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EDITORIAL

With the December *Bulletin* it has become customary to remind readers that it is time to ask you to vote for the "most enjoyed article in the four 2015 issues". Please send up to three choices, in order of preference, by email to editor@sundialsoc.org.uk or by letter to Frank King at the address given inside the back cover. The result will be announced in Liverpool at the 2016 BSS Conference.

This issue contains the usual mix of articles with Scotland dominating geographically. Two articles relate to the most enjoyable time that some of us were fortunate enough to spend in Victoria, BC, and the neighbouring area, when we went to the NASS Conference in June.

As always, we are grateful to all our many contributors.



This is from a real Christmas card dating, I would guess, from between the Wars. The artist has caught the main requirements of a vertical south-facing dial though not the numerical details!

JD

THE TETRAHEDRON CAIRN

MARK LENNOX-BOYD

I have often found inspiration in classical design, not the modern reproduction of Georgian architecture about which I am extremely doubtful, but rather the incorporation of classical ideas into contemporary design. Following this thinking I have over the years made three large scaphe dials in turned slate, which are of course direct descendants from the hemispherium of Berossus.

In 2014 I was asked by my friend David Heathcoat-Amory to design a sundial to be constructed on a cairn that he wished to build in Scotland, to celebrate his lifetime of love for a beautiful family property in the hills of Perthshire. A cairn is a marker and can be described as a visual metaphor for the occasional visit by people to its location, and a sundial likewise can be called a visual metaphor for the passage of time. The combination of the two was most appropriate to express David's intentions, and I am glad to say that an idea came to me quickly. There were five regular solids known to the Ancients: the cube, tetrahedron, octahedron, dodecahedron and icosahedron. Why not build a cairn in the shape of a tetrahedron, with three inclined triangular faces, two of them with sundials, one to the south west and one to south east, the third north face with something decorative; and the base forming the fourth triangular side?

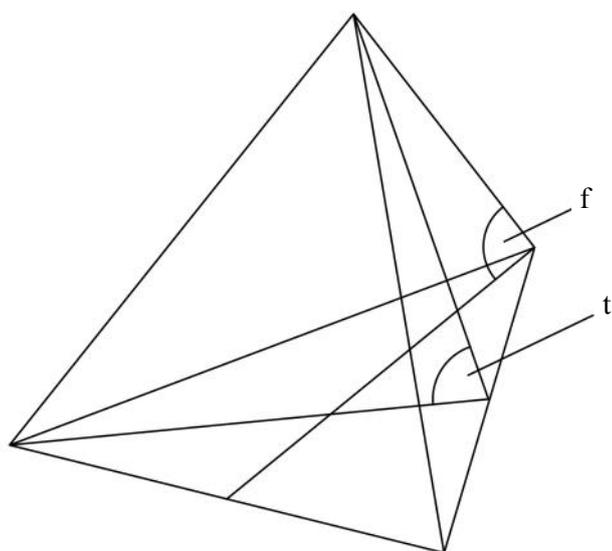


Fig. 1. f is the angle the edge makes with an adjacent plane. In a regular tetrahedron this is 56.13° but if this angle is increased to 56.78° , equal to the latitude of the site, then the angle t , the angle of inclination of the face with the base, is 71.86° . This is the angle of the reclining sundial faces.



Fig. 2. View of the cairn showing the south-western and north faces.

The idea seemed to me a development of classical geometry, and so appropriate to my thinking and taste. It was also in the tradition of polyhedral dials so prevalent in 17th-century Scotland. The object would have two declining reclining sundials on the two faces adjacent to an edge which would be in line with the local meridian. I proceeded to investigate the geometry of a tetrahedron further and calculated that the edges of a regular tetrahedron form an angle of 56.13° with one of the faces. This point is explained by the sketch in Fig. 1. However, the latitude of the Scottish site is 56.78° , a difference of 0.65° , and it occurred to me that it might be more interesting to make what might be called a semi-regular tetrahedron, with an equilateral base and three isosceles faces so that one of the edges was parallel to the axis of the Earth. These isosceles triangles would be not noticeably different in shape and dimension from equilateral triangles. Some of the geometry of a regular and this semi-regular tetrahedron is explained in Fig. 1.

The cairn was completed in July 2015, built in the form of a tetrahedron which is between 9 and 10 feet high and can be seen standing proudly in Fig. 2. The faces are of Brandy Crag grey slate from Burlington, the gnomons are of bronze, and the other material was scavenged from some



Fig. 3. The south-eastern face.



Fig. 4. The south-western face.



Fig. 5. The north face.

collapsed stonework in the area. There are several elegant consequences that flow from the design concept. As mentioned, the north-pointing edge is parallel to the Earth's axis. So of course are the two gnomons. It follows that they are parallel to the north-pointing edge and that all time lines are parallel to each other and also the two gnomons. These interesting features are illustrated in Figs 3 and 4, while Fig. 5 shows the north face.

I knew that Ben Jones should engrave the faces. I decided that the north face should depict some approximate corrections in minutes for the Equation of Time, and that the dials should incorporate the displacement from the Greenwich meridian, and be calibrated in BST, for at a height of 1000 feet in this latitude the cairn will be covered in snow during the winter months. I designed the faces in the software package Shadowspro. Both faces incline 71.86° , one declines 30° west, the other 30° east. Following my drawings and sketches Ben then designed the numerals and lettering on the faces. My regular breathing down his

neck was no doubt sometimes an irritation to him. The central logo on the north face was my idea to portray the initials of our patron. The initials of myself, Ben and Colin Meldrum the builder of the cairn are also to be seen, together with the co-ordinates of the location.

To establish the dial faces accurately on a rough stone cairn was inevitably extremely difficult. A technique which I had successfully devised for the Buscot obelisk¹ was followed. John Huddlestone, my neighbour in Lancashire and skilled metal worker, made a stainless steel cage, perhaps better called a frame (Fig. 6), to which the three faces were bolted, and which could rotate slightly on another stainless steel cut-out base plate which was established precisely level on a pillar. The foundation of the cairn was made by Colin, the pillar built and the assembly delivered by Ben to Scotland. It was Ben's responsibility to fix and align the dials. This he did with some difficulty because he needed a long shadow to align the dials accurately. Fortunately, one day Ben was able to get a good fix at 12:00 BST on



Fig. 6. The stainless steel frame in John Huddlestons workshop. The three oblongs to which the faces are bolted are reclining at an inclination of 71.86° . The base on which the frame rotates slightly can be seen together with the upright levelling bolts.

the south-western face and Fig. 7 shows the assembly established in position. The illustration may appear a little misleading because in high summer the shadow cast by the gnomon on this face has moved off it by 12:00 (the dial can be read at this time on the other face). However, by clamping a strip to the gnomon Ben could get a nice long shadow and accurately fix the assembly. The concept



Fig. 7. The dials established in position. There was a brief moment of sunlight and by means of a strip clamped to the gnomon of the south-western face Ben was able to adjust the frame to the right time at 12:00 LST.

behind the design does not lead to very great accuracy in reading the time. Inevitably the angles of steel frame will, however well made, be very slightly inaccurate and the dials require at times very long shadows. Any inaccuracy in the construction will lead to considerable inaccuracy in reading times. Furthermore the corrections on the north face are very approximate. However, the dials after a few test readings appear to give values accurate to within about two minutes, after correction for the Equation of Time.

Once the steel frame with the dials was in place and fixed Colin built the surrounding cairn and filled the void inside with stones and concrete, taking great care not to damage the dials. The areas at the ends of the dial faces caused me some concern. I knew it would not be possible to make the slates long enough and accurate enough to meet neatly at the cairn edges, and decided to finish each of the three end areas with stepped triangular layers of slate slanted and roughened on the edges. These features can be seen in Fig. 8.



Fig. 8. The south-eastern face showing its bronze gnomon and two of the roughened and stepped slate ends at the corners of the cairn.

David asked a scholarly friend to devise a suitable inscription in Latin: *MONTES AMABAT SEMPITERNOS* – He used to love the eternal hills.

David is delighted with the cairn as are Ben, Colin and I; and if on a clear night an invited visitor walks up the hill and crouches with one eye looking up its southern edge the pole star will be clearly visible.

REFERENCE

1. M. Lennox-Boyd: 'The Buscot Obelisk', *BSS Bulletin*, 25(iii), 2–5 (September 2013).

For a portrait and CV of the author, see *Bulletin* 24(i), March 2012. He can be contacted at marklennoxboyd@mac.com

ANDREW SOMERVILLE AND HIS SNOW OBELISK DIAL

JAMES HOLLAND

I have just found this wonderful picture of Andrew Somerville that I had been seeking for many years, in *A Book of Sundials* by Warrington Hogg (1922), where I had put it for ‘safekeeping’!

Andrew Somerville, the first Chairman and one of the founders of The British Sundial Society, extensively catalogued ancient Scottish sundials, publishing articles and a book about them.

At the first BSS conference, held on 23–25 March 1990 at Exeter College, Oxford, he gave an illustrated talk to the 79 registrants entitled ‘The “Symbolic” Renaissance Dials of Scotland’, concerning a distinct group of free-standing polyhedral dials made in the 17th and early 18th centuries and found particularly in Scotland. He said that they were usually made for the estates of wealthy gentry and were not associated with churches or public buildings.

Of the three main types (lectern, obelisk and facet-head), he described the obelisk as being the most characteristic; it seemed to be unique to Scotland. As the individual faces of these dials were small, it was improbable, he thought, that they were made for accurate time-keeping! He called them ‘symbolic’ dials, suggesting that some elements of their decoration, such as stars, moons and hearts, might perhaps indicate some religious or other symbolic significance. Obelisk dials in particular incorporated these designs.

Andrew concluded his talk by projecting this picture of himself standing proudly by the obelisk dial that he had made of compacted snow. George Higgs immediately called out from the audience, “I assume it showed only Temporary Hours”. Laughter and appreciative applause followed.

Dennis Cowan suggests that it be called an ‘obel-ice-k’ dial. Indeed!

A black-and-white version of the picture appeared in the *Bulletin* almost 20 years ago at the end of an article by Anne Somerville.¹ She explained that the photograph had been taken when there was “an unusually heavy snowfall of the right type, and Andrew worked furiously to make his first obelisk dial before the snow melted – in fact, it keeled over a few minutes later”.

Andrew’s presentation at that first conference rather poignantly illustrated his gentle sense of humour, knowledge and imaginative skill. He died of a heart attack only three months later, honoured and mourned by his many friends.



Andrew Somerville with his compacted snow dial; some of the decoration typically found on obelisk dials can be seen on the shaft and capital. Photo: Anne Somerville.

My wife Jackie and I attended the first BSS conference and as the only American registrants we were warmly welcomed by the Somervilles and others, and we made lasting friendships. The unexpectedly large attendance pleasantly surprised the founders.

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BRATWURSTS, VINEYARDS AND SUNDIALS

DENNIS COWAN

In my younger days, I spent three and a half years with the Army in Germany. Since that time I have had a love affair with bratwurst¹ and at Edinburgh's annual Christmas Market I am always first in the queue at one of the German stalls to consummate our love.

In the summer of 2014, my wife Evelyn and I went for a short holiday once again to our friends, Margaret and Norman, who live in Luxembourg. One night after a short discussion of where to go the following day, I suggested that we head for Trier.



Fig. 1. Trier market cross.

Trier is an old city of Roman origin over the border in Germany on the banks of the River Moselle. I remembered that when I was there before, I had noticed a sundial on the market cross in the main square. Unfortunately I did not have my camera with me at the time, so was unable to take a photo. This would be another opportunity to get that photo. I had an ulterior motive of course – this would be a chance to meet my lover once again – the bratwurst.

The others knew what I was up to of course, but they agreed to my suggestion. We set off the next morning. It was a short drive of less than an hour and, on arrival in the main square, I was torn. Where should we head to first – sundial or bratwurst? Norman solved that problem by

saying that he fancied an ice-cream and the ladies agreed. As they headed for the ice-cream stall, I went next door for a bratwurst. It tasted as good as I had hoped.

Next stop was the sundial. It stands in the centre of the square on a tall circular column on a three-stepped square base. A large cross sits on the capital on top of the column, and the sundial is on the end of the cross's southern arm (Fig. 1). The sundial itself is painted red with a gold border and with gold hour lines from 8 am to 7 pm. However, only the hour lines of 10 am, noon and 3 pm are marked in Roman numerals of X, XII and XV. There are a number of Latin inscriptions on the capital and the cross.

Norman then suggested that we head for Bernkastel, which is a town about 30 miles further down river and is a well known wine-growing centre in the Middle Moselle. That sounded good to me. The River Moselle rises in the Vosges Mountains in France and flows through Luxembourg and then on to Germany where it eventually joins the Rhine at Koblenz. There are wine-growing regions on the Moselle in each of these countries, the most important of which is in Germany.

When I was in the Army, I spent two weeks in the area around Bernkastel and Cochem in 1966, and Bernkastel was the place where I first tasted wine. Not only that, I could remember a stall near to a bridge in Bernkastel where they sold the best bratwurst ever. I wondered if it would still be there.

The road from Trier to Bernkastel follows the Moselle, and on arrival at our destination we parked in Kues which is joined to Bernkastel by a bridge over the river. On walking over the bridge I was surprised to see a large glass circular sundial in the view down river (Fig. 2).

On closer inspection, it was a south-facing dial with "Bernkastel-Kues" at the top and Roman numerals from 7 am to 8 pm, with 9 am not marked. Was that a mistake or was there a reason for it? The Roman numerals were unusual, however. Eleven and twelve had the usual X, but with one dot above to denote eleven and two dots above to denote twelve. Four had what looked more like a Y than a V, with one dot below to denote four, whilst six, seven and eight had the Y with one, two and three dots respectively above. The dial appeared to be longitude-corrected for Central European Summer Time (CEST) (Fig. 3).

The figure in the centre of the dial, Cusanus (also known as Nicholas of Kues), was a German philosopher,



Figs 2 and 3. Bernkastel sundial looking down river; detail of the dial.

theologian and astronomer. He was made a cardinal by Pope Nicholas V around 1448 and died in 1464. I presume that he found his way onto the dial because he was a famous and important local resident.

And now for another bratwurst – would the stall still be there after almost fifty years? Disappointingly, not only did I not see the bratwurst stall, I didn't recognise anything! Ah well, fifty years is a long time.



Fig. 5. The Wehlen sundial sitting high on the slopes of the vineyard.



Fig. 6. Detail of the Wehlen dial.

It didn't take long to find another place to eat, though, and needless to say I had another bratwurst accompanied by a glass of local wine to celebrate my first taste of the stuff fifty years before.

Over lunch we pondered on our next move. Since it was a nice day, overcast but warm and dry, we decided to head for Cochem, another hour's drive or so down river. There were a number of routes that we could take, but although not the shortest option, following the river seemed to be the best bet. On this section, the Moselle twists and turns as it meanders towards the Rhine with vineyards on both sides of the river (Fig. 4).

We were only a few minutes out of Bernkastel just across the river from Wehlen, when I shouted "STOP!" Norman slammed on the brakes. "What's wrong?" he asked. "Nothing" I replied, "but I think I see a sundial". And there it was, nestling against a small cliff face near the top of the vineyard (Fig. 5).



Fig. 4. The Moselle winding its way between Bernkastel and Kues. The sundial is just behind the white van on the bridge.



Fig. 7. The Zeltingen sundial against the small cliff face.



Figs 8 and 9. Detail of the Zeltingen sundial (left); the small figure in the niche (right).

It was a white rectangular west-declining dial face with a ridged roof and black Arabic numerals from 8 am to 6 pm but no hour lines. There was a niche in the centre containing a female figure. It all looked to be freshly painted and in good condition (Fig. 6). Subsequent investigations when I returned home indicated that it had been installed in 1842. Around 1900, the vineyard took its name, Wehlener Sonnenuhr, from its sundial and by all accounts it produces outstanding (and rather expensive) Riesling wines.

We had travelled only another minute or so, to just before Zeltingen, and there was another one! It too was high on the slopes of the vineyard, again against a small cliff face (Fig. 7). This dial had certainly not been painted recently, but again was a white rectangular west-declining dial with black Arabic numerals from 7 am to 6 pm and hour lines (Fig. 8). It, however, had three circular holes at the top as well as a niche in the lower centre. This niche contained a tiny female figure – surely not the original (Fig. 9).

In Zeltingen the road crossed over to the other bank of the river, but as it twisted and turned this bank soon became south facing. It wasn't long, just before Urzig, when suddenly Norman braked and stopped the car. He had spotted a sundial on his side of the road – I think that the bug is catching! This time though, the sundial was just a

couple of yards from the road, on a ruined tower that was built into the cliff face at the foot of the vineyard (Fig.10).

It was a white rectangular south-facing dial, but with a fluted bottom and a sloping top. It had a large niche in the centre, this time containing a large religious male figure (a bishop perhaps?) and it had black Roman numerals from 7 am to 5 pm (Fig. 11).

A few miles further on, there was yet another dial, but this time there was a queue of traffic behind us and no safe place to stop. That was the last dial that we saw before arriving in Cochem, although I have since discovered that there are some others, but not on that section of the Moselle.

After we parked the car in Cochem, we walked towards the bridge. There it was – the bratwurst stall that I thought was in Bernkastel! My memory was not quite accurate, but after fifty years that's not surprising. I just had to have one, although the others declined. It was lovely, and the memories of my youth came flooding back!



Fig. 10. The Urzig sundial on the ruined tower built into the cliff face.



Fig. 11. Detail of the Urzig sundial.



Fig. 12. The typically German Reichsburg Castle above Cochem.

After a bit of sightseeing around this lovely town, including a trip up to the Reichsburg Castle (Fig. 12), it was time for dinner. We found a nice place and although bratwurst was available, I was feeling a little bratwursted out. However, currywurst was on the menu, so I decided on that with chips rather than on a *Brötchen*. Currywurst is simply a

bratwurst smothered in ketchup and liberally sprinkled with curry powder. It was so good.

So that was it – a great day out with four bratwursts, five sundials and around sixty miles of vineyards on both sides of the Moselle. It couldn't have been better.

Actually, it could have been. I found out later that there was another sundial just off the main square in Trier. Not only that – do you recall the first sundial that we saw in the vineyard after leaving Bernkastel? It was on the opposite bank from Wehlen. It appears that Wehlen is known as the “place of a hundred sundials”. They don't actually have a hundred yet, but they are heading that way. There are photographs of many of them on their website www.wehlen.de/sonnenuhren-location.html

Still, that'll be somewhere to go on our next visit to Luxembourg!

NOTE

1. German sausage, normally grilled or cooked on a barbeque, and served in a *Brötchen* (bread roll – literally little bread).

For a portrait and CV of the author, see *Bulletin* 27(i), March 2015. He can be contacted at dennis.cowan@btinternet.com

Postcard Potpourri 33 – Old Market Cross, Mansfield, Nottinghamshire

Peter Ransom

The Old Market Cross at Mansfield is a Grade II listed building located at Westgate, Mansfield, NG18 1RU. The cross dates from circa 1600 and the associated pump commemorates the first Methodist service in the town in 1788. Today the pump is exposed and there is no basin or trough to be seen. On 31 March 1603, James VI of Scotland was proclaimed King James I of England here by Sir John Byron and others.

The dial appears in the 2010 BSS Register (SRN 6557) where its description states that it is 19th century and damaged in 2004/5. The gnomons are now bent and it is in need of restoration.

The postcard is not dated and has no other information on it, but a similar card with different people on it, published under The Milton Postcard Artlette series 223 by Woolstone Bros of London, has a postmark of 1906 on it, so I believe this is of the same period. Looking at the shadow of the cross and the gnomons I imagine the picture was taken shortly after noon.



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WHAT HAPPENED TO THE RAUNSLIFFE HALL DIAL?

MARTIN JENKINS

On the cover of the Shire Library booklet *The Arts and Crafts Garden*¹ there is a watercolour illustration of a sundial in a garden by George S. Elgood. The original watercolour was painted in 1908. The dial illustrated is a horizontal dial, with what appears to be a pierced gnomon, mounted on a classical stone pedestal, set amongst flower beds and topiary (Fig.1). The garden is given as being at Raunsliffe Hall, Leicestershire.

Having searched the BSS Register of 2010, the latest edition I have, I wondered why no entry was to be found given that Raunsliffe Hall sounded pretty grand and most such properties tend to have taken good care of their architectural acquisitions over the decades, and surely some BSS member had seen it!

Background Information

My searches revealed that George Samuel Elgood (1851–1943) was an English artist and illustrator who became well known for his paintings of formal gardens. He was born in Leicester, one of a family of seven boys and three girls. After a private education at various schools he studied art at Leicester Art School under Wilmot Pilsbury, and then architectural drawing at the South Kensington School in London. Elgood's father died in 1874 which required him to return home to look after the family business, although he continued to paint part-time. He went on painting expeditions and holidays with his art school tutor Wilmot Pilsbury, and had some lessons from local artist John Fulleylove who was his brother-in-law, as well as travelling and painting with his wife, Mary Clepham, who was also an artist. In the early 1880s he was free to resume art full-time and became a member of the Royal Institute of Painters in Watercolours in 1882 and a member of the Royal Institute of Oil Painters a few years later. He exhibited several times at the Fine Art Society between 1890 and 1925. George Elgood became known mainly as a painter of historic gardens, travelling throughout England, France, Spain and Italy in the course of his professional life. In 1908 George and Mary settled in an old 16th-century timbered house called Knockwood near Tenterden in Kent, where they designed and constructed their own formal garden in the grounds. Many of his paintings were used to illustrate *Some English Gardens*,² a book by the

famous garden designer Gertrude Jekyll, although there is no mention in the book of Raunsliffe Hall. However, Raunsliffe does get a mention in another book illustrated by him, namely; *The Gardens of England in the Midland and Eastern Counties*.³



Fig. 1. Sundial in the garden of Raunsliffe Hall, Leicestershire. From a painting by G.S. Elgood, 1908.

The Mystery

So where was Raunsliffe Hall located? The name Raunsliffe is given by land record as being in the parish of Markfield, in the district of Hinckley and Bosworth, in the county of Leicestershire. According to Ordnance Survey maps, Markfield is not far from junction 22 of the M1 and the A50. Even a search on Google Earth failed to show what might look like a 'grand house and garden' anywhere in that region. The only references I could find relating to the name Raunsliffe are to some cottages and a farm a short distance from Markfield. I was becoming more and more intrigued by the mystery of Raunsliffe Hall when, as part of the research, I obtained a secondhand copy of the book about George Elgood's life written by his great niece Eve Eckstein.⁴ The mystery was then solved; there never was a Raunsliffe Hall!

The dial and garden painting was of Elgood's own garden at 'The Cot, Markfield', one of the cottages at Raunsliffe in the parish of Markfield. The cottage is still there but it is impossible to determine from Google Earth whether the garden still exists in any meaningful condition. So why was

Raunsliffe Hall given as the dial's location in the various illustrated garden books? Apparently George Elgood used three different location names associated with his own garden, Raunsliffe, Raundsliffe, and Ramscliffe in order to secure family privacy. This misleading name strategy was to make it difficult for anyone to find or identify the Elgoods' house. George Elgood nearly succeeded, as my endeavours to locate the dial have shown!

A photograph in the book purports to show the dial still extant in 1995 but a careful examination of the photograph shows that no dial can be seen atop the pedestal. So what happened to the dial, where is it now?

Elgood's Other Sundials

While investigating this little mystery of the Raunsliffe dial, the book by Eve Eckstein also provided some information regarding other dials that Elgood had painted. When the Elgoods moved to Knockwood in Kent, they established a new garden and one of his paintings is of 'The Dial, Knockwood'. The painting clearly shows a pedestal for a horizontal dial but not the dial itself. Given Elgood's attention to detail and the dial's position in the painting, a gnomon should be clearly visible but there isn't one. However, a plan of the garden drawn around 1930 clearly shows the dial to be to the rear of the house and having a gnomon. Further research has failed to determine exactly where Knockwood is, or was, and the dial is not listed in my edition of the BSS Register. So another little mystery!

George Elgood painted several other dials, some of which are in the BSS Register. The dial at Guarlford, Worcestershire is recorded, as is the one at Arlen in Warwickshire, and the one at Loseley House in Guildford. Some others mentioned in the book but not illustrated are given as being at Wroxton in Oxfordshire, Levens in Cumbria, and Stob Hall in Perthshire.

The research into George Elgood and his Raunsliffe dial has also inadvertently enabled me to add information to the BSS Register concerning the dial on St Martin's Cathedral, Leicester. The dial was recorded by BSS member Peter Ransom in 1992 (SRN 0854). It is a vertical slate dial and carries the date of 1897. It was listed in the Register as 'maker unknown' until recently, when in 2014 BSS member Kevin Karney was able to update the Register with more information and a photograph (Fig. 2); this shows the edge border at the bottom right of the dial to be inscribed with T S ELGOOD INV SC et DON; John Davis has suggested that this is an abbreviation for "T S Elgood invenit, sculpsit et donavit" and translates as "designed, made and gave it").

Eve Eckstein's book contains a section on the Elgood family history as well as history directly relating to George Elgood.

In the 1870s three of George's brothers, Richard Harris, John Egbert and Thomas Scott started an art metal



Fig. 2. Slate dial on St Martin's Cathedral, Leicester.
Photo: Kevin Karney.

company called Elgood Brothers in Market Street, Leicester that specialized in the production of high quality wrought iron products. Thomas Scott Elgood was an engineer, and artist, who had worked on the Darlington railway until the slump of the 1870s. The Elgood Brothers Company produced, to commission, large items such as the wrought iron gates for the Midland and Great Central Railway Station and bandstands such as that at Victoria Park. It is stated in Eve Eckstein's book that: "they were also commissioned to supply internal ironwork for a church in Norway and to make a sundial of slate and gilt work for Leicester Cathedral". This is surely the same dial?

Conclusion

Don't buy more gardening books, especially those illustrating classical gardens containing sundials, as it only results in unravelling dialling mysteries and the purchase of even more books!

ACKNOWLEDGEMENTS

I would like to thank John Foad for providing me with the updated Register information concerning the Leicester Cathedral dial, and Kevin Karney for providing the Register with a clear photograph of the dial.

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For a portrait and CV of the author, see *Bulletin* 27(i), March 2015. He can be contacted at sundialduo@gmail.com

READERS' LETTERS

'Walton Hall' Sundial

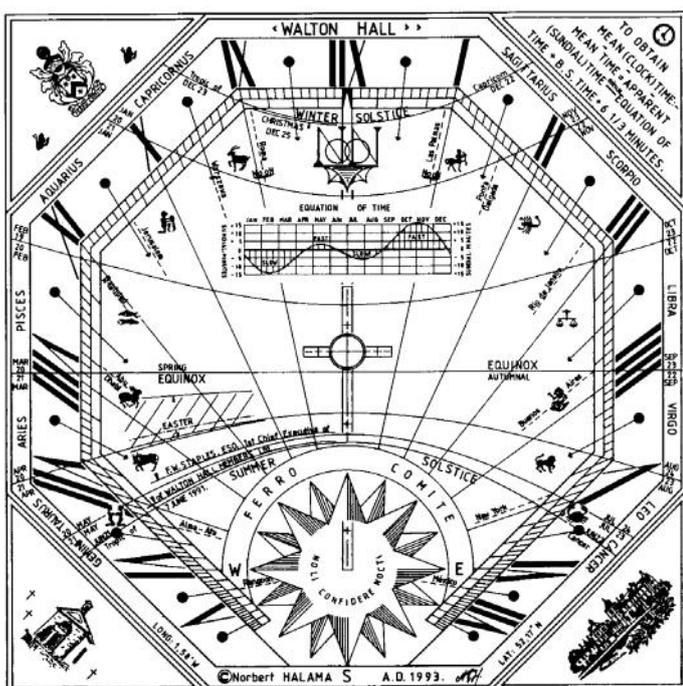
The Tony Moss horizontal sundial shown on the inside front cover of the June 2015 issue of the *Bulletin* evoked many reminiscences and memories of my dialling days before the formation of the British Sundial Society.

In May 1987 I completed a 3-year correspondence course and became a graduate of the British Horological Institute. Apart from pursuing my interest in timekeepers I became interested in the design and construction of sundials. At that time – as computers came into more general use – I devoted a considerable amount of time to writing design programs in order to simplify and speed up the design of complex dials.

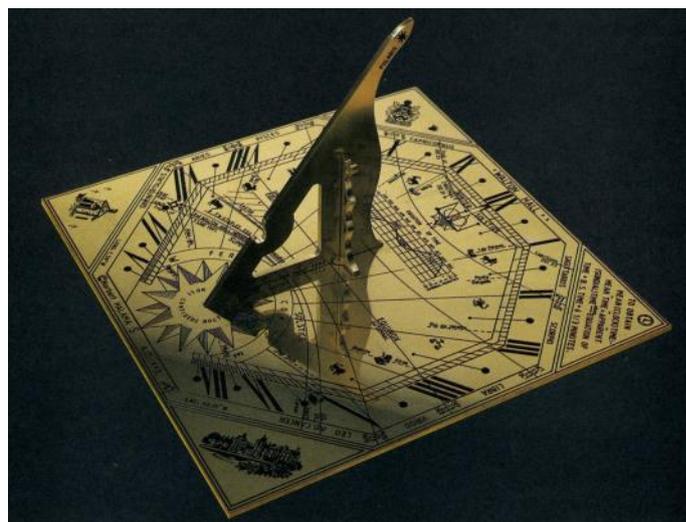
The first sundial I designed using my program was a Family Tree sundial produced in 1991. The second was a horizontal, 280 mm square sundial, 'Walton Hall', completed in 1993. You may find the photographs of this sundial of interest as it looks very much like the Tony Moss sundial shown in the *Bulletin*.

The sundial was constructed in four main stages:

1. Calculations – performed on my CASIO Computer.
2. Preparation of artwork – drawn with pen and black ink on a full-size sheet of 1 mm graph paper.
3. Photo-etching – carried out by a firm of professional engravers, paying particular attention to maintaining



Artwork. The sundial commemorates an important date in the life of Walton Hall Members Ltd, of which I was, at the time, a Member: hence the 7 June on the declination line.



This picture clearly shows the notch in the gnomon which provides the shadow reading the calendar dates.



This view gives a good indication of the gnomon's location on the dial and the position of the notch.

distortion-free photography. Polished brass 4 mm thick plate etched, black-filled and varnished.

4. Machining and assembly – carried out using precision tools in order to maintain accuracy.

You may also be interested to know that I exhibited this program at the 1990 BSS Conference at Oxford, which turned out to be such a momentous occasion.

*Norbert Halama
Chipping Campden*

The Niddrie Marischal Sundial

On page 34 of the September *Bulletin* the words ‘copy of an ancient sundial at Niddrie Marischal, Midlothian’ caught my eye. The pictures below show the horizontal dial that I described at the 2008 BSS Conference; as author Ian Butson says in his article, this is not, of course, the ‘ancient dial’ of the inscription, but it is nonetheless intriguing.

This James Clark dial was made for Wauchope of Niddrie Marischal, a gracious 17th-century mansion on the eastern edges of Edinburgh in Thomas Ross’s time.¹ The house was demolished shortly after the war (and the area occupied by a rather ghastly 1960s housing scheme) but the dial was removed and was installed in the grounds of an elegant villa in north Edinburgh where I encountered it, still on its pedestal, in the mid-1980s. We recorded it photographically, but, sad to relate, within weeks, the dial was ripped from its pedestal and has never re-emerged.



James Clark’s dial, made for Wauchope of Niddrie Marischal, Edinburgh, with the arms of the family in relief on the richly carved sandstone pedestal. Photos © National Museums Scotland.



1. D. MacGibbon and T. Ross: *The Castellated and Domestic Architecture of Scotland*, David Douglas, Edinburgh (1892), p. 495.

*Alison Morrison-Low
National Museums Scotland Edinburgh*

The Kirktonhall Project

Those members who attended the 2015 BSS Conference at Nottingham may remember my talk on the Kirktonhall Project, a concise version of which was printed in the September *Bulletin* (pp. 40–41).

Things have moved along a bit since then, but not in the direction that I had hoped. First, for some unknown reason, the local Council removed the preferred bidder status from the Kirktonhall Creative Media Group, the group that was set up to save Kirktonhall and its obelisk sundial. Then the obelisk was vandalised, the finial being knocked off, and then despite two attempts at having an AGM the required numbers were not forthcoming. The Group was left with no option other than disbanding.

This was a great pity, as they had some terrific ideas, none more so than 3D imaging Scotland’s obelisk and other sundials, as well as a sundial garden with scaled-down copies of these dials, with the by-product of a sundial chess set. At least I have a two-inch prototype of their obelisk as a souvenir!

Also in my talk at the Conference, I questioned whether there was a twenty-seventh complete obelisk sundial at Dunphail in the north of Scotland. It is clear now that there is not. The dial there was a newly designed obelisk commissioned between 1988 and 1990 as a retirement gift for Lord Laing, Chairman of United Biscuits and one-time friend of Margaret Thatcher. I had previously thought (hoped) that it was a new copy of an ancient one at Dunphail, but this was not to be.

One has to question therefore why this sundial is registered with the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) given that it is only twenty-five years old. Perhaps they are looking ahead and see it as a future ancient sundial!

A footnote to the previous letter: before she died, my aunt used to live in the “ghastly 1960s housing scheme”, in Wauchope Terrace no less!

*Dennis Cowan
Fife*



The vandalised Kirktonhall obelisk, July 2015. Photo: Christine Northeast.

A VISIT TO BRITISH COLUMBIA, CANADA FOR THE 2015 NASS CONFERENCE

JACKIE JONES

We had never been to the NASS conference before, so when we discovered that the 2015 conference was being held in Victoria, British Columbia, where my husband Rob has family, we really thought we should go this year. Fred Sawyer then asked whether I could repeat the ceiling dial talk that I gave at the 2014 BSS conference at Greenwich, so we were committed.

The hotel where the conference was held is in the centre of the city, which gave easy access to all its attractions. Partners of delegates who were not interested in sundials were taken on a tour of the surrounding area. This had the strange result that for most of the presentations, I was the only woman in the room.

The first joy was to find that our talks would be held in the aptly named Lookout Room. It is on the 12th floor and one does indeed have a good view north-east over Victoria Harbour and James Bay. In the breaks one could watch the small ferries (which looked as though they belonged in a Lego kit) cross the harbour, as well as the 12-seater passenger planes (which fly regularly between Vancouver and Victoria) land at the water aerodrome.

The conference started on the Thursday afternoon with refreshments and a draw for one of 20 door prizes. These range from sundial books and small sundials to T-shirts. If there is something you really want, you can put all your 15 tickets into that prize to give you more chances. Although I didn't win anything, it was a great ice-breaker; amongst the 50 delegates, there were many I had not previously met.

Friday was Sundial Tour Day. Many of the delegates had never been to Victoria before, so it was also an excellent introduction to the area. We started with a walking tour of dials around the hotel, the first being at the BC Legislature Rose Garden (Fig. 1). It is a typical horizontal garden sundial, the dial plate of cast bronze being about 12" in diameter; as someone said, it was "fit for purpose". It works, is correct for the location, just not very interesting. But we all gathered round to inspect it closely.

Then it was on to St Anne's Academy to see a reproduction of the memorial dial for a 12-year-old student who died in 1922 (Fig. 2). The original had been relocated to the nuns' retirement home at Queenswood when the school closed.



Fig. 1. British Columbia Legislature Rose Garden sundial.



Fig. 2. St Anne's Academy sundial.

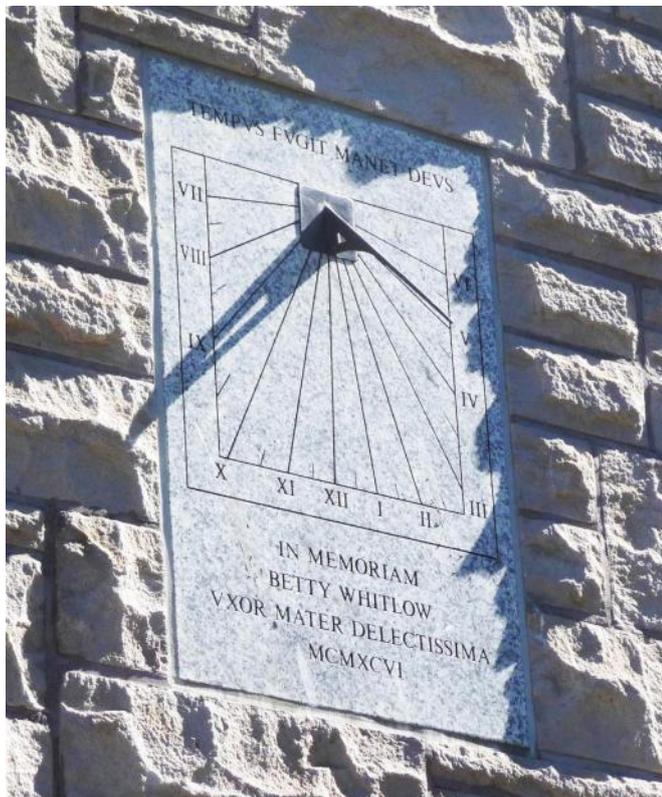


Fig. 3. Christ Church Cathedral sundial.

The dial at Christ Church Cathedral (Fig. 3) is a well-designed vertical declining dial made of granite and set into the nearly south-facing stone wall beside a door into the cathedral. There is information on the equation of time and longitude correction just inside. The dial measures 30" × 20" and declines 7° 33' west. It was commissioned by Dean Brian Whitlow in memory of his wife and was designed by Alan Batten.

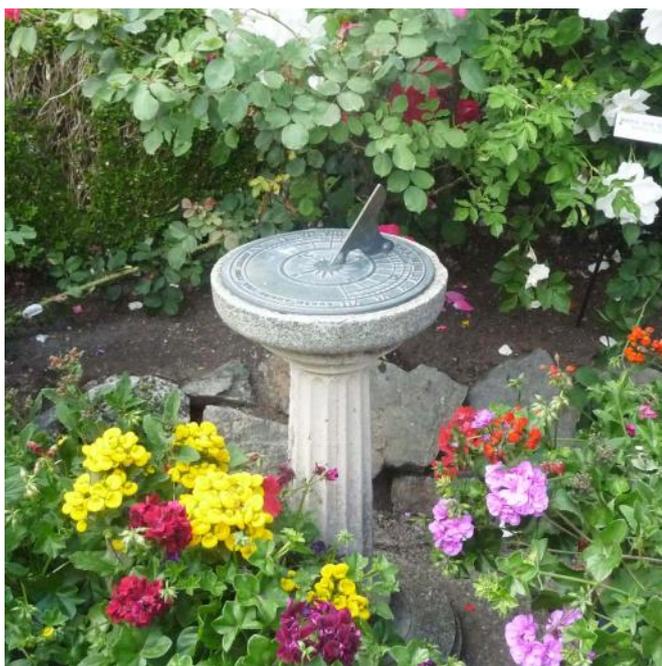


Fig. 5. Butchart Gardens sundial in the rose garden.



Fig. 4. British Columbia Government House Orca sundial.

The coach then met us for the rest of the day's tour. We were treated to an interesting and informative commentary from the driver who obviously knew the area well and included many 'not in the guide book' stories. Our first stop was at Government House, the residence of the Lieutenant Governor of British Columbia, to see the Orca sundial (Fig. 4). Although it is a typical horizontal sundial, the pedestal is interesting. It is a short totem of Orca, or the Killer Whale, that is often seen around the coast of Vancouver Island and was carved by a Coast Salish Native sculptor, Aubrey La Fortune. The dial was donated by the Rotary Club in 2001.

We then ventured much further afield: north through the countryside of the west Saanich peninsula to Butchart Gardens, 22 hectares of floral show gardens in different styles. The landscaping began in 1904 from an idea by Jennie Butchart to beautify the worked-out limestone quarry that had supplied her husband's cement plant. Rare and exotic plants were collected during their extensive world travels and it is now a stunning spectacle of seasonally changing floral displays. In the rose garden is a simple horizontal sundial (Fig. 5). The surroundings were more impressive than the dial, but it was a grand place to have an excellent lunch and a few hours exploring the grounds.

Driving back south on the east side of the peninsula, we saw more countryside and coast with the continuation of fascinating commentary until we arrived at Ogden Point, the main cruise ship terminal in Victoria. There we



Fig. 6. Ogden Point analemmatic sundial.

gathered around the analemmatic sundial (Fig. 6) which was installed in 2009 to celebrate 150 years of British Columbia. The dial was designed by Andrei Golovkine with Dmitry Monin, an astrophysicist, who did the gnomonics. There are brass hour marks and numbers set in a grey chapter ring around a red concrete ellipse, as well as a Zodiac table and longitude and Equation of Time corrections. Without doubt, it was the most impressive dial of the day, added to by a talk from Andrei.

Saturday's talks started early at 8:30 am after breakfast and setting up exhibits; although it was mentioned that this was a late start by NASS standards, it seemed early enough to me. Talks were, as they are at BSS conferences, a combination of details of new dials, historic sundials and the theory of gnomonics.

Len Berggren began by telling us about a new equatorial sundial at Simon Fraser University at Vancouver. It has an aperture-type analemma gnomon composed of two leaves which, when rotated, leave a slot for light to pass through. The gnomon can be rotated so that either the analemma for mean time, or the slot for sun time, can be used.

John Schilke displayed some splendid old images showing the use of the heliotrope and heliograph and their use in determining angles and distance. Barry Duell continued the history theme with the story of a horizontal sundial installed at Willamette University at Salem, Oregon, USA, by the class of 1916 to leave something permanent in the community. Made of granite with a bronze gnomon, it has the motto: "Audacity; Sagacity; Holiness; Charity". Unfortunately, the following year, the gnomon was broken off; it was later replaced, possibly more than once.

Fred Sawyer gave a fascinating talk based on an article he wrote for the *BSS Bulletin* in 1991 about the myth of two different types of portable dials used together always being self-aligning. The error seemed to originate in early editions of *Sundials* by Mayall and Mayall,¹ first published in 1938 and not corrected until 1973. Wikipedia still has it wrong stating that, given two dials mounted together on one plate, if they operate on different principles, such as a horizontal and an analemmatic, then their times agree only

when the plate is aligned properly. So if you move the plate until both dials say the same time, then both will be correctly orientated. Not quite right, as Fred went on to explain in detail. What is needed is a combination that can indicate both time and solar declination as outputs.

Woody Sullivan talked about three new public sundials and then Roger Bailey discussed whether an analemmatic dial could be used as a moon dial. Pierre Georges, in 1660, constructed a method that will work within a week either side of a full moon; it requires a correction of about 48 minutes a day. Although possible, it looked so complicated that one did wonder whether it was worth it, apart from it being an academic exercise.

Sasch Stephens opened the afternoon session with a talk about how he makes sundials from everyday and found objects. He lives in Washington state with a large amount of land, enough to have an enviable "resource materials collection facility", otherwise known as a junk pile. Many of his dials are made from translucent cylinders with a bead suspended at the top centre, the largest being 11 ft by 10 ft. Other domestic objects also have their uses, such as a banana stand for suspending a ring dial and a tray as a vertical dial.

Doug Bateman described his engraved glass noon dial at Farnborough Defence Research and Evaluation Agency. Designed to be seen from inside the building, it shows local apparent time when the sun is due south (on a vertical line), mean time (on an analemma) and the date.

After I had given my talk about painting our reflecting ceiling dial, Claude Hartman continued the theme: this time, on walls outside that are in the shade, where a small mirror is used to reflect the sunlight. One advantage of this method is that quite a large dial can be created. After more talks on ancient Egyptian shadow clocks and a digital gnomon sundial, we had our conference dinner. It was a chance to socialise again over good food, wine and discussions.

Talks continued on Sunday morning. For many years Frank King has been walking along the same corridor in Cambridge, one side of which is wire-reinforced glass. The sun shines through a tree and then through the glass onto the plain wall on the opposite side; one day he noticed in greater detail the effects of the light being broken and did some calculations to explain it. It's all to do with the spacing of the wires being just sufficient to accommodate the apparent angular diameter of the solar disc. The moral is that even if you have studied a shadow 10,000 times, it may still be worth another look. His talk was interrupted by an alarm on someone's phone to mark the exact moment of the summer solstice. We welcomed the solstice with a cheer, some pessimist declared it was now all downhill to winter and we then continued the talks.

Roger Bailey talked about a new sundial with a Peter Rabbit theme. The designer, a landscape architect, had



Fig. 7. Sundial in Victoria Museum.

problems with the delineation, so contacted the BSS help and advice service. The query was passed to Roger who assisted the enquirer in creating an accurate large vertical declining dial of cut steel.

The conference concluded with a show of John Schilke's photographs of the Northern Lights, taken on holiday in Iceland.

Our stay in Victoria coincided with a heatwave with the temperature rising to 30°C. The city has an excellent museum which is air-conditioned, so we spent 6 hours exploring the exhibitions in great detail. Badly displayed, in a dark corner, we found another sundial (Fig. 7). It was made by the Royal Engineers in 1860 for the town of Hope in British Columbia. Fort Hope was established by the Hudson's Bay Company in 1848 and then really took off with the Fraser Canyon gold rush of 1858. The dial is in good condition, so it is a pity that it is not given more prominence.



Fig. 8. Equatorial sundial at English Bay, Vancouver.



Fig. 9. Armillary sundial at Nelson, British Columbia.

Thanks to the information on the NASS website, we found other dials on our travels. In Vancouver, at English Bay, we saw the 30" diameter bronze equatorial sundial shown in Fig. 8. A slot in the rotatable gnomon projects a fine line of sunshine onto the equatorial ring. The dial was made in 1967 and the inscription reads: "This sundial commemorates three English Greenhorns ... who in 1862 filed the first claim and planned the first house and industry in the then heavily wooded area bounded by Burrard Inlet, Stanley Park and Burrard St to which they received title in 1867". It is wonderful how much local history one can learn from sundial plaques.

We then flew 250 miles east to Nelson, where in the garden of a rather good café stands a 6 ft tall armillary dial of mild steel (Fig. 9). The ecliptic ring features Zodiac symbols. Designed and built in 2005 by Nathan Smith, it is manually adjustable for standard or DST.

As with the BSS conferences, the venue changes each year, which gives a good opportunity to explore many new dials.

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For a portrait and CV of the author, see *Bulletin* 26(ii), June 2014. She can be contacted at jackie@waitrose.com

A TRANSYLVANIAN ANALEMMATIC SUNDIAL REVISITED

DAN UZA

While looking through the bibliography of articles in the BSS *Bulletin* early this March, the following title from 1994 caught my eye: ‘A Transylvanian Analemmatic Sundial’, by Robert McVean.¹ I managed to locate a copy. The story dealt with an analemmatic sundial near Braşov (Transylvania, Romania) constructed in a village schoolyard by a team of British volunteers in 1993. They were: Liz Peel, Helena King, Alison Foote, Roland Hughes, Trudy, Robert McVean, John Cottgreave, John Kilner, John Biggadike, David Orchard, Chris Bestwick and Andrew Muddiman. According to this article, the sundial consisted of a date scale made of concrete with a mosaic representing the months, and vertical wooden posts of varying heights bearing hour marks. Most materials were shipped from the UK and the base plan was drawn by C.H. McVean of the British Sundial Society.

Being a sundial enthusiast, it was only natural that I set out to establish whether this sundial still exists today. I first thought about contacting Robert McVean for further details. Since this proved to be a rather difficult task and without any guarantee of success, I then thought about calling the school instead and asking for information. Alas, this turned out to be impossible because their phone was permanently down. Finally I found an e-mail address and asked whether the sundial was still in existence today. I got a reply from the Headmistress, who informed me that some Englishmen had indeed been there in the early 1990s, but that no sundial could be seen now. This was quite a setback to my efforts. More than twenty years had passed since the

dial’s construction, but I knew that concrete normally lasts for hundreds of years so some evidence should have remained. It bothered me so much that it stuck in my mind. Then, in late June, I learned that I had to take a work-related trip to Braşov, some 300 km away from my home. So I wrote again to the school, this time asking for permission to visit their premises. The Headmistress replied saying that because the school was part of a larger compound I needed to talk to the General Manager. She gave me his private mobile number to speed things up – I was already on the road by the time her reply came back. I felt very happy because I finally obtained permission to visit the premises and take a look for myself (Fig. 1).

Brădet is a poor village about 25 km south-east from Braşov. The *Complexul pentru Reabilitare Şcolară Brădet* (Brădet Compound for Educational Rehabilitation) houses around 100 children with special needs and/or behavioural problems, with a minimum of education, often deprived of family affection. A professional staff, dedicated to their work and motivated more by their results than their salaries, made a pledge to educate these children to their best knowledge in a secluded, quiet setting, away from urban turmoil. Needless to say, Government funding is scarce. Mr Adrian Diac, the Manager, was a very friendly person; in fact he had an interest in sundials himself. He even showed me his makeshift armillary which he had installed on top of a pole (Fig. 2). More importantly, he finally confirmed the existence of the concrete date scale somewhere inside the compound, but he had never thought of it as a sundial.



Fig. 1. Brădet Compound for Educational Rehabilitation near Braşov, Romania.



Fig. 2. Makeshift armillary sundial.



Fig. 3. Clearing the grass around the date scale.

After meeting Mr Diac and the children, I was escorted by him to the rear of a long building which he told me was the old TB sanatorium. He then pointed to a field with dense vegetation, grass and shrubs growing to almost the height of an adult man; he said he remembered that the concrete date scale used to be there somewhere.. He then called for a boy, Ovidiu, to bring a scythe and cut an path through the tall grass so that we might pass. I looked at the thick grey clouds lurking overhead and I knew we didn't have much time for this new kind of sundial archaeology – a heavy downpour was about to start. The grass was tall, wet and



Fig. 4. The analemmatic sundial date scale.

heavy; for Ovidiu it must have felt just like shovelling snow in the middle of summer. Finally, aided by his daughter Adela, Mr Diac spotted some pieces of broken floor tiles over concrete. We went ahead and cleared the area (Fig. 3).

The concrete slab measured 4.3 metres by almost 1 metre (Fig. 4). The mosaic was damaged, but in pretty good shape all things considered. As I said, more than twenty years had passed since construction and winters here can be very harsh – summers are often sizzling hot. Today was obviously an exception.

The letters, made from small pieces of white tiles inlaid in a blue background, stand for the Romanian months of the year. Starting from the bottom up, the first column reads January (Ianuarie), February, March, April, May, June (Iunie), and the second one from the top down July (Iulie), August, September, October, November and December. The user had to stand with his or her heels on the given month of the year, then his or her shadow pointed to a certain post driven into the ground nearby. According to McVean's article, those wooden posts (made from telegraph poles) were numbered by Roman numerals and showed true solar time – unfortunately no trace of them remains today. Near the concrete date scale there are a couple of square mosaics, one of which Mr Diac – noting the particular hillshape – thinks depicts the sun rising in the sky above Brădet. A couple of metres further to the north-west there is a curious explanatory cement slab (Fig. 5), which seems to translate Roman numerals into Arabic numbers. The inscription "Cît e ceasul?" is Romanian for "What is the time?".



Fig. 5. Explanatory cement slab.



Fig. 6. Group photo. From left to right: Adela and Adrian Diac, Dan Uza.

My investigation proved to be successful: in Brădet there still exist parts of the analemmatic sundial made by British volunteers in 1993 – the first of such dial type in Romania. It is interesting to note as well that the British team also painted their national flag on a concrete fence in the background. Unfortunately the analemmatic sundial no longer works, but Mr Diac wants to have it restored by early next spring. If you would like to join his endeavour or to help the children of the Compound for Educational Rehabilitation in Brădet, please think about making a donation. You can write to me and I will put you through to him.

Oh, and in the end there was still enough time for a group photograph (Fig. 6) before it started raining...

ACKNOWLEDGEMENTS

The author wishes to acknowledge the contributions of Patrick Powers and Adrian Diac in writing this article.

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Born and raised in Cluj-Napoca (Romania), **Dan Uza** studied economics and now works at Romania's North West Development Agency. His spare-time interests include archaeoastronomy, folklore, astrological symbolism and gnomonics. The 31-year-old has raised awareness of sundials through numerous articles published on his blog as well as in Romanian astronomy magazines. His recent book *Cadrane solare din Transilvania, Banat, Crişana şi Maramureş* is the first and only photographic registry of Romanian sundials. He can be contacted at cerculdestele@gmail.com

TEMPUS FUGIT!

IAN BUTSON

Tempus Fugit – a warning sometimes seen on the face of a clock, as a motto on a sundial, but very rarely found on a gravestone.

However, this one was seen in All Saints' churchyard at Greetwell, Lincolnshire.

Perhaps a salutary reminder to all those dial recorders hurrying around churches and graveyards in the hope of finding yet another unrecorded dial that ...

... TEMPUS does indeed FUGIT!



Flying hour glass on an iron grave-cover at Marholm, Cambridgeshire.

tipsdial.orangehome.co.uk

No dials found here, though!



WHO MADE THESE ENGLISH DIALS?

MIKE COWHAM

The dials in this study are of brass and are almost certainly of English origin, possibly being manufactured outside London, and possibly even from the same workshop. They are generally well made but lack any maker's signature. Two different types are discussed: inclining dials and Butterfield dials.

English Inclining Dials, c.1740

Four of these dials have been studied and the two illustrated in Figs 1 and 2 are certainly by the same maker. It is unusual for English dials not to be signed: it was one of the rules of the guild system that such objects should carry their makers' names. One reason why these dials are unsigned may be that they were made not in London, but perhaps in the provinces, possibly even as far away as Scotland. This is just conjecture, but some of their latitude scales suggest 58° or more North. In the provinces the guild system was not as well established as in London and makers would not have been so strictly controlled.

Of the two inclining dials illustrated, the larger one (Fig. 1) is 90 mm × 79 mm (3.5" × 3.1") and the smaller (Fig. 2) is 56 mm × 48 mm (2.2" × 1.9"). They are similar in many ways. In particular, the springs beneath that keep the latitude arc erect are both of the same profile around the compass bowl and are engraved in a very similar manner as can be seen in Figs 3 and 4. Both dials are delineated as for a horizontal dial of 60° N. The dial plate is then tilted against the scale on the latitude arc which goes from 0° to 60°. These arcs are inscribed on the inside, next to the dial plate. On many dials such markings are on the outside. The gnomons, although with different decorative detail, are of the same outline shape, as can be seen in Figs 5 and 6.

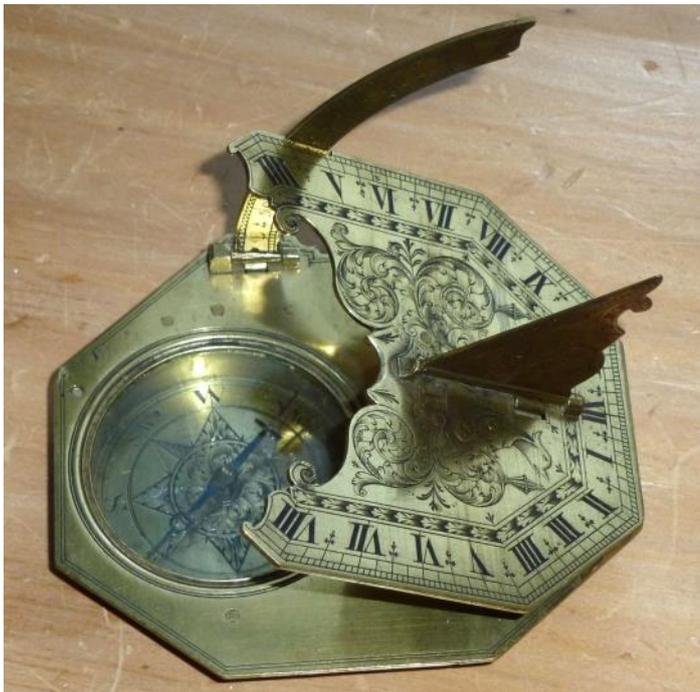


Fig. 1. Unsigned brass inclining dial.



Fig. 2. Similar, but smaller, dial by the same maker.



Figs 3 and 4. The latitude arc spring engraving.



Figs 5 and 6. Comparison of the two inclining dial gnomons, having a similar shape.



Figs 7 and 8. Undersides of the dials shown in Figs 1 and 2.



Fig. 9. Shape of compass needle.

Even the engraving of the latitudes of the towns on their undersides (Figs 7 and 8) shows many similarities. Interestingly, the larger dial seems to have been made for an East Anglian customer as it has latitudes for Ely, Cambridge, Bury St Edmunds, Newmarket, Chelmsford, Ipswich and Norwich. Although the compass bowls are somewhat different, their needles are of the same pattern with a circular hole near one end and a cross bar near the other (Fig. 9). These bowls also have scales around N for magnetic declination. The larger dial (Fig. 1) has $\pm 30^\circ$ and the other (Fig. 2) has $\pm 20^\circ$. This could mean that the larger dial was made later as the magnetic declination went beyond 20° in around 1760.

English Butterfield Dials, c.1740

The two oval Butterfield dials in Figs 10 and 11 are almost certainly by the same maker, possibly the same as that of the two inclining dials already discussed. It could also be that the octagonal dial (Fig. 12) is again by this maker, but this is less certain. Considering the oval ones first, many features of each are common, although both are unsigned. Each has its outer chapter ring delineated for $51^\circ 32' N$, the latitude of London. The dial in Fig. 10 also has a chapter



Figs 10 and 11. Two English-made Butterfield dials.



Fig. 12. Eight-sided Butterfield dial.



Fig. 13. Arc showing erased signature of maker.

ring for 60° N and that in Fig. 11 has two hour scales, one each for 41° N and 48° N. In the compass bowl there is a scale for setting the compass needle to the current magnetic declination, extending 20° either side of N in 2° steps on both dials. Both of the gnomon-supporting birds are very similar, appearing to be a bit like the Jay, particularly with the crest on their heads. A similar-looking dial is known that is signed S. SAUNDERS LONDINI FECIT but it has fewer features in common with those shown here.

The eight-sided Butterfield dial (Fig. 12) differs in various ways so it could be by a different maker. It was probably once signed in the arc next to the root of the gnomon, but the name here has been effectively, if not too prettily, erased (Fig. 13). This leaves us to wonder why the erasure was necessary. We do not know the facts so can only guess the reason.

This dial is actually not well delineated, its three dial scales being not very accurately engraved. Even its VI–VI line is about 1° off being at right angles to the XII line. It also



Fig. 14. Errors in gnomon angle marking.

shows errors where the degree scale was put on the gnomon, and these erroneous figures have been corrected later as can be seen in Fig. 14. The original engraving seems to show it as “50 60 70” instead of the correct “40 50 60”. It is therefore possible that the guild system rejected this dial and, for some reason, it was not immediately destroyed. The main hour-line calibrations show errors of more than 2° for some of their angles. Checking the three hour scales shows that it was made for the three latitudes of approximately 53·8°, 50° and 43°; these places could be Hull, Plymouth and Marseilles. I suggest Plymouth because other Butterfield dials are known that were made for Plymouth, it being an important sea port at the time.

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MOST ENJOYED ARTICLE 2014

The Most Enjoyed Article of 2014, decided by vote at the 2015 BSS Conference at Nottingham was, as announced in the June *Bulletin*, ‘The Eaton Hall Sundial Pillar: a moving story of deviant orientation’ by Mike Shaw (*BSS Bulletin* 26(iii), pp. 24–28, September 2014).

Here he is receiving his certificate from Chairman Frank King at the BSS Newbury One-Day Meeting in September 2015.

The final sentence of the article read “Sadly, despite my best efforts, the pillar remains incorrectly orientated”. The good news is that Mike was able to report at Newbury that the pillar had at last been correctly orientated (see p. 38 of this issue).



SUNDIALS IN SEATTLE

DOUGLAS BATEMAN

Following the NASS conference in Victoria a small number of delegates were in the privileged position of both visiting Seattle and having a personal guided tour of some of its dials by astronomer Woody Sullivan. Woody had designed four of them so we were given detailed descriptions and accounts of his dialogues with architects and metalworkers.



Fig. 1. A very elaborate analemmatic dial in Gas Works Park. Woody Sullivan is in the centre, wearing a white shirt.



Fig. 2. The north-south axis. Note the footprints appropriate for the winter solstice.

The first dial, not designed by Woody, was an unusual analemmatic dial (Figs 1–3) on a small hill in Gas Works Park. Nearby, rusty gas-generating retorts and furnaces had been left as a tribute to this former industry. The dial is very elaborate, with a mixture of bronze and ceramic mosaic. Even the drain covers (Fig. 3) have ‘pointers’ to north, south, east and west. The art almost obscures the function but, fortunately, there is a detailed explanatory plaque.

The group then split into two cars and proceeded to the next dial (Fig. 4), Woody’s first. It is a superb declining dial on the Physics and Astronomy Building of the University of Washington, and was installed in 1994. Woody described the dialogue with the metal fabricators and drew attention to the special paint fluoropolymer coating, specifically a polyvinylidene difluoride (PVDF) sold under the name ‘Kynar’. This type of paint is highly non-reactive so has architectural applications; in the case of this dial there is no sign of fading after more than 20 years on the aluminium alloy structure. A slightly curious feature of this dial is that the gnomon has a large ball at the tip, offset above the axis of the gnomon. Besides its large size and accuracy, the dial is also unique in that its design in fact incorporates *two* dial planes: the shadow of the 7 ft tube gnomon should be read on the brick wall, but the shadow of the ball nodus is designed to be read from the plane defined by the outer surfaces of the metal equinoctial and solstice lines, about 3 inches from the wall. A large explanatory panel is installed on two posts at eye level.



Fig. 3. One of the drain covers, with a ‘pointer’ to the west.

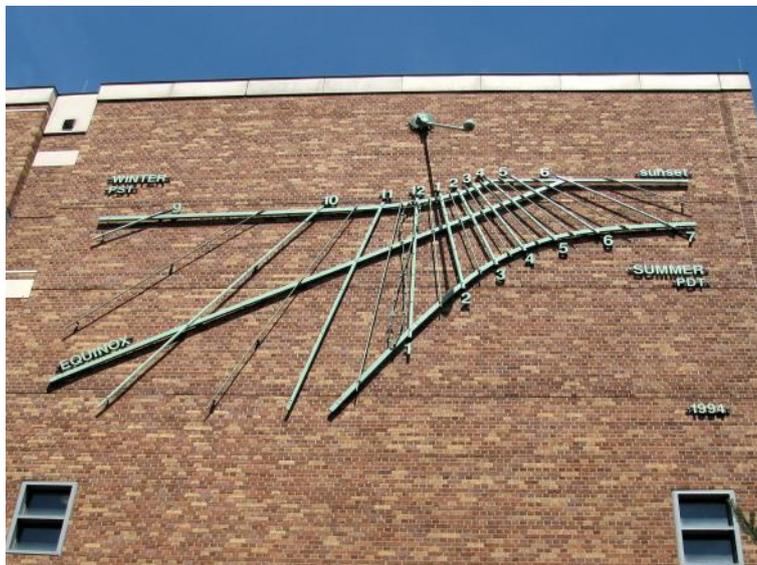


Fig. 4. Vertical declining dial on the Physics and Astronomy Building of the University of Washington. Winter PST means Pacific Standard Time, and Summer PDT is Pacific Daylight Time. The analemma has a single arrow to remind one of the progression of the months throughout the year.



Fig. 5. A shepherd's-style dial at an elementary school. The shadow of the gnomon is not quite vertical; the group of diallists might have done better than this. Moving the handle a fraction to the right would have made the shadow truly vertical and the band of sunlight from the slit at the end of the gnomon would have then fallen over the date for two days after the summer solstice, the date of the tour!

Next on the tour was the 'Puma' dial at the University Prep High School (Puma is the school's emblem), another of Woody's designs (Fig. 5). Instead of the usual cylinder of a shepherd's dial, it is in the form of a truncated bronze cone, with a gnomon 10 ft above ground level, and a large horizontal handle at the base, used to rotate the gnomon. The dial was constructed in 2002 and is in excellent condition.

A visit to another school followed – the Epiphany School in a quiet residential area – to see the third of Woody's dials (Fig. 6). This is a direct south-facing dial whose numerals are held in place with magnets. The numerals are changed twice a year by a member of staff – a good teaching moment for the children to witness the transition from winter to summer time. Woody was keen to point out a subtlety in the hour and half hour markers. Instead of a

symmetrical central fold in the aluminium, each marker has the fold off-centre which gives a more interesting 'shadow-scape' on the wall – not readily appreciated until pointed out.

The next port of call was Woody's home for some refreshments and to see his amazing ceiling dial (Figs 7 and 8). A small mirror had been placed on a sill, and the



Fig. 6. Direct south-facing dial at the Epiphany School.



Fig. 7. Woody explaining some of the details of the ceiling dial at his home.



Fig. 8. A selected view of the ceiling dial.

markings had been produced by a combination of observation and computation. A painter with considerable skill had produced the graded hour bands and had been given a free hand with the lettering and signs of the Zodiac. We were privileged to see this dial, having heard Woody's description at the 2011 Newbury meeting; it requires some time of personal viewing to take in the wealth of information that it incorporates.

It was then on the road again to see the oldest dial in Seattle, dated 1909, to the rear of Sam Hill Mansion (Fig. 9). Hill was an industrialist with an interest in concrete buildings. The dial, about 60×120 cm, is in deep relief in bronze with a sturdy gnomon and a noon gap but no Equation of Time graph. In small letters below the motto is the name ROWLAND HAZARD, a business friend who had a similar dial made for his mansion in Rhode Island.



Fig. 9. The earliest dial in Seattle, at Sam Hill Mansion.

Approaching the end of our tour, we visited another school to see more evidence of Woody's ingenuity. The support for the horizontal aperture nodus (Fig. 10) could easily be mistaken for some form of street light by someone walking down the nearby steps. Even the hour lines on the paved area (Fig. 11) could be easily overlooked, but the numbers are a give-away and there is an explanatory panel nearby. The dial dates from 2003.



Fig. 10. The horizontal aperture nodus for a dial at Greenwood School.



Fig. 11. The hour lines at Greenwood School; the circular spot of light cast by the aperture nodus indicates hour-angle and declination.

The final dial of the tour was in a public park (Figs 12 and 13). The design and construction, and installation in 1997, is credited to Chuck Nafziger who designed, fabricated, and installed the dial, although advice was given by Woody and others on details. The shadow centre of the gnomon/polar axis can be read to 1–2 minute accuracy, and the shadow of the disk (falling on the gnomon) allows the date to be read. Both the upper (summer half of the year) and lower (winter half) surfaces of the disk are finely marked with one-minute divisions; this type of dial cannot be used within about 3–5 days of the equinoxes because the sun is then travelling in the (equatorial) plane and no usable



Figs 12 and 13. The Webster Park equatorial dial, surrounded by ever-growing trees.

shadow is cast. The entire time scale is rotated by 9.6 minutes, in order to compensate for the shift from PST to the local longitude, although one still must adjust for the Equation of Time in order to obtain clock time.

To conclude, the party somehow found its way to an excellent lakeside restaurant. As a modest appreciation of Woody's efforts in organising the tour, the least we could

do was to have Woody as our guest, and listen to more stories about sundials and timekeeping.

Further information may be obtained from the following websites:

www.astro.washington.edu/users/woody/Sundials/Seattle/Seattle.html

www.sundials.co.uk/~seattle.htm

douglas.bateman@btinternet.com

'LANGLOIS SLOT' TIME FROG AND TIME TOAD

MALCOLM BISHOP



'Time Frog' and 'Time Toad'.

Separating a 'Langlois Slot'¹ from the conventional aspects of the gnomon allows for the making of further pottery varieties of time-keeper, albeit limited to showing a couple of hours at a time.

Once again, the liberty provided by pottery to play with a concept has been employed, and a 'Time Frog' and 'Time Toad' made. The frog has a Langlois-type bridge to mark the equinoxes, while the toad has a simple slot (to which a bridge can be added at any time, as described in the second of the previous papers).

The bodies are hollow, and each measures the passing of approximately two hours on a rough scale between the front legs. Whether this is of any practical use does not seem particularly important! Both are being given as presents.

1. See *BSS Bulletins* 26(iv), 2-4 (December 2014) and 27(i), 45-50 (March 2015).

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HORIZONTAL AZIMUTH DIALS

MIKE COWHAM

In the previous *Bulletin*,¹ I discussed the magnetic azimuth dial and described briefly how to construct it. It occurred to me that a standard type of horizontal dial could also use this method of layout. I therefore took the dial design as developed, reversed the hour numerals, now to function clockwise, and added a simple vertical gnomon. In order to be certain which side of the shadow to use, a fancy edge was added on the north side of the gnomon, the active vertical face being on the south side. The result is as in Fig. 1.

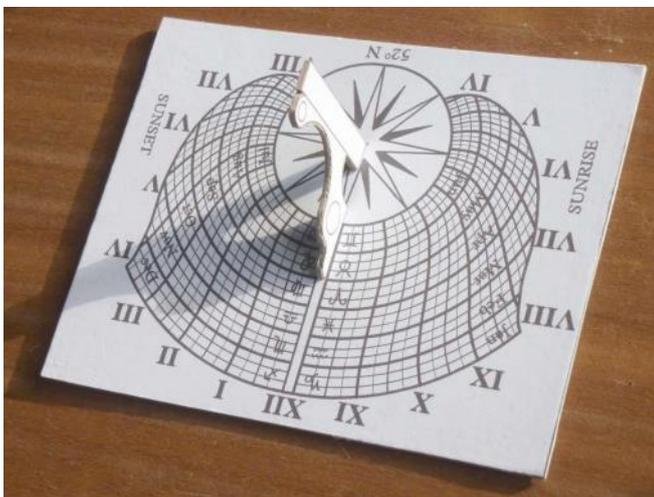


Fig. 1. A horizontal azimuth dial.

Another version was made using a solid cylindrical gnomon (Fig. 2). When constructing this, it is important to make the shadow, and hence the calibration lines, come tangentially from the edge of the cylinder at all angles. Its diameter is as the white central circle. A shadow has been drawn in at 09:00 at an equinox. The right side of the shadow is used for morning hours and the left for afternoon. With such a gnomon its vertical height will need to be sufficient only for its shadow to reach all of the lines throughout the year, this height being somewhat shorter than that required by a normal horizontal dial. With this layout it can be relatively short as the summer months are closest to the gnomon, so long shadows are not needed. The main problem with this azimuth dial design is that it is not immediately clear from which side of the shadow to read the time. In order to make things clearer, a small decorative 'support bracket' should be fixed to the north side of the gnomon, producing a shadow, a bit like that in Fig. 1, that is non-linear on the 'wrong' side.

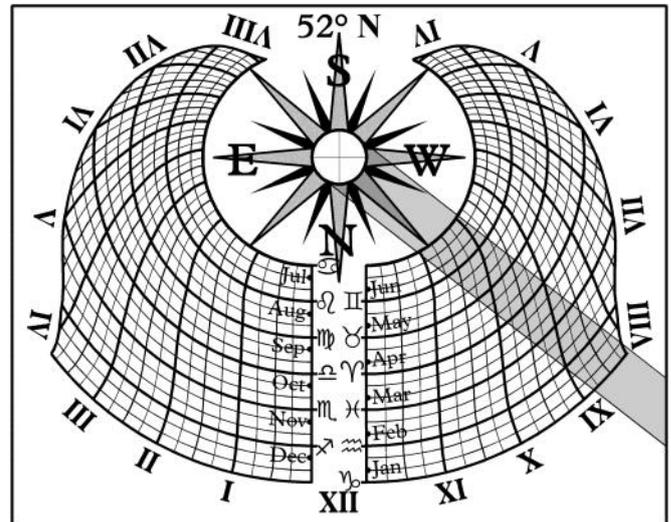


Fig. 2. A dial with a vertical cylindrical gnomon.

Another version of the azimuth dial is shown in Fig. 3. This has straight hour lines and looks just like the inside of a cylinder.

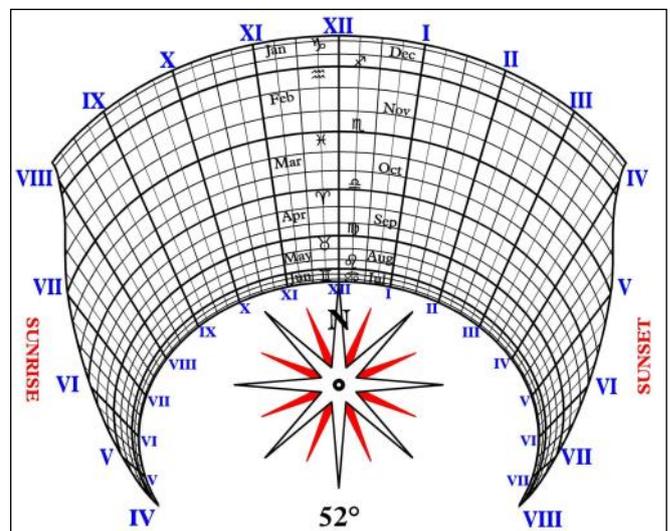


Fig. 3. A version of the dial with straight hour lines.

These azimuth dials are of an ideal type to go with a vertical pole, such as a lamp post, or any other vertical object. It could therefore be used where the shadow is provided by the vertical edge of a wall on a building, then perhaps just one half, or more, of the dial could be constructed on the ground, depending on the orientation of the wall.

Other versions are possible where the layout of the hour lines or the spacings of the date lines are different. By

changing one of these features, the other will automatically change to accommodate it.

It occurred to me that the calibrations for the stereographic component of a double-horizontal dial could be made in a similar way, so this version was also constructed using similar techniques (Fig. 4). The gnomon gap has been ignored as the gnomon here is simply a thin spike.

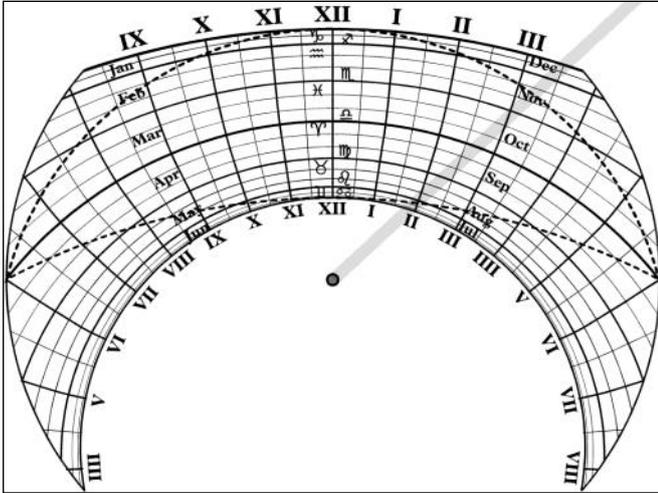


Fig. 4. A version of the azimuth dial as used with the stereographic projection component of a double-horizontal dial.

Having done this, various other layouts were tried. The first of these uses equally spaced and parallel hour lines. It makes for a rather wide scale, but the hour lines are now, conveniently, equally spaced (Fig. 5). Note that the date

lines are now as produced from a calendar scale constructed around the periphery of a circle.

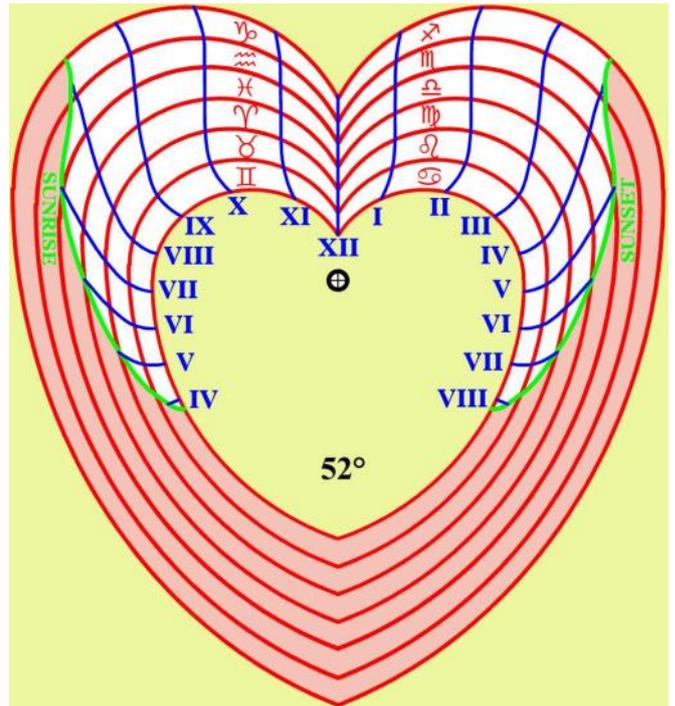


Fig. 6. A heart-shaped dial.

Another design that was tried was heart shaped (Fig. 6). The gnomon here has been placed quite close to the 'V' at the top of the heart in order to keep the hour lines equally spaced.

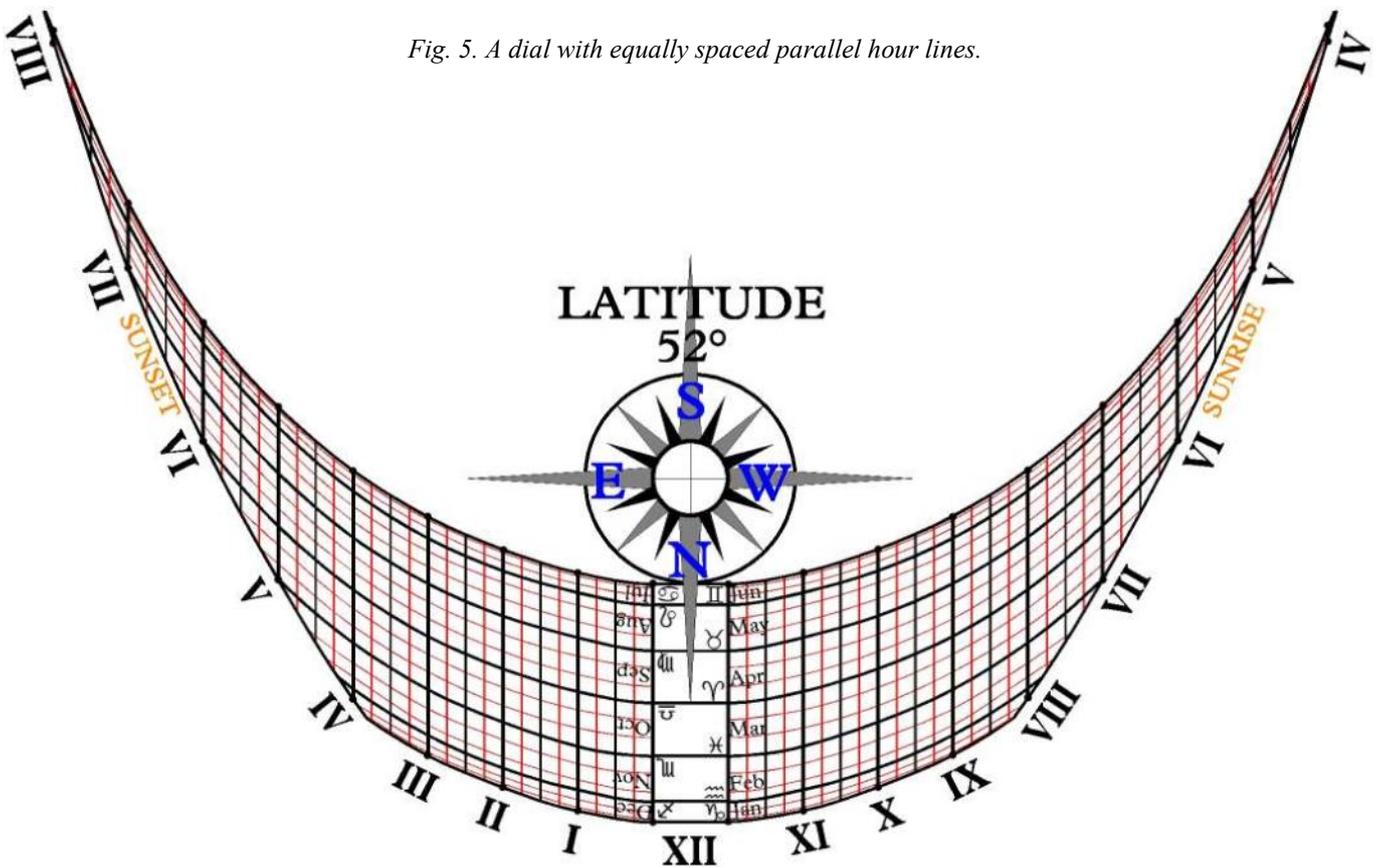


Fig. 5. A dial with equally spaced parallel hour lines.

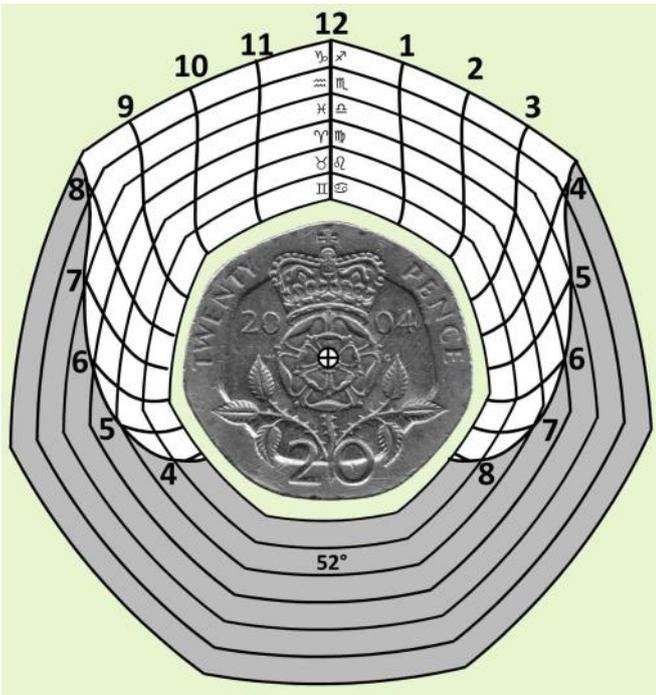


Fig. 7. A dial with date lines shaped like a twenty pence coin.

The 'Twenty Pence' design (Fig. 7) shows how complex shapes may be used for the construction of these dials. Here is a seven-sided figure, like the 20p coin (one is placed at its centre for reference), with each of its sides slightly curved. Note that the central point for the gnomon has been placed in the centre of the coin, but this too could be placed at virtually any point, thereby changing the layout of the hour lines. Note also that when the hour lines cross an abrupt change in the date line shape, the hour line will also have a similar abrupt angle.

It is not necessary to make the design fully symmetrical, so I also tried an irregular figure, which I have called my 'Treasure Island' (Fig. 8). Other shapes were tried, such as the outline of an elephant, but this became rather too complicated and confused.

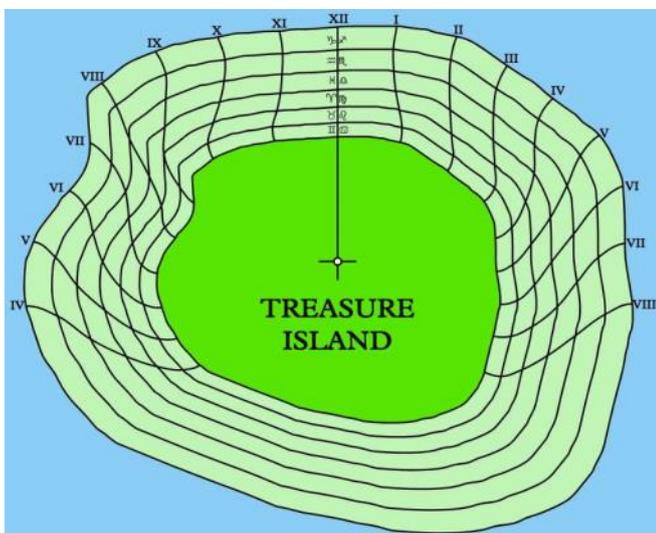


Fig. 8. A dial with an irregular outline for the date scales.

The Construction Method for Azimuth Dials

Refer to the diagrams in Figs 9 and 10.

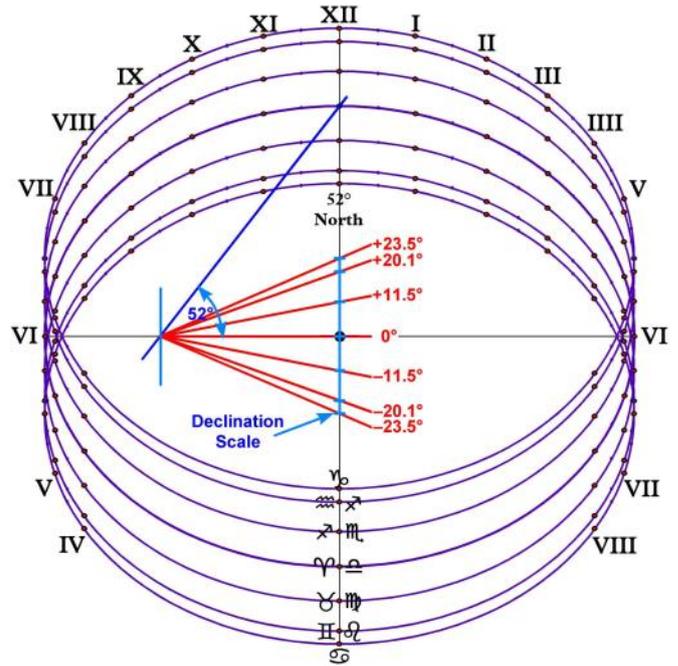


Fig. 9. The dialling template for 52° north.

The main dialling template (Fig. 9) consists of seven ellipses and is constructed in the following manner. Initially a circle is drawn with 24 equally spaced points around its periphery, representing each hour. (Those between VIII pm and IV am have been removed except for the XII midnight points.)

The whole circle is then made into an ellipse (the equinoctial ellipse) by scaling its vertical dimension by the sine of the intended latitude, here $\sin(52^\circ) = 0.788$.

A (blue) line is then drawn from the XII point on the equinoctial ellipse and is arranged to make an angle of 52° to the central horizontal line.

From the intersection on the horizontal line, (red) lines are drawn to cut the central vertical axis at the necessary angles for each Zodiac division. These are at $\pm 11.5^\circ$, $\pm 20.1^\circ$ and $\pm 23.5^\circ$. These crossing points are the centres for placing each of the seven ellipses.

The vertical gnomon will be placed at the centre of the equinoctial ellipse. From this point, lines are then drawn through each of the hour marks on each of the ellipses, continued outwards as necessary until each crosses the appropriate date line. The date lines in Fig. 10 are equally spaced circles, but any reasonable shape or spacing would work, such as those in Figs 3, 5, 6, 7 and 8. In fact, the spacing of such lines can be adjusted to give various features, such as straight or equally spaced hour lines, as Fig. 5.

On the right side of Fig. 10 the date circles have been so placed that the summer solstice is represented by the inner circle and the winter solstice by the outside one. On the left

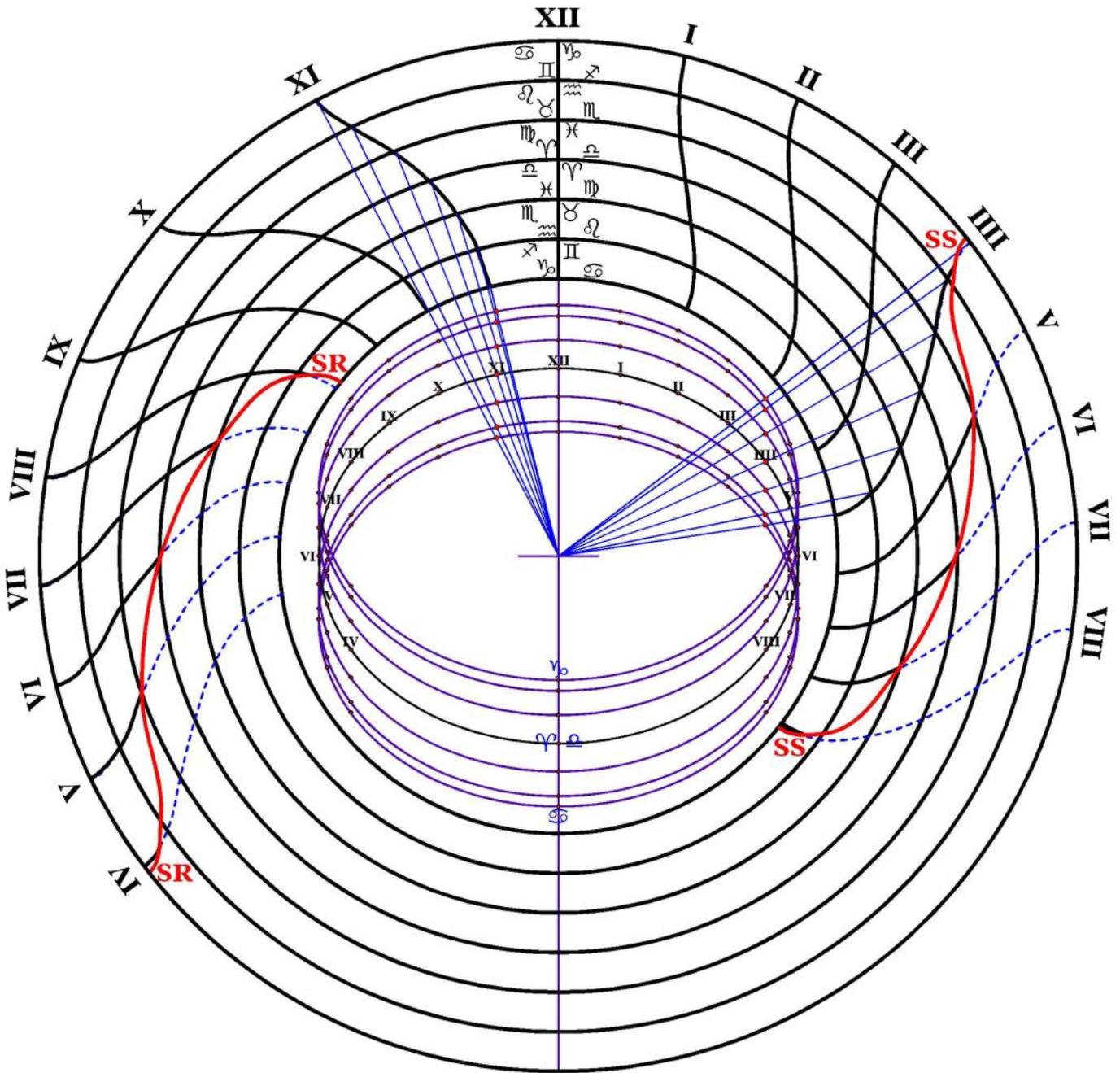


Fig. 10. Construction details for azimuth dials.

side of the diagram, the reverse has been shown. This illustrates how the hour lines are more equally spaced with the layout on the right and will actually produce a more compact dial than those on the left. Also, with the summer months nearer to the gnomon, the required height of the gnomon will be considerably less.

Construction lines have been included for XI am on the left and III pm on the right.

The (red) lines for sunrise and sunset (SR and SS) have been determined from tables of sunrise and sunset for 52° north as supplied by Waugh.²

Unwanted date lines and parts of hour lines may then be removed.

Many other dials may be made with different date rings using the basic dialling template with its seven Zodiac ellipses.

The azimuth dial may therefore be produced in a multitude of forms. It is a little more complex to use than a normal horizontal dial because it is necessary to read the time with reference to the appropriate date line. However, it opens up a wide variety of ideas for decorative, but still functional, dials.

REFERENCES

1. M. Cowham: 'The magnetic azimuth dial', *BSS Bulletin*, 27(iii), 8–12 (September 2015).
2. A.E. Waugh: *Sundials: their Theory and Construction*, Dover, New York (1973).

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IN THE FOOTSTEPS OF THOMAS ROSS

Part 13: The One That Got Away – Nearly

DENNIS COWAN

Some of the sundials identified by Thomas Ross in volume 5 of *The Castellated and Domestic Architecture of Scotland*¹ are very easy to find today, others less so.

But when I read what Ross had to say about the dial at Polton House in Midlothian I just knew that it was going to be difficult. He said:

“This drawing shows the ruins of what has been either one or two dials, apparently of exceptional design. They are now built up against the garden wall so as to form a rockery, and are here sketched as they appear [Fig. 1].

“The three lower dial-stones have been part of one structure. They are unusually fine in workmanship and design, all the figures and ornaments being raised in relief. The lowest stone is a cube of about 22½ inches, and has large cup-hollows of about 13 inches diameter. The next two tiers of dials are each cut out of one stone, the lower being a square of 13 inches by 22 inches in height, containing the date 1685; the next, of a polygonal section, is 9¼ inches high, with faces of about 6 inches in breadth. On one of the exposed sides are the initials I.I. and A.M. These have all formed part of one dial, and when the exceptionally large size of the lowest stone is considered, along with the careful finish and beauty of the whole, we are warranted in concluding that this must have been one of the finest of Scottish dials.

“The dial-stone immediately above, with the figure of Death and his scythe encircling the globe, appears to have belonged to a different structure. The two carved stones on either side are suggestive of having belonged to a dial similar in design to those of Newbattle;² the left-hand figure would fit such a position as those standing on the pedestal of the latter, while the carved head on the right hand, reclining on the scroll, recalls the similar features on the upper part of the Newbattle dials, and so likewise does the carved tapering finial. The lintel-like stone on which this latter rests may or may not be a part of the dial. It contains the date 1672.”

So these dials were built up as to form a rockery. Would that rockery still be there one hundred and twenty-three years later? But after a little more investigation, when I found that Polton House was demolished in the 1970s, this interesting dial went straight into the missing file.

A couple of years later, whilst I was in the Scottish Borders, I recalled that I had previously noted that there

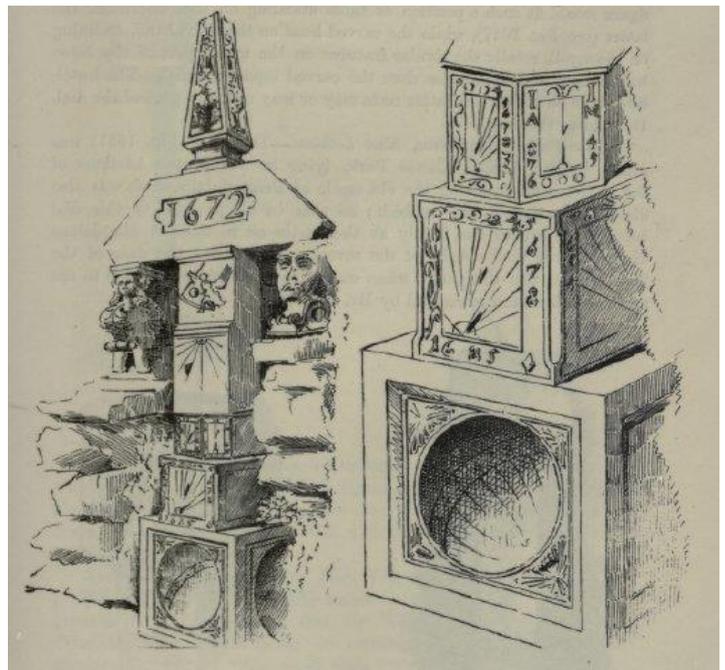


Fig. 1. Ross's sketch of the Polton House dials.

was a sundial at a house called Birkinshaw near Traquair. My wife and I were in that area, so I decided to see if I could find it.

After a few false starts, I eventually found the house. I was surprised to find that it was a relatively modern 1950/60s bungalow. It didn't look too promising but I rang the doorbell anyway. No-one answered. So that was that.

A few days later I carried out further investigation on the internet as I wasn't sure that it was the right house. It turned out that it was the right house, but more interestingly I uncovered a planning application from 2011 to move a sundial together with some 'stones' from Birkinshaw to a new location – Arniston House in Midlothian.

This sounded very interesting especially when the planning application noted that the 'stones' originally came from Polton House. Could this possibly be Polton House's missing sundial?

A covering letter from Mrs Dundas-Bekker, the owner of Arniston House, in support of the planning application tells the story better than I can.

An abridged version of this letter says:

“As the owner of Arniston House, Midlothian, I can confirm that it is my intention to re-erect the sundials and stones at Arniston. My daughter and I conduct tours round our home and inform visitors on the Dundas connection with Polton House.

“The stones from Polton House were presented by my father Sir Philip Dundas, to one of his younger brothers, James Dundas, in about 1946. James Dundas eventually set up the stones in the garden of his new house, Birkinshaw at Traquair in 1957.

“In view of the imminent sale of Birkinshaw, my cousin (and heir of James Dundas), Davina Findlay, wishes to return the stones to Midlothian. Although Polton House was sold by my father in 1946 and demolished by the subsequent owners in the 1970s, the archives and a number of other artefacts from Polton survive at Arniston. The stones will be re-united with these other records of Polton and will be well cared for in their new location at Arniston.”

What a stroke of luck, although the letter seemed to major on the stones and not the sundial, this must surely be the sundial described by Ross, but I had to see it to be certain. I should note that the planning application was approved, so the sundial hopefully was now at Arniston.

I eventually made contact with Henrietta Dundas, the daughter mentioned in the above letter. She indeed confirmed that the sundial was at Arniston and that although it was in her mother’s private garden, I was welcome to visit to see it.



Fig. 2. Arniston House.

A couple of weeks later, my wife and I visited Arniston (Fig. 2), and as soon as we entered the private garden I could see that this almost certainly was the missing Polton House dial. There were changes, the lowest (and largest) dial was missing, but the two tiers of dials above as described by Ross were there, albeit now mounted on a newer column (Fig. 3), with the uppermost having gained a horizontal dial on top. Actually, on closer inspection it was only decorative. A gnomon was in place but there were no



Fig. 3. The dials today on their newer column.

numerals or hour lines on its surface (Fig. 4), and a number of the other dial faces also had replacement gnomons.

As can be seen from Fig. 5, which more or less corresponds to Ross’s sketch, the date of 1685 on the north-east face of the cube dial can be seen as can the initials of I.I. and A (but the M cannot be clearly seen) on the north face of the six-sided polygonal dial above. This was definitely the same dial. What a stroke of luck that was in finding that planning application!

Unfortunately, although the new gnomon on the horizontal surface is set correctly with respects to the rest of the dial, and despite the assistance of Historic Scotland in setting up



Fig. 4. The horizontal surface with the added gnomon.



Fig. 5. The north-east face showing the date of 1685.

the dial in its new location, it is set to the south-west rather than north!

But what of the other parts of the dial that sat in the rock garden at Polton House all those years ago? Luckily, leaning against a wall nearby, was the topmost dial with the figure of Death and his scythe encircling the globe above (Fig. 6). It was in a poorer condition than the other parts of the dial, having much lichen, but some hour lines can be seen as well as the gnomon root.

Also nearby are the 'stones' which have accompanied these dials for more than a century or even longer (Figs 7 and 8). However, the lower and larger dial at the base of the original structure as seen by Ross is missing and the owners of Arniston House have no knowledge of it. There is also no sign of the finial or the date stone of 1672 that stood below it. A great pity, but nevertheless the hunt for the Polton House dial has been a great success with a great deal of luck thrown in.

ACKNOWLEDGEMENT

Many thanks to Mrs Dundas-Bekker and her daughter Henrietta Bekker for being most helpful and welcoming me to their home at Arniston House.



Fig. 6. The topmost dial with the figure of Death above.



Figs 7 and 8. The 'stones'.

REFERENCE and NOTE

1. D. MacGibbon and T. Ross: *The Castellated and Domestic Architecture of Scotland*, David Douglas, Edinburgh (1892).
2. The Newbattle dials will feature in a future article.

For a portrait and CV of the author, see *Bulletin* 27(i), March 2015. He can be contacted at dennis.cowan@btinternet.com

A DISREGARDED SEVENTEENTH-CENTURY HORIZONTAL DIAL FROM SCOTLAND

JOHN DAVIS

The battered-looking horizontal dial in Fig. 1 was advertised as a “post-1940 sundial with ware” (*sic*) but even in the rather out-of-focus photos it caught my eye as rather more interesting than that and I successfully bid a few pounds for it.

I have seen square dials with missing and rounded corners before¹ and have generally been of the opinion that the combination of a deeply-engraved outer circle and a thin dial-plate of rather poor quality brass has caused the corner to shear ‘along the dotted line’ when someone has tried to lever the dial off a pedestal. In this case, though, the missing piece seems to have been cut off rather neatly (unless someone has tidied-up the break) perhaps to fit the dial into the corner of a windowsill. Another feature of the ‘wear’ is a group of six small, randomly-spaced holes, all about 1.2 mm in diameter and rather neatly drilled, in the southwestern sector of the dial. I have absolutely no explanation for these. The other aspect of wear was the corners broken around the fixing holes. This is quite common in dials of any age, of course, but here the holes are surrounded by neat six-petalled geometric flowers – a nice period touch.



Fig. 1. Overall photograph of the ‘Scottish’ dial.

One of the features of the dial which suggested to me that it might be 17th century is that the hour numerals are inward-facing, something which the mid-20th century ‘reproductions’ by the likes of Pearson–Page rarely got



Fig. 2. Front and back of the dial showing the hammered plate and tenons, and highlighting the group of small holes with the two small delineation holes.



Fig. 3. Close-up of the Roman numerals showing the unusual infill shading.

right. This, together with a dial-plate which varies wildly in thickness between 0.9 mm and 2.4 mm and which has clear marks of being hammered rather than rolled sheet (see Fig. 2) made it clear that this was truly old. The dial is 174 × 177 mm (6¾" × 7" nominal) and the hours are marked by well-formed Roman numerals. The engraver clearly knew what he was doing but the style of the engraving, which is quite deep (over 0.5 mm in places), shows a slightly idiosyncratic form – the infill uses short diagonal strokes from the serifs which I've not seen before (Fig. 3).

The main decorative feature of the dial is the sun face in the centre which has a rather strange bifurcated nose. This had slightly put me off as many nasty modern reproductions include sun faces along with their rather twee mottoes but, in this case, I'm prepared to believe that it is authentic.

The centre of delineation is offset towards the south, showing that the dial doesn't come from the very earliest period of dial-making (before around 1620) when it was nearly always in the geometric centre of the plate. The offset is quite small though (about 26% of the dial radius), suggesting that it is probably before the end of the 17th century. Similarly, there is a noon gap to accommodate the nominally one-eighth inch thick gnomon rather than the earlier style of a knife-edge gnomon. There are also two very small holes in the plate at the 'toe' of the gnomon to define the two centres of delineation.

The delineation divides the hours into half-hours then quarters and half-quarters (7½ minutes). It is well executed with the half-hours being marked by a strong triple-dot motif, exactly as a top London instrument maker would do. The division to half-quarters, which were obsolescent by the



Fig. 4. Side view of the gnomon (inset: close-up showing the 'draft angle' on the edges of the scrollwork, tapering towards the camera).

first quarter of the 17th century when they were gradually replaced by 10- and 5-minute intervals for the primary timescales, again confirms the quite early date.

The gnomon (Fig. 4), still firmly attached by a pair of hammered-over tenons, is really rather special. The piercing features the 'thick-and-thin' scrollwork characteristic of some of the best instrument makers in the first half of the century. Close inspection shows that it is a cast item rather than cut from a sheet as the 'draft' (a slight taper to the sides of the pattern to allow it to be withdrawn from the sand mould) is apparent inside the scrolls, although the working outside edges have been filed square. This taper makes the scroll look different on the east and west sides of the gnomon and suggests that the mould was a simple one-sided or 'open' one. I could see that the gnomon angle was fairly steep but was surprised to measure it as 57.5 degrees. The bottom rail has a low angle taper to it suggesting that the shape has been adapted from a slightly shallower latitude angle, where the rail would have been parallel to the plate surface. I knew that the seller of the dial lived in Scotland so I enquired about its provenance and was pleased to be told that it had come from the cottage of the seller's deceased aunt, on the outskirts of Dumfries. The latitude there is 55.07° – somewhat less than the gnomon angle but at least giving credence to a Scottish origin. This is supported by a least-squares analysis of the hour-line angles which indicates a best-fit design latitude of 56.0 ± 0.5°. Thus it seems probable that the dial was originally made for the Glasgow–Edinburgh region and that it had remained in the vicinity for four centuries.

Dial	Part	Cu	Zn	Sn	Pb	Ni	Fe	Others/Comments
Scottish horizontal	Dial plate	84.2	13.4	1.3	0.8	nd	0.3	Cleaned area
	Gnomon	88.6	7.7	2.5	0.8	nd	0.5	Uncleaned
Hole Park horizontal	Dial plate	84.1	11.5	0.3	0.5	nd	0.9	Back, uncleaned
	Gnomon	86.2	5.8	3.0	2.5	nd	2.3	Replacement? Uncleaned

Table 1. XRF analyses of the copper-alloys of the Scottish dial and similar results for the Hole Park dial for comparison. All values in wt%; nd indicates not detected.

One of my reasons for purchasing the dial was so that I could analyse its metallurgy. The results of an X-ray fluorescence analysis are shown in Table 1. The table also includes results for the quite similar dial at Hole Park in Kent, described in a recent article.² The alloy, a low-zinc leaded gunmetal in modern terms, is quite clearly appropriate for the 17th century: similar alloys can also be found at earlier periods. It was clearly available across the length of the whole country unless, of course, the Scottish dial was not actually made locally but further south, for example, London.

Although the dial has clearly seen better days, enough of its features remain to show that it was once a quality instrument, properly made with care for a client who, although not rich, was probably middle ranking. Exactly who made the dial remains unresolved.

REFERENCE and NOTE

1. Tony Wood has recently brought a similar dial in Stroud Museum to my attention, in that case with two corners missing.
2. B. Dillon: 'Restoration of the Hole Park Sundial', *BSS Bull.*, 27(ii), 36–37 (June 2015).

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NEWBURY ONE-DAY MEETING

26 September 2015

IAN BUTSON and DOUGLAS BATEMAN

Once again members of the Society met at Stockcross Village Hall for the annual one-day get-together to be entertained with tales of recent sundialling activity, to meet old friends, greet new ones and examine the exhibits on display in pleasant surroundings, on a warm and sunny autumn day. A full and varied program of short talks had been arranged by David Pawley, with them being overseen by Peter Ransom.

After welcoming members to the meeting, but before commencing the talks, Peter asked that we should all hold a minute's silence in remembrance of three long-standing members who had recently passed away: Michael Maltin, Mike Groom and Maurice Kenn (who had recently moved to Australia). All were well known members of the BSS with Michael Maltin regularly attending and giving presentations at past Newbury meetings. A display featuring aspects of his life and of his sundial interests was also on show at this meeting.

Morning

The first talk, by **Doug Bateman**, was entitled 'Sundials in Seattle' and featured a number of dials, many designed by Woody Sullivan. These included an unusually artistic dial, ornamented with a number of creatures; a vertical declining wall dial; and a large rotating shepherd's dial made from metal for children to explore and interpret. He also described a vertical dial, for a school, which had magnetic hour markers that could be changed to adjust for summer or winter time. A ceiling dial, also with declination lines and, interestingly, seasonal insects, was described. This was followed with a vertical dial from 1909, the oldest dial in Seattle; then a large 'aperture dial' showing hour markings set into the footway; and, finally, an equatorial dial mounted on a concrete base, but



unfortunately completely overshadowed by trees.

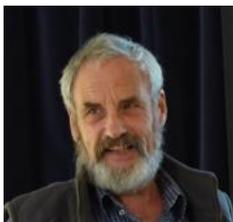
In **Irene Brightmer's** talk, 'Uncovering an Old Dial's Secrets' she described how, for a long period, she had known of a multiple dial on a classical column standing in the grounds of a country house in North Wales, but had only recently been able to see it. The dial was originally installed in the 1730s at another country house a few miles away, but over the years the family fortunes had declined and with it, during the 20th century, the collapse of the dial's pillar and its near destruction. Three decades ago, the dial was rescued by the new heir to the estate, who restored and moved it to its present location. During her visit, Irene mentioned the dial to the owner and how wonderful it would be to inspect it more closely and to investigate the



markings in greater detail. The owner immediately offered to get the gardener to set up scaffolding later that week to allow this to happen.

Subsequently, Irene was able to return, armed with soft brushes and water to clean away much of the lichen obscuring the sphere and the faces of the dial, and to uncover more of the markings. The two most exciting discoveries during this cleaning process were that the stone sphere surmounting the cube dial block was actually a globe dial and that the brass gnomons incorporated decorative dolphins, the crest in the family coat of arms going back hundreds of years. With still a little cleaning to be completed, her researches also continue into the history of the dial and its maker, with the prospect that there may be more secrets yet to be discovered.

'A New Garden Addition' was the first of **Martin Jenkins'** presentations of the day. Martin explained it was felt that something other than plants might be appropriate to include in an area of their garden in Venn Ottery in Devon. Having received an



invitation to a garden and pottery exhibition locally, he found that a horizontal dial made by Ben Jones was there on display. Although having a globe dial, made by Anton Schmitz, in their garden already, the horizontal Cumbria stone dial on a tapering pedestal was obtained, to enhance that part of the garden perfectly.

Peter Ransom, a keen collector of books



having a dialling connection, spoke of his recent acquisition, 'The Reverend Tuckwell's Book of Sundials' by William Tuckwell (1829–1919) and of the

correspondence with the three female doyennes of those times, Margaret Gatty, Eleanor Lloyd and Horatia Eden.

With the forthcoming BSS Conference to be held in Liverpool, **Mike Shaw** gave a short talk highlighting various features and places of interest in Liverpool that should not be missed whilst at the Conference. These included the Anglican and Catholic Cathedrals, The Liver Building with its Liver Birds, The Mersey



Ferry, The Walker Art Gallery and the National Museum.

He went on to explain his recent involvement in

the refurbishment of a wooden cross dial on 'A Sphinx in Port Sunlight', which was originally erected in 1899 to commemorate the Relief of Mafeking.

Further to Mike's article about the misaligned Eaton Hall Sundial Pillar on the Duke of Westminster's estate, he contacted the estate authorities when he heard that the dial was to be realigned, with the offer of assistance with its correct orientation. Disappointingly, this offer was declined, and he was not given access during the relocation process. However, he was informed that he would be allowed to see it in the new position when the gardens were next open to the public, having paid the normal entry fee! Understandably, he was not impressed.

Mike had been voted the author of the 'Most Enjoyed Article' of 2014 and a certificate recording this success was presented to him by the Chairman, Frank King.

As a tribute to and remembering Michael Maltin, **Frank King** decided to give a talk which followed Michael's presentation style, eschewing



all use of the data projector and, instead, using an everyday object just as Michael might have

done. From his bag, Frank produced an example of the "world's first deployable structure", an umbrella (from which he quickly removed the canopy) to demonstrate 'An Unusual Astronomical Instrument'. The eight ribs of the umbrella, fully extended and labelled every 3 hours, represented the 24 hours of the day, with the main shaft of the umbrella forming the gnomon of this unusual device. With the shaft pointing north and inclined at an angle matching the local latitude, the ribs indicated the direction of the sun, with the lower ribs showing where the sun is at night. By moving along the room and adjusting the shaft's angle to the horizontal, the sun's behaviour at any latitude, from pole to pole, could be displayed. When representing the sun in the southern

hemisphere the shaft of the umbrella points downwards. By adjusting the degree to which the umbrella is opened one can represent any solar declination. This is a universal instrument. By rotating the shaft of the umbrella so that a 12 o'clock rib is horizontal, Babylonian and Italian Hours can be shown. With all the ribs in the same plane and the midday rib set to the noon altitude of the sun, he showed a cunning scheme whereby the instrument could indicate unequal hours. This was a most inventive demonstration which Michael would surely have approved of with a smile.

For the last talk in the morning session, **Martin Jenkins** presented his 'Dial in the Lane.' As a deterrent to the wild rabbits from enjoying his wife Janet's garden flowers, it was decided that a wall should be built upon the grass bank bordering the lane, from where the rabbits entered their garden. This wall would be completed with decorative and rabbit-proof railings. At the end of this bank a brick planter had previously been built, but to blend in with the new wall the end panel of the planter would need to be extended upwards. But this new piece of brickwork was to have a further use and, since it faced south, just perfect for a sundial. Using a rescued piece of slate from a scrapped laboratory balance, Martin set about designing, delineating and carving the furniture and lettering for the sundial. Now installed, it enhances the wall and is used, and admired, by neighbours and passers-by in the village of Venn Ottery.

Following the morning session, members assembled outside for a group photograph before breaking for lunch, socialising and looking around the displays and the bookstall. But before commencing the afternoon session, David Pawley had again arranged for us to see the Singleton helical sundial in the grounds of the nearby Bayford House Nursing Home.

Afternoon

The afternoon session began with a presentation to Janet Jenkins and Wendy



Turnham, for their contribution to Newbury meetings over the years.

The first talk of the afternoon was by **Peter Ransom**, speaking about 'The Meridians of Bourges Cathedral'. Unusually, there are two aperture gnomons in a stained glass window, one about 1.5 metres above the other. Peter was able to show a short movie of the spot of sunlight crossing the line set in the floor. There were no date or seasonal indications on the line, apart from a carved circle at one end. There was quite a lot of discussion about the fact that the two spots of light on the line appeared to be circular rather than elliptical, and had fairly sharp edges, or minimal penumbra. A third aperture was in another window with its line in the form of a rope hanging on a pillar in the nave. The lines could have been installed in about 1757 although confirmation was not found. As a bonus, the cathedral has a twin-dial astronomical clock.

David Brown talked about 'Some Recent Sundials', with the sub-title 'Continuing to Learn by Experience', even with 200 dials to his name. Cost compromises have to be made with some customers, and there were the usual annoyances with architects who either failed to understand the requirements, failed to say that the ground sloped, or in one case, supplied an uneven assortment of bricks for the base of an analemmatic dial. One of the first such dials David had made, in 1991, was for Kingswood School in Bath. A new building was being built, and despite protective layers of earth, the dial was damaged. However, a replacement was arguably better, this

time with full control over the bricks and levelling. One fun dial was a pop-up analemmatic at an agricultural fair, where straw bales were used as a surround with the numerals propped in place.

The next talk, again by **David Brown**, was entitled 'Tales of the Unexpected'. This reflected the variety of queries that came to the Society. A recent query was about a rare double-horizontal dial by Nathaniel Witham, not previously recorded as having made such dials. The Royal College of Physicians had taken ownership of an equatorial dial with a large back plate and a rotatable aperture



gnomon, and needed advice on its function and setting up. Another query concerned the repositioning of a Silas Higgon dial at Brodick

Castle, Arran. Some discussion then ensued about an unusual dial that is in Israel, and credited to Kitchener (before he became a General) with a plaque on the plinth noting that it was erected when Kitchener was engaged on the survey of Palestine in 1875. It was restored in 1925, possibly very badly.

David Hawker, with an intriguing title, 'Top Secret', gave a musical interlude! George Formby, no less, was singing one of his risqué songs, *They Can't Fool Me*. The point was the very mention of a sundial in a song, the relevant verse being *There's a baby born they say, every clock tick that's O.K. I bought a sundial yesterday, they can't fool me*.

Linked with other innuendos in the song, we assume that having a sundial, there are no ticks therefore no babies.



Martin Jenkins' third talk was about a 'New Greek Sundial', a teasing title as it turned out. The starting point was a tall conventional noon dial with analemma on slate, that he had made a number of years ago. Thinking that he would make use of a local noon indication, the dial had a slot cut in the slate along the apparent-noon line. At a later date a beautiful statue of a partially clothed goddess-like figure named Vergogne Phryne was purchased for the garden. There are connections with Aphrodite in classical mythology, but setting such learning aside, Martin had rather cheekily placed the statue just behind the noon dial slot so that at noon a long 'slice' of sunlight fell on the shoulder and abdomen, and most emphatically, over the perfectly poised right breast.

Geoff Parsons followed with a broad resumé of 'Sydney Sundials', as seen in the Botanical Gardens, for example, the



large bronze equatorial by Folkard and Ward, Governor's House, and views in and around the Observatory.

As ever, very well illustrated with informative anecdotes.

Finally, **Patrick Arnold** talked about 'A Viking Sun Compass'. There was a





sizeable settlement on Greenland between 900 and 1000 AD when the climate was warmer. A Danish archaeology dig in 1948 found, in a farmhouse, part of a wooden disc that had notches cut in the perimeter. A

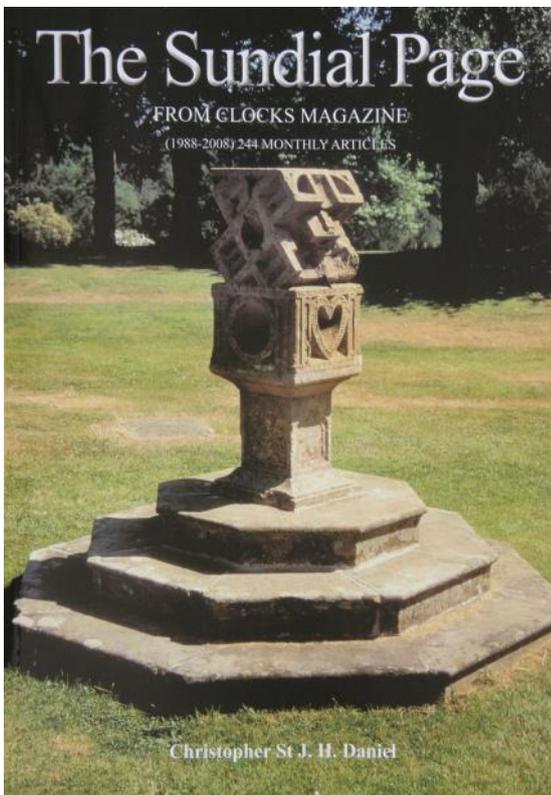
great many studies followed that stressed, with academic 'thoroughness' that it was part of a sun compass. With a model, Patrick showed that as an altitude device, it would be quite impractical on a ship. Given that it was found in a *farmhouse* (no nautical connection) a more convincing application was as a form of retaining

brooch for a pinafore. Another model was shown, reinforcing the point – with the agreement of members!

Photos from Mike Shaw and Geoff Parsons

BOOK REVIEW

The Sundial Page from Clocks Magazine, by Christopher St J. H. Daniel. A4 soft covers, 320pp, approx 300 illustrated, many in colour. Splat Publications 2015. Obtainable from BSS Sales, £33 + p&p.



For over 20 years Chris Daniel wrote a monthly page on sundials for *Clocks*, the world's leading independent horological magazine. These essays have now been collected into a single volume, a work of erudition and scholarship, which makes ideal fireside or bedside reading for any lover of the subject.

Some members may have picked up the earlier pages, which were issued in photocopied collections and sold at BSS Conferences and at Newbury meetings. This book brings them all together, with the bonus of the years 2006 to 2008, never previously re-published, and with the great benefit of a comprehensive index.

Open the book at random and you are drawn in to a web of fascinating detail. Pen-portraits abound, with a life of the unique Peter Drinkwater, polymath and antiquarian, an obituary of Charles Aked, joint founder member and irascible first editor of the *BSS Bulletin*, and the history of the Gatti family back to their origins in Florence where the Gatti tombs may be found. Old names are brought to life, from the famous – Flamsteed, Oughtred and Wren – to the less well known such as Benjamin Donn, William Watson and John Ryder Oliver.

The collection starts with an eight-page article on all the stained glass dials then known in England and Wales. Throughout the volume we find stories of non-dials and nearly-dials; miniature dials and one that once spread across a whole hillside; reflecting wall and ceiling dials; noon guns and noon marks, moon dials and mean-time dials; and all the multifarious varieties that we have today.

My favourite piece, and an example of the range of background information to be found, is the story for September 2007. A small home-made dial in South Africa sparks off an informative history of the Province of Natal starting with Vasco da Gama in 1497, moving on to the British and the Dutch in the nineteenth century, discussing the great Zulu King Chaka, diamonds and gold, and war with the Boers and the Zulus, and passing at last to the tranquil farming community of the present day, where the simple sundial stands.

If the book were to be republished, it would benefit from page numbering (referencing from the index to year and month is unambiguous, but is cumbersome with the dates showing differently on different pages). The fine photograph on the cover is not identified, but is Moccas Court at Hay-on-Wye, SRN 2235 (and is described in detail in the article for February 1991). But these are minor quibbles, and do not seriously detract from a delightful book – and a most desirable Christmas present, to give or to receive!

John Foad

DOUBLE RESTORATION AT BARNES

KEITH SCOBIE-YOUNGS

The Cumbria Clock Company, based in Penrith, specialises in the repair and maintenance of church and public clocks. Occasionally, though, as on the Tudor brick tower of the church of St Mary, Barnes in southwest London, there is an accompanying sundial needing our attention too (Fig. 1, SRN 1319).

The dial was originally painted onto render which was failing, so we made a 2 mm stainless steel plate, split down the middle to allow for the gnomon (Fig. 2). Sadly we are not clever enough to be making sundials, but just copied what was already there! It was clear that the hour lines had suffered restoration drift over successive repaintings but no adjustment was requested so we simply carefully traced the original design¹ and transferred that onto the stainless steel. We have done the same thing at Royston parish church in Yorkshire and at Wingham in Kent. Finally, the steel plate was screwed onto the rendered surface (Fig. 3).

Painting stainless steel is all about preparation: de-grease it, lightly abrade and then use an adhesive primer, before applying the top coat – this is very durable when done correctly. We have been using the method for 15 years and nothing has failed yet. The gold leaf is applied traditionally; we do not use vinyl transfers or anything like that.



Figs 2 and 3. The new dial plate in the workshop (above), and installed at Barnes (below).

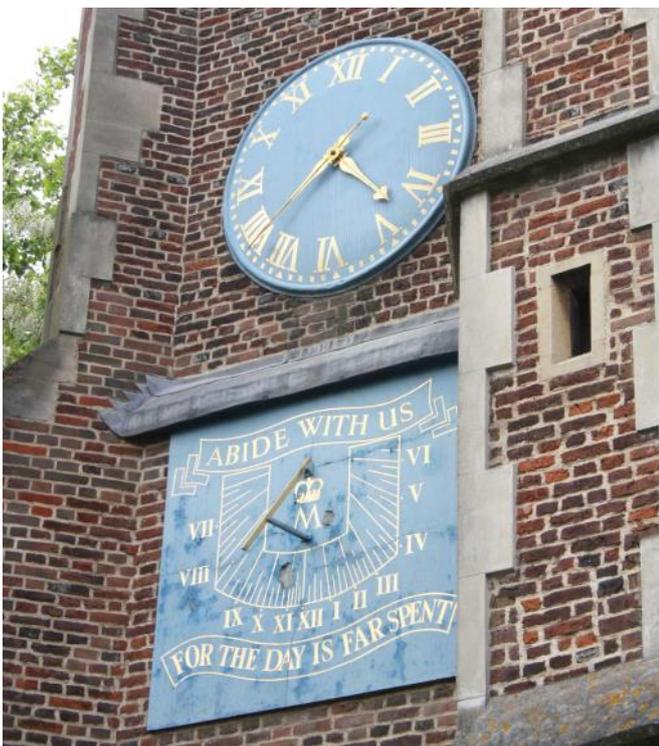


Fig. 1. Dial and clock before restoration in 2013.

I'm not saying anything is wrong in doing so but if you have the design it is as quick to do it by hand.

NOTE

1. According to notes by Maisie Brown in St Mary's Scrapbook, a dial and clock were originally presented to the parish in 1794, but the present design dates from 1953, when three new features were added to the dial in honour of Queen Mary (who died that year and who had local connections). Members of the congregation named Mary paid for a letter M, a representation of the crown she had worn at her coronation, and a motto alluding to her favourite hymn 'Abide with Me'.

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DESIGNING SUNDIALS USING 3D DRAWING SOFTWARE

Implementing the BSS Horizontal Sundial

PHIL WALKER

The inside front cover of *BSS Bulletin* 27(ii) (June 2015) featured Tony Moss' designs for horizontal sundials which can be downloaded in PDF format from the BSS website.¹ Designs are available at 0.1° intervals for most British latitudes. The intention was that readers could download and print the design for their own latitude.



Fig. 1. Millennium dial, chemically etched in brass.



Fig. 2. Anniversary dial made in ceramic tiles by Jackfield Tiles.

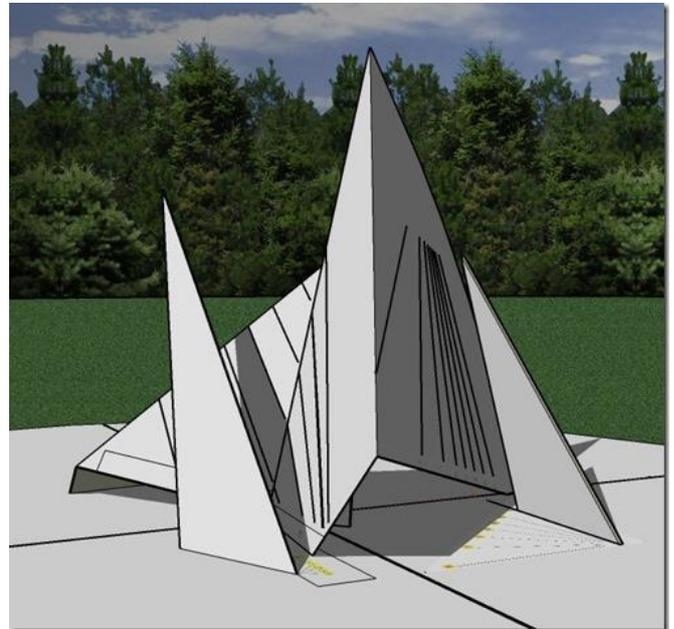


Fig. 3. Sketchup 'virtual' dial for La Nef de Tavel in the South of France with 'shadowing'.

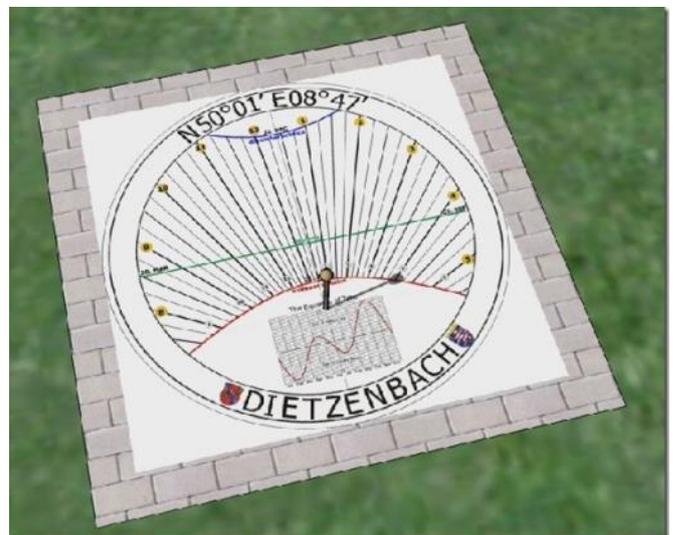


Fig. 4. Sketchup 'virtual' horizontal dial for Dietzenbach, Germany, showing the shadow of the nodus.

Clearly, the paper dial would not be weatherproof and the notes in the *Bulletin* suggested "Those who wish for something a little more durable should note that the PDF file is suitable for chemical-etching technology. These sundials look stunning when etched into brass". I too felt that Tony's design could be realised in more substantial materials.



Fig. 5. My Tony Moss BSS horizontal sundial.

In addition to sundials, my interests are computer programming and software. In the past I have designed dials, which I have had made for me. Two of them are shown in Figs 1 and 2.

For several years, I have used the 3D drawing software, Trimble's Sketchup Make,² for designing sundials. I found it relatively easy to learn. It has two advantages: it is free and, key to the diallist, it provides a shadowing feature. For your 3D dial/model, you specify latitude, longitude and time (year, date and hour), and your model can be shadowed automatically.

I have designed virtual sundials on my website and Figs 3 and 4 show how the software creates the correct shadows from the direction of the sun and the position of the gnomon.

Returning to Tony Moss' BSS horizontal sundial, Fig. 5 shows a dial in my garden, which I have had made up to my and Tony's design by two service firms. London-based CLC Creative Ltd³ is "a laser-cutting and engraving service, designed specifically for the need of creative individual and industries".

The dial plate was pre-designed from the BSS website PDF, specifying my latitude as 52° 48' N. The only change made was to reduce the size of the plate to 134 mm across

the flats before sending the PDF to the company. The plate material was a plastic, two-ply laminate, white on black, which was laser-etched to reveal the PDF design detail. The material used was Rowmark Laser Max, described as "external-quality, laserable, non-glare, high durable finish laminate". My order was delivered as specified and all that was necessary was for me to make the gnomon.

Instead of using Tony's gnomons, I took a photo of a 'scrollwork' gnomon, traced it, re-sized the image to ensure that the gnomon's latitude was at the correct angle and then 'pulled' the 2D image into a 3D model of the required width using the Sketchup software. Sketchup has always used its own file system, SKP, for its output files but, with the growing use of 3D printing, it now also offers the Export STL option. Only two parameters needed to be specified for my 3D gnomon model, namely Export Units: millimetres (the same as in my Sketchup model) and the file format: ASCII.

In order to print the white, solid plastic gnomon, I chose Shapeways, a growing Dutch 3D printing service, which features a wide range of materials from plastics, through ceramics, to precious metals and a website

providing good support and advice to users of their service. Their web address is used for uploading STL files.⁴ They advised me on which material to use and I chose their 'Strong and Flexible Plastics'. It was relatively cheap and quick to deliver to the UK. All that was left for me to do was fix the gnomon to the dial plate with a dab of Loctite glue, align the dial and hope for sunny days.

I hope this gives sufficient detail to enable others to have a go themselves.

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2. www.sketchup.com/products/sketchup
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4. www.shapeways.com/create

Phil Walker lives in Shropshire and is a retired IT manager, with interests in computer programming and local history as well as sundials. He has been a BSS member since 1991. He is the webmaster of the Newport History Society. He can be contacted at phil.walker@sunandshadows.net



A MEDIEVAL SUNDIAL FROM THE BENEDICTINE MONASTERY OF KAPOSSZENTJAKAB (SOMOGY COUNTY, HUNGARY)

MÁTÉ VARGA AND SÁNDOR KESZTHELYI

This article is based on one originally published in Hungarian in *Study Volume of the Fifth Annual Conference of Young Medieval Archaeologists*, Szentendre (2014).¹ This version is published here as the find is an extremely interesting one. The Editors have some reservations about the authors' interpretations of the item and readers are cautioned to form their own opinions on the details of the gnomonics. *Ed.*

In the course of excavations in 1960–6 at the Benedictine monastery of Kaposzentjakab (in modern Kaposvár) which flourished between the 11th and 16th centuries, there came to light a fragment of a medieval sundial carved in stone. This rare and extraordinary object is one of few similar examples occurring in Hungary and is worthy of note from the point of view of archaeology, history and astronomy. A sundial can be seen as an artistic creation or a technical masterpiece since the choice of material and the craftsmanship involved in its construction require great ability. This is why we think it is worth describing this unique discovery in a short article.

Provenance and Description of the Fragment

The fragment (Fig. 1) is kept in the Rippl-Rónai Museum in Kaposvár (inventory number 1067.716.1). It was found in 1964 at the south-eastern corner of the monastery of Kaposzentjakab in a layer of building rubble dating from the 15th century according to a note in the inventory book. Neither the details of the results of the excavation nor those of the collection have appeared until recently so we are at present unable to assign a more precise date. The discovery site is at 42° 22' N, 17° 48' E though we do not know the exact position where the fragment was found. It measures 14 × 7.5 cm and is between 1 and 1.5 cm thick. It is a thin slab of grey slaty sandstone; on its surface can be seen the finely scored divisions of the sundial with numerals lying between two more deeply carved semicircles. The hour lines diverge from a focus. The dial plate could have had 12 hour lines and possibly lines above the sunrise–sunset line as well. The numerals are Arabic as we can see from the presence of a zero and since they proceed anticlockwise

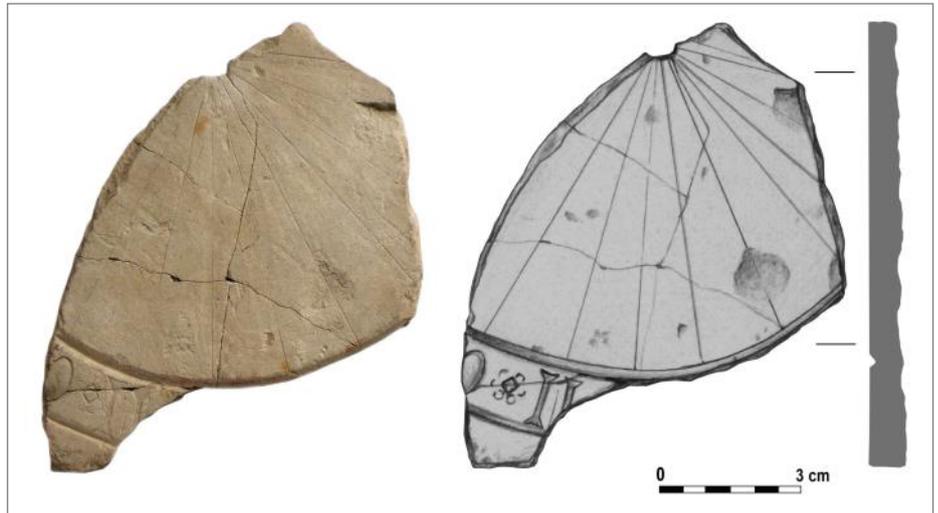


Fig. 1. The fragment of the sundial of Kaposzentjakab.
Photo and drawing: Zsolt Nyári.

we know this must have been a vertical dial. The rosettes between the numerals could mark the half hours as in the case of the sundial of the Saxon St Bartholomew's Evangelical church at Brasov (Romania). The missing gnomon presumably had its origin at the focus of the hour lines. Comparing the Kaposvár dial with others of a medieval origin it appears to be of better quality and made by more skilful hands.

On Vertical Sundials

Vertical dials tended to be located on the southerly aspect of buildings though these did not usually face due south so that dials often needed to be slightly asymmetrical. They were often placed high on buildings which made for more difficulties though it also helped to ensure their survival. They would show local solar time though in 1848 unified local time was introduced from Budapest, connected with the Hungarian train service. On a vertical dial the hour divisions are closer together around midday and further apart towards the morning and the evening hours. We often find that the divisions are incorrect owing to the ignorance of the maker or to the age of the dial. The number of correctly delineated dials in Hungary increased from the 15th century onwards. In ancient and medieval times the daylight hours were divided into 12 equal parts as were the hours of darkness. In the earliest examples the day was divided into four or eight parts relating to the rites of the

church and though their divisions were equal they did not represent equal periods of time. To mark equal periods of time it is necessary that the divisions have varied angles as detailed above. The earliest example in Europe dates back to 1342.

Sundials in many cases formed parts of buildings or, in later times, monuments. The database of Hungarian sundials contains 405 entries of which 234 are vertical dials, few of these being medieval or modern. We can date only one to the Árpadian age (1000–1301) and this is on the Roman Catholic church in Pozsonyi Street in Sopron. We can date six examples to the late Middle Ages (1301–1526): Rudabánya, Mátraverebély, Szentendre, Narda, Kőszeg and Ráckeve. There remain eight examples from the early modern period (1526–1711): Kőszegdoroszló, Kőszeg, Győr, Balf (four dials) and Sopron. It is difficult to find exactly similar parallels in Hungary – as Adrienne Buka writes – because the majority were sited on monasteries or churches which were later destroyed. Even if painted or carved sundials survived the centuries they could still be destroyed during restoration work because of lack of interest in such archaic structures. Only two sundial fragments have been discovered by archaeological excavations apart from that at Kaposszentjakab. A sundial fragment was found at the nunnery of Veszprémvölgy (Veszprém, Veszprém county) and a further one came to light near Buda Castle (Budapest) when excavations in Öntőház Street were made by Károly Magyar.

Reconstruction and Dating

As the majority of sundials are systematically designed according to astronomical principles it is theoretically possible to reconstruct the dial at Kaposszentjakab. It could originally have been semi-circular or rectangular, the gnomon being at or above the focus of the hour lines and probably polar-oriented. The radius of the dial from the focus of the hour lines to the outer semicircle is 17 cm, the part of the fragment outside this being 2.0 cm, and the part outside the upper surface of the dial being at least 1.5 cm. The area of the original slab was at least 38×19 cm and may have been as large as 46×25 cm.

This slab could have been fixed to a south facade, showing the time on the south wall of the monastery courtyard. It was either pulled down and destroyed or it fell and was found by later excavation. The church and monastery of Kaposszentjakab have by and large an east–west alignment, taken from the western nave to the eastern apse. The main walls of the monastery face the four main compass points so that the northern wing of the monastery courtyard faced south. Its exact measured azimuth is 93.3° , only 3.3° from due east.

On the polished surface of the sundial radial lines from the focus end at a double semicircle, the 12 divisions representing the 12 daylight hours, the six on the right representing the afternoon hours. On the left only three

sections remain. Here also can be seen the inner pair of semicircles terminating the hour lines. The hour lines are straight and seem to have been carved with a sharp tool. They converge with millimetre accuracy to a point. Five (from 9 am to 2 pm) are complete while the remainder (3 pm to 6 pm) are partial but still accurate in direction. After extending the hour lines we have measured the exact angles with a goniometer as:

10 – 11	14.8°
11 – 12	13.6°
12 – 1	14.0°
1 – 2	13.9°
2 – 3	15.3°
3 – 4	14.8°
4 – 5	14.1°
5 – 6	14.4°

These lie between 13.6° and 15.3° and if we ignore the two outside values the rest vary between 13.9° and 14.8° with an average of 14.3° . In practical terms the angles are almost equal and the scratched lines on this hard but friable material mark out equal sections.

If the dial were a complete semicircle each of the 12 divisions would measure 15° , but in the case of the Kaposszentjakab dial the vertical noon line and the 6 pm line are not orthogonal but are at an angle of 86.5° to one another. This difference of 3.5° makes the reconstruction of the fragment more difficult and we can imagine two explanations for this difference:

1. The noon line of the dial is the vertical axis of symmetry. The six 14.4° sections of the afternoon hours would equal about 86.5° and this could be true of the morning hours as well. The upper edge of the dial would not be horizontal and the 6 am and 6 pm lines would each depart from it by 3.5° . With a vertical noon line and morning and afternoon hours equalling one another the sundial would be totally symmetrical.
2. The 6 pm line of the sundial could be horizontal with the noon line being shifted 3.5° to the right. This would mean that the 6 am line would be shifted down 7° from the horizontal making the sundial asymmetrical.

The second explanation is more probable and connected to the fact that the southern wall of the monastery does not face due south but deviates from it by 3.3° . At the foundation of the monastery in the 11th century it was intended to orientate the wall exactly south but this was not achieved. The designers and makers of the dial could take this into consideration. The sun's course across the sky is a regular 15° per hour from east to west but at our latitude a vertical dial plate is at a fairly large angle from the ecliptic. We have calculated, using the program www.kompf.de/gps/sunclock.php, all the hour line angles for 46.35° N, 17.84° E. Present-day sundials take into account standard time (for us Central European Time, CET) which agrees with modern time signals. Until the introduction of

standard time in 1892, sundials showed local solar time. This is why we have made the calculation for 15° E which is in the middle of our 7.5° to 22.5° E CET time zone.

Assuming an exact south-facing wall and a vertical noon line the angles of the 12 sectors were: 21.2, 18.7, 15.3, 12.9, 10.5, 10.5, 10.5, 11.2, 12.9, 15.3, 18.7, 21.2, with an average of 15° though the individual hours are considerably divergent from 15°.

If the program takes into consideration the 3.3° deflection of the wall at Kaposzentjakab the hour lines alter somewhat and the sundial is asymmetrical. A calculation on another wall produced different angles and the 6 am line was not included since sunlight would not fall on that wall at that time. The angles from 7 am were: 19.7, 16.4, 13.6, 11.6, 10.6, 10.4, 10.9, 12.3, 14.6, 17.7, 20.6. The noon line on the wall is vertical. The average of the sections of the correctly calculated sundial is 14.4° (as only 11 sections add up to $[71.9 + 86.5] = 158.4$ degrees), but the angles of the sectors are between 10.4 and 20.8 degrees. These are very different from the 15 and 14.4 degrees. It is interesting that the average of the sectors calculated with a modern program is in accord with the medieval sundial discovered here. It is even more interesting that the 6 pm line calculated from the computer program is not horizontal either but lies at 86.5° as is the case with our sundial.

So the sundial used to be a chronometer divided into 12 equal parts and could be used for so-called monastic or temporal timing ('ancient timing') so that prayer times (Fig. 2) were related to it. The times of prayer were:

- Prime – at dawn
- Terce – at the third hour ca. 9 am
- Sext – at the sixth hour ca. midday
- None – at the ninth hour ca. 3 pm
- Vespers – at eventide

The sundial was a transition between the equiangular ones of the early Middle Ages (4–8 sectors) and the ones with varying angles from the late Middle Ages (12 sectors). Though the dials with varying angles showed equal hours, the hours shown by the equiangular ones could be anything from 40 to 80 minutes in duration. According to these we could construct a sundial which accords with the first theory but will show considerable variation (Fig. 3).

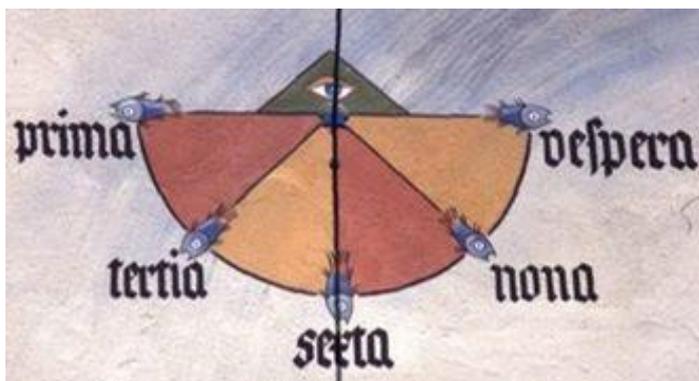


Fig. 2. So-called monastic sundial.²

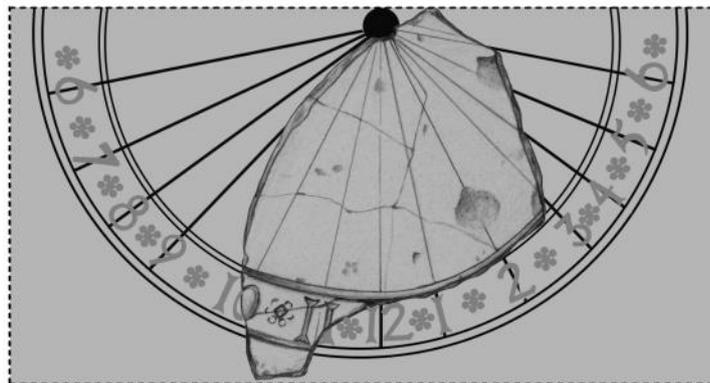


Fig. 3. Reconstruction of the sundial of Kaposzentjakab. Design: Máté Varga, drawing: Zsolt Nyári.

Script with Arabic numerals spread through our homeland during the 15th century though Roman numerals were in use earlier. For a while both styles were to be found on both documents and sundials. Some say that the first inscription using Arabic numerals is in the sanctuary of the church of Magyarvalkó (Valeni, Romania) where there is a mixture of Arabic and Roman numerals. The numbers 1 and 4 were written and followed by V and II representing the date 1452. We know an earlier inscription which uses an Arabic numeral. On a headstone in Segesd (Somogy county) is inscribed M•CCC•XL followed by an Arabic 6 which dates the stone to 1346. Since we do not know from the fragment which script method was used we are using standard Arabic numerals in use in the 16th century, though it is still possible that a mixed numbering was used.

Although there is no date on the fragment we can assign a *terminus ante quem* to its date of installation. The territories outside Somogy county came under Turkish rule in 1543, but Kaposvár with its fortified monastery of Kaposzentjakab and its direct surroundings were occupied by the Turks in 1555. According to these facts we date the design of the sundial to the second half of the 15th century or the beginning of the 16th.

Parallels

There are no sundials similar to that of Kaposzentjakab in the Carpathian Basin but the one which most resembles it is to be found at Szentendre in Pest County (Fig. 4) where there is a round-arched sundial with 12 equal sections (all around 15°) but no numerals. There is another similar sundial on the wall of the medieval church at Kolozsmonostor in Transylvania (Fig. 5) with Roman numerals but no lines above the 6 o'clock hour lines. It may date from 1440.

There are more sundials with similar structures in other countries. In Germany particularly we can easily find parallels since over 6,000 sundials have been recorded there. Those most similar to our discovery are at Stendal (Fig. 6), Oebisfelde (Fig. 7), and Erfurt (Fig. 8). All three have Arabic numerals lying between two semicircles. The



Fig. 4. The sundial of Szentendre.³



Fig. 5. The sundial of Kolozsmonostor.⁴

first sundial is semicircular while the other two occupy a full circle and we can date all three to the turn of the 15th/16th centuries.

Summary

In medieval Hungary many different types of sundial were in use but few are left for us to investigate today. In particular we know of very few from excavations, so the review and analysis of the one at Kaposszentjakab is important for several reasons. Vertical sundials are often located on medieval churches or monasteries because the daily life of their residents was governed by them. At first sight it seems that the vertical sundial carved in stone at Kaposszentjakab is a well-constructed work but its compilation is a little imprecise. From the sundial fragment we can reconstruct the whole: on an equiangular sundial one sector can represent between 40 and 80 minutes. The semicircle was divided into 12 equal parts showing the time between 6 am and 6 pm. The average angle of the 12 sections is 14.4° . The rod of the gnomon which was polar oriented is lost but its root can be seen. The numerals of the



Fig. 6. Sundial in Stendal.⁵



Fig. 7. Sundial in Oebisfelde.⁶

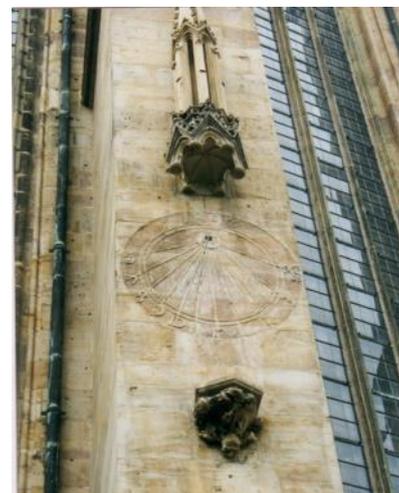


Fig. 8. Sundial in Erfurt.⁷

sundial are located between two semi-circles and we can see fragments of the Arabic numbers 10 and 11. We can find parallels with this sundial in Szentendre and Kolozsmonostor in the Carpathian Basin, while foreign parallels are in Stendal, Oebisfelde, and Erfurt in Germany. From these and their dating we can date the construction of the sundial to the second half of the 15th century or at the very latest to the beginning of the 16th century. It could not have been made later than 1555.

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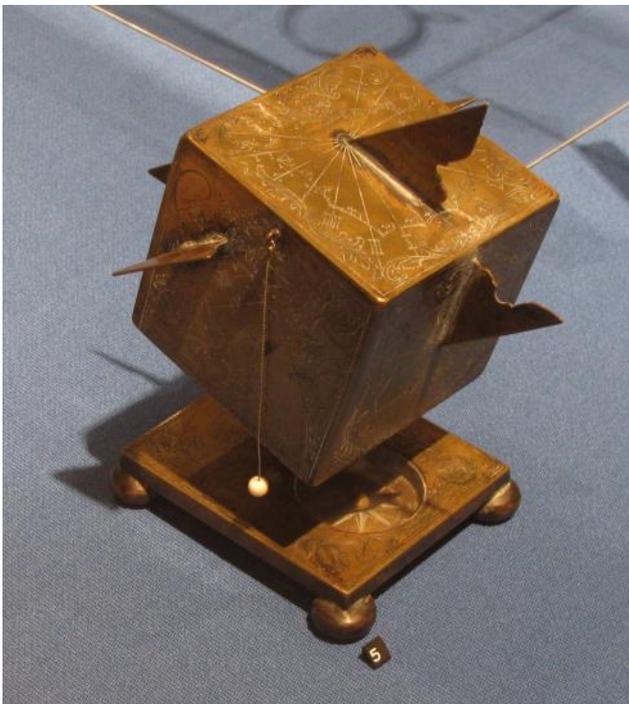


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HOLIDAY PICTURES

DOUGLAS BATEMAN



Whilst on a visit to Neufchatel to give a lecture to fellow horologists I visited the world-famous clock museum at La Chaux-de-Fonds. They have a good collection of sundials as well, of which the photographs above show a small sample. The cube dial is by D. Beringer

and dated 18th century. The left-hand pocket dial is by another of the Beringers, David Beringer, and dated about 1760. The right-hand pocket dial is anonymous and dated 17th century.

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