to any detailed discussions over the manner of restoration. As a consequence all subsequent restoration works had to follow the existing design and materials and longer-life options using more modern materials were not permitted.

Royal Warrant holders Charles Perry Restorations of St Albans won the contract to perform the work. Owing to the risk that the gnomon might soon fall the dial was swiftly removed from its position, well before any consideration could be given to the matter of the work needed to remedy its many defects of delineation.

Despite the many renovations and remakes over the years, archived photographs show quite a remarkable consistency of design. All show the unusual ladder-like scale of solar altitude, something which is rare, if not unique, on vertical dials in the British Isles. All show the same three time arcs showing solar time in Jamaica, Jerusalem and Moscow. The Jamaica link is clear from the history but the linkages with Jerusalem and – more particularly – with Moscow are not understood. It was common to include the time in Jerusalem in any set of significant place or city markings on dials at that time; however why Moscow should be important to this family is not clear. Peter the Great's 'Grand Embassy' (a Russian Diplomatic mission sent to Western Europe to search for allies – and especially advisers – in the fight against the Ottoman Empire) had visited England sometime in 1697–98, possibly even in the year of the Lawes' marriage. Perhaps Lawes had military connexions with that? As far as the dial is concerned, one might conjecture that this would then represent a balance of the interests of husband and his lately deceased wife.

The Many Errors of Delineation

Once in the hands of the restorers, the dial was carefully examined. There were many serious errors some of which can be seen in Fig. 3. Although clearly a declining dial, the hour scale was fundamentally incorrect, the hour lines did not meet at the gnomon root, the times given in the place name arcs and even the direction stated for Jamaica were all incorrect, the solar altitude scale and the gnomon itself

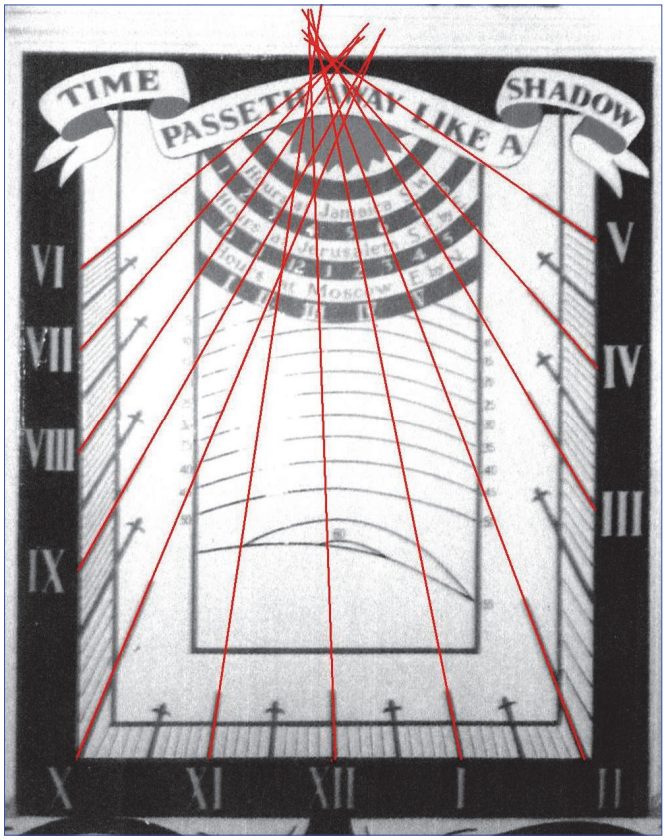


Fig. 3. Problems of delineation.

were wrongly centred on the noon line, the altitude lines were drawn as circular arcs and only one declination line (that for the summer solstice) had been drawn but even that had not been identified.

Additionally, an examination of the gnomon showed that there didn't ever appear to have been a nodus whose shadow against the altitude and declination scales would have been needed.

The inter-hour markings (which had been painted freehand and again did not point to the dial origin) had been drawn to show intervals of six minutes – something which is thought to be present on no other similar dial in the UK and which, from the available archival evidence, had never been used on any earlier manifestations of this dial. The gnomon was itself bent and its fixing was broken. Then there was the state of the 2½ inch thick plywood backing, a partly rotten easternmost mahogany corbel, a missing westernmost corbel and the loss of the lower part of the dial-plate's framing.

Fig. 4. The dial as restored and installed.

Problems of Declination

As if all that was not enough, the declination of the dial in its present place was not accurately known. With its present mounting high up between two modern, angled brick pillars, simple methods of declination measurement did not apply. Worse, the dial had been removed by the time that the delineation was being considered. The incorrect hour lines did not permit more than a rudimentary reverse calculation of dial declination, there was no flat wall that could be used to measure it by ordinary means and even a 1:200 digital Ordnance Survey map of the church proved to be inconsistent. In the event, an average of a series of readings taken from Google Earth was used and a figure of 5° 47′ East of South obtained. The gnomon for such a dial would need a style 'height' of 38° 30′ which reassuringly was found to be the actual angle of the gnomon after it had been straightened. Accordingly, a declination of 5° 47′ East of South was adopted for the new design and the fixings on the tower adapted to provide some modest adjustment.

Place Name Directions

As mentioned above, the arcs that show times in Jamaica, Jerusalem and Moscow also include the direction from Isleworth. These directions are the bearings which if followed continuously would lead to the place in question. They are of course loxodromic or rhumb lines which cross all meridians in their path at the same angle. They are represented by straight lines on a Mercator projection and the directions were checked using Colton's 1855 Map of the World. On the 1999 dial the directions stated for Jerusalem and Moscow were correct but that for Jamaica was wrongly given as "S.W." rather than as the correct 'S.W. by W'. It is to be supposed that this was a consequence of a simple omission in the earlier restoration.

Delineation and Painting

The dial's delineation was completely reworked and checked and the final basic layout transferred to a CAD drawing package so that a full sized cartoon could be produced. A new marine ply dial-plate was constructed, sealed and painted on both sides with a white gloss exterior grade paint. The design was then pricked through the cartoon onto it. In view of the extensive artwork that had to be reproduced on this dial, all fonts, numeric styles and the hour line markers were left to be brought into balance by the signwriter who faithfully used the same colours, and styles that were known to have been used in past versions of the dial. The scroll-work on the backplate was not copied from the 1999 design shown in Fig. 1 since all known earlier restorations were found to have much more floral scrolling. This floral scrolling was copied as far as was possible using the descriptions and the b&w images available in the church's archive.

Remaking the Backing and Surround

The original dial as removed had been constructed from a single backing piece of 2½ inch thick ply. Its weight had proved to be a major obstacle during removal of the dial from the tower and it was decided that the replacement should be made in two lap-jointed halves of marine ply that could be simply bolted together after raising them in place. This was achieved using concealed fittings. The reduced sizes of the component parts also made it easier for the dial to be transported to the signwriter for all of this work. He had recently retired to Cornwall but had been persuaded to come out of retirement for this one further project.

As much as possible of the arched pediment and the remaining damaged corbel was retained by letting in new

wood where appropriate and a completely new west corbel was carved to replace that which had been lost.

Once all of the painting had been completed, the scalloped edges of the backing together with the tops and horizontal inner surfaces of the pediment were covered in lead and the gnomon, together with its new spherical nodus, was fitted.

Testing and Installation

Before being taken to site, the fully assembled dial was set in a frame and oriented and slightly tilted to allow it to be fully checked at ground level in St Albans. The test showed an excellent performance. Following this the dial was transported, assembled and installed at All Saints'. Installation to a precise alignment at such a height – and with four separate mountings, each with links – proved not to be easy. It was aligned as far as was possible given available sunshine. This was done against a pre-calculated table of the solar time that should be indicated for any clock time during the day. Figure 4 shows the new dial in place on the tower.

ACKNOWLEDGEMENTS

Restoration and Installation Services: Charles Perry Restorations Ltd. Dial Consultancy and Delineation: Patrick Powers. Image copyright permissions: Mrs Gillian Churchill: Fig. 1, Charles Perry Restorations: Figs 2 and 4.

patrick_powers@compuserve.com

THE SAUGHTON PARK SUNDIAL

Saughton Park is one of Edinburgh's hidden jewels. It came into Council ownership in 1900 when it was purchased from Sir William Baird Tuke.

Nowadays it has playing fields and an athletic track and, since 2010, the largest skateboard park in Scotland. It has a delightful formal garden with clipped yew hedges, heather and flower beds, an Italian garden and a rose garden which is contained within the garden walls of the old mansionhouse.

Unfortunately, the mansionhouse was razed to the ground in the mid 20th-century in a controlled burning as it had become riddled with dry rot. However, it is within this rose garden that a tall ornately decorated sundial, the remaining vestige of the old mansionhouse, sits proudly amongst the roses (Fig. 1).

1

3

It has four vertical circular dials at the cardinal points (Fig. 2) and a tapered finial ornamented with scrolled brackets and foliate forms (Fig. 3). These parts of the structure are from the 17th century whilst the remaining structure underneath the dials is from the restoration in 1899.

2

Below the dials are four cherubs' heads (Fig. 4) and neoclassical urns and swags. It has many mottoes including the Scottish 'tak tent o time ere time be tint'.

Dennis Cowan

4

ENGRAVED DECORATION ON ENGLISH HORIZONTAL DIALS

JOHN DAVIS

Horizontal sundials engraved on brass[1] have developed a very identifiable style in England.[2] This style is not generally heavily decorated but the elements of decoration which the dials do contain show the developments in engraving skills and style over nearly five centuries. The basic tools used were almost unchanged over this period – a burin or graver of hardened steel together with a straight-edge, a pair of compasses, and perhaps some simple templates or jigs. Nevertheless, it is usually possible to date a dial to within 50 years simply by the layout and style that the maker has adopted.

London-made sundials, produced by a small group of professional mathematical instrument makers, were key to setting the general style of sundials from the mid 16th century until the end of the 19th century. The London guild structure meant that the styles were passed from master to apprentice and changed only slowly over the centuries. The overall impression of these 'London dials' was of a rather restrained style appropriate for a scientific instrument with decoration only in the fine details and, perhaps, in a coat of arms. Outside London, 'provincial dials', perhaps made by a local clockmaker or an enthusiastic amateur, often went in for much more flamboyant decoration and hence are rather more difficult to date, the style usually being many decades behind that current in London.

The details of a brass sundial which may be considered as decorative include features such as the compass rose, the markers for half- and quarter-hours, lettering styles, cartouches for names, and borders. In addition, there may also be features (figures, flowers, astronomical diagrams *etc*.) added as pure decoration to fill a blank area of brass. Indeed, on the better dials over the whole period, it was usually considered to be a sin to leave an area of brass blank!

Fig. 1. A dial for Henry VIII dated 1542, by Nicholas Oursian. The gnomon is not original.

Courtesy of the Oxford Museum of the History of Science.

The Earliest English Brass Horizontal Dials

The earliest extant English brass dials come from the Tudor period. Although there is written evidence of dials in the reign of Henry VII, the dial in Fig. 1 from the period of Henry VIII is the earliest dated extant example (1542). The key points to the overall style of this dial are that the origin of the delineation is in the centre of the dial plate and that it is divided only to half-hours, marked by punched stars. The original gnomon would have been much thinner than the replacement seen here, probably with a knife-edged style, so that no noon gap was necessary. The hours are numbered with inward-facing Roman numerals which have quite wide angles for the Xs and Vs. The decorative elements are the crowned Tudor rose between the HR (for *Henricus Rex*) and the floral band round the edge. The maker, Nicholas Oursian, was an immigrant, a friend of Nicholas Kratzer and responsible for the astronomical clock at Hampton Court Palace. It is likely that he bought his engraving skills with him, as did the famous maker Thomas Gemini a few decades later.

A slightly later dial (Fig. 2) from the Elizabethan era, made in 1578 by an unknown maker for Sir Philip Sidney (1554–86), is quite similar to the Oursian one in general style and whoever engraved it had a very assured hand – look at the regularity of the rope-work border. Notice too the 'scrolls' at the ends of the chapter ring; an early appearance of what

Fig. 2. An Elizabethan dial with arms featuring the motto of

Fig. 3. A very simple Tudor dial almost without decoration and made with the use of punches. Note, in passing, the decorative shape of the gnomon – an area for further study.

Fig. 4. A late-Elizabethan dial by Isaack Symmes.

Photo by the author, courtesy the Science Museum, Kensington

would become a common feature on high-quality English dials where it was a standard providing a decorative termination for any interrupted scale ring.

It seems likely that these high-class dials have been engraved by workers also skilled in other fields, such as goldsmiths, as the quality and style of the engraving is reminiscent of that found on gold- and silverware, and also on brass items such as the plaques above the stalls of the Garter knights in St George's Chapel at Windsor Castle.[3] In contrast, more everyday dials of the period (Fig. 3) are much simpler and are mainly punched rather than engraved, sometimes with I, V, X and * punches and even, at times, just the I and *.[4]

At the end of the Elizabethan period, a few dials were made with a florid lettering style which reflects that seen in manuscripts of the period. Fig. 4 shows an example of this from the goldsmith Isaack Symmes. The origin of delineation has now been moved towards the southern edge of the dial-plate so that the space is better used and the division is now down to quarter-hours. Decoration is strictly limited though full use of the dial-plate is made by the set of declination lines[5] and the lunar volvelle – an item more often found on portable dials.

The Seventeenth Century

At the beginning of the 17th century, in the Jacobean period, dials became devoted more to simple time-telling and the style was dictated by the work of Elias Allen (c.1558–1653)[6] and his workshop, generally regarded as the father of the mathematical instrument making industry in Britain. Allen was an accomplished maker of accurate scientific instruments but his style was quite austere – for example, his half-hour markers were simple 'T' shapes. The divisions of his dials usually went to at least 5-minute, and sometimes 1-minute intervals. They also sometimes showed the old 'half-quarters' (*i.e.* 7½-minute) divisions which were in general use a generation earlier. This use of fractional hours in a subsidiary chapter ring carried on well into the 18th century by which time it was completely redundant and only continued for traditional reasons.

As well as the London scientific instrument makers, dials were produced by provincial makers. The dial in Fig. 5 is an idiosyncratic one-off dial from this period by an unknown maker. Besides being complex (it includes a stereographic projection although it is not a standard double horizontal dial to William Oughtred's design[7]) the dial has two charming decorative elements. One of these is a mariner looking like Mr Punch and using a cross-staff

Fig. 5. Details of a dial by an unknown maker, probably in the early 17th century.

although, like many illustrations found in contemporary books, it shows the instrument fitted with all its optional cross-pieces at the same time. The dial uses a particularly elaborate pattern – very time-consuming to engrave – in the borders and has an excellent N mark to the compass. The rather weak fleur-de-lys half-hour marks point to an inexperienced engraver working on a major project.

The middle part of the century saw dial-making continue through all types of problems including the Civil War and several outbreaks of the plague (which killed, for example, Henry Sutton (w.1649–1665) who was probably the greatest engraver of accurate scales on scientific instruments of the time[8]). Styles did not advance very much although the control and precision of the engravers did steadily increase.

After the Restoration of the monarchy in 1660, the restored aristocracy wanted to renovate their houses and gardens and often included a sundial – the bigger, the better. They thus managed to display conspicuous consumption as well as the owner's scientific knowledge and taste. The leading maker at the end of the seventeenth century was undoubtedly Henry Wynne who could trace his 'ancestry' though a master-apprentice relationship through to Elias Allen. His output included a group of very large double horizontal dials[9] where the stereographic projection in the centre of the dial-plate meant there was little room for significant decoration. One of the characteristic features of his dials is the use of an elaborate half-hour mark (Fig. 6) in an 'H' form and based on a group of five drilled dots: on badly worn dials, these dots become the most prominent feature.

One decorative feature of horizontal sundials of this period is their pierced gnomons (Fig. 7). This really is a subject in its own right and the styles included the use of piercing with a mixture of thin and thick scrolls, and pierced monograms and coats of arms. These latter would usually include engraving on both sides of the gnomon as well as the piercing, adding considerably to the work and hence cost. It is worth saying that the gnomons on all dials, including quite small and plain ones, would have been produced from a bespoke casting, finished with much filing. Today, most gnomons are cut from a metal plate either by waterjet or laser-cutting for larger dials or a scrollsaw for smaller examples.

Fig. 6. The characteristic 5-dot half-hour mark used by Henry Wynne.

Fig. 7. Pierced gnomons by (left) Hilkiah Bedford, late 17th C, and (right) William Deane, early 18th C.

The arrival of Flamsteed's Equation of Time tables in the 1680s and the need to convert sundial time into mean time (to allow setting of longcase clocks with ever-increasing accuracy) meant that there was a need to find space on the dial-plate for this information. Thus features such as moon dials and complete chapter rings for numerous world-wide locations, which had previously filled the space outside a central compass rose, were dropped. The 'geographical' data was sometimes retained by simply putting the place-name in the main chapter ring at the point where it would indicate the sundial time of local noon at the place. This scheme started with Henry Wynne and later became a staple of the standard 18th-century design.

During the last two decades of the 17th century, makers experimented with methods of presenting the EoT data.[10] The dials signed by Thomas Tompion[11] tended to use calendar tables with a value for every day of the year (or every other day on smaller dials) which was extremely time-consuming to engrave. Henry Wynne, on the other hand, experimented with 'strip' scales, placing a continuous calendar scale against another of the EoT in half-minute steps. Initially, the strip was a linear one along the style edge of the gnomon (as on the Staunton Harold DH dial) but quickly moving to concentric arcs around the central compass rose. At this time, the main hour-numerals and the other engraving were still oriented towards the centre of the dial ('inward facing') so it was natural for the calendar scale to follow this, running clockwise.

The EoT rings were initially labelled as the 'Æquation of Natural Days' but this description was later taken as read and the rings were simply noted as 'Watch [or Clock] Fast [or Slow]. They would normally be separated from the compass rose on the inside, and the chapter ring on the outside, by narrow rings of 'oakleaf' decoration, sometimes called 'wheatear'. The presence of these rings, requiring hundreds of short graver strokes, is sometimes taken as a badge or 'logo' that the maker was a member of one of the London guilds. This does not seem to be an actual rule (although the signing of all dials certainly was) but it is generally a good indication.

The Eighteenth and Early Nineteenth Centuries

When Henry Wynne retired in around 1709, a new generation of mathematical instrument makers began to develop what would, by the middle of the eighteenth century, become the standard 'London pattern' dial. Wynne's own apprentices, including Thomas Wright (who took over his workshop), Richard Glynne and Thomas Tuttell all contributed small details to the style. But the biggest influence to the really top-quality dial design was John Rowley (Fig. 8). It was probably Rowley who first decided that, for large dials on relatively tall pedestals, it was easier to read the time if the main hour numerals were outward-facing. This seemingly simple change from the earlier 'clock-dial like' arrangement which was universal up to the end of the 17th century gradually spread, first to the other London makers and then, in the second half of the 18th century, to more provincial ones.

The corresponding change in orientation for the Equation of Time scales to outward-facing initially kept a clockwise direction which meant that the months were, very awkwardly, read from right to left. This was quite quickly solved by changing the scale to an anti-clockwise one.

Fig. 8. The superb quality of John Rowley's engraving.

From this point (first seen in the early 1710s), the 'standard' pattern for the London dial was set and no further major changes were made.

Mathematical instrument making had become an industry by the middle of the eighteenth century with makers such as Thomas Heath having large workshops of 'journeyman' workers each specialising in a particular aspect of the work. Engravers were just one of the specialisms (it is suspected that it was the poor apprentices that got the job of scraping the front surface of the dial-plate smooth before engraving began!). Dials were no longer 'signed' finishing with *fecit* as the name was that of the business rather than the worker. In the second half of the century, the name might just have been that of the retailer, sometimes from a different line of business such as an optician, with the maker not being mentioned at all.

Decorative features were mainly the scrolls at the terminations of the EoT and other circular rings and also the cartouches for signatures and coasts of arms. The designs for these seem to have come from an as-yet unlocated patternbook. With no photographic enlarging machines available, these features were sometimes inserted into a space which was slightly too small for them, leading to a visible cropping or truncation. Extra swirls could be added if the space was larger than the patternbook element.

By the 19th century, dials had become almost commodity items to a near-standard design. The trend to simplify the decorative elements continued though the use, for example, of diamond-shaped half-hour markers though the dials remained quite complex with full Equation of Time rings being found on all the top dials.

Another simplification was the replacement of the oakleaf border with a zig-zag one which was much quicker to engrave. The use of dedicated engravers, though, did lead to a general improvement in the overall quality of the engraving with very clean and flowing lines and much fine detail. Nice touches were developed by the best engravers, such as gentle tapers on the fine strokes of the Roman numerals and 'buttressed' serifs. Another variant was to the infill of the broad strokes: earlier, they had always been produced by a series of closely-spaced parallel lines along their length but some engravers developed a side-to-side infill method.

Fig. 9. A dial from John Whitehurst of Derby.

A dial from the first half of the 19th century by John Whitehurst & Son is seen in Fig. 9. Whitehurst worked from Derby rather than London but the oakleaf border is plainly seen. The scrolls at the end of the EoT scale are very similar indeed to those of nearly a century earlier. They are cropped as described above.

In the second half of the 19th century, very high quality dials by the likes of Troughton & Simms showed the variations and simplifications of the earlier form such as that in Fig. 10. Points to note are the dog-tooth or zig-zag borders and the infill on the Roman numerals.

Fig. 10. A high-quality dial by Troughton & Simms, one of the last of the mathematical instrument makers producing dials. Talc has been used to highlight the engraving.

Late Nineteenth and Early Twentieth Centuries

Towards the end of the nineteenth century, the number of active dial-makers decreased as time was distributed electrically with the telegraph and clocks and watches did not need resetting on a daily basis. A few high-quality makers did survive, most notably Francis Barker and Son. They had a large workshop and even issued a catalogue of many different decorative designs, all properly delineated. Most were hand engraved but they did start to employ other techniques, such as a form of chemical etching (the details are currently unknown) for the more repetitive decorative features. Machine (pantograph) engraving also started to make an appearance: it has an easily identifiable characteristic of flat-bottomed lines of very uniform width ending in a semicircle. The more decorative dials of this period are starting to become valuable antiques in their own right.

Styles became even more simplified and the 'Watch Faster / Slower' type of EoT ring disappeared, occasionally replaced by a much simplified table or even, after WWI, a graph. One noticeable introduction was the use of Arabic numerals for the hours. One of the earliest examples of this was a dial sold in small numbers by Liberty and designed in an *art deco* style (and manufactured by F. Barker).

Modern Times

Modern techniques mean that styles from earlier periods can be reproduced relatively easily – buyer beware! But the knowledge to produce a convincing reproduction, or even a properly delineated dial, is restricted to only a few modern makers, mostly BSS members. Modernistic styles by 'artistic' makers using techniques ranging from casting to hand-engraving do make an appearance but are impossible to categorise.

'Fakes'

The definition of 'fake' used here is a dial made, or sold, with the intention to deceive. There are a lot (many hundreds, probably thousands) of dials made in the early and mid 20th century which carry false dates from the 17th and 18th centuries and sometimes with spurious makers' names as well. For decoration, they usually have a motto (virtually unknown before the late Victorian period) and engraved features such as Father Time figures, suns, and even masonic symbols. The most famous company to make these dials was Pearson Page Ltd or its later variants such as Peerless Brass. Their excuse, valid at the time but certainly not acceptable now, was that they were producing "what the customer wanted". With 50+ years of natural patination, these dials can at first glance look the part and they are certainly far better than a modern garden-centre dial but they can generally be recognised for what they are by the relative coarseness of the engraving – look at the spacing of the parallel-line infill on a compass point.

Conclusions

Many people like the sight of a nicely patinated brass sundial on a pedestal in a rose garden. Look closely and you might be able to construct a story of how long it has been there, the type of workman that produced it and how he had learned the skills of engraving something which is both an accurate scientific instrument and a piece of decorative art. Try to guess how many hours it took to make, especially if it has a finely-pierced gnomon. And if it features a coat of arms, perhaps half hidden below the patination, there is another field of knowledge to explore. The more you look at a sundial, the more interesting it becomes!

REFERENCES and NOTES

1. The material should really be described as copper-alloy as the dials may actually be of brass (copper-zinc) or bronze (copper-tin) or gunmetal (copper-zinc-tin) all with or without some lead.
2. Dials have also been made in other parts of the British Isles but they generally follow English (and mainly London) styles.
3. Examples of these plaques can also be seen in the British Museum.
4. See, for example, the palimpsest dial in *Bull*. 20(iii) 144-7.
5. M. Lowne & J. Davis: 'Lines of Declination and Two Seventeenth Century Dials', *BSS Bull,* 19(iii), pp.128-134, (June 2007). The delineation of the Symmes dial, which contains errors, is considered in some detail.
6. See J. Wilson: *Biographical Index of British Sundial Makers from the Seventh Century to 1920*, 2nd edition. BSS monograph No. 2. BSS, Crowthorne, (2007).
7. J. Davis & M. Lowne: *The Double Horizontal Dial – and associated instruments*, BSS Monograph No. 5. BSS, London (2009). See pp. 116–119.
8. Jill Wilson *ibid* (Ref 6); Henry Sutton.
9. J. Davis & C.M. Lowne: 'Henry Wynne's Double Horizontal Dial at Staunton Harold', *BSS Bulletin*, 15(ii) pp 46-58 (2003).
10. J. Davis: 'The Equation of Time as Represented on Sundials', *BSS Bulletin*, 15(iv), pp.135-144, (2003) and J. Davis: 'More on the Equation of Time on Sundials', *BSS Bulletin*, 17(ii), pp. 66-75, (June 2005).
11. Tompion's dials were not actually engraved by him: it is likely that John Rowley manufactured them for him and eventually made the style his own.

john.davis@btinternet.com

HONORARY OFFICIALS OF THE BRITISH SUNDIAL SOCIETY

Patron: The Hon. Sir Mark Lennox-Boyd
President: Christopher St J H Daniel MBE
Vice-Presidents: David A Young & Frederick W Sawyer III

COUNCIL MEMBERS

Dr Frank King 12 Victoria St CAMBRIDGE CB1 1JP	(Chairman & Restoration) Tel: 07766 756 997 chairman@sundialsoc.org.uk	Mr Chris H K Williams c/o The Editor	(Secretary) Tel: 01233 712550 secretary@sundialsoc.org.uk
Mr Bill Visick Kites Nest Cottage Kites Nest Lane BOURTON Dorset SP8 5AZ	(Webmaster) Tel: 07901 954568 webmaster@sundialsoc.org.uk	Mr Graham Stapleton 50 Woodberry Avenue NORTH HARROW Middlesex, HA2 6AX	(Treasurer) Tel: 020 8863 3281 treasurer@sundialsoc.org.uk
Ms Jackie Jones 51 Upper Lewes Rd BRIGHTON East Sussex, BN2 3FH	(Membership Secretary) Tel: 01273 673511 membership@sundialsoc.org.uk	Mr Chris Lusby Taylor 32 Turnpike Rd NEWBURY Berks, RG14 2NB	(Conference Organiser) Tel: 01635 33270 conferences@sundialsoc.org.uk
Mr David Brown Gibbs Orchard, Sutton Rd SOMERTON Somerset, TA11 6QP	(2014 Anniversary Coordination) Tel: 01458 274841 2014@sundialsoc.org.uk		

SPECIALISTS

Dr John Davis Orchard View, Tye Lane FLOWTON Suffolk, IP8 4LD	(Editor) Tel: 01473 658646 editor@sundialsoc.org.uk	Mr Peter Ransom 29 Rufus Close Rownhams SOUTHAMPTON Hampshire SO16 8LR	(Education) Tel: 023 8073 0547 education@sundialsoc.org.uk
Mr A O (Tony) Wood 5 Leacey Court CHURCHDOWN Gloucester, GL3 1LA	(Mass Dials) Tel: 01452 712953 massdials@sundialsoc.org.uk	Mr J Mike Shaw 3 Millwood Higher Bebington WIRRAL, CH63 8RQ	(Newsletter Editor) Tel: 0151 608 8610 newsletter@sundialsoc.org.uk
Mr John Foad Greenfields Crumps Lane ULCOMBE Kent, ME17 1EX	(Registrar) Tel: 01622 858853 registrar@sundialsoc.org.uk	Mrs Elspeth Hill 4 The Village Stonegate Nr WADHURST East Sussex, TN5 7EN	(Sales) Tel: 01580 201720 sales@sundialsoc.org.uk
Miss R (Jill) Wilson Hart Croft 14 Pear Tree Close CHIPPING CAMPDEN Gloucs., GL55 6DB	(Biographical Projects) Tel: 01386 841007 biographical@sundialsoc.org.uk	Mr David Pawley 8 Rosemary Terrace Enborne Place NEWBURY Berks., RG14 6BB	(Newbury Meeting Organiser) Tel: 01635 33519 newbury@sundialsoc.org.uk
Mr Nick Orders 14 Gordon Rd Burton Joyce NOTTINGHAM NG14 5GN	(Librarian) Tel: 0115 9314313 librarian@sundialsoc.org.uk	Mr Ian R Butson 60 Churnwood Rd Parsons Heath COLCHESTER Essex, CO4 3EY	(Photographic Competition) Tel: 01206 860 724 photos@sundialsoc.org.uk

The British Sundial Society
c/o The Royal Astronomical Society
Burlington House
Piccadilly
London, W1J 0BQ

The Society's website is at www.sundialsoc.org.uk
The British Sundial Society is Registered Charity No. 1032530