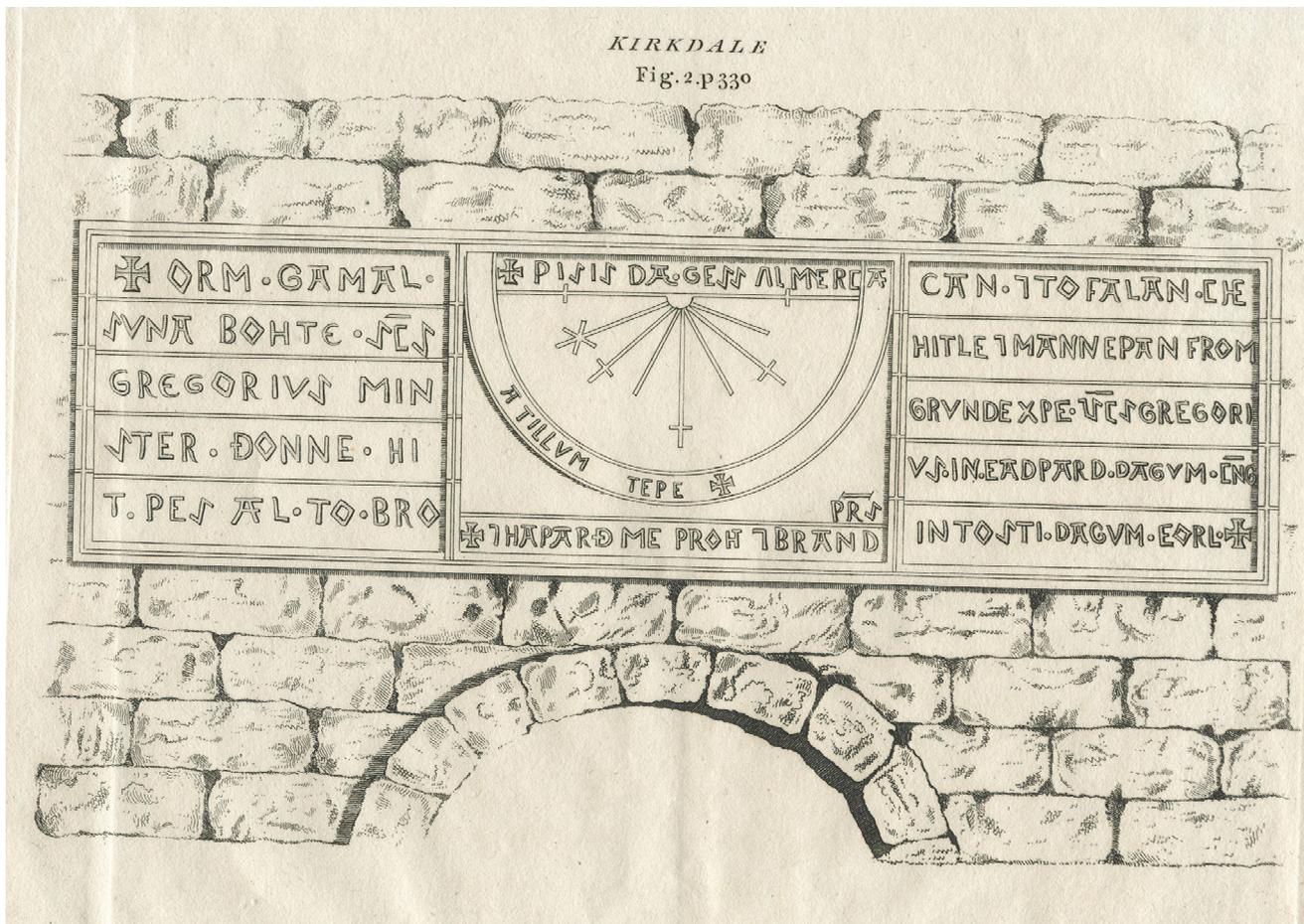
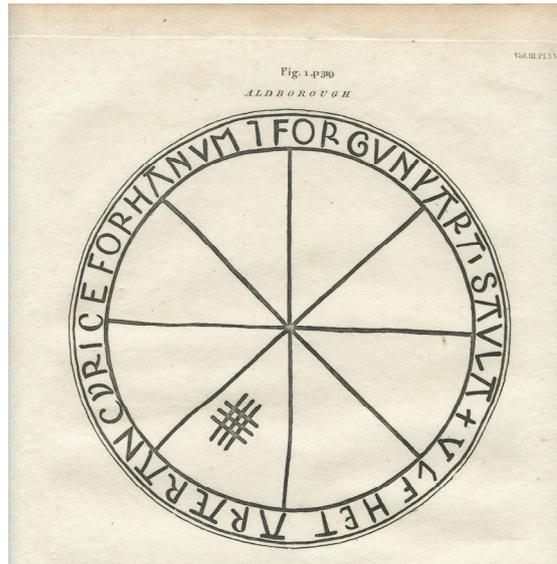


# The British Sundial Society

## BULLETIN





The Saxon dials at Aldborough and Kirkdale are rightly famous and photographs and illustrations of them are seen in many publications. Unfortunately, the dials have become rather less easy to read over the past couple of centuries and the often-used drawings of Haigh, published in 1879, are often better than modern photographs. Here, we see reproductions from an even earlier source – the copperplate engraving by John Cary for William Camden’s ‘Brittania: a geographical description of the flourishing kingdoms of England, Scotland and Ireland’, published by John Stockdale, Piccadilly, in 1806 (vol III, plate XVIII, p. 319). We are unlikely to find a clearer representation of the inscriptions.

**Front cover:** The “Roy Grosvenor Thomas” stained glass sundial, recently located after many years ‘lost’. See page 27 for more details. Photo by Russell E Perry.

**Back cover:** Advertisement – see page 52 for the full story.

# BULLETIN

## OF THE BRITISH SUNDIAL SOCIETY

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### EDITORIAL

December again so it’s time to vote for your ‘Most Enjoyed Article’ once more, this time for articles in the four 2013 issues. Please do send me your choices (up to three, in order) by any means you like—email, telephone, letter or carrier-pigeon. Last year the competition was won by a single vote so every vote is important. Authors put a lot of effort into writing their articles so do show them due recognition by voting.

A bumper Christmas issue for you this time. In mid-September I was rather short of material but in the end, lots of good articles arrived. Please keep them coming!

### ERRATUM

In the article ‘Planetary Hours’ (*BSS Bulletin*, 25(iii) September 2013), by Lowne and Davis, the definition of equal hours on page 40, towards the bottom of the right hand column, is wrong. Instead of saying that it is “the time for the vertical through the sun to pass through 15° of the equatorial circle”, it should have said that it was ‘the time for the hour circle passing through the sun and the poles to move 15° round the equatorial circle’.

The authors thank Frank King for bringing this to their attention.

# A SUNDIAL FOUND IN THE EGYPTIAN VALLEY OF THE KINGS

RITA GAUTSCHY and SUSANNE BICKEL

The University of Basel Kings' Valley Project is investigating a number of non-royal tombs in the famous necropolis of the Pharaohs on the west-bank of Luxor in Upper Egypt.<sup>1</sup> From the 15<sup>th</sup> to the 11<sup>th</sup> century BC, almost all the kings and a certain number of queens and officials were buried in this desert valley. The construction and decoration of elaborate tombs involved the continuous presence of workmen on the site. During their work shifts these workmen stayed in stone huts close to the place they were building, whereas their actual living quarters were at a certain distance in the village today called Deir el-Medina.

While clearing the entrance of an 18<sup>th</sup> dynasty (14<sup>th</sup> century BC) non-royal tomb in February 2013, remains of slightly younger workmen's huts were found. They contained the objects usually left in these structures, namely pottery plates and vessels as well as so called *ostraca*, flat limestone chips on which the workmen drew pictures or inscribed

texts.<sup>2</sup> Among these *ostraca* was the piece described here: one of the oldest Egyptian sundials (Fig. 1). The position of these huts in relation to the royal tombs in the Valley as well as the objects found within and around the huts indicate a date in the late 19<sup>th</sup> dynasty (*ca.* 1202–1190 BC), which also applies to the sundial.

## Description

The sundial is made of a piece of local ochre limestone of irregular shape. The back of the instrument is left rough. The dimensions of the sundial are 15.5×17.5×3.6 cm. No traces of bore holes for a possible mounting of the sundial are visible. Size and material suggest that it is intended to be a mobile instrument. Since the piece of stone is pointed in the lower part, it may be that the sundial was simply put into the sand on the ground for time measurements. Alternatively, an original upper part of the instrument including bore holes for mounting may have broken off. On the front side a black horizontal line is drawn. Its original centre contains a bore hole with a depth of 10 mm and a diameter of 6 mm. There, the now-lost gnomon was inserted, presumably without inclination. The gnomon may have been a wooden, bronze or lead pole. The horizontal line marks the hour lines for 6am (left) and 6pm (right). The noon line (12am) runs in an almost right angle (91° and 89°, respectively) to the horizontal line. In between five extra lines are sketched in the morning and in the afternoon part of the sundial. Additionally, black dots are present indicating half hours. Based on the semicircular design of the dial plane it is obvious that this instrument is a vertical direct south sundial, *i.e.* the dial plane had to be vertical and facing south in order to read the time correctly.

## Ancient Egyptian Time Measurement

The lapse of time between sunrise and sunset has customarily been divided into twelve equal parts in ancient Egypt. This means that an hour during winter is shorter (and during summer longer) than an equinoctial or equal hour used nowadays. Therefore, Egyptian hours are usually called unequal or temporal hours. Only at the equinoxes (EQU) do the length of a temporal hour match the length of an equal hour. For the geographical latitude  $\varphi$  of Luxor of approximately 25.5° N, the length of a temporal hour varies between 51 minutes at winter solstice (WS) and 69 minutes



Fig. 1. Sundial on a limestone ostrakon from the Valley of the Kings, 13<sup>th</sup>–12<sup>th</sup> centuries BC.

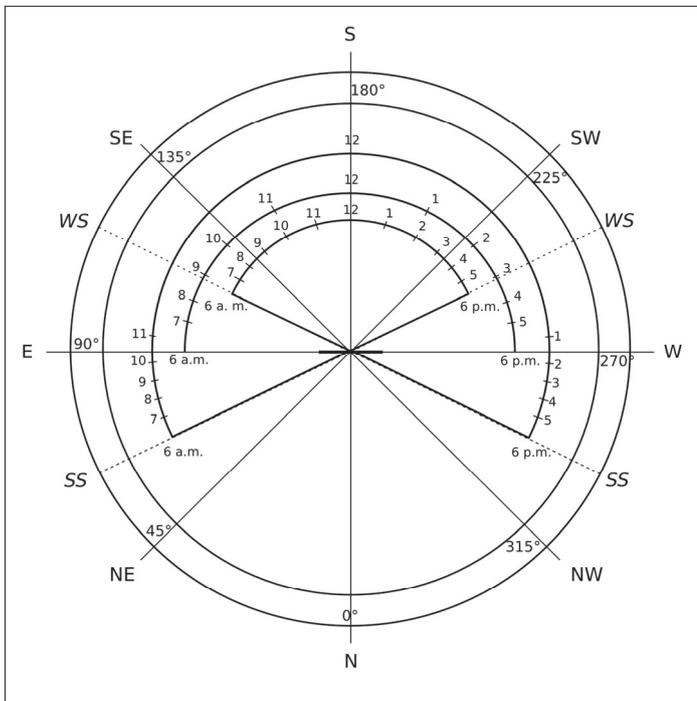


Fig. 2. Diurnal arc of the Sun at winter solstice (inner circular arc), at the equinoxes (middle circular arc), and at the summer solstice (outer circular arc). All data are calculated for a geographical latitude of Luxor ( $\varphi = 25.5^\circ$ ). Additionally, the solar azimuths for temporal hours are shown on the diurnal arcs.

at summer solstice (SS). The apparent directions of sunrise and sunset vary within a year. The position of a heavenly body is determined by its altitude and its azimuth in the horizontal coordinate system. For a visible object, the altitude ranges between  $0^\circ$  and  $90^\circ$ . The azimuth is the angle of the object along the horizon, here counted in the direction north, east, south and west. Thus, for an object rising exactly east the azimuth is  $90^\circ$ , and for an object setting exactly west the azimuth is  $270^\circ$ . Neglecting the effects of the equation of time and of refraction, this is the case for the Sun at the equinoxes. The middle circular arc in Fig. 2 illustrates this situation and in addition the azimuths of the temporal hours are shown on this arc. It is obvious that on a direct vertical south sundial mounted in the origin all the hours between 6am and 6pm may be displayed. At winter

solstice the Sun rises in southeast direction and sets in southwest direction. For Luxor, the solar azimuth at sunrise amounts to approximately  $116^\circ$  and at sunset to approximately  $244^\circ$  (inner circular arc in Fig. 2). Again, all the hours between 6am and 6pm can be indicated by the sundial. A different situation occurs at summer solstice (outer circular arc in Fig. 2). The Sun rises in the northeast and sets in the northwest; the corresponding solar azimuths are approximately  $64^\circ$  and approx.  $296^\circ$ , respectively. Since the sundial is not transparent only those hours where the solar azimuth lies between  $90^\circ$  and  $270^\circ$  can be indicated. For Luxor, this is the case only between 10:15am and 1:45pm expressed in temporal hours (between 10:00am and 2:00pm in equal hours). Thus, Fig. 2 illustrates clearly that the period of measurement of the sun's position for a vertical south facing sundial is considerably shorter during summer than in winter with a minimum at the summer solstice.

### Potential Precision of the Luxor Sundial

Fig. 2 illustrates that strictly speaking a simple sundial such as the one from the Valley of the Kings can tell the time correctly only twice a year: at the equinoxes. Only then does the Sun rise exactly east and set exactly west. Additionally, two further conditions must be fulfilled: the dial plane must be placed facing south exactly, and the upper horizontal line must be aligned east-west. The second condition can be easily achieved by using a plumb, the first by mounting the instrument on a south directed wall. For the mounting of the gnomon basically two possibilities exist. Firstly, a polos [a polar-oriented gnomon] can be used (as mentioned by the Greek author Herodotus, but which became common only during the Middle Ages<sup>3</sup>) mounted parallel to the axis of the Earth's rotation. For Luxor the polos has to be inclined  $25.5^\circ$  from the horizontal. Secondly, a gnomon such as a simple stick can be mounted at right angles to the dial face. This is the type of mounting which we have to assume for the sundial from the Valley of the Kings. This type is nowadays generally denoted as a canonical sundial because it was mainly used in cloisters to indicate the prayer times during the Middle Ages. Fig. 3 shows the differences in the alignment of the shadow lines for a

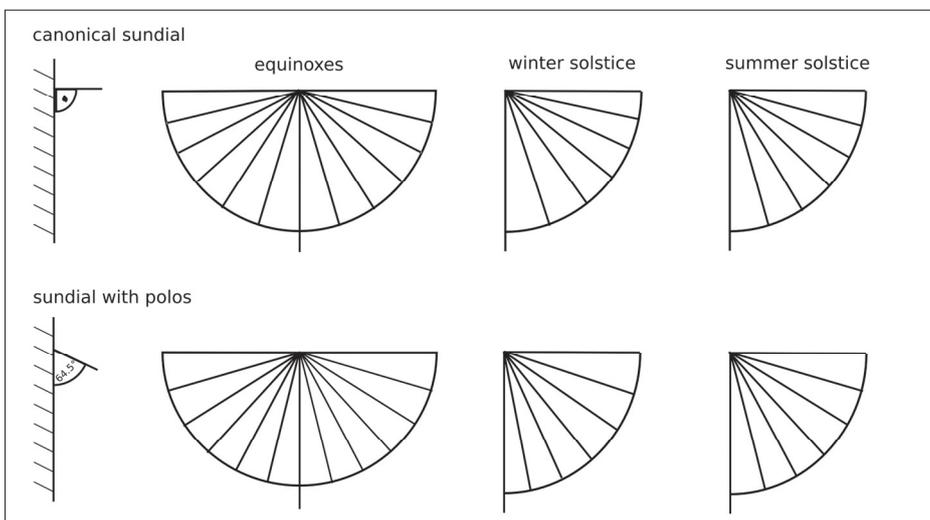


Fig. 3. Alignment of the shadow lines for the equinoxes, the winter solstice and the summer solstice for a canonical sundial and temporal hours (upper panel) and for a sundial with polos and temporal hours (lower panel). All hour lines are calculated for the geographical latitude of Luxor ( $25.5^\circ$  N).

canonical sundial and for a sundial with polos. When comparing the canonical sundial with temporal hours (upper panel) with a sundial with polos and temporal hours (lower panel) one can see that the angles of the shadow lines in the morning, evening and noon hours differ markedly. In the case of a canonical sundial the smallest angles occur in the morning and in the evening and the largest angles around noon while the situation is the opposite way round for a sundial with polos.

When looking at the position of the shadow lines on the sundial from the Valley of the Kings one notices that there is a tendency for larger hour angles in the morning and evening, with smaller ones around noon. This is contrary to the pattern of a canonical sundial which one has to assume in the 13<sup>th</sup> century BC. Hence, two possible interpretations remain:

The ancient Egyptians developed a theory of a regular 15°-division for the hours, which is in fact only valid at the equator. In that case, the hour divisions on the sundial were carelessly made and the deviations of the hour lines from multiples of 15° pure chance.

The polos which is mounted parallel to the axis of the Earth's rotation was already known. However, no such piece of evidence in contemporary texts or depictions exists.

The table in Fig. 4 summarises the hour angles on the sundial from the Valley of the Kings as well as the rounded calculated hour angles for a canonical sundial and for a sundial with polos, both calculated for a geographical latitude of Luxor for the equinoxes (EQU), the winter solstice (WS), and the summer solstice (SS). Fig. 5 shows a graphical comparison of the newly found sundial with a canonical sundial. Therefore, the noon line on the sundial was chosen as zero point. Since the 6am/6pm line is not positioned exactly at a right angle to the noon line, the calculat-

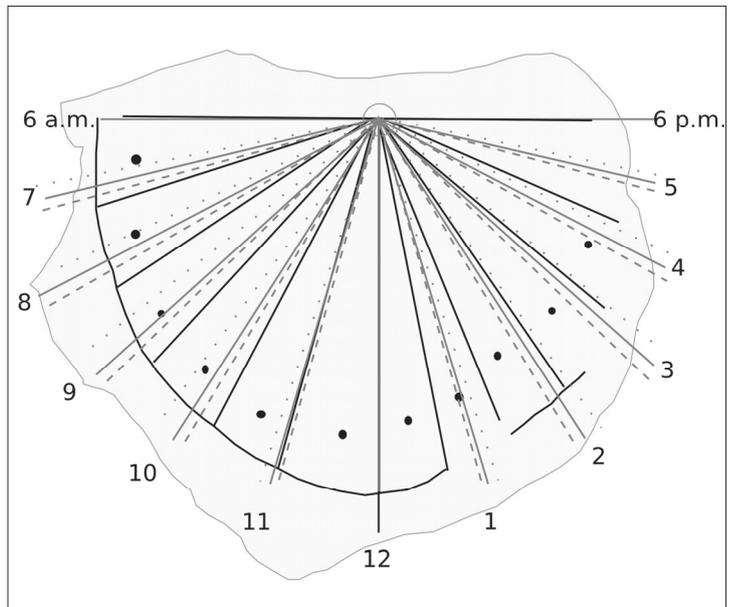


Fig. 5. Graphic rendering of the sundial hour lines (black lines) as well as the calculated temporal hour lines for the equinoxes (grey solid), the summer solstice (grey dashed) and the winter solstice (grey dotted).

ed and the actual horizontal lines diverge slightly. At noon, when the Sun is at its highest position in the sky, all lines coincide at all times. By means of the table in Fig. 4 the potential accuracy or inaccuracy can be easily investigated: each degree corresponds to 4 minutes, i.e. if the deviation amounts to 3°, the inaccuracy adds up to 12 minutes.

Figs 5 and 6 illustrate that the hour lines in the afternoon are far less precisely positioned on the dial face than those before noon. Compared with a calculated canonical sundial, the sundial from the Valley of the Kings is late by 4 to 32 minutes before noon, and early by 22 to 68 minutes in the afternoon. The largest deviations occur around the winter solstice. Alternatively, assuming a sundial with polos, the deviations are lowered considerably: before noon the devia-

	7 am	8 am	9 am	10 am	11 am	12	1 pm	2 pm	3 pm	4 pm	5 pm
sundial from the Valley of the Kings											
	17°	33°	47°	60°	76°	90°	100°	111°	124°	139°	156°
canonical sundial with temporal hours, calculated for Luxor ( $\phi = +25.5^\circ$ )											
EQU	14°	28°	42.5°	57.5°	73.5°	90°	106.5°	122.5°	137.5°	152°	166°
WS	12°	25°	39°	54.5°	72°	90°	108°	125.5°	141°	155°	168°
SS	15°	29.5°	44°	59°	74.5°	90°	105.5°	121.5°	136°	150.5°	165°
sundial with polos with temporal hours, calculated for Luxor ( $\phi = +25.5^\circ$ )											
EQU	16.5°	32.5°	48°	62.5°	76.5°	90°	103.5°	117.5°	132°	147.5°	163.5°
WS	18°	34.5°	51°	65.5°	78.5°	90°	101.5°	114.5°	129°	145.5°	162°
SS	16°	31.5°	46.5°	61.5°	76°	90°	104°	118.5°	133.5°	149°	164°
theory of a regular 15°-division											
	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°

Fig. 4. Angles of the hour lines on the newly-excavated sundial from the Valley of the Kings as well as the rounded calculated values for a canonical sundial and for a sundial with polos for the equinoxes (EQU), the winter solstice (WS) and the summer solstice (SS). Additionally, the corresponding values for a regular 15° division are given for comparison.

	7 am	8 am	9 am	10 am	11 am	12 am	1 pm	2 pm	3 pm	4 pm	5 pm
canonical sundial with temporal hours, calculated for Luxor ( $\varphi = +25.5^\circ$ )											
EQU	12 <sup>m</sup>	20 <sup>m</sup>	14 <sup>m</sup>	10 <sup>m</sup>	10 <sup>m</sup>	0 <sup>m</sup>	26 <sup>m</sup>	46 <sup>m</sup>	54 <sup>m</sup>	52 <sup>m</sup>	40 <sup>m</sup>
WS	20 <sup>m</sup>	32 <sup>m</sup>	32 <sup>m</sup>	22 <sup>m</sup>	16 <sup>m</sup>	0 <sup>m</sup>	32 <sup>m</sup>	58 <sup>m</sup>	68 <sup>m</sup>	64 <sup>m</sup>	48 <sup>m</sup>
SS	8 <sup>m</sup>	14 <sup>m</sup>	12 <sup>m</sup>	4 <sup>m</sup>	6 <sup>m</sup>	0 <sup>m</sup>	22 <sup>m</sup>	42 <sup>m</sup>	48 <sup>m</sup>	46 <sup>m</sup>	36 <sup>m</sup>
sundial with polos with temporal hours, calculated for Luxor ( $\varphi = +25.5^\circ$ )											
EQU	2 <sup>m</sup>	2 <sup>m</sup>	4 <sup>m</sup>	10 <sup>m</sup>	2 <sup>m</sup>	0 <sup>m</sup>	14 <sup>m</sup>	26 <sup>m</sup>	32 <sup>m</sup>	34 <sup>m</sup>	30 <sup>m</sup>
WS	4 <sup>m</sup>	6 <sup>m</sup>	16 <sup>m</sup>	22 <sup>m</sup>	10 <sup>m</sup>	0 <sup>m</sup>	6 <sup>m</sup>	14 <sup>m</sup>	20 <sup>m</sup>	26 <sup>m</sup>	24 <sup>m</sup>
SS	4 <sup>m</sup>	6 <sup>m</sup>	2 <sup>m</sup>	6 <sup>m</sup>	0 <sup>m</sup>	0 <sup>m</sup>	16 <sup>m</sup>	30 <sup>m</sup>	38 <sup>m</sup>	40 <sup>m</sup>	32 <sup>m</sup>
theory of a regular 15°-division											
	8 <sup>m</sup>	12 <sup>m</sup>	8 <sup>m</sup>	4 <sup>m</sup>	4 <sup>m</sup>	0 <sup>m</sup>	20 <sup>m</sup>	36 <sup>m</sup>	44 <sup>m</sup>	44 <sup>m</sup>	36 <sup>m</sup>

Fig. 6. Impreciseness of the location of the hour lines on the sundial from the Valley of the Kings in minutes in comparison to a canonical sundial, a sundial with polos, and to a simple theory of a 15° division.

tions would amount between 0 and 22 minutes, in the afternoon between 6 and 40 minutes.

### Similar Sundials

To our present knowledge vertical sundials are not common in ancient Egypt in the 2<sup>nd</sup> millennium BC. Indeed, the author of one of the (still) most important books about antique sundials, Ludwig Borchardt, was of the opinion that vertical sundials are a Greek invention and hence that all vertical sundials found in Egypt have to be dated to Graeco-Roman times (332 BC – 395 AD).<sup>4</sup> A brief treatise about the different types of Egyptian sundials has been published by Allan Mills.<sup>5</sup> We are not aware of any other find of a vertical sundial from the 2<sup>nd</sup> millennium BC. One repeatedly cited object was found in Gezer.<sup>6</sup> The excavator described the semicircular ivory object containing the cartouche of

the Egyptian pharaoh Merneptah (1213-1203 BC) as a pendant.<sup>7</sup> In his illustrations several remnants of rays are visible on the reverse of the object which have been later interpreted as a dial face.<sup>8</sup> The available drawings show a hole for a potential gnomon on the obverse of the object, but not on the reverse where it would be necessary to cast the shadow if it were to have been used as a sundial. Since the object seems to be lost it is unfortunately impossible to verify whether all details of the drawings are correct or not.<sup>9</sup> If they are correct, the object could not have been used as a sundial.

The few similar sundials existing from ancient Egypt are customarily dated to later times, mainly the Graeco-Roman period. The table in Fig. 7 summarises the characteristics of all small portable vertical sundials from ancient Egypt

sundial	find spot	place of purchase	dimensions	material	No. of hours	dating
Luxor 436	Valley of the Kings	-	L×H×B: 155×175×36 mm	local limestone	12	13 <sup>th</sup> century BC (secure)
Berlin 20322	?	Luxor	L×H×B: 74×68×12 mm	greenish faience	12	Graeco-Roman
Leiden F 1987/2.2	?	?	L×H×B: 90×61×12 mm	greenish faience	12	Graeco-Roman
Brussels E.7330	?	Cairo	L×H: 91×55 mm	steatite	12	Graeco-Roman
Paris E.11738	?	Cairo	L×H: 58×60 mm	alabaster	10	?
Liverpool SACE E.8501	Meroë (temple)	-	L: 98 mm	wood	11	100 BC – 200 AD (secure)
Dendera	Dendera	-	?	stone	12	?
Debod (non-portable)	Debod (quarry)	-	?	local stone	12	ptolemaic (secure)
Kertassi (non-portable)	Kertassi (quarry)	-	?	local stone	12	200 – 300 AD (secure)

Fig. 7. Properties of all small portable vertical sundial from ancient Egypt known to us as well as two non-portable exemplars from stone quarries.

known to us as well as two non-portable exemplars from stone quarries. We have analysed the dial faces of all these dials and compared their manufacturing quality and precision to the specimen from the Valley of the Kings.<sup>10</sup> When looking at the portable exemplars, it is clear that only this sundial from the Valley of the Kings and the specimen from Meroë (Sudan) have secure find contexts and hence a secure dating. Borchardt's opinion (see ref. 4) that vertical sundials are a later Greek invention has strongly influenced the dating practice of Egyptian vertical sundials. The sundial from the Valley of the Kings, dated to the late 13<sup>th</sup> – early 12<sup>th</sup> century BC, shows that vertical sundials were known in Egypt during the New Kingdom (ca. 1550 – ca. 1070 BC). This should be taken into account for the dating of the vertical sundials without known provenance.

The two non-portable sundials in the stone quarries of Debod and Kertassi are securely datable. Undoubtedly they served for telling the workmen the approximate time. Although they are up to 1500 years younger than the Luxor sundial they are not able to tell the time more precisely. With regard to the manufacturing quality and the precision of the instruments, the sundial from the Lion Temple in Meroë stands out. None of the dial faces shows a strict pattern with the morning and evening hour segments smaller than the ones around noon as one would expect for a correct canonical sundial. Only the fragment from Dendera may hint in this direction. On the contrary, the new sundial as well as the Berlin and the Paris specimens tend to show the opposite trend: larger hour segments in the morning and evening, smaller ones around noon – a behaviour expected for a sundial with polos. The sundial in Brussels shows no trend at all.

### Interpretation

The rather unsystematic distribution of the dimensions of the hour segments on all these sundials leads us to the conclusion that the ancient Egyptians had developed the theory of a regular 15°-division for the hours, which is in fact only valid at the equator. The further north or south the location the larger will be the divergence of the morning, evening and noon hour segments compared to the fixed 15°-segments. We suggest that the deviations from a regular 15°-partition of the dial faces was unintended. While the hour lines on the sundials in Meroë and Brussels are relatively precise, all other dials show much larger discrepancies. The new sundial from the Valley of the Kings is probably the oldest example. For the hours before noon the hour lines are as precise as on the other sundials which are probably considerably younger. However, the afternoon hour lines are very imprecise. The new sundial is the only specimen where half hours are indicated. Borchardt's judgment about the preciseness of ancient Egyptian sundials was pejorative.<sup>11</sup> However, one should keep in mind that today's claims of preciseness were completely inappropriate for the ancient Egyptian society and even for the monastical life in the Middle Ages. Presumably, it was less important to

achieve precise hour divisions, but more to determine benchmarks like a bisection or a quartering of the day. Once more the canonical sundials on numerous medieval cloisters announcing the daily prayer times seem to be the best examples for a comparison: although it was well known for a long time already that this kind of sundial was not able to tell the correct time independent from the season, it obviously sufficed the needs of the monks and nuns.

### Purpose of Use

The new sundial could have been used to arrange the labour times of the workmen in the Valley of the Kings comparable to the function of the two non-portable vertical sundials in the stone quarries of Debod and Kertassi. Jaroslav Černý was able to show by means of an analysis of the lists about the distribution of torches to the workmen that two working shifts existed: one before noon and one in the afternoon.<sup>12</sup> Thus, the working day was separated into two parts with a break around noon for recovery and probably also for a meal. Additionally, Černý observed that the number of torches given to the workmen before noon and in the afternoon are mostly multiples of the number four. He suggests tentatively that a normal working day may have consisted of four hours before noon and of four hours in the afternoon.<sup>13</sup> The Luxor sundial is able to provide such a division of the day visible for all. With a hypothetical four-hour working shift from 7am till 11am, a break between 11am and 1pm, and another four-hour working shift from 1pm till 5pm the afternoon working shift would be only 12 minutes shorter than the working shift before noon. Since the sundial can only announce the noon hours for some time around the summer solstice its main purpose during this season would have been to mark the break. The indication of half hours on the dial face stands seemingly in contradiction to the presented interpretation that the ancient Egyptians were more interested in the labelling of larger fractions of time than in single equally long hours. Maybe they were important in connection with physically very exhausting activities such as the clearing of stone overhead: a change of working position after relatively short fractions of time would make sense for reasons of productivity.

### ACKNOWLEDGEMENTS

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13. J. Černý: *The Valley of the Kings: fragments d'un manuscrit inachevé*, Institut français d'archéologie orientale, Cairo, 48 (1973).

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<http://aegyptologie.unibas.ch/fachbereich/personen/profil/portrait/person/bickel/>



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For more information of the University of Basel Kings, Valley Project: <http://aegyptologie.unibas.ch/fachbereich/personen/profil/portrait/person/bickel/>

## A Dial by George Bradford

This slightly battered but well-engraved 9" diameter dial is signed to the north of the gnomon: "Geo Bradford 99 Minories LONDON". It also has the name of its original owner to the south of the gnomon: "Edw<sup>d</sup> Jones Hermitage Debtling Kent". Debtling is now called Detling and has a Georgian mansion called the 'Little Hermitage' which is Grade II listed and a commercial wedding venue. The details of Edward Jones have yet to be uncovered.

George Adams Bradford (w. 1817–1851) has not previously been recorded as a sundial maker though he does appear as a mathematical instrument maker in, for example, Gloria Clifton's *Directory of British Scientific Instrument Makers 1550–1851*. He was often associated with his son, Isaac, and they have been recorded as selling octants, compasses and sextants.

The records of the Sun Fire Office show that he was at 99 Minories, London, in 1826 (when he is described as an MIM and a "dealer in hardware") but then in 1827 he insured 136 Minories and 125 Minories in 1832. Whether these were separate premises or due to postal renumbering is not known. The 91<sup>st</sup> edition of *Kent's Original London Directory* has, in 1823, George at number 136 and Isaac at 136.

Later, we find adverts for "John Omer, nephew and suc-



cessor to George Bradford. Real maker of mathematical instruments, 99 Minories near Tower Hill".

The gnomon on the dial is not original (it is too thick and does not have the square 'foot' which the dial engraving shows it would have had) but is a reasonable match. The 'dog's-tooth' border inside the chapter ring and the diamond half-hour markers show the slightly simplified engraving expected of the early 19<sup>th</sup> century.

*John Davis*

# AMATERASU

## The Japanese Sun Goddess rises in Shipston on Stour

SIMON FRY

This engaging sundial (Fig. 1) would never have come about had not personal circumstances forced a house-move to a bungalow with a large enough garden to welcome plenty of sunlight throughout both day and year. So starting two years ago, I embarked on my Japanese-style garden and took the opportunity to seriously consider making a sculpture for it. All gardens demand at least one decent-sized ornament and ostensibly I had room for two: one to celebrate the beauty and elegance of athletic youth, the other – a sundial.

The space is very modest (approx. 180 sq m) and from the outset the dimensions of the sculpture were of prime consideration: too small and it would be insignificant and lost; too large and it would dominate its surroundings, negating any future effort to create the peace and harmony appropriate to a Japanese garden. I had harboured a desire to combine both sculpture and sundial in one design from early on, and as the idea gelled the most suitable location for it became the issue. This involved drawing sight-lines from many locations around the house and garden. Only one situation met all criteria: a mere 5 m from the house, it would enjoy full Sun from around 7:30am to 6:30pm between the vernal and autumnal equinoxes, reduced to about three hours at the winter solstice.

Resolved as I was to use the human figure as the basis for the project, I thought it might be fun to use a raised arm or leg for the gnomon. I drew up many alternatives but no solution gave me that creative buzz. I trawled the internet for some inspiration only to discover that in thousands of sundials no-one, it seemed, had ever made one involving solely the human figure. Why, I wondered? There were some in which a figure was holding a sundial but I wanted one in which the figure *was* the sundial. Then, out of the blue, two quite unrelated images fell into my life: an abstract sculpture of a girl at an art exhibition in Bristol, and, shortly afterwards, the catching sight of some rhythmic gymnasts on TV, one of them cavorting with a hoop. My imagination did the rest by instantly processing a link. That hoop, if horizontal, would make a dial, I thought, and her leg through it a gnomon. The result? 'Amaterasu' springs to life in my garden every day.

I am not a sculptor (this being my first attempt) nor am I a sundialist, though I did make one for the Millennium (see *BSS Bull.*, 13(i)). I am not a professional artist either (although I was an art teacher), nor am I an engineer or a garden designer, so this was always going to be a real challenge. First up was my choice of materials: it had to be totally weatherproof and bird\*\*\*\*proof. I would love to have used bronze but this would prove way too expensive. I considered wood, steel and ceramics as alternatives but each medium came with its own particular disadvantages. In the end I settled for quick-setting cement, used for speedy repairs in the building trade. I would have to experiment with ways to colour it as I wanted the finished effect to look like bronze, so, supported from within by a metal armature and mounted on a stone plinth – what could be easier? With the whole project one big experiment I set off into the dark.

### Construction

After making several mock-ups in card, wire and polystyrene I could see the idea had legs (no pun intended). In my desire for accuracy, I bought a professional gymnasts' hoop and acquired the assistance of a model. Now not even a super-fit retired ballet dancer can hold a pose like the one I had planned for more than a few seconds; so, forsaking the pencil, I relied on my camera and speed before she crumpled in agony!

Next came hours doing research in the cast room at the V&A and more hours in the life studio to fill in those elusive details. Having settled on my design all I now had to do was to teach myself figure-sculpture, brass-engraving, stone-carving, mathematics, astronomy, sundialing and exterior gilding, because the surface decoration would only work successfully in burnished 23ct gold.

I proceeded to make a full-scale mock-up in clay and made detailed structural drawings to a scale of 1:1. I took these to a local fabricator who would weld together the armature in 8 mm stainless-steel. The main difficulty posed by the design was incorporating the twenty-inch (500 mm) diameter dial ring in 25 mm × 3 mm brass. This had to be perfectly circular and flat, and kept separate, or it would be impossi-



Fig. 1. The completed *Amaterasu* sundial.

*Fig. 2. Taken half way through the cement build-up, this shows how a mirror dial gives no shadow. On the vertical inner face a shadow can be seen where the surface was dull.*



ble to engrave later. It couldn't be welded or brazed to the armature anyway as the heat generated would cause colour changes and give rise to distortions. Finally, I wanted nothing to interrupt the dial surface, so drilling it and bolting it into place was also out of the question.

The leg-profile gnomon, cut from a sheet of 4 mm stainless-steel and set at precisely 52°, had to be vertical in the north-south plane and perpendicular to the horizontal plane of the absent dial. These in turn had to be parallel to the plane of the points of contact of the hand, toe and hair on the absent plinth, and aligned perfectly for the north-south orientation of the completed work whilst dividing the dial precisely along its north-south axis. (He was pretty good too, the fabricator, as the dial required only a tweak or two with a couple of washers to ensure the excellent time-keeping I can now enjoy, with dial readings accurate to within less than a minute through most of the day). Incidentally, the dial diameter in relation to the height of my figure is the same as a hoop to the average gymnast.

As is often the case with experimental work, I changed my mind about certain design details as the execution progressed. One of these has a minor effect on the accuracy of the dial. Originally I intended the raised-leg gnomon to remain in polished stainless-steel. Not having thought everything through completely, late in the day it dawned on me that a gnomon can be of any thickness as long as the sight edges are straight and parallel. Adapting my design during the cementing process (Fig. 2) I thickened the right leg to achieve a better anatomical and aesthetic balance with the left leg and, as a result, with the whole sculpture. This slight thickening to the upper thigh means that very early in the day and very late in the day the sundial runs a few minutes fast. Fortunately these times are outside my direct sunlight thresholds.

Initial tests revealed that the cement would not bond permanently to the armature. I abraded the metal surface and applied resin and glass fibre, building up the forms with zinc

mesh and galvanised wire before adding more resin to the outer surface. The cement/stainless-steel bond appeared good. (At the time of writing it has withstood all weathers quite happily for six months.) It took the best part of two weeks to sculpt the form you see. Before applying any colour, I attached the dial, (then a mirror-polished brass ring,) and placed it outside. It looked magical, like a pure white baroque marble statue with a huge golden halo pulling the Sun and sky down to earth. It was tempting to leave her like that, but visually she was far too overbearing for a domestic garden.

Eventually it was down to sealing the surface, choosing and applying the appropriate colour to give the effect of patinated bronze, and selecting the designs for gilding. The right relationship between pictorial decoration and open space was critical for the final effect. Too much gold and it could appear vulgar and tasteless. Too little and it could appear uncertain and ill-considered. Each design in turn was sketched in soft pencil and then every detail drawn in water-based red fine-liner. As gold size is transparent it is impossible to see where you have applied it. To tint it with pigment would be to risk corrupting the delicate balance of its adhesive properties. The applied gold leaf was then burnished with an agate burnisher. It's no Bernini or Rodin, just a decorative sculpture designed specifically for its domestic space, but the changing light effects whatever the weather, but particularly when direct or reflected sunlight strikes the gold, thrills every day.

### Setting the Dial

I Googled my precise location (later to be carved into the top surface of the Bath-stone plinth) and set about making a rectifactory. I transferred this graphic to a cardboard ring and in turn to the brass dial using a pencil, having previous-



*Fig. 3. Showing the stainless-steel gnomon and the polished dial held in place with a bulldog clip. This was an alignment check: the light wood frame on the base is aligned for true north for when it is set into the stone plinth when all is completed.*

ly demirrored the surface with fine emery paper to ensure clear and sharp shadows. I engraved two circles onto the dial (with an engraver's burin set into a purpose-built jig) creating an inner band to carry GMT hours in Roman numerals, a middle band to carry BST hours in Roman numerals plus the half-hours, and an outer which has the addition of quarter-hours. (The E-W 6am–6pm lines are set 5 mm back from the thigh leading edge to align with the plane of the gnomon's flat surface higher up.) Early outdoor tests with the full-size clay maquette set in a wooden block established the N-S axis in the garden so that no problems would arise when it came to cutting the turf and levelling the foundation.

On the vertical east-facing side of the gnomon are three gilded lines with accompanying Sun symbols. These indicate the angle of altitude of the Sun at the solstices and equinoxes:  $61^\circ$  at the summer solstice, etc.. Another graphic I decided to include is on the dorsal surface of the foot. This is an astronomical depiction of Ursa Minor. Polaris ( $\alpha$  Ursae Minoris) is displayed on the big toe with the rest of the constellation below, each of the major stars identified by their respective Greek letter. This celestial orientation, vertical, with Polaris at the top, occurs several times during the year, one of them, at 22:00 on 15 December, is indicated on the lower shin aligned with an accompanying axis line down the centre of the gnomon. The gilding makes this easy to find by moonlight.

### The Base

The suitability of a plinth for a given sculpture is as critical as the choice of frame for a picture. The concept of this plinth was executed as I originally conceived it. The upper surface has, from the east, the location of the dial in degrees, minutes and seconds (to one decimal point) and the height above sea level (75 m). From the west one reads the equation of time. The line is drawn twice: once for GMT and a second for LMT, the latter delineated in red for the observer's easy identification. As Shipston on Stour is six and a half minutes behind Greenwich we enjoy only two days a year when the Sun is due south at 12 o'clock. The graph is divided horizontally into one minute intervals – numerically into fives, with pluses and minuses, down the left side. Along the bottom are the twelve months evenly spaced (sorry February!), identified by their respective capital letters, each being divided into quarters at approximately the 8<sup>th</sup>, 15<sup>th</sup>, 23<sup>rd</sup> and 30<sup>th</sup> days.

The legends, both in Latin, appear as a frieze just below the upper margin of each side; the first is well known, I think: PULVUS OMBRA SOMUS (We are dust and a shadow); the second less so: SUFFICIT UNUM LUMEN IN TENEBRIS (A single light in the darkness is enough), is from the *impresa* of Isabella d'Este, 1525. No Christian inference should be drawn from the presence of this even though it paraphrases a phrase from John, 1, in the Bible.



Fig. 4. The left foot barely touching the earth as she is about to leap; the tail of the Chinese dragon clearly visible as is the equation of time, the toe touching in a convenient space as time reads gradually faster on the dial above.



Fig. 5. The gilded flying Amaterasu, with a sunburst behind her cave, across the chest and upper abdomen; the engraved rings showing GMT and BST.



Fig. 6. A sunburst, looking south.



Fig. 7. Detail of the equation of time graph.

The names of fifty-six astronomical A-listers from around the globe over the last four millennia sweep their way round the lower plinth. Chosen for their discoveries and observations relating to the Sun and eclipses in the main, they begin at the NW corner with some Greeks and Egyptians, and end with Stephen Hawking and Prof Brian Cox. They do not appear in strict chronological order, but the wave their names follow endlessly around the limestone block accurately reproduces the equation of time; starting at the same NW corner, this time on 1 January.



Fig. 8. Delicately outlined by hoar frost: 8.00am two days before the vernal equinox.

#### Amaterasu

The Japanese Goddess of the Sun ran off and hid in a cave after being attacked by her brother Susanoo. (This possibly symbolises the onset of winter or even a solar eclipse, though it is more likely the passage of night and day.) The other Gods became distressed by the prolonged darkness until a minor Goddess, Ama-no-Azume, saved the day (pun intended!). She turned over a large tub outside the cave, tore off all her clothes, jumped onto the barrel and began a wild and frantic dance. (Historically this is a version of the 'obscene dance' which was performed around the world, only by women, who would expose themselves as part of fertility rites, in spring and/or autumn, to ensure a good harvest.) The drumming of her feet on the barrel and the laughter of the other Gods, amused by the display, made such a racket that it alerted Amaterasu, who emerged from

the cave to see what all the fuss was about. Now you know why the Sun rises – a better reason than all that big bang, gravity and physics stuff don't you think?

#### Sun-Related Imagery

In addition to those already mentioned above: the poem: 'A Nocturnall Upon St Lucy's Day', John Donne (opening few lines); a wheel from the Hindu Chariot of the Sun; a feather from the wing of an already doomed Icarus; Amaterasu flying across the right chest (her name in Japanese); the Chinese zodiac (left chest and arm); the Greek zodiac (right thigh and lower abdomen); the Arab zodiac (bracelet on left wrist and left forearm); the magic square of the Sun (left thigh); a Neolithic male fecundity figure (sun-symbol attached to the phallus); Hathor, the Egyptian Sun and Cow Goddess (right shoulder, deltoid and triceps); Greek symbols for the Sun moon and planets (sorry, no Pluto) (on her right arm), accompanied by two Greek zodiac signs: Leo (ruling planet: the Sun) and Taurus (for Simon Fry!); and lastly, spiralling up her left leg leaps a Chinese dragon poised to take a huge bite out of the Sun – the next time near England being over the Faroe Islands and north Atlantic in 2015. You have been warned!

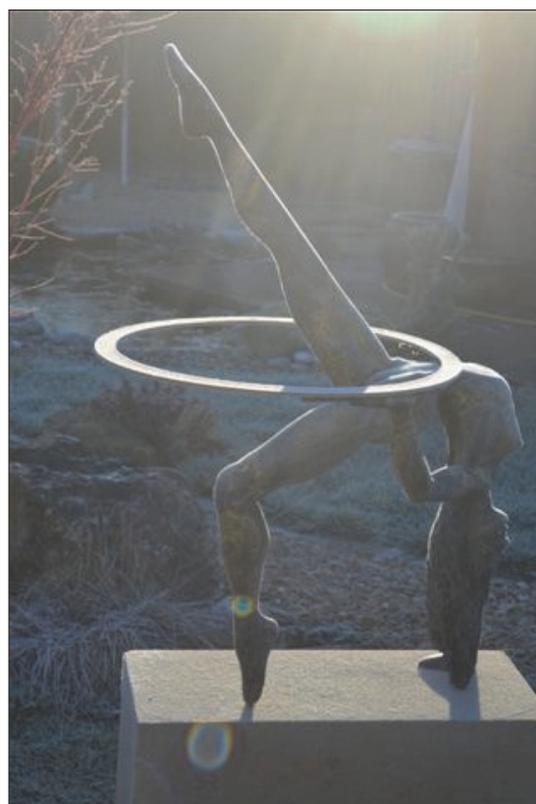


Fig. 9. Sharp shadow on hoar frost.

#### ACKNOWLEDGEMENTS

I would like to thank John Davis for his kind and encouraging words, and also Jill Wilson and Tony Wood for their generous and complimentary comments. I hope the reader might agree with them that this amateur sundial maker spent much of the last nine months quite fruitfully.

*simonfry105@gmail.com*

# A NOTE ON THE CONSERVATION OF AN EIGHTEENTH CENTURY CHURCH DIAL

FRANK EVANS

By 2012 the dial on Christ Church in North Shields, England (55° 01'N, 1° 27'W) had got into a poor state. It is a sandstone dial, installed in 1793. We know this from a dated manuscript note in the county archive which reads "To Mr. Pringles Bill for drawing the lines and taking the Suns declination for the dial for the church".<sup>1</sup> Unfortunately, the cost is not known because the edge of the relevant page has been worn away. The dial is carefully made, declining 7°E and divided to 5-minutes. In 1991 its condition was fair (Fig. 1), although the motto had long been illegible. However, the dial thenceforth deteriorated quickly, partly because of a failed gutter above, and the church authorities finally decided that conservation should be undertaken. The work was carried out by Alun Walker, stonemason, of Kettering during 2012.



Fig. 1. The dial in fair condition, 1991.

The North Shields dial resembles a great many parish church dials in England, having been installed in Georgian times and currently falling into disrepair. There is no money to conserve such dials other than what the church authorities may supply and funds are perennially short. It is felt that an account may be useful of what care may sometimes be achieved, in this instance for a few thousand pounds.

A small number of other church dials in the locality have received some maintenance. One of them simply needed a new gnomon but two others have had their stonework

attended to. These two dials are important Anglo-Saxon dials, possibly the oldest dials in the country.<sup>2</sup> At Escomb, County Durham, both the dial and the church are believed to date from around 700 AD. Conservation consisted of removing the accumulation of centuries of industrial soot deposited on it, by grit-blasting with a soft aluminium powder at a low and controlled nozzle speed. This was followed by careful pointing with masonry cement around the dial plate to keep out water and frost. A similar procedure was followed at Dalton-le-Dale, County Durham. Although this latter dial is mounted on a thirteenth century nave wall it is clearly of the same age as the Escomb dial, both having ornamented dial plates with similar barley twist edging.



Fig. 2. The flaking dial plate before conservation, 2012.

It is a little surprising that the stonemason involved used masonry cement. This cement has slaked lime or other plasticiser as an addition and is preferred for stone jointing to OPC (Ordinary Portland Cement). OPC was first produced in the nineteenth century. It is the colour of Portland stone and when mixed with sand and water is waterproof and inflexible. It is excellent for many purposes including brickwork but less suitable to be applied to stone. Stone may settle and being porous may admit some moisture, which must



Fig. 3. Separating laminae at the gnomon root.

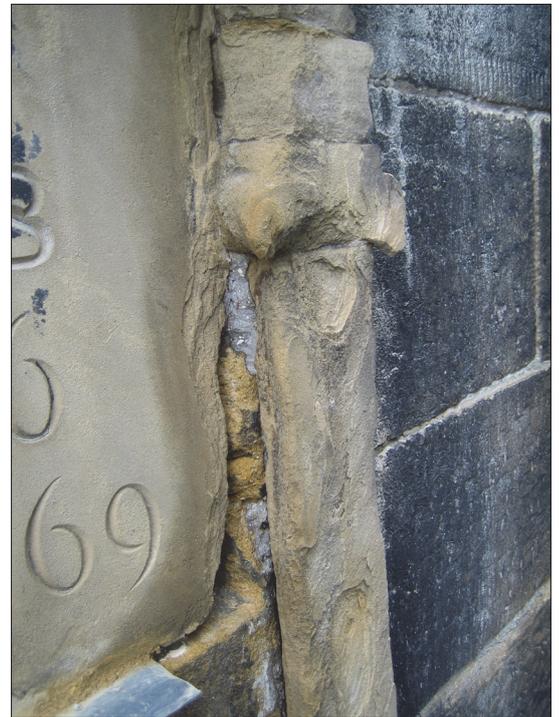


Fig. 4. Deep removal of cement before replacement with lime mortar.

be allowed to escape. OPC defeats both requirements and being rigid may cause the stone to crack. A more suitable substance is indeed masonry cement but even better is lime mortar, which has been used in building for many centuries.<sup>3</sup>

It is a remarkable fact that the old-fashioned virtues of tried and tested lime mortar were not fully appreciated until the nineteen seventies.<sup>4</sup> It is now generally agreed to be preferable to cement for bonding stone. Both lime mortar and cement mortar start with the same ingredients, chalk and clay, but in cement manufacture the chalk and clay are taken to a high temperature, while with lime, the chalk is first converted by a lower heat to quicklime, then slaked to form lime putty. Lime putty keeps and indeed improves for many months. The sand is finally added cold to form the mortar. Cement sets with water while lime mortar sets in air,<sup>5</sup> taking up carbon dioxide. As noted, lime mortar is more flexible, or rather, under stress it produces multiple small cracks which in time will anneal by chemical reaction.<sup>6</sup> The whole setting process with lime mortar is far longer than with cement and it must initially be protected from wetting.

At North Shields, once scaffolding had been erected around the dial it was possible to examine its condition. At last it was possible to decipher the eroded motto. It reads: *Mortalia facta peribunt* ('Mortal deeds will perish') from Horace, *Ars Poetica*.<sup>7</sup> The motto is absent from Mrs Gatty. The dial had clearly once been coloured and gilded and it is possible that the paint visible in Fig. 1 is as old as the dial. The strata of the sandstone dial plate are laid vertically and so any ingress of water will more easily tend to separate the laminae (Figs 2 & 3).

Examination revealed that the dial was supported with much cement. It was first cleaned and encrusting salts removed before as much cement as safely possible was

extracted (Fig. 4) and replaced with lime mortar. The surface of the dial and its surround was consolidated with lime mortar followed by lime grout. The sandstone was weather-proofed with several coats of lime water and given a shelter coat of lime wash (Fig. 5).



Fig. 5. The gnomon awaits its gilding.

Additional work to repair the stonework about the sundial was undertaken to reduce rainwater ingress. Lead sheeting was inserted above the dial and also on the decorative mantel of the dial to help slow down weathering by redirecting water run-off from the building.



Fig. 6.  
The completed conservation.



Fig. 7. Christ Church, North Shields

Finally the gnomon, which is copper-based and most probably bronze, was gilded (Figs 6 & 7).

#### REFERENCES and NOTES

1. Extract from the manuscript 'Gleanings from the Records of Tynemouth Parish Church' by H.A. Adamson, in the County Archives, Woodhorn, Northumberland, revealed by Mr M. Scott.
2. F. & R. Evans: 'Some early sundials of Northumbria,' *BSS Bull.*, 11(ii), 100-103 (1999).
3. Alec Clifton-Taylor & A.S. Ireson: *English Stone Building*, Victor Gollancz, London, 126-129 (1994).
4. P.R. Hill & J.C.E. David: *Practical Stone Masonry*, Donhead, London, p.174 (1995).
5. The reference is to non-hydraulic lime mortar. Hydraulic lime mortar is different.
6. *Teste* Frank King.
7. We are indebted to John Pepper of Toronto for both the source and the translation.

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## An Edwin Russell Designed Horizontal Dial

An appreciation of some of Edwin Russell's sculptural sundials appears on p. 32 of this issue. But not everyone can afford the multi-thousand-pound price-tag that goes with a Russell sculpture. For those people who would like a horizontal sundial for their garden of rather better quality than can be found in the local garden centre, Russell designed the simple but elegant dial seen here.

The dial was made by Brookbrae in a limited edition of 500 and each came with a small certificate with Russell's flowing signature, giving its number in the sequence. This example is stamped on the back with its number 113 and was bought for not much more than its scrap value.



The cast dial-plate is described as bronze though the actual alloy is more like a gunmetal so it ought to weather well. The 'engraving', including that on the sides of the gnomon, is actually etched and gives GMT and BST (neglecting the EoT and longitude). The pattern, including the numerals, are clearly hand-drawn by Russell.

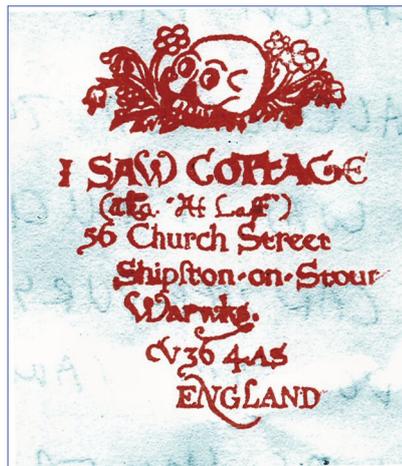
*John Davis*

# PETER I DRINKWATER

As the month of July came to a close, the Society received the sad news that, on Thursday 25 July, Peter Drinkwater had suffered a severe heart attack, whilst out gardening, and had collapsed. He was airlifted to hospital, but died the following morning on 26 July 2013 at the age of 65 years.

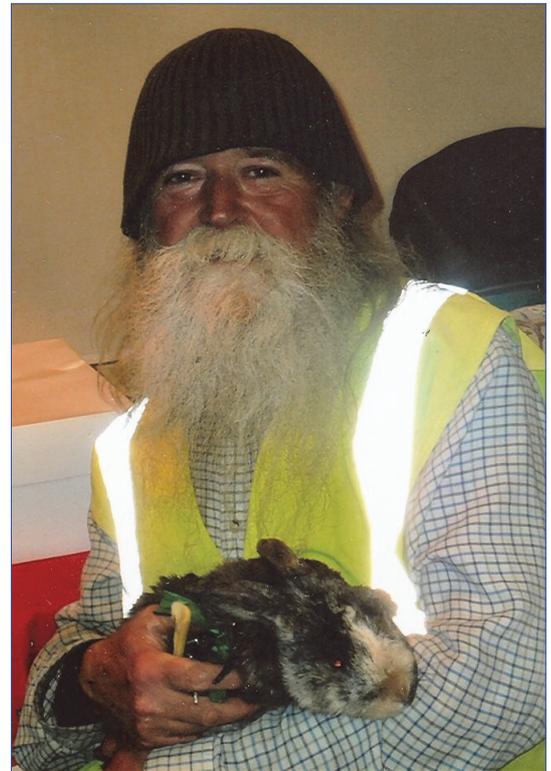
Peter Drinkwater will be known to members of the British Sundial Society as the author of the book *The Art of Sundial Construction*, first published in 1985, which ran to a number of editions, and also for his notable contributions to the *Bulletin*. I first met him in the spring of 1984, when Doreen Bowyer and I came across one of his various publications in a bookshop in Moreton-in-the-Marsh. This one concerned county boundary markers, with two beautiful hand drawn sketches of sundials. From the address in the book, we decided to see if we could track him down, which we did at his home in Shipston-on-Stour. We were invited in to his upstairs one-room office, library and bedroom, which groaned with books and papers; but there was just enough room to sit on the edge of his bed! We soon found that we had a common interest in sundials and he showed us the manuscript of his proposed work on the subject. He seemed somewhat diffident as to whether it was worthy of publication; but Doreen and I persuaded him that it would be a valuable contribution to the very limited dialling literature of the time. He subsequently requested me to write the foreword to his work.

Peter Drinkwater was a remarkable character, something of an eccentric and self-taught in all his principal accomplishments, as an artist, author, calligrapher, diallist, draughtsman, illustrator and publisher, not to mention what might have been lesser interests. I even devoted 'The Sundial Page' in the March 1994 issue of *Clocks Magazine* to him, under the title *Something of an eccentric?* However, he gives an illuminating biography of himself on the inside cover of his book, together with a self-drawn silhouette of himself in the style of the late 18<sup>th</sup> century. He states that he was born on Holy Innocents Day, the 28<sup>th</sup> December 1947, hence he was named Peter Innocentius Drinkwater. He describes himself as a chaste bachelor by practice and a liberal puritan by conviction. However, he became a devout Roman Catholic and took an active part in his local Roman Catholic Church of Our Lady and the Apostles, where he became the organist.



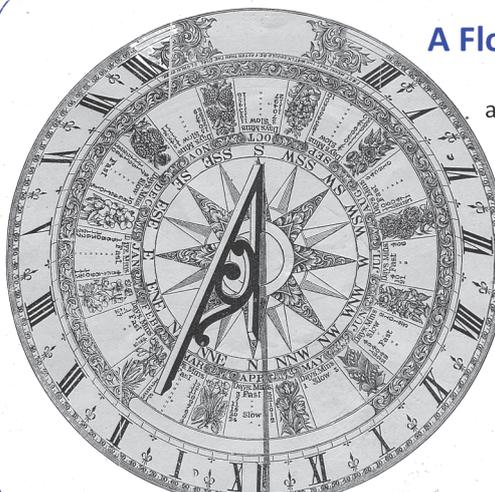
*Peter's one concession to technology was this rubber stamp for his address.*

*Peter in standard hi-viz garb with his pet rabbit, often seen together around the local village*



It is evident that Peter Drinkwater was a much loved local historian in Shipston, who lived his life close to nature, who loved and understood the past, whilst being fully aware of the present. To my mind, perhaps his most notable achievement was the use of his self-taught understanding of Latin and Greek to learn the principles and practice of the art of dialling from the early classical works on the subject, which he studied in the Bodleian Library at Oxford. I doubt if he would have wished to be described as a modern-day diallist; but he was certainly a diallist of considerable standing in the modern world and will be a great loss to this scientific art!

*Christopher Daniel*



### A Floral Dial

as shown in F Barker's catalogue. An 18" version could be yours for £18 0s 0d — but that was in 1914!

# SUNDIAL TRIP TO LONDON

MAUREEN HARMER

Early this year, Kevin Karney gave one of his stimulating lectures on sundials to the Lavant Valley Decorative & Fine Arts Society at Chichester, which he cleverly tailored to the local area. His talk was rated top marks and it spurred a new interest by the members, resulting in a fully booked coach trip to London to see sundials, but unfortunately this outing had to be cancelled due to icy road conditions. By request, an alternative modified trip was organized for later in the year by Prof Liz Juniper, with people making their own travel arrangements to London for a guided tour of the City and its sundials.

We all congregated in the coffee shop at St Paul's Cathedral where our Guide, Judy Stephenson, who is a member of the City of London Guide Lecturers' Association, met us. Judy, together with Tim Kidd, were approached a few years ago by Piers Nicholson, the creator of the sundial on the river close to the Millennium Bridge, who asked if they would do sundial tours mainly for the equinoxes and solstices, but also at other times, when requested. Judy briefly discussed

the tour duration and options with our Group, before setting off towards Paternoster Square to see the noon mark dial by Frank King and Kristi Shea. The idea was to view this imposing dial in all its glory in the sunshine at noon, but sadly we were blessed with rain instead.

Upon my request we walked back towards St Paul's Cathedral to the gardens in Amen Court, which belongs to the Chapter of St Paul's Cathedral, to see whether the gate was open and access was possible. We were in luck and the eighteenth century horizontal dial by John Rowley and attributed to Christopher Wren (Fig. 1) was inspected by all, before making a hasty exit, aware that we were indeed on private property. The names Amen Court and nearby Ave Maria Lane both originate from words recited by clergy in their litanies on procession around the medieval cathedral.

Judy was very informative and entertaining regarding the history of the City, and the sundial viewings were interspersed by learning about past life in the City, of how street names originated, and how trading took place in coffee houses prior to the current Stock Exchange being built. General meeting places were designated by illustrated signs as many

people were illiterate, and the nursery rhyme of 'Hey diddle, diddle, the cat and the fiddle, the cow jumped over the moon' was derived from this tradition.

We walked onto Blackfriars to the City of London Boys School in Paul's Walk, where there is the splendid polar dial by Piers Nicholson which was unveiled by the Rt. Hon. Lord Mayor of the City of London on the 13 December 1999. This is a millennium dial with exactly 2000 engineering bricks and a time capsule (Fig. 2, below).



We also noted other means of time-keeping and on Bracken House in Cannon Street, named after Bernard Bracken the one time Chairman of the Financial Times, a memorial clock dedicated to Sir Winston Churchill was of particular interest. Winston's face is at the centre of a golden sunburst and surrounded by gilded signs of the zodiac on an azure background. This is described as 'not a sundial but an unusual astronomical sundial related clock' and was designed by Frank Dobson and Philip Bentham in 1959.

Our next port of call was a Wren church of St Stephen's, where a modern wide bowstring equatorial sundial was standing in the courtyard surrounded by buildings and thus proving an inappropriate location for a sundial. There is, however, a chink in the buildings and the dial may well be able to indicate noon, but a sunny day is required to check this out.



Fig. 1 .The John Rowley dial, on a pedestal sometimes attributed to Wren, at Amen Court.

Apparently The Venerable Peter Delaney, the priest in charge, told Judy that Henry Moore was adamant that this was precisely where the dial should go. It is a maquette of the famous Henry Moore 5.5 m tall sundial, made for The Times newspaper and erected in 1967 outside their now non-existent premises opposite Blackfriars Station, before being sold and shipped to Belgium.

Further dials visited were in Cheapside (Fig. 3), where on the corner are two vertical stone dials, one west declining and the other south declining with a gold sunburst,



Fig. 3. Twin dials at Cheapside.

Fig. 4. The dial at St Catherine Cree.



attributed to Prof J. Skeaping, which were erected in 1958 when this post-war building was constructed for the Sun Life Insurance Company. Then on to St Katherine Cree Historic Church which survived the Great Fire of London and dates from 1630. On the street side is a vertical south declining rectangular dial dating from around 1700 (Fig. 4). The gnomon is rather

Fig. 5. The 1982 memorial to the Merchant Seafarers.



precarious but the face is in fair condition with gilded embellishments including declining lines, Babylonian/Italian hours, Zodiac signs and a motto 'Non Sine Lumine' (Nothing without Light).

We passed by the Clockmakers' Museum in Guildhall Library, Aldermanbury, which I noted for a visit on another day, and continued down to Tower Hill, where an imposing horizontal dial of over 6m sits over the Underground Station (see the item on Edwin Russell on p.32). This has an outer ring depicting the history of London from AD43 to 1982 including the founding of the Tower of London, the Thames freezing over, the Civil

considered a privilege to be beheaded and this was saved for Royalty and other dignitaries, as common people were hanged. Nearby was the short stretch of medieval wall built on Roman foundations dating from the conquest in AD 43 when London was founded.

A further memorial was to be found close by with an anchor and chain and points of the compass (Fig. 5). This rather impressive landmark is in memory of the Merchant Seafarers who gave their lives to secure the freedom of the Falkland Islands dated 1982. This is not described as a sundial but does have all the attributes of looking like one, with the anchor and chain being a gnomon and Roman numerals engraved around the outside of the top plate.

During our tour Judy also mentioned the White Rabbit in Alice in Wonderland by Lewis Carroll (aka Charles Dodgson) who was an Oxford mathematician. Apparently the White Rabbit was based on Dean Liddell who was always running late for services as the bell tower at Christ Church was running on 'Oxford Time' which was always 5 minutes behind London time and thus making him late.

The day was very enjoyable and we all appreciated the time and knowledge given by Judy and since then one of the party has already observed and photographed a dial while on her annual holiday in Croatia, commenting that prior to the recent sundial experiences it had gone unnoticed.

Further information can be obtained from downloading The City of London sundial trail from the internet.

*m.harmer@waitrose.com*

War and, of course, the Great Fire of 1666. It was crowded with tourists, but I would suspect that the fascination was due to the historical facts portrayed and also the sheer size of the dial, rather than its time-keeping factor.

There was a memorial on the once site of the Tower Hill scaffold where many met their fate. It was

# MORE NEWLY REPORTED DIALS

JOHN FOAD

There are still many good dials out there waiting to be recorded! Here is a selection of recent additions to the Register.

1. A cuboctahedron dated 1823. It has dials on 6 faces – square direct east and west dials; polar dials on the south upper and north lower diamond faces; and summer and winter equatorials on the other south and north diamond faces. It was made for the Grant family of Ramsbottom, who had Scots origins, a clue perhaps to the form of the dial. They were fabric printers and local philanthropists, and are said to have been Dickens’ prototypes for the Cheeryble brothers in Nicholas Nickleby. SRN 7514, Greenmount United Reformed Church, Manchester, Open.

2. This geographical dial of 1720 is by Robert Spurrell, a previously unrecorded schoolmaster of Bath. Another Spurrell dial has recently come to light, with unusual astronomical volvelles in the corners. SRN 7517, a Private dial in the Kendal area.

3. The ‘Smith Dial’ in The People’s Park, Halifax, dates from 1858 and was recently restored. It carries mottoes in Greek, Latin and English, and has an inner chapter ring with New York time. It was created by John Smith for Pocklington School but was rejected, bought by Matthew Smith (relationship not known), and presented to Halifax in 1873. Matthew became Mayor of Halifax in 1879 for a short time until his early death. John made more elaborate versions of the dial about 20 years later for Middlesborough and Castle Howard, adding Hebrew mottoes and a Melbourne chapter ring. SRN 7508, Open.

4. This is one of only a few dials to be found on river bridges. It dates from 1770 and is supported by a corbel carved with the head of the Water Kelpie who brought the stones to build the bridge! The Shielhill Bridge spans the South Esk at Kirriemuir in the Tayside Region (DD8 3TT if you are using Sat Nav). SRN 7505, Open.

5. This dial, though noted by Gatty, has escaped members’ notice until now. It is high on a chimney stack, visible from the road, but you have to look carefully! The house was once a Royal Mint, later occupied by Queen Elizabeth and James I successively. SRN 7500, The King’s House, Thetford, Norfolk.

6. Verticals with geographical noon times are fairly rare. This example is found in a canted niche in the front wall of a village house in Norfolk. Twelve locations are marked, from Bantam in Java in the east to the Bermudas in the west. SRN 7499, Denton Lodge Farm House, Feltwell, Visible from the road.

7. A cube dial mounted high on the peak of a gable over a second-floor attic window; it needs good eyes to read the time. Numerals on the SE face show a flat-topped ‘8’, and reversed ‘5’ and ‘9’. It probably dates from the early 17<sup>th</sup> century, and may have had a weathervane on top. SRN 7531, East Knoyle, Wilts. Private.

8. Our President’s noon mark on the Guildhall in his home town of Faversham, Kent, was inaugurated earlier this year and should not be missed if you are in the area. The Guildhall dates from 1574, and shows its origin as a Market Hall in the arcaded ground floor. As a Grade II\* listed building,

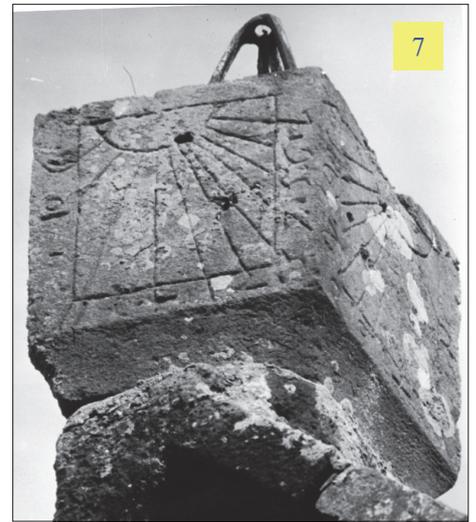




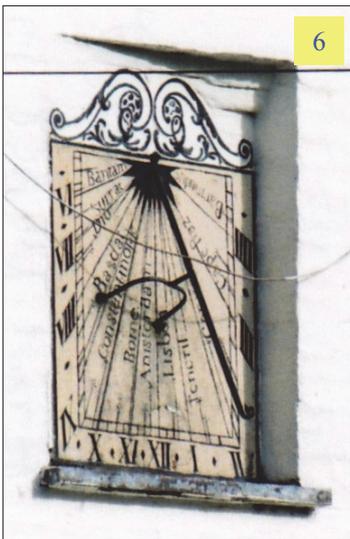
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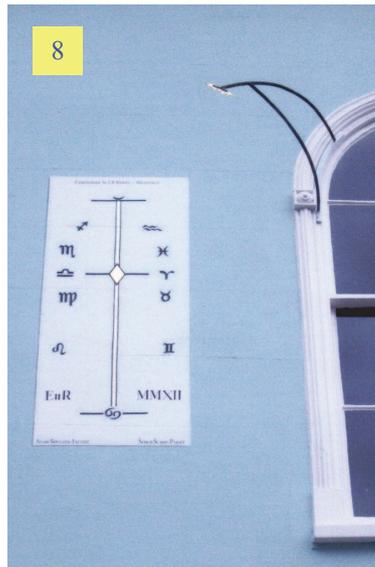
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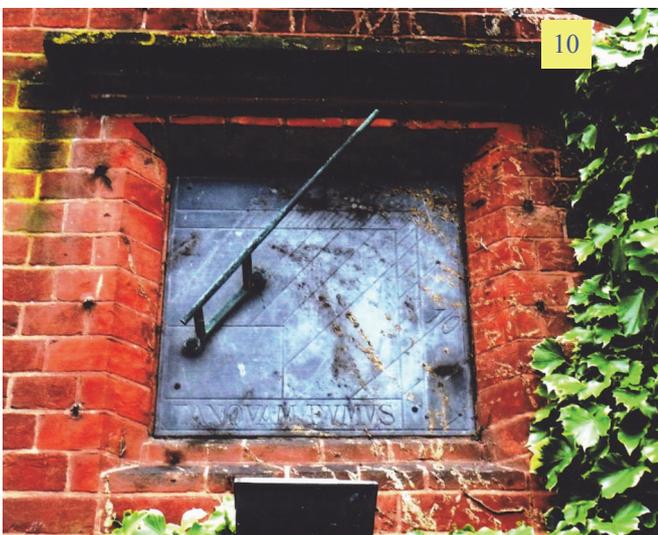
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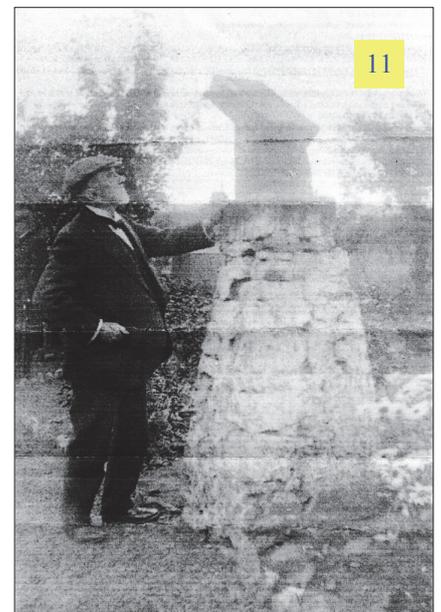
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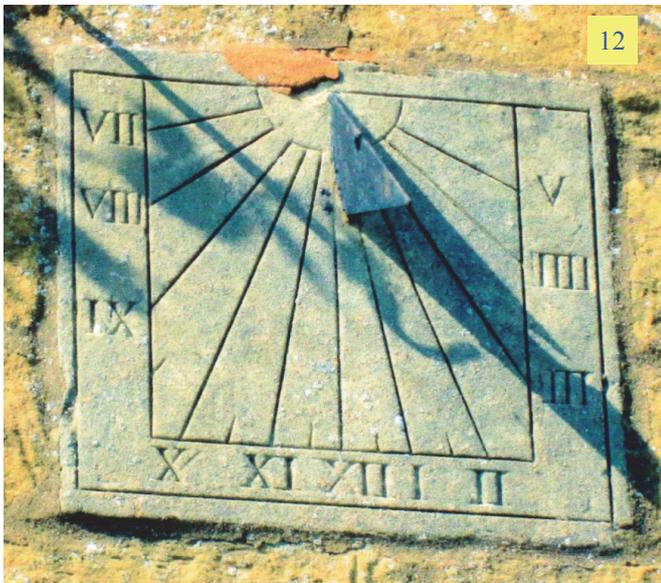
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no structure could be attached to the stuccoed south front: the dial is entirely painted on the surface, and the gilded flaming sun forming the pierced nodus is held by struts from an adjoining window frame. SRN 7471, Open.

9. Cemetery dials are often simple commercial affairs, which is understandable in view of their vulnerability. This example with the initials of the deceased ("CCRB") worked into the gnomon is remarkable. SRN 7447, Gosberton, Lincs, Open.

10. Dating from 1887, this is probably just too early to be by Edwin Lutyens, but it is much in the style that he developed, with its simple delineation and shaped brick housing. SRN 7483, Birch Hotel, Haywards Heath, West Sussex, Open.

11. The uppermost surface is marked "RSD 1715" for Ralph and Susannah Dixon. Ralph's grandson Jeremiah



observed the transits of Venus in 1761 and 1769. He also surveyed the Maryland/Pennsylvania border, giving his name with that of his partner Charles Mason to the famous north/south demarcation line. The photograph shows Waynman Dixon, a descendant, by the dial in about 1920. The instrument, with equatorial, vertical, polar and direct east and west dials, is housed in the Bowes Museum, Barnard Castle, Co Durham. SRN 7529, Restricted to Museum visitors. Better photographs of all the component dials are held in the Register!

12. A well preserved dial; the house dates from about 1720. There are no declination lines, but the gnomon has a clear nodus. Possibly a replacement? SRN 7548, Porch House, Blockley, Glos., Visible from the road.



13. A bit of a puzzle, this one. A massive sandstone block, well shaped and carved. The date is 1826, and the inscription seems to be D B Taif or D B Tais – both conjectural readings! SRN 7518. Another private dial in the Kendal area.

[registrar@sundialsoc.org.uk](mailto:registrar@sundialsoc.org.uk)

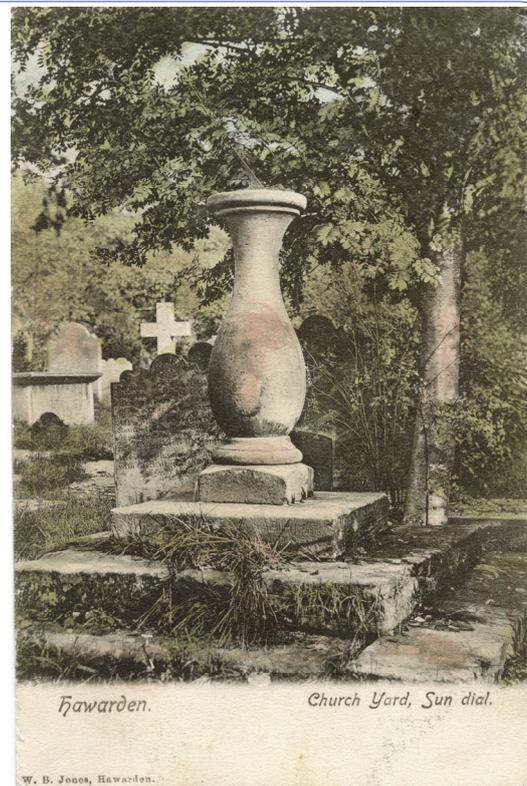
## Postcard Potpourri 28 – St Deiniol’s Churchyard, Hawarden, Clwyd

Peter Ransom

This postcard brings back many childhood memories for me! There is a steep hill near the church and my father always had to rev-up his car to manage to get up the hill when we went on our holidays in North Wales from Liverpool.

The dial is now missing according to the 2010 Register (SRN 6671), but it was dated 1735 and signed “Geo: Jones del” and inscribed inside a scrolled decorative frame “Thos Turner / Tho Meyler / Church Wardens 1735”. The postcard, postmarked 25 November 1903, appears to be hand-coloured as I have a very similar one in black and white postmarked July 15 1908. Both cards were printed in Saxony. The one illustrated here has the name of the photographer, W.B. Jones, at the bottom and it appears he did a lot of photographic recording of the church and surrounding area.

The other card has The Wrench Series No 3691 at the bottom and it was Sir John Evelyn Leslie Wrench who noticed the lead that the Continent had over Great Britain in the production of picture postcards, and instituted a firm that soon became the largest of its kind in the country. This occupied him from 1900 until 1904, when the firm failed, mainly through too rapid an expansion and lack of capital. For more details of him visit [http://en.wikipedia.org/wiki/Evelyn\\_Wrench](http://en.wikipedia.org/wiki/Evelyn_Wrench).

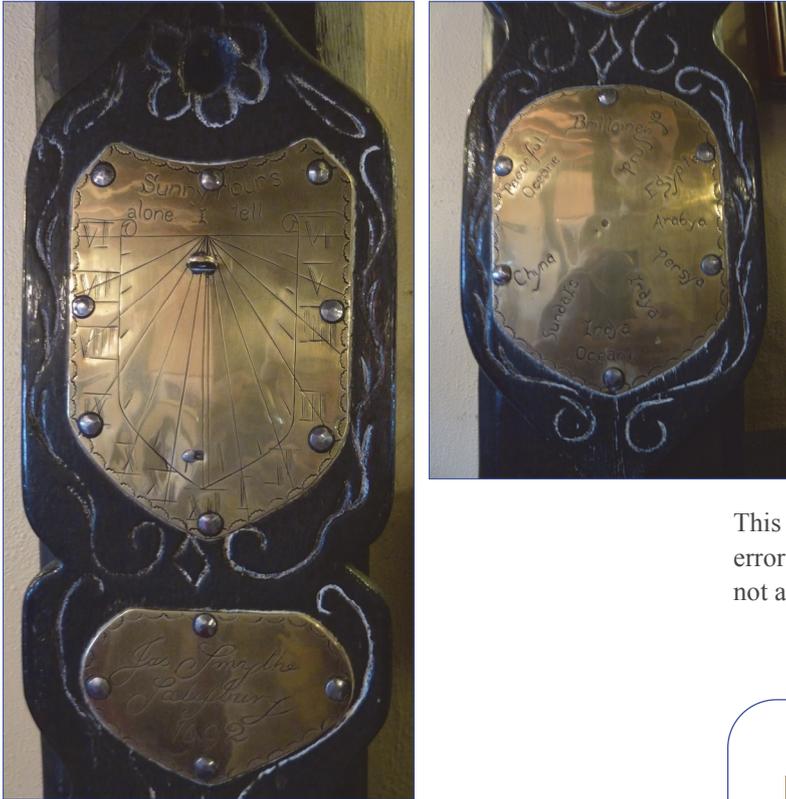


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## READERS' LETTERS

### Three-plate Dial

I received the September *Bulletin* on Saturday and thought that I would write to you regarding Tony Wood and Jill Wilson's articles on the 'three plate' sundials.



I don't know how many more may be found but you might like to see the attached photographs I took of the one I saw on a wall in a dark corner of the Star and Eagle pub/hotel in Goudhurst, Kent in August 2012. As you will see, the bottom plate has all the identical locations as the other two including 'Egypte', 'Peeceful Oceane', 'Chyna', 'Persya' etc.

This one has a centre plate that says that it was made by Jas Smythe of Salisbury in 1692. Jas Smythe is not in Jill's *Biographical Index* and the only Smythe doesn't come from Salisbury. This dial also obviously had a hinged gnomon as the top hinge bracket is still there but the bottom one is broken and the gnomon missing. There is an attempt at an 12 o'clock hour gap but the lines converge together at the 6 o'clock line! It also has a motto "Sunny hours alone I tell". I haven't had time to try and find the source of this but it doesn't sound quite right for 1692!

There are lots of other points that could be noted, but altogether, it struck me as a bit of a fake when I saw it and, I guess, the other two discoveries pretty much confirm that.

David Hawker  
Bromley, Kent

### Universal Equinoctial Dial

In his article in the *Bulletin* for September 2013, Mike Cowham refers to the trial-and-error process of levelling the dial by setting the two spirit levels correctly. There is a systematic way of doing this quickly, which I remember from my university surveying course when setting up a theodolite. First, observe the levelling bubble that lies in a line parallel to two of the adjusting screws, which I will call A and B. Hold both these knobs, one with each hand, between index finger and thumb. Rotate both simultaneously in opposite directions to centre the bubble, which moves in the direction of movement of the left thumb. Then hold the third knob (C) in the same way with the left hand and adjust it to centre the second bubble – again the bubble follows the thumb. This should cause little or no movement of the first bubble, but if necessary make final adjustments with A and B, then with C.

This logical procedure cuts out a lot of frustrating trial and error, and I hope it will be found useful to anyone who is not already aware of it.

Ken Head  
Cobham, Surrey

### A Day in the Library



John Davis

Readers may know that our Chairman, Frank King, is currently recuperating after major surgery. He recently decided that a morning in the library of Gonville and Caius College, Cambridge, measuring their two medieval astrolabes, would be good therapy. Here he is progressing well and complete with white gloves! We wish him well.

# IN THE FOOTSTEPS OF THOMAS ROSS

## Part 7: Scotland's Grandest Sundials

DENNIS COWAN

In his travels, whilst gathering information for the *'Castellated and Domestic Architecture of Scotland'*,<sup>1</sup> Thomas Ross saw and sketched many sundials, but four of them were out of the ordinary and were of a truly grand nature. Ross obviously thought so, as he described all four of them at length.

Included within this select band of 17<sup>th</sup>-century sundials was the magnificent example at Glamis Castle, north of Perth, one time home of the Queen Mother. Ross says:

*"This dial [Fig. 1] has been classed with those of the facet-headed type, as it has their distinguishing feature in a very pronounced form. It may be regarded as certainly one of the finest monumental dials in Scotland, befitting the majestic castle beside which it is erected."*

In *'The Book of Sun-Dials'* Mrs Gatty writes *"perhaps the most beautiful dial which the world can show is at Glamis Castle, that place of mystery and legend. It is simply a masterpiece; nothing so grand can be seen anywhere else"*.<sup>2</sup>

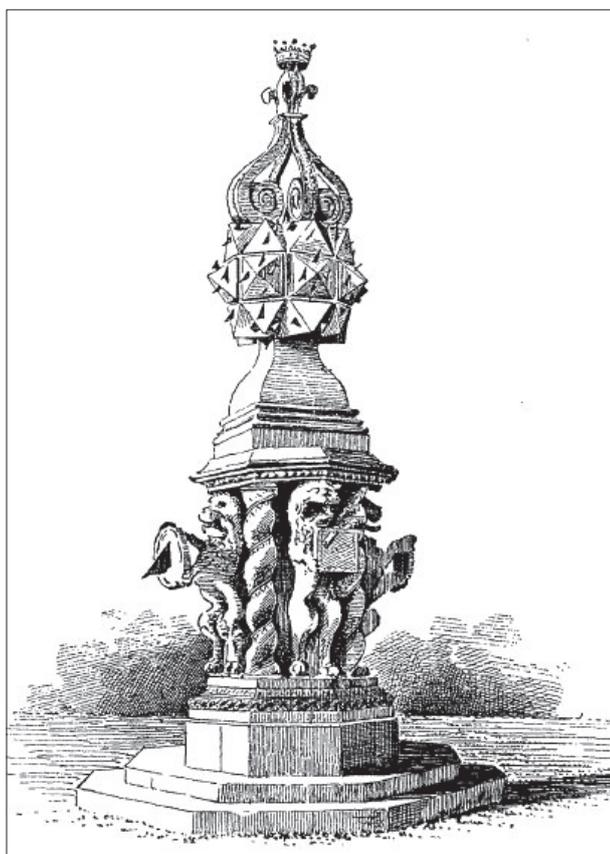


Fig. 1. Sketch of the Glamis Castle dial, drawn by Thomas Ross.<sup>1</sup>



Fig. 2. Photograph of the Glamis dial from a distance.

Unfortunately at the time of my visit, access to the lawn on which the sundial sits was not allowed, and despite my pleas, I was only able to take long distance photos of this magnificent sundial (Fig. 2) using my telephoto lens.

Tentatively dated to around 1683 (but it may be much earlier) it contains eighty-four separate dials, eighty of which are on the 'pineapple top' (Fig. 3), properly called a stellar rhombicuboctahedron. It was fully described and illustrated by David Gauld in his excellent article in a *BSS Bulletin* in 2009.<sup>3</sup>



Fig. 3. The 'pineapple top' of the Glamis dial.



Fig. 4. The Drummond Castle obelisk dial.

It was the truly fabulous obelisk sundial at Drummond Castle Gardens (Fig. 4) at Muthill near Crieff in Perthshire, that grabbed my interest in the first place and got me hooked on sundials. I didn't know that anything like that existed. There are only twenty-six known complete examples of obelisk sundials in Scotland and this is the oldest known of its type. It is from 1630 and was by John Mylne III at a cost of £32 18s. Ross describes it as follows:

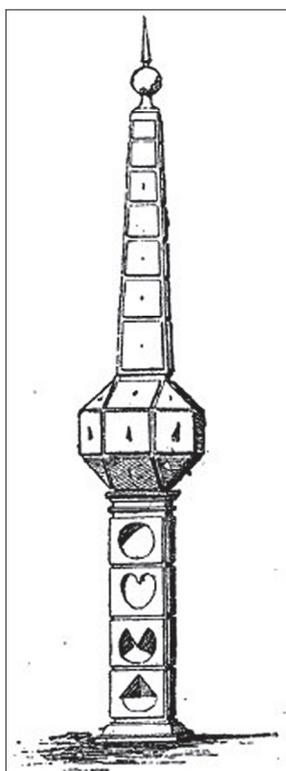


Fig. 5. Ross's sketch of the Drummond Castle dial.

Fig. 6. The boss and finial of the Drummond Castle dial. Most of the individual dials still have their gnomons in place.

"This dial stands [Fig. 5] in the centre of the splendid gardens at Drummond Castle. Its upper part is considerably higher than the shaft, and the whole dial is cut into plaques which correspond to the spaces of the normal type. On the shaft only they are enriched with hollow figures, some of which are new and different from those hitherto met with. The shaft contains four spaces instead of the usual five in the height, and for the first time we have a neck-moulding beneath the capital, while the triangular spaces at the angles of the obelisk are not cut out, thus losing the effective shadows so conspicuous in the dials of the ordinary type.

"The dial finishes with a stone ball having a metal point, while its base consists of a thin spreading moulding. A Latin inscription informs us that it was erected by the second Earl of Perth in 1630; and from the Dictionary of Architecture we find that it was made by John Mylne (the third of the name), who was the architect of extensive additions at Drummond Castle. The dial contains five stanzas of rhyme in which the hours as sisters descant on the flight of time."

It is said to contain around seventy separate dials, but I have to say that I have not managed to count them. There are cup hollows of various shapes, 'normal' vertical dials, reclining and inclining faces as well as dials with pin gnomons on the upper part (Fig. 6). It is unlikely that the dials with pin gnomons can now tell the correct time. They rely on the length of the pin and these are unlikely to be of their original length due to some corrosion.

That said, it is in excellent condition considering that it is nearly 400 years old and it is a truly remarkable sundial. As a bonus, it is situated in magnificent surroundings which are said to be one of the finest formal gardens in Europe.



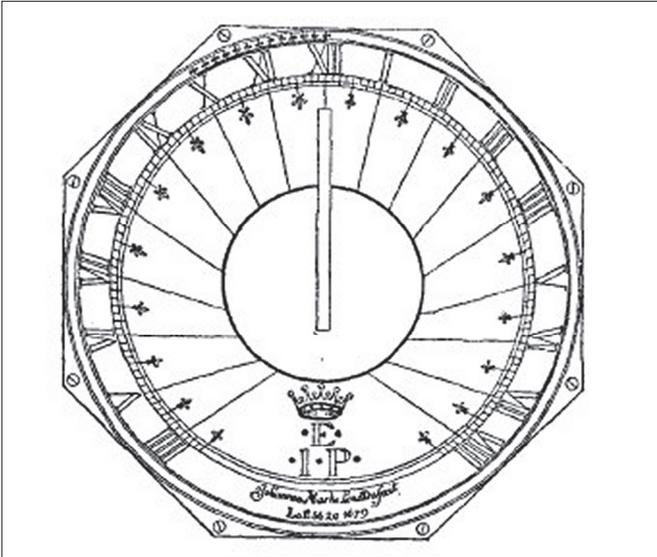


Fig. 7. Copy of the rubbing made by Ross of the John Marke dial at Drummond Castle and

Fig. 8. Recent photograph of the dial.

There are two other sundials at Drummond Castle, both of the horizontal type, which should not be ignored. They are both similar and sit on the terrace overlooking the gardens and Ross provides a rubbing of one of them (Fig. 7). It is by Johannes Marke of London and is dated 1679. The dial is marked with the latitude  $56^{\circ} 20'$  which is spot on for its position. It also contains the initials of John, Earl of Perth which are surmounted by an earl's coronet (Fig. 8).

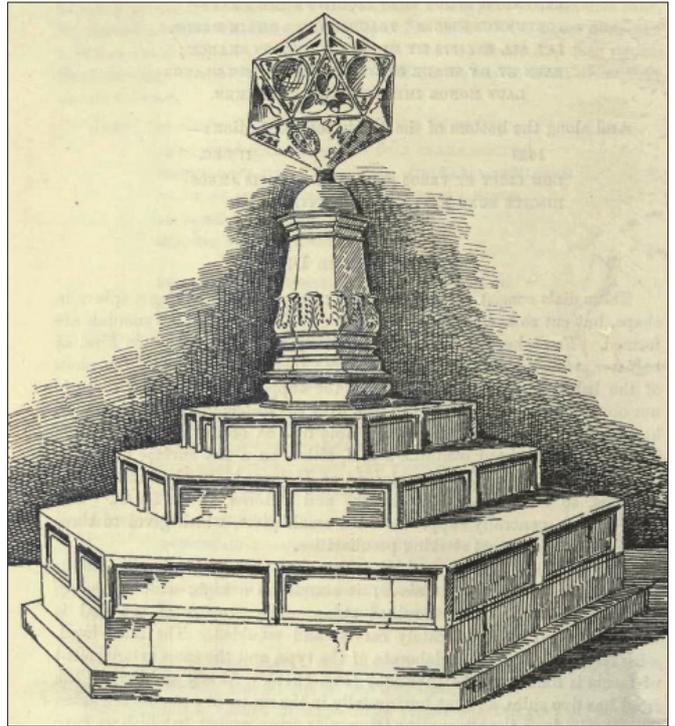
The third of these grand sundials is at the Palace of Holyroodhouse in Edinburgh, the official home of the Queen in Scotland. Ross tells us:

*“This dial [Fig. 9] is situated in the grounds of Holyrood Palace; it stands on a high, wide-spreading base, consisting of three moulded steps. The support of the dial is hexagonal, and it is delicately carved and moulded. The facet-head, with its dials, is the most elaborate of the type.*

*“At top and bottom the head has five sides, and cut horizontally in the centre it presents ten sides. This results from the alternating triangular arrangement, in which we have a triangle resting on its base, then one resting on its apex, and so on. The dials are hollowed out with figures of vari-*

*ous shapes. In one the gnomon is formed by the nose of a grotesque face; in another by the points of a thistle-leaved ornament. The under surfaces have no dials, except on one small heart-shaped lozenge, but are decorated instead with heraldic and other devices. These comprise the royal arms as borne in Scotland, with the collar and badge of the Thistle. There are also the initials of Charles I and his queen, Henrietta Maria, for whom Charles is said to have had the dial made.*

*“We learn that this sundial was made by John Mylne, the king's master mason, in 1633, with the assistance of his two sons, John and Alexander, for which he was paid the sum of £408 15s 6d Scots.”*



Figs 9 & 10: Ross's sketch of the Holyroodhouse polyhedral dial and a modern photograph of it.

*“The dial and pedestal measure 6 feet 7 inches high, and the total height, including the base, is 10 feet, and the width at the ground is 10 feet 3 inches. It is stated that this dial was lying broken and uncared for, and that it was put in order by command of the queen.”*

The Queen referred to above was Victoria. This sundial consisting of twenty faces currently sits in the North Garden (Fig. 10) and was visited by a number of BSS members during the BSS Edinburgh Conference in 2013 where free access to the grounds of the Palace was organised by Chris Lusby Taylor. Fig. 11 shows the grotesque face mentioned by Ross as well as the small dial on the heart-shaped lozenge underneath. There is one of these small dials on each of the five declining faces.



Fig. 11. The grotesque face on the Holyroodhouse dial.

It will be noted that there was a huge difference in price for the dials at Drummond Castle and Holyroodhouse, even allowing for their difference in styles – did Mylne consider that the King could afford to pay substantially more and set his price accordingly?

This sundial was already over 100 years old when Bonnie Prince Charlie<sup>4</sup> established his headquarters at Holyroodhouse in 1745, whilst his troops occupied Edinburgh during the Jacobite Rebellion. I have always found it difficult to visualise the contrast between the skilled mason crafting these beautiful, intricate and mathematically correct sundials on the one hand, with the kilted highlander with claymore and targe (sword and shield) rampaging through the streets of Edinburgh on the other hand.

These three sundials, at Glamis Castle<sup>5</sup>, Drummond Castle<sup>6</sup> and the Palace of Holyroodhouse<sup>7</sup> are certainly very grand sundials and are all worthwhile paying a visit. All of the grounds in which they sit are open to the public; Glamis Castle and Holyroodhouse throughout the year, and Drummond Castle during the summer months. However, if you do plan to visit, ensure that you check beforehand as the Palace of Holyroodhouse is closed when the Queen is in attendance, normally for a couple of weeks towards the end of June and the beginning of July each year.



Fig. 12. Ross's sketches of the Dundas Castle dial.

Fig. 13. The Dundas Castle dial and fountain in operation.



The final sundial of this remarkable group is at Dundas Castle near South Queensferry on the western outskirts of Edinburgh. Dundas Castle is currently run as an up-market wedding venue and conference centre within a private estate and is not open to the public. This is a great shame as its fountain with its integrated sundial is truly remarkable. Ross says:

*“This combined fountain and dial [Fig. 12] well illustrates the magnificent ideas which prevailed during the seventeenth century with regard to the monumental accessories considered desirable for the adornment of pleasure grounds and gardens, and we learn from the inscriptions on the fountain that many more objects of the kind once existed here which have been swept away. The fountain and dial do not appear to be in their original position, as is evident from an unpublished drawing in the possession of the Royal Scottish Academy. They were probably shifted when an old house which stood here was taken down.*

*“A flight of ten steps leads up to the dial, which is supported on an octagonal shaft adorned with winged figures; above this is the swelling basin of a second fountain, out of which rises the dial proper. It contains the usual features,*



Fig. 14. Close-up of the dial and fountain at Dundas Castle.

with certain peculiarities which can easily be seen on examination of the sketch. The principal fountain, which is square, measures about 7 feet each way by about 7 feet high to platform, above which the dial and pedestal rise to a height of 5 feet 8 inches. From an inscription seen on the drawing we learn that the structure was built in 1623.

*“There are numerous initials and other inscriptions on the fountain; the former are those of Sir Walter Dundas, and his lady, Dame Ann Menteith; and the latter, amongst other things, advise visitors to behave themselves seemly, to forbear to do harm to the fountain, nor yet should’st those inclined to injure the signs of the dial.”*

In ‘*The Book of Sun-Dials*’, Mrs Gatty goes a little further and provides a translation of one of the inscriptions as follows:

*“Sir Walter Dundas in the year of our Lord, 1623, and the sixty-first of his own age, erected and adorned, as an ornament of his country and family, sacred to the memory of himself, and as a future memorial of his posterity, as also an amusing recreation for friends, guests, and visitors, this fountain in the form of a castle, this dial with its retinue of goddesses, and this garden with its buildings, walls and quadrangular walks, surrounded with stones, piled on high, rocks having been on all sides deeply cut out, which inconveniently covered the ground.*

*“Whoever thou art, who comest hither, we, so many half-fiendish specters, are placed here lately by order, expressly for bugbears to the bad, so that the hideous show their visages, lest any meddling evil disposed person, should put forth his hand on the dial or garden. We warn robbers to depart, burglars to desist, nothing here is prey for plunder!*

*“For the pleasure and enjoyment of spectators are all these placed here: but we, who rather laugh with joyous front to a free sight, we bid frankly the kind and welcome friends of the host. Boldly use every freedom with the master, the dial, the garden, and the garden-beds and couches – him for friendship and conversation, them for the recreation of the mind and thought. With ordinary things to content us here, is to be even with others, we envy not their better things.”*

This dial is of the lectern type and its date of 1623 identifies it as the oldest of its type in Scotland and the second oldest overall. However, this view was not shared by Andrew Somerville who commented in a letter to the NMRS (National Monuments Record of Scotland)<sup>8</sup> *“To my mind it sits rather uneasily on the top basin of the fountain, with the jets hard up against it so that their pattern would have been spoilt, and there are no water marks on the dial as one might have expected if the dial had been in place when the fountain was operating. This suggests to me that the dial was not part of the original structure but was added later when the fountain had ceased to be operational. However, the Latin inscription on the fountain dated 1623 undoubtedly mentions the dial, though if one reads it carefully it does not necessarily imply that it was an integral part of the fountain; it could merely have been one of the other furnishings of the garden. And of course it need not necessarily have been the dial which is present now”.*



Figs 15 & 16. Scaphe dials and the star dial at Dundas Castle.

So is the sundial original to the fountain or not, or does it matter? Reading the translation provided by Mrs Gatty above, I can see where Somerville was coming from, but you could also read it the other way too, in that the dial was an integral part of the fountain. Either way, it is still a grand structure (Fig. 13). Nowadays the fountain is operating correctly and it currently sits to the right of the castle. The jets on the fountain referred to by Somerville are not interfered with by the sundial in any way (Fig. 14).

The sundial on top of the fountain contains 35 separate dials of several different types including cup hollows (scaphe), heart shaped and geometric sinkings, cylindrical and vertical dials (Fig. 15). The star on top has dials in each angle as well as its top surface (Fig. 16). All of the gnomons are missing except two, all visible numerals are Arabic and the majority of the hour lines are still visible.

So that's it – four sundials, three of them in the grounds of castles and another in the grounds of a palace. These fabulous sundials are all situated in the best of surroundings as befits their status as Scotland's grandest sundials.

## ACKNOWLEDGEMENT

Many thanks to Lucy Scillitoe, Commercial Director at Dundas Castle, for allowing me access to view and photograph their sundial.

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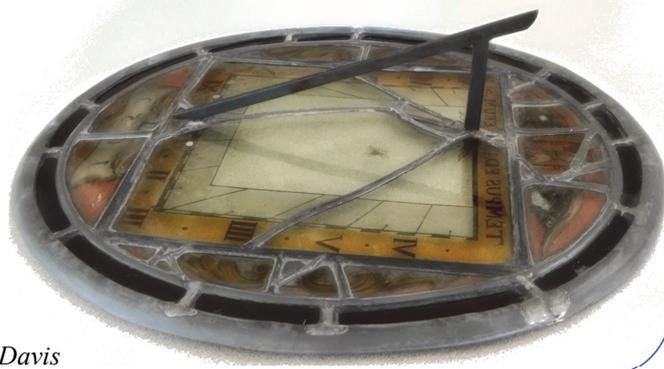
## A MISSING STAINED GLASS SUNDIAL LOCATED

Stained glass sundials are comparatively rare but at [www.advanceassociates.com/Sundials/Stained\\_Glass](http://www.advanceassociates.com/Sundials/Stained_Glass) John Carmichael and Dave Bell provide a catalogue of all the examples known to them, several having been identified and filmed by Hans Behrendt in the 1970s. Dial 33 on their list is called "The Roy Grosvenor Thomas dial" as it was in the collection of this American dealer and collector of stained glass in the middle of the 20<sup>th</sup> century. Unfortunately, it had disappeared from view and all we had was a single black and white photo of it taken from a TV screen.

The value of the online catalogue has once again been demonstrated when the owner of the dial, Russell E Perry of St Louis, Missouri, recently contacted John Carmichael to find out more about the dial which he had inherited. Russell has kindly allowed the photos here and on the cover to be published.

The dial is 12" × 15" and has had a gnomon fitted since the b&w photo, though it does not have supporting struts from the two holes visible in the bottom border of the glass and the sub-style angle is wrong. The dial is designed for a latitude of 51.5° and a wall declination of 16° W, this latter value being scratched at the top on the outside, as on some other dials. It is clearly a 'London' dial and has tentatively been attributed to Baptist Sutton or just possibly John Oliver, though the date of 1652 seems too early for the latter.

The motto, TEMPUS EDAX RERUM (time, the devourer of all things) is a standard one, as are the images of the winged hourglass and the fly. The original location of the dial remains unknown—almost certainly a large London house—but it is good to know that it is now in good hands.



John Davis

# THE SCADBURY HORIZONTAL STONE SUNDIAL

DAVID HAWKER

## Introduction

I first saw this dial, Figs 1, 2 & 3, in 2009 in an exhibition cabinet at Bromley Museum,<sup>1</sup> an interesting, small museum located in Orpington in the Borough of Bromley. A few years later, John Davis threw up a picture of the same dial at one of his conference lectures and then referred to it again at the 2012 conference. At this stage I mentioned to him that I knew of this dial and he suggested that I investigated it for the Society. Hence this report.

This stone, horizontal dial was discovered in Scadbury Park during excavations by the Orpington and District Archaeological Society (ODAS)<sup>2</sup> of the medieval moated manor and surrounding buildings. The dial was found in the foundations of the Tudor gatehouse.

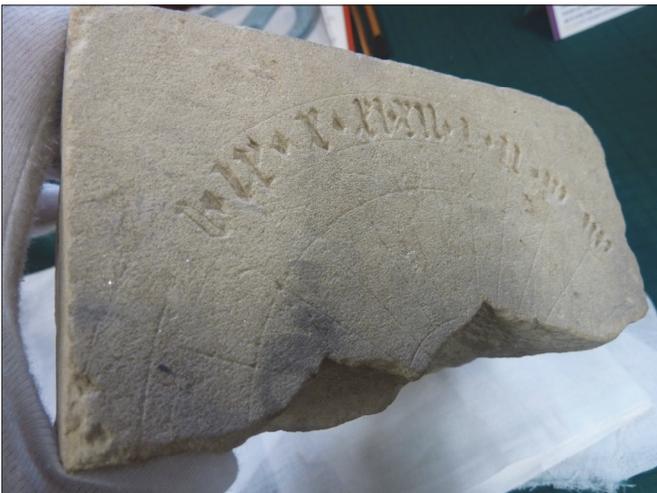


Fig. 1. The Scadbury sundial.



Fig. 2. The morning hours.

Alan Hart of the ODAS has written a number of articles on the discovery of the dial and has made his own analysis of the dial's origins. This report makes references to these publications.

I had the opportunity to examine the dial closely at the Bromley museum with kind permission and help of the museum's curator, Marie-Louise Kerr.<sup>3</sup> Having made measurements and taken photographs, I then made two gentle rubbings with a soft pencil so that I could spend more time analysing the layout of the dial at a later date. Handling the dial was quite scary really as it is considered the most important artefact to be discovered from the excavations and is a prized exhibit at the museum. It has also been photographed and included on the BBC/British Museum's *History of the World* web site.<sup>4</sup> Consequently, kid gloves were used – metaphorically and in practice (well, not kid!).

## History of Scadbury Manor<sup>5</sup>

The remains of the moated Scadbury Manor House, Fig. 4, are situated in Scadbury Park which lies between Chislehurst and Sidcup in Kent. The first mention of Scadbury can be traced to the 13th century where the 'de Scadbury' family is mentioned in a series of deeds of nearby Kenmal Manor. The first known reference to the manor is in 1341 as a settlement on the marriage of John de Scadbury to Christina de Hadresham. Nothing much more is heard of the estate until 1424 when Thomas Walsingham bought the manor, the first association of the manor with the Walsingham family. The manor stayed in the Walsingham family up to 1659 when Thomas Walsingham V sold the estate. His father Thomas Walsingham IV was in favour



Fig. 3. The afternoon hours.



Fig. 4. The remains of the moated manor house. The mansion/gatehouse ruins lie some 100 yards beyond.



Fig. 5. Excavations of the mansion/gatehouse foundations. The dial was found near to the nearest digger.

with Elizabeth I and in 1597 she visited Scadbury where she knighted Thomas, an occasion pictured on the nearby Chislehurst village sign.

The manor was purchased by Sir Richard Bettenson and passed down through that family and the associated Selwyn and Townshend families. In the mid-18<sup>th</sup> century, Thomas Townshend purchased nearby Frognal and leased out Scadbury. In 1904, Hugh Sydney Mersham-Townshend moved to Scadbury into a mansion built close to the moated manor house, which had been demolished in 1738. The estate passed to his son John who was the last resident owner to reside at Scadbury. This mansion, relevant to this story, was damaged by a V1 flying bomb in 1945, burnt down in 1976 and demolished in 1984. The 300 acre Scadbury Park was purchased by Bromley Council in 1983 and was opened as a Nature Reserve in 1985.

### Discovery of the Dial

Excavations of the 300 acre park by the ODAS began back in 1986, but excavations of the area of the 'modern' mansion house, mentioned above, Fig. 5, took place between 1997 and 1999.

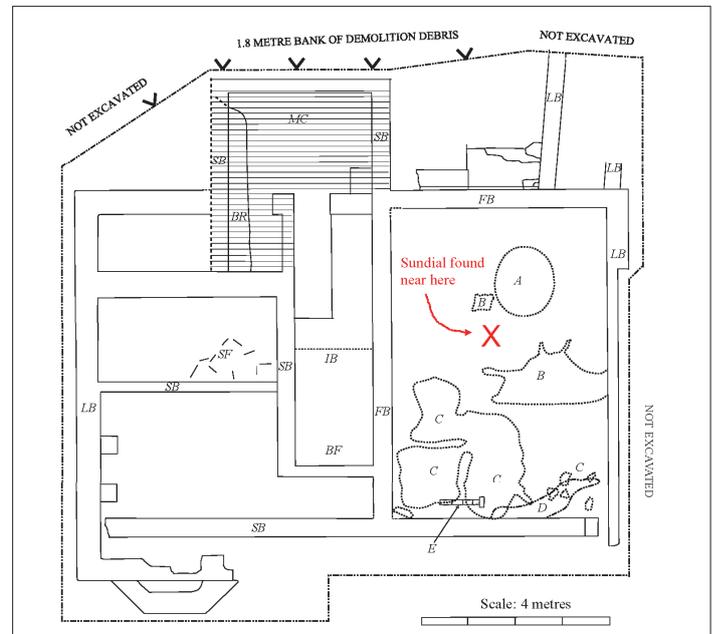


Fig. 6. Plan of the Gatehouse foundations. The dial find location is indicated by X.

Excavations of the remains of the mansion, some 100 yards west of the moated manor house, determined that parts of the foundations were of mid-16th century origin and these are believed to be for a gatehouse to the moated manor.<sup>6</sup> Over the centuries, the gatehouse was replaced with numerous buildings culminating in the building of the mansion house in the 19th century. The dial was found in the rubble and soft sand of the floor of one of the excavated Tudor rooms and the archaeologists suggest that the dial is most likely to be contemporary with the floor deposits presently dated between 1535 and 1560.<sup>7</sup> See Fig. 6.

It is interesting that this dial was found amongst rubble infill since the St James's Priory Bristol equinoctial dial was also found in rubble infill, in this case of a wall.<sup>8</sup> Rubble is obviously manna from heaven for archaeologists.

### Dial Details

The sundial is carved on a piece of, what was, rectangular or square limestone the remains of which are 6" (150mm) wide, by approximately 3" (75mm) from the north edge to the broken edge, by just under 4½" (close to 110mm) thick. The break line is across the dial just above the 6 o'clock line. The dial is unfinished and it appears to have been broken on purpose by two hefty blows with a hammer and chisel. The other part of the dial has not been found. There is no typical weathering discolouration of the surface so it is expected that it was discarded soon after being broken and buried with the rubble to be used for backfilling the building foundations.

The carved surface is flat and polished. The sides are also flat but are not as smooth as the carved surface and the base is roughly cut.

The carved surface has the remains of four arcs, a 12 o'clock hour line and hour lines for 7am to 5pm. The hour lines converge to a point below the broken edge, 2"

(50.8mm) from the second arc. This arc has distinct markings comprising incised points or peck marks which are assumed to be layout marks for the hour lines. Neither the hour lines nor the arcs are deeply carved.

The innermost arc, of which only a short section remains, between 8 and 11 o'clock, has a radius of around  $\frac{3}{4}$ " (19mm). The second arc, with a radius of 2" (50.8mm) starts at the broken edge just before the 7am line and ends just after the 5pm marker point. The third and fourth arcs have radii of  $2\frac{1}{2}$ " (63mm) and 3" (76mm) respectively and these arcs enclose the hour numerals. The 12 o'clock hour line has been scribed through the hour numeral annulus up to the outer edge of the stone. The 10, 11, 2 and 4 o'clock hour lines are scribed through to the outer hour numeral arc. Possibly all the hour lines had been scribed through to this point although they are not readily discernible.

The hour numerals are Roman starting with an incomplete VIII of which only the last 'I' has been outlined. Numbers IX, X, XI, XII, I and II are finished but only parts of III and IIII have been carved. Strangely, only the tops of III and IIII have been carved and the carvings are not sharp, however there is some damage to the surface at figure III. The figures have been more deeply cut than the hour lines. The cutting appears to have been of the V-cut method although the bottoms of the figures are quite rough and not sharply defined. The hour numbers, with the exception of III to IIII, are separated with a decorative carved diamond which may have suggested the half hour.

Determining the angles of the hour lines proved more frustrating than originally envisaged. Firstly, acetate templates for a range of latitudes from 51° to 56° were laid over the dial and the nearest set of hour angles to align with the dial seemed to be a set equating to 56° latitude which is somewhat distant, to say the least, from the location of Scadbury Manor which is at 51.4° N. However, none of the templates aligned precisely with the lines on the dial. If the inner lines of the templates matched the dial, then the outer lines of the template were beyond those of the dial. Similarly, if the outer lines were matched, then the inner lines of the templates were outside the dial lines. This tendency is shown in the tables where calculated angles are compared with the actual angles for various latitudes, Figs 7 and 8.

Calculations of the hour line angles were made using measurements from the rubbings taking the distances between adjacent mark-out points (peck marks) through which the hour lines were scribed together with the radius, 2" (50.8mm) using simple trigonometry. These were backed up by using measurement of the distance of each mark from that on the 12 o'clock marker. In addition, the hour lines on the rubbings were extended and a protractor was used to obtain a further set of readings for comparison. The three sets of angles and the resultant average are given in Fig 7.

The tables go to show the difficulties in obtaining consistent results from measurements of incomplete dial features and particularly without the hour line convergent

Hour	From Adjacent hour marks	From 12 o'clock hour mark	by Protractor	Average hour line angle
7	72	72	72.6	72.2
8	55.4	55.2	55.3	55.3
9	40	39.9	39.8	40
10	25.3	25.4	25.4	25.4
11	12	11.9	11.7	11.8
12	0	0	0	0
1	12.1	12.2	12.1	12.2
2	25.3	24.7	25.8	25.3
3	40.1	40.2	40.5	40.3
4	55.5	55.9	55.9	55.8
5	71.6	72.3	72.6	72.1

Fig. 7. Calculated and average hour line angles from: (1) measurements of adjacent 'peck' marks; (2) measurements of peck marks from 12 o'clock mark; (3) angles measured by protractor.

point. However, reasonable conclusions can be made and reference to the table in Fig. 8, which shows the hour angles for Scadbury Park and for latitudes 55° and 56° together with the error differences between these angles and the average calculated angle from Fig. 7, suggests that the dial may have been delineated for latitude 56°. Alan Hart's measurements led him to suggest a latitude of 55°. It is not expected that angles for a latitude further north are relevant. If 56° is correct, then it happens that this is the latitude for Edinburgh and it is possible that the mason may have had a set of figures for this location and worked with those – perhaps before realising that these were wrong for this loca-

Comparison of hour angles with Latitudes					
Scadbury Park Latitude 51.4°	Error	Latitude 55°	Error	Latitude 56°	Error
71.1	1.1	71.9	0.3	72.1	0.1
53.5	1.8	54.8	0.5	55.1	0.2
38.0	2.0	39.3	0.7	39.7	0.3
24.3	1.1	25.3	0.1	25.6	0.2
11.8	0.0	12.4	0.7	12.5	0.7
0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.4	12.4	0.2	12.5	0.3
24.3	1.0	25.3	0.0	25.6	0.3
38.0	2.3	39.3	1.0	39.7	0.6
53.5	2.3	54.8	1.0	55.1	0.7
71.1	1.0	71.9	0.2	72.1	0.0
Total error	13.0		4.7		3.4

Fig. 8. Errors (degrees) for various latitudes from calculated average hour line angles.

tion! Well, a whole raft of reasons can be considered for the destruction of the dial; it has been suggested that it may have been a discarded practice piece<sup>9</sup>, an apprentice piece or maybe there was damage to the other part of the dial that made it unusable: I guess we will never know.

### Calligraphy

There are no letters carved on this dial only the numerals which are carved inside, but not touching, the outer scribed annulus. The figures are Roman and the style of the letter cutting is an angular Textura which started being extensively used at the end of the fourteenth century, continued through the fifteenth and into the sixteenth and was typically used on brasses, tombstones and tapestries. The terminals are angled; one of the typical methods of terminating these letters.<sup>10</sup>

The style of the numerals therefore fits easily with the expected date of the dial which, as mentioned above, is ca. 1550.

### Summary

This stone, horizontal sundial has been realistically dated to the mid-16th century primarily from the archaeology of the area in which it was found and with some confirmation from the style of the carved numerals. It is certainly a 'scientific' dial and, on this basis is quite a rare dial; one of only a few known to exist from this era. When writing his report, Alan Hart had contacted Christopher Daniel who commented on the rarity of early stone horizontal dials and John Davis has an on-going project researching early English dials and confirms the scarcity of scientific dials, and particularly stone horizontal dials from Tudor times.

### ACKNOWLEDGEMENTS

Grateful thanks go to Alan Hart for providing a fund of information and for the kind permission to quote from the ODAS publications. Thanks are due to the ODAS for the site photographs and Gatehouse plan. Many thanks also to Marie-Louise Kerr for granting me access to the sundial at the Bromley Museum premises at the Priory, Orpington. Thanks to John Davis for encouraging me to write this report.

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**David Hawker** is a retired but still working engineer in the field



of power boilers and refinery and chemical plant furnaces. With an interest in all things scientific, he made his first sundial in 1999, using a library edition of Waugh and scraping the lines and figures in slate. Since then, he has learnt letter carving and has made over 40 dials, mostly in slate. He can be contacted on [david@hawkerdials.co.uk](mailto:david@hawkerdials.co.uk).

## A Ceramic Sundial

This ceramic sundial was seen at the Newbury meeting. It was made by the children of Tipton St John Church of England Primary School in Devon and was given to Janet Jenkins, who is the Chair of the Governors there, on the occasion of the pupils' leaving ceremony. Some of the other governors received ceramic birdbaths but Janet's love of sundials was well-known.

The headteacher of the school designed the actual sundial and the children made all the 'garden critters' around the edge. The dial should probably be categorised as an indoor decorative type and is both a good way to get the children thinking about the sun and sundials at an early age and a very personal gift.

JD



# AN APPRECIATION OF EDWIN RUSSELL'S SUNDIALS

DOUGLAS BATEMAN

with contributions from Joanna Migdal and Christopher Daniel

The Dolphin Sundial in Greenwich is one of our most well known dials, designed by Christopher Daniel, with its two dolphins most elegantly and beautifully sculpted by Edwin Russell (1939–2013), Fellow of the Royal Society of British Sculptors. Russell was a sculptor of national standing with works in St Paul's Cathedral, Westminster Abbey and Wells Cathedral. *Who's Who* lists some 27 major works ranging from two in St Paul's Cathedral, Westminster Abbey, Oman, Dubai, Nassau, and many for corporations. Russell died recently after a long illness: there were several members of the BSS who have fond personal recollections of him.



D. Bateman

*The Dolphin Dial in its present location in the former garden of the Royal Observatory, Greenwich.*

Joanna Migdal, having studied with Edwin Russell for over 20 years, says that:

“He never asked us to do anything he would not do himself – that was very tough indeed. He had such a talent in sculpture; in his art he was a free man. He was not easy and was disciplined and aimed for perfection beyond all. It had to be the best possible, regardless of how long it took. People asked why I stayed and put up with the long hours and the hard work – it was because Edwin had access to another world, the world of artistry that he was prepared to share. When I first arrived as an 18 year old student in 1976, Edwin was working on the sublime sculpture of the Dolphin Sundial to mark the Queen's Silver Jubilee for Greenwich. From the original concept given to him, he created what is the most perfect sculptured sundial ever, an amazing unity of art and science. It has a touch of genius and it inspired me for life. Edwin was the artistic director of Brookbrae



*Edwin Russell and Joanna Migdal at the unveiling of the Millennium Sundial in Guildford.*

and we worked on simply hundreds of sundials together over the years. In the early years Edwin did the designs and I drew them up full size and made as much as possible, then over the years the balance changed and latterly we worked together on many pieces. He also encouraged me to learn hand engraving, engineering, calligraphy and fostered my love of mathematics. He could always advise how – with a little change here and a tweak there – the design could be so much better. When I set up in my own sundial studio, it became clear how everything he had taught was a deep influence. A number of his many students remark that it is as if Edwin's spirit is still with us as a guiding light. He was fully supported, loved and looked after to the end by his beloved wife Lorne, a talented sculptor herself.”

Christopher Daniel writes:

“Since Edwin sculpted my first sundial, the Dolphin dial in 1978, I naturally involved him in most of my early dials, including the Marine Society & Nautical Institute dial, those on St Margaret's Westminster, and the Savoy armillary. He produced the limited edition of miniatures of the Dolphin dial. Edwin's relationship with Brookbrae Ltd was a family one. His wife Lorne's sister, Fiona, was married to Oliver Gero, the MD of Brookbrae, and Edwin was the artistic director of the firm. I first met Oliver when he ap-

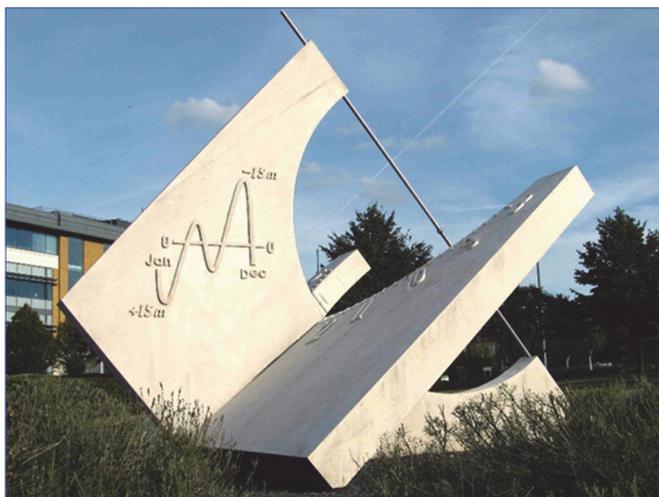


National Maritime Museum

*Edwin Russell (left) in his studio in 1977, discussing his clay model of the planned Dolphin dial with Chris Daniel.*

proached me for advice and help with an equinoctial sundial, copied from one in the National Maritime Museum's collection. In turn, when developing the Dolphin Sundial, it was natural to engage Brookbrae, *i.e.*, Edwin Russell, to undertake the work. At this time, I made many trips down to Lethendry (his home and studio in Surrey) to see Edwin, where I met Joanna, who was under Edwin's tuition."

My own much more limited connection came about through the re-siting of the large granite dial in Marlow, originally for the Rank Xerox headquarters, and then with the unveiling of a new dial in Horsham. The former came about when authorities in Marlow contacted me about the re-siting of the dial and setting out a meridian line. Russell's wife Lorne (an eminent sculptor in her own right as Lorne McKean) checked the new location from



D. Bateman

*The massive concrete equatorial at Bracknell, 1999 (SN 4502, delineated by J. Migdal).*



*The apple-blossom dial which once stood in the East Malling Research Station, 1982 (SN 3555, delin. by C. Daniel).*



*The vertical in Grouville, Jersey, where Russell sculpted the frieze incorporating a Greek chariot, 1986 (SN 4615).*



M. Harmer

*The large vertical over Tower Hill Underground station, 1990 (SN 2101, delin. C. Daniel).*

an artistic point of view, and the eventual siting became a family occasion.<sup>1</sup> The second dial for the centre of Horsham, a bronze equatorial, 2.7 m in diameter, was under construction when I was privileged to see it in the studio, and eventually unveiled by The Queen.<sup>2</sup>

The following illustrations and those on p. 44 are of the more well known dials associated with Edwin Russell.

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# SUNDIALS AND SLAVERY

ROGER BOWLING

## The Story So Far

Twenty years ago I recorded two dials, one at Dunham Massey, Greater Manchester, SRN 1720 and the other at Arley Hall in Cheshire, SRN 1724. The Dunham Massey dial was supported by a kneeling figure of a Blackamoor, and the Arley Hall dial by a kneeling figure of an Indian. Both the figures were made of lead.

I suspected there might have been some connection between these two dials and the figures supporting them. Other lead figures supporting dials were later found, there were other Blackamoor figures, some differing from that at Dunham Massey, more Indians, two versions of Father Time, and Hercules. I reported this work in 1997.<sup>1</sup> Over the following twenty years many members of the society reported details of more figures, some were found *in situ*, some from books on garden history, old copies of *Country Life*, and from the literature of the art and antique trade. It appears to me that my only contribution to this work was to sit back and await more sightings. There were also Father Time figures supporting sundials, but this article concerns only the Blackamoor and Indian figures.

The figures were produced by four 18<sup>th</sup>-century sculptors. I tried to classify the figures and match them with their sculptors using the stance of the figure as the key which was only partly successful as the sculptors reused others' moulds, and unless a close view of the figure was available it was difficult. They were the first mass produced garden ornaments, and were very popular. The Blackamoor and the Indian have been suggested as the first two of a set of four representing the four 18<sup>th</sup>-century continents and were first made in 1701 and 1702 for King William III's privy garden at Hampton Court Palace.

I was always ready for questions as to why this should be of interest to the Society. I had two answers. One, that the figures were a pointer to a good 18<sup>th</sup>-century dial, and though some are spoiled by the ravages of corrosion, this has proved to be true. The other was that here was something the society had at times talked about, a study of plinths and other supports that displayed dials. I was though never asked the question.

In 2007, ten years after the first article, I published an updated list of figures and their dials.<sup>2</sup> That I thought was the end of the story, and I was happy – but it was all to change, for there was a very big gap in my understanding. For over almost twenty years I had failed to recognise, and really never even considered, the significance of the figures, the Blackamoor and the Indian. They were far more important than mere garden ornaments.

## The Real Story

In 2010 I had an e-mail from a lady in London saying that one of my articles concerning Blackamoors had been noticed in America and could she have a copy please. The lady was an historian; she had studied the history of the black community in north London and was interested in garden history. At that time she was writing an article and drawing illustrations for a garden history journal. I was delighted to have found at least one other person who had an interest in these figures. A short time later I received another request for my articles, from Dr Patrick Eyres, a garden historian and for thirty years the editor of the *New Arcadian Journal*, a work devoted to the Georgian garden. The issue he was then working on was to be titled, "The Blackamoor and the Georgian Garden".<sup>3</sup>

Dr Eyres is also a trustee of the large project to recreate the large Wentworth Castle estate and gardens, near Barnsley. This was the subject of one of the TV programmes, 'Restoration' competitions some years ago. The interest for me was that at Wentworth there was a good Blackamoor that had stood in the grounds since the early 18<sup>th</sup> century but had not seen the light of day for over twenty years but had recently been restored. Also, it was a type I had not seen closely before, one by John Nost II. Dr Eyres was including in the issue of the *New Arcadian Journal* an inventory of Blackamoor and Indian figures and asked if I could help. Yes I could and did, a few new figures and facts, a confirmation or correction here and there, and some details of the dials: the agreement between our two lists was close. The inventory (see Appendix) contains 28 figures and dials, extant, moved and lost, and a few which have passed through the auction houses.

Wentworth, near Barnsley was the area where my family had farmed for many years, and still do, and a relative once lived in the castle lodge. In Autumn 2011 my wife and I decided we really must visit Wentworth. We met Dr Eyres at the nearby Cannon Hall, now a museum and country park, where the Blackamoor was in store in the cellars after restoration, and awaiting installation in the gardens, all being well in late 2013. The dial was also in the cellars, a very fine instrument by Jonathan Sisson in good condition (SRN 7348). This long story certainly kept the best until the end, but I think that I am now able to give the real story of the two lead figures of the Blackamoor and the Indian.

## The Figures and their Sculptors

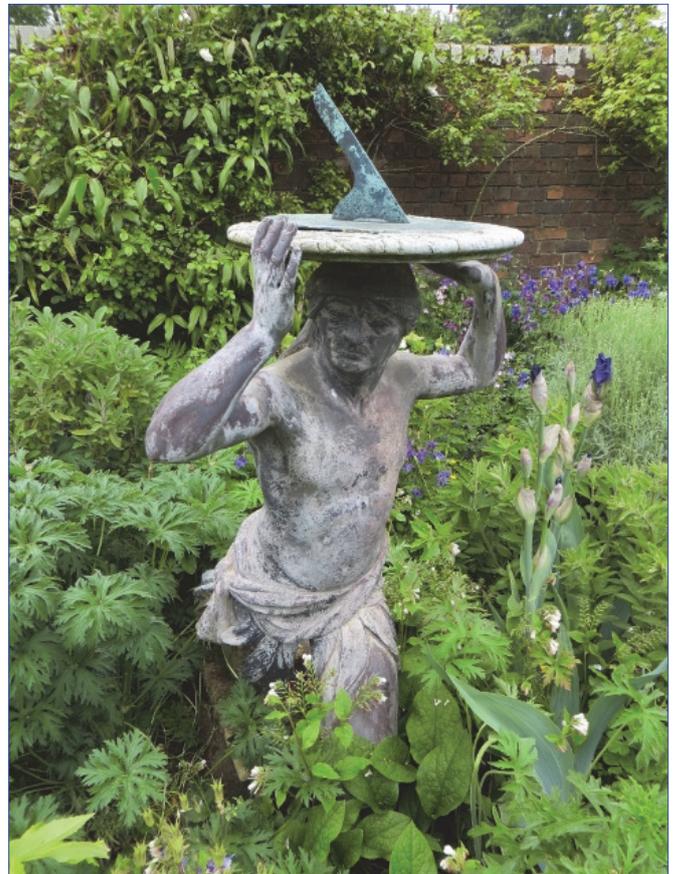
The first two figures were made by Jan van Ost who came from Mechelen in Holland in about 1678. He anglicised his name to John Nost and worked at first for Arnold Quellin.



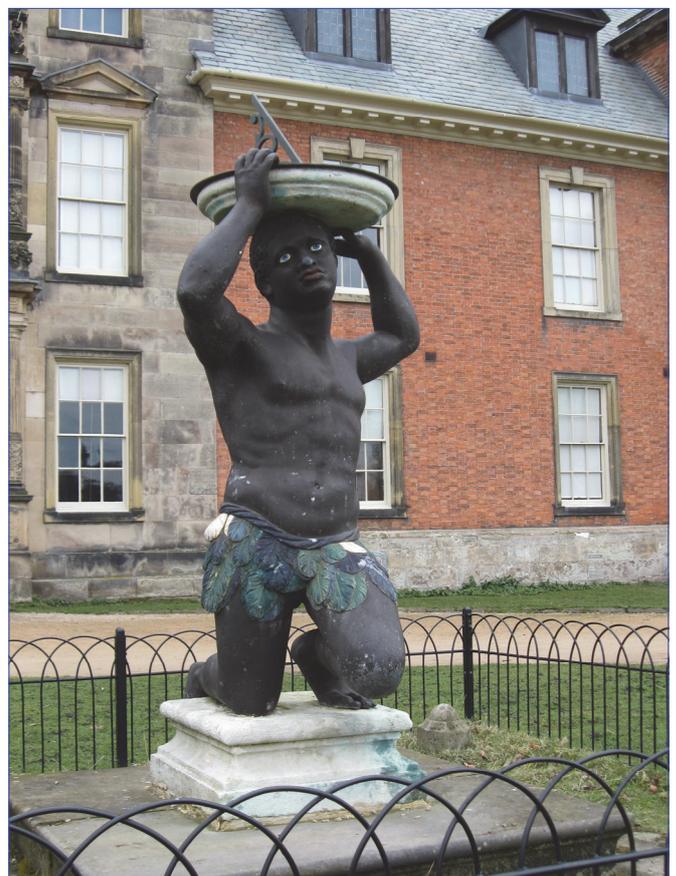
*Fig. 1. John Nost I, Blackamoor. Photo: Yale University Art Gallery.*

He married Quellin's widow and acquired the business near the Haymarket in London. He was a prolific sculptor and many of his works are found in the grandest gardens. The two figures concerned here are the Blackamoor and the Indian, both cast in lead and about life size.

The Blackamoor by Nost I (Fig. 1) kneels on his left knee and looks towards the left, his hands balance the dial on his head. He wears only a skirt of ostrich feathers and it is these that proclaim him to be an African, rather than the Europeans idea of a Red Indian as has been stated. The second figure that Nost I made was an Indian (Fig. 2) wearing a loin cloth and a turban, and, like the Blackamoor, carries the dial on his head. John Nost I employed Andries Carpentiere (1673–1737) who set up on his own near Hyde Park Corner before 1722, and became another famous monumental sculptor. His Blackamoor figure (Fig. 3) is the only type which kneels on his right knee and looks towards the right. It is my opinion that the Carpentiere figure looks younger than the Nost I type. Carpentiere's sales list also included an Indian (for £8) but I cannot discern any differences between his Indian figures and those made by John Nost I. Judging from the number of surviving Indian figures they must always have been less popular than the Blackamoor. John Nost I died in 1710 and Frances his widow in 1716. She bequeathed the business to her late husband's cousin, also John Nost, who thus becomes John Nost II, also a maker of Blackamoors with dials (Fig. 4). There was also a John Nost III who was also a sculptor but



*Fig. 2. John Nost I, Indian. Private garden, Hampshire. Photo: Sue Manston.*



*Fig. 3. Andries Carpentiere, Blackamoor, Dunham Massey, Cheshire. Photo: Fay J Bowling.*



Fig. 4. John Nost II, Blackamoor. Wentworth Country Park, Barnsley. Photo: Fay J Bowling.

happily he seems never to have produced a Blackamoor. The Nost family genealogy was only worked out and published in 2009 and has cleared the fog of misattribution and uncertainty as to who had produced which figures.<sup>4</sup>

In 1737 the business came to John Cheere, brother of, and often confused with, the more famous Sir Henry Cheere. For fifty years John Cheere was a prolific producer of lead garden statuary, including Blackamoors. The Cheere figure also kneels on his left knee, though I think the two can be distinguished as the Cheere figure appears a much older man (Fig. 5). It has been suggested that the best way to differentiate the work of the four sculptors might be by the modelling of the Blackamoors hair, which sounds a good idea, but I have only ever seen two of the figures close enough for that method; the Blackamoors of John Nost I and II are especially difficult to distinguish. Lacking a close view or a good photograph the only reliable way is from documentary evidence such as the estate archives.

The figures were usually painted naturalistically, but sometimes white to mimic stone. Sometimes the ostrich feathers are coloured white instead of the more usual green/ blue. Over almost three hundred years most figures have been repainted several times.

#### The Four Continents

The four 18<sup>th</sup>-century continents were Africa, Europe, Asia and the Americas. There was a hierarchy with Europe and Asia as the civilised continents and Africa and America the

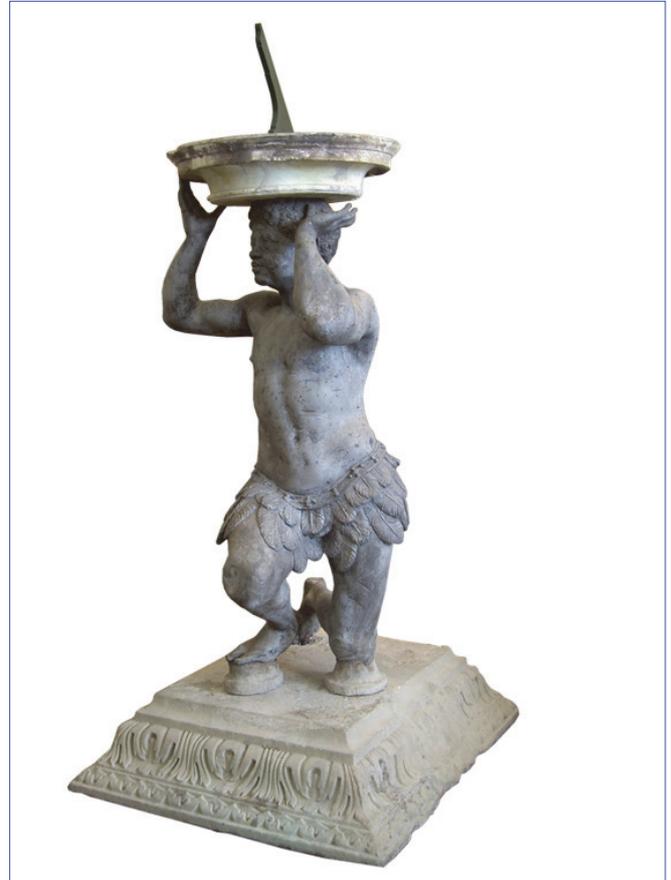


Fig. 5. John Cheere, Blackamoor. Once at Bush Hill Old Park, Enfield, now in USA. Photo: Engs-Dimitri Fine Art and Antiques, Los Angeles.

uncivilised. In the 16<sup>th</sup> and 17<sup>th</sup> centuries all the figures were female. That representing Europe, the principal part of the world for religion, art and arms, showed a figure holding a model of a temple, a cornucopia, a book, an artist's palette, sceptre and crown, musical instruments and other symbols of civilisation. Asia provided the produce necessary for the good life and so the figure has a splendid dress, flowers, fruit, spices and a camel. America by contrast was both barbaric and exotic, the lady is naked except for a feathered headdress and carries a bow and arrows. The African lady was nearly naked with frizzy hair and a necklace of coral. Her headdress was an elephant's head, and she was surrounded by a cornucopia, a lion, a viper, and a scorpion.

Since the first of Nost's figures were unveiled at Hampton Court in 1701, there has always been the question 'was this the first of a set of four representing the four continents?' King William III, once Prince of Orange from Holland, and his chosen sculptor would have been conversant with all this iconography for Nost had worked on the decoration of the Dutch Royal Palace, Het Loo. And as Hampton Court Palace and Kensington Palace are both adorned with the four continents theme, I think it very likely that the King would have extended this theme to the gardens. But the question is academic for in 1702, soon after the Indian figure had been installed, King William fell from his horse and was killed. Queen Anne, either to reduce expense or

having different plans for the garden, quickly removed the figures, and that was the end of the four continents project. It is interesting, though, to consider what John Nost would have produced to represent the two missing continents, America and Europe.

In 1787 John Cheere, the last of the lead-figure sculptors, died and no more Blackamoor or Indian figures were made. 1787 was also the year of the formation of the Committee for the Abolition of the African Slave Trade. At this time and throughout the 19<sup>th</sup> century, the Blackamoor became the symbol of anti-slavery movements. In 1838 slave ownership was outlawed through the British Empire. There has since always been a steady movement of the figures through the art and antique salerooms. The Blackamoor figures have provoked concern in the gardens of some of the National Trust properties making explanation notices necessary, but it seems almost unbelievable that full size replica Nost figures, cast in lead, were produced post-1973, for £5850, including VAT, ex works!

What John Nost, gave us were two new figures, like nothing those had been seen before, one of which was symbolic of civilised taste, dressed in fine cloth and the other a heathen dressed in feathers. It is reasonable, therefore, to question what these two contrasting figures really represented.

#### **The Significance of the Blackamoor and the Indian**

There was an Atlantic slave trade as early as 1440. It was pioneered by Portugal but British involvement began in about 1580, and by 1650 African slaves were working in British Caribbean sugar, and Southern American tobacco plantations. All the seafaring nations of Europe were involved in the trade and Britain became the major participant. Britain was the victor of a long series of European wars culminating in the War of Spanish Succession (1701–1713). One of the spoils of the victory was the award by Spain to Britain of the *Assiento de Negros*, a monopoly trading right to supply slaves to the Spanish properties in the Caribbean and Southern America.

The British government privatised the business and several trading companies, among them The Royal Africa Company, the South Sea Company and the East India Company, soon became very rich. The business included the purchase of slaves from West Africa, their transport across the Atlantic, and their employment on the British and Spanish owned plantations. It was a three-way trade, shipping British exports to West Africa, the purchase of slaves, their transport across the Atlantic and sale to the plantation owners, the ships returning to Britain loaded with the produce of the Caribbean, sugar, cotton, tobacco, rum, spices and timber. The voyage from Africa across the Atlantic became known as the infamous ‘middle passage’, marking the death of very many slaves which represented a large fraction of the cargo. Between 1660 and the British abolition of the slave trade (though not the employment of slaves) in 1807, it is estimated that Britain carried 6 million African slaves, (though that figure is constantly increased),

many more than the other shipping nations, Holland, France, Italy and Portugal put together. Those involved in the trade – slave traders, ship owners, plantation owners, directors of the company involved, and of course the politicians – all became immensely rich very quickly and of course this wealth had to be displayed.

I think there is no better statement telling how the wealth was spent than “it is likely that every Palladian mansion in the care of the National Trust was built with the profits of the Atlantic slave trade”.<sup>5</sup> But I see no reason to restrict the scope to National Trust, and Palladian properties, and of course this includes the gardens, landscaping, garden sculpture – the most important of which was the sundial.

In Georgian times Britain became omnipotent, ruling the seas and with a trading empire spanning half the world. It was King William’s choice to celebrate this power by the decoration of Hampton Court Palace and its gardens. The Blackamoor and the Indian advertised what the wealth was founded upon, trade and slavery. This might seem obscene to our ears but in those times it was considered a very good thing, a noble trade. The Blackamoor and the Indian were installed in the gardens of the newly rich gentry, a patriotic act, but I suggest more as a statement “look, observe our wealth, aren’t we rich, and this is how we made our money”. But what better symbol could have been chosen? The Blackamoor was a very popular figure, and not only in the garden, there must have been many more than can be accounted for nowadays. Not all the gardens with the figures can be connected with the slave trade, patriotism and fashion must also be reason, but then the whole economy was built on slavery. The Blackamoor figure was not at first called a slave, but the Indian was. It is my view that neither figure is really depicting a slave, their dress is not that of a slave, neither wears chains. The Blackamoor wears an ostrich feather skirt, and the Indian feathers and fine cloth: they are the British idea of an African and an Indian and they represent Africa and Asia.

#### **The Significance of the Sundial**

Dr Eyres suggests that the sundial represents not surprisingly, ‘Time, but in the sense that the time then, the 18<sup>th</sup> century, was Britain’s Time. We ruled the world and the seas, it really was ‘Rule Britannia’ time – 1740. But also as the sundial is found in the garden, the place of leisure, then our leisure time is also earned from our trade, on the backs of the poor slaves. I think however there is another explanation for the sundial. As all in this Society know, the sundial is a scientific instrument and a work of art, and as such is a fitting adornment to the garden of any age. The dials supported by the figures were by the best makers of the 18<sup>th</sup> century and included Thomas Tompion, Jonathan Sisson, Thomas Heath and Thomas Wright. I think the symbolism of the dial is the same as that for the Blackamoor, ‘look, we have the best scientific instrument that money can buy, and we know what all the lines and figures on it mean’.

## APPENDIX

### Inventory of the Two Figures and Their Dials

#### 1. Extant and presumed in their original location

**Cheshire, Arley Hall.** Indian slave by John Nost I, pre-1708. This figure appears to be in mint condition. The dial (SRN 1724) is very corroded and by Heath & Wing, London. The dial, which must post-date 1751 when the partnership of Heath & Wing began, is much too small for the plate on which it rests, and must be many years later than the figure, suggesting a replacement for an earlier dial. Private, open to the public.

**Cheshire, Dunham Massey.** Blackamoor by Andries Carpentiere, c.1735. The figure is in excellent condition, recently restored, very accessible and much photographed. The dial, (SRN 1720) is corroded, no detail visible but with a very fine gnomon. NT property, open to the public.

**Cumbria, Dallam Tower.** Blackamoor by John Nost II (?), c.1720. Dial by John Howard, near Charing Cross (SRN 3978). Gardens and house, 1730. Private, with occasional open days.

**Derbyshire, Melbourne Hall.** Two figures, Indian Slave and Blackamoor both by John Nost I, 1705, £30 the pair. These are the only figures that do not support sundials; they are replaced by urns. Private, open to the public.

**Devonshire, Sherwood.** Blackamoor by John Nost II, 1717. Dial maker not known. Private, open to the public.

**London, Lincoln's Inn.** Blackamoor by Andries Carpentiere, c.1731. Dial bears date 1731 (SRN 2113). Donated to **Clements Inn** by Viscount Clare c.1770. Sold and bought by Mr William Holmes in 1884 who presented it to the Inner Temple. Private gardens. This dial has, or had, an apt poem on the pedestal.

In vain poor sable son of woe,  
Thou seek'st the tender tear,  
For thee in vain with pangs they flow,  
For mercy dwells not here,  
From cannibals thou fledst in vain,  
Lawyers less quarter give,  
The first won't eat you till you're dead,  
The last will do't alive.

**Merseyside, Knowsley Hall.** Blackamoor by John Nost II (?), 1720. Dial by Thomas Wynn (?), 1720. Private gardens.

**South Yorkshire, Wentworth Castle.** Blackamoor by John Nost II, c.1720. Dial by Jonathan Sisson, fl. 1722 (SRN 7348). Figure, recently restored, and dial in excellent condition, the best in this inventory. Awaiting installation in the restored conservatory in late 2013. For many years in the second half of the 20<sup>th</sup> century Wentworth Castle was a teachers' training college: the students made a political statement by painting the Blackamoor white. Gardens and grounds open to public.

**Staffordshire, Okeover Hall.** Blackamoor by John Cheere, 1743, £8 18s. Dialmaker not known. Private gardens.

#### 2. Extant but not in original location

**Cornwall, Pine Lodge Gardens.** Indian Slave by John Nost I. No details of dial (SRN 5145). Gardens open to the public.

**Hampshire, private garden.** Indian Slave by John Nost I. Dial by Thomas Heath (SRN 7532). Originally at **Guy's Cliffe**,

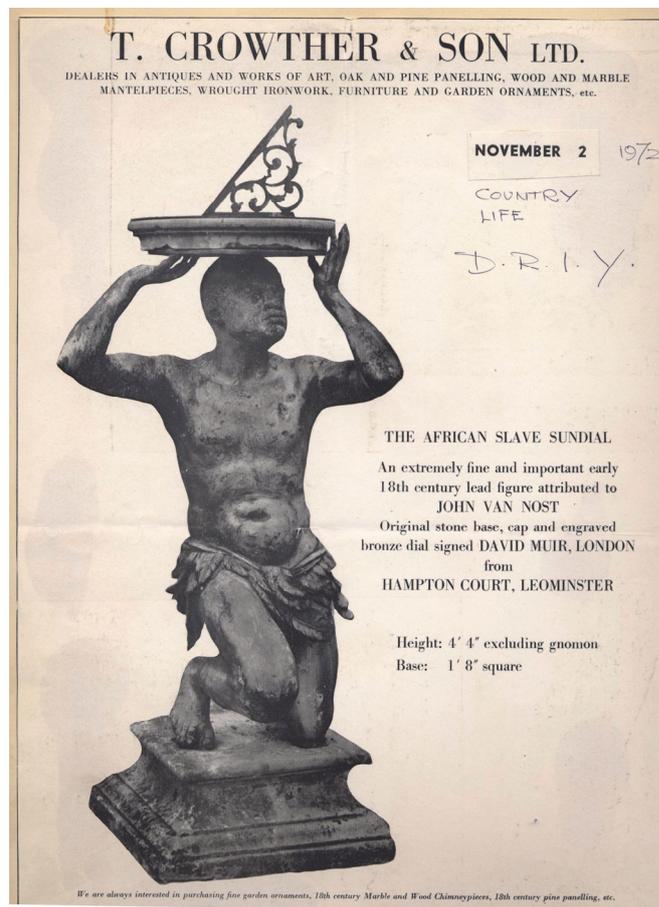


Fig. 6. An advert for the John Nost I Blackamoor sold in 1972, location now unknown.

**Warwickshire.** Has been moved twice before its present home.

**Hampshire, West Green House.** Blackamoor by John Nost I. Dial by Nathaniel Witham, London, 1716 (SRN 4368). Removed from **Slindon Park, Sussex**, c. 1977. NT, open to the public.

**North Yorkshire, Norton Conyers.** Blackamoor by John Nost II(?). Now supports a dodecahedron dial, clearly a modern replacement, the only one noted so far. Possibly originally at **Nunnington Hall, North Yorks**, c.1738. Gardens occasionally open, Historic Houses Association.

**Wiltshire.** Blackamoor by John Nost I. This figure, but not the dial, is the original from Hampton Court Palace of 1701. Dial now by Daniel Delander (SRN 3802). The Indian, the other figure of the pair, is now lost.

After the death of King William III, Queen Anne, either to reduce costs or because she had different plans for the garden, quickly removed the dials. She gave the Blackamoor to the Duke and Duchess of Marlborough who took them to Windsor. Before removal the Thomas Tompion dial was replaced by one by Daniel Delander and inscribed with the Marlborough cipher. Later, the dial was presented by King George IV to the predecessors of the Earl of Egmont who removed it to Cowdray Park. It was sold from there in 1897. Richard Crowther, proprietor of T. Crowther & Son, Fulham, purchased the dial at the Blackdown House sale in 1986 for what he believed was a world record price. In 1992 he offered the dial to English Heritage – he considered that such an important piece of garden heritage should be restored to its rightful place. But all the money had been spent on soft furnishings for the Palace and the offer was refused. The dial is now in a private Wiltshire garden.

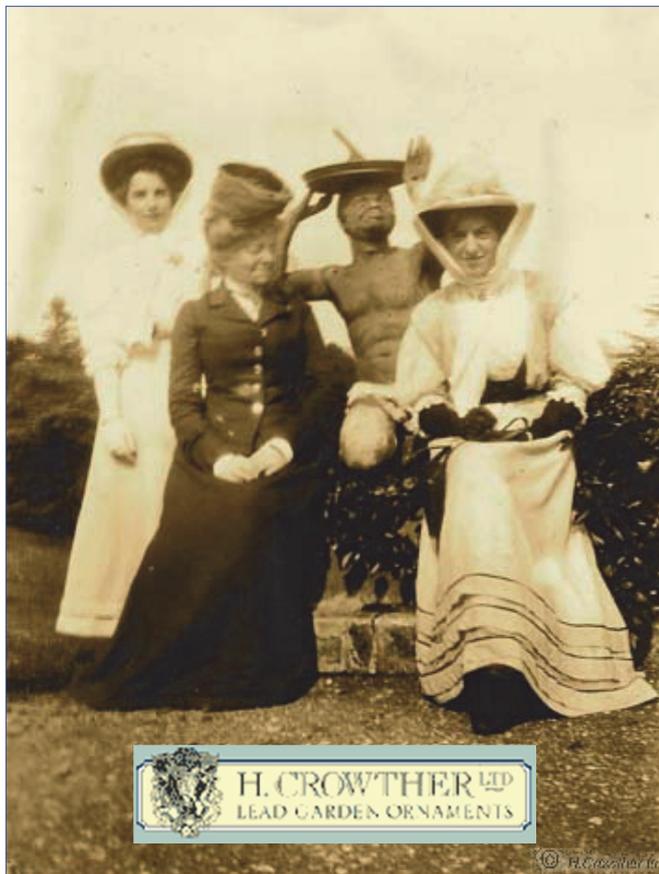


Fig. 7. Advertisement for a 20<sup>th</sup>-century Blackamoor. The text ran:

F023 Hampton Court Moor  
Life-size, faithful copy of The Moor of Africa. The sundial, thought originally to be one of a set of four, depicts the continents. Commissioned for Hampton Court Palace by John van Nost.

**Dimensions:**

107cm (42in) high x 76cm (30in) wide

**Footprint:**

47cm (18in) front x 47cm (18in) side

**Price:** £5850 inc. VAT, ex. works

**Yale University, Johnathan Edwards College, USA.** Now in Yale University Art Gallery. Blackamoor, John Nost I. No details of the dial. This dial previously at **Campsey Ash, Suffolk**, and **Glemham Hall, Suffolk**. At Glemham Hall it may have had a companion Indian dial, removed c.1882. The dial has a history closely connected with Elihu Yale, founder of Yale University. Well documented by John Davis<sup>6</sup> and Fred Sawyer<sup>7</sup>.

**3. Figures and Dials Now Lost**

**Bedfordshire, Wrest Park.** Blackamoor by Andries Carpentiere, 1730, £28. No details of the dial.

**Berkshire, Purley Hall.** Blackamoor by Andries Carpentiere (?), c.1720. No details of the dial.

**Cumbria, Wood Hall.** Indian with dial. John Nost I; no details of the dial. Was in the 1920 Thomas Mawson garden, on the site of an older building.

**Gloucestershire, Painswick House.** Blackamoor by John Nost I with dial. Appears in a painting of the house by Thomas Robins, 1748.

**Gloucestershire, Sandywell Park.** Blackamoor and dial. No details of dial, missing before 1909.

**Herefordshire, Hampton Court.** Blackamoor by John Nost I (?) with dial by David Muir, London. Looks a fine dial, but no details of David Muir known. Passed through salerooms in 1972, present location unknown. See also below, T. Crowther & Son, London.

**Hertfordshire, Aldenham.** Now Haberdasher's Ashe's School. Blackamoor by Andries Carpentiere. Missing after 1927.

**Middlesex, Bush Hill Old Park.** Blackamoor by John Cheere. c.1730. Dial by Thomas Wright, "Instrument maker to His Majesty King George". Now in USA. See below **Dimitri Fine Arts and Antiques, Los Angeles**.

**Middlesex, Cannons.** Blackamoor by Andries Carpentiere (?). c. 1722. No details of dial. Mansion destroyed and contents sold 1747.

**Oxfordshire, Friar Park.** Fantastic gardens, the creation from 1882 of Sir Frank Crisp, included a Sundial Garden containing 39 dials, one of which appears to be a Blackamoor. Documented by John Foad.<sup>8</sup>

**Suffolk, Campsey Ash.** See Yale University.

**Suffolk, Glemham Hall.** See Yale University.

**Surrey, Fetcham Park.** Blackamoor by John Nost I, c. 1701.

**Surrey, Ockham Hall.** Blackamoor and dial. Hall no longer exists.

**Sussex, Cowdray Park.** Blackamoor by John Nost I. This could have been the original Hampton Court figure, missing before 1909.

**4. Some Figures and Dials Passed Through the Antique Trade Salerooms**

**Summers Place Auctions Ltd. West Sussex, 2011.** Indian with dial. John Nost I. Dial appears to have once been a good 18<sup>th</sup>-century one, now very corroded. Sold for £16000, far in excess of estimate.

**T. Crowther & Son Ltd. London, 1972.** Blackamoor with dial, John Nost I. Dial by David Muir, London, of whom at the present nothing is known. (Fig. 6) Very fine ornate gnomon which should be easily recognisable if this figure appears again, as it is identical to the one on the Dunham Massey dial. Crowthers note that the piece came from Hampton Court, Herefordshire.

**T. Crowther & Son Ltd. London, 1968.** Blackamoor with dial; Andries Carpentiere. Marble dial.

**Christies, London, 1992.** Part of the sale of the T. Crowther and Son Ltd collection of architectural furnishings. Blackamoor with dial, John Nost II (?). No details of dial.

**Strutt and Parker, Blackdown House Sale, 1986.** Blackamoor, the original Hampton Court Palace figure by John Nost I. Bought by T. Crowther for a world record price.

**Dimitri Fine Art and Antiques, Los Angeles, 2011.** Blackamoor with dial, John Cheere. c.1730. Dial by Thomas Wright, "Instrument Maker to His Majesty King George". Original location Bush Hill Old Park, Enfield, London. Believed bought from T. Crowther & Son, London, c.1960. Sold for \$120,000.

**20<sup>th</sup>-century Blackamoors**

**H. Crowther Ltd.** (No connection with T. Crowther & Son,

mentioned above.) Lead replica of the Nost I figure, full size. Post-1973. £5850, inc VAT, ex works (Fig. 7).

**Sotheby's Sale, Garden decoration, Sussex, 2005.** Similar to above, supporting an armillary sphere! Surely a few must have been made.

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## Some books found useful

Laurence Weaver: *English Leadwork: Its Art and History*, Batsford (1909).

H. Inigo Triggs: *Formal Gardens in England and Scotland*, Batsford (1902).

Gertrude Jekyll: *Garden Ornament, Country Life* (1918).

John Davis: *Antique Garden Ornaments*, Antique Collectors Club (1991).

## ACKNOWLEDGEMENTS

To all the many members of the Society, and a few non-members, who sent me their recordings and photographs – thank you. I have no knowledge of 18<sup>th</sup>-century European political, military, architectural and garden history so, like the 18<sup>th</sup>-century slave traders, I have plundered what I needed from Dr Patrick Eyres' excellent account (ref 3).

Charles Foster of Arley Hall; Richard Crowther of T. Crowther & Son; Dimitri Fine Art and Antiques, Los Angeles; The National Trust curator of Dunham Massey. John Davis, for the help and encouragement to finally bring this twenty year epic to a close.

**Roger Bowling** is a microbiologist who had a 25-year career in Big Pharma and the Civil Service. He retired to work in his wife's plant nursery for another 20 years. He is impressed with the huge intellect within the Society, but not being a mathematician, astronomer or dial maker, tries to make a contribution in other fields. He can be contacted at [rogerbowling@hotmail.co.uk](mailto:rogerbowling@hotmail.co.uk).



# THE REWORKING OF MASS DIALS

## TONY WOOD

Way back in 2000, I received a letter from an historical archaeologist at Cambridge<sup>1</sup> referring to a paragraph in a recently published book<sup>2</sup> which claimed that the author had "taken pleasure in reworking these old [mass] dials" ('for the benefit of the public' implied). The writer expressed considerable concern and wished to establish the Society's view of such activities. I replied that we were opposed to such procedures, in spite of the fact that mass dials were gradually eroding and today many have practically disappeared. In fact some dials have been covered in glass or Perspex or a drip ledge has been inserted above the dial in an attempt at preservation.

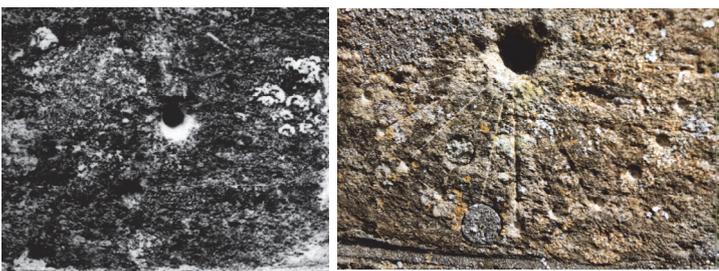


Fig. 1. Crewkerne dial original (left) and new (right).

I wrote to the author, who held a Craft Fellowship of the Society for the Preservation of Ancient Buildings, and he replied explaining:

- (a) that the reworking was a 'one-off' at the request of the vicar of Crewkerne in Somerset, a personal friend,
- (b) the sentence in the book was not written by him but added editorially, and
- (c) that it would certainly be the only scratch dial so treated by him.

Bob Adams, an experienced mass dial recorder, had also noted the paragraph in the book and was sufficiently concerned to write a short note outlining possible actions by the Society.<sup>3</sup>

Recently two further reworkings have come to light and it must be said that, by comparison, Crewkerne is at least a good attempt to restore the dial to an original form (Figs 1b). This is not so with the more recent carvings, at Lamas, Norfolk which has two reworked dials (Figs. 2b and 3) and Martyr Worthy in Hampshire (Fig. 4). The lines are quite deeply cut with a modern chisel/gouge of V-section and look distinctly 20<sup>th</sup> century.

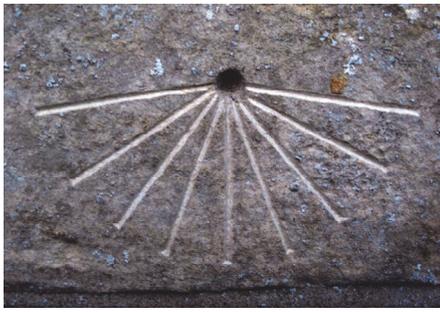


Fig. 2. (left) Lamas dial 1, reworked; (below left) Lamas dial 2 (original) and



Fig. 3. (below right) reworked.



Fig. 4 (left). The reworked dial at Matryr Worthy.



Another dial, at Botolphs in West Sussex, has also possibly been re-cut. Figs 5a and 5b show the dial in 1993 and then in 2012; the restoration appears to be much less violent than at Lamas and Martyr Worthy.

Whilst entering a dial into the Mass Dial Register for Black Bourton, Oxfordshire, it was noticed that a more recent photograph from 2010 (Fig. 6b) appeared to show the dial far more clearly carved, with good straight lines, than an earlier photograph from 1999 (Fig. 6a). Going back beyond 1999 we have in the files Ted Hesketh's photo from the 1980s (and a similar Noel T'a Bois' picture from 1989) showing the dial with lines less worn than in 1999. The changes in appearance are apparently rapid in mass dial terms: further research is envisaged but it seems evident that some 'tidying up' has taken place.



Fig. 6. The dial at Black Bourton (a, left) in 1999 and (b, right) in 2010.

By chance, we have photographs of Crewkerne and Lamas no. 1 prior to the re-cutting. The Crewkerne picture (Fig. 1a) dates from c.1910 and is by Dom Ethelbert Horne. The Lamas photograph (Fig. 2a) dates from 2010 and, like Crewkerne the dial, is in the last stages of being easily visible.

For Lamas, I was sufficiently concerned to telephone further and enquired if a faculty had been obtained: the churchwarden sidestepped the question but the story emerged that the dial, which is near Sandringham, had been shown to Her Majesty the Queen Mother, who had shown a lively interest and asked all the right questions.

At Martyr Worthy there are traces visible of the original dial still and the new carving is very similar to Lamas. We have no record of the dial prior to re-carving.

### Summary

We re-iterate that the policy of the Society is not to attempt any restoration. However, if sufficient interest is shown in an endangered dial which is disappearing, then a copy dial, ideally at the same height, could be carved nearby with a plaque explaining what has been done. Certainly the examples here reveal that at least some congregations are sufficiently concerned to attempt extending the life of their mass dials.

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Fig. 5. The dial at Botolphs (a, left) original; (b, right) reworked.

# NEWBURY ONE-DAY MEETING

## 21 September 2013

### MIKE ISAACS

This year's meeting at Newbury was serendipitously arranged to be on the autumn equinox, but unfortunately the weather conspired against us, being cloudy all day, so no outside activities and demonstrations were possible.

Nevertheless, the indoor meeting was very successful. David Pawley and Geoff Parsons had attracted ten speakers for a full day's programme of talks, and a good quantity of varied exhibits were brought by visitors from far and wide, with attendees coming from all directions in England. (There were no overseas visitors, for a change.) The meeting proper started with a short intro by the chairman, Geoff Parsons, who then introduced the first speaker, Mike Shaw.



Mike gave a tour-de-force talk about the Sundials of Eaton Hall, a stately home close to where Mike lives. (The hall is owned by the Duke of Westminster, who is so wealthy that he could apparently pay for the first 12 miles of proposed HS2 railway by himself.) A pillar dial is located in the grounds, but on examination the alignment of the dial does not seem to be correct.

Mike had since done a great amount of research into the origin and design of the dial, including finding the original plans of the estate and for the dial. The dial was supposed to be placed in a particular garden, but the delineation of the dial does not fit in with this orientation. Further investigation showed that the location of the dial had changed at least twice before it arrived in its current position. Mike's researches have led him to find the makers of the dial, who were prominent stonemasons who were involved in the construction of the Albert

Memorial, and other major buildings.

The actual delineation of the dial shows how it should have been set up, and Mike and his wife are now awaiting an invitation from the current Duchess of Westminster, who has a great interest in the Eaton Hall estate, to discuss how the pillar dial should be properly restored to its correct orientation.

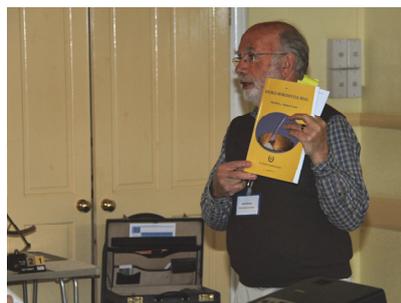
The next speaker was David Young, who gave a talk on the history of the Horniman Museum's Sundial trail. There are ten dials at the museum, including a ceiling dial and a stained glass dial. The



remainder are spread throughout the extensive gardens of the museum. Many of the dials were designed and made by BSS members for the garden, with several produced by David and John Moir.

John Davis spoke about the Zutphen Quadrant, which was retrieved from an excavation in the medieval ditch of the Dutch town of Zutphen. The quadrant was found in a layer of strata which can be precisely dated to between 1300 and 1325, and will be described in the *BSS Bulletin* in due course.

After a break, David Brown gave a fascinating account of the construction of



his M-29 slate double horizontal dial. He started by sawing a slab of slate to a octagonal shape and, after smoothing the surface, it was coated with a layer of gouache, a thick opaque paint, which will take pencil layout markings.

David found information about these dials in John Davis and Michael Lowne's BSS monograph on DH dials, and also in the book, *The Astrolabe* by James E. Morrison, which contains drawings of a DH dial for 51° designed by Oughtred in the 1600s.

An engineers' trammel from Axminster Tools was used to inscribe the various circles, and the calendar scales were drawn full size on graph paper, fixed to the slate and the day markings transferred using a dentists drill through the paper. Inscribing the various arcs on the dial was an interesting challenge, as the radii of the outer arcs were up to 3+ metres long! David emphasised the problems of inscribing clean lines, especially if the scribe needs to draw the lines several times to reach a satisfactory depth. Fortunately, when the lines are filled with paint afterwards, only the correct line can be filled.

The dial took about 2-3 months for the calculations, and the total job took about a year. The dial was later exhibited at a local exhibition, and a visitor enquired if it was for sale. The attendant at the show looked in a file, and said that it would be £120. Fortunately the visitor realised that the price quoted was incorrect, and did not pursue the enquiry, much to David's later relief!

Michael Lee followed, with an account of his construction of one of AP





Tony Wood's talk was entitled Mass Dials, but was actually about dials he had come across in a trip to the Forest of Dean. None could be described as mass dials, but some turned out to be 'garden centre' dials. One had a kneeling figure supporting the dial on its head, and another showed an equatorial dial mounted on a split concrete pillar, which had a strong chain securing the dial to a buried anchorage. Don't try to steal this one!

Martin Jenkins gave a talk covering a number of topics. The first outlined a visit to India. As a keen motorcyclist, Martin and his wife Janet travelled under their own steam to visit the magnificent Jai Singh monumental dials at Delhi and Jaipur.



He next showed two new Devon war memorials incorporating dials, at Pyworthy and Drewstaignton, and a splendid new Diamond Jubilee dial by BSS member Ben Jones, which has a gnomon split into six sections to represent the six decades of the Queen's reign.

Finally, Martin described a heliochronometer designed by William Arthur Cooke, an Australian, which incorporated a mechanical clock-face linked to a heliochronometer's rotating alidade. Martin liked the clock-face linkage, and had made a variation of this design, using a ring-dial with integral analemma linked to the clock, as a retirement gift for a colleague in 1996. This variant had been described by Allan Mills in BSS 95.3. Since making the retirement gift, Martin had promised to make one for his wife, Janet, and he showed a slide of the 103 components, which had taken 300 hours to produce. The completed clock was on display for all to admire.



*Above: a good attentive audience.*

*Plenty of chat at lunchtime!*

Herbert's Sun Clocks. Mike had this on display, in addition to his moon clock which he had previously constructed. Mike is essentially a model engineer who makes dials as a hobby. He enjoys turning mathematical ideas into 3D models. He found that AP Herbert's book to be hard going, but finally produced the Sun Clock, No 2. The plinth of the clock was made from American black wood, with blocks of the wood glued together. The clock parts (130 in all) were made from stainless steel and brass. The components, many of which were highly skeletonised, were made by photo-etching using phosphoric acid. Protecting the brass parts from tarnishing was achieved by patination, which could be used to make a range of brown colours.

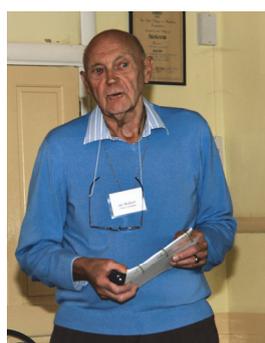
The Sun Clock is an equatorial dial for universal locations. It has two concentric plates flush with each other, and also a split gnomon, which can be rotated to give a sharp line of light for every azimuth of the sun.

Mike thanked David Brown for helping him in deciphering AP Herbert's convoluted explanations, and announced that his next project would be making the Antikythera device!

Lunch was taken next, which gave everyone a chance to see the many exhibits, including David Brown's DH dial with some of the marking out instruments, and Mike Lee's Moon and Sun Clocks.

Ian Butson kicked off the afternoon session with an account of the restoration of a Cambridge dial. The dial was on a pillar and was a memorial to Rudolf Cecil Hopkinson, who was killed in the First World War. He came from a distinguished family of engineers. A wing of the Cambridge University Engineering Laboratory was dedicated to his father and an elder brother, and the family had links with the Bragg family of scientists, and the Siemens family of electrical engineers.

The dial had been copied from one at a Scottish mansion, Niddrie Marischal, and was placed on a pillar set up over the grave. A new gnomon was made for the dial, and will be installed soon.



David Brown returned to give a account of some of his recent commissions, including an update on the Olympic Park dial, and a dodecahedral dial for the retirement of a colleague. He also was asked to make a dial for a museum from a block of slate, which looked like a bagatelle board, but was actually from a gravestone. The required location and orientation were not straightforward, needing a dial which was both reclining and declining, but the clients seemed satisfied. Another attractive dial was for a wall facing 96.5° E, incorporating an analemma and calibrated for BST.

David's next commission was for a vertical dial for a science block at Sherborne girls school. The dial declined NE and one unusual requirement was that the hour markers should be the symbols of the appropriately numbered element from the periodic table, *i.e.* element no 1 is Hydrogen (H) at 1 pm, element No 2 Helium (He) at 2pm, 3 pm – Li (Lithium), right up to element No 12 Magnesium (Mg) at noon.

The next project shown was the restoration of a multi-gnomon slate dial, and the final dial was a slate pillar with dials facing east and west, the morning face inscribed "Bon Jour".



Alastair Hunter spoke about the factors to be considered when exhibiting dials at showgrounds, *e.g.* Chelsea and others. Alastair's dials were constructed from stainless steel and brass, and he described the various finishes that could be used on the brass portions to provide a pleasing anti-corrosion finish to these.

Finally, Geoff Parsons gave an account of his visit to the NASS 2013 Conference in Boston. Geoff usually arrives at the conferences a day or two early, so that he can see the towns or cities as well as the conference centre, and told us about



his travels on the Boston Heritage Trail. The conference itself was in Cambridge, in Harvard University, and included visits to the scientific instruments museum, with special displays of sundials and instruments. A visit to the observatory enabled participants to see the work on cataloguing the tons of glass plates from more than a century's observations of the stars, which gave a unique opportunity for astronomers to plot the changing positions of far-distant celestial objects.

After the formal talks concluded, Chris Lusby-Taylor announced that next year's Annual Conference, will be held at Greenwich, on 24 -27 April, 2014. The extra day is to celebrate the 25th anniversary of the Society.

The meeting concluded with participants looking at the display, before dispersing until next year.

mike@mdji.co.uk



## More Dials From Edwin Russell's Workshop

Following on from the Appreciation of Russell's sundials on page 32, here are two more examples.

The 'botanical' armillary sphere is at Kew Gardens and was made in 1987 (SRN1991). The engraving is by Joanna Migdal and it features the Zodiac signs in silhouette, as well as painted flowers.

The dial with a cricketer gnomon (underslung!) is on the Green at Holyport and was delineated by Joanna Migdal (SRN5757).



Douglas Bateman



# DESIGNING AND CREATING PIERCED GNOMONS

## Some initial ideas

TONY MOSS

Fretted ornamental gnomons were one of the things which I offered to clients as an *extra* item from an early stage in my dialling career. Development of a visually interesting design which was easily modified for different latitudes was the product of much head scratching and cut-and-try experiments. The feature that pleased me most in the resulting design was that the gnomon could be adjusted to most northern latitudes by ‘radially telescoping’ the part-circular main scroll about the style origin without altering any other decorative feature. First attempts always seemed to be visually incomplete and lacking a feature until I hit upon the idea of placing a ‘spur’ on the heel of the front ‘foot’. As I have never seen anything even similar I have come to regard this gnomon design as my unofficial trade mark although one of my several ‘pupils-by-email’ insists on using it himself. Several gnomons in this style have been made for wedding and birthday gifts over the years. One of the earliest was a unique item for an Irish antique dealer with a fine plate by Yeates of Dublin, sans gnomon (Fig. 1). The ‘fish-tail’ cross-section at the style edge made for a very rigid attachment to the plate while requiring much metal removal from the ‘cheeks’. With the hindsight of my increasing dialling experience, I now see that this was an anachronistic misfit but the client was delighted with it. Truth be told, I cut my dialling teeth by handling that plate and observing the work of its designer and engraver.

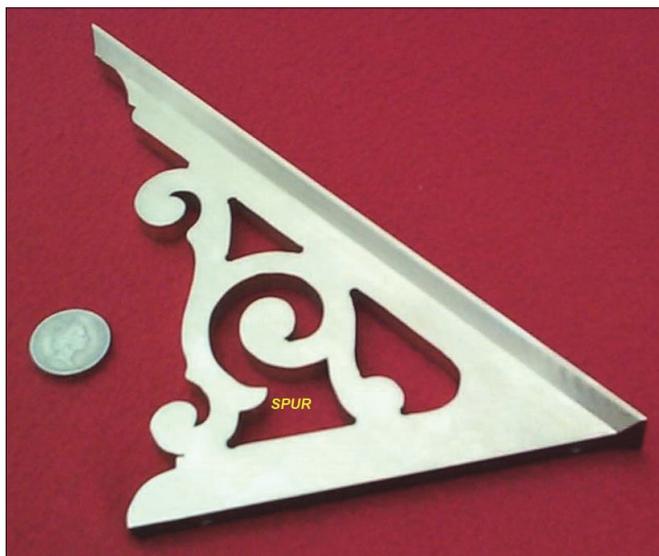


Fig. 1. The replacement gnomon for a horizontal dial by Yeates of Dublin.

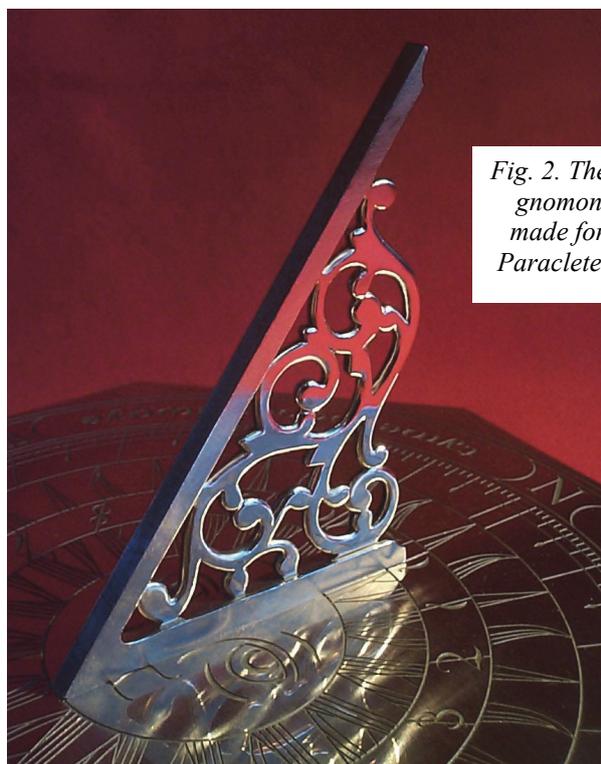


Fig. 2. The complex gnomon on a dial made for the Holy Paraclete Convent.

A move towards more complex fretting came with a reproduction commissioned for The Holy Paraclete Convent (Fig. 2) at Sneaton Castle near Whitby, North Yorkshire.<sup>1</sup> The nuns must have assumed that the sundial to which it was attached was very old and precious as it came to me packed like a Faberge Easter Egg. The 3/16" Whitworth nuts and threaded studs attaching the gnomon to the plate suggested otherwise however. The original gnomon was a complex batch-produced casting but I decided that fretting the scrollwork by hand was probably the most economical in time and effort for a one-off item.

The success of the Holy Paraclete reproduction spawned the idea for a full ‘trade sample’ for Lindisfarne Sundials with my own initials combined with LS as ‘TMLS’ polished and gold plated – Fig. 3.

In 2001 it was suggested that NASS members should all send a paper sundial of their own design to Fred Sawyer for his birthday. This led me to propose a celebratory dial in bronze perhaps with ‘FWS’ fretted out of the gold-plated gnomon web if NASS would bear the material costs – which they were very happy to do. The initials ‘FWS’, set in the ornate font *Harrington*, were overlapped in various trial layouts and the result converted to *Outlines* in Adobe

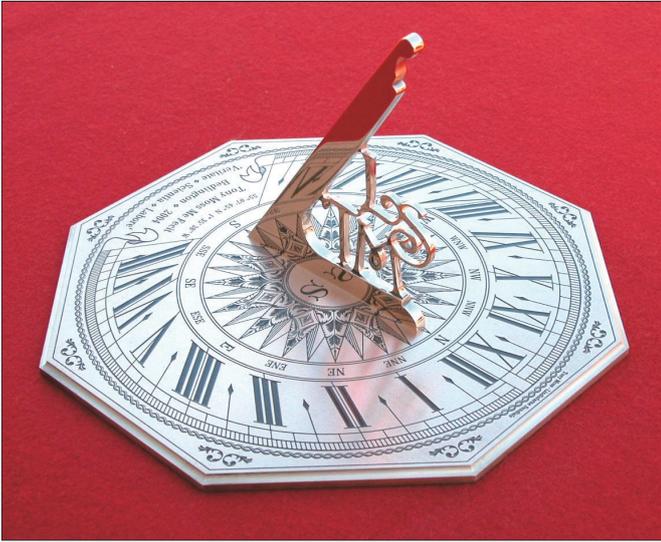


Fig. 3. A personal dial with a 'TMLS' gnomon.

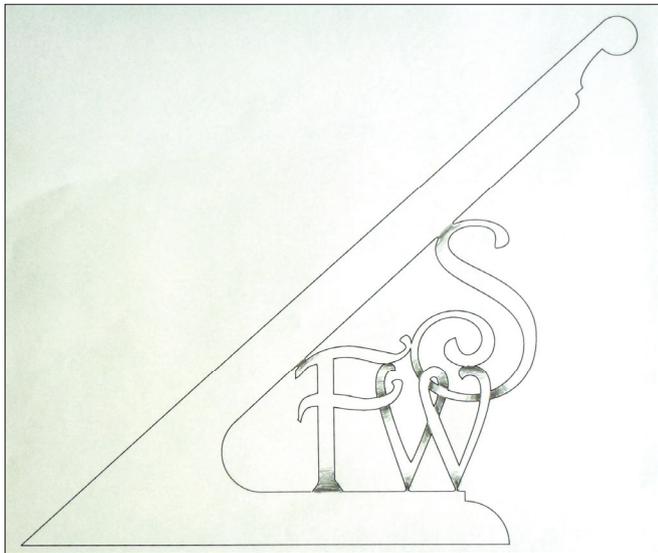


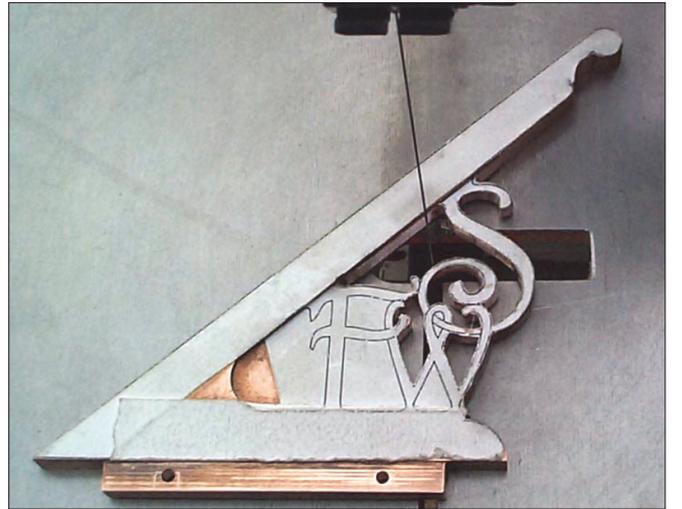
Fig. 4. The pencil-shaded drawing of an interlaced FWS gnomon.

Illustrator. Oversized printouts were pencil-shaded by hand to investigate the most pleasing *interlaced ribbon* effect see Fig. 4. The elaborate piercing of the letters in metal was initially arrived at by careful hand work with my Hegner clockmakers' fretsaw (Fig. 5) the cast iron table of which is impervious to the ragged underside edges of sawn bronze. My original trick of placing a piece of oil-soaked thin plywood under the workpiece allowed the fine saw blade to pick up a film of cutting oil with each upward stroke thus prolonging its working life – Fig. 6). The effects of the interlacing are shown in Figs 7 and 8 with the finished dial seen in Figs 7 and 8 with the finished dial seen in Fig. 9.

A Thiel filing machine (Fig. 10) and flexible shaft machine (Fig. 11) which is similar to a dentist's drill, did much of the contouring with its specialist bits and burrs (Fig. 12) assisted by various shaped needle-files for fine detailing (Fig. 13).

*Figs 5 & 6. The Hegner fretsaw (or scrollsaw) used for the initial piercing of gnomons and the saw in action on the 'FWS' gnomon.*

*Figs. 7 & 8. The FWS gnomon before and after interlacing.*





Figs 10 – 13. The Thiel filing machine; a flexible-shaft machine and handpiece, a collection of needle files, and a stand with various burs and specialist bits.



Fig. 9. The completed dial with 'FWS' gnomon.

### Workshop Tips and Trade Secrets

Over the years, I have lost count of the many variations on the fretted gnomon theme for wedding gifts *etc.* until perhaps my final example which, as I write this, is to be a birthday gift for an old schoolmate, lifelong friend and colleague at the request of his wife (Fig. 14). So 'DJL', combining their initials, forms the fretted supporting web. The short-notice completion date prohibited a full interlaced design seen in the right of Fig. 15. For anyone considering taking up a similar challenge, there follows a sequence of in-production images of this late opus.

My flexible-shaft machine purchased from H.S. Walsh jewellery supplies<sup>2</sup> has a variable foot pedal control with speeds up to 23,000 rpm. Your dentist/dental technician uses compatible burs some of



Fig. 14. The etched dial plate with the slab of bronze destined to become the 'DJL' gnomon.

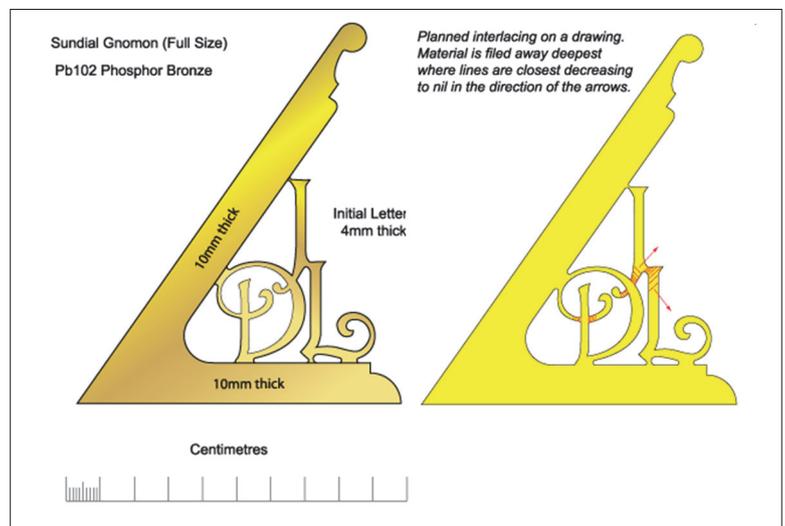
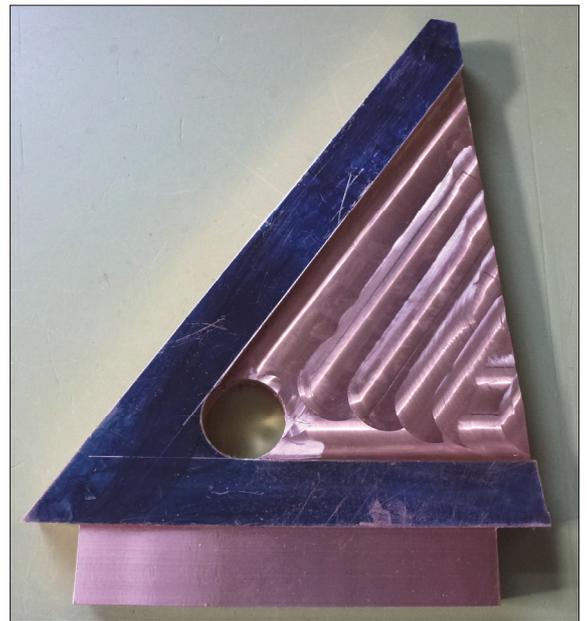
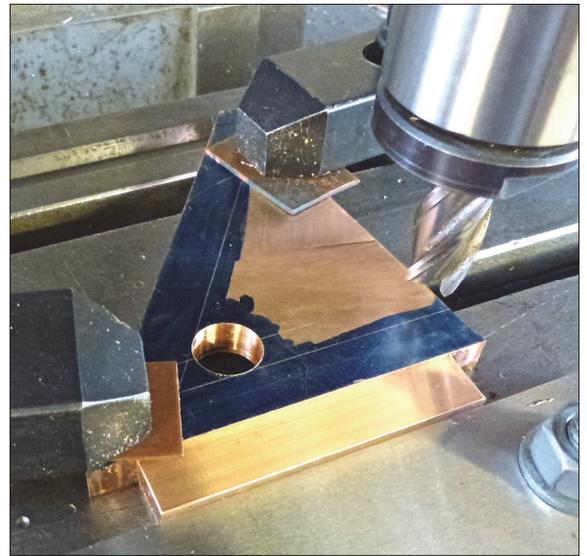


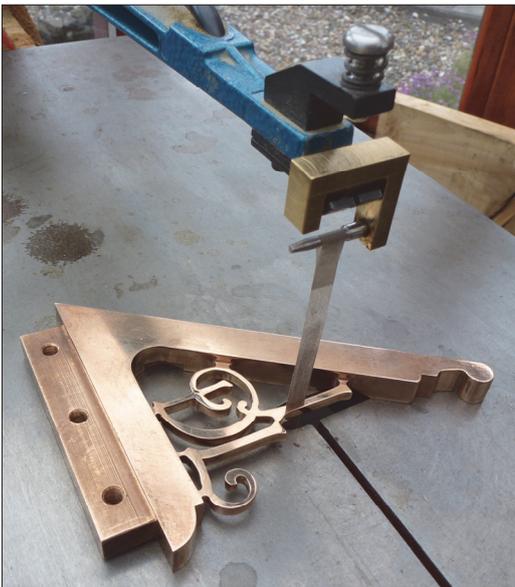
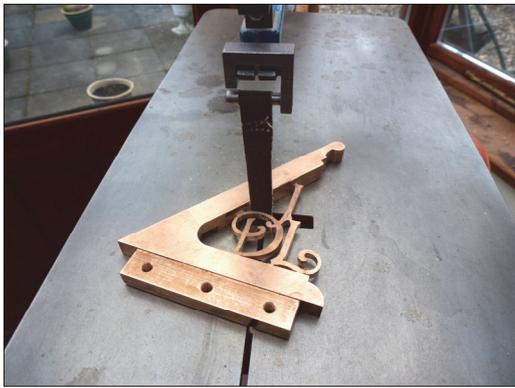
Fig. 15. Two views of the design for the 'DJL' gnomon, the one on the right showing where the brass could have been thinned to produce an 'interlaced' form.



*Figs 16 – 19. Tools for finishing: a burr with reduced-diameter shaft; a split-mandrel in a flexible-shaft hand-piece; various abrasive rubber discs and rods; FlexiFile, and Hegner mounts.*

*Figs 20 – 22. Ready to mill the web; web rough milled; paper pattern in place and holes drilled for fretsaw blade access.*





which are perfect for sculpting brass and bronze when their initial life has expired. These tools for flexible-shaft work in dentistry and jewellery have shank diameters of 3/32" whereas the hand-held Dremel tool shanks are larger (1/8") but can be turned down in a lathe to fit – Fig. 16. One of the simplest and most effective tools for me is the ‘split-mandrel (Fig. 17) which grips and rolls a small strip of any abrasive tape into a tube for the finest contouring and finishing in the tightest spaces. The piercing process is shown in Figs 20 to 26. Dental technicians and jewellers use a variety of rotary tools which include rubber rods and discs impregnated with fine silicon carbide. Held in a spinning electric drill chuck, the rods can be shaped into a cone *etc.* against a grinding wheel to finish detail work (Fig. 18). Flat surfaces are best finished with graduated abrasive wet-and-dry papers held on a rubber or cork backing block. Unless there are already deep scratches in the metal, I usually begin with 240 grit followed by 400/600/1000 and 1200 grits with each successive grade at right angles to the previous one. Each stage is judged complete when no trace of the previous coarser stage remains. Long straight strokes covering the full length of the plate get best results but *never* a back-&-forth *scrubbing* motion. More recently, I have followed the 600 grit stage with ‘Garryflex blocks’ (Fig. 26) which are widely available online. Used wet from coarse to fine grades, these grit-impregnated rubber blocks produce a most satisfactory ‘instrument’ finish (Fig. 19).

No doubt the current developments in 3D printing will eventually reduce all of the above to a few keystrokes modifying gnomonic clip art for a library culled from the work of previous generations, just as I initially developed my dialling craft from that fortuitous handling of a Yeates dial.

“The lyf so short, the craft so long to lerne.”

*Geoffrey Chaucer*

Figs 23 – 26. Rough finishing in the Hegner; fine finishing; final polishing with GaryFlex blocks.

Top right: The finished dial.

## REFERENCES and NOTES

1. [www.geolocation.ws/v/W/File%3ASt%20Hilda%27s%20Priory%20-%20geograph.org.uk%20-%2020236273.jpg/-en](http://www.geolocation.ws/v/W/File%3ASt%20Hilda%27s%20Priory%20-%20geograph.org.uk%20-%2020236273.jpg/-en)
2. [www.hswalsh.com/about-walsh](http://www.hswalsh.com/about-walsh)

For a CV and portrait of **Tony Moss**, see *Bulletin* 24(iv), December 2012. He can be contacted at [lindisum189@gmail.com](mailto:lindisum189@gmail.com).

# THE SINGLETON ‘DRUID’ HELICAL DIALS

BARRIE SINGLETON

## Introduction

Some of the developments of the Singleton helical sundial were covered by Tony Wood in his article in the March 2013 *Bulletin*. I can now add some personal insights and updates.

The ‘inaugural’ BSS meeting at Oxford was sufficiently close to Newbury for the Mk. 1 (all PVC) embodiment of the dial to be shown by my brother John and myself. I re-configured and built a 6ft high Druid for the first BSS Sundial Design Competition in 1995. (We sank without trace.) Thereafter John and I appeared like the Marley-Twin Ghosts at David Pawley’s annual Newbury ‘do’ – always with a new quirk of dialling, until John ran out of steam.

## The Druid - Innovation

John derived the Druid spiral dial from a personal study of existing dials, paying particular attention to their faults. Polymath that he surely was, John first decided on the name ‘Druid’, then followed by ‘reverse engineering’ the latent acronym to yield: ‘Daytime Readout Universal Imaging Device’. He



Fig. 1 (above). General view of the Highclere Castle dial, as a monument to John Singleton.

Fig. 2. The Highclere Druid in full sun – the time is ten to four.



showed me a very crude mock-up and I was immediately hooked on the project, thereafter functioning as design engineer (lay). As the invention developed, a sequence of ‘inventive steps’ emerged.

1. spiral dial,
2. gnomon-to-spiral mounting, *via* spokes,
3. shadow of precise time-width, to be read *either edge*, as required,
4. ‘three bar’ numbers configured to the ‘smart’ shadow’ – no separate scale is required.
5. spiral structure formed by a sequence of precision-machined billets. Each billet is drilled normally to the mating faces with two sliding-fit holes for stainless steel pins. Engineering glue completes the assembly. The precision is such that no jiggling is required. (The scale can also be a flexible strip, self-forming consequent to mounted on spokes, or incrementally bent rigid strip.)

Patents, now expired, were granted in UK, USA and Canada.

## The Highclere Castle Dial

Highclere Castle is just south of Newbury (51.3° N, 1.36° W): it is TV’s ‘Downton Abbey’. I touted the (fully funded) offer round to a wide range of sites. The Eden Project failed to see what I saw. Greenwich said: “We have one thanks.” Nottingham University were solicitous but a long way away. With little confidence of success, I offered it to Lord and Lady Carnarvon and they instantly invited me to walk their acres and *choose a site!* (In deference to Christian heritage, the name Druid was readily dropped.) A crude wooden full-sized mock-up was put in place and the (unexpectedly complex) endeavour of sourcing begun. We are eternally in debt to The Earl and Countess of Carnarvon. The dial (Figs 1 & 2) was installed in late August 2013. It has a base, with a nominal 2 × 2 foot footprint, of grey granite. The upper structure is all stainless steel. The spiral is plasma coated with aluminium-doped titanium nitride to achieve durable ‘faux brass’. The overall height is around 7 feet. It was manufactured by Engineering Solutions of

Newbury and the stonemason was Peter Huntley, also of Newbury.

The dial bears a legend on the offset strip of spiral-rear:

Omnia tempus habent, et suis spatiis  
transeunt universa sub caelo.

‘All things have their time and, in their season, [all things] pass under heaven.’ (Ecclesiastes Ch.3 v.1). At the time of writing, this still has to be affixed.

The base of the dial has a plaque with the simple inscription

Universal Sundial.

John Singleton – inventor. 1932 – 2009

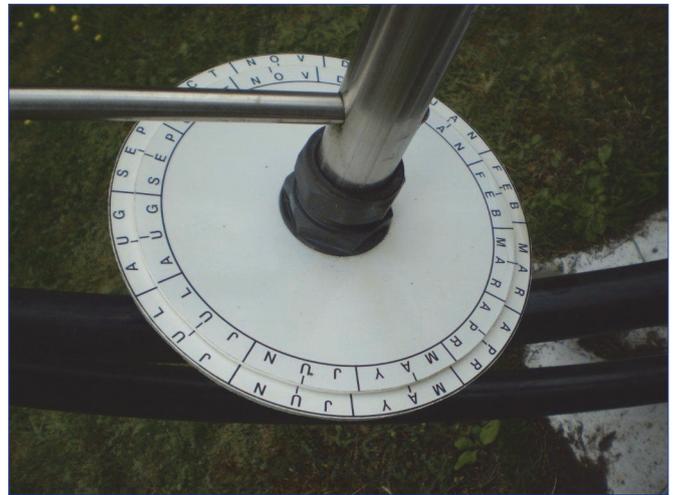
### Bayford House Care Home Dial

This earlier embodiment of the design was built for the BSS Sundial Design Competition and was located on a ‘permanent’ site at a garden centre just off the A4, Thatcham, Berks. When the owners needed the space, it was dumped in a corner. It then spent a long time in the wilderness of factory and garage storage before re-emerging to stand – as it does today – under the window of the room where John died, at Bayford House Care Home. (Rookwood, Stockcross, Newbury, Berkshire, RG20 8LB)

This dial is fully adjustable and has a dual dial system for correcting Equation of Time as seen in Fig. 3. One slackens the gnomon at the top gland-nut and rotates the spiral



*Fig. 3. Druid at Bayford House, originally built for the BSS Sundial Design Competition. It is adjustable for the equation of time.*



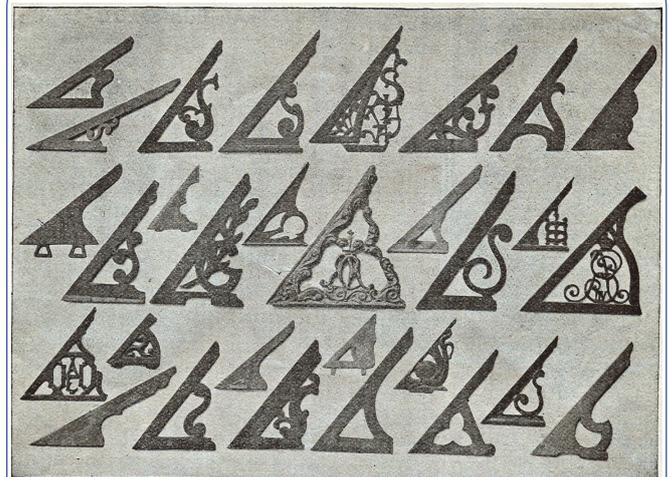
*Fig. 4. The Druid EoT adjustment mechanism. Rotation of the spiral moves one disc against the other.*

(advance or reverse) until the correct register for the month and time-of-month is showing. If the dial has been properly set up in all other fixed-variables, EoT ‘error’ is then nullified and the gnomon is re-clamped. The disc markings were drafted by John and transferred to outdoor-duty self-adhesive PVC, printed with durable ink (all signage requisites).

The dial has a mild steel frame (powder coated), painted mild steel base, stainless steel gnomon and spokes, and a PVC foam-board spiral with self adhesive numerals. It is weathering well.

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### Pierced Gnomons



This great variety of pierced gnomons is an illustration from a sundial catalogue of Francis Barker & Son Ltd of Clerkenwell, dated 1914. They say that they were from dials made over the preceding three-quarters of a century and include several made for “Royal and other eminent persons”. Does anyone recognise any of them?

Tony Moss: you have competition!

# PORTABLE SUNDIALS AT THE GALERIE DELALANDE

DOMINIQUE and ERIC DELALANDE

The Delalande exhibition will gather a variety of over 140 sundials in their premises at the Louvre des Antiquaires, Paris from December 17, 2013 to January 19, 2014. It will be accompanied by a book of around 450 pages in French/English, including full descriptions and artistic pictures. The target is to explain in depth these small instruments measuring the time and which followed man's evolution throughout history.

The selection mostly concerns pocket dials from Renaissance times till the end of the 18<sup>th</sup> century and covers the main categories existing at the time: Renaissance dials (Figs 1 & 2), string-gnomon dials (Fig. 3), horizontal dials (Fig. 4), Nuremberg dials (Fig. 5), equinoctial dials (Figs 6 & 7), analemmatic dials (Fig. 8) and particular dials (Figs 9–11).

This exhibition shows the great diversity of pocket sundials in both their form (Figs 12 & 13) and function (Figs 14 & 15) but also in the materials used. It is also a tribute to the manufacturers of their time, real-scientists and mathematicians at the same time, gifted artisans of remarkable skill in terms of astronomical and trigonometric calculations, technique, achieving real small masterpieces (compendia in particular), often very complex and with exceptional engravings or paintings. It is also a tribute to the collectors who have managed to find, keep and preserve, generation to generation sometimes, these wonderful little objects.

This exhibition, which required a detailed study of each dial and long photographic sessions, is the result of a patient and careful research of objects, for some, quite difficult to find nowadays.

We will focus here on the description of three exceptional sundials presented at the exhibition: a compendium signed Humphrey Cole and dated 1579 (Fig. 16), a French compendium dated 1608 (Fig. 17) and a universal equinoctial sundial by Richard Glynne, c.1720 (Fig. 18).

## Humphrey Cole Compendium, 1579.<sup>1</sup> Fig. 16a & b

This gilt-brass compendium for latitudes 0°–90°, dated 1579, is signed « + Humphrey + Cole + 1579 + » on the equinoctial ring and « · H + Cole + » on the disc indicating the dates of entry of the Sun in the zodiac. Its diameter is 55 mm (without the suspension ring) and its thickness is 20 mm. It can be noted that Humphrey 'Humfrae' Cole (c.1520–1591) was one of the finest makers of scientific instruments in England in the time of Queen Elizabeth I. This



Fig. 1. Diptych sundial. Ivory, brass, steel and glass. 65×50×12 mm. Signed « PI » and dated « 1565 ». Coat of arms of Louis d'Orbec, France.



Fig. 2. Astronomical diptych sundial. Rosewood, silver, steel, brass and mica. 80×65×20 mm. Signed « HILARIVS 1556 ». Original leather case.

© Galerie Delalande Paris



Fig. 3. String-gnomon horizontal sundial and lunar dial. Gilt-brass and silvered brass. 67×64×11 mm. Signed « Johan Martin in Augspurg 48 ». Augsburg, c.1680. Green leather case.

© Galerie Delalande Paris



Fig. 4. Oval horizontal sundial. Silver, steel, brass and glass. 55×41×10 mm. Signed « Cremstorff à Paris ». France c.1670. Later shagreen leather case.

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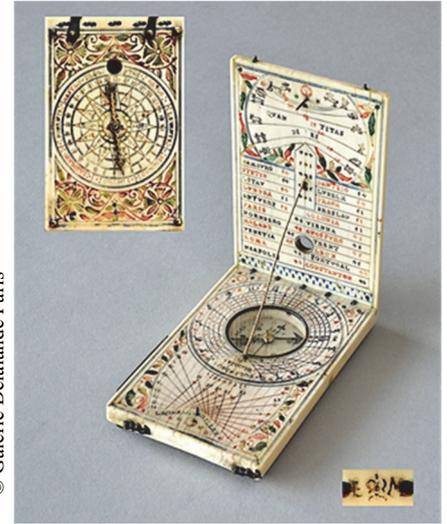


Fig. 5. Diptych sundial. Polychrome ivory, brass, steel and glass. 108×67×19 mm. Signed « Leonhart MILLER » with his mark. Nuremberg « 1638 ».

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Fig. 6. Mechanical equinoctial sundial also called 'minute dial'. Gilt-brass, silver, steel and glass. Base 99×99 mm, height 200 mm, diameter of the hour-circle 200 mm. Attributed to Johann Gottfried Zimmer, Germany, c.1750.

© Galerie Delalande Paris



Fig. 7. Crescent dial. Silver, gilt-brass and steel. 62 × 62 × 15 mm. Signed « Johan Martin in Augspurg 48 ». Original leather case. Augsburg, c.1700.

© Galerie Delalande Paris



Fig. 8. Brass analemmatic sundial consisting of two different dials: an octagonal horizontal dial and an elliptical azimuth dial, set on four shaped brass feet. 119×127×13 mm (closed). Signed « Pierre Sevin à Paris ». France, c.1670. This dial tells the time by the local direction of the Sun, once the octagonal plate has been set for the correct date along the declination scale on the elliptical plate.

compendium is made up of a number of different scientific instruments with many uses, in a very small volume. Let us describe this complex instrument.

This circular instrument has four leaves (8 faces) held together by hinges. One outer leaf is domed and carries a ring whereas the other one is flat and carries a mobile arm. Both outer leaves have a rope trim around the rim and the following inscriptions: « *TEMPORA + MVTANTVR + & + NOS + MVTAMVR + IN + ILLIS* » and « *SICVT + VMBRA + DIES + NOSTRI + SVPER + TERRAM* ». The flat external face is a solar watch (equivalent to the back of an astrolabe) with around the edge a scale for degrees (clockwise from the top : 90°-0°/0°-90°/90°-0°/0°-90). The inner surface is divided into two halves. The upper half accommodates a

diagram for the unequal hours named « *Hora planutaru* ». The lower half is engraved with a double shadow square named « *Umbra Recta* » and « *Umbra Versa* » with 12 units (numbered every three units, divisions every single unit). The unengraved alidade counterchanges in the middle and there is a small hole at one end. Inside, there is a table of thirty-two cities with their latitudes in circle. In the centre, an inscription reads « *The names of sites and townes of Europe* ». The other face is a perpetual calendar with the following inscription in the centre: « *THIS TABLE BEGINIT-*



Fig. 9. Universal inclining sundial. Silver, brass, steel and glass. 120 × 71 × 27 mm (closed). Signed « Houdin Fils à Blois ». France, c.1740.



Fig. 10. Regiomontanus-type sundial made of brass with a plummet. 98×58×10 mm. Signed « Le Febvre A Paris ». France, circa 1680. Original leather case.

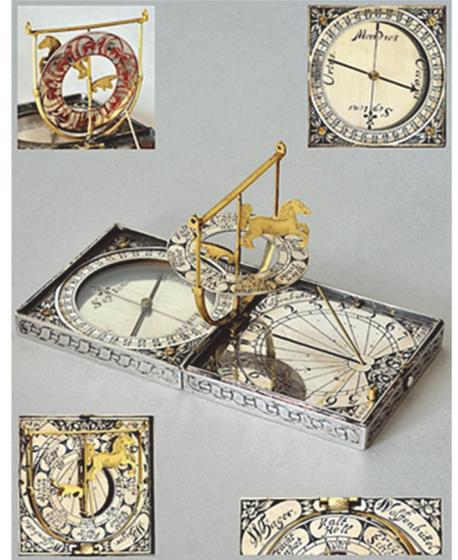


Fig. 11. Horizontal sundial with a weather vane in the form of horse. Silver, gilt-brass, steel and glass. 46×46×18 mm (closed). Signed « W Hager Wolfenbüttel » and dated « anno 1690 ». Germany.



Fig. 12. String-gnomon horizontal dial in the form of a viola. Ivory and brass. 72×22×10 mm. Attributed to Leonhart Miller, Germany, c.1620.



Fig. 13. Brass ring dial. Diameter 52 mm, width 18 mm. Signed and dated « IAM 1697 ». Germany.



Fig. 14. Astronomical compendium. Gilt-brass, steel and glass. 133×78×26 mm. Signed « F », attributed to Antoine Ferrer. Coat of arms of the Renty family. France, c.1610.

AT A 1579 AN SO FOR EVER ». The underside of the domed face carries a compass with a blued-iron needle and a glass plate over all. At the base there is an eight-point windrose in paper with all the 32 directions marked and painted in red, green and white. The third mobile plate is a nocturnal with a fixed disc, one rotatable disc and a rotatable arm. The fixed main disc has a date scale divided anticlockwise to named months, subdivided to 10 and to 2 days. The upper rotatable disc has an hour scale numbered anticlockwise 1–12 twice. The upper index arm is shaped and marked « INDEX POLARIS ». The other side of this leaf shows the position of the Sun in a zodiacal scale with the inscription in the centre: « A table for the sones intraun in ro anye the 12 signes ». In the middle is a hinged universal equinoctial

dial with dial ring mounted in a decorated semi-circular support. The dial ring is numbered on one side clockwise I–XII twice, divided to 30 minutes. The other side is numbered anticlockwise VI–XII, I–VI, divided to 30 minutes and has the maker's signature: « + Humphrey + Cole + 1579 + ». A strut is pivoted across the North-South diameter. It is crossed at the centre by a rod gnomon. This latitude quadrant is divided on both sides 0°-90°.

#### French Compendium, 1608.<sup>2</sup> Fig. 17a & b

This rectangular (111 × 97 × 23 mm) diptych sundial consists of two ivory leaves (4 faces) hinged by brass wires and a gilt-brass plate (2 faces). The compendium is composed of a string-gnomon horizontal dial with a compass, four equi-



Fig. 15. *Astronomical compendium.* Ivory, gilt-brass, steel and glass. 80×58×21 (closed). Unsigned. Flanders, c.1650.



Fig. 16 a & b. *Exceptional astronomical compendium with a compass.* Gilt-brass, steel, glass and painted paper. Diameter 55 mm, thickness 20 mm (closed). Signed twice « Humphrey Cole 1579 » and « H Cole ». England.



noctial dials, two lunar dials and an horary quadrant. It is completely engraved on all faces and some are beautifully painted.

The upper face of the lid, made of ivory, carries two equinoctial dials usable for the spring and summer months, a sundial and a lunar dial. The equatorial sundial, engraved on ivory, carries an hour-scale graduated clockwise I–XII twice and subdivided to 15 minutes with small black and white squares. Inside the hour-circle, a gilt-brass volvelle, forming a lunar equatorial dial, is engraved with a hour-scale identical to the previous one. This volvelle has a rose decoration in the centre and two windows in periphery: one is circular, showing the appearance of the various moon phases painted on vellum; and the other one, of lengthened shape with an index, reveals a scale graduated from 1 to 30 allowing exact adjustment of the Moon's age. This face is

engraved with a garland of flowers all around and in each corner it has an acanthus decoration. A double line on the edge completes the decoration.

The underside of the base-plate, made of thicker ivory, is an horary quadrant, two of the sides of which are engraved with friezes of foliage, and the two others by a square of shadows and are engraved with a hour-scale graduated 3–6–9–12–9–6–3 and subdivided to hours. In the centre, the quadrant consists of a quarter circle, the top of which is decorated with a scene of Apollo on his chariot, the right part with a goddess having the world in her hands, and the bottom is decorated with foliage. The circumference of the quadrant carries a degree scale, the inner graduated 0–90°, numbered by 10°, subdivided to 1°; and an outer zodiac scale marked by the twelve signs of zodiac. The top is engraved with an hour-scale graduated on two lines 6–12, 1–6. In the centre of the quadrant, hour-lines marked IIII–XII and I–VIII. The fastening for the plumb line as well as the plumb are missing.

The underside of the lid, made of ivory, is composed of two equatorial dials usable for the autumn and winter months, a sundial and a lunar dial. The equatorial sundial, engraved on ivory, carries an hour circle graduated clockwise IV–XII–IV (inversion in Roman numerals) and subdivided to 15 minutes with lines and dots. The rest of the hour-circle is painted with two branches. Inside, a gilt-brass volvelle, forming a lunar equatorial dial, is engraved with an hour-scale identical to the previous one. This volvelle has a rose decoration in the centre and one window in periphery for showing the appearance of the various Moon phases painted on vellum. This volvelle carries an index and rotates on a day scale graduated from 1 to 30 allowing exact setting of the Moon's age. All



Fig. 17. *Exceptional emblazoned diptych sundial with 8 dials and a compass.* Engraved and painted ivory, gilt-brass, steel and glass. 111×97×23 mm. Unsigned. France, 1608.

around the hour-circle, engraved on the ivory, is a coloured decoration (red, green, blue and yellow) of painted flowers and fruits (carnations, pansies, old roses and wild strawberries). All around, a red frieze has been painted with grey lines surrounded by two gold lines.

The upper face of the base-plate is a horizontal dial with a string-gnomon (missing) carrying only one hour-scale, for the latitude of 49°, graduated on ivory V–XII–VII, subdivided to 15 minutes by lines and dots. Outside the hour-circle, the face is entirely painted with a flower and fruit decoration similar to the one on the previous face with the corners painted in gold on a blue bottom. All around is a red frieze painted with grey lines surrounded by two gold lines. We also find a small gilt-brass mobile arm which allows the setting of the internal equatorial dial. Inside the hour-circle, we find a compass of which the base is painted in blue, red, green and yellow with coats of arms surrounded by a garland of leaves and a windrose of 32 directions with a circle graduated 0–90–0–90–0° and divided to 2°. The original magnetic declination (white line painted on the windrose) is marked at 8° East, corresponding exactly to the date of manufacturing of the dial, 1608. Note that a second magnetic declination has been painted later at 16° West, showing a use of the dial around 1740 in France. The blued needle is mounted on a brass pivot with a glass plate over all.

On the upper face of the base-plate, we also find a gilt-brass moving plate, which is a double equatorial dial. The centre has been pierced by a large circular window to allow the reading of the compass. This plate is engraved on each side with an hour-scale graduated IIII–XII–VIII and subdivided to 15 minutes. In the centre, a crossbar with a hole supports the pin-gnomon which is stored in a compartment in the front of the dial. This plate is finely engraved with foliage decorations and the underside carries also a latitude scale 0–90° to adjust the latitude of the place with the use of the mobile arm located on top of the upper face of the thicker plate.

Three of the sides of the dial are completely engraved with a decoration of dogs hunting game (deer, hare and swan) with a frieze of foliage on the top. The back side, with the hinges and the two holes for the pinnules, is entirely engraved with a foliage decoration and a geometrical frieze. On the front, we find two silver hooks and the small hole to store the gnomon of the central equatorial dial. Note that the left side of the baseplate of the dial has a special compartment for storing the two brass viewfinders (similar to pin-hole sights) used to measure the altitude of the sun when



Fig. 18. Exceptional universal equinoctial sundial. Brass, steel and glass. Square, 157×157 mm. Signed « R : GLYNNE FECIT ». England, c.1720.

they are placed on the rear of the base-plate.

### Richard Glynne Universal Equinoctial Sundial, c.1720<sup>3</sup>

Fig. 18. The square horizontal base-plate (157×157 mm), supported by four adjustable screw feet which pass through a rose decoration, is engraved with a degree scale graduated 90°–0°–90°–0°–90°, subdivided to 1°, and a calendar scale divided by months (named by their initials) and subdivided to 1 day. Inside this is a third scale marked “Watch Faster/Slower” to correct for the Equation of Time through the year and a frieze of leaves. In the centre of the base-plate there is a glazed compass box with two folding cross-hair sights on one side of the surround for use as a simple theodolite. The whole

compass rotates in the centre of the horizontal base-plate with an index to read off the three surrounding scales. The silvered compass face, with a blued-iron needle surmounted by a brass pivot, is engraved with a 16-point windrose (seven named by their initials), a magnetic declination scale graduated 30°W–0°–30°E, and a degree scale divided around the circumference in four quadrants graduated 90°–0°–90°–0°–90°. The glazed compass box is surmounted by a hinged hour-ring supporting a folding pierced triangular gnomon with a vertical pin in the centre, the whole hinged on an engraved four-scroll support in the centre of the chapter ring. The hour-ring is engraved with three scales: one hour-scale (inner) graduated clockwise IIII–XII–VIII, subdivided to 5 minutes and signed “R : GLYNNE FECIT” a direction scale (middle) for 32 initialled points of the windrose of the compass, and a degree scale (outer) graduated in four quadrants 90°–0°–90°–0°–90°. The ring is arranged to read off a folding latitude arm graduated 0–60°. The underside of the horizontal base-plate is blank.

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### REFERENCES and NOTES

1. For similar compendia, see Gerard L'E. Turner: *Elizabethan Instrument Makers, The Origins of the London trade in Precision Instrument Making 2000* – cat.26, p.160, plate 8; Greenwich Museum (inv.ASTO172, Higton, cat.295, p.301, oval shape, dated 1579); Elskamp's collection, Michel, cat.505, p.62, dated 1579); Ward, n°360, p.125, dated 1575, British Museum (inv. MLA 1888,12-1.293).
2. No other known copy of this quality in public museums.
3. No other known copy of this quality by Glynne in public museums. Richard Glynne (1681-1755) was apprenticed to Henry Wynne in the Clockmakers' Company and free of the Company in 1705. He worked from that date till 1725 and mainly made sundials, armillary spheres, orreries and drawing instruments.

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