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EDITORIAL

As is customary for the March *Bulletin*, this issue is, in part, formal material that our Constitution requires members to have prior to each year's AGM. Accordingly, towards the end, you will find the Annual Report by the Trustees and the Annual Accounts. The Editorial Team apologises for the uglification of the Report; this is a consequence of massaging by the software used by our new Examiners.

There are several articles with Scottish subject matter in this *Bulletin*, starting with Alastair Hunter's account of the history and restoration of a monumental Scottish sundial at Drummond Castle. Another Scottish castle, Glamis Castle, features in the article by John Davis and Rosaleen Robertson, but the castle sundial they refer to has somehow found its way to New Zealand. A third Scottish castle, Neidpath Castle, is the subject of the latest article in Dennis Cowan's Thomas Ross series.

No March issue would be complete without a Dial Dealings article by Mike Cowham and the photographs are every bit as splendid as usual. He notes, in particular, a remarkable astrolabe quadrant sold for £731,250.

We return to the antipodes, this time to Tasmania, with an article about an agricultural sundial that Christine Northeast managed to fashion from a few photographs and scraps of information which were sent to John Lester by two friends.

We have heard from both Helmut Sonderegger and Walter Hofmann that Karl Schwarzinger has died at the age of 92. Karl Schwarzinger was instrumental in founding the Austrian Sundial Society (GSA) in 1990 and was Chairman from 1990 to 2000. He also started the Austrian Sundial Catalogue. Those unfamiliar with the initials GSA might note that it is Latin: *Gnomonicae Societas Austriaca*, the Austrian society for gnomonics. It is also known as *Arbeitsgruppe Sonnenuhren*, the Sundials Workgroup, which is affiliated to the Austrian Astronomical Association.

Frank King

RESTORATION OF THE DRUMMOND CASTLE OBELISK SUNDIAL

Part 1: History and Reinstatement Ceremony

ALASTAIR HUNTER

A version of this article has previously appeared on the Macmillan Hunter website *www.macmillanhunter.co.uk*

The obelisk sundial at Drummond Castle in Perthshire (Fig. 1) has a long and distinguished history not only for its place in the architecture of the ancient castles and houses in Scotland, but also for its connection with the very earliest days of the British Sundial Society, and for its importance among the free-standing multiple dials of the early 1600s across the British Isles.

By 2017, after almost four hundred years outdoors, the sundial was showing serious signs of the stone deteriorating and the whole structure was feared to be unsound (Fig. 2). Making it safe had become urgent. In the early months of that year the sundial was completely dismantled and removed to specialist workshops in Edinburgh. A programme of total restoration and conservation treatment was approved.

Fig. 2. Poor condition of the lower part of the shaft and the moulded base in early 2017. Photo: Graciela Ainsworth Sculpture Conservation Ltd.

Fig. 1. The Drummond Castle obelisk sundial after restoration. Photo at summer solstice, June 2019.

As work progressed, significant gnomonic features, which had not previously been recognised, became apparent; in addition, misconceptions about the function of the sundial, which had probably circulated for 150 years or more, were properly corrected. The sundial is in fact a compendium of mathematical delineations of its era, in particular including Babylonian, Italian and seasonal hours on a large minority of the dials, together with common hours and declination

Fig. 3. "One of the finest formal gardens in Europe", view from the castle, September 2019.

lines. None of the dials shows the time of world cities as was always believed. The key to all of the gnomonic features is the Latin inscription carved on a scroll which identifies them and explains how they were coloured.

Once the intricacies of this sundial were understood it was decided that "it must be got working again", in addition to doing the major work of conserving the fabric of the stone against future deterioration. All the gnomons were to be new and correct and the whole rebuild aligned and accurate. This was a considerable step-up in the restoration work. The story of the sundial is introduced in this article, from its original date of 1630 through to the reinstatement ceremony held in the gardens at Drummond Castle in June 2019. There is much greater detail in the story still to be told, which will follow in later parts of the article over a period of time.

History of Drummond Castle and the Sundial

The Drummond family have a long history dating back to the 1300s. Around 1490 the 1st Lord Drummond was granted permission by King James IV of Scotland to build a great stronghold on the rocky outcrop south of Crieff in the lands of Strathearn where Drummond Castle now stands. The original castle was a fortified tower, or keep.[1]

In 1605 the 4th Lord Drummond was created 1st Earl of Perth after giving service to James (VI of Scotland) I of England on a mission to secure peace with Spain. He modified the keep and had it extended. John Drummond, 2nd Earl of Perth, succeeded his brother on his death in 1612. John was a Privy Councillor under both James I and Charles I. His education was in France and he knew mathematics. Between 1630 and 1636, he developed the range of buildings further at the castle and laid out new gardens below (Fig. 3).

The 2nd Earl engaged master mason John Mylne III of Perth for the building work. The Mylne family were master masons over the course of eleven generations up to the 19th century. They are credited with raising architecture to the status of a profession in Scotland, and had commissions for public works and grand mansion houses in Scotland and England. In 1631 John Mylne III was appointed principal master mason in Scotland to Charles I. The Drummond obelisk and the magnificent sundial at Holyrood Palace in Edinburgh are both his work, in which he was assisted by his sons John and Alexander. The Holyrood dial (Fig. 4) was a gift to Queen Henrietta Maria from the King on the occasion of his Scottish coronation in 1633.[2]

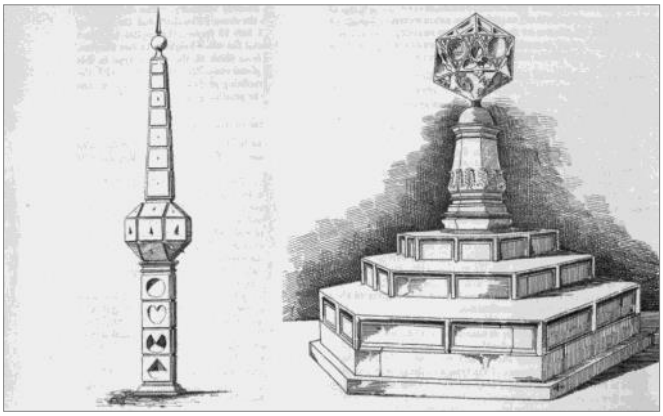

Fig. 4. Drummond and Holyrood sundials sketched by Ross (1892).

It is presumed that John Drummond and John Mylne III worked together on the design and realisation of the sundial obelisk for the new gardens at Drummond Castle. Carved in a hard sandstone, it displays the unequivocal date 1630 (Fig. 5), which is three years earlier than the Holyrood dial. The two are in contrasting forms for their respective clients. The Drummond dial is restrained and geometric, while the Holyrood dial is elaborate and richly carved. These prestigious sundial commissions seem to have established the great tradition of fine stone sundials in Scotland, which flourished for 150 years.

The castle and gardens were redesigned, rebuilt and extended over the centuries, starting with the aftermath of destruction by Cromwell's troops in the 1650s, and

Fig. 5. Date shield 1630.

interrupted at different times by war and politics both at home and abroad. In the late 1700s romantic landscapes were in fashion but by the 1800s interest in formal gardens had revived. Queen Victoria and Prince Albert visited Drummond Castle in 1842 and walked in the gardens. Although the planting schemes have altered since the time of their visit, the layout of a St Andrew's Cross with the sundial obelisk at its centre is unchanged. It is still "one of the finest formal gardens in Europe".[3]

Connections with the British Sundial Society

David Drummond, 17th Earl of Perth, accepted the invitation to become Patron of the British Sundial Society at its foundation in 1989.[4] He had a keen interest in sundials and at his home Stobhall Castle, on the banks of the River Tay just north of Perth, there was a historic pillar dial also by Mylne. His ancestral family continued to own Drummond Castle and its gardens. No doubt he and Andrew Somerville, the first Chairman of the BSS, had had an association of interests during the period of Andrew's deep studies into the ancient sundials of Scotland. His research was published in 1987 as a paper in the *Proceedings of the Society of Antiquaries of Scotland*, of which Lord Perth was already a Fellow.[5]

Andrew and his wife Anne and another very early member of the BSS, George Higgs, made many trips together to examine sundials in Scotland. George was skilled at restoring damaged and missing metal gnomons. An archive of photographs, notes, correspondence and calculations of theirs is lodged with Historic Environment Scotland in Edinburgh.[6] These show that George had made preliminary calculations for the gnomon of one sunken dial on the Drummond Castle obelisk. Andrew identified the Babylonian, Italian and seasonal hours, and lines of declination present on the dials, while Anne transcribed the complete text from the carved Latin scroll (Fig. 6) and corresponded about its translation with another early BSS member, Dr Philip Pattenden. More recently Dennis Cowan, in Part 7 of his series, describes the obelisk as one of Scotland's grandest sundials.[7]

It is unclear whether the delineation and functional operation of all the dials on the Drummond obelisk were fully defined in the 1980s. Probably they were not, for good reasons – outdoors the growth of moss and lichen on the stone obscures detail, lines are eroded by the weather, dials that are high up are hard to see from the ground, and lastly the task is big. Andrew did specify the design for a new obelisk sundial made in bronze for Dunphail House in Morayshire. It includes facet dials and hollow dials and is probably the first in Scotland since 1630 to include hour lines for other than common hours. It is smaller and simpler in concept than the one at Drummond Castle.[8]

The recent detailed examinations indoors in dry conditions have revealed that the Drummond sundial is extremely complex. It is possibly the most important multiple sundial from the 17th century in the British Isles in working condition today.

Description of the Obelisk and the Multiple Dials

The sundial is a tall stone column standing some 4.5 metres (15 feet) high. There are four principal sections. The square shaft supports a massive polyhedral boss or capital. The

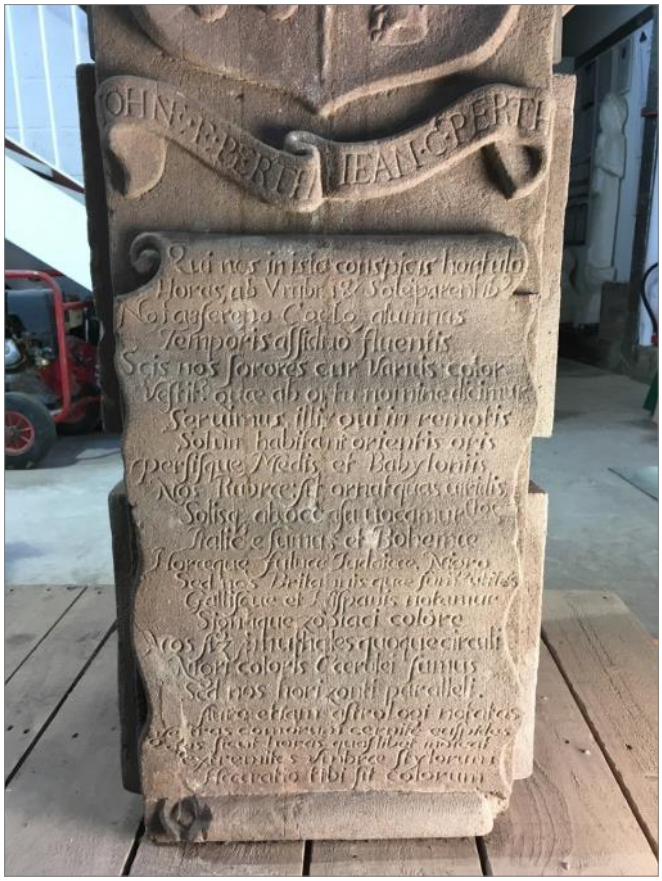

Fig. 6. The carved Latin scroll on the lower north side of the shaft. Interpretation of the scroll is fascinating and will require a separate article. Photo: Graciela Ainsworth Sculpture Conservation Ltd.

Fig. 7. The polyhedral stone in poor condition. The gnomons proved to be an irregular set, not uniform in thickness or metal composition. Some were damaged, incorrect, or missing.
Photo: Historic Environment Scotland.

tapering finial has a lower and upper section. The whole rests on a moulded base and it is finished with a ball and spike on top. The facets are cut in relief, forming individual dial panels. The result is a clean and pleasing geometric form.

The lower shaft has dials on three sides: east, south, and west. These dials are carved as sunken hollows in varied geometric shapes. They are in four tiers making twelve dials on the three sides. Six of these, three on the east and three on the west, are compound types incorporating sub-dials. Several dials have complex delineation with sets of lines overlaid on each other. The dial orientations are vertical, polar, and equinoctial. One dial on each of the three sides is a full hemisphere. On the north side there is a single dial, which is a sunken pyramid at the level of the top tier. A coat of arms and the Latin scroll are placed below it.

The polyhedral boss stone has twenty-four dials. Its proper name is a rhombicuboctahedron, which is one of the figures of Archimedes. Again the facets are panels cut in relief (Fig. 7). Unlike the shaft, none of the dials is sunken and none is compound. The eight dials around the middle are vertical and decline towards eight compass points. The eight upper dials are reclining and the lower eight proclining. Ten of the 24 have complex delineation with sets of lines overlaid. Every dial is delineated and none is redundant. Each one is fully illuminated by the sun at the proper times. The sun is high in summer, sunrise is early and evenings are long at the northern latitude of Drummond Castle, but the sun is very low in winter.

The sixteen panels above the boss stone, on the lower section of the finial, have four heraldic crests in the top tier, leaving twelve dials on the three tiers below it. Each one has single delineation as a simple dial for Babylonian, Italian, or seasonal hours. They decline towards the four cardinal points and recline to the taper angle of the finial. All four sides of the finial are occupied. The upper section of the finial has a further twelve dials in three tiers. Each one is for common hours, and the dials are arranged in association so they display as long a period of hours through the day as possible.

To sum up, there are 13 compound and complex dials on the shaft, 24 simple dials on the polyhedron but 10 of them with complex delineation, 12 simple dials on the lower finial and a further 12 on the upper finial. This is a total of 61 principal dials on the obelisk. To include sub-dials, declination lines, Babylonian, Italian, seasonal, and common hours, and associated dial declination and inclination angles, there are 131 systems of time measurement on this sundial.

Distinctive Features of the Drummond Sundial

The sundial at Drummond Castle is a free-standing stone monument. This in itself does not distinguish it from others of its day. In the first years of BSS considerable effort was spent on researching monumental sundials. As well as working on Scottish dials, Andrew Somerville and other founding members delved into sundials of the 16th and 17th centuries in England. The grandest ones were made for royal palace gardens like Whitehall and Hampton Court.[9,10]

Fig. 8. The massive cube dial at Madeley Court in Shropshire, which may well have resembled and date from the same period as the famous sundial at Whitehall designed for James I in 1622 by mathematician Edmund Gunter.[11] *Photo: British Listed Buildings.*

Fig. 9. Compound Drummond dial facing west with four sub-dials. The half-cylinder lies on a polar axis, its two long edges acting as gnomon styles for hours before and after 6 pm.

These were massive stone blocks with multiple dials; as many as 117 dials are mentioned. Instruction manuscripts and tables of data were supplied for an entire compendium of horological, astronomical and calendrical information that could be determined. Generally the mathematicians and horologists designed their own dials, no doubt referring back to the texts of scholars like Sebastian Münster's *Horologiographia* of 1531. The typical design pattern was the massive cube with polar and equinoctial carvings. In his illustrated book *Sundials*, Chris Daniel shows some examples that have survived, such as the one shown in Fig. 8.[11]

The obelisk sundial at Drummond Castle is distinctive because it departs from this design pattern. While it retains all the precise and complex detail of the mathematician, it is a work designed by the mason architect for aesthetic form. This is a creative design imagined for a particular outdoor space. The whole rises towards the sky and each section is conceived as a complete multiple dial. It was a distinctive new approach for 17th century sundials. In fact, John Mylne's obelisk in Drummond Castle gardens pioneered a whole sundial class unique to Scotland and unknown in the rest of Britain.

Two more features make this sundial distinctive. The sunken or scaphe dials on the shaft are more intricate than others known. They are visually intriguing and the sub-dials show great mathematical ingenuity (Fig. 9). There has been the suggestion that the shapes are associated with freemasonry but this is not evident; they have specific gnomonic functions. The second feature is the delineation of Babylonian, Italian, and seasonal hours on all parts of the dial, with the explanatory scroll in Latin. This must be rare. Without examining every surviving monumental sundial in Scotland and England in very close detail it is impossible to say that this is the only one, but it could be. It is likely that this was the Earl of Perth's unique specification, derived from his years living abroad.

Fig. 10. Repairing a fissure in the stone.
Photo: Graciela Ainsworth Sculpture Conservation Ltd.

Finally, the whole 61 dials, a majority of them declining from south, and 38 also reclining or proclining, represent a long and difficult work of graphical construction followed by realisation in stone. This must have been fully intended and necessary in order to create such a masterful display of sundial mathematics. The fact that this sundial in all its detail has survived practically unaltered for nearly 400 years, still standing in its own garden, is perhaps the most distinctive feature of all.

Purposes of the Restoration Work

By 2017 sections of stone were deteriorating. Cracks and splits were visible (Fig. 10). Critically, the moulded stone base, on which the whole weight of the sundial was resting, had disintegrated. The entire structure was unsafe and was removed for restoration to the workshops of Graciela Ainsworth Sculpture Conservation Ltd in Edinburgh.[12] Previous restoration work was in the 1980s, and presumably at earlier times, but there is little information.

Dr Jim Tate was in charge of local initiatives and management of the restoration programme on behalf of the Grimsthorpe and Drummond Castle Trust, who have the castle and gardens in their care. Jim, formerly of the National Museums of Scotland, is an adviser to the Trust. The structure of all the stone was consolidated first. The bronze material of the gnomons was analysed. A laser scan of the whole sundial was commissioned, which provided a 3D data record. This could feed into a future hologram display for the public. Jim also invited his wife Claudine, who is a classics scholar, to translate the Latin scroll. Meanwhile Graciela recommended that the author should join the team for his knowledge of gnomonics.

Fig. 11. Three complex dials on the Drummond polyhedron after restoration. The direct south vertical dial has delineations for common hours, and Babylonian and Italian hours. The same delineations are on the south-east dial. The south-west dial has common hours and zodiac declination lines. There are 7 more complex dials on the polyhedron while the remaining 14 have common hours only.

A number of points were clear. The laser scan would not resolve fine detail of the gnomonics (Fig. 11). The Latin translation, however, opened an entirely new window. At a stroke it swept away all the preconceptions about the sundial of the past. The key words that stand out in the text are "Babylonian" and "Italian". These words dispel all the myths about the dials showing time at different cities, and indicate instead that this is about hours since sunrise and sunset.

The scroll fully explains the dial delineation and the line colours. It is a set of instructions for distinguishing the lines and reading the shadows of the gnomons – albeit in poetic language confusing for modern readers. The whole sundial is a gnomonic triumph almost certainly designed as an exhibition piece for the Earl of Perth to display to his friends.

Fig. 12. Direct south vertical hemisphere. This is a complex equinoctial Drummond dial inscribed with common and seasonal hour lines, and zodiac declination lines. The new gnomon has a polar style edge and a nodus point. The shadow of the hemisphere rim is not significant. Photo at noon, autumn equinox, September 2019.

This was a revelation to the team and to the Trust, who were then undecided whether to complete the conservation work in the sundial's present condition, or to reinstate it as a fully functioning object. After instructing a preliminary gnomonic examination, and a review of this sundial's apparent place in the context of sundial history, the Trust decided to proceed. It was to be restored to working order: in the words of the Managing Trustee, "this sundial has to be got working!" The work would not require re-incising dial lines, but it did need all metal gnomons to be replaced with new ones (Fig. 12).

Replacement of Gnomons

There are 61 dials with gnomons. On the shaft the compound dials with sub-dials need more than one, some are already carved in stone and some are metal. On the polyhedron the dials with overlaid delineation need both gnomon style and nodus. On the finial the gnomons are pins with the tip acting as nodus. Repairing and replacing all of these was a long process which effectively was the reverse of doing the original design.

The first task was defining the lines. This was not so easy when lines were faint, delineations were overlaid, and dials were at compound angles. The next step was measuring dial dimensions, line spacings, and angles. This supplied the necessary data for computations determining gnomon style and nodus height and sub-style angle. Designing new gnomons followed, which must match existing socket positions to fix the gnomons in the stone. The gnomons were manufactured in bronze, patinated, and carefully fitted on the dials. Some of the stone gnomons were eroded and needed to be built up again at the nodus point.

Rebuilding the Sundial

When stone repairs and conservation work were complete, and new gnomons were in place, the sundial was ready for rebuilding. Alignment with true north was measured by the sun on site in the garden and fixed with markers. Previously the sundial had been in line with the axis of the

Fig. 13. The process of hoisting the heavy stone shaft and transferring it onto the base stone in a vertical position.

garden, which was not true north. The new base stone was then aligned and set in its position. It was a replacement for the old stone that was broken. Its edge would be the datum for lining up all the sundial stones above.

A scaffold tower and hoists were erected to raise the sundial stones and set them in turn into position, a process that took three days (Fig. 13). Because of the angular profiles of the stones, especially with protruding gnomons, measuring their exact alignment was difficult. Much depended on judgement by eye. The stones were built up with mortar joints, which were finished with pointing. On the fourth day the scaffold was taken down. When all work was done the whole sundial was wrapped in wet hessian to prevent the mortar drying out.

Work was finished on Friday 21 June 2019, the day of summer solstice. This date had been pre-planned but it turned out to be a day of brilliant sunshine, perfect for admiring the newly restored sundial and taking photographs. The dial shadows were very accurate. The whole sequence of restoration, gnomon replacement, and rebuilding had been a success.

Reinstatement Ceremony

A Sundial Reinstatement Ceremony was held two days later at 11 am on Sunday 23 June 2019. Members of the family and guests, and the restoration team, were kindly invited by the Trust to attend. Head of the family, Lady Willoughby de Eresby, was present.

Graciela and Alastair each gave a talk describing the restoration and conservation process and explaining the historical context and how this sundial worked. Everyone was fascinated by the obelisk brought back to life once again. No one doubted that everything about the sundial must be on record for the future.

A visual guide to the sundial had been prepared in advance and printed. This gives a broad story plus a detailed description of some of the most intriguing dials.[13] The booklet will serve as information for visitors to the castle and gardens for many years. An indoor exhibition is also in hand. The gardens are open to the public at Easter each year and from May to October (Fig. 14).

Fig. 14. The obelisk sundial three months after reinstatement in the Drummond Castle gardens, and three days before the autumn equinox, 20 September 2019.

Postscript

The aim of this article has been to describe the history of the sundial through to the present day. There is much more still to explain. Future parts to the article are planned – conservation and restoration techniques, interpretation of the Latin scroll, definition of all dials, sundial simulation in 3D.

ACKNOWLEDGEMENTS

The Grimsthorpe and Drummond Castle Trust kindly supported the project work and agreed to this article for the *BSS Bulletin*. Graciela Ainsworth and her expert conservation team collaborated freely on detailed work for gnomon replacement and sundial alignment.

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Postcard Potpourri 50
St Mary's Priory, Hurley, Berkshire

Peter Ransom

This dial needs someone to investigate it further! As the picture shows, it appears to be a vertical south dial with a person seated on top of the column, holding on to the gnomon from above.

Hurley Priory is a former Benedictine Priory. It was founded in 1086 by the Norman Geoffrey de Mandeville, who was one of the ten richest magnates during the reign of William the Conqueror. In 1536, during the reign of Henry VIII, the property passed into lay hands. By the 19th century the main Abbey property had become uninhabitable and was demolished in 1837. The long narrow nave of the priory church is now used as Hurley parish church.

The postcard is undated: to me it appears to be one produced between the wars. It is embossed in the bottom right corner with "Repro. by S. Georges 12 Villa Road London S.W.9" in four lines and also has the number 0/8480. I have been unable to find any information about this person.

ransompeter687@gmail.com

WONKY SUNDIALS:
Our Heritage – Safe in their Hands?

JOHN WILSON

Horizontal sundials are a popular feature of the gardens at many hotels, stately homes and other public or semi-public places. However, some are not what they seem, with their orientation leaving much to be desired. Attempting to check the time by such a sundial can be frustrating.

Three examples come to mind.

Holme Lacy House Hotel, Herefordshire

Holme Lacy House Hotel is one of the Warner chain of holiday hotels. It has a most ornate Italianate garden, and the sundial occupies pride of place therein (Fig. 1). According to the 2015 BSS Fixed Dial Register, this dial (SRN 6916) was recorded in 2009 by Tony Wood. The description of the dial in the Register states:

"*In the Italianate garden is a horizontal dial which looks unfinished. It has a gnomon appropriate for a double horizontal dial but the whole area where the delineation for such a dial should be has been left blank. It has numerals for the hours V–VII but no hour lines though the chapter ring has been divided into quarter hour intervals … The dial is modern and it has been suggested that it represents an abandoned project.*"

When my wife and I visited in 2016, we examined the dial carefully. It appeared to be around 25 degrees off the correct north–south alignment, so regardless of whether or not it is an unfinished project, it does not accurately indicate the time.

Fig. 1. Sundial at Holme Lacy House Hotel.

Fig. 2. Sundial at Hodsock Priory.

Hodsock Priory, Nottinghamshire

Hodsock Priory is a privately-owned house in Nottinghamshire belonging to the Buchanan family. It is used for functions such as weddings, and also opens in February each year for visitors to see the gardens with the important Buchanan collection of snowdrop varieties in flower. There is an interesting horizontal sundial (SRN 8131) made by Joseph Wilson of Stamford (Fig. 2). The Wilson family were prominent makers of clocks and watches, so it is not surprising to find a sundial bearing Joseph's name. There is no date on the dial, but Joseph Wilson was in business from 1818, when he took over his uncle's clockmaking business in Stamford, Lincolnshire, until about 1860.[1]

We enquired of Sir Andrew Buchanan, the owner of Hodsock Priory, who told us

"*All we know about [the sundial] is that it was at my parents' home at St Anne's Manor, Sutton Bonington [Nottinghamshire] and when we sold the house in 1986, we brought it here. The house had belonged to my father's aunt the Hon. Mrs Ruth Tennant who was a prolific collector of a wide variety of objects bought, I think, at auctions during the first part of the twentieth century.*"

So, the original owner of the sundial, and its location, are unknown.

The sundial is on a 'garden trail' leaflet for children and attracts much attention. Unfortunately, it is 55 degrees out of alignment, so the times shown are misleading and erroneous.

It is possible that, when the dial was brought to Hodsock in about 1968, the gardeners simply placed it where it would 'look nice' with no concern about setting it up correctly.

Canons Ashby, Northamptonshire

Canons Ashby is a Tudor-era house, not particularly grand or imposing, but very interesting for its architectural quirks. The house is now owned by the National Trust. The former owners, for several hundred years, were the Dryden family, who still maintain an apartment in the house, although they are not often in residence. There is an interesting horizontal dial in the garden (SRN 2573), with the inscription "R. Glynne fecit" (Fig. 3). The house staff stated that the dial dates from 1710. However, I understand that a number of commercial replicas of a Glynne dial were made in the 1970s.[2] The engraving on the Canons Ashby dial seems remarkably clear and unweathered for an early 18th century dial, so perhaps this is one of the replicas. Further investigation into this dial is warranted.

The dial is about 41 degrees out of true, so is useless for telling the time. We spoke to the house manager, who said that the discrepancy was known about, but it "would cost too much to have it put right".

Fig. 3. Sundial at Canons Ashby.

Publicly visible dials such as those discussed above are a problem if they are not orientated correctly. A badly set up dial brings sundials, and those interested in them, into disrepute. We observed a gentleman at Canons Ashby look at the dial, then look at his watch and shake his head in disbelief.

I now carry a magnetic compass with me on any excursions, in case I meet a sundial…

Several questions come to mind:

- How many National Trust properties have sundials?
- How many National Trust sundials have been checked for the accuracy of their alignment?
- Has anyone in the BSS made a specific study of the accuracy of alignment of horizontal dials in general?

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2. John Davis: personal communication, November 2019.

librarian@sundialsoc.org.uk

Peter Ransom MBE

We are pleased to report that long-time BSS member Peter Ransom was presented with an MBE by Prince William at Buckingham Palace at the end of November 2019. The citation was for "Voluntary service to mathematics education" which largely reflects Peter's work for The Mathematical Association though he has been an important contributor to using gnomonics in teaching mathematics for many years and is currently the Society's Education specialist as well as recently having taken on the work on Biographical Projects. We offer our congratulations and look forward to Peter's presence at future Conferences and Newbury meetings.

JD

A SUNDIAL FOR THE OLD SCHOOL HOUSE AT DURGAN, CORNWALL

CAROLYN MARTIN and BEN JONES

Having just completed 25 years as a volunteer (at one time as 'Keeper of the Maze') at the National Trust's Glendurgan Garden, it seemed to me (Carolyn) appropriate to leave some sort of legacy. A sundial immediately sprang to mind, a special dial created by Ben Jones, whose work as a letter carver I have long admired.

The first problem was to obtain permission from the National Trust and then to decide on a location. It was thought that a horizontal dial within the garden could restrict any changes in planting and design, and after consultation it was decided that a vertical dial on the Old School House in the village of Durgan, where the Trust have a number of holiday cottages overlooking the beach (Fig. 1), would be appropriate. Dating from 1876, the Old School House was created and opened by Sir Joseph Pease, MP; he was the son-in-law of the original owner, Alfred Fox, who began the garden, describing it as "a small peace [sic] of heaven on earth". After the School House closed, the school moved into the village of Mawnan Smith. Standing proudly overlooking the Helford River, the building is now a holiday let for visitors wanting to enjoy Glendurgan Garden and the peaceful situation beside the river (Fig. 2).

Fig. 1. The Old School House overlooking the beach at Durgan (photo: Carolyn Martin).

Fig. 2. The beach at Durgan on the Helford River (photo: The National Trust).

Fig. 3. Gable end of the Old School House.

Ben continues:

In November 2018 Ned Lomax (Assistant Head Gardener), Carolyn and I met in Durgan to look at a number of buildings on which a dial could be set. The gable end of the Old School House looked to be the perfect site.

It was perfect except for the overhanging roof (Fig. 3). This cast its shadow across the wall early and late in the day, especially in the summer when the sun was high. My estimations indicated that the dial would show a limited but still sensible number of hours in the summer and it was felt that the pleasing way a diamond-shaped dial sat so neatly under the gable justified the limitations.

The Old School is built from stone with granite lintels and quoins. The stone ashlar is very weathered and uneven. To find the declination of the wall I fixed three screws in an L-shape to the wall where the dial would be fixed. From the left and right screw I measured the declination of the wall, which at the place I measured is 17½ degrees east of south. The screw above the left one was adjusted so that the pair would keep the dial plate plumb while it was being fixed.

Fig. 4. The Durgan sundial.

Measuring a wall's declination can be done with odd bursts of sunshine throughout a day but to fix a dial I prefer a day with good long spells of sunshine and these can be hard to arrange, especially at Durgan where I was allowed to work only on Thursdays between 10 am and 3 pm, the house being a holiday let and Thursday being the changeover day.

Having missed the whole summer in 2019 owing to administrative delays and other problems, the October day chosen for fixing was actually sunny. If it had been overcast I would have trusted the declination screws and fixed the dial anyway, but it was nice to have a good shadow to confirm that no major errors had been made.

When installing a sundial, it can be useful to fix a temporary batten to the wall to take the weight of the dial while it is being adjusted and when the resin or cement holding the fixing dowels is setting.

The shape of this dial and the state of the wall meant it was not practical to use a batten to support the dial from below so instead I used one central dowel near the top of the slate from which the dial could be 'hung' while it was adjusted and while the resin in the other dowel holes set.

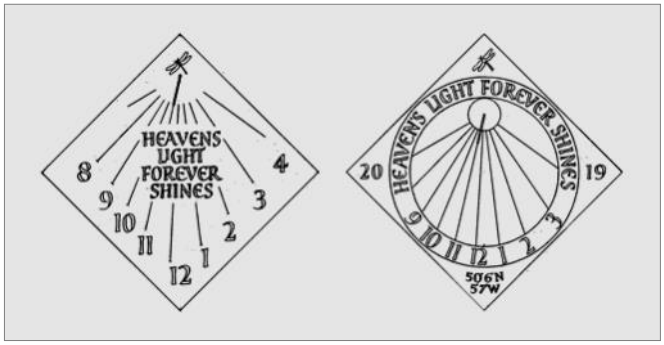

Fig. 5. The two sketches.

With the declination screws holding the dial plate plumb and aligned I was free to concentrate on moving the bottom of the slate left or right until the dial plate was level. There is a scored horizontal line across the dial's face for this.

The sub style and noon line are scored in. These are just about invisible from the ground but might be useful in the future should the dial need renovating.

The dial is 500 mm square and 30 mm thick slate. This made it the maximum weight that I could handle off a ladder. Of course, using 20 mm slate would have made it a third lighter. The gnomon is 10 mm diameter bronze.

It is much easier to drill very precisely positioned dowel holes into slate than into rough stone walls so my tip is to drill the wall first. Any 'wandering' of the drill can then be allowed for when marking out the dowel positions on back of the plate.

If you have to fix the dowels into random-sized stones or you are obliged to put your fixings into the joints between odd-sized blocks, then the positioning of your dowels will be very unsymmetrical.

To avoid drilling holes on the wrong sides, write the word *left* on the *right*-hand side of back of the slate and *right* on the *left*-hand side. While you are there you might as well mark top and bottom and check everything again.

The dial (Fig. 4) is adjusted for longitude, so it shows 'Greenwich Apparent Time'. There is a small notch on the chapter ring to show Durgan local noon.

"Heaven's light forever shines" is from P.B. Shelley's elegy on the death of John Keats. As Carolyn says above, when the gardens were set out at the big house above the village, they were described as a "small peace [sic] of heaven on earth".

A diamond is an interesting shape to use. It can look more special than a square of the same size and yet there is no more work or material involved in making it. A small diamond dial on a large wall can look less lost than a similar-sized square dial. It can be an awkward shape to fill, though. Using a chapter ring is a simple way to give a dial face a clear structure, but a circular one within a square produces empty corners. It can be a struggle to fit 11 12 1 successfully into the bottom corner of a diamond-shaped chapter ring. An 'open' dial-face design can be a good way to fill the whole dial face as its geometry is much more elastic. Getting the dial, date, dragonfly (Carolyn is a member of the British Dragonfly Society) and quotation onto this dial was tricky. I sketched two basic designs (Fig. 5) and was not sorry that in the end the formal, slightly safer, route was chosen.

I thank Carolyn very much for this commission. It was wonderful to be asked to make a dial for this lovely village on the shore of this most beautiful river.

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A LONG WAY FROM HOME
A Dial for Glamis Castle now in New Zealand

JOHN DAVIS and ROSALEEN ROBERTSON

British-made sundials turn up all over the world, particularly in parts of the old British Empire and the Commonwealth. Often, they have been specially commissioned from a British mathematical instrument maker by an ex-patriot for their new location but sometimes they were designed for a British latitude and have just been taken as a non-functioning keepsake.[1] The latter seems to be the case for the dial described here – made for Scotland but unused there and now a treasured item in New Zealand (see Fig. 1).

Fig. 1. General view of the dial in New Zealand. This and all other photos of the dial are courtesy of Kathryn Nobbs.

Background – Rosaleen Begins

The story begins when I came across this most unlikely 'find'. A friend and I were chatting, and we got around to talking about things we love to do. I admitted a passion for sundials, the joy of discovery, their story and cataloguing them. It was therefore quite a surprise when the friend, let's call him the 'NZ owner', said "I have one on display sitting on the top shelf in my living room. I really like it; and think it must be pretty old; I don't know much about it and have often wondered." A few days later a 'snap' arrived on my phone, piquing my interest. On the first visit to owner's home I realised that this was a unique find. As a member of the BSS, I put out an enquiry to some British members. Doug Bateman, whom I had met when he had visited NZ several years ago, responded and introduced John; the to-ing and fro-ing between England and New Zealand began.

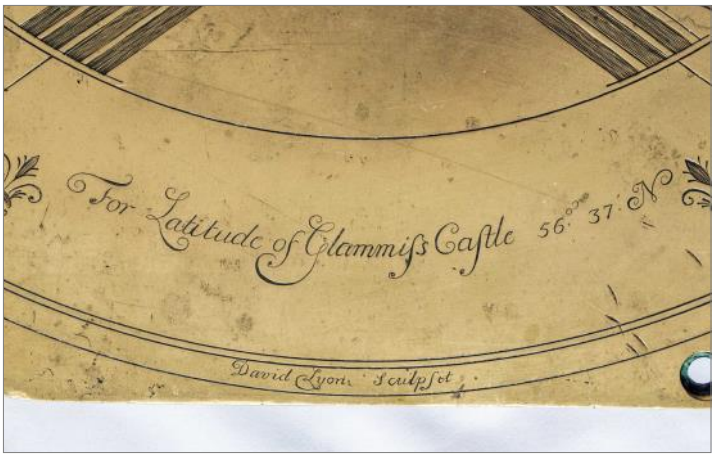

Fig. 2. Inscriptions around the southern edge of the dial.

Description and Identification

The earliest low-resolution photos of the dial immediately identified it as a large brass northern hemisphere dial of very good quality and in excellent condition and with a steep gnomon angle. The general style was not that of an 18th century London mathematical instrument but it did look British. As better pictures came in and the inscription around the southern edge could be read things became clearer (Fig. 2). It said:

For Latitude of Glammiſs Caſtle 56° 37′ N
David Lyon Sculpſit

"Glammiss Castle", now known as Glamis Castle, is in Angus, Scotland[2] and is the ancestral home of the Earls of Strathmore and Kinghorne. It is perhaps best-known as the childhood home of HM Queen Elizabeth the Queen Mother (Elizabeth Bowes-Lyon) but, for diallists, it is famous for the multi-faceted polyhedral stone sundial which incorporates four lions each holding a sundial (Fig. 3). This sundial has appeared several times in the *Bulletin* but

Fig. 3. The Glamis Castle 'four lions' polyhedral sundial. Photo courtesy of David Gauld (ref. 23).

perhaps the best descriptions of it are in the articles by David Gauld[3] and by Dennis Cowan.[4] The signature 'David Lyon sculpsit' is recorded on one other horizontal dial, at Lennoxlove, which has also been described by Cowan.[5]

The NZ Glamis dial is a 17¼″ (438 mm) across-the-flats octagon (Fig. 1) which weighs a substantial 6.56 kg (nearly 14½ lbs), with a significant variation in thickness across the dial plate. From the outside inwards, the dial has a minutes ring divided to individual minutes, numbered in 10s, and then there is an unusually broad band for the hour lines with elaborate half-hour markers and simpler quarter-hour fleurs-de-lis. The very large Roman numerals are oriented to be read from the inside, showing that the outward-facing fashion had yet to reach Scotland. The total time span of III:30 to VIII:30 is somewhat less than the maximum hours of daylight at that northerly latitude.

Inside this, there is a detailed Equation of Time scale of the Watch Too Fast/Slow type, in a full circle and again facing inward with the months running clockwise. It gives the EoT numbered in whole minutes for every day of the year, but with the scale divided to 10-second increments, perhaps the highest resolution seen for any dial scale of this type. The scale is clearly for the old Julian calendar which allows us to date the dial to before the 1752 calendar change. A sun symbol shows the days when the EoT is zero and, very conveniently, it also has the added feature of specifying the values of the EoT in minutes and seconds at the four maxima/minima. These are:

Jan 30	14:49	Watch Too Fast
May 4	4:13	Slow
July 15	5:46	Fast
October 25	[16:00]	Slow

These values can be compared with a database[6] of published tables from the 18th century and it is found that they are a good match to a table calculated by the first Astronomer Royal John Flamsteed and published by John Smart in 1710. The only difference is that Flamsteed gives a value of 16m 1s for the October maximum whereas the dial has no extra figure, implying a value of 16m 0s: this, though, is also the case on many dials by London makers which use the Flamsteed/Smart data.[7] Thus, we can date the dial with reasonable confidence to between 1710 and 1752, and most probably near the middle of that period as the Flamsteed/Smart table was obsolete by around 1735.

The gnomon (Fig. 4) is very substantial and has a typical pierced design. It is retained by three tenons (another sign of quality) which have iron wedges through them. The tip

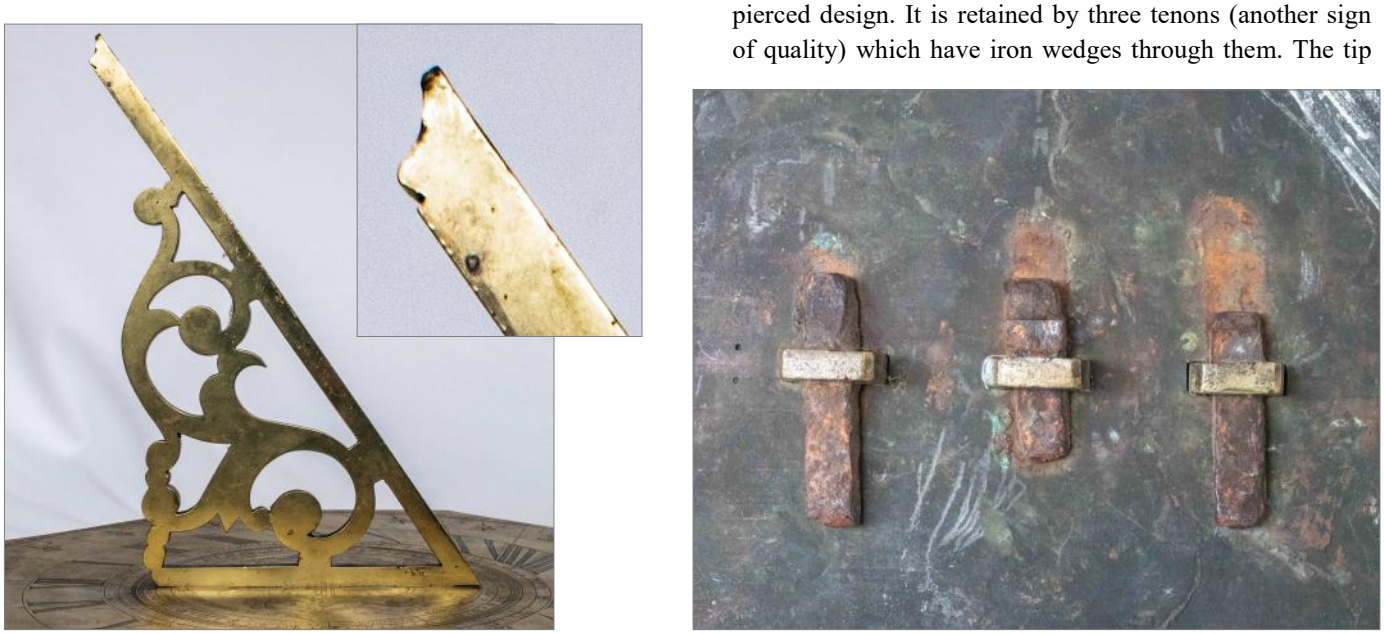

Fig. 4. The gnomon. Left, profile, with tip inset. Right, the three tenons and iron wedges underneath.

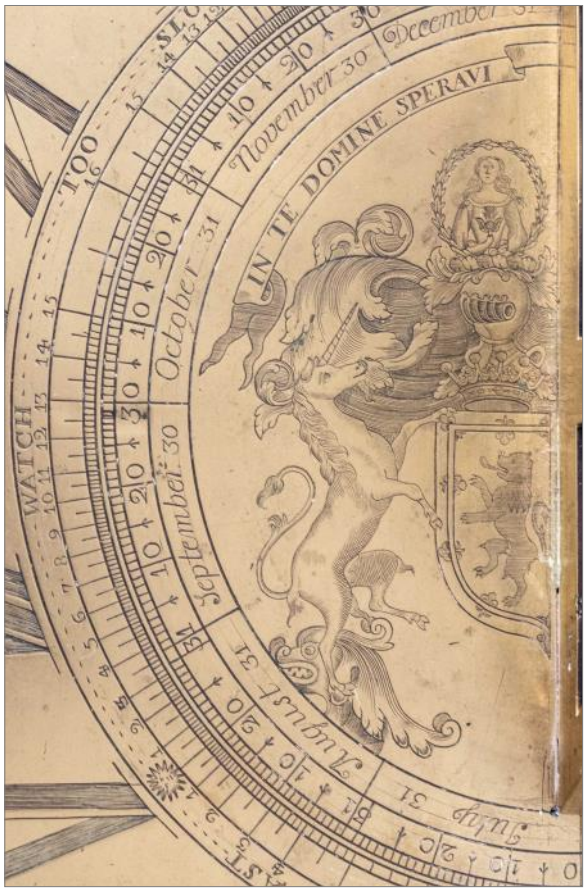

Fig. 5. Close-up of the dexter side of the arms. Notice especially the crest and also the finely-divided EoT scale.

of the gnomon has an elegant shape which is reminiscent of the profile used by Henry Wynne at the end of the 17th century and might in future lead to identification of the maker.

The Coat of Arms

The dominant feature of the NZ Glamis dial is the magnificent coat of arms in the centre. This is so clear and comprehensive that it serves as a textbook lesson in engraved heraldry. These arms are *impaled*; on the *dexter* side of the gnomon (left as we look at it) are the arms of one family or individual, and on the *sinister* side of the gnomon (right side) there are the arms of another family or individual. If the arms are for a married couple, the dominant male side is the dexter and his wife is the sinister. In this case, both halves are surmounted by identical coronets. These have five visible *pearls* (balls on stalks) and four *strawberry leaves* which identifies them as belonging to an earl and his wife the countess.

It is often easier to identify a coat of arms from the crest and/or motto than from the main arms themselves. The dexter side of our arms (Fig. 5; to the west of the gnomon) has the motto

IN TE DOMINE SPERAVI
(On you, God, I have fixed my hope)

which can be found in *Fairbairn's Crests*[8] as belonging to the Earl of Strathmore and Kinghorn(e), Baron Glamis, Tannadyce, Seidlaw, and Stradichtie. The accompanying crest is blazoned (i.e. described in heraldic language) as "*within two branches of laurel, a lady to the girdle, vested, in dexter the royal thistle, all proper*". This can be seen to be a good description of what is actually engraved on the dial, as shown in Fig. 5. This crest is highly significant and is discussed further below.

With this identification, it is possible to turn to the main arms with its '*lion rampant, azure*' (the blue colour is indicated by the horizontal 'Petra Sancta' hatching). The standard source is *Papworth's Ordinary*[9] and here there are scores of pages and hundreds of families whose arms feature lions but with the specific blazon clearly visible on the dial of '*argent a lion rampant azure, armed and langued gules within a double tressure flory counter-flory of the second*' we can narrow this down to belonging to the Lyon family who provided many of the Earls of Strathmore. They are a highly influential family who have held power in Scotland since the 14th century which is confirmed by the fact that the Court of Lord Lyon (or Lyon Court) is the Scottish equivalent of the English College of Heralds, responsible for regulating the heraldry for that country. Also, it is noticeable how close the Lyon arms are to those of Scotland.

Turning now to the sinister side of the arms, to the east of the gnomon (Fig. 6) we find the motto

VIRTUTE ET LABORE
(By Virtue and Toil)

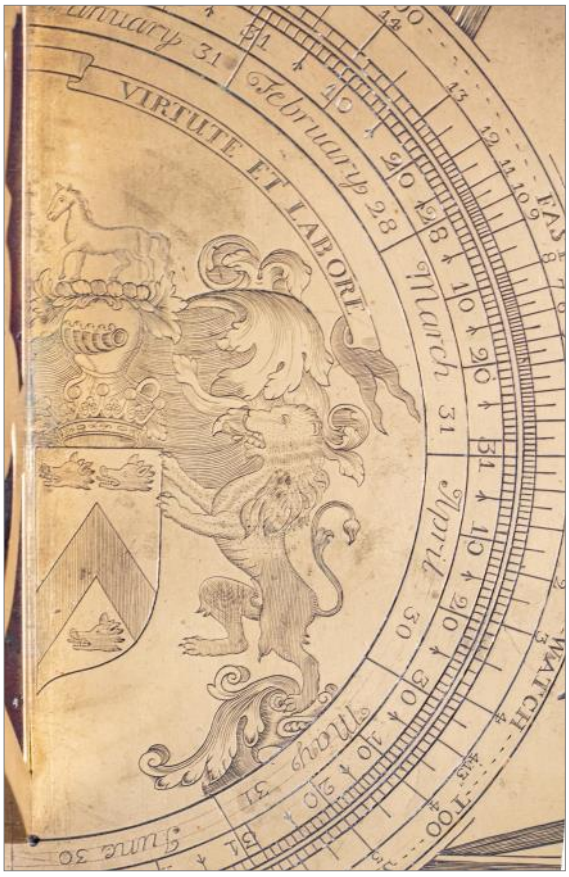

Fig. 6. Close-up of the sinister side of the arms.

Fig. 7. Portrait of Charles Lyon, 6th Earl of Strathmore. Copyright Glamis Castle Collection.

and the crest *a horse, passant, argent*. Fairbairn identifies these as belonging to the Cochran(e) family, the Earls of Dundonald. The main arms, *argent, a chevron gules between three boars heads erased azure,* confirms this identification.

Finally, the supporters of the shield are the famous lion and the unicorn found on the British coat of arms since 1603 when James VI of Scotland became James I of England but in this case it is the Scottish unicorn which is on the dominant dexter side!

Who Was the Dial Made For?

Having established the families that were the original owners of the dial, and its intended location, it is necessary to identify the date and the actual individuals concerned. It was fairly easy to find the marriage in July 1725 of Charles Lyon, 6th Earl of Strathmore and Kinghorne (Fig. 7), to Susan Cochrane, the sixteen-year-old daughter of the 4th Earl of Dundonald and his wife, Lady Anne Murray. Susan is said to have been "the most beautiful woman of her day in Scotland".[10] It seems very likely that the NZ Glamis dial was either a wedding present or commissioned by the Earl very soon afterwards. The story is a tragic one[11] and sheds light on the fact that the dial was evidently never installed at Glamis,[12] despite the great enthusiasm for dialling there – see for example the drawing of Fig. 9. Susan Cochrane was the second daughter of the 4th Earl but he had died in 1715 leaving Susan's sickly brother William as the 5th Earl so when he died in the January of 1725 Susan was effectively the head of the clan. (Her elder sister had died in childbirth the previous year.) This may account for the coronet on the sinister side of the dial's arms as Susan was then a countess in her own right, in addition to being the wife of an earl.

After only three years of marriage, in 1728 Charles Lyon tried to intervene in a drunken brawl between two of his friends and was run through by a sword for his efforts.[13] Thus Susan Cochrane was a widow at the age of about 20. Although she was fabulously wealthy she was no longer the Countess of Strathmore and so she vacated Glamis Castle, moving to Lyon Castle, earlier called Huntly Castle (a name to which it has subsequently reverted).[14] The sundial, with its quartered arms for the 6th Earl and his Countess, was no longer appropriate for the new 7th Earl living at Glamis and hence was unused. Exactly what happened to it in the subsequent period up to the early 20th century remains to be discovered. Either it was left in a cupboard at Glamis or, perhaps more likely, Susan Cochrane took it with her to Lyon Castle. Her life from this point was not a particularly happy one and was somewhat scandalous; she died in Paris in 1754.[15]

How Did the Dial Get to New Zealand?

Following the advice of Dr Katie Barclay at Adelaide University, who has researched the life of Susan Cochrane, "To do provenance for goods the best way is to look at the most recent owner and see where they got it and then work backwards…like anybody's belongings, though things are bought and sold, stolen, and given away, so things end up all over the world for all sorts of reasons. It could have been a gift to a servant for example. It may also have come over much later, so that it was passed down for a few generations then came over in the nineteenth century or even later."

The 'story' of how the dial got to New Zealand is not particularly clear, but we have two definite leads. The NZ owner's grandmother, an Englishwoman, and his grandfather, a First World War Kiwi soldier, married in London. After the war the couple settled in New Zealand on a farm. They were followed a few years later by her parents who immigrated along with a young man who had been 'adopted' into their family and is now known only as 'Darkie'. True to his nickname, little is known about Darkie except that the family think he had been a gardener. In any case, here was a strong bond as he was like a son, brother and best mate and laboured on the family farm in New Zealand for the rest of his life.

The great-great grandfather, who had been a pianoforte maker, didn't settle well into life in NZ (one of his jobs was apple box maker for an orchard) so he returned to the UK three times, presumably to satisfy his yearning for the 'home country'. It is possible he picked up the Glamis dial on one of his trips or that Darkie brought it with him in the early 1920s. The family folklore favours the latter. The owner recalls as a youth his grandmother used to chuckle that clearly Darkie hadn't realised the dial would not have been any good "to tell the time down here".

Despite no one knowing anything of Darkie's family or circumstances or as to why he would have been inclined to bring the Glamis dial with him, the owner wonders if maybe Darkie had some meaningful connection with the dial to go to the effort to get it to NZ. Of all the family, and from childhood, the current owner's particular fascination and fondness of the dial resulted in his inheriting it.

The quest continues. Unfortunately, all the older-generation relatives have passed on, apart from one who is actively assisting; other extended family members have also been recruited. There is some progress but nothing concrete has come to light yet. Darkie's headstone cannot be found and the cemetery records were destroyed by fire but the search continues to discover his real name. Further avenues to explore include shipping passenger lists, and Scottish authorities to learn whether inventory records or wills might reveal something of the start of the Glamis dial's journey. There is a long way to go to connect the dots, and those involved are far from giving up.

Who Was David Lyon?

Although the signature on the NZ Glamis dial is very clearly "David Lyon sculpsit" we initially had no clear idea who he actually was – Dennis Cowan had drawn a blank.[16] 'Lyon' is of course the family name of the Earls of Strathmore but it seemed unlikely that a member of an aristocratic family would be an artisan who had undergone a seven-year apprenticeship and, judging by the standard of the engraving on the dial, had subsequently gained a considerable amount of experience. One other dial, a less well-known horizontal at Lennoxlove, has the same signature and although it is now heavily patinated it is possible to see that it is also octagonal with a similar general style though it does not have an Equation of Time scale.[17] Also, it can be seen (Fig. 8) that it has an intricate

Fig. 8. Close-up of the half-hour marker on the (left) Lennoxlove and (right) NZ Glamis dials (the former photo courtesy of Dennis Cowan).

'H-form' half-hour marker not unlike those used by Henry Wynne and also found on the NZ Glamis dial. Cowan was not able to find any other instruments from this period by David Lyon and he is not listed in the usual sources. It is likely, then, that we should not interpret 'sculpsit' as 'made' or 'engraved it' but perhaps as 'designed it', with the actual engraving being contracted out to a specialist.

Some clues in identifying David Lyon are given by an entry in an 1825 book[18] on the parish of Longforgan (a village about 15 miles south of Glamis) which says that "In 1694 there was giv'n out to David Lyon at Castle Lyon for his gilding and painting ye clock and Horologes, £65 18s 6d." This is very useful as it both locates Lyon at the castle and also associates him with knowledge of clocks and "horologes" which must surely refer to sundials. The sum of money is considerable and suggests payment for more than just oiling the clock and painting a simple vertical sundial. The date of 1694 is three decades before the assumed date of the Glamis dial but this is just feasible within one working lifetime or, as many sons are named after their fathers, it could refer to the next generation – there are many Davids in the Lyon clan over the centuries.

Fig. 9. Drawing of Glamis Castle by John Elphinstone, c.1746 (BL). Pencil on paper. Note the two vertical dials on the corners of the building and the clock in the centre. Courtesy of the Trustees of the British Library, Shelfmark K.top Vol. 49, item 23.a.5.

A further reference to what is probably the same David Lyon is in notes for the Longforgan churchyard which refer to "a memorial stone to Appollonia wife of David Lyon of Castle Lyon dated 1698".[19] The importance of this is that the name Appollonia is very unusual and almost certainly derives from Appollonius of Perga, the Ancient Greek mathematician and astronomer credited with the theory of conic sections which are so central to dialling, especially scaphe-type dials. Could it be that our dialmaker had a mother or wife who was named to celebrate the origins of dialling?

What was David Lyon's rôle at Castle Lyon? His name appears several times in a diary for the years 1684–9 kept by the first Earl of Strathmore, mainly recording financial transactions and payment of rents by tenants.[20] David is sometimes referred to as a "grinter" which seems to be the local name for an official at a granary. Interestingly, this same source includes (page 44) the sentence "Ther is in the gardin a fine dyal erected and howsoon the walk and green plots are layed there will be statu's put into it, and there is a designe for a fountain in the Bouling green" which can only refer to the 'four-lions' dial at Glamis. The date of the diary is again rather early for our dial but a later source also refers to Lyon as a grinter and says that "David Lyon, factor of Castle Lyon, was required in 1695 to take in hand the harvest at Dronlaw".[21] Well after the date of the dial, in 1746, we have "By Cash paid David Lyon, prisoner in the Canongate, from the 27 May to the 21 July inclusive, on Mr. Home, solicitor's order, and Lyon's receipt in terms of said order, ... 18s 4d".[22] This is surely evidence of several generations of David Lyons so it seems likely that there was continuing enthusiasm from the Earls of Strathmore for sundials as is demonstrated by the 1746 drawing in Fig. 9, which shows two vertical dials, no longer extant.

As an aside, it is noted that the 'four-lions' dial at Glamis has a rudimentary Equation of Time table (one value, in whole minutes, per week) engraved in four sections around the stone base.[23] It is not at all certain that this is contemporary with the actual dial, usually dated 1670–80, as it could easily have been added later and the date is significantly earlier than John Flamsteed's earliest publications. Not all the values can now be read but those that can do not match exactly with any known table. Could a mathematically-astute grinter at Lyon Castle be responsible for them?

The Strathmore Crest and the Lennoxlove Lady

The statue of a lady bearing a polyhedral sundial on her head, now at Lennoxlove near Haddington (Fig. 10), vies with the 'four lions' one at Glamis Castle as the most famous sundial in Scotland. According to Dennis Cowan, quoting Andrew Somerville and Andrew Ross, the Lennoxlove dial was made in 1679 and the stonework is said to be by the mason James Gifford.[24] It is said to have previously been at North Barr in Renfrewshire, an estate occupied by the Stewarts of Barscube from about 1490 to

Fig. 10. The Lennoxlove dial on the head of a lady. Photo courtesy of Alastair Hunter (ref. 26).

1673 but then sold to the wealthy Glasgow merchant Donald MacGilchrist who built the old Barr House in 1676.[25] Alastair Hunter has written an article trying to find the identity of the lady with long coils of hair who acts as the supporter for the Lennoxlove dial.[26] He came to the conclusion that it was not made by James Gifford and that the Lady was a representation of Frances Teresa Stuart, Duchess of Richmond and Lennox (1647–1702). A wax effigy of her in coronation robes shows her holding a rose in her right hand, as does the stone Lady at Lennoxlove. Whilst this may all be true, the Strathmore crest on the NZ Glamis dial points to an earlier representation on which the effigy, and the sundial supporter, may have been based.

The Strathmore crest, blazoned above, is the same as the Lennoxlove Lady with the exception that she is holding a 'royal thistle' instead of a rose – visually, the two charges are very similar. Fairbairn[27] says that this is "in allusion to the alliance of Sir John Lyon, Lord of Glamis (d. 1383) with Jean [or Johanna] daughter of King Robert II of Scotland, whose second marriage was to Sir John." This would predate the sundial by over two centuries. An alternative origin for the crest is given by Andrew Ross who refers to "the Workman ms., temp. Jac. VI., a naked woman from the middle with hair dishevelled, within a wreath of laurel proper, a grim allusion doubtless to the unmerited fate of Jonet, Lady Glamis".[28] Jonet (or Janet)

Douglas was burnt at the stake for witchcraft in 1537 by order of James V. Ross also gives later versions, "the Esplin ms., circa 1636, a lady from the waist holding a thistle in her hand encircled with a garland of bay leaves; in the Carse ms., already alluded to in this volume […], a lady above the waist circled about with a garland of bay leaves, and holding in her right hand a thistle, the badge of Scotland." The manuscripts to which Ross refers all predate Frances Stuart's death and so she may have been consciously adopting the pose as an earlier lady, if not of a daughter of the king of Scotland.

Final Thoughts

Thus, a chance find in New Zealand has thrown light on several aspects of Scottish dialling in the 17th and 18th centuries. The future of the NZ Glamis dial is currently unclear but it is a much-treasured possession and so it will probably remain where it is in the 'Shaky Isles'. Even though it was formerly securely clipped onto the top shelf in the NZ owner's living room, it has not been returned to that precarious position for a number of good reasons – risk of harm to people, itself or other property as it is a 14 kg, unique, high quality-crafted, 300-year-old antiquity in earthquake-prone New Zealand.

ACKNOWLEDGEMENTS

We are grateful to the NZ owner for access to the dial and to Kathryn Nobbs for the photography. We are also grateful to Doug Bateman, Dennis Cowan, Alastair Hunter and Katie Barclay (University of Adelaide) for their help.

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13. The resulting trial is remembered in Scottish legal history as the first to provide a 'not guilty' verdict as opposed to the standard 'not proven' one.
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DIAL DEALINGS 2019

MIKE COWHAM

The past year has seen only a few fine dials sold by auction. Some of the more interesting ones that I have seen are shown below.

Sworders, Stansted Mountfitchet, 3 December 2019

In this sale were two rather interesting dials. The first was an octagonal brass double horizontal dial, 22 cm across, by Elias Allen, probably dating from around 1620–30 (Fig. 1). The top end of its gnomon appears to have been broken off. It sold well above its estimate at £3,300.

Fig. 1. Double horizontal dial by Elias Allen. © Sworders, Stansted Mountfitchet.

Fig. 2. Multiple slate dial by Richard Melvin. © Sworders, Stansted Mountfitchet.

The other dial was a slate dial signed by 'Richard Melvin, Maker to the Crystal Palace Co., London' (Fig. 2). (He is also known as Richard Melville.) It was circular, 55 cm in diameter and dates from around 1860. It had a main dial at its centre with eight small dials around the edge showing the times in various countries. Around the main dial were about 68 cities and towns from countries around the World, four for each hour marked on the dial, showing when it is noon compared with that at Greenwich. Each of the small dials had two scales showing the time at two different places. Most of its gnomons were present. Although a fine and interesting dial, it was broken into two parts. It had at some time been repaired by two threaded dowels but these had been pulled out. It would probably be quite simple to repair it again. The dial also had its own small pedestal. It sold for just £900.

Christie's, London, 11 December 2019

This was a sale of 'Important Books, Globes & Scientific Instruments from the Collection of Nico & Nanni Israel.'

The first item in the auction was a medieval astrolabe quadrant (Fig. 3). It is believed to be from southern France and dated 1291–1310. Its radius is 4¾″ or 120.6 mm. The reverse side has calendrical scales. It is housed in a fine leather case. It had an amazingly high estimate of £400,000 to £600,000, but it exceeded this, making £731,250.

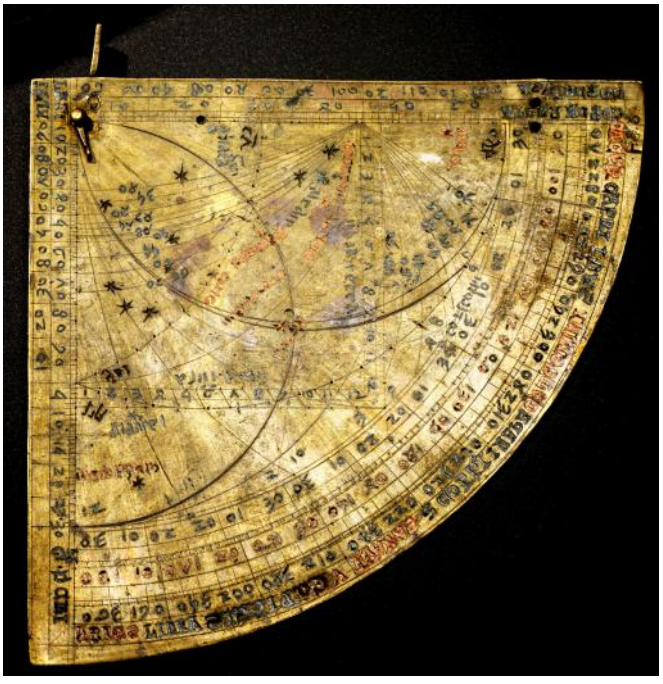

Fig. 3. Astrolabe quadrant. © Christie's, London.

The next dial was a good silver Butterfield dial (Fig. 4). It was complete with its original leather carrying case. Although estimated £2,000 to £3,000, it sold for £5,250.

The next two dials were from Augsburg, the first being by Andreas Vogler (Fig. 5), and estimated £700 to £1,000, but in this sale it made £2,000.

The other Augsburg dial, by Ludwig Theodatus Müller (Fig. 6), came with its original leather case and a sheet of paper describing its use. On its reverse was a list of places and their latitudes. It also sold over its estimate of between £1,000 and £1,500, making a fine price of £3,500.

Fig. 4. Silver dial by Michael Butterfield. © Christie's, London.

Fig. 5. Augsburg dial by Andreas Vogler. © Christie's, London.

Fig. 6. Augsburg dial by Ludwig Theodatus Müller. © Christie's, London.

Also in this sale were two lots of eight modern reproduction astrolabes and dials. Many of these are 'signed' with the names of earlier makers. Those illustrated (Fig. 7) were estimated at just £5,000 to £8,000 and actually sold for £17,500.

Bonhams, New York, 17 September 2019

In this 'Air and Space Sale' was an interesting model aeroplane which was mounted on a base containing a sundial (Fig. 8). It has the Gulfstream 1 aircraft supported on the dial's gnomon. Although the dial is modern and probably not correctly delineated, the model uses this interesting stand for supporting the aeroplane. Its dial base has been corrected from this photograph (Fig. 9), and shows that the calibration lines on the dial appear to be set at 15° apart (suitable for use at the North Pole, if it had a vertical gnomon!). The model was estimated $1,000 to $1,500 and was apparently unsold in this sale.

Fig. 7. Reproduction astrolabes and dials. © Christie's, London.

Fig. 8. Aeroplane mounted on the dial gnomon.
© Bonhams, New York.

Fig. 9. Sundial base for the aeroplane stand.
© Bonhams, New York.

ACKNOWLEDGEMENTS

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Sworders, Stansted Mountfitchet: Figs 1 and 2.
Christie's, London: Figs 3, 4, 5, 6 and 7.
Bonhams, New York: Figs 8 and 9.

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A NEW SUNDIAL FOR CENTRAL LONDON

PIERS NICHOLSON

In December, 12 years of planning, negotiating, and discussing came to an end when the City of London gave planning permission for the Fleet Street Heritage Sundial. The next stage is the serious business of raising the funds and building it. You can follow progress on *www.fleetstreetheritagesundial.uk*, and it would be much appreciated if you would add your name to the "Please support us" page.

In 2007, my wife and I bought a micro-flat of 170 sq. ft. in Bouverie Street, just off Fleet Street in central London (Fig. 1). We could not help noticing the very large blank wall on the building adjoining our new flat, and we were slightly puzzled that our new address was 62 Fleet Street even though the front door is in Bouverie Street.

It took some years to find out why there were no windows in the large blank wall. The answer was that there had originally been another building alongside the wall, covering about half of what is now the entrance to Bouverie Street. Old maps show Bouverie Street narrowing down to eight feet or so at the junction with Fleet Street (Fig. 2).

Fig. 1. The junction of Fleet Street and Bouverie Street.

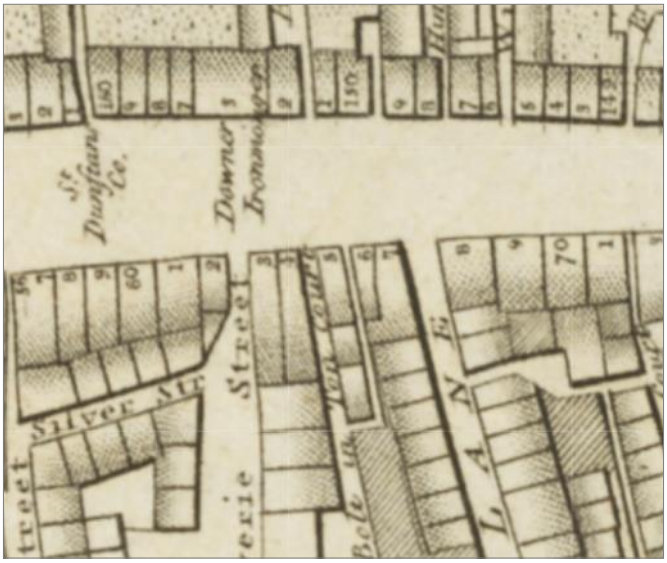

Fig. 2. The corner of Fleet Street and Bouverie Street as shown in Richard Horwood's map of 1799.

Around 150 years ago, the City had one of its periodic campaigns to widen Fleet Street, and, at the same time, decided to widen the access to Bouverie Street by purchasing and demolishing 62 Fleet Street. The current building numbered 62 seems to have been built at the back of no. 61. However, the reason for the absence of windows is that the City did not need the whole site of the original no. 62. There was a strip about a foot wide which was surplus to their requirements. This strip can be seen on the ground as a separate lighter colour against the squares of the pavement. The title deed of the new 62 incorporated this strip, extending all the way to Fleet Street. Thus, the wall is not the exterior wall of no. 61, but the party wall between 61 and 62.

Fig. 3. Fleet Street about a hundred years ago. (Museum of London).

By the 1930s this wall had been put to commercial use, with a 4 × 4 grid of standard-size posters advertising a wide variety of products (Fig. 3). After the war, the City of London adopted a strict policy banning advertisements above ground floor level. The owners of the wall attempted to get around this restriction, but were forced to comply after the City of London took enforcement action.

For 40 years or more, the wall has remained blank. When I first arrived in the flat, I did some research on the original 62, and discovered that it had been the publishing house of Richard Carlile, who had started a newspaper called *The Republican* in 1819. It was not a good time for republicanism then, and the government tried to silence *The Republican* by increasing the newspaper tax from ½d. to 4d. per copy, by prosecuting Richard Carlile for seditious blasphemy, and, in the end, sending him to prison. He was one of the many who campaigned for the freedom of the press, and one of the very few who were imprisoned for it.

I thought it would be a good place for a sundial, since the wall faces a few degrees north of east. In addition, I had also noticed how few reminders of the newspaper industry there are left in Fleet Street. The iconic *Daily Express* building still has its Grade II* listed Art Deco facade with aluminium lettering for the *Daily* and *Sunday Express*. Further away from Ludgate Circus, mosaics on a wall commemorate the *Dundee Courier* and the *People's Friend*, and high up on a building opposite is the lettering for the London News Agency Ltd at no. 44. And down the hill off Whitefriars Street is Ashentree Court with some metal information panels about the *Daily Mail* which was printed in Northcliffe House nearby. This in turn leads into Magpie Alley which has some ceramic panels showing how the newspapers were printed.

The purpose of the new sundial is to remind the many users of Fleet Street (residents, City workers, and tourists) of the worldwide reputation of Fleet Street in the days when it was the hub of the newspaper industry, and also to provide a permanent memorial to those like Richard Carlile (who lived on this site) and others who fought and suffered for the freedom of the press.

The Fleet Street Heritage Sundial project has four elements:

- The face of the sundial located on the wall which faces a few degrees north of east
- The gnomon projecting out from the top left corner of the sundial face
- The three explanatory panels at head height at the foot of the wall
- The *fleetstreetheritagesundial.uk* website

The sundial face is marked out with the lines where the shadow falls for every hour from 6 to 10 with additional lines below. Between six pairs of these lines appear the

Fig. 4. A draft design for the sundial at the top half of the wall.

mastheads of five newspapers. The particular newspaper titles to be used have not yet been selected, but three or four of them will be newspapers no longer published (starting with the *Republican* which was printed on this site) and one or two of them may be current newspapers (Fig. 4).

The final selection of newspaper mastheads to be included in the sundial will be decided at a later stage. The hour lines and the newspaper mastheads will be painted on the wall by an experienced signwriter. The painting is expected to take about 3 weeks, and will be done from scaffolding.

The position and size of the gnomon is determined by the mathematics derived from the orientation of the wall relative to due South. The gnomon will be fabricated from stainless steel tubing and will be attached to the wall with suitable anchor bolts.

An occupational hazard for sundials in large cities is that sunlight may be interrupted by neighbouring buildings and trees. This sundial will not have any problem with trees, and the building opposite is quite modern, and is unlikely to be redeveloped. The sun will shine on this sundial the whole year except for a few weeks around the winter solstice. A projecting part of the building opposite also interrupts the sunshine for the very early hours when the sun is low. Apart from these, the sunlight will cover the complete upper part of the wall until around 11:30 GMT.

The provisional text for the three plaques at the base of the wall is given below.

Plaque 1 – Freedom of the Press

Number 62 Fleet Street stood on this site until it was pulled down to widen Bouverie Street in the late 1800s. It was the printing office of Richard Carlile who published *The Republican* here from 1819 to 1826. He was present at the Peterloo massacre in 1819, and published the first report of it in London. Carlile also published *The Rights of Man* and other books by Thomas Paine. The Government attempted to shut down *The Republican* on many occasions and Carlile was prosecuted and sent to prison three times.

Plaque 2 – Fleet Street Heritage Sundial

Fleet Street was the hub of the British newspaper industry for over 100 years until the late 1980s when the need to adopt new technology, to work in modern buildings, and to modernise labour relations caused the newspapers to move to other parts of London. The sundial on the wall above commemorates some of the newspapers which made the name of Fleet Street famous throughout the world, and the individuals like Richard Carlile who spoke out for the freedom of the press which we enjoy today.

Plaque 3 – More about Sundials

Sundials are a very ancient technology, starting in Egypt and Greece over 2000 years ago. Our website, www.fleetstreetheritagesundial.uk, tells you more about this east-facing sundial, which only tells the time in the morning.

It has a link to the Thames sundial trail at www.sundials.co.uk/trailthames, which will take you to other fine sundials nearby. This website also has a wealth of other information about sundials, including projects for you to do, technical explanations, pictures of sundials worldwide, and other sundial trails.

News of the progress of this project will appear on Twitter *@allsundials.*

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IN THE FOOTSTEPS OF THOMAS ROSS
Part 30: Neidpath Castle

DENNIS COWAN

Neidpath Castle is a Scottish tower house overlooking the River Tweed just outside Peebles in the Scottish Borders (Fig. 1). The castle has been owned by three famous Scottish border families – Fraser, Hay and Douglas, and subsequently the Wemyss family from Fife. The original castle owned by the Frasers was burnt to the ground by the English during the Scottish Wars of Independence, and the owner Sir Simon Fraser was executed in London in 1306, the year after Sir William Wallace of Braveheart fame.

The present castle was built by the next owners, the Hays who had married into the Frasers, in the late 14th century. It was during the tenure of the Hays that the castle was visited by both Mary Queen of Scots and her son James VI (James I of England).

During the 1660s the castle was remodelled, but it was then sold to William Douglas, first Duke of Queensberry, in 1686. The castle eventually passed to the fourth Duke, known as 'Old Q', who proved to be unpredictable, and in 1795 he cut down all the trees and the hanging gardens that sloped down to the River Tweed. The castle was neglected during Old Q's ownership, and when he died unmarried in 1810 the castle passed to the Wemyss family through the descendants of the first Duke's daughter. It remains in the possession of the Wemyss family and they have improved and maintained it to this day, although part of the castle is still in ruins.

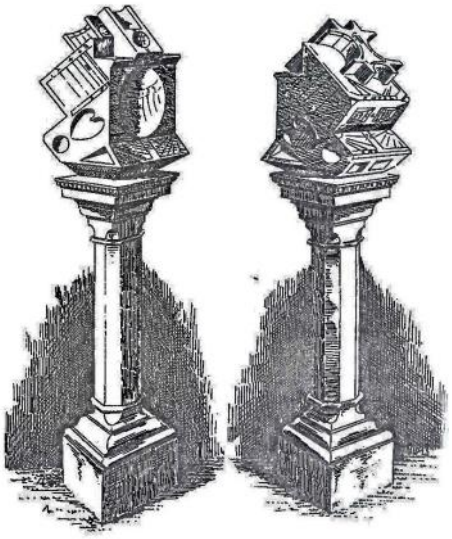

Fig. 2. Ross's sketches of the Neidpath sundial.

Fig. 1. Neidpath Castle overlooking the River Tweed.

As a regular visitor to Peebles, I had long known of Neidpath and that it was occasionally open to the public, but I had never visited it. Almost as soon as I became interested in sundials and was aware that there was a sundial there, it stopped having open days! I learned that the sundial was stored indoors and that no one lived at the castle, and I had no information on how to contact anyone. It appeared that my chance to see the sundial was gone.

But what did Thomas Ross say of this sundial in volume 5 of *The Castellated and Domestic Architecture of Scotland*?[1]

"*This dial* [Fig. 2] *has all the permanent features of the type, but the book part, instead of being square as in the normal conditions, is oblong, while the sloping cylinder is closed about half-way down, and on the flat surface thus made there is a cup-hollow. Its other features are all normal. The measured drawing* [Fig. 3] *of this dial, prepared by Mr. Robert Murray, architect, gives a definite representation not only of it, but of those of the type. This dial belonged to Neidpath Castle, and about the time (1795) when 'Old Q.' began his work of desolation there, his gardener, Mr. Spalding, fortunately got possession of the dial, and his son, a nurseryman in Peebles, erected it in his grounds, where it remained for many years, till it was presented to the Chambers Institute a few years ago, where it now remains, but without the shaft.*"

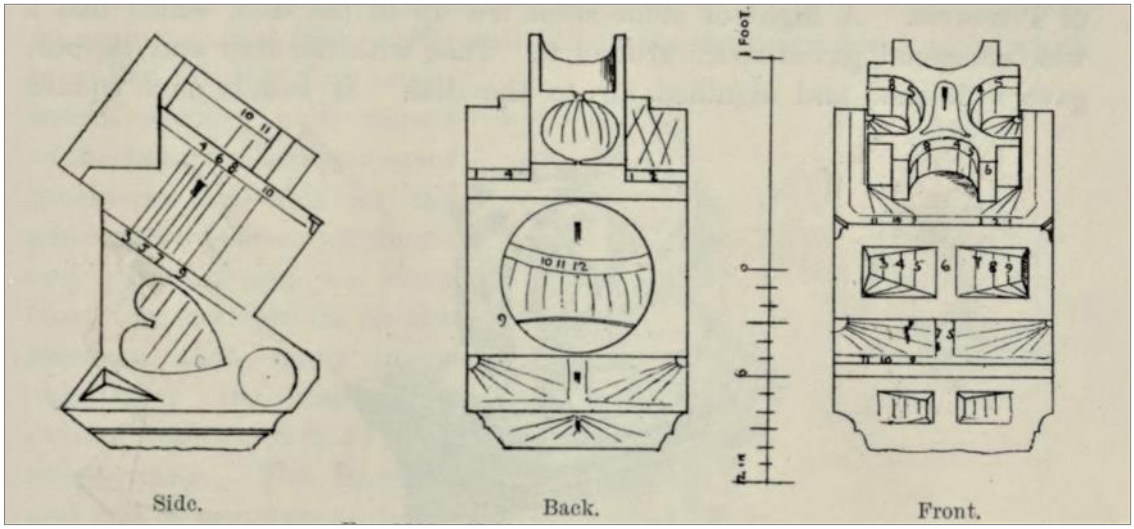

Fig. 3. Architectural drawings of the Neidpath sundial.

When Ross said that the sundial had all of the features of the type, he was of course referring to the fact that it was a lectern sundial of which there are fewer than thirty complete examples left in Scotland. As he explained, it is slightly different from the normal and, of the two main types (with and without a star on top), it is of the type that has a star.

After the gardener 'rescued' the sundial from Old Q it was kept safe in his family before being donated in the 1880s to the Chambers Institute, a museum in Peebles. Subsequently it was acquired in 1912 by E.A. Hornell, one of the famous 'Glasgow Boys' group of artists, and kept at his home at Broughton House in the south-west of Scotland. In 1961 it was returned to Neidpath.

Luckily, a chance encounter in early 2019 while surfing the Internet revealed contact details for Lulu Benson, a member of the Wemyss family. I subsequently made contact with her and she said that although she lived in Edinburgh, she would be delighted to show me the sundial.

When the day came for the visit, the sundial was inside the castle as expected and still without a shaft. It was quite dark inside, so Lulu had moved it to near a window and provided a temporary lamp, but unfortunately the lighting conditions were not ideal for photography. I thought that given its age (probably from mid-17th century), it was in a fair condition, but it had lost its metal gnomons, the star on top was missing some of its structure and many of the numerals were difficult to read, as were some of the hour lines.

On the south face, unusually, the sloping hemi-cylinder ends half-way down and underneath that is a small cup hollow (scaphe dial) which as Ross rightly says is not normal (Fig. 4). What is mystifying though is that both Ross's sketch and the architectural drawing show that underneath the large cup hollow on the south face there are two reclining dials, but the hour lines that can be seen today and the gnomon hole suggest that it was a polar dial (Fig. 5). Underneath this is a proclining dial not seen in the photograph, but it can be seen in the architectural drawing.

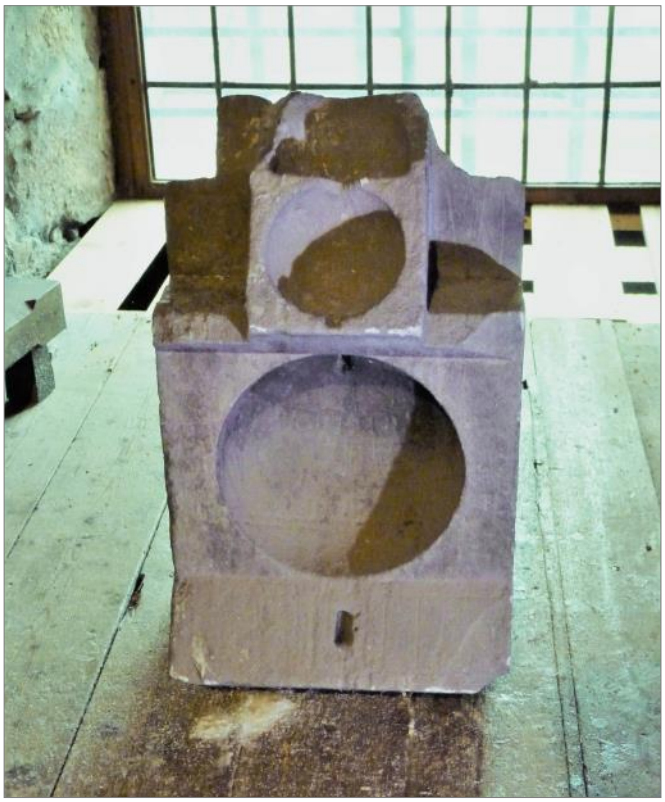

Fig. 4. South face of the sundial.

Fig. 5. Close-up of the polar dial on the south face.

Fig. 6. North face of the sundial.

Fig. 7. East face of the sundial.

The star on the north side has dials in each of the angles in addition to the dial on the flat surface on top of the star, with sunken, reclining and proclining dials below (Fig. 6).

The east and west faces are mirror copies of each other with sunken triangular, circular and heart-shaped dials as well as the more familiar east and west vertical dials (Figs 7 and 8).

Lulu very kindly gave my wife and me a guided tour of the castle, which is now available to rent on Airbnb,[2] although it should be mentioned that it sleeps only two and that the bedroom is up several flights of stairs. You have free access to the whole castle and the sundial can also be seen. I have to say that the castle is luxurious and, although expensive, is well worth a one-night stay.

ACKNOWLEDGEMENT

I am very grateful to Lulu Benson for letting me see the sundial and for giving my wife and me a guided tour.

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Fig. 8. West face of the sundial.

GERALD DUNN, POLYMATH AND SUNDIAL MAKER

IAN BUTSON

An article in the December 2018 issue of the *BSS Bulletin,* 'Two unusual sundials at Tollesbury', featured sundials on two gravestones in the village cemetery.[1] One of the graves is fitted with a polar cross sundial and commemorates Martin Roy Moss Dunn, who died in March 1974 as a result of a motoring accident. The adjacent grave is that of his parents, Gerald and Maureen Dunn, and has an impression of a notional sundial engraved on the stone; on this grave, Gerald is described as a 'polymath'.

Gerald Raymond Dunn was born in India on 9 December 1917, his father being the Borough Surveyor to the city of Bombay.

In 1936 he joined the army, gaining a commission at the Royal Military Academy Sandhurst and subsequently attaining the rank of Captain in the Wiltshire Regiment. He was then posted to India with a battalion of the regiment attached to the Indian Army (Fig. 1).

He met his future wife, Maureen Parsons, in India, where they married in 1942. Their daughter Alexandra was born in Mysore, India in 1944 and their son Christopher was also born there in 1945. Four further children were born: Martin (d.1974) in 1947 in Lüneburg, Germany; Mary in 1950 in Colchester; Greg in 1959 in Colchester; and Juliana in 1961 also in Colchester.

Following the Partition of India in 1947, and with the Indian army having been reorganised, he returned to the Wiltshire Regiment and was posted to the Black Forest area of Germany, where he oversaw work on the War Reparation scheme following the Second World War. In 1948 he was posted back to Devizes with the Wiltshire Regiment, still at his earlier rank of Captain, where he remained until he left the army in 1950.

On leaving the army he bought Great Downs Farm at Tollesbury, Essex. To keep the farm on an economic footing at this time, he also worked as a representative for the gin manufacturing organisation, Tanqueray Gordons & Co.; in addition he did agricultural work with a local man in the area.

Initially the farm produced apples as a crop, but it became uneconomic owing to much larger organisations dominating the market, and was affected by tree damage caused by the effects of the harsh winter of 1962–63. To help make ends meet, he also took on a job as manager of a farm at Maldon. At this point he decided to turn from fruit

Fig. 1. Gerald Dunn, in India.

to chicken farming for the commercial market. However, by around 1968 this had also become unprofitable, owing to the dominance of the poultry market by suppliers using industrial-scale factory-farming techniques.

Following the adverse development in this field of farming, Gerald turned to another enterprise. He became involved as a researcher with one of only two organisations at that time who were investigating the associated family history links in relation to unclaimed estates, and the distribution of estate assets to their rightful owners (similar to the 'Heir Hunters' organisations of today, who investigate the *Bona Vacantia* lists).

He was also a local leisure sailor, and it was during this period, whilst commuting daily by train to London for these researches, that he conceived a basic navigational aid, the Cruiserfix solar navigator (Fig. 2). A patent was taken out for the device, with a significant number of them being produced and marketed. Unfortunately, it was also during this time, in the early 1970s, that satellite navigation systems were being developed and becoming economically

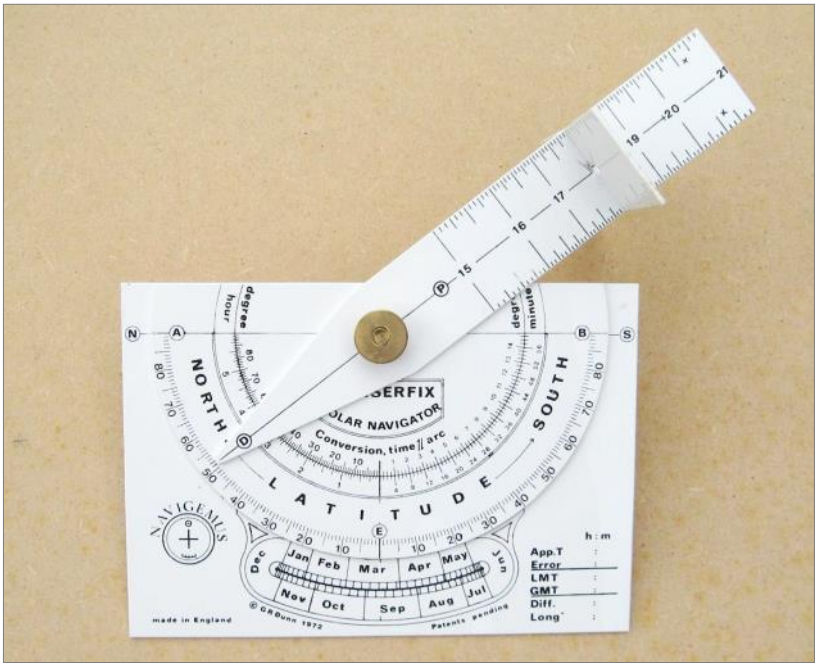


Fig. 2. 'Cruiserfix' solar navigator.

available. Although the simple Cruiserfix navigator was modestly priced at about £5 and hugely popular with a small but loyal cadre of navigation enthusiasts, the yachting community largely adopted the modern satellite navigation systems available at the time, which offered more immediate results with higher accuracy, and sales for the Cruiserfix diminished. An example of the Cruiserfix device is currently held at the National Maritime Museum at Greenwich.

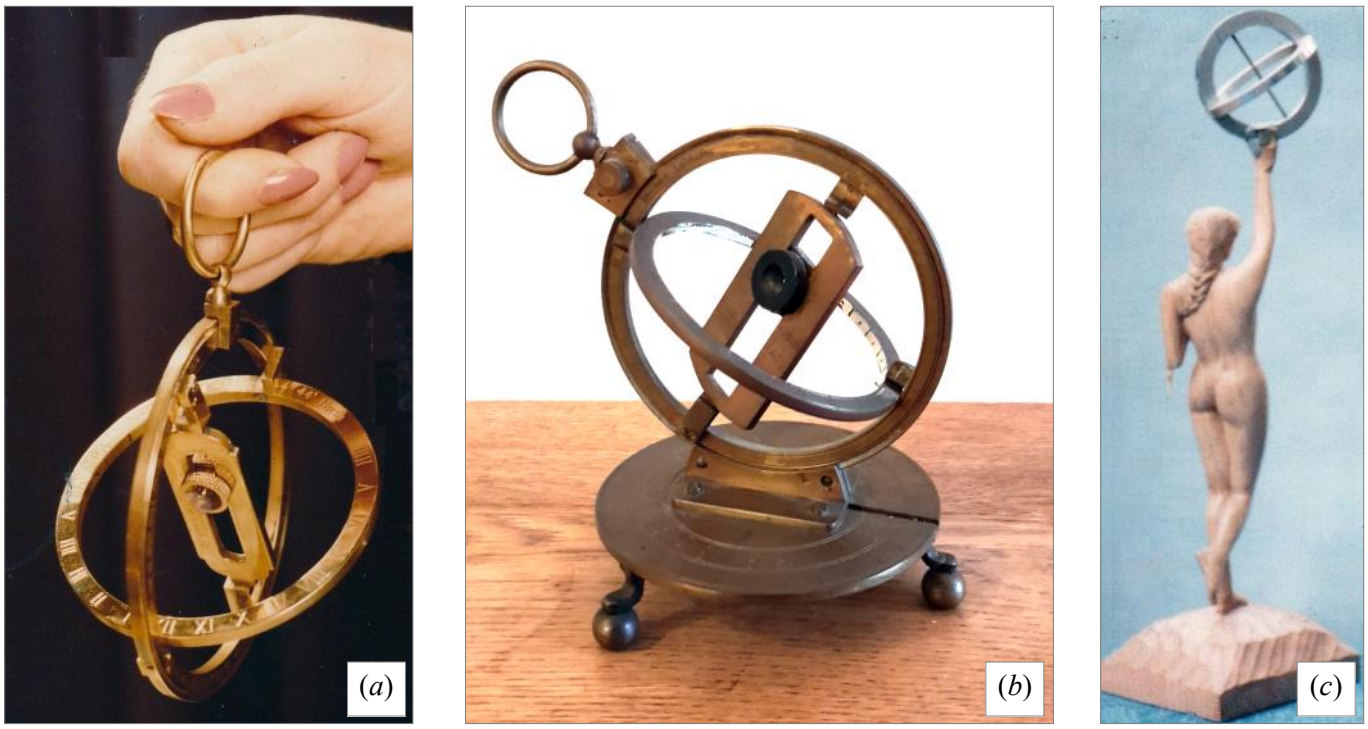
With the aid of a support grant from the government, Gerald then undertook a metalwork engineering course at Brentwood Technical College. This gave him the basic skills which enabled him to start making sundials, another area in which he had become particularly interested. He made various sundials, ring dials, sun-clocks and astro-labes, with some to commission and others also for family members. A selection of dials made by him is shown in Fig. 3. His particular favourite was based on the equinoctial ring dial form (Figs 3a and b).

In the early 1970s he was approached by the Army and supplied a simple sun compass for use in an expedition mounted to cross the Sahara Desert in which the newly-developed satellite navigation systems were being tested against traditional navigational methods of the day. The results obtained with the simple sun compass that he had made compared consistently well against those of the new satellite system being tested (Figs 4 and 5).

In practice when using this solar compass, the local latitude would be set against the markings on the smaller vertical disc for either the northern or the southern hemisphere, which then allowed the 'halo-ring', marked in hours, to rotate and to be correctly inclined to act as an equinoctial dial at that latitude, with its central rod gnomon. The required direction of travel is then set by aligning the lower

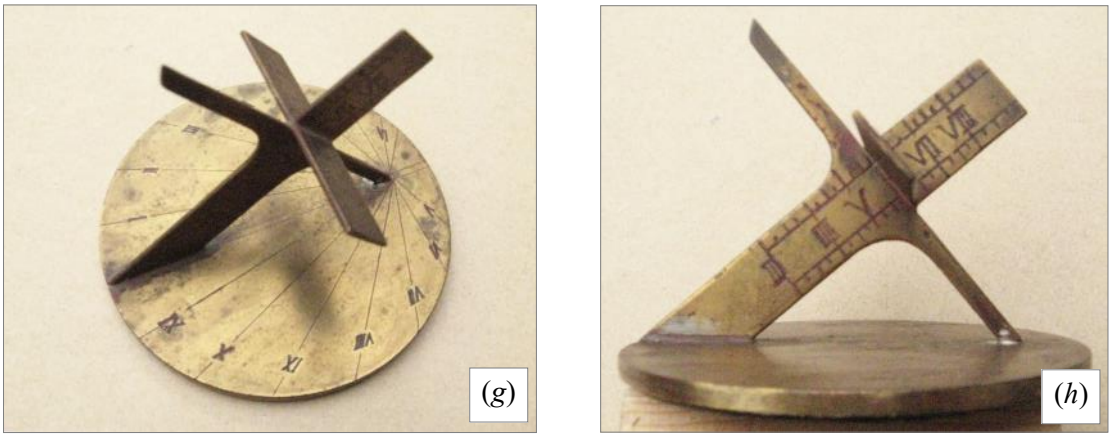
Fig. 4. Solar compass.

Fig. 5. Solar compass, detail of markings.



(a) Equinoctial ring dial; (b) standing ring dial; (c) ring dial supported by a carved wooden classical figure;

(d) ring dial, folded; (e) equinoctial dial; (f) equinoctial dial;



(g) horizontal dial with polar cross; (h) detail of polar cross.

Fig. 3. A selection of Gerald Dunn's dials.

direction disc against its direction pointer index, and proceeding such that the time as shown on the equinoctial dial ring is in agreement with that as shown on one's watch. A small circular spirit level is fitted so that the user can ensure that the lower directional disc is level.

This would seem to be a simple instrument to use, and would give better results than an ordinary magnetic compass, which could well be affected by nearby metal, such as that of the vehicle being used.

For a while he also took up teaching technical drawing, but after a period found this no longer enjoyable, and in 1975 he decided to retire from teaching. Gerald tried various ideas, but he was not really a commercially-minded person and he was not fully in touch with what was in vogue with the population in general, rather than what he assumed they needed.

A confident, but shy and retiring person who did not particularly enjoy large gatherings, he was content with small family parties only. Whereas his wife Maureen was very sociable, Gerald was a quiet person and not interested in the trivialities of life. He much enjoyed local and coastal sailing (Fig. 6). He also made several sailing excursions up the River Thames in the Cornish Shrimper type boat that he had suitably modified to contend with the locks and bridges encountered.

Other interests included wood carving of figures in classical form (Fig. 7), glass engraving (Fig. 8), and modelling miniature figures in bronze and resin. He was always a very active man, having among all his other interests, an enjoyment of smoking and the occasional glass of gin.

Fig. 6. Gerald in his sailing-boat Fenella.

Fig. 7. Ballet dancer.

Fig. 8. Engraved glass.

Gerald Dunn died on 3 September 2002 and is buried in the village cemetery at Tollesbury in Essex. He was, indeed, a 'polymath'.

ACKNOWLEDGEMENTS

I should like to thank Christopher Dunn for the background historical details about his father and for the images in Figs 1 and 6, and my thanks go to Greg and Juliet Dunn for additionally providing Figs 3a–f.

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THE TRANSIT OF VENUS SUNDIAL, CAMPBELL TOWN, TASMANIA

CHRISTINE NORTHEAST

Ken and Linda Evans, friends of John Lester, sent him these photographs of an unusual dial that they had spotted in a corner of Valentine Park, Campbell Town, Tasmania. It is known as the 'Transit of Venus Sundial' (Figs 1 and 2).

Campbell Town is situated on the banks of the Elizabeth River, approximately 80 miles north of the Tasmanian capital Hobart, on the Midland (or 'Heritage') Highway. It is surrounded by an area of fine wool growing, beef cattle production, and timber milling.

An attractive and well-preserved Georgian town, it is small but of considerable interest, with a wide main street and, amongst other features, a handsome red bridge built by convicts; a large former coaching inn known as The Foxhunters Return, also built by convicts; and The Grange, constructed in the style of an English manor house.

Valentine Park is in the centre of the Campbell Town, and takes its name from Dr William Valentine, who was born at Martock, Somerset, around 1808, and who in 1839 arrived in Van Diemen's Land (as it was then called) to be the hospital's doctor. He played a prominent part in the religious, educational, cultural, and scientific life of the town, was an acknowledged authority on Tasmanian plants, and was a keen amateur astronomer. The Grange was built for him in 1847; it is adjacent to Valentine Park (and not far from the sundial). It was through Dr Valentine's interest in astronomy that Campbell Town gained another claim to fame – its part in the observation of the 1874 transit of Venus, as described below.[1]

Fig. 2. The dial in operation.

Fig. 1. The Transit of Venus Sundial.

The Sundial and its Construction

The dial, at approximately 41° 55.5′ S, 147° 29.5′ E, was designed and built by Anthony (Tony) Sprent of the University of Tasmania,[2] for the town-wide celebrations of the transit of Venus on 8 June 2004. It weighs about half a tonne, and is mounted on a sandstone base.

In planning the dial, Tony Sprent wanted to reflect the rural connections of the town, and, as he explained, "to provide an impression similar to that of old farm machinery commonly seen standing rusty and abandoned in various paddocks throughout Tasmania". Most of the components were found on a dump on a nearby agricultural property, and included parts of an old horse-drawn seed and fertiliser spreader, cast iron wheels and wrought iron axles from a 'timber jinker' (used for transporting large logs), together with assorted brackets, shafts and gears. A cast iron tractor seat, ploughshare and nuts and bolts of a similar era were also acquired.[3]

Many of the pieces had to be repaired, rejuvenated, or otherwise modified, and some new parts had to be fabricated, whilst still retaining the appearance of old machinery. A bronze casting of a plough disc was made, as the surface of the original would not be in sufficiently good condition to allow for the engraving. The disc was polished, and a fine drill mounted in the head of a milling machine was used to mark the points on the analemma.

The project took several hundred hours to complete from first idea to opening on 8 June 2004 by the Governor of Tasmania in the presence of about 500 people.

Using the Dial

Instructions are provided nearby:

"*To use the dial, sit in the seat then rotate the hand-wheel until the plough disc is facing the sun. Adjust the disc until the light of the sun through the small hole in front of the disc is shining on the line of dots engraved nearest the current month of the year. Now read the time displayed on the scale. The date is given by counting the number of dots since the beginning of the month to the dot where the sun is shining.*"

It is similar in operation to the A.N. Goddard sundial at Bloomfield Hills in the USA, which was discussed in articles in the December 2017 and March 2018 issues of the *Bulletin*,[4,5] and to the French heliochronometer shown at the 2019 Newbury meeting by Ben Green.[6]

As with these examples, there is an aperture nodus – in this case a hole through the centre of a small gear wheel (Fig. 3). This is used to project a spot of light on to an analemma, here engraved as a line of dots on a plough disc (Fig. 4). There is a dot for each day, with month separators formed by short three-dot lines that cross the analemma curve at right angles. The analemma is split into two sections (Fig. 5): April to September for AEST (Australian Eastern Standard Time, UTC + 10:00) and October to March for AEDT (Australian Eastern Daylight Time, UTC + 11:00). Also engraved on the disc are "1874 – TRANSIT OF VENUS – 2004" above the analemma, and "CAMPBELL TOWN Anthony Sprent" below the analemma. A fixed hour scale is attached to the rim of a wheel; on this the hours, with Arabic numerals, are shown divided to 5-minute intervals (Fig. 6). A pointer on the nodus support indicates the time. The disc and nodus support, fixed together, rotate about a polar axis; Fig. 7 shows the small hand wheel for turning the disc and nodus arm assembly. Gears from an old seed spreader are used to drive the dial, and are safely encased to avoid accidents. The user sits on an old iron tractor seat whilst operating the dial.

Fig. 3. The gear wheel aperture nodus.

Fig. 4. The spot of light (almost) on the analemma.

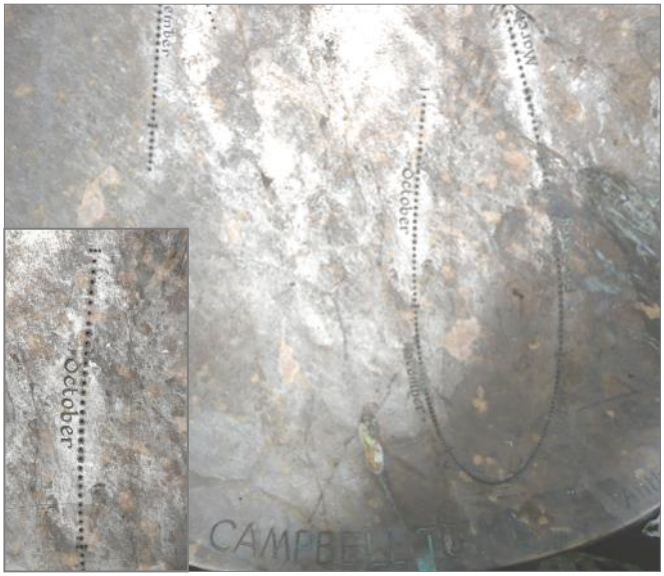

Fig. 5. Parts of the split analemma: winter months on the left, summer months on the right. Inset: October.

Fig. 6. Close-up of the hour scale and pointer.

Fig. 7. The nodus arm, hour scale and hand wheel, and the casing for the gears used to drive the dial.

Campbell Town and the 1874 Transit of Venus

As the inscription indicates, the sundial was made not only for the 2004 celebrations of the transit of Venus, but, more importantly, to commemorate the part that Campbell Town played in the worldwide observations of the 1874 transit, which came about by chance.

During 1874, parties were sent by several countries to locations widely differing in latitude to observe and photograph the transit on 9 December that year, with a view to gaining a better estimate of the Astronomical Unit (the semi-major axis of the Earth's orbit) than previously obtained.[7] Two of the eight teams under the auspices of the United States Naval Laboratory were despatched to the subantarctic Crozet Islands in the South Indian Ocean, and to Hobart in Tasmania. Storms prevented the Crozet party from landing, so they remained on the ship and were disembarked at Hobart along with that team, there to search for an alternative observing site that was easy of access and with a meteorological record indicating a strong possibility of clear weather on the day of the transit.[8]

Dr William Valentine, with his passion for astronomy, offered a suitable field at The Grange in Campbell Town. Captain C.W. Raymond, leader of the Crozet team, noted that the town "occupied nearly the highest available ground on the island, and is unpleasantly celebrated for dry weather during the summer months… Meterological records…show clear weather on December 9 for at least nine years preceding. It is separated by hills from Hobart Town [the other observing station in Tasmania], so that local storms are not likely to extend from one place to the other."[9]

After other options had been considered, Dr Valentine's invitation was accepted, and in a paddock to the north of his house the 'Campbell Town Observatory' was set up. In spite of less than perfect weather on the day of the transit, many photographs were taken, of which just one print still exists; it is said to be the only surviving photograph of the transit from any of the US stations. When the Americans left, they expressed their thanks to Dr Valentine for his generous hospitality by giving him the station's 'Equatorial House' to use as an observatory, and it was later modified to form a summer house at The Grange.[10]

Astronomical Connotations of the Sundial

It is clear that the sundial reflects the agricultural nature of the area, but how does it reflect the transit of Venus? Tony Sprent explains, by drawing attention to some of the dial's "astronomical connotations", as follows:

"*The disc is reminiscent of the shape of the parabolic dish of a radio telescope or the primary mirror of an optical telescope. The aperture (nodus) through which the sun shines on to the disc is at the centre of an old gear wheel. This casts a shadow with a serrated edge rather like the rays of the sun with a central spot of light in the middle – somewhat like a negative image of the sun being transited by Venus.*"[11]

ACKNOWLEDGEMENTS

Many thanks to Ken and Linda Evans for the photographs, to John Lester for forwarding them to the *Bulletin*, and to Tony Sprent for locating a copy of his 2007 paper.

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2. Another dial designed by Tony Sprent is to be found in the central mall of the University of Tasmania Campus in Sandy Bay; photographs and a description by BSS member Piers Nicholson can be seen at *http://sundials.co/~tasmania.htm*
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NEW SUNDIAL AT THE OLD SCHOOL, WIGGENHALL ST MARY MAGDALEN, NORFOLK

DAVID PAYNE

Following an enquiry made to the BSS by Kevin Grief, I was asked to contact him and help in the construction of a large armillary dial to be placed in front of the old school at Wiggenhall St Mary Magdalen, Norfolk (52.672° N, 0.351° E). It started its creation from a surplus length of cold rolled 3-metre diameter H-beam section mild steel, which a friend of Kevin's had suggested could be used to make a sundial.

The aluminium central globe nodus is approximately 30 cm in diameter; it was an off-the-shelf item from India, found on the Internet and not made for the dial.

The rest of the components were made from a mixture of mild steel and stainless steel, and were manufactured by TAM Engineering Services Ltd of Wisbech. Rolling was carried out by the three-roller technique, with two bed rollers and a top roller (Fig. 1). These items included:

- Celestial equatorial ring, made from stainless steel 30 cm wide, 3.5 metres long and 5 mm thick. Roman numerals were laser cut from the same material and riveted on to the equatorial ring.

Fig. 4. The pedestal, with the dial attachment on the grass behind.

Fig. 1. Inside the rolling mill.

Fig. 2. Equinoctial colure ring.

Fig. 3. Celestial polar ring.

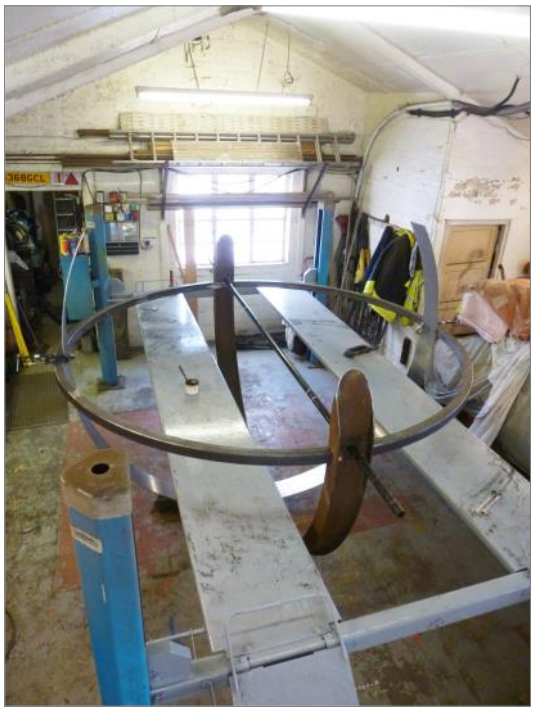

Fig. 5. Assembling the dial inside the workshop.

Fig. 6. The dial being reassembled on site.

Fig. 7. The dial being lifted into position on to its pedestal.

- Equinoctial colure ring, giving rigidity to the whole structure, and rolled from two 60 × 60 mm box section lengths of mild steel. In order to roll a 3-metre diameter ring accurately, it had to be rolled in two halves and joined (Fig. 2).
- Celestial polar ring, made from H-beam of mild steel 20 × 20 cm cross section and cold rolled (Fig. 3).
- Arrow-tipped rod gnomon, made from 25 mm diameter solid stainless steel rod.

The pedestal was made from stainless steel tube and a tripod design was used for better stability (Fig. 4). It was set in 1.5 tons of concrete reinforced with grid mesh.

The various mild steel parts were painted with a high-build primer and a top coat of industrial paint, and the dial was assembled in Kevin Grief's workshop (Fig. 5).

It was then taken apart and reassembled next to its final position (Fig. 6), before finally being lifted on to its pedestal (Fig. 7).

Fig. 8 shows the completed and reassembled dial in front of the old school.

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Fig. 8. Kevin Grief and his completed dial in front of the old school.

A MASS DIAL AT AUCTION

JOHN DAVIS

Mass dials are rarely found for sale as they are integral parts of buildings (usually churches or chapels) and so only become available if the building is demolished or rebuilt. An exception came up in November 2019 when the dial in Fig. 1 was placed for auction by TimeLine Auctions Ltd at one of their regular London sales of antiquities and historical artefacts.[1] The estimated price was £400–£600 with no reserve but the hammer price after 25 bids was £700 (with a buyer's premium of 30%). The item is actually more interesting than most mass dials.

The auction catalogue explained that the dial had belonged to a Norfolk collector and that it had originally been collected from the south of that county. It is basically an 8½″ (c. 210 mm) cube of stone (undefined but probably limestone) with a large chamfer to the back and weighing 11.1 kg. Close examination of Fig. 1 (lower picture) shows that there are some inscribed numbers or letters at the ends of the hour lines, between a pair of circles, which are, very roughly, at a 15° spacing so the dial qualifies as a 'transitional' one.[2] They have not been deciphered. The dial was described as 13th or 14th century which seems plausible and would fit in with the earliest introduction of clocks and the move to 'hours' – first unequal then equal – as a form of timekeeping rather than the canonical hours used earlier.

The fact that it comes from Norfolk, an area without any indigenous building stone, is significant because of other transitional dials that have come from the county. One which was once at St Wandregesilius's church in Bixley, just to the south of Norwich, was described in an earlier article and must have been within a few miles of the auction dial.[3] That article also describes another transitional dial – a type which nationally is quite rare – at St Andrew's church, Wickhampton, again in the south of Norfolk. Thus, together with other evidence of timekeeping artefacts from the area, the case for Norfolk being at the forefront of timekeeping developments in the early 14th century continues to grow stronger.

The angles of the hour-lines of the auction dial were determined from the single available picture, bearing in mind the problems with non-ideal photographs reported recently by Kevin Karney.[4] It was first perspective-corrected by drawing four tangents to the outer circle of Fig. 1 parallel to the edges of the block and employing the algorithm in PaintShopPro™. This resulted in a rectangle

Fig. 1. The mass dial sold at auction. Photo © TimeLine Auctions Ltd. Below, close-up showing the remnants of engraved labels for the hour lines.

which needed to be stretched by 11.1% in the Y-direction to turn it into the square seen in Fig. 2. It can be seen that the hour lines do not all go through the centre of the gnomon hole but that their spacing is indeed roughly 15°. As well as the radius lines for the hours there are shorter tick marks inside the inner circle but they are clearly not intended to be half-hour marks, being positioned more like a quarter of the gap from the left side. One of these short lines is much closer to the vertical 'noon' position than the adjacent full lines. This feature is unexplained: perhaps an empirical adjustment was being attempted to allow for a wall direction which was not exactly due south. Despite these uncertainties, it seems likely that the dial was attempting to reproduce the times indicated by an early clock.

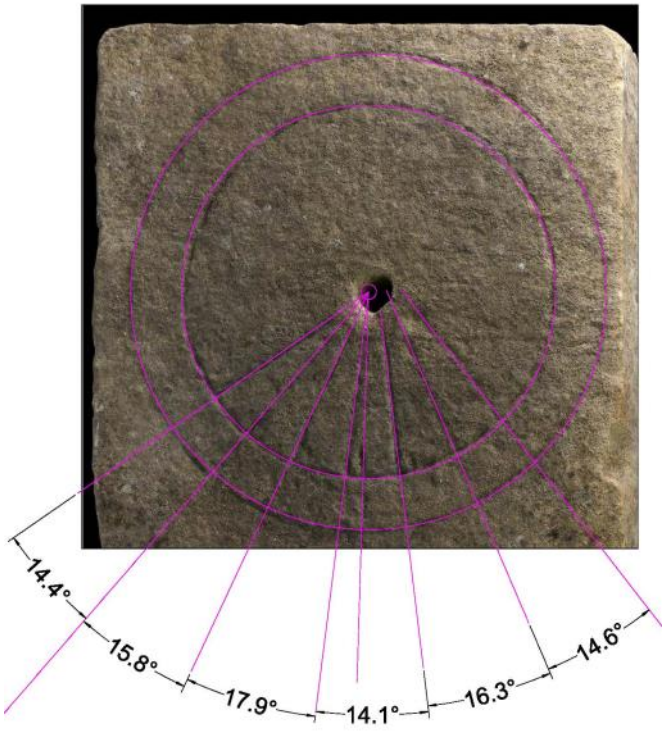

Fig. 2. The dial face, perspective and geometry corrected.

The intriguing chamfer of the stone block prompts a question of where on a building it was likely to have been positioned. Ben Jones, who once worked as a stone mason for a short time, remarked that the circular dial comes very close to the edges of the block and wondered whether this suggested that it had been surrounded by other stonework. He also wondered whether the splayed left side might have been part of keying the block into a door or window moulding.[5] Note, though, that for the Wickhampton dial mentioned earlier, the church is necessarily mainly flintwork so the dial is actually on the buttress and comes very close to the left and right edges of the block.

As an aside to the auction mass dial, attention may be drawn to another piece of early dialling in Norwich, shown by the pictures of Fig. 3. This is on a square stone block of similar size to the mass dial but in this case it appears to be an attempt at a scientific dial. It is now upside down in a modern wall built of recycled material to the rear of the refectory at Norwich Cathedral. It seems that delegates to the BSS Conference held in Norwich in 2018 missed the dial despite a walking tour passing through the precinct! Evidence for the attachment of a metal-plate gnomon can be seen in the form of two bolt holes near the central 'noon' line. The hour lines seem to be rather crudely engraved through a thin render layer and come from an origin which is near what originally would have been the top of the stone. The angles are too variable to attempt reverse-engineering the design. It is impossible to date the dial but the general feel is that it is rather old, possibly 16th century, and could be one of the first faltering steps at producing a scientific dial but using the same general style as a late mass dial.

The market for mass dials cannot be large, so churches are probably safe from having them ripped out of their fabric. It is a shame that the original location of the auction dial has

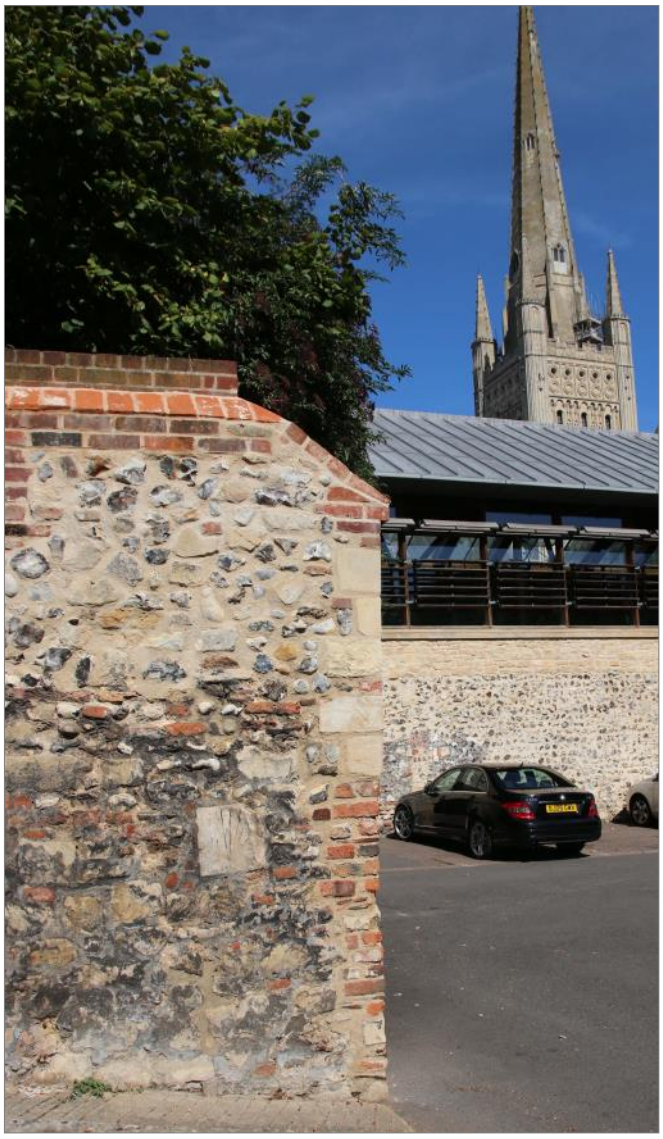

Fig. 3. A reused, early scientific dial in a modern wall to the rear of the Refectory in the Norwich Cathedral precinct. It is upside down. Left: the wall and general surroundings; above: close-up of the dial.

not been released, but the fact that it was from Norfolk adds to the fascinating story of the county's place in the history of timekeeping.

ACKNOWLEDGEMENTS

I am grateful to TimeLine Auctions Ltd for Fig. 1 and to Ben Jones for useful conversations on church stonework features and early graffiti.

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5. Ben Jones, personal communication 24 November 2019.

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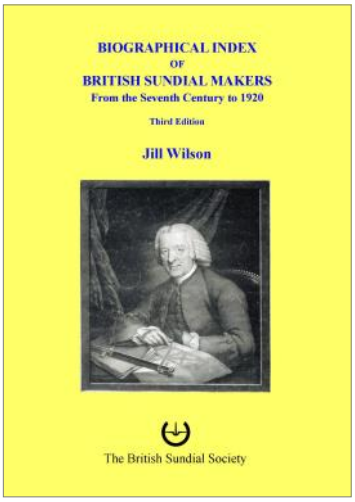
NEW BOOK

Biographical Index of British Sundial Makers from the Seventh Century to 1920 (3rd Edition) by Jill Wilson (BSS Monograph No. 12), pp.230 + x, b&w illustrations throughout, A4, soft cover. ISBN 978-0-9558872-9-1. Published December 2019. Price £18.50.

This new edition of the *Biographical Index*, updated and expanded with the fruits of Jill Wilson's researches in the 10 years after the 2nd edition was published back in 2007, contains entries for almost 1900 makers, nearly 330 more than before; in addition, many of the existing entries incorporate new information. The biographies vary in length from a line or two to almost a page, and many are accompanied by one or more illustrations, but all are given a useful list of up to 20 references, enabling the reader to extend his or her reading. Wikipedia does not appear in these lists!



The main part of the Index is divided by century, with an introduction to each chapter detailing aspects of dials and dial making that Jill saw as distinguishing that particular time period. This is not simply a telephone-directory type of index: dipping into the book at random is more rewarding than simply using it to look up a particular maker and returning it straight back to the shelf, for there are many interesting snippets as well as the bare facts.

Complementary material in the Appendices includes lists of Freemen and Brothers of London Guilds, a note about indentured apprenticeship, and 'family trees' depicting successions of masters and apprentices.

No BSS member with an interest in dials of the past should be without a copy of Jill Wilson's book.

CHN

Joanna Migdal

Master of the Worshipful Company of Clockmakers

On 28 January, noted BSS member Joanna Migdal was installed as the 2020 Master of the Worshipful Company of Clockmakers. The photograph shows Joanna flanked by her three Wardens and the Deputy Master shortly after the Installation Court in the Painters' Hall.

The installation was followed by a Service in St James Garlickhythe. After the Service, the Company returned to the Painters' Hall for the Installation Dinner.

In her speech, Joanna referred to two early past Masters, Elias Allen (1636) and Henry Wynne (1690), both names familiar to BSS members as sundial makers. Joanna has, of course, made many fine sundials herself.

Two other BSS members were at the dinner: Keith Scobie-Youngs and, as guest speaker, Frank King.

FHK

Photo: Caroline Kearsley.

Charity number: 1155688

The British Sundial Society

Report of the Trustees and Unaudited Financial Statements

For the year ended 31 December 2019

The British Sundial Society
Report of the Trustees
For the year ended 31 December 2019

The Trustees have pleasure in presenting their report and the financial statements for the charity for the year ended 31 December 2019. The Trustees have adopted the provisions of Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their accounts in accordance with the Financial Reporting Standard applicable in the UK and the Republic of Ireland (FRS 102) (effective 1 January 2015).

The British Sundial Society
Report of the Trustees Continued
For the year ended 31 December 2019

Chair's report

During 2019, our 30th anniversary, the Society again successfully maintained and delivered its ongoing core activities (including the Bulletin, annual conference, and Newbury meeting) and infrastructure (including the website, dial registers, and help and advice service). In addition two of the Society's key published reference works, the historical index of sundial makers and register of fixed dials, saw revised and updated editions published. The Society's finances remain capable of supporting current activities and plans for the foreseeable future.

Members continue their involvement in an ever evolving multitude of individual projects and particular dials: see below for numerous examples thereof that were included in our recent public benefit submission to the Charity Commission.

Increasingly the Society's window on the world is its website. There is no more efficient way to spread the word, or advertisement for the Society, and it is the way most new members find us. It is an enormous educational resource free to all in excess of 10,000 pages. In 2019 visitors to, and page views on, www.sundialsoc.org.uk <http://www.sundialsoc.org.uk/> increased by 10 per cent. Our help and advice service is accessed via the website and becoming increasingly popular.

The entirety of Society's activities are conducted on a voluntary basis by members. On behalf of the whole Society the trustees wish to thank all - those in ongoing front or back office roles, the army of recorders, authors, and researchers, plus those that respond to ad hoc requests for advice/assistance - who make the Society what it is. As ever, we are limited to the volunteer resources we have available. If you feel able to help in any way, we would love to hear from you.

Further more detailed information is contained in the annex below.

Jackie Jones, Frank King, Graham Stapleton,
Bill Visick and Chris Williams

ANNEX

Examples of individual projects and dials
Extracts from 2019 public benefit submission:

- Member constructed new sundials in public locations: War memorial, East Stour (Dorset); Interactive sundial, Ensleigh (Somerset).
- Member restorations to historic public sundials: Haddenham (Cambridgeshire); Cambridge City centre.
- Research findings on local sundials: City of Bath; Iwade (Kent); Shenstone (Staffordshire); Newquay (Cornwall); Upend (Cambridgeshire); Langham (Essex); Chertsey (Surrey); Geddington (Northamptonshire); Hughenden (Buckinghamshire); multiple locations in Scotland.
- Digital mapping of sundials in the British Isles was continued, enabling members to be Citizen Scientists, reporting extra data for the national database.
- Member media engagement: BBC website, Orla Moore, 17 February; The Daily Telegraph, Nic Brunetti, 18 February; The Daily Mail, David Leafe, 21 February; The Times, Jack Malvern, 28 February; ITV Anglia, Mathew Hudson, 27 February; Radio Cambridgeshire, Thordis Fridriksson, 20 February; talkRadio, Mathew Wright, 28 February; Cambridge Radio, Leigh Chambers, 8 March.

The Bulletin
Four quarterly issues of the Bulletin were published in 2019. The articles ranged from the scholarly to the light-hearted. Following our usual practice, the March issue included the Trustees' Annual Report and the Society's Accounts; the June issue included reports on the annual BSS Conference and the minutes of the Annual General Meeting, both held in April; and the December issue included a report of the annual one-day BSS Meeting in Newbury in September.

The Bulletin team includes John Davis, Frank King, Christine Northeast and Bill Visick, who receive invaluable help from Fiona Vincent who proof-reads every issue. The Team freely calls on other members of the Society when special expertise is required.
The Editorial Team

Other BSS Publications
On a less regular basis, the Society produces many other publications. These days we publish in both print and digital formats and copies of almost all our output are sent to the Deposit Libraries.
With the exception of dial register publications (handled by John Foad) everything else passes through the editorial team. Whilst publication of the Biographical Index was bought to fruition (see below) progress on other projects has been frustratingly slow. The planned revised edition of the BSS Glossary and updated edition of the digital Bulletin archive have encountered unexpected problems - including, amongst others, the compatibility of old files with current software and indexing consistency.
Clearly the quarterly Bulletin has to take priority, and with the present resources there have been inevitable delays to other projects. If you have editing/publishing software experience and would like to help, we would love to hear from you.

The Editorial Team

The Biographical Index

The Third Edition of The Biographical Index of British Sundial Makers has now been published, the culmination of (the late) Jill Wilson's work over twenty years, and a fitting tribute to her. Editing was completed by Christine Northeast, who also acted as interim keeper of new material for a future Fourth Edition. During 2019, ten new names have emerged (albeit some of them spurious, on 'antique' dials), and useful additional information on ten other makers has been found, mostly by John Davis, and occasionally via queries to the BSS Help and Advice service.

Jill's biographical index records (paper and computer files) have been retrieved from her executors by Chris Williams. These, and 2019's new recordings, are being transferred to Peter Ransom, who has nobly taken on the role of Biographical Indexer.

Christine Northeast

Fixed Dial Registrar

A new issue of the Fixed Dial Register, designed for sale to the general public, was published. Some 4,500 dials in the British Isles are included, with a full description and one large photograph per dial and up to three smaller photos. Coordinates can be copied and pasted directly into mapping apps like Google Maps or Streetmap. The register is in the form of a pdf file, indexed and book-marked by county. It is available in USB-stick and DVD format.

The Register was extended to accommodate additional location and reference fields for decimal Latitude & Longitude, What3Words and Sundial Atlas.

John Foad

Mass Dial Registrar

During 2019, I received twelve queries about mass dials, through the website. Some of these were from members of The Arts Society (formerly NADFASS) and others from the general public. The usual question was 'is it a mass dial?' I encouraged the correspondents to submit good quality photographs, not only the dial itself, but also of its locational context. Some of the reported mass dials were new, some were known to us from previous reports, and the occasional 'dial' was not actually a mass dial - at least one was an Ordnance Survey datum point (showing height above mean sea level). I will be submitting a full article in the Bulletin.

Just over a year ago, I received a large collection of original mass dial records which had been amassed by my predecessor Tony Wood. Many of the Society's mass dial records are stored for us at the Borthwick Institute for Archives, University of York. In October I travelled to York: I was able to examine only a fraction of the BSS records held there but have submitted a full report to the trustees. My thanks to the staff of the Borthwick Institute for their assistance.

My Library report (see below) mentions the visit from Kelley Walker, archaeology student at University of Worcestershire. Her dissertation was on mass dials extant on churches in Worcestershire, and her work has enhanced our knowledge of mass dials in that county. I will place a copy of her dissertation in the Library.

John Wilson

Library

Members will recall that the Bromley House Library has been closed for part of the year in order that a major programme of restoration and improvements could be carried out. I am pleased to report that the Library is once again fully open. A small amount of restoration is still to be done but will only affect the roof over the shops owned by Bromley House and will not affect the library itself. All the books which had been moved to off-site storage (including the BSS Library) were returned to Bromley House in November and all placed in their new homes. Unfortunately, ill-health has prevented me from inspecting the BSS collection. This will be undertaken in the new year.

The only new acquisitions were two small books and a set of sixteen bound volumes of reports that constitute the Fixed Dial Register. Due to the restoration work these temporarily occupy some 80cm of shelf space in my study. I will discuss with Bromley House their incorporation into the BSS space.

Earlier in the year, the BSS Library received a visit from an undergraduate archaeology student - see mass dial report above.

John Wilson

Website

Website usage continues to grow: new and returning visitor numbers have both increased by about 10 per cent year-on-year, as has the number of page views, while average session duration has increased by 17 per cent. The most popular area on the website is the latitude-specific diy BSS Horizontal Sundial; while BRIDOL, the list of designers and makers, How-Do-Sundials-Work and the Bulletin also remain popular. Our experiment with an online discussion forum has not generated significant traffic so we consider the future for this area.

As ever, contributions for the website are always welcome.

Bill Visick

Help and Advice

2019 has been very busy for the BSS Help and Advice service. We have dealt with 90 enquiries - an increase of 40 per cent on the previous year.

The queries fell into the following categories: where/what to buy (4), dial/pedestal restoration (11), replacement gnomon (4), valuation/selling (3), delineation (8), information about an existing dial (47), and other (13). The 'other' category includes requests for software and information for magazine publishers and TV/film producers.
There were 13 enquiries from overseas: USA (6), Canada (1), Ireland (1), Greece (1), Netherlands (2), and New Zealand (2). Queries from USA and Canada are usually forwarded to NASS for resolution, but this year we answered four of them as they concerned UK sundials.
About 70 per cent of our replies received a response - a thank you or further discussion. Two enquirers have now joined the Society. We have offered suggestions and advice for two very large sundial projects - both on private land - and hope to be able to write about them when they are completed. Two enquiries have resulted in articles for the Bulletin - one concerning a dial that had been liberated from a church in Kent and bought by an unsuspecting buyer on a well-known auction website.
Some queries can be answered relatively easily; others can take a lot of time and involve advice from other members. I am very grateful to all members (far too numerous to mention) who provide their knowledge and assistance.
Sue Manston

Conferences
The 2019 conference was successfully held at Bath. In celebration of the Society's 30th anniversary it included an extended programme of visits. The Saturday afternoon tour of Bath, its sundials, and Kingswood School ('home' to David Brown boy and man!) included the unveiling, by Frank King, of a plaque explaining that the Parade Gardens armillary dial had been restored to commemorate the 30th anniversary of the Society's founding. Sunday morning included private visits to the Pump Room (to see the Tompion clock and dial) and the Roman Bath complex, followed by a further private visit to the Herschel Museum of Astronomy.
The 2020 conference will shortly be held in York, with bookings being taken since September. The 2021 conference will be in Exeter, and a venue has been contracted for.
The core conference team comprises Doug Bateman (lecture programme), Bill Visick (IT), plus Liz and Chris Williams (who, between them, do everything else). The permanent team requires, for each conference, a temporary local member to advise on potential venues and arrange conference outings/visits. Our thanks to David Brown for joining the Bath(2019) team. Thanks also to Kevin Karney for overseeing (in Bill's absence) IT at the Bath conference. Louise Smail has kindly volunteered to join the York(2020), and Martin Jenkins the Exeter(2021), teams.
Volunteers are required for 2022 and beyond. If you would like to help or have ideas for future locations/venues, we would love to hear from you.
The Conference Team

Photographic
The Photographic Competition is a biennial event held at the annual conference and 2019 was a 'between' year. However, in recognition and celebration of the Society's 30th anniversary, a special historical display was arranged. With the help of many members a photograph from each year of the Society's existence was selected and mounted for display. For many of the earlier years photographs were reproduced from the Bulletin but the later years included entries to previous photographic competitions. The display was successful with much enjoyment and interest shown by conference delegates.
The competition resumes in York in 2020 and another entry of quality photographs is anticipated.
David Hawker

Membership
During 2019 twelve new members joined the Society. They are from various parts of the world - Belgium, Ireland, Israel, Netherlands and Switzerland - as well as the UK. They found out about us mainly through the website but also Help and Advice, other members and newspapers (Daily Mail and The Telegraph).
However, slightly more have left. The twenty leavers left for various reasons: six have died, two mentioned old age, two gave no reason and the rest were deleted for non-payment - after a number of reminders. The year end membership, including organisations and other societies, stood at 306.
Since June 2018 I have been sending out renewal letters by email. This has cut the postage bill plus reduced paper and envelopes. More reminders seem to be required as emails tend to be 'ignored' more than a letter in the post! However now the system is fully and properly up and running it is a lot quicker.
Jackie Jones

OBJECTIVES AND ACTIVITIES

Objectives and aims

The trustees have considered the Charity Commision's guidance on public benefit, including the guidance 'public benefit: running a charity (PB2)'.
The charity acknowledges its requirement to demonstrate clearly that it must have charitable purposes or 'aims' that are for the public benefit. Details of how the charity has achieved this are provided in the Trustees' report. The trustees confirm that they have paid due regard to the Charity Commission guidance on public benefit before deciding what activities the charity should undertake.

The British Sundial Society
Report of the Trustees Continued
For the year ended 31 December 2019

FINANCIAL REVIEW

Reserves

The trustees have considered the level of reserves they wish to retain appropriate to the charity's needs. This is based on the charity's size and the level of financial commitments held. The trustees aim to ensure the charity will be able to continue to fulfil its charitable objectives even if there is a temporary shortfall in income or unexpected expenditure. The trustees will endeavour not to set aside funds unnecessarily.

RISK ASSESSMENT

The trustees actively review the major risks which the charity faces on a regular basis and believe that maintaining the free reserves stated, combined with their annual review of the controls over key financial systems, will provide sufficient resources in the event of adverse conditions. The trustees have also examined other operational and business risks which they face and confirm that they have established systems to mitigate the significant risks.

REFERENCE AND ADMINISTRATIVE INFORMATION

Name of Charity	The British Sundial Society
Charity registration number	1155688
Principal address	99 Western Road Lewes East Sussex BN7 1RS

Trustees

The trustees and officers serving during the year and since the year end were as follows:

	Frank King Chris Williams Jackie Jones Graham Stapleton David Brown
Secretary	Chris Williams
Independent examiners	Counterculture Partnership LLP Unit NH.204 E1 Business Studios 7 Whitechapel Road London E1 1DU
Bankers	The Co-operative Bank PO Box 101 1 Balloon Street Manchester, M60 4EP

Approved by the Board of Trustees and signed on its behalf by

Frank H. King

.....

The British Sundial Society
Independent Examiners Report to the Trustees
For the year ended 31 December 2019

I report to the trustees on my examination of the accounts of the charity for the year ended 31 December 2019.

Responsibilities and basis of report

As the charity trustees, you are responsible for the preparation of the accounts in accordance with the requirements of the Charities Act 2011 ('the 2011 Act').

I report in respect of my examination of the charity's accounts carried out under section 145 of the 2011 Act and in carrying out my examination I have followed all the applicable Directions given by the Charity Commission under section 145(5)(b) of the Act.

Independent examiners statement

I have completed my examination. I confirm that no matters have come to my attention in connection with the examination giving me cause to believe that in any material respect:

1. accounting records were not kept in respect of the Charity as required by section 130 of the 2011 Act; or
2. the accounts do not accord with those records; or
3. the accounts do not comply with the applicable requirements concerning the form and content of accounts set out in the Charities (Accounts and Reports) Regulations 2008 other than any requirement that the accounts give a 'true and fair view' which is not a matter considered as part of an independent examination.

I have no concerns and have come across no other matters in connection with the examination to which attention should be drawn in this report in order to enable a proper understanding of the accounts to be reached.

Counterculture Partnership LLP
Unit NH.204
E1 Business Studios
7 Whitechapel Road
London
E1 1DU

The British Sundial Society
Statement of Financial Activities
For the year ended 31 December 2019

	Notes	Unrestricted funds	Restricted funds	2019	2018
		£	£	£	£
Income and endowments from:					
Donations and legacies	2	2,538	-	2,538	1,464
Charitable activities	3	30,303	-	30,303	30,753
Investments	4	324	-	324	257
Total		**33,165**	**-**	**33,165**	**32,474**
Expenditure on:					
Charitable activities	5/6	(35,709)	(391)	(36,100)	(27,844)
Other expenditure		(4,996)	-	(4,996)	(3,471)
Total		**(40,705)**	**(391)**	**(41,096)**	**(31,315)**
Net income/expenditure		**(7,540)**	**(391)**	**(7,931)**	**1,159**
Reconciliation of funds					
Total funds brought forward		85,327	7,537	92,864	91,705
Total funds carried forward		**77,787**	**7,146**	**84,933**	**92,864**

The British Sundial Society
Statement of Financial Position
As at 31 December 2019

	Notes	2019	2018
		£	£
Fixed assets			
Tangible assets	11	17,228	17,228
		17,228	**17,228**
Current assets			
Debtors	12	11,304	4,829
Cash at bank and in hand		61,815	80,181
		73,119	**85,010**
Creditors: amounts falling due within one year	13	(5,414)	(9,374)
Net current assets		**67,705**	**75,636**
Total assets less current liabilities		**84,933**	**92,864**
Net assets		**84,933**	**92,864**
The funds of the charity			
Restricted income funds	14	7,146	7,537
Unrestricted income funds	14	77,787	85,327
Total funds		**84,933**	**92,864**

The financial statement were approved and authorised for issue by the Board and signed on its behalf by:

The British Sundial Society
Notes to the Financial Statements
For the year ended 31 December 2019

Accounting Policies

Basis of accounting

The financial statements have been prepared under the historical cost convention, except for investments which are included at market value and the revaluation of certain fixed assets and in accordance with the Charities SORP (FRS 102) 'Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their accounts in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102) (effective 1 January 2015)', Financial Reporting Standard 102 the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102), and the Charities Act 2011.

The British Sundial Society meets the definition of a public benefit entity under FRS 102. Assets and liabilities are initially recognised at historical cost or transaction value unless otherwise stated in the relevant accounting policy note(s).

Going concern

The financial statements are prepared, on a going concern basis, under the historical cost convention.

Change in accounting policy

There have been no changes to the accounting policies since last year or to policies used by the former charity British Sundial Society (registered charity number 1032536).

Incoming resources

Recognition of Incoming Resources
These are included in the Statement of Financial Activities (SOFA) when:
- the charity becomes entitled to the resources;
- the trustees are virtually certain they will receive the resources; and
- the monetary value can be measured with sufficient reliability.

Incoming Resources with Related Expenditure
Where incoming resources have related expenditure (as with fundraising or contract income) the incoming resource and related expenditure are reported gross in the SOFA.

Grants and Donations
Grants and Donations are only included in the SOFA when the charity has unconditional entitlement to the resources.

Tax reclaims on Donations and Gifts
Incoming resources from tax reclaims are included in the SOFA during the same period as the gift to which they relate.

Contractual Income and Performance Related Grants
This is only included in the SOFA once the related goods or services has been delivered.

Investment Income
This is included in the accounts when receivable.

Investment Gains and Losses
This includes any gain or loss on the sale of investments and any gain or loss resulting from revaluing investments to market value at the end of the period.

Donated goods, services and facilities

Gifts in Kind
Gifts in kind are accounted for at a reasonable estimate of their value to the charity or the amount actually realised. Gifts in kind for sale or distribution are included in the accounts as gifts only when sold or distributed by the charity. Gifts in kind for use by the charity are included in the SOFA as incoming resources when receivable.

Donated Services and Facilities
These are only included in incoming resources (with an equivalent amount in resources expended) where the benefit to the charity is reasonably quantifiable, measurable and material. The value placed on these resources is the estimated value to the charity of the service or facility received.

Volunteer Help
The value of any voluntary help received is not included in the accounts but is described in the trustees' report.

Resources expended

Liabilities are recognised as resources expended when there is a legal or constructive obligation committing the Charity to the expenditure:

Governance Costs
Include costs of the preparation and examination of statutory accounts, the costs of the trustees' meetings and cost of any legal advice to trustees on governance or constitutional matters.

Annual Commitments
There are no annual commitments under non-cancelling operating leases and no capital commitments.

Investments
Investments quoted on a recognised stock exchange are valued at market value at the period end. Other investment assets are included at trustees' best estimate of market value.

Tangible fixed assets

The British Sundial Society Library is stated at valuation based on the 2014 value calculated by Rogers Turner Books.

2. Income from donations and legacies

	2019	2018
	£	£
Unrestricted funds		
Donations received	2,380	1,464
Legacies received	158	-
	2,538	**1,464**

3. Income from charitable activities

	2019	2018
	£	£
Unrestricted funds		
Promoting the Art and Science of Gnomonics		
Conference Auction	-	70
Day Meetngs	310	350
Sales	410	787
Subscriptions	9,704	10,939
Events	19,879	18,607
	30,303	**30,753**
	30,303	**30,753**

4. Investment income

	2019	2018
	£	£
Unrestricted funds		
Bank interest receivable	324	257
	324	**257**

5. Costs of charitable activities by fund type

	Unrestricted funds	Restricted funds	2019	2018
	£	£	£	£
Promoting the Art and Science of Gnomonics				
Direct cost				
Bulletin/Publication	12,164	-	12,164	10,663
Day Meetings	205	-	205	152
Events	22,366	-	22,366	13,741
Postal Sales	69	-	69	25
Subscriptions	-	-	-	34
Travel	150	-	150	561
Somerville Lecture	-	200	200	34
Education	-	191	191	-
	34,954	**391**	**35,345**	**25,210**
Support costs				
Promoting the Art and Science of				
Governance costs				
Accountancy fees	720	-	720	675
Legal fees	35	-	35	1,959
	755	**-**	**755**	**2,634**
	35,709	**391**	**36,100**	**27,844**

6. Costs of charitable activities by activity type

	2019	2018
	£	£
Activities undertaken directly		
Promoting the Art and Science of Gnomonics	36,100	27,844

7. Analysis of support costs

	2019	2018
	£	£
Governance costs		
Accountancy fees	720	675
Legal fees	35	1,959
	755	**2,634**

8. Net income/(expenditure) for the year

This is stated after charging/(crediting):

	2019	2018
	£	£
Accountancy fees	720	675

10. Comparative for the Statement of Financial Activities

	Unrestricted funds	Restricted funds	2018
	£	£	£
Income and endowments from:			
Donations and legacies	1,464	-	1,464
Charitable activities	30,753	-	30,753
Investments	257	-	257
Total	**32,474**	**-**	**32,474**
Expenditure on:			
Charitable activities	(27,810)	(34)	(27,844)
Other expenditure	(3,471)	-	(3,471)
Total	**(31,281)**	**(34)**	**(31,315)**
Net income/expenditure	**1,193**	**(34)**	**1,159**
Reconciliation of funds			
Total funds brought forward	84,134	7,571	91,705
Total funds carried forward	**85,327**	**7,537**	**92,864**

11. Tangible fixed assets

	Library
Cost or valuation	
	£
At 01 January 2019	17,228
At 31 December 2019	**17,228**
Net book values	
At 31 December 2019	**17,228**
At 31 December 2018	**17,228**

12. Debtors

	2019	2018
	£	£
Amounts due within one year:		
Trade debtors	1,190	-
Prepayments and accrued income	10,114	4,829
	11,304	**4,829**

13. Creditors: amounts falling due within one year

	2019	2018
	£	£
Accruals and deferred income	5,414	9,374
	5,414	**9,374**

14. Movement in funds

Unrestricted Funds

	Balance at 01/01/2019	Incoming resources	Outgoing resources	Balance at 31/12/2019
	£	£	£	£
General				
General Fund	85,327	33,165	(40,705)	77,787
	85,327	**33,165**	**(40,705)**	**77,787**

Unrestricted Funds - Previous year

	Balance at 01/01/2018 £	Incoming resources £	Outgoing resources £	Balance at 31/12/2018 £
General				
General Fund	84,134	32,474	(31,281)	85,327
	84,134	**32,474**	**(31,281)**	**85,327**

Purpose of unrestricted Funds

General Fund

The purpose of this fund is for the general running of the chairlty

Restricted Funds

	Balance at 01/01/2019 £	Outgoing resources £	Balance at 31/12/2019 £
Andrew Somerville Memorial Fund	6,389	(391)	5,998
St Katherine Cree Restoration Fund	1,148	-	1,148
	7,537	**(391)**	**7,146**

Restricted Funds - Previous year

	Balance at 01/01/2018 £	Outgoing resources £	Balance at 31/12/2018 £
Andrew Somerville Memorial Fund	6,423	(34)	6,389
St Katherine Cree Restoration Fund	1,148	-	1,148
	7,571	**(34)**	**7,537**

Purpose of restricted funds

Andrew Somerville Memorial Fund

The Andrew Somerville Memorial Fund is part of the general BSS Assets, but its use is restricted to funding the annual Andrew Somerville Lecture and restoration and educataion grants, should these be made.

St Katherine Cree Restoration Fund

The purpose of the fund is for the restoration of the sundial at St. Katherine Cree Church, Leadenhall Street, City of London.

15. Analysis of net assets between funds

	Tangible fixed assets	Net current assets / (liabilities)	Net Assets
	£	£	£
Unrestricted funds			
General			
General Fund	17,228	67,705	84,933
	17,228	**67,705**	**84,933**

Previous year

	Tangible fixed assets	Net current assets / (liabilities)	Net Assets
	£	£	£
Unrestricted funds			
General			
General Fund	17,228	75,636	92,864
	17,228	**75,636**	**92,864**