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EDITORIAL

This issue opens with an article by Vsevolod Buravchenko who lives in Ukraine. He describes an unusual portable sundial in the Lviv Historical Museum. His account extends to presenting two new dials which are slightly adapted reproductions of the original.

Dennis Cowan writes about obelisk dials of the West coast of Scotland in his Thomas Ross series.

Peter Ransom's Postcard Potpourri shows a sundial beside the Boating Lake in Great Yarmouth. The so-called Venetian Waterways have been restored in recent years but sadly the sundial seems to have vanished.

Irene Brightmer reports on progress of investigations into her Welsh slate sundial and speculates on the identity of its maker, while Kevin Fuller writes about a dial made by William Holloway of Stroud in the 17th century.

Valery Dmitriev, our Russian contributor, gives an account of a new sundial at Peterhof, a country residence of Peter the Great. The design and construction took many months and involved many individuals in 2021.

Doug Bateman came across an article in another journal about the sundial at Westminster School which is a memorial to a former teacher Adolf Prag. The article was written by his three sons who have allowed a slightly amended version to be published in these pages. The dial was originally reported in the December 2007 *Bulletin* but there is much additional information in this new article.

Sue Manston describes a fascinating portable sundial which was the subject of a query to the BSS Help and Advice Service.

In ordinary times, the March issue of the *Bulletin* includes the Annual Report and Accounts for the past calendar year. Unfortunately the relevant items are not yet ready but they will be published in the June issue.

Frank King

JERZY OSSOLIŃSKI'S POCKET SUNDIAL FROM THE LVIV HISTORICAL MUSEUM

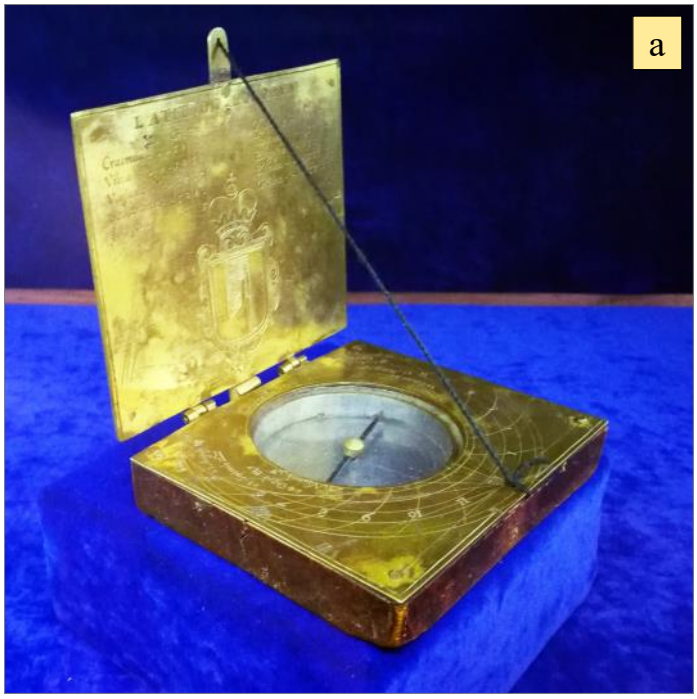
Creating a Replica and its Use

VSEVOLOD BURAVCHENKO

[This article is a shortened version of one published in Ukrainian with the same title in 2021: *Stryi*, (3), 73-90. A note on spelling: place names etc. are spelled in anglicised versions of the Ukrainian phonetic e.g. Kyiv, Lviv, Kamianets-Podilsky, but readers may be more familiar with the older Russian versions (Kiev, Lvov, Kamenets-Podolsky) used before the 1990s. Ed.]

A case with a small collection of sun- and star-dials from the 16th to the 18th centuries attracts the attention of visitors to the Lviv Historical Museum (LHM), located in the former residence of Constantine Korniaktos, a merchant and native of Crete. Among other exhibits of the collection which are no less interesting, but only typical representatives of mass production of workshops in Nuremberg, Augsburg and Paris, one stands out that has no known direct analogue in museums around the world – a pocket compass dial (museum catalogue no. MT-1838) shown in Fig. 1 with a dedication to the famous politician, orator, and writer Jerzy Ossoliński (Fig. 1c).

The base of the compass is a board of tropical redwood measuring 98 × 85 mm with a brass surface to which a lid is attached with two hinges. A well contains the compass in the form of a round silvered brass bowl with an engraved



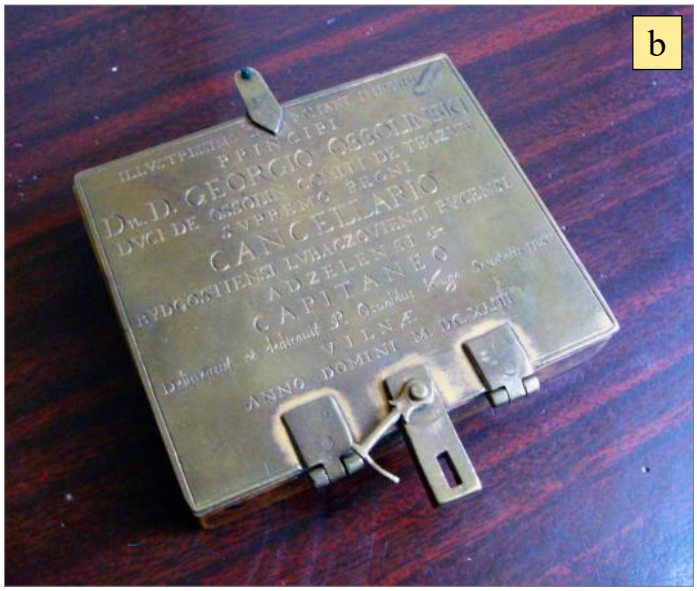


Fig. 1. (a) General view of the sundial in the Lviv Museum (photograph by the author); (b) the lid with the dedication and the lock (photograph by the author); (c) portrait of Jerzy Ossoliński by Bartholo Bartholomeus Stroebel, 1635; National Museum, Warsaw (public domain).

needle which indicates the direction of the magnetic North pole. The compass needle is cut from an iron sheet with a turned brass hub at its centre. Contrary to expectations, the needle is still magnetised (!) and correctly indicates magnetic North as it is today, probably owing to its ability to turn automatically and be magnetised by the Earth's field. The cover is also from brass sheet and is attached to the base with four screws, the caps of which are countersunk into the bottom of the compass.

There are two sundial scales engraved on the base, one a simple horizontal, graduated with Roman numerals clockwise, and the other azimuthal, graduated with Arabic numerals counterclockwise. The gnomon is a thread stretched through holes in the cover and lid. The original thread has not been preserved; the one that can be seen on the exhibit was recently installed by museum staff.

The external side of the lid cover bears an engraved dedication and the maker's signature, engraved with a typical combination of antique and italic fonts from the 16th/17th centuries (Fig. 1b).[1] It reads:

ILLVSTRISSIMO S[…] ROMANI IMPERII
PRINCIPI
Dn. D. GEORGIO OSSOLINSKI
DVCI DE OSSOLIN COMITI DE TECZYN
SVPREMO REGNI
CANCELLARIO
BYDGOSTIENSI LVBACZOVIENSI RYCENSI
ADZELENSI
CAPITANEO
Delineauit et dedicauit P. Osualdus Krüger
Societatis IESV
VILNÆ
ANNO DOMINI M. DC. XLIIII

To Eminent of H[oly] Roman Empire
Prince
Lord Master George Ossoliński
Duke of Ossolino, Count of Teczyn
Supreme Crown
Chancellor
Steward of Bydgoszcz, Lubaczów, Adzel
Drawn and dedicated by p[ater?, professor?] Oswald Krüger
of the Society of Jesus
Vilnius
A.D. 1644

The tab for the upper end of the gnomon string is riveted partially over the inscription. The internal part bears the coat of arms "Topór" (meaning "axe") – one of the oldest known arms of the Polish nobility, with a prince's crown over the shield. It also has a table of latitudes (Table 1) of some towns of the Republic.

The artefact was transferred to the Lviv Historical Museum in 1940 from the Museum of the Princes Lubomyrskis in Lviv, for which it was purchased in 1931 from Lady Brodoska from Bilgoraj (Lublin voivodeship) for 500 zlotys. Its previous history is unknown.

We had a rare opportunity to try to analyse the circumstances of its creation through connections with the personalities of the persons involved because the dedication in the lid of the device gives the names of both the developer and the (presumed) owner.

Jerzy Ossoliński

Jerzy (George) Ossoliński (1595–1650) was descended from an old noble family. In preparation for his statesman's career, he studied at the Jesuit College in Pultusk in 1604–06 and in Graz in 1608–12, and he probably maintained some ties with the Society of Jesus. From 1613 to 1616 he continued his education, travelling around Europe and visiting the universities of Louvain, Paris, Orleans, Padua, Bologna, Rome and Naples. From 1617 he began service at the court and took part in the war against the Muscovy. In 1621 Ossoliński was sent to England with the mission to attract the king, James I, to the anti-Turkish alliance. He later held a number of governmental positions and headed international embassies. In 1633 he received from Emperor Ferdinand II the personal title of Prince of the Holy Roman Empire, which allowed him to crown his hereditary coat of arms with the princely crown. In 1643 he took the post of Supreme Crown Chancellor, the *de facto* ruler of the Kingdom of Poland. He spent his fortune on the patronage of monastic orders and colleges. He shared ideas of absolutism and tried to pursue a policy of centralisation of power, which aroused hatred and opposition from the nobility.

In 1644, Ossoliński was at the zenith of his political career and was involved in many activities in different parts of the state. Not the least of these was material assistance to the Society of Jesus. As a pupil of the Jesuits and as the steward of Bydgoszcz since 1633, Prince George supported the construction of the convent, collegium and church of St Ignatius in the city, and in 1642 even asked for the right of guardianship over the construction, a right which had previously belonged to the Bishop of Chelmno (Kulm) Casper Dzialinski. In April 1643, an agreement was reached under which Ossoliński and Dzyalinski were recognised as co-founders. This shows that in this period, the Chancellor and officials of the Order were in a very friendly and productive relationship.

Oswald Krüger

Another hero of our story, Oswald Krüger (?–1655, in some sources[2] 'Kryger' but in this case we have his autograph), was also in the heyday of his scientific work at this time. Little is known about the early years of the future mathematician, a native of Prussia. More or less reliable information appears only from the time of his entry into the Order in Vilnius in 1618. After completing his term as a novice, he undertook an internship in Rome in 1622–23, after which he returned to Vilnius to complete his studies.

For some time he taught at institutions in Polotsk, Pultusk and Nesvizh. From 1632 he was a professor of mathematics

LATITUDO LOCORUM						Latitude of the Area (modern confirmed values)					
	Gr	Min		Gr	Min		Deg	Min		Deg	Min
Cracouia	50	0	Ossolino	50	0	Krakow	50	4	Ossolino	50	40
Vilna	54	50	Taykury	50	54	Vilnius	54	41	Taykury	50	32
Varsauia	52	53	Bidgoscia	53	8	Warsaw	52	13	Bydgoszcz	53	7
Sandomiria	50	40	Kiiouia	51	5	Sandomierz	50	41	Kyiv	50	27
Leopolis	50	5	Grodna	53	50	Lviv	49	50	Grodno	53	40

Table 1. Latitudes of the locations shown on the sundial and their modern values.

at the Vilnius Academy and in some years he also taught Hebrew and moral theology. But from the list of scientific works that Krüger published in the 1630s and 1640s almost every year, it is clear that his real passion was mathematics and natural science. His legacy includes textbooks on arithmetic and geometry, works on mechanics, optics, the functioning of the human eye, the formation of rainbows and the nature of colours, calculating calendars, and the use of geometry for the problems of artillery and fortification. A manuscript on the design of sundials remains unpublished.[3]

In 1653 Krüger became the rector of the Nesvizh Academy and, in 1655 by order of King John II Casimir, he was appointed an engineer of fortifications in Grodno. Unfortunately, owing to an illness leading to a premature death, the Jesuit scholar did not have time to prove himself in his new position.

Krüger was one of the first scientists in Eastern Europe to make telescopic observations with his students of the satellites of Jupiter[4] and he introduced students to the theory of the heliocentric solar system. He built machines for astronomical observations and, according to contemporaries, had a reputation as the "Archimedes of his time". Interestingly, the documents from the archive of Nesvizh Castle from 1655–56 mention four "Krüger's guns", which at that time were transferred from the castle's arsenal to other garrisons. Although this may be a simple coincidence of surnames, it is possible that the Jesuit may have been involved in their creation or at least modernisation.[5]

One can assume that at that time the Order's officials thought of celebrating the Chancellor's fruitful cooperation with the Order and his generous donations with a gift, not so much an expensive as a symbolic one, which could display the value of his support to development of education and science in the Commonwealth. Such a gift could be, for example, a pocket sundial. Whatever the motive, the Order had a person who could organise the making of a unique gift.

Description of the Dial

Comparing it with a range of known pocket sundials, it should be noted that the Krüger compass dial is larger than is typical, as most do not exceed 50 mm. Also unusual is the combination of a wooden base and a brass lid. It seems that Krüger and those jewellers he could hire to do the work focused on the materials they could buy and the techniques they were familiar with. The compass bowl shows a declination towards the west corresponding exactly to the data of the reconstruction of the Earth's magnetic field in the 17th century (Fig. 2).[6] At that time in Eastern Europe, the magnetic declination was indeed to the west. If the current alignment of the compass is not an accident or the result of careless re-assembly of the compass at a later time, it must be admitted that Professor Krüger did not neglect this aspect, and took into account the magnetic declination quite correctly.

The table of cities and their latitudes (Table 1) is carefully selected for the identity of its owner. Here is the birthplace of the Prince (Sandomierz), his hereditary estates (Ossolino, Taykury), and the location of the college, the construction of which at that time was under the care of the Chancellor (Bydgoszcz). Bydgoszcz and Sandomierz were also under Ossoliński's stewardship. Warsaw, Krakow and Vilnius were the capitals of the Commonwealth and were associated with its state activities. In addition, Vilnius was

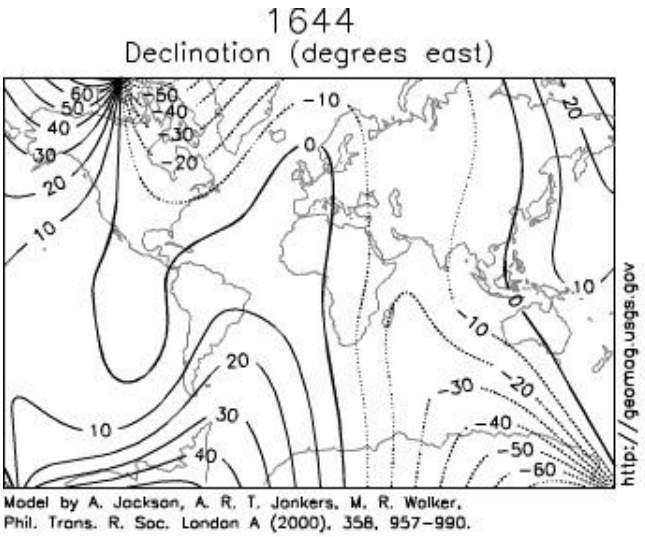


Fig. 2. Reconstruction, according to the Royal Society of London, of the values of magnetic declination in 1644. Negative values correspond to a western declination.[12]

the place where Krüger worked and created the dial. It is not known why Lviv and Kyiv were included in this table, ahead of Gdansk, the largest city and international trade hub of the Commonwealth, in terms of its importance for its owner. Whether this was due to the Chancellor's activities or to the Order's plans remains a mystery.

The latitudes of cities are given in degrees and arc-minutes with an accuracy higher than could be determined by a pocket quadrant or portable astrolabe. There is no doubt that high-precision instruments were used to measure these values. The typical navigational astrolabe of the time was calibrated only to whole degrees, and it was difficult to obtain values with an accuracy higher than quarter degrees. The errors are quite small, literally a few arc-minutes.

In any case, the table has only a reference function and, unlike the export products of the Bavarian workshops, cannot be used to adjust the dial for use at different latitudes because there is only one hour scale in each of the sundials (horizontal and azimuthal). The dials match with those drawn for latitude of Vilnius (54° 50′). It is possible that Krüger created the gift using templates he used earlier to produce teaching samples from cheaper materials.

The lock of the lid is not typical for known sundials: it consists of a frame riveted to the lid, which extends far beyond the rectangular sheet. When the latter is raised, the slit in the frame is put onto the iron hook protruding from the wooden case, and fastens to it with a riveted brass hook. The design looks vulnerable and inconvenient, since when carried in a pocket or a cloth bag, the frame and hook can damage the fabric. In professionally made sundials of bone or wood, the task of fixing the lid is solved in a much simpler and more practical way. This gives the impression that Krüger faced the problem of keeping the heavy metal lid upright, which was not significant in his previous dials, possibly made from cardboard. But because the position of the gnomon and the accuracy of the time measurement depended on it, he solved the problem, although not in a very practical way (Fig. 3).

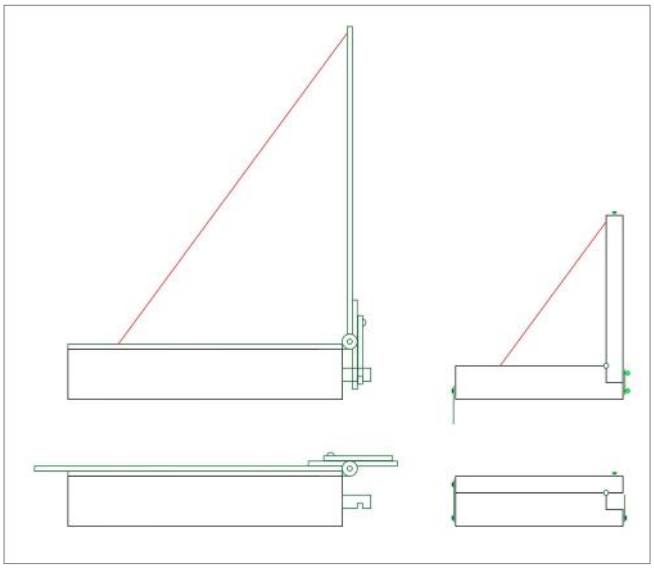


Fig. 3. Compass sundials in open and closed position: on the left – by Krüger, on the right – a more professional example.

It is difficult to say anything specific about the design of the holder of the upper end of the gnomon string. The original one was broken off, and instead an improvised one was riveted over the dedication inscription. Assuming that the dial was designed for the latitude of Vilnius, it means that the thread had to be stretched at an angle of 55° to the horizontal. Thus, the holder had to protrude beyond the rectangular lid by more than 20 mm. It is now impossible to say whether it could fold or had some other features in the absence of analogues. In any case, the holder was the most vulnerable part of the structure and was broken off. Similarly, we cannot say whether it was owned by Jerzy Ossoliński himself or his heirs at the time, but it is safe to say that the owner planned to use it further and repaired the sundial with available means.

The Two Dial Types

The most characteristic feature of the instrument is the combination of two dial types: horizontal and azimuthal. The horizontal dial is quite traditional, where the time is determined by the shadow from the gnomon falling onto the dial, when the magnetic arrow matches with the mark for magnetic declination. The use of the azimuth dial is based on the change of direction of the shadow from a vertical gnomon (Fig. 4a). The hours are marked counterclockwise, which may surprise the user, since in the northern hemisphere on any day of the year the shadow on the horizontal plane moves clockwise.

In fact, at each moment the deviation of the Sun from the meridian is equal to that indicated on the dial, but is opposite in direction (Fig. 4a). This markup is not an error, but the dial belongs to the type of 'magnetic azimuthal dials', where the time is indicated not with the shadow but with the magnetic needle,[7] and can be used using the procedure shown in Fig. 4b. With the compass in a horizontal plane, rotate it until the shadow of the gnomon falls onto the hub. Then the southern end of the magnetic needle should indicate the current time mark on the circle corresponding to the date. Unfortunately, this technique does not take into account the value of the magnetic declination. Alternatively, the edge of the upright lid can be used as a gnomon (Fig. 4c). Rotate the dial until the edges of the shadow from the lid match the edges of the dial and the northern end of the needle will point to the time.

Thus, the azimuthal dial will give some error – slightly slow when the declination is eastern and fast if it is to the west. So, in the given example, at 14:00, the southern end of the arrow will point at approximately 13:40.

Other notable samples of magnetic azimuth dials are paper sundials printed on paper sheets to be put under the compass needle, published by Henry Sutton in London in the mid-17th century, and pocket ivory dials produced in

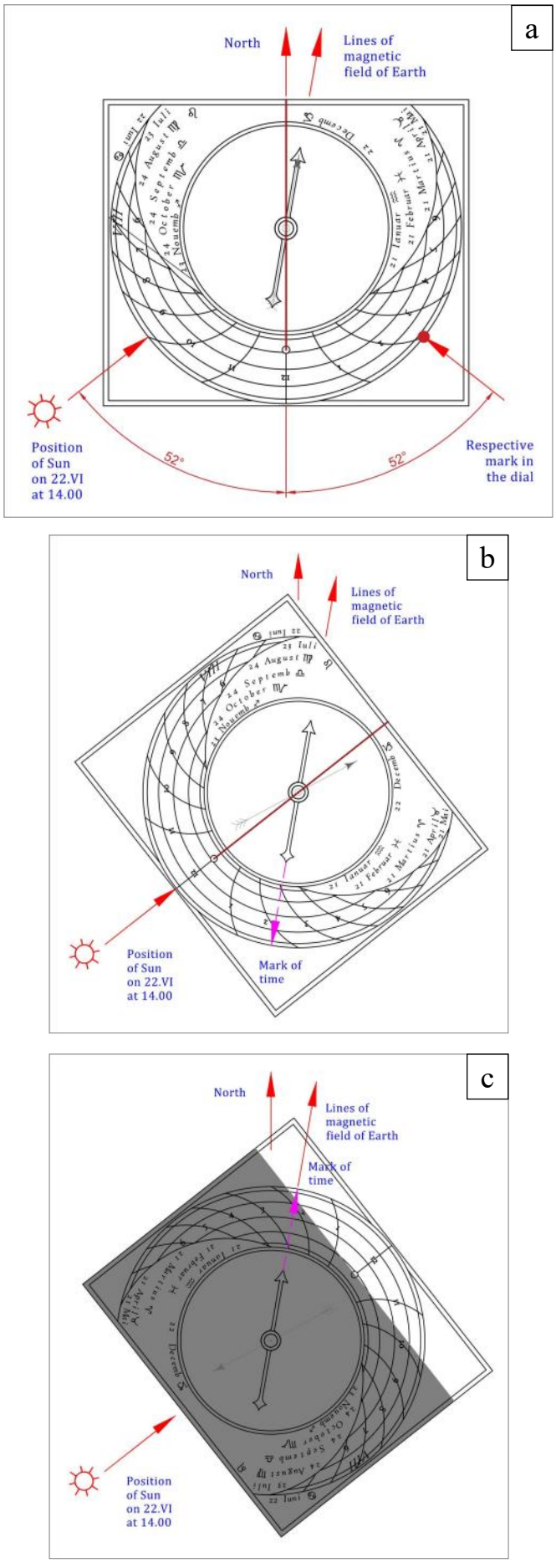


Fig. 4. (a) Principle of azimuth sundial; (b) possible use of azimuth sundial (variant for the latitude of Kyiv), (c) another possible use.

Dieppe in second half of the 17th by Charles Bloud's workshop.[8]

It is also interesting to compare the idea of combining two types of sundials in Krüger's device with other types of twin sundials, for example the 'Oughtred' or 'double horizontal dials' produced in the 1630s by Elias Allen.[9,10] The combination of two dials drawn in different projections allowed a user to align the sundial without the need for a compass. However, this quality, which was an advantage for double dials, was barely needed in Krüger's device, as the latter included a compass.

In addition, if the sense of the double dial was that both of its scales would show time in the same position, the Krüger device apparently was intended to use them in different positions, making it difficult to use both together to verify the magnetic needle readings. Thus, the author failed to identify clear advantages in such a combination of Krüger's two dials in one instrument. From the author's point of view, such a decision of the Jesuit was dictated more by the desire to promote his skills than to provide certain functional benefits. But it is undoubtedly interesting that Krüger was interested not only in the tradition of designing sundials, but also in the developments of his contemporaries.

Making the Replica

Thanks to the staff of LHM, in 2019 the author had the opportunity to get acquainted with the artifact directly, measuring and photographing it from different angles, including those usually hidden from visitors. Naturally there was interest in trying to recreate it as part of the '*Master Terebrus*' project. This is a joint project of the author and his associates – specialists in metal and wood crafts. Since 2016, project participants have recreated more than 50 types of historical sundials, compasses, quadrants, astrolabes and other tools of astronomy and navigation for use in living history events, interactive museums and more. The objects reproduced come mostly from Western Europe, so an opportunity to reproduce an instrument related to the history of the states, which at that time included the lands of Ukraine, was particularly interesting.[11]

Customers from Kyiv and Kamianets-Podilskyi financed the production of two functional replicas (Fig. 5). As the coat of arms of the original owner of the compass and the text of the dedication were too personal, customers were given the choice of to whom the replica should be dedicated. The sundial for the customer from Kamianets was decorated with his own name and associated coat of arms, and for the Kyiv sample, Opanas (Athanasius) Predrymyrsky, a military leader from Kyiv in the middle of the 17th century, was chosen. The texts of the dedications were translated into Latin. The dials were drawn for use at the latitudes of Kamianets (48° 40′), and Kyiv (50° 30′) respectively.

Fig. 5. Replica sundials produced by participants of the Master Terebrus project in 2019–21 (photo by the author).

The design of the dials for lower latitudes than the Vilnius original meant that the gnomon strings would lie at shallower angle, which allowed them to fit within the dimension of the lids and thus avoid the uncertainty of the original design of the upper end holder. As the texts of the dedications were much shorter than the original list of titles and positions of the Supreme Crown Chancellor, it was decided to rearrange the decorations by moving the coat of arms to the outside of the lids, allowing an expansion of the latitude table to include a list of Latin names of the cities that, in the first half of the 17th century, were parts of the Polish–Lithuanian Commonwealth.

An Indonesian merbau board, similar in colour to the original compass wood, was used for the base. For the cover, lid and other details 1.5 mm brass sheet was used, which is close to the thickness of the original. The main engraving was applied to the metal by electrochemical etching, after which the decoration was completed by manual engraving.

The compass needle was cut from a sheet of high-carbon steel and magnetised with a DC electromagnet. For its hub, instead of the turned cylindrical one, as in the original, a supply of cast parts available in the workshop was used in the form typical of other pocket compasses of that time – pyramids with a transverse wall. This alteration did not affect the functionality of the products. The silver-plated compass bowl was installed, aligned for the value of magnetic declination in Ukraine today, into a depression carved in the board. The cover holding the compass bowl and the glass was attached with four hand-cut brass screws.

As the experience of using the sundial at the events of living history in the summer of 2021 has shown, the replica compass is a convenient and accurate tool for navigating the area and determining the time with the limitations typical of other compass sundials. But the delicate design of the lid lock requires careful handling, so the owner should have a special case to carry the instrument.

From the studies conducted in 2019–21, the author formed an opinion that Professor Oswald Krüger was an outstanding mathematician of his time, but until then had no experience in producing sundials of this type. He skilfully calculated both dials, but because of a lack of experience, he encountered technical and operational problems which he and his subcontractors solved with varying degrees of success. If he had continued to make compasses and sundials, Krüger could have corrected the teething problems of his products and brought them to technical perfection, but we do not know of any other similar product to which he applied his hand. This was probably because he was primarily a clergyman, scholar and teacher, not planning to make the production of pocket gadgets his life's work. Therefore, apparently, the Vilnius compass remains a unique artifact – evidence of the complex cultural life of the 17th century.

REFERENCES and NOTES

1. P. Slobodyan: 'Rarities of the Museum Collection. Ancient portable devices of the 16–18th centuries used to measure time by tracking celestial bodies', *Scientific Notes, Lviv Historical Museum,* 12, 182-188 (2008). [Слободян, Петро. 'Раритети музейної колекції. Давні портативні прилади XVI-XVIII ст. для виміру часу через стеження за небесними світилами." Наукові записки. Львівський історичний музей, вип. 12, 2008, 182-188]
2. F. Bentowski: *Hystorya Literatury Polskiey wystawiona w spisie dzieł drukiem ogłoszonych*. Tom II. Warszawa: Zawadski i Komp, 1814, s. 314-315.
3. '*Horolographia practica, niedokończone i nie wydane*', see *https://pl.wikipedia.org/wiki/Oswald_Kr%C3%BCger*
4. J. Südzius: 'Astronomy at the Vilnius University', *Baltic Astronomy*, vol. 3, 1994, pp. 7-15.
5. N. Volkov: 'Artillery of Nesvizh Castle in the late 16th – early 18th centuries', *ARCHE. Military History of Great Duchy of Lithuania*, 6, 182-188 (2012). [Волкаў, М. "Артылерыя Нясвіжскага замка ў канцы XVI – пачатку XVIII ст." ARCHE. Вайсковая гісторыя Вялікага Княства Літоўскага, №6, 2012, с. 41–91.]
6. A. Jackson et al: 'Four centuries of geomagnetic secular variation from historical records.' *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 358 (1768), 957-990 (2000).
7. M. Cowham: 'Magnetic Azimuth Dials', *BSS Bulletin* 16(ii), 47-49 (2004).
8. Cowham, *ibid.*
9. J. Davis and C.M. Lowne: *The Double Horizontal Dial.* BSS Monograph No. 5, pp. 130-145 (2009).
10. F.W. Sawyer: 'William Oughtred's Double Horizontal Dial' *NASS Compendium*, 4(1), 1997, 1-6.
11. At that time, the majority of the land that now makes up Ukraine was part of the Kingdom of Poland.
12. Jackson, note 6.

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A PROVINCIAL SUNDIAL BY WILLIAM HOLLOWAY OF STROUD, GLOUCESTERSHIRE

KEVIN FULLER

In the September 2018 *BSS Bulletin*[1] I wrote about a dial made circa 1820 by the Beilby family of Bristol who were linked to a small dynasty of Bristol dialmakers that included Joshua Springer and John Wright. John Davis wrote about these makers in the December 2016 and September 2018 issues of the *Bulletin*.[2,3]

It is always interesting to discover sundials made provincially and remote from the established London and bigger city-based scientific instrument-making community. The dial described here, by William Holloway of Stroud, is one such example.

This particular dial is most unusual (Fig. 1). It is in the provincial style of the 17th century and is ostensibly a period dial, dating from between 1658 and 1693. It is simple, 165 × 165 mm square, made of brass and fixed to a later pedestal. The plate is 2 mm thick which is usual for a dial from the 17th century. The engraved letters and numerals are in the early clock face style and are read from the inside. It is signed "Will:^{m} Holloway Fecit" (Fig. 2). The time scale runs from 3:45 am to 8:15 pm, which is appropriate for summer solstice sunrise and sunset times at latitude 51.57°; this fits very well with the latitude of Stroud in Gloucestershire.

The gnomon, however, is a strange affair (Fig. 3). Firstly, it is much too big for the dial, protruding too far south and encroaching upon the north chapter ring, and it is of an alien shape. The gnomon angle is 54.5° which is incorrect for the latitude of Stroud but would be appropriate for a northern UK city or town. It is unlikely that William

Fig. 1. Dial by William Holloway. Inset: the 'NE', with its reversed letter 'N'.

Fig. 2. Close-up of the signature.

Fig. 3. The gnomon.

Fig. 4. Close-up of one of the spandrels, showing a crescent moon; other corners have suns or stars etc.

Fig. 6. William Holloway's house and workshop in 2010. Photo courtesy of Pauline Stevens.

Holloway had a commission for the sundial from a northern client, as he and his wider family lived and were embedded in the southwest of England; furthermore he was not known for making dials. This reinforces the view that the gnomon is a later replacement.

William's son, another William, was also a clockmaker but he worked and traded in London until 1723 and made finer grade clocks. He is not known for any sundials, but any made by William the son would have been of a finer quality and of a much higher standard.

The engraving of the dial is very peculiar: it appears to be by two different hands which could be nearly contemporary or perhaps the additions are slightly later. Some aspects of the engraving are almost childlike and crude. Notice the engraving around the screwholes as, for example, that shown in Fig. 4. The numerals are also carelessly executed with ragged finishing lines. Most obvious is the mistaken incorrect reversed 'N' of the 'NE', an inadvertent error (Fig. 1, inset). It all adds up to a rather rustic piece and this somewhat adds to its charm.

There are no other known sundials by this maker and perhaps this was a one-off. The building containing his shop and workshop in Stroud remarkably still stands at 46/47 High Street (Figs 5 and 6). According to the *Biographical Index*,[4] the shop "has marks of an old dial", and 19th-century records show a large dial there, but having looked extensively, sadly I can report that there are now no signs of any past dials or fixings.

William Holloway's clocks are well known in clockmaking circles and he was a prolific maker, particularly of lantern

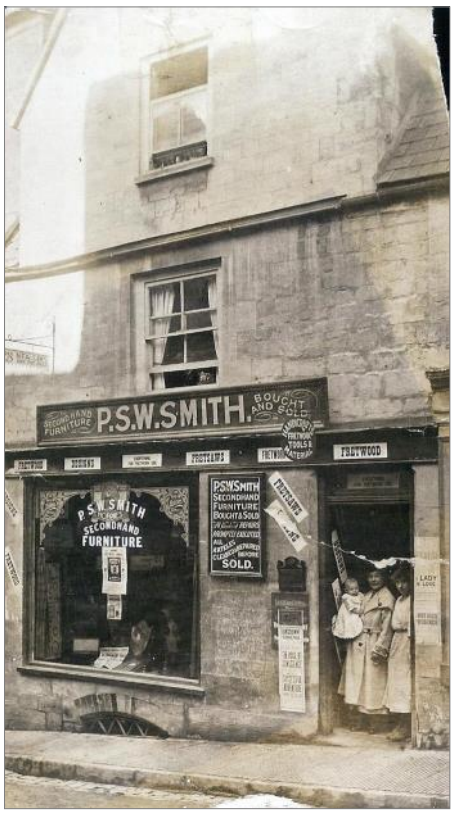

Fig. 5. The house at 46/47 High Street, Stroud where William Holloway worked from 1658 to 1693, circa 1900. Image courtesy of Ian Mackintosh.

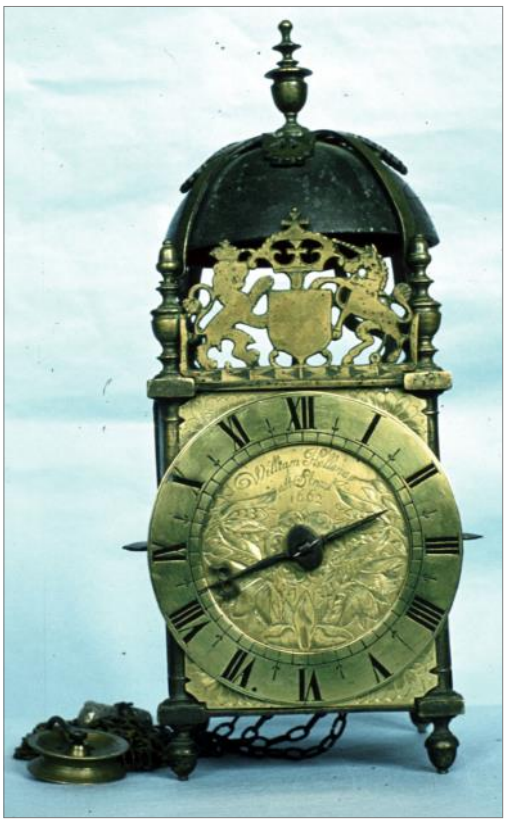

Fig. 7. Lantern clock made by William Holloway of Stroud, 1662. Courtesy of the Stroud Museum in the Park. Photo: Alexia Clark.

clocks. These clocks have distinctive features unique to him and his family of West Country makers which makes them particularly desirable and sought after. Examples of his clocks such as the one shown in Fig. 7 are housed in the Stroud Museum in the Park Collection and elsewhere. Very few clocks remain and sadly none of his watches.

William Holloway was born in Market Lavington in Wiltshire in 1638, the son of clockmaker John Holloway (1605-76).[5] William's brothers Richard and John were also clockmakers. Their father John Holloway was trained, it is thought, by John Snow who also worked in Market Lavington and had family links to Salisbury. The family remained in Market Lavington but our William moved to Stroud in 1658 and set up a shop and workshop at what is now 46/47 High Street. He remained there until his death in 1693. He looked after the church clock and evidently prospered, becoming an established figure in the community. His sons William and John also became clockmakers and moved to London as makers and traders. After William's death in 1693 the shop was taken on by his son William and was eventually sold to a Richard Cam whose family continued the watchmaking tradition.

ACKNOWLEDGEMENTS

I should like to thank Pauline Stevens and Ian Mackintosh of the Stroud Local History Society for their helpful advice, research and assistance. Also, kind permission of David Lewis, owner of Spraucy, the antique shop at 46 High Street, Stroud. Christine Northeast is thanked for considerable editorial assistance.

REFERENCES

1. Kevin Fuller: 'The 'Ingenious Beilbys' and a dial made in Bristol', *BSS Bulletin*, 30(iii), 34-36 (September 2018).
2. John Davis: 'Joshua Springer of Bristol: An eighteenth-century provincial dialmaker', *BSS Bulletin*, 28(iv), 12-16 (December 2016).
3. John Davis: 'Joshua Wright of London and Bristol: The beginning of the scientific instrument trade in Bristol', *BSS Bulletin*, 30(iii), 28-32 (September 2018).
4. Jill Wilson: *Biographical Index of British Sundial Makers from the Seventh Century to 1920*, BSS Monograph No.12, British Sundial Society (2019). The *Index* quotes Brian Loomes: *The Early Clockmakers of Great Britain*, NAG Press Ltd (1981), p.307 as a major source.
5. G.S.J. White: 'Measured motion of time: William Holloway of Stroud (1638-93)', *Country Life,* No.4451 (1982).

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The Bedlington Sundial Unveiled

Mike Shaw

In the September 2020 issue of the *Bulletin*,[1] Tony Moss of Lindisfarne Sundials described how he had made his last dial (though I've heard that before) for his home town of Bedlington. This large dial commemorates the town's coal mining heritage and the undershot gnomon features a Bedlington terrier.

I was honoured to be invited to play a small part in the dial's unveiling ceremony in the town's Market Square during December 2021. The pictures show Tony talking about the dial during the ceremony and, of course, the sun refused to shine!

Reference

1. Tony Moss: 'Sunshine in Bedlington: On the last of the very last', *BSS Bulletin*, 32(iii), 28-29 (September 2020).

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A WAR MEMORIAL SUN MARK FOR BOLAM PARISH, NORTHUMBERLAND

TONY THICK

Bolam is an ancient, rural parish in mid Northumberland with a population of around 300. The area of the parish straddles the A696 road from Newcastle upon Tyne as it passes through Belsay village on its way towards Jedburgh. Bolam itself was once a significant medieval town known for its saddlery, with a castle at one end and the church at the other, but is no more. All that remains, after Scottish raiding parties and land enclosures, are the 11th century church, a few scattered houses and the ditches around the site of the castle. The stones from the ruined castle were reused to build Bolam Hall.

Fig. 1. The war memorial sun mark. Photo: Jim Grant.

The parish had no war memorial apart from a small brass plaque on a classroom wall in Belsay First School. So, having been inspired by a sundial made for my wife and me by Piers Nicholson, I decided in 2014 to offer a design to the church council to place in the churchyard to commemorate the centenary of Armistice Day 1918. Fig. 1 shows the completed War Memorial Sun Mark.

The aim of the design was three-fold: first, to provide a public memorial to the seven young men who died during the First World War; second, to acknowledge that war affects civilians; and third, to recognise that suffering and death due to war never seem to stop (not just in the past, but the present and doubtless in the future too).

The memorial is arranged as a sun mark for 11 am on 11 November because it commemorates the armistice at the end of the First World War. The design could have been set up as a more sophisticated sundial, but that would have lost one of the key messages of the memorial concerning that specific time on that particular day. So the sun mark functions during the annual Remembrance Sunday Service, sunshine permitting, notwithstanding what happens on any other days.

Fig. 2. St Andrew's Church, Bolam.

Fig. 3. The block plinth with Kate Thick, the dry stone waller and Colin Wilkinson, the blacksmith.

Fig. 4. Close-up of the poppy on the left-hand wheel.

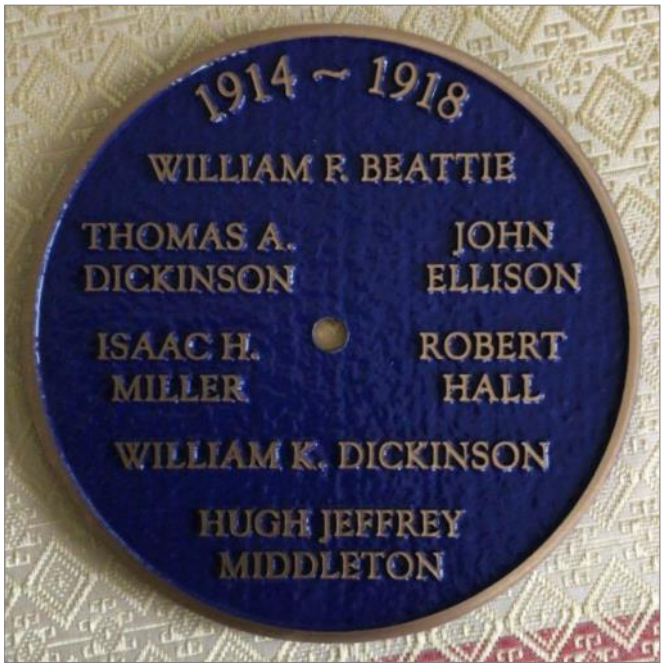

Fig. 5. The plaque.

St Andrew's church, Bolam (Fig. 2), which incidentally has a partially covered scratch dial in the porch, was built out of sandstone quarried a short distance along the ridge on the edge of which the church stands. So the block plinth to which the memorial is fixed at each corner (Fig. 3) is finished in sandstone to echo both the church itself and the local dry stone walls enclosing pasture for sheep. The dry

Fig. 6. The steel base with its Morse message round the edge.

stone work was done by my sister, Kate Thick, who is a local stone waller.

Since sheep farming is the predominant form of local agriculture, the memorial is based on two 'shepherd's hut' wheels. The wheels are rusty iron of about the vintage of the First World War, though in fact probably from a farm implement rather than a true shepherd's hut. The intention is for the memorial to rust as uniformly as possible.

The gnomon of the sundial is formed out of a 25 mm steel shepherd's crook angled at 55° 08′ with a perforated disc welded into it. At 11 am on 11 November, sunlight passes through the aperture onto the centre of a gold-coloured medallion mounted on a stylized poppy flower, which is itself fixed in front of the hub of the left-hand wheel. The aperture plate has been kept small so as not to obscure the medallion, although this has meant a rather small spot of light. The other possible roles of the light spot itself have not been utilised. The arrangement does not preclude a sun spot from landing somewhere on the medallion on days close to 30 January as well as those close to 11 November.

The poppy has seed heads, a flower and buds to represent the victims of wars past, present and future (Fig. 4).

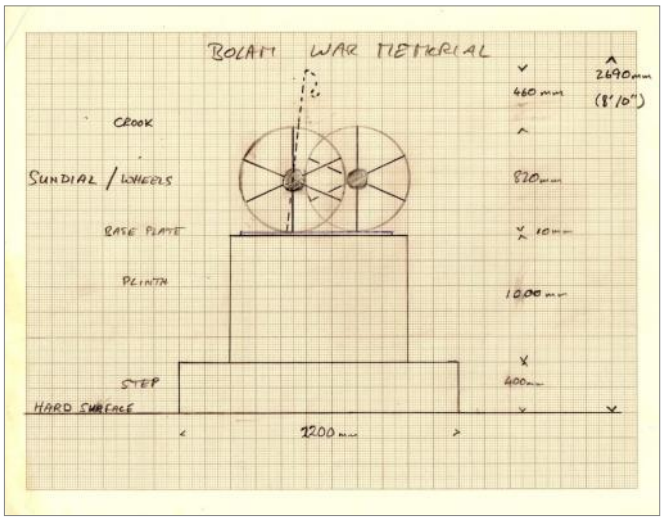

Fig. 7. The first drawing.

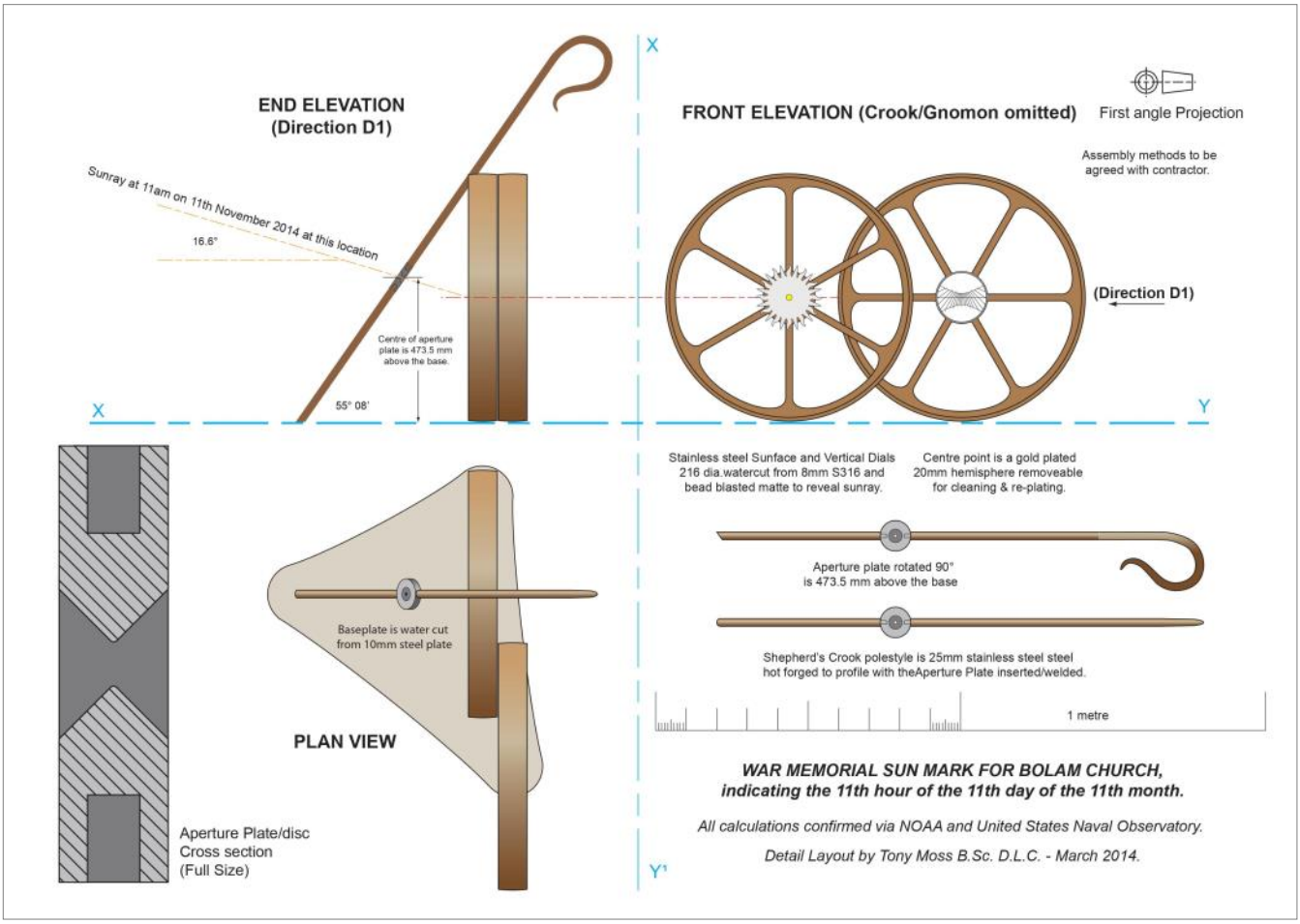

Fig. 8. The drawing produced by Tony Moss.

Fig. 9. Remembrance Service 2021. Photo: Jim Grant.

The hub of the right-hand wheel contains a plaque with the names of the fallen (Fig. 5). There is only one war grave in the churchyard, of Lieutenant H.J. Middleton RN.

The triangular base of the sundial is made of 10 mm steel sheets layered to look like a contour map. Local school children contributed a Morse code message to go on the three benches that are positioned around the edge of the rolled limestone pavement. While the memorial was being installed, the Morse message was pasted onto the edge of the steel base and can be seen in Fig. 6. The message translates as: "Belsay children remember the past and greet the future".

I had the great good fortune to benefit from the help of Tony Moss in turning my initial idea for the design (Fig. 7) into a technical drawing from which the monument could be created. I am sure that without his drawing (Fig. 8) I would not have been able to win over the Parish, the Diocese and the Local Authority.

I was also fortunate to be put in touch with a blacksmith in Ashington by the name of Colin Wilkinson, who built the metalwork.

Finding funding for the project proved unexpectedly difficult. We had to cancel the planned resurfacing of the church car park that would have significantly improved access to the memorial. But with local fundraising events, several private donations, a few small charitable grants and our own spadework we achieved an acceptable result. Fig. 9 shows the 2021 Remembrance Day service around the memorial.

Dr **Tony Thick** is a retired NHS GP, practising in Enfield and then Newcastle upon Tyne. He retired with his wife Ann to the Isle of Man in 2020. His interests include climate change and he has replaced their oil boiler with a heat pump and solar panels. He is membership secretary of the Isle of Man Green Party. He can be contacted at *tony.thick@btinternet.com*

IN THE FOOTSTEPS OF THOMAS ROSS
Part 38: The West Coast Obelisks

DENNIS COWAN

There are 26 known complete ancient obelisk sundials in Scotland, and in volume 5 of *The Castellated and Domestic Architecture of Scotland,*[1] Thomas Ross has this to say of them:

"*This name, while it fairly describes the appearance of the dials of this class, has a further fitness from the circumstance that the Egyptian obelisks are believed, amongst other purposes, to have acted as gnomons. The constant parts of these dials are a square shaft, a bulged capital, and a tapering finial. Where the dial is of the normal type and unaltered, the shaft is divided on each side into five horizontal spaces by incised lines, thus presenting twenty compartments. These compartments are hollowed out with cup-shaped, heart-shaped, triangular, and other sinkings, which are generally lineated so as to mark the hours, and were without doubt always meant to be so. The sharp edge of the figure casts the shadow, which is especially distinct in the angular shapes and at the top of the heart sinkings, where there is often a certain amount of undercutting. Stone gnomons of various forms are frequently left in the cup hollows, and metal stiles are to be found in all the dials. Occasionally some of the spaces are left blank, and on the north side initials, dates, and arms sometimes occur.*

"*The capital is always bulged out so as to form an octagon in the centre, with an upright facet on each of the eight sides, having a dial on each. Above and below each facet over the four sides of the shaft are sloping facets, with a reclining dial or a proclining dial on each the former being those dials whose faces slope towards the sky, and the latter those whose faces slope towards the ground. The eight triangular pieces formed by the meeting of the square and octagon are cut out, and most effective shadows, from an artistic point of view, result from this arrangement, giving an air of dignity to the capital, which is wanting in the one instance (at Drummond Gardens) where this arrangement is departed from.*

"*The upright facets of the octagonal part have heart-shaped and cup-shaped sinkings, as in the shaft; but the proclining and reclining parts seldom have sinkings. Nor has the tapering finial, although usually covered with dials, ever any sinkings; like the shaft, this part is divided by horizontal incised lines, the number of spaces, for which there appears to have been no rule, varying according to the height of the finial. The obelisk-shaped dials are generally set on some kind of base, consisting either of steps or a pedestal; the former frequently alternate, being set square and diagonally as they ascend. The pedestals have a general resemblance to each other, being frequently ornamented with representations of the sun and moon.*"

Here, we will look at four of these obelisks on or leading to the west coast of Scotland, the first of which is at Ballindalloch, about 20 miles to the west of Stirling, and on

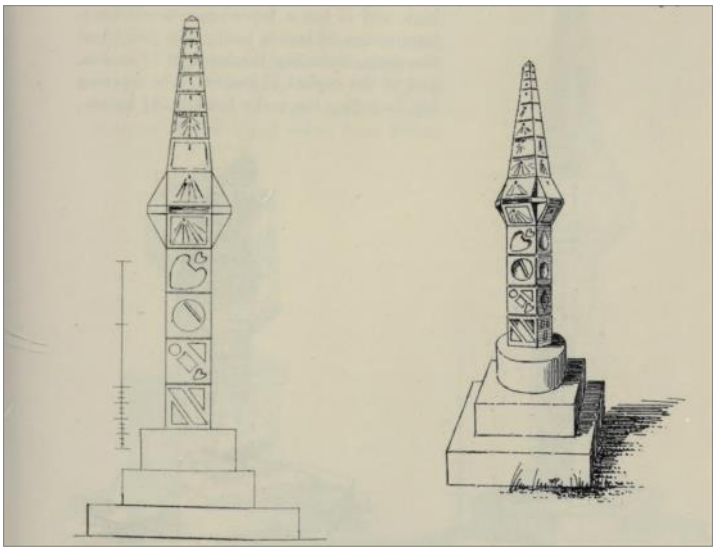

Fig. 1. Ross's architectural drawing and sketch of the Ballindalloch obelisk.

Fig. 2. The Ballindalloch obelisk and its unusual and extremely thin octagonal part of the capital.

the way to the west coast from my home in the east of the country.

Ross has the following to say of this sundial:

"*This dial* [Fig. 1] *is of the normal type, except that the octagonal part of the capital is extremely thin, being reduced to 1½ inches while it is continued round the cardinal sides as a narrow sinking* [Fig. 2]. *The dial rests on three steps, the upper one being round. The dimensions of the dial are height of shaft, 2 feet 10½ inches; height of capital, 1 foot 2½ inches; height of top, 2 feet 5 inches; height of steps, 1 foot 9 inches; total height, 8 feet 3 inches. The breadth of the shaft is 8½ inches. For a perspective sketch of this dial we are indebted to Mr. E. Thornton Shiels, architect, and for its dimensions to Mr. A. H. Cooper, W.S.*"

Fig. 3. The Ballindalloch obelisk standing unusually on one circular and two square steps.

Ross does well to pick out the octagonal part of the capital as being worthy of comment as I do not know of another obelisk with this configuration. Whilst it is normal for these obelisk dials to rest on three steps, to have the bottom two square and the upper one round is also quite unusual (Fig. 3). Today it is in a very poor condition with no gnomons surviving and no hour lines or numerals visible. More seriously there are a number of cracks which are held together with metal ties (Fig. 4).

Several years ago, the previous owners decided to move it thirty yards and it took three men three days to do so. As it is a listed structure, they had to secure all of the necessary permissions beforehand, even to move it that short distance.

Moving on to the west coast, Lochgoilhead sits, as its name suggests, at the head of Loch Goil, which is a sea loch

Fig. 4. The cracks in the Ballindalloch shaft held together with metal ties.

leading on to Loch Long and then to the Firth of Clyde. Of the obelisk here, Ross comments that:

"*This is a conspicuous object in the village, and was probably a market cross* [Fig. 5]. *On the north side, and on the upper space of the shaft, there are the initials* $^{D}_{H}{}_{M}$ [Fig. 6]*; further down on a shield are the initials S.C.C.* [Fig. 7]*, and on the under space is the date 1626* [Fig. 8]. *The dial was overthrown and broken across the middle of the shaft by some Glasgow excursionists about thirty years ago. It was repaired and set up again, and is now protected by an iron railing. The drawing is from a photograph made expressly for the purpose by Mr. John Parker, C.A., Glasgow.*"

Fig. 5. Ross's sketch of the Lochgoilhead obelisk.

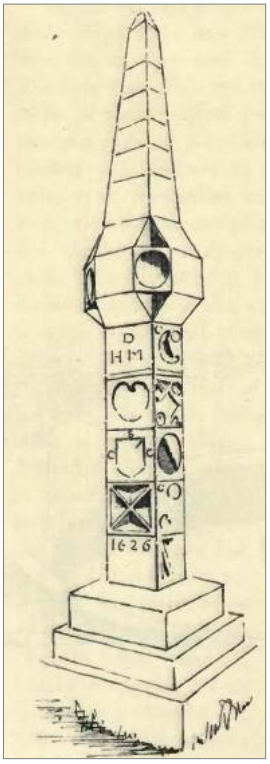

Fig. 6. The initials D.H.M. on the shaft of the Lochgoilhead obelisk.

Fig. 8. The date of 1626 on the Lochgoilhead shaft which was thought to be incorrectly re-carved from 1696.

Fig. 7. The initials S.C.C. (with the 2nd C missing) on the shaft of the Lochgoilhead obelisk.

Fig. 9. The railings protecting the Lochgoilhead obelisk from "Glasgow excursionists".

It sits on top of four square steps and is still protected by iron railings, but I do not think that would protect it from any of today's "Glasgow excursionists" (Fig. 9). There is a serious crack running all the way down the south face of the finial (Fig. 10) and little of the numerals and hour lines has survived.

The initials S.C.C. are believed to be those of Sir Colin Campbell who died in 1709, with D.H.M. for his wife Dame Helen Maxwell. The stone on which D.H.M. is carved, as well as the capital and finial, looks to be a different stone from the bottom four sections of the shaft. Also the style of the letters looks different from S.C.C.,

Fig. 10. The serious crack on the finial of the Lochgoilhead obelisk.

which has lost the second C owing to a poor repair. So something has happened in the past. Has there been a significant repair or is it an amalgamation of two different obelisks perhaps?

It certainly is in a prominent position in the village overlooking the loch (Fig. 11). New gnomons have been added in recent years, but they are not typical (Fig. 12) and although Ross says it was probably a market cross, this is unlikely. As to the date of 1626, this is also unlikely. Historic Environment Scotland say that the date of 1626 was mistakenly re-cut in the 19th century from 1696 and they mention the similarity to the 1695 obelisk at nearby Asknish House.[2]

Fig. 11. The obelisk overlooking Loch Goil.

Fig. 12. The new non-typical gnomons on the capital of the Lochgoilhead obelisk.

Whilst in the area I took the time to visit Asknish House, not mentioned by Ross, which was not easy to find. Indeed the house and whole estate had been abandoned, including two cars still in the drive. The sundial was sitting almost in a wilderness in what once had been immaculate grounds (Fig. 13). It had seen better days with significant lichen, no surviving metal gnomons and with some serious damage (Fig. 14). Happily the estate was sold in 2017 and hopefully the new owners are bringing the house and grounds (and maybe the sundial) back to their former glory.

Fig. 13. The obelisk in the abandoned estate of Asknish.

Fig. 14. The damage on the middle section of the shaft of the Asknish obelisk.

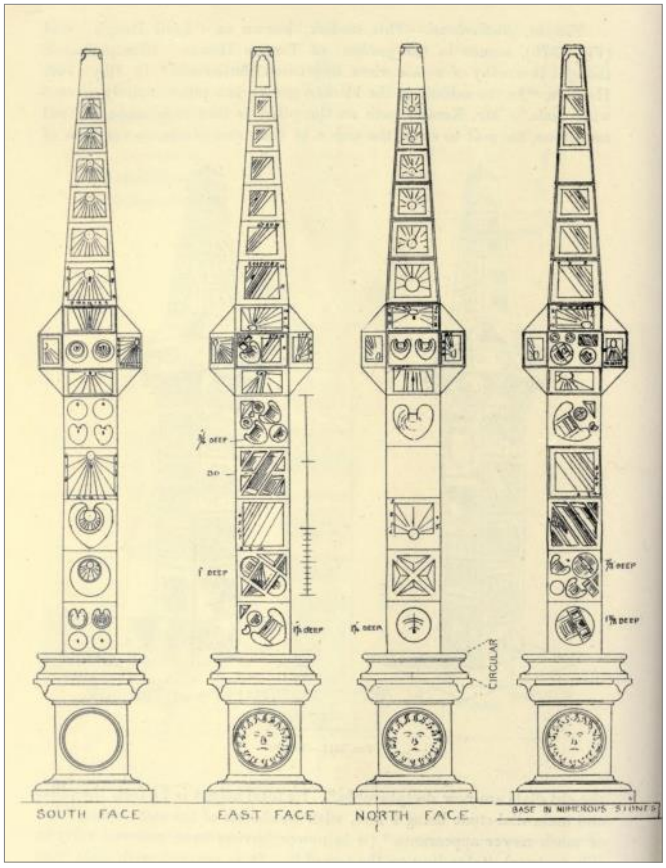

Fig. 15. Ross's architectural drawing of the obelisk at Mount Stuart on the Isle of Bute showing all four faces.

Whilst researching my trip to the ferry to see the obelisk at Mount Stuart on the Isle of Bute, I noticed that I would be passing the gateway to Ardgowan, but more of that later. A short half hour ferry journey takes you from Wemyss Bay on the west coast to Rothesay, the main town on the Isle of Bute. A lovely drive down the coast leads on to Mount Stuart, a 19th century mansion with huge gardens. Indeed the obelisk here is located in the Wee Garden, which is not so wee at five acres! Ross has the following to say of it:

"*The drawings of this dial* [Fig. 15]*, which were kindly lent us by Mr. G. Washington Browne, architect, are so minute as to render description scarcely necessary. The dial rests on a pavement of stones taken from the shore. The shaft and the tapering part of the dial each measure 3 feet 10 inches, the capital is 1 foot 10 inches, and including the pedestal the whole height is 11 feet 4 inches. The capital of this dial differs from those of the normal type in this respect, that the four triangular pieces connecting the octagon with the square are left in on the upper reclining surfaces, and are only cut out in the usual manner on the under or proclining surfaces.*"

Fig. 16 shows the four sides of the obelisk during my visit. I do not understand Ross's comment regarding the triangular pieces connecting the octagon with the square as they have been cut out in the usual manner on both the reclining and the proclining surfaces. Today it is in a very poor condition with many cracks and much lichen and it is no longer on the pavement of stones. As can be seen in Fig. 17, at some point the gnomons have been replaced and unfortunately south gnomons have been fitted to the dials on the north faces of the finial.

Fig. 16. The four faces of the Mount Stuart obelisk today (South, East, North and West).

Fig. 17. The finial's north face of the Mount Stuart obelisk on the left side with the incorrect gnomons.

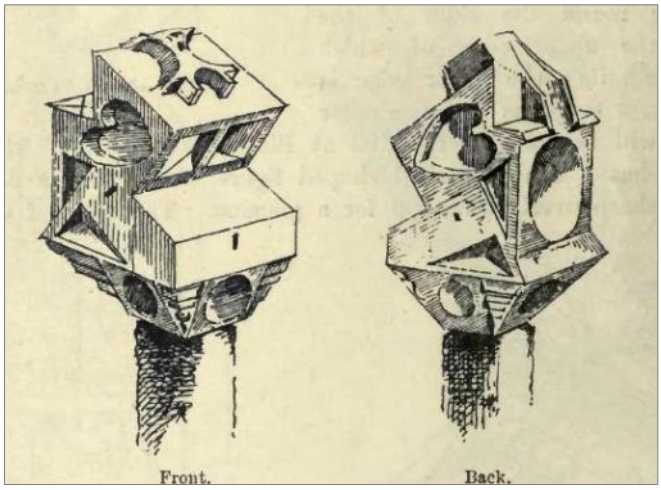

Fig. 18. Ross's sketches of the "mutilated" Ardgowan lectern sundial.

On our return to the mainland I called in to Ardgowan to see the once lost lectern sundial. Ross said:

"*This mutilated dial* [Fig. 18]*, which adjoins the old castle, has a considerable resemblance to the Ruchlaw*[3] *and Neidpath*[4] *dials*."

Somerville recorded this lectern dial as missing[5] but Sir Ludo Shaw Stewart, the owner, advised me that his mother had stored it away in a room in the ruined castle within the estate. Today it is now located within an outbuilding adjacent to the main house and, as Ross suggests, it is in a poor condition. Unfortunately the lighting in the outbuilding was poor and not conducive to photography and it was far too heavy to turn or move outside, so I could only get a poor photograph of the west face (Fig. 19). However, I am glad to record that it is no longer missing and Sir Ludo plans to have it restored at some point in the future.

Fig. 19. The west face of the Ardgowan lectern sundial today in the outbuilding.

There is another sundial here at Ardgowan, not mentioned by Ross, and it is positioned in the formal garden to the south-west of the house. It is a stone cube sundial on a high pillar that is decorated with swags and tails and foliage

Fig. 20. The Ardgowan cube sundial high on its decorated pillar.

Fig. 21. The north and east faces of the Ardgowan cube sundial with the three Atlas figures holding the globe aloft.

(Fig. 20) and thought to date from 1766. There are dials on all four sides with the Roman numerals all carved in relief and the four oversize gnomons are all complete. On top of the cube, three lead Atlas figures hold a globe aloft on their shoulders but with the weight taken by a metal rod (Fig. 21).

A fine end to my long trip to the Isle of Bute.

REFERENCES

1. D. MacGibbon and T. Ross: *The Castellated and Domestic Architecture of Scotland – Volume 5,* David Douglas, Edinburgh (1892).
2. *https://canmore.org.uk/site/23615/lochgoilhead-sundial*
3. Dennis Cowan: 'In the Footsteps of Thomas Ross. Pt. 36. Some East of Scotland Sundials', *BSS Bull*., 33(iii), 10-16 (September 2021).
4. Dennis Cowan: 'In the Footsteps of Thomas Ross. Pt. 30. Neidpath Castle', *BSS Bull*., 32(i), 26-28 (March 2020).
5. Andrew R. Somerville: *The Ancient Sundials of Scotland*, Rogers Turner Books, London (1994).

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Postcard Potpourri 58 – Great Yarmouth

Peter Ransom

A simple horizontal dial by the Boating Lake in The Waterways park at Great Yarmouth features on this postcard, of which I have two copies, both postally used. One is dated 1929, the other 1932. The Boating Lake and the associated 'Venetian Waterways' were constructed between 1926 and 1928, so these cards were perhaps popular at the time.

The Waterways were a success, but by the late 20th century and early 21st a decline in the number of visitors led to their deterioration from lack of maintenance, and the Boating Lake was closed for more than a decade.

In August 2019 the Great Yarmouth Venetian Waterways re-opened after extensive restoration. People can hire a rowing boat or pedalo to get across to the island café (shown on the postcard) if they do not want to use the bridge.

There is no record of this dial in the Fixed Dial Register, so perhaps it was not restored. A search on eBay for postcards featuring the boating lake show various views that include the dial: one postcard dated 1965 shows the dial plate on the pedestal, but the gnomon is missing.

The postcard was produced by Donlion Productions, Doncaster, which opened in 1924 and closed in 1931. A full history can be found on the Internet by searching for Donlion Jamson (the family name of the company).

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READERS' LETTERS

Belvoir Castle: Another Stolen Sundial

Folk who travel along the A52 from Nottingham to Grantham may be rewarded by the magnificent sight of Belvoir Castle on its ridge on the skyline, dominating the whole of the Vale of Belvoir in Leicestershire. The castle, the seat of the Dukes of Rutland, was built during Norman times but has been extensively altered in the subsequent 800 years.

In the summer, my wife and I took our two teenage granddaughters, at their request, to visit the castle. The gardens are splendid, and we spotted what appeared to be a sundial in the Rose Garden. Sadly, when we got closer, it was obvious that all was not well. There on a short pillar sat the base plate of a heliochronometer (Figs 1 and 2). There was no sign of the actual instrument. I contacted the Castle Archivist, Dr Vicki Perry, who informed me that it had been stolen some time ago.

Fig. 1. The 'sundial' in the Rose Garden.

The Belvoir heliochronometer is number SRN 8008 in the BSS Sundial Register 2020. The only photograph we have is from the Internet (Fig. 3), unfortunately of low resolution, which shows how the instrument looked before the theft. It was made by John Gunning, serial number JPG072. The heliochronometer was beautifully decorated with a floral pattern. The correction for the Equation of

Fig. 2. Closeup of the base plate of the heliochronometer.

Fig. 3. The original Gunning heliochronometer. Photo: J. Hannan-Briggs, used under Creative Commons Licence.

Time was by an analemma carved on the backsight, rather than by a complicated mechanism as in the Pilkington and Gibbs heliochronometers.

It is unlikely that the heliochronometer will re-surface, but one never knows. Perhaps members would keep a lookout for it. It is very distinctive.

John Wilson

A London Welsh Sundial?

Following my article on sundials with Welsh language inscriptions in the September 2021 issue of the *Bulletin*[1] I received a number of interesting emails. They mostly related to my own vertical slate dial, dated 1812, signed by 'Griffith Dafydd', but of uncertain provenance (Figs 1 and 2). I acquired this dial thanks to Doug Bateman, former chair of the BSS. Doug originally reported that the dial had been found at an Oxfordshire farm, but he has now revised this. It seems that the farm was located in outer London, and was thought to have once been owned by an Oxford college, hence the mistake.

Fig. 1. Vertical slate dial signed "GRIFFITH DAFYDD".

Of particular interest was a letter from Sue Manston recalling her *Bulletin* article from September 2017,[2] for which I am most grateful. Sue included the details of a prizewinning dial of 1820 which was made by a London Welshman called 'Griffith Davies'. Sue wondered whether the maker of my 1812 slate dial, 'Gryffith Dafydd' (as I had originally interpreted the signature), and 'Griffith Davies', maker of the prizewinning slate dial only eight years later, could be one and the same person. We are both aware that the form and spelling of Welsh names and their English equivalents have always been, and still remain, variable, therefore this is a real possibility. But we are also aware that these names are not unusual.

Fig. 2. Close-ups of "Griffith" and "Dafydd".

The biography written by his nephew shows that Griffith Davies was from North Wales, and was born 'Gruffydd Dafydd' into a poor family in rural Caernarvonshire in 1788. Like his illiterate father he worked on farms and in slate quarries. After acquiring some education he moved to London in 1809. There he developed further his interest in mathematics and joined the Mathematical Society whose library was of huge importance to him. He became a teacher of mathematics, also taught navigation, wrote on trigonometry and applied himself to learning the theory and practice of life assurance, and eventually became a prominent actuary. He was consulted by assurance societies at home and abroad, and worked for the East India Company and the Bank of England. In 1831 he became a Fellow of the Royal Society. But it was as an actuary that he was most widely known.

We can assume that by 1819 he was also well known for making sundials because he was advised in that year by the Society for the Encouragement of Arts, Manufactures and Commerce to submit to them the horizontal sundial which he had engraved on Welsh slate some years earlier. For this he was awarded the society's large silver medal in the summer of 1820, and a description and engraving of his prize dial was published in the society's transactions in 1821.

In his submission statement which accompanied the original sketch of what was to be his prizewinning dial, Davies commended slate as a material because of "…the lowness of the price for which such dials may be engraved compared with brass…". His prizewinning dial was 27 inches square and one inch thick. (The 1812 vertical dial is just over 17 inches square and is also one inch thick.)

Whether the original slate dial still exists is unknown, but Sue Manston has described it in detail in the 2017 *Bulletin* article, based on the published engraving. This complex dial was designed for a latitude of 51° 32′ N, the approximate latitude of Griffith Davies's school of mathematics in Cannon Street, London, where he was based at the time.

If Griffith Davies was already known for making slate sundials in the early years of the 19th century, as shown from the invitation to submit his prizewinning design, could my own dial, signed by 'Griffith Dafydd' in 1812, also have been made by the man from Caernarvonshire, by then living in London? It was only three years after his arrival in London, so he may well have still been using the

Welsh version of his name, especially among his fellow-Welshmen, even alongside the use of the English form in his professional life. There was certainly a large Welsh community in London at that time, and Griffith Davies, a Welsh Calvinistic Methodist, was a chapel-goer and later became an elder in his chapel, where all the services were held in Welsh.

If we could establish that the 1812 dial had been made for the latitude of London, this could support the possibility that it was made by the prizewinning Griffith Davies, either for himself or for a local Welsh customer. I took the dial, which had long ago lost its gnomon, to the BSS meeting in Newbury in September 2021 and Sue Manston took measurements (Fig. 3). She used them at home to calculate the declination and the latitude for which the dial was delineated. Her calculations revealed that the dial was made to face approximately 20° E, and for a latitude in the range of 51.3° to 51.7°, which is close to the latitude of the prizewinning dial for London. We know from his biography that Griffith Davies moved house in 1812 to Bartholomew Square; was the dial made for his new house? And we know too that he was married in November 1812, so might the vertical dial have been made to commemorate this event? This seems unlikely as neither the Welsh inscription (translated as "The days are like a shadow") nor the Latin inscription (translated as "The hour which has passed cannot return") have a celebratory ring to them. And we may also have expected to see a more direct reference to the occasion. We read in his biography that Griffith Davies had "slight acquaintance with Latin", so need not be too surprised at his use of an extract from Ovid, if he was indeed the maker of this dial.

We come back to where the 1812 dial was 'found' in the 21st century, namely on a historic farm site in the parish of Northolt in Ealing. (I can find no connection, past or present, of this farm with an Oxford college.) A farmhouse was built there in the late 17th/early 18th century which incorporated parts of an early Tudor building, but this was demolished in 1954 and a smaller house replaced it. So the dial would not have been made for the present building. But the latitude of this farm is 51.5° N, matching the dial. Perhaps I need to delve further into the history of the farm and especially its 19th-century occupants. If a Welsh connection could be established, it might add something to the story.

Without any justification I had always assumed that my dial was originally made for a location in North Wales, and had 'accidentally' arrived at the English farmhouse where it was found. But one thing I do know now is that it was not made for North Wales.

Many factors support the supposition that Griffith Davies and Griffith Dafydd are the same person: the name itself, the proximity in dates of the two dials, the use of Welsh slate, and not least the London latitude of the dials. But none of these is sufficient to prove the case beyond reasonable doubt, but nor is there anything we know which precludes the possibility either.

Fig. 3. Irene Brightmer, John Davis and Sue Manston (L-R) examining the dial at the 2021 Newbury Meeting.

It could possibly be argued that the 1812 dial may have been made by a Welsh diallist named Griffith Dafydd for a location anywhere along the latitude of 51.5° N, for a Welsh client with some interest in the classics. However, this latitude rules out any possibility that the dial was made for a Welsh location, except for a very short stretch in the southernmost part which fits the 51.5° latitude of the 1812 dial.

I therefore like to think that my 1812 Welsh slate dial was made by a notable London Welshman, a Fellow of the Royal Society, and the maker of a prizewinning Welsh slate dial of 1820. My dial may well have been made for his own new house in Bartholomew Square, or even the farmhouse in Ealing.

But we shall never know for sure.

REFERENCES

1. Irene Brightmer: 'Welsh language inscriptions on sundials', *BSS Bulletin*, 33(iii), 32-35 (September 2021).
2. Sue Manston: 'An interesting slate sundial by Griffith Davies, FRS', *BSS Bulletin*, 29(iii), 28-32 (September 2017).

Irene Brightmer

Correction

In my article 'A Celebration Sundial – Using CAD/CAM', published on pages 30–35 of the December 2021 *Bulletin*, I referred to the dial type as 'hectemoros'. This was incorrect. In dialling, the term 'hectemoros' refers to the Ptolemaic system of coordinates, and dials using such a system are detailed in the NASS *Compendium*, September 1998, 5(3):17-24, reprinted in *Sciatherics* Vol. 2 by Fred Sawyer. In this article, a latitude-independent mean time dial is described which has very similar wavy hour lines for each month as in my dial. So my dial should be named by its other more prosaic term 'spider dial'. Thanks to Steve Lelievre and Fred Sawyer for pointing this out.

Kevin Karney

HOW NOT TO RE-GNOMON A SUNDIAL

JOHN DAVIS

Replacing lost or broken gnomons is a very frequent request to any sundial maker. It really should not be difficult: the basic geometry and dimensions are determined by the dial plate, the artistic style can be chosen to match its period and the materials are also determined by those of the dial. I am constantly amazed, though, at what an awful job I see carried out on perfectly good sundials by well-meaning but ignorant DIYers. The dial in Fig. 1 shows just about all the pitfalls it is possible to find and so is an object lesson in what to avoid.

Fig. 1. The dial with its replacement gnomon.

The dial was described by its seller as being from the late-17th century which is quite a reasonable guess though it could equally be from the early 18th. He admitted that the gnomon was a later replacement but said that it "looked the part" which it most definitely does not. When I saw the original lo-res photographs I guessed that it had been made by bending a length of square-section brass rod but this turned out not to be the case. In fact, it has been rather neatly cut from a sheet of mild steel, probably using waterjet or laser cutting and with the edges nicely machined square and smooth. It is 10.4 mm thick which is not a standard metric or Imperial size and is much thicker than the noon gap and the width of the tenon slots. The reddish colour is due to a fine layer of rust which unfortunately has also begun to spread across the dial plate and indicates that the dial has really been outdoors. The gnomon is held to the plate by two Pozidriv™ screws which date the repair to after 1963 at the very earliest. They are inserted through newly created countersunk holes rather than the rectangular slots cut for the original tenons.

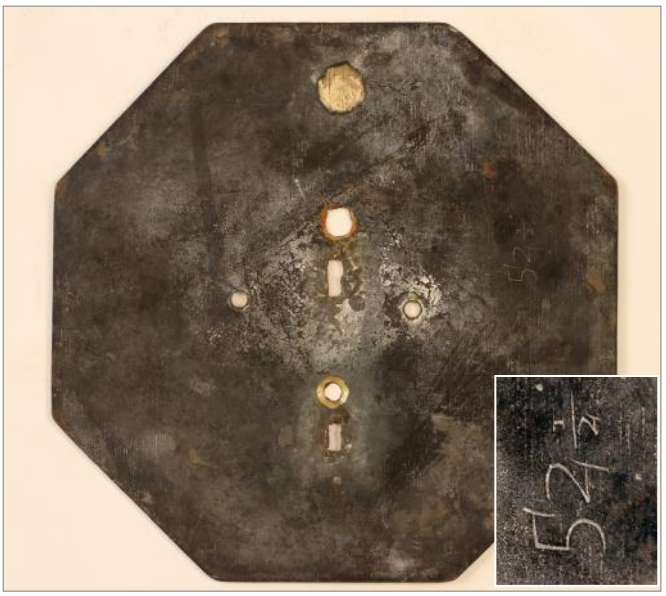

Fig. 2. The back of the plate with (expanded in the inset) the engraved design latitude of 52½°. [The bright spot at the top is an area cleaned for XRF analysis.]

The angle of the gnomon has been accurately cut to 40.0° – why is anyone's guess. The gnomon has also been positioned approximately centrally on the plate so that the nominal 'toe' (taking the rounding into account) falls far to the south of the VI–VI line. It does not take much thought to realize that the shadow of the style edge is not going to lie along the hour lines but clearly this did not occur to the repairer.

There really was no excuse for getting the gnomon angle wrong as the numerals "52½" are neatly and clearly engraved on the back of the plate – see Fig. 2. This is quite unusual and one of the reasons I was drawn to the dial. The numeral style is 17/18th century and was obviously put there by the original maker to remind him of the design latitude, perhaps because he had several dials on his workbench at the time or as an instruction to an engraver for what dial he needed to draw. This latitude is rather an unusual one as it runs between the centres of Ipswich and Norwich in East Anglia and on through the town (at the time) of Birmingham (at 52.49°) further west. The tolerance on quoted latitudes in the pre-Ordnance Survey

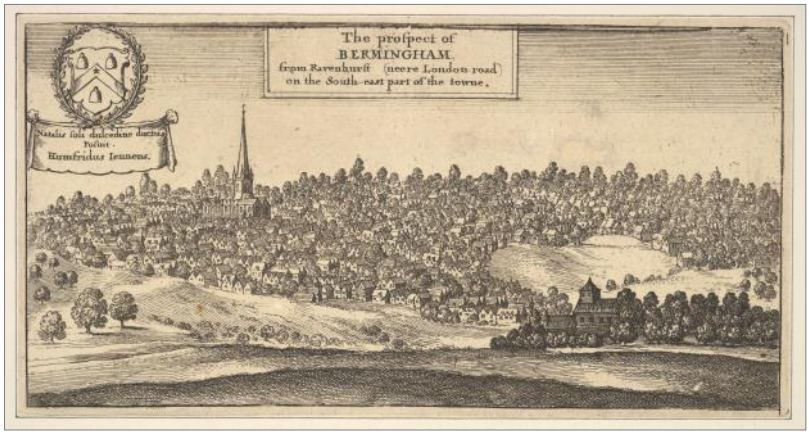

Fig. 3. Engraving of Birmingham by Wenceslas Hollar, from Dugdale's 'The Antiquities of Warwickshire', 1656, p. 957.

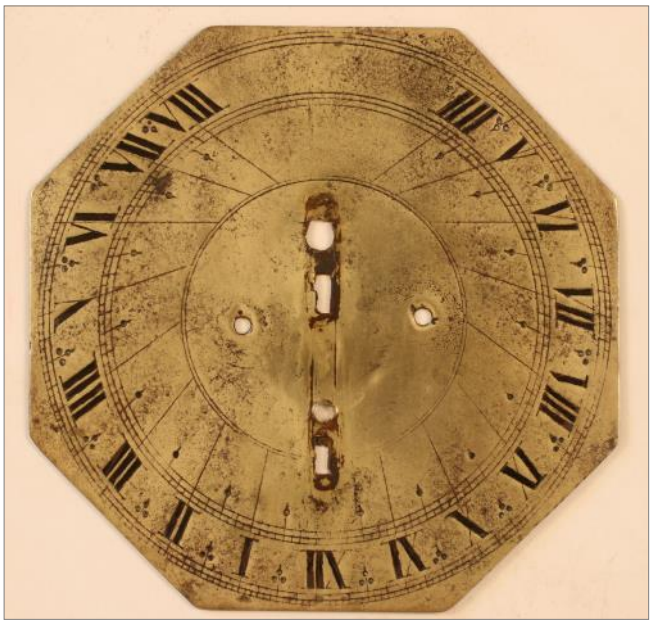

Fig. 4. The cleaned and waxed dial plate.

map era was generally around 5 to 10 arcminutes so that would include quite a broad swathe of land. The smallish size of the dial (178 mm a/f, 7″ nominal), though, suggests that it was not intended for a grand country house. Birmingham at the time was a much smaller town than it is today (see Fig. 3) but its first library had been established by 1642, the same year that Nathaniel Nye – the town's first known scientist – published his *New Almanacke and Prognostication calculated exactly for the faire and populous Towne of Birmicham in Warwickshire*.[1] The dial itself is not signed which should not have been allowed if it had been a London-made one so perhaps it was locally made.

Another feature which attracted me to the dial was that it has both an outer chapter ring divided to 5-minute increments and an inner one divided to half-quarters (7½ minutes). This feature is often found on larger high-quality dials from this same period but to find it on a smaller dial is more unusual. In this case, the material is a typical hand-hammered plate a nominal 1/16″ thick and of a copper alloy which closely mirrors that of the John Sill dial recently analysed and reported.[2]

After removing the offending gnomon, the plate was conserved by cleaning off the rust using the commercial 'De-corroder' fluid supplied by the same provider as the 'Renaissance' micro-crystalline wax which was then used to protect it from further oxidation.[3] The former liquid was applied by a stiff brush for a limited period as, although it claims to be safe for long immersion, it does reveal the grains in old copper alloys in the form of lighter-coloured irregular polygons of about a millimetre in size. See Fig. 4.

As the dial states its design latitude, it was of interest to see how accurately the maker had managed to achieve this. The angles of the hour and half-hour lines were carefully measured by importing a photograph of the plate into a CAD system and comparing them with the theoretically calculated values. The results are shown in Fig. 5 and indicate that the design has indeed been executed quite accurately with the errors (i.e. theoretical *minus* measured angle) being in the range ±0.3°. If the points for the 'back hours' (before 6 am and after 6 pm) are excluded, leaving only the hour angles between –90° and +90°, then the band is even narrower with an average value of 52.48° ± 0.08°. This is equal to the best London dials of the period, especially when it is remembered that part of this variability will be my measurement error.

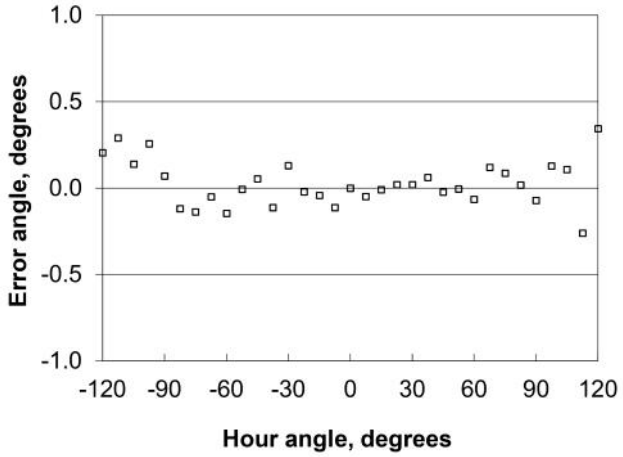

Fig. 5. Error profile for the dial's hour lines compared to the stated design latitude of 52.5°.

As yet, I have not made a proper replacement gnomon. I may well do so as the latitude would suit my home very well.

REFERENCES

1. See Wikipedia entry for Birmingham.
2. John Davis: 'John Sill of Ulverston. An unrecorded Cumbrian dialmaker', *BSS Bull*., 33(iv), 2-6 (Dec. 2021).
3. Produced by Picreator Enterprises Ltd. The 'de-corroder' is an amine complex of hydro-oxycarboxilic acid in an aqueous solution. It is a green liquid with a pH of approximately 4.0.

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SUNDIALS OF PETERHOF

VALERY DMITRIEV

Located 20 km from St Petersburg on the shore of the Gulf of Finland and widely known as the Russian capital of fountains, Peterhof is Peter I's favourite country residence. The first garden sundial appeared at Peterhof under Peter I and, on his direct instructions in 1723, five sundials were brought there "By His Imperial Majesty's personal decree". Five alabaster sundials were ordered to be made and located in convenient places according to their prospects. "For these sundials, it is necessary to make five pointers from copper boards according to the model with which the sundial will show the time… And then, they must be sent to Peterhof".[1]

Of the five original sundials, we know two of the places where they were installed – in the Upper Garden near the Grand Palace and in the Lower Park near the Monplaisir Palace (*Mon plaisir* in French means my pleasure). I have already described the sundial of the Upper Garden in the *BSS Bulletin*.[2] Now we will discuss the sundial of Monplaisir[3] which was built in 1714–23. In the favourite residence of the Russian Tsar, the huge Peterhof palace and park ensemble, there is a small palace with its garden on the seashore. Monplaisir, located on a cosy and secluded corner, was the favourite vacation spot of Peter I, which reminded him of his beloved Netherlands.

Peter first became acquainted with a variety of sundials during the Great Embassy of 1698, in particular when visiting London and its suburbs. The young, ardent and inquisitive Tsar of All of Russia, while travelling in Europe, greedily absorbed new knowledge and skills in various fields of science and technology, including astronomy and astrometry. A quarter of a century later, in 1723, Peter the Great was already the All-Russian Emperor, a great lover and connoisseur of sundials, the owner of a wonderful collection of dials, a man who took part in the creation of curious sundials and in the editing of a book which was partly devoted to the calculation of sundials.[4] His favourite country residence had to have this astronomical time measuring device.

The first Monplaisir sundial stood from 1723 to the middle of the 18th century. In 1748, a new sundial was installed at the Monplaisir Palace. The Order of the Office of the Buildings states that "The stone dial available to the master of Tsvenhoff should be sent to Peterhof for the installation at the Monplaisir Palace".[5] The reason for replacing the sundial under Elizabeth Petrovna – the youngest daughter (1709-62) of Peter the First, Russian Empress 1741–62 – is not known to me. I presume that it is most likely to be due to the destruction of the dial made of alabaster; the new stone dial was put in its old place.

Fig. 1. Discussion of the sundial project at the meeting of the Restoration Council of Peterhof State Museum-Reserve. Photo: Elena Chernyaeva.

We can find an image of this dial on the axonometric plan of Saint-Hilaire[6] in 1772: it shows a horizontal sundial on a pedestal – you can see the simple triangular gnomon and the square dial. The last known image of this sundial is dated 1933: it also shows a horizontal sundial on a pedestal and you can see the simple triangular gnomon and the square dial. In the photograph of the details you can see only a thin, most likely metallic, triangular gnomon.[7]

The available information suggests that the Monplaisir dial was a horizontal sundial with a classic gnomon in the form of a curly triangle. According to the materials used, the sundial had a stone (marble) dial plate and metal (gilded copper) gnomon. Neither detailed descriptions nor images of the gnomon and the dial have been preserved.

The second sundial of 1723 – in the Upper Garden of Peterhof – has also had several incarnations (material realizations) over the past 300 years. The last surviving description and photograph speak of a horizontal sundial with a marble dial and a gilded copper gnomon.

During the Second World War, the Monplaisir sundial was lost. For the last 75 years, nothing has reminded us about this sundial, but the year 2021 has come and the reconstruction has begun. The will and desire of the Peterhof State Museum-Reserve Director, active sponsors, manufacturer, historian and master of sundials, architect,

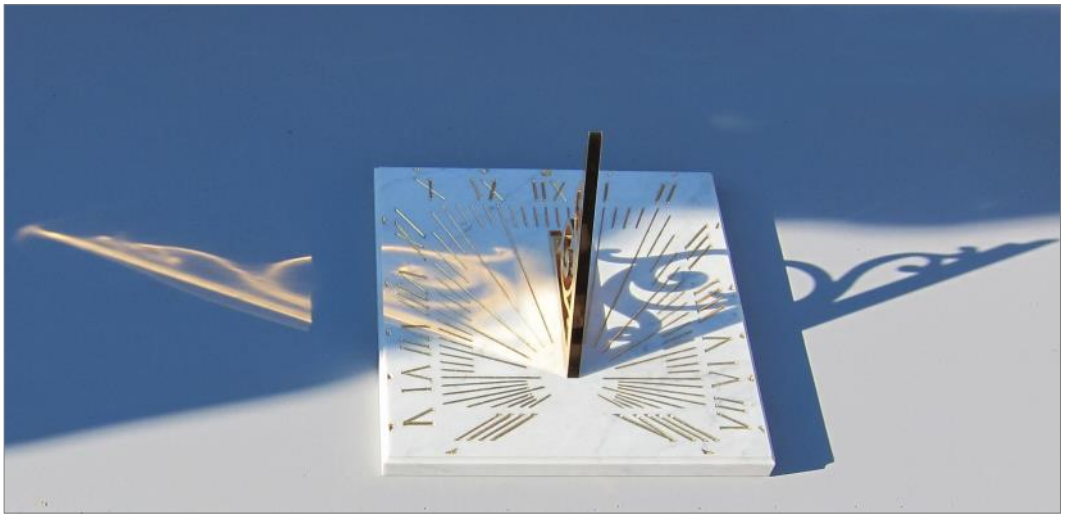

Fig. 2. Waiting for the pedestal.

Fig. 3. Installing the sundial on the pedestal. Photo: Nadezhda Lebedeva.

curators and restorers have been found. In violation of Murphy's law, this large team managed not only to develop the project, but also to bring it to a practical result – the manufacture and installation of the sundial. For half a year, the course of design and manufacture was constantly discussed at the Restoration Council of the Peterhof State Museum-Reserve (see Fig. 1).

As the basis for the design solution, the keepers of the sculpture of the Peterhof State Museum-Reserve chose the garden sundial with an ornamental floral gnomon. There are quite a lot of such sundials in the history of gnomonics with the most similar in spirit to the Monplaisir garden being the dials of the English mathematical instrument master John Rowley, including the sundial installed in 1719 in the Berggarten in Hanover.

The project of recreating the sundial for the Monplaisir Palace was developed by the author and the Chief architect of the Peterhof State Museum-Reserve, Ivan Lebedev. It was important not to copy Rowley's works but to create a beautiful and correct sundial in the wonderful architectural and garden environment, so none of Rowley's famous dials were copied. The sundial shows local solar time for the installation location having coordinates 59° 53′ 13.7″ N and 29° 57′ 7.69″ E.

The pedestal for the sundial was made of marble in the 18th century. The place of installation is almost authentic, at the corner of two alleys near the Monplaisir Palace (the original historical place is occupied by a thuja tree, next to which the pedestal is installed). The dial plate is made of white Carrara marble (380 × 380 × 30 mm); the engraved numerals, hour lines and hour markers are covered with gold leaf. The gnomon is made of gilded bronze.

The manufacturer of the sundial is Petrodvorets Watch Factory "Raketa", the sponsors of the re-creation are Petrodvorets Watch Factory "Raketa" and Total Energy Marketing Russia. Of course, specialist restorers of the Peterhof State Museum-Reserve participated in the manufacturing of sundials. The pedestal was restored in the restoration workshop "Heritage".

The sundial was born (i.e. the assembly of the gnomon, dial and base plate) on 11 October 2021 at 11:00. It saw sunlight two hours later and, while waiting for the pedestal, spread its 'wings' in the form of two 'shadows' of the gnomon – direct and reflected, and enjoyed the sun, light and the beginning of life (Fig. 2).

The pleasure did not last long – while the pedestal (Fig. 3) was being installed along the pre-marked midday line, then a short admiring of the last rays of the sun and the 'first steps' of the sundial in measuring time (Fig. 4) – after which the lid of the protective box closed the sundial, and it was left without sunlight for three days in anticipation of the grand opening celebration.

Fig. 4. "I measure time".

On the day of the grand opening on 14 October 2021, the sundial stood under the red blanket (Fig. 5) waiting for all the guests to arrive. "I missed the sunlight, it's time to get to work," thought the sundial, "Now everyone will gather and start speaking. I wonder if anyone will think to praise me? Or as usual will they praise only Peter the Great and Peterhof ?"

But then all the invitees came and fell silent, and the Director of the Peterhof State Museum-Reserve, Elena Kalnitskaya, and the Chief manager of the Petrodvorets Watch Factory "Raketa", David Henderson-Stewart, approached the pedestal with the sundial. They opened the dial to the autumn sky (the day was not sunny) as can be seen in Fig. 6. And so, the 'new old' Monplaisir sundial began its operation. The time of Peter the Great and the true solar time have returned to Peterhof.

Fig. 5. Waiting for the grand opening.

Fig. 6. Opening of the sundial.

The speakers at the opening talked about the history of Peterhof, Peter the Great, sundials, and PWF "Raketa". By the way, the company is the successor of the Peterhof Lapidary Factory founded by Peter the Great and has a 300-year history. While the speeches were flowing, the

Fig. 7. After all the guests left the Monplaisir garden. Photo: Ivan Lenedev.

assembled guests were able to see and photograph the sundial in detail and then, half an hour later when all the invited guests left Monplaisir, the dial was left alone waiting for the sun (Fig. 7).

Postscript

For me, this project was very interesting for the opportunity to participate in the reconstruction, albeit a little free, of the historical sundial of the time of Peter the Great in a wonderful architectural and landscape environment. Maybe someday all five sundials of the 18th century will be restored and Peterhof, in addition to its famous titles, will become the capital of garden sundials of Russia. God willing.

In addition to the garden sundial in the Peterhof State Museum-Reserve, there is a small collection of museum sundials, which is exhibited in a Special Storeroom of the Grand Palace of Peterhof and in the Travelling Palace of Peter I in Strelna (10 km from Peterhof). The jewel of the collection, of course, is the John Rowley sundial, which is part of the exposition of the Grand Palace. It is a Mechanical Equinoctial Ring Dial (Fig. 8). It was commissioned by George I from his 'Master of Mechanicks' John Rowley, dated 1715 and presented to Peter I as a diplomatic gift. There are two inscriptions on the dial plate: "*By His Majesty of the Great Britain Command*" and "*Made by His Majesty J. Rowley Master of Mechanics*". On the sighting circle under the crown is the monogram of King George the First. Next to it in the glass showcase are portraits of Peter the First and George the First.

In addition to the Rowley sundial, there are two small silver sundials of the French master Michael Butterfield. These are horizontal sundials with compass, two scales of digits with the inscription *Butterfield de Paris* and gnomons in the form of a bird with a variable angle of inclination.

In the Travel Palace of Peter the Great in Strelna (the Russian Tsar's residence) there are a small horizontal sundial by an unknown maker and an astronomical compendium, including a horizontal sundial and a lunar volvelle, made by French dial maker Charles Bloud from Dieppe.

Fig. 8. John Rowley. Mechanical Equinoctial Universal Equatorial Sundial. 1715. © The Peterhof State Museum-Reserve, photo, 2021. Photo: D.G. Iakovlev.

ACKNOWLEDGEMENT

I am grateful to Maciek Lose for the information and comments on the garden sundial of John Rowley and Charles Bloud sundial.

REFERENCES and NOTES

1. Russian State Historical Archive – РГИА. Фонд 470, Опись 5, Дело 4, Сентябрь 1723, Листы 46–47, 75.
2. Valery Dmitriev: 'Sundials of St Petersburg', *BSS Bull*., 21(i), 22-26 (March 2009).
3. V.I. Dmitriev: 'The history of the Peterhof sundials and the issues of its reconstruction', Дмитриев В.И. История солнечных часов Петергофа и вопросы их воссоздания. От «царского огорода» к музею-заповеднику: Сборник статей по материалам научно-практической конференции ГМЗ «Петергоф». СПб, ГМЗ «Петергоф», 2018, С.280-286.
4. Jacob Bruce: 'The techniques of dividers and rulers or the most chosen beginning in the mathematical arts'. – Брюс Яков Вилимович. Приемы циркуля и линейки или избраннейшее начало в математических искусствах, М, 1709.
5. N.I. Arkhipov: Reference to the project of restoration of the Lower Garden – Архипов Н. И. Справка к проекту реставрации Нижнего сада. 1966. С. 70 // Архив ГМЗ «Петергоф».
6. P.A. Saint-Hilaire: Axonometric plan of Monplaisir Palace in the Lower Park in Peterhof. 1772-1774 – Сент-Илер П. А., Аксонометрический план. Дворец Монплезир в Нижнем парке в Петергофе. Фрагмент. 1772–1774 // Архив ГМЗ «Петергоф».
7. Central State Archive of Literature and Art of St. Petersburg – ЦГАЛИ СПб. Фонд 420, Опись 1, Дело 51, Лист 11.

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THE PRAG SUNDIAL, WESTMINSTER

JOHN, PETER and THOMAS PRAG

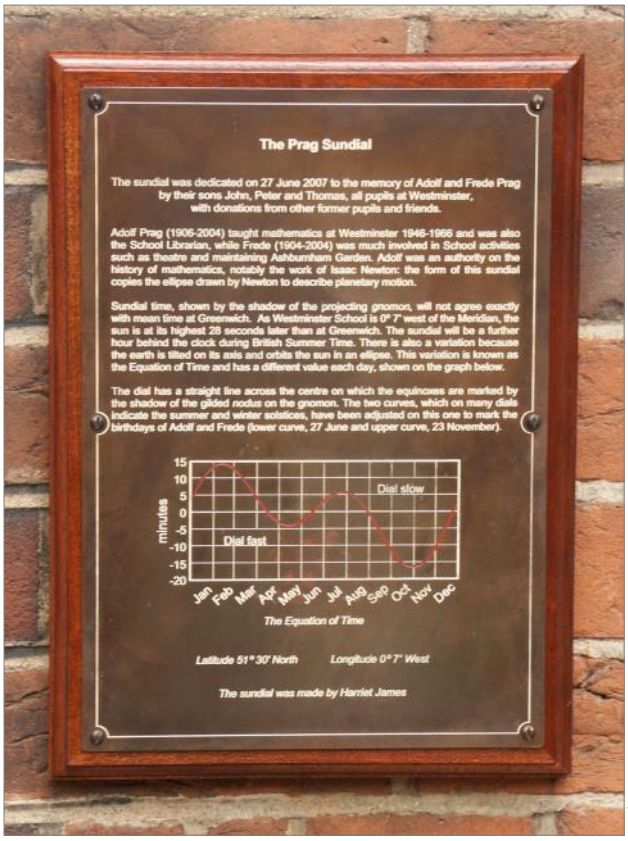
The text of this article was previously published in the Society for the History of Astronomy's *Bulletin*, 36, 26-29 (Autumn 2021). The opening of the dial was reported in the New Dials feature of the *BSS Bulletin* in December 2007.

Fig. 1. The Prag Sundial.

Our father Adolf Prag (1906–2004) was an exceptional and much-loved teacher as well as an authority on the history of mathematics, notably the work of Isaac Newton. His teaching career began in Germany but in 1933 Nazi policies forced him to emigrate to Britain, where he taught at St Edward's School in Oxford, Winchester College and finally from 1946 to 1966 at Westminster School. He had a deep love of clocks (the house was full of them) and because Westminster had no real school clock and relied on the chimes of Big Ben nearby he presented a fine turret clock to mark the successful passage of his first son through the school, which was installed over the archway leading from Dean's Yard into the heart of the school in Little Dean's Yard. However, he was so modest that only long afterwards did he allow a very small plaque to be attached beneath it. Later he gave a second clock to celebrate his second son which was placed on the wall of the school hall ('Up School') (and later mislaid during refurbishment) but the third clock for the third son never happened.

He has no other memorial: his ashes, together with those of his wife Frede (1904–2004) who was also much involved in Westminster's activities, are scattered over their favourite Welsh hill and we – their three sons – felt that it would be appropriate to mark their long association with Westminster not with a third clock but with a sundial. It was a notion that won the support of many of their friends and former colleagues, and one which would continue the theme started by Adolf himself while also commemorating his various contributions to research on Isaac Newton. He was personally responsible for the restoration of Newton's monument in the Abbey, quietly and doggedly ensuring that it was done to the proper standards, often in the face of indifference from the Abbey authorities. Frustrated by bureaucratic delays, he paid for the restoration himself, even using money collected to mark his retirement from Westminster towards the cost. He spent the first 25 years of his retirement as a key member of the team led by Professor D.T. Whiteside which edited and published Newton's correspondence and mathematical papers, but only allowed his name to be listed as a co-author in the final volume.[1]

Fig. 2. Harriet James with Mark Rawlins (the stonemason who expertly inserted the dial into a Listed wall and also invented the machine that cut the scaphes in the dial corners).



John Davis

Fig. 3. Descriptive plaque attached to Ashburnham House and showing the Equation of Time.

The dial (Fig. 1) was commissioned from Harriet James,[2] one of the country's finest sundial designers (Fig. 2). Newton was himself very interested in sundials and her design is based on the ellipse drawn by Newton to describe planetary notion and thus the course of the Earth around the Sun, while also complementing the setting in Little Dean's Yard 0° 7′ west of the meridian where the sun reaches its highest point 28 seconds later than at Greenwich. Lines which indicate the summer and winter solstices are found on many dials: Harriet adjusted them here to mark the birthdays of Adolf (27 June) and Frede (23 November), a very personal and appropriate piece of fine tuning typical of her approach. The colours chosen are those common on eighteenth-century dials, and the corners of the rectangular slab are embellished with golden hemispherical hollows which recall the scaphe dials of the Greeks and Romans in which the shape of the deep shadow cast by the circumference changes with the sun's movement during the day. The dial is accompanied by an explanatory plaque with an Equation of Time graph (Fig. 3).

The first idea had been to place the dial on the south wing of Ashburnham House beneath the windows of the room where Adolf had taught for twenty years. However, this is a listed building from the sixteenth and seventeenth centuries: with this in mind Martin Ashley, the school architect, suggested instead a position on the neighbouring Turle's House, close to the windows of Adolf's classroom, which works well on both aesthetic and architectural grounds (Fig. 4).

The sundial was unveiled at noon GMT (13:04 local summer time at Westminster) on 27 June 2007, the day on which Adolf would have celebrated his 101st birthday. To see the sundial hoisted on the scaffolding and secured into place in the preceding weeks was a nerve-racking experience, and was followed by apprehension about whether the sun would actually shine at the right moment. Typically for an English day in early summer there were spots of rain as the entire Prag family together with about seventy of Adolf's former pupils, members of the school staff and guests gathered on 27 June (Fig. 5); happily at seven minutes past one the sun did indeed make a brief appearance and the sundial could begin its work.

Westminster now has a timepiece which is unlikely to be lost, is not subject to the vagaries of power cuts, nor even like Big Ben likely to be silenced by occasional repairs. It was very moving to discover how many former pupils


John Davis

Fig. 4. The dial on Turle's House, Little Dean's Yard.


John Davis

Fig. 5. Thomas Prag introducing the dial at the unveiling ceremony on 27 June 2007.

remembered Adolf and Frede with affection and wanted to contribute to the cost of the dial, and did so with such generosity that the school was also able to establish an annual award in their memory. We like to think that modest and self-effacing though they may have been in life, nonetheless our parents are pleased to be remembered in this way.

ACKNOWLEDGEMENTS

Many people have contributed to the creation of the Prag Sundial. Harriet James's name stands first, for she did far more than just put chisel to stone, and working through the concept and the designs with her was a sheer delight from start to finish. Tom Whiteside gave liberally of his knowledge of Newton. At Westminster many people gave their enthusiastic support to the project: Stephen Spurr, the Head Master, and Eddie Smith, the Under Master and Archivist – this despite his being a devotee of Newton's enemy Robert Hooke, the Bursar Chris Silcock and the school maintenance staff, and the school Architect Martin Ashley (Martin Ashley Architects). Tori Roddy and her colleagues in the Development Office suggested and then organised not just the fund-raising but also the arrangements for the unveiling. At Westminster Abbey the Surveyor's Office took great trouble to ease access to the Newton monument. There are others whose names have slipped from our memory: we include them all in our thanks.

REFERENCES

1. D.T. Whiteside (ed.): *The Mathematical Papers of Isaac Newton*, Cambridge University Press (1964-81), 8 vols.
2. *www.sunnydials.co.uk*

STRANGE LONGITUDE REVISITED

JOHN FOAD

I recently came across an attractive dial at St Mark's, Longwood, West Yorkshire (Fig. 1). It was shown on the Geograph website[1] with the comment:

"*An unusual feature is that it bears latitude and longitude co-ordinates, which however are totally meaningless since they refer to a point in the Atlantic Ocean, west of Ireland.*"

"Long 25 35 West" across the top of the dial plate does look like an error, and the dial has been through at least three major refurbishments, where mistakes of transcription can easily occur. Indeed, it appears from an old trade directory[2] that Joseph Sayles in the top arch was originally shown as Joseph Sykes, and the longitude was shown as 26 15 West. But that still left the dial far out in the Atlantic, so there had to be another explanation.

The dial on the Old Grammar School at Hawkshead, Cumbria (Fig. 2) shows a similarly unexpected longitude, having the inscription Pl Long 35° 43′ 40″, a location even further west! This gave rise to lengthy discussion in the Sundial Mailing List in 2007, summarised in an article in the *Bulletin*.[3] The conclusion was that Pl Long stood for the Plane's Longitude, the longitude of the places where it is noon when the gnomon casts no shadow to either side. It is also the longitude of the place where the dial could be used as a horizontal, if relocated there without changing its

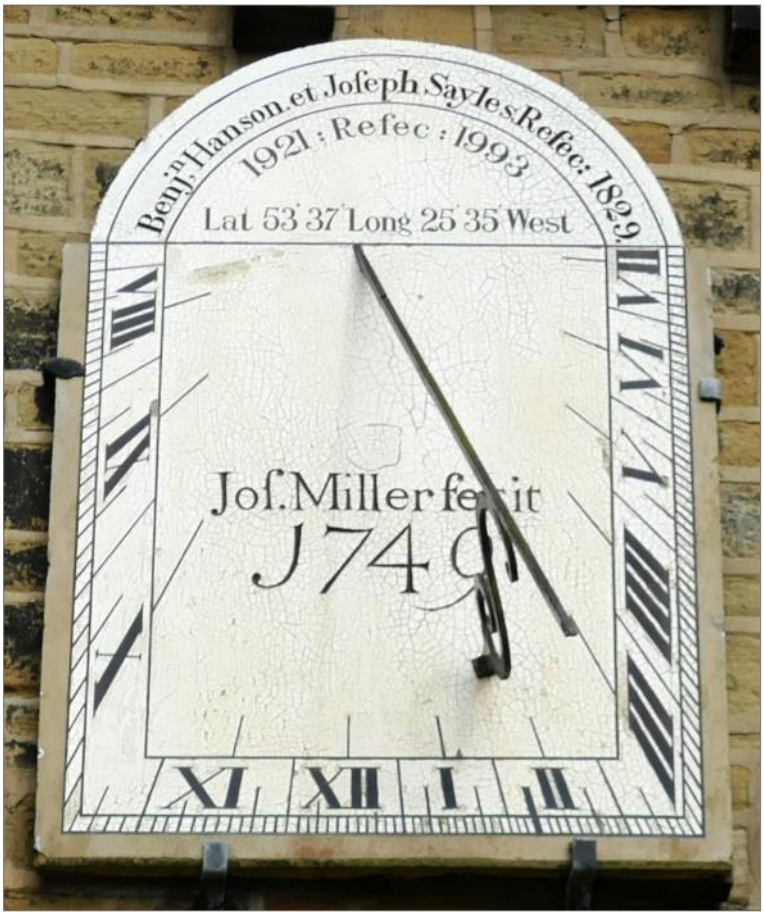


Fig 1. St Mark's, Longwood (SRN 8307). Copyright Diocese of Leeds, used with permission of the photographer.

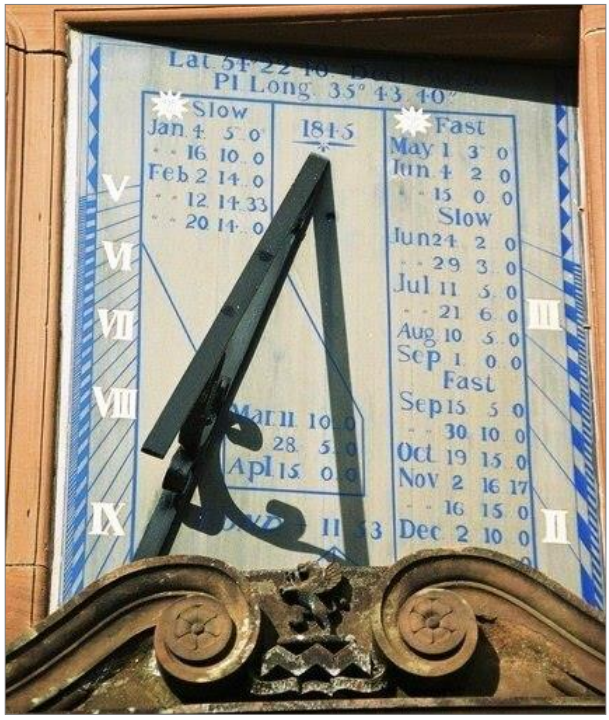


Fig. 2. The Old Grammar School, Hawkshead (SRN 1134). Photo: © Chris Downer(cc-by-sa/2.0).

orientation, still showing Hawkshead time (in this example), of course. And finally, it is numerically the same as the hour angle between the substyle line and the noon line.

Returning to Longwood, the chapter ring is conveniently (and unusually) marked with the position of the substyle, having a noon gap block at 1:45 pm. This distance of 1 h 45 min from the noon line corresponds to an angular distance of 26° 15′ (at 15° per hour) – exactly the measure originally inscribed on the dial (but later transcribed in error as 25 35). So although the title "Plane's Longitude" is not used, there can be no doubt that this is what is shown. I am not aware of it being used on any other dial apart from Hawkshead.

Little is known of the history of the dial, but it predates the church. It was designed for a declination of 22° west, and the church faces 15° west, so the dial has been canted out a small amount on the right-hand side to allow for the extra declination.

With thanks to Sue Manston for her detective work leading to the original version of the inscriptions.

REFERENCES

1. *https://www.geograph.org.uk/photo/6095422*.
2. Kelly's Directory of the West Riding of Yorkshire, 1881 [Part 2: Places L-Y, p.847].
3. F. Evans: 'Strange Longitude', *BSS Bulletin* 19(iii), 114-115 (September 2007).

registrar@sundialsoc.org.uk

Buyer Beware

The dial in the pictures is quite nicely hand engraved and is 'signed' "I Myatt Bath fecit / 1745". It even has a well executed coat of arms at the south (including hatchings) with the motto "Domine dirige nos" [Lord, guide us]. This is the motto of the City of London and indeed the arms do match theirs. This is rather odd as the 8" a/f dial is rather too small for any public location in London – was it a gift to some long-serving functionary, you might wonder. A bigger clue that something is not right is the 'holey' gnomon which just does not have a mid 18th century shape, despite being properly attached by the original tenon and not machine-riveted on; it even has a pair of dots at the 'toe' for the centres of delineation. In fact, several dials with gnomons like this are known, not all octagonal but always with the City of London arms. Sue Manston tells me that at least one has been the subject of an enquiry to the Help and Advice Desk.

They are signed by a variety of names with 'D Pullen' being one. These are well produced dials which look the part and pass all the standard tests for an antique dial, except that XRF indicates 20th century brass. If you saw only one, you might be deceived.

John Davis

A UNIVERSAL CROSS DIAL BY SAMUEL PORTER

SUE MANSTON

Many of the queries sent to the BSS Help and Advice Service involve dials discovered in attics or gardens during house clearances. Often the dials are of the mass-produced, early to mid-20th century 'antique' type, but occasionally we receive a query about something really interesting, like this little gem — a portable, universal cross dial by Samuel Porter. This dial was found by David Guy as he was clearing his late father's house.

Samuel Porter was a London sundial maker who specialised in pocket-sized dials. He was working in the early part of the 19th century at premises in Norfolk Place, Shacklewell.[1] There are examples of Porter's sundials in the Science Museum, the National Maritime Museum and the History of Science Museum, Oxford. The dial in the National Maritime Museum collection is in an ivory case with a gnomon on a 'floating compass card' and is dated 16th Feb. 1824. A pocket magnetic sundial in a turned lignum vitae box is in the collection of Buckinghamshire County Museum, Aylesbury. The label inside the case reads "Porter's Magnetic Sun Dial. Patronized by the King. Floating on an Agate Cap".

Webster's Signature Database[2] records Samuel Porter as a MIM (mathematical instrument maker), c.1824 in England. In the comments section it states that Porter patented the

Fig. 1. The closed dial case.

Fig. 2. Inside the dial with cross folded down.

Fig. 3. Compass, spirit levels and levelling screws.

Fig. 4. Hour scales showing 30, 15 and 5 minute divisions.

floating sundial on Feb. 14, 1824. There is also mention of a cruciform sundial, but no further details are given.

The dial described here is a 'Universal Sun Dial on a Cross' — it will work at any latitude and is a nice combination of simplicity and effectiveness. The turned wooden case (possibly lignum vitae) is 115 mm in diameter and 60 mm high (Fig. 1). It contains a pivoted cross, a 16-point compass, two spirit levels and three levelling screws (Figs 2 and 3). When the cross is folded completely down it depresses a tiny button which raises (and locks) the compass needle. Needle lifters are quite common in quality compasses to avoid wear on the pivot point.

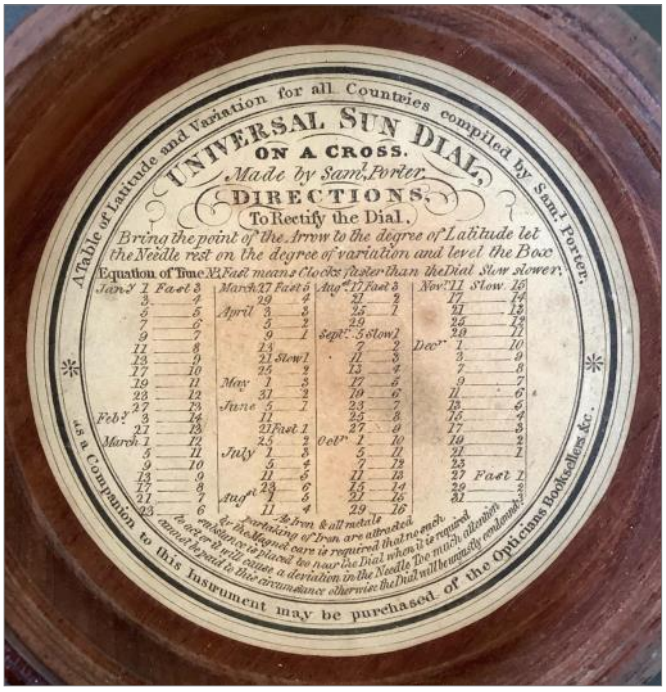


Fig. 5. The inside of the lid with EoT table and instructions for use.

Fig. 6. Close-up of the pivot to set the latitude.

The hour lines and Roman numerals are on paper fixed to the wooden cross (Fig. 4) and the hours are divided into 30, 15 and 5 minute intervals. The lid (Fig. 5), which has possibly been refurbished at some stage, contains an Equation of Time table, "Made by Sam[1]. Porter" and the following instructions for use:

> "*Directions to Rectify the Dial*
> *Bring the point of the Arrow to the degree of Latitude let the Needle rest on the degree of variation and level the Box*
> ***Equation of Time*** *NB Fast means Clocks faster than the Dial Slow slower*"
>
> "*As Iron & all metals partaking of Iron are attracted by the Magnet care is required that no such substance is placed too near the Dial when it is required to act or it will cause a deviation in the Needle Too much attention cannot be paid to this circumstance otherwise the Dial will be unjustly condemnd*"

The EoT table shows only whole minutes so reverse engineering to find the data source is unlikely to be possible.

The dial is universal, which means it can be used at any latitude by tilting the cross to the latitude required. The pivot (Fig. 6) is marked for degrees of latitude in 10° intervals, "South", "North" and "Latitude". When the cross is positioned at the mark for 50° latitude it will make an angle of 40° (the co-latitude) with the user's horizon. To use the dial in the Northern Hemisphere the cross should point to the South (Figs 7 and 8).

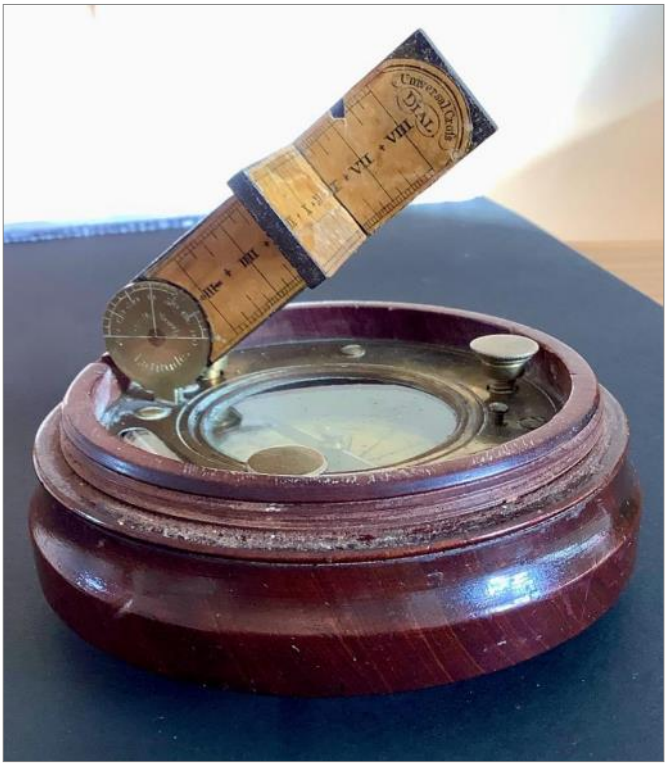


Fig. 7. The cross set up for 50° latitude.

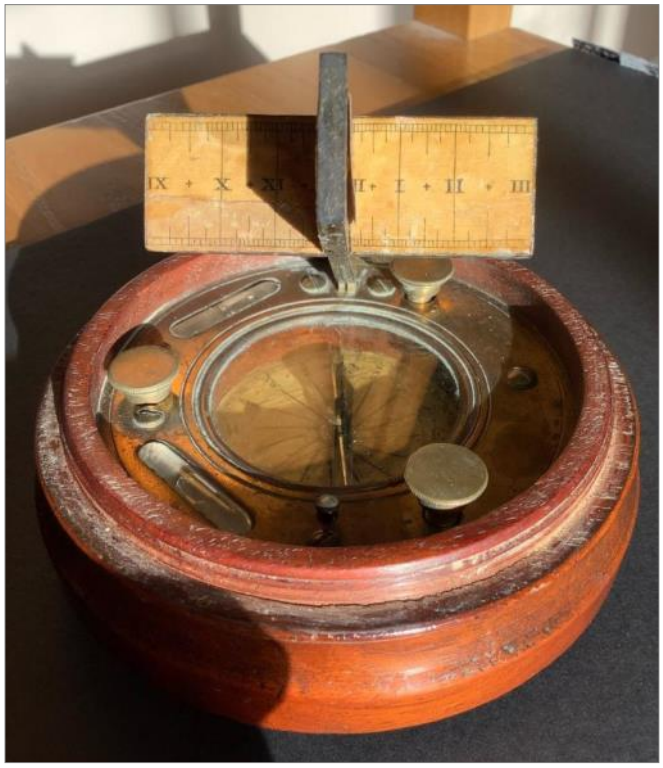


Fig. 8. Showing the time at approximately 10:25 LAT.

There is a slight disadvantage in the fact that the cross may obscure the user's view of the compass when used in the Northern Hemisphere. Even so, it is a delightful little dial — might it be the only one of its kind in existence?

ACKNOWLEDGEMENTS

I am very grateful to David Guy for sending the dial through the post for me to examine and photograph.

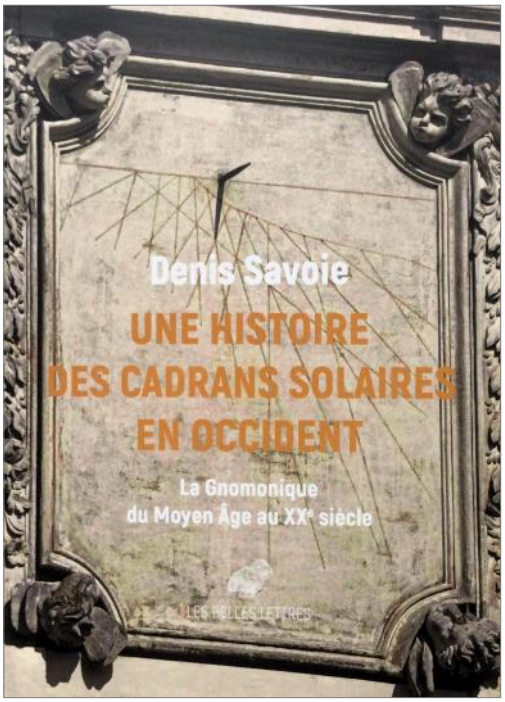
REFERENCES

1. J. Wilson: *Biographical Index of British Sundial Makers from the Seventh Century to 1920*, Third Edition. BSS Monograph No. 12 (2019).
2. *http://historydb.adlerplanetarium.org/signatures/*

suemanston@outlook.com

NEW BOOK

Une Histoire des Cadrans Solaire en Occident. La gnomonique du Moyen Âge au XX^{e} siècle
[A History of Sundials in the West. Gnomonics from the Middle Ages to the 20th Century]
by Denis Savoie. Les Belles Lettres (2021).
ISBN 978-2-2514523-1-9. 150 × 215 mm,
soft covers, 308 pp. Price 26.50 euros (online).



This recently published book by the prolific French expert on sundials contains exactly what its title suggests. Even if your French, like mine, dates back to schooldays, its many excellent colour photographs clearly lead the reader through all the important developments in the West over the last millennium. With the aid of Google Translate, it should give a comprehensive account to all with an interest in gnomonics.

John Davis