

The British Sundial Society



BULLETIN

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SEPTEMBER 2001



Front Cover: Equatorial Ring Dial, 1975, designed by Wendy Taylor; on Thames embankment at St. Katharine's Dock

Back Cover: 'Boulby's Sundial' a multiple Dial at Walton Hall, Wakefield Yorkshire (Photo: Colourcard postcard)

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BULLETIN

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VOLUME 13 (iii) - SEPTEMBER 2001

EDITORIAL

In this issue there are sundials Ancient - a medieval scratch dial in Jerusalem; and Modern-millennium armillary in Cheadle, Cheshire. There are dials Scientific-stereographic projection of complex designs; and Artistic - 'Eye of Time' and Father Time Statuary. But the most interesting dial herein is the horizontal sundial made 60 years ago, and described in the article page 127-9. This dial is remarkable, not for any special features of layout, but for the extraordinary circumstances of its design and construction: Made in a Japanese internment camp in China, out of scrap material salvaged from ruins,

using improvised tools, by a man who beforehand had known nothing about sundials and whose only reference sources were Whitaker's Almanack and the local telephone directory, it kept perfect time (with built-in EoT correction) and was indeed the only timepiece in the internment camp. It apparently continued to keep time (with suitable latitude adjustment) when brought home to Britain by its designer/maker. We hope that his heirs and descendants appreciated and valued his sundial. Perhaps it is even now somewhere in Norfolk, counting sunny hours and uplifting hearts.

FROM THE CHAIRMAN'S PEN

Last year we published the latest edition of the sundial **Register**, made a number of Awards, and sponsored many other activities such as conferences, tours and visits. This year, we are increasing the number of *Bulletins* from three to four. I must say that it gives me pride and pleasure to be Chairman of such an active and thriving society.

Success, however, does not come without a lot of effort by a great many people. Apart from the Council, these include the contributors to the *Bulletin*, those who engage in recording sundials for the Register, and those who carry out the organisation of local meetings, events and other activities. I cannot name them here, but I thank them all on your behalf. Of course, there are many members who, due to their work or their location, or for other very valid reasons, are unable to make such contributions, but whose membership is valued just the same and I thank them also for their support.

Nevertheless, there is one area where *all* members can help the Society and that is by making life easier for the Council

Members. Please remember that all work carried out for the Society is unpaid and that many Members of the Council spend the equivalent of several working weeks every year in handling the Society's affairs on your behalf. This is time that they could easily spend on more exciting activities connected with sundials.

I would be grateful, therefore, if you would please try not to increase their work-load. Please respond promptly to reminders for subscriptions, return Gift Aid forms as quickly as you can, make sure that standing orders are correct, etc. It costs the Society money when "chasers" have to be sent out, *your* money and *our* money, and it wastes the time of your Honorary Officers! For example, sending out 120 second 'reminders' costs the Society £36 and wastes several evenings of leisure time.

Please let us all ensure our continued success in the future by supporting the Society in every way that we can. Thank you.

C.St.J.H.D.

A MEDIEVAL SUNDIAL IN JERUSALEM

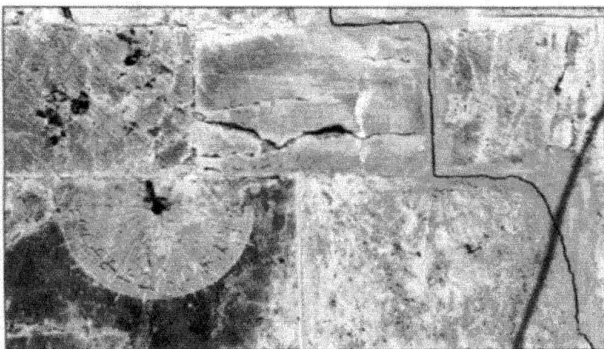
SHAUL ADAM

A newly discovered mediaeval scratched sundial has been reported previously by Daniel Rubinstein (reporter of the Hebrew daily newspaper "Ha'aretz" [The Land]). The sundial had been discovered in the Armenian Church in the Old City of Jerusalem.

Rubinstein mentions that most of the Church's congregation and visitors did not even know of this sundial. The initial information came to him from an Armenian clock maker in Jerusalem, and when he came to the church to survey the sundial, the gate man and the church's secretary told him (and persisted) that there was no sundial on the church. Luckily a young man who came in and heard the conversation confirmed that there is indeed such a sundial and he led Daniel Rubinstein to the southern wall facing the church's yard. The sundial is scratched on the southern wall of the ancient structure of the church, about 4-5 metres above the ground. The church was first built in the 5th century AD, and rebuilt in the 12th century AD.

The scratch dial is half a circle, about 35cm in diameter, divided into 12 equal hour sectors, and there are divisions to halves of hours marked by short lines on the circular peripheral line in the middle of each hour sector. The hour's numerals are Armenian letters, scratched in the end of each hour sector. The gnomon is missing and there is much damage around the gnomon's hole. The lines, marks and letters are very well preserved and visible.

Another sundial of this type, of the same size, is scratched on another stone, just to the right of the stone with the main sundial. However, this second sundial is much simpler, and has only the lines dividing it to 12 sectors, with no numerals or lettering, or any further division. It is scratched quite shallowly and only just visible in the photograph. It is not clear whether this simple sundial was an initial attempt to scratch a sundial and then was abandoned for some reason



The main dial and the second dial on the south wall of the Armenian Church, Jerusalem

(a mistake, or unsatisfactory for the sundial maker) and the maker scratched another sundial on the next stone; or whether it is a completely different sundial that was scratched at some other time by somebody else; or possibly scratched at the same time to serve a different purpose. Mario Arnaldi suggests that these two sundials might have been 'twin sundials' showing different time divisions for different religious needs, serving different religious groups or probably a different Armenian liturgy. Arnaldi remarked on similar twin sundials known from Osakan, Mankanoc, in Armenia, where the left dial is divided into 13 sectors and the right one into 12 sectors. He also mentions a 13th century sundial from Italy with 13 hour-sectors.

Mr. George Hintelian, a historian of the Armenian community in Jerusalem, with whom I talked about the sundial, told me of written evidence which appears in Armenian history sources. Johanes of Wurzburg (a German pilgrim) wrote in "*The inscriptions of Johanes of Wurzburg*" that he visited the church in 1150, "...shortly after its new building completion". As already mentioned, the original building of the church is from the 5th century AD and it was reconstructed in the 12th Century AD. The "Inscriptions" was written in 1161 AD. From this evidence it may be assumed that the sundials were scratched on the church's wall during or shortly after the completion of the re-building.

Comparison with a sundial of the 12th century AD from Bjni in Armenia reveals the similarity between the two sundials, and it may be assumed that the sundials from Jerusalem are also from the 12th century.

It is interesting that no sundials from the Crusaders epoch have been found in Israel up till now, as far as I know; and actually after the Byzantine epoch that ended in the 8th century, no later sundials have been found in Israel so far, until the discovery of these Armenian Sundials.

ACKNOWLEDGEMENTS

I warmly thank Mr. George Hintelian from the Armenian Community in Jerusalem; also Mr. Daniel Rubinstein from Jerusalem, for the information on the Armenian Sundial; and Mr. Mario Arnaldi from Ravenna, Italy, for a photograph of the sundial from Bjni (Armenia) and for information on mediaeval sundials.

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NOTE

In the article by M. Lowne 'Design and Characteristics of the Double Horizontal Sundial' *Bull.BSS* 13, 47-55, there were a number of printing errors, the grossest of which are corrected in the erratum-slip enclosed herewith. A corrected and amended version of the entire article will appear in a later issue of the Bulletin, probably in December 2001. Apologies to the author and all concerned.-Ed.

OLD FATHER TIME

JOHN WALL

To my knowledge there are in Britain only three freestanding stone statues of 'Father Time', each of which incorporates a sundial as his principal attribute. Before we explore the origins and history of this familiar personification of Time, let us reprise what we know about the statues. They ornament the grounds of Anglesey Abbey, Cambridgeshire; Duncombe Park, near Helmsley in North Yorkshire; and Welbum Hall, also near Helmsley.

JOHN NOST, SCULPTOR

All three statues are the work of John van Ost, or John Nost in the Anglicised form of his name. He was born in 1686 in Mechelen in Flanders, where he became a sculptor and decorator before moving as a young man to London. He was at first employed as foreman by the sculptor Quellin and then established a studio and statuary on his own account in the Haymarket in London. He subsequently established a profitable business supplying the aristocracy with lead copies of classical antiques, urns, carved stone statues, monuments and chimney pieces. One of his earliest patrons was Thomas Coke, Vice-Chamberlain to Queen Anne. The last remaining examples of John Nost's work in lead adorn the grounds of his country seat, Melbourne Hall in Derbyshire. His most celebrated work was the series of statues in the pediment over the portico of Buckingham House, now Buckingham Palace.

Although in all three cases John Nost's Father Time gazes down on a horizontal sundial mounted on a pedestal, the figures themselves are subtly different. Unlike lead statues of which a number of identical copies may be cast from a single mould, a stone statue is a unique creation. This is the case with John Nost's only other recorded essay in the marrying of sculpture with sundials, a trio of statues of kneeling 'Blackamores' as pedestals to support a horizontal sundial held aloft in their arms. Although they appear to be superficially the same, there are small but distinctive differences in execution. These three sundials were provided for Hampton Court, for which John Nost was paid £30!; for Okeover, Staffordshire; and for Dunham Massey,

a National Trust property in Cheshire, where the dial can still be seen from the present entrance through the Coach Houses.

John Nost's treatment of the Father Time figures especially, and in particular his incorporation of a sundial rather than an hour-glass as the old man's principal attribute, is without parallel. It demonstrates invention, imagination, and creativity of a high order.

John Nost was at first assisted by Andrew Carpenter (or Andreas Carpentière), of whom more anon, and later by his own son Anthony, from whom John Cheere eventually took over the yard. He died on 26th April, 1729, having, in the words of Vertue, 'become a master of reputation and left behind a good fortune'.

LOCATIONS

(1) Anglesey Abbey (Figure 1)

The Father Time statue/sundial in the centre of the Hyacinth Garden at this National Trust property was described and illustrated by Maurice Cohen in the October 1999 issue of the Bulletin.² As he remarks, it is wrongly orientated - the dial actually points north-east. Many of the ornaments in the grounds of Anglesey Abbey came originally from Stowe, including two life-sized lions cast in lead, also by John Nost. It is probable that the Father Time statue/sundial was wrongly positioned when the transfer took place.

It was probably through a commission from Charles Howard, Third Earl of Carlisle, for the grounds of his newly built 'palace' of Castle Howard, that John Nost came to the attention of the owners of Duncombe Park and Welburn Hall, only 11 miles and 9.5 miles distant respectively. It is possible that he was recommended to the Earl by Sir John Vanbrugh, the brilliant and precocious architect of Castle Howard, who was himself half-Flemish. Between 1703-1710 he was paid nearly £100 for lead figures, copies of classical statues from Greece and Rome. Thirty such figures were commissioned for Castle Howard from John



*Fig.1 Sundial in Hyacinth Garden,
Anglesey Abbey Cambridgeshire*

Nost, his one-time assistant Andrew Carpenter, and John Cheere, his successor. Fifteen of these remain, newly restored, and for the most part relocated immediately to the south of the House. None of these can be attributed to John Nost himself with certainty. It is not inconceivable, however, that he also executed a Father Time statue/sundial for Castle Howard which has since been lost. It is significant that among John Nost's other work in North Yorkshire is a life-size standing figure of Thomas Belasaye, Earl of Fauconberg, and another of Belasaye's son by Andrew Carpenter, in Coxwold church, 12 miles from Castle Howard.

(2) Duncombe Park (Figure 2)

This seat of the Earls of Feversharn was built for Thomas Brown Duncombe to the designs of William Wakefield between 1713 - 18. It is likely that he was advised by Vanbrugh who was working at Castle Howard at the time. The establishment of the gardens here was a landmark in the development of the English Natural style, even anticipating Castle Howard on account of the magnificent Terrace overlooking the valley of the River Rye. Instead of a formal avenue centred on the house, the house overlooks a large square of level lawn bounded by the Terrace to the east. The focal point of the view from the house is the white

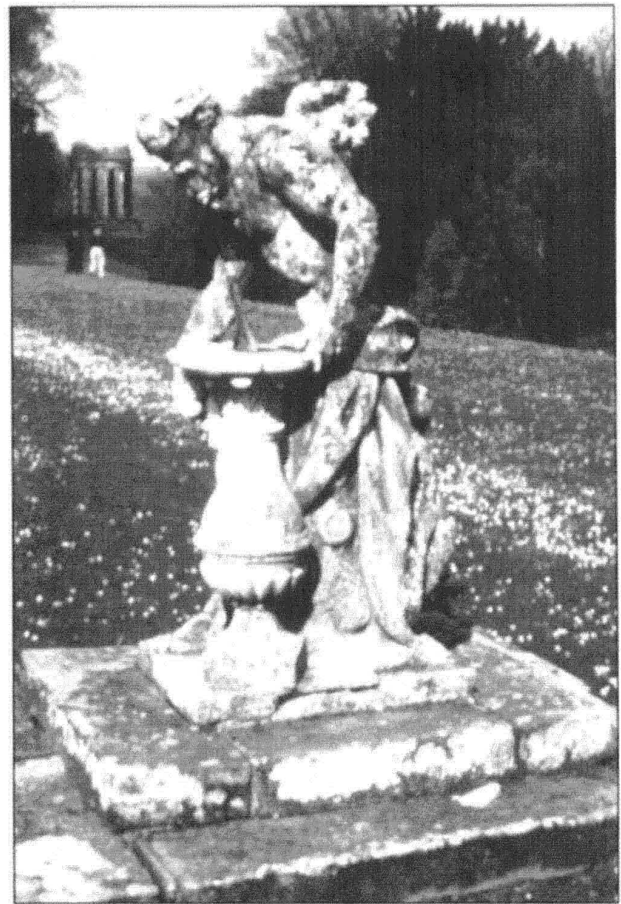


Fig.2 Sundial at Duncombe Park, Yorkshire

figure of Father Time at the far side of the lawn, from which can be seen the Ionic Temple at the north end of the curved, sweeping Terrace, and the Tuscan Temple at the south end. The statue/sundial was commissioned for the grounds in 1715.

(3) Welburn Hall (Figure 3)

Less than five miles east of Duncombe Park (and a mere three-quarters of a mile south-east of the finest Saxon sundial with inscription in Britain at Kirkdale) lies Welburn Hall. The original Jacobean manor house, built for Sir John Gibson c. 1603, survives as one wing of the present much-enlarged mansion. John Nost's Father Time statue/sundial, overlooking the lake in the grounds to the south of the Hall, is one of the few pieces of evidence that it was extended and the gardens laid out in the early 17th century, since most of the building was destroyed as a result of two disastrous fires in 1890 and then in 1932, when it was rebuilt in imitation Jacobean style. Welburn Hall today houses a North Yorkshire County Council residential school for handicapped children. It is not normally open to the public.

THOMAS HEATH, SUNDIAL MAKER

Of course, the three brass Father Time sundial plates were not themselves made by John Nost. They were

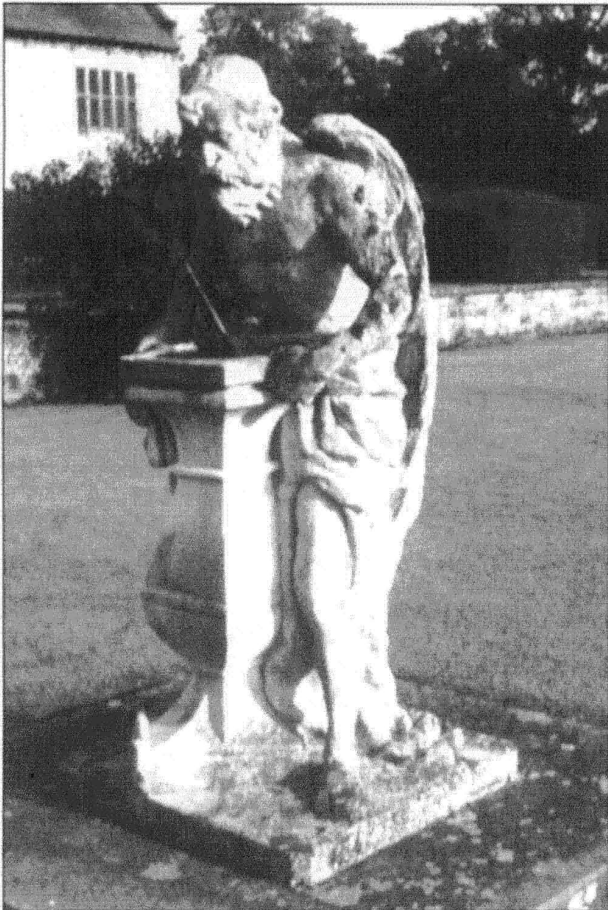


Fig.3 Sundial at Welburn Hall, Yorkshire

commissioned, either individually by the owners of the mansions as patrons, or more likely by John Nost on their behalf, from an independent scientific instrument maker, Thomas Heath (*floreat* 1714, died 1773). Only one of the sundials is signed with his name – ‘T(homas) Heath fecit’ – at Duncombe Park. It is almost certain, however, that the other two at Anglesey Abbey and Welburn Hall can be attributed to him also on account of stylistic similarities. Thomas Heath's works occupied the 'Hercules and Globe' premises, next door to the Fountain tavern near Exeter Exchange in the Strand, London. Heath was one of the most notable instrument makers of his day. His trade card advertised all sorts of optical, astronomical and mathematical instruments as well as globes, mathematical books and weatherglasses. He was also a prolific advertiser in newspapers. In 1740 he took Tycho Wing into partnership and the firm, known as Heath and Wing, remained in business until Heath's death in 1773. On October 7th of that year the *Morning Post* advertised the sale of Heath's stock in trade and announced Wing's retirement.³

Given the quality of Heath's work, it is not surprising that he was commissioned by aspiring, wealthy and titled owners of a number of country houses to provide sundials for their grounds. To date I have identified 11 such dials of

very high quality, at Penshurst Place, Kent; St Cross Hospital, Winchester, Hampshire; Powderham Castle, near Exeter, Devon; Erdigg Hall (a National Trust property), Wrexham, Clwyd; Hampton Court, Surrey; Claydon House, Buckinghamshire (another National Trust property); the Kenmore Hotel, near Aberfeldy, Tayside⁴; the three Father Time examples; and finally a dial in private ownership in my home town, Kirkbymoorside, North Yorkshire. There is a mystery as to how this came to rest here, since it was made for Billingbear House, between Binfield and Bracknell in Berkshire. This is evident from the name Billingbare (sic), and the latitude, inscribed upon it. The furniture of this large 16" diameter dial (only exceeded by the 18" dial at the Kenmore Hotel) is exceptionally finely detailed and ornamented. It includes a ring for the Equation of Time and a ring marked with 16 points of the compass. Its most distinguished feature, however (and one which it shares with the dials at Kenmore and Claydon House) is the naming of 32 exotic locations round the globe, positioned on the hour ring so as to indicate when, according to Billingbare time, it is noon at those places.

The three Father Time sundials are only marginally less detailed. The 13.5" diameter dial at Duncombe Park, for example, includes a compass rose of 32 points, alternately shaded and scrolled. Every sector of ten degrees is marked, as is every ten minutes on the hour ring.

Readers who are inspired to seek out the three Father Time statue/sundials might bear in mind that in each case there are other sundials of note in the grounds. For example, in each there is a sundial set in a rose garden on the strength of a punning association between 'rose' (a flower) and a (compass) 'rose'. As at Duncombe Park, a compass rose is provided as part of the furniture of the more elaborate dials in order to determine the direction of sunrise and sunset throughout the year and (less accurately) the hour angle of the sun at other times of day. There is a particularly fine example in the rose garden at Castle Howard.

OLD FATHER TIME

The figure of Father Time which is familiar to us is a comparatively modern creation, or at least 'cobbled together from bits and pieces over a period of about a thousand years'.⁵ The basic concept, however, is much more ancient. It can be traced back to the Greek penchant for word-association. The Greek for Time, *Chronos*, was very similar to the name of one of their oldest gods, Kronos, the oldest of the Titans and the father of Zeus. He was primarily an agricultural god, and was usually depicted as an old man, with long hair and a flowing beard, grasping a sickle. We are indebted to Plutarch for providing the earliest surviving

source of the claim that the similarity of these two words has meaning. 'As the powers of the gods are drawn from the primordial elements with which they have associations, then Kronos must be the god of time'. (Lippincott, p.171). It was not until the early Middle Ages that Kronos (the Roman god Saturn) came to be depicted in art with some of the more familiar attributes, and this through the work of commentators on classical texts. A 4th century grammarian, Servius, commenting on Virgil, was the first to suggest that Saturn's sickle is a symbol of the way in which Time cuts through all things. Another attribute of Father Time is a snake, and again Macrobius points out that this is a symbol of the year. The way in which it bites its own tail is a symbol of the manner in which time devours itself.

In Nicholas Poussin's well-known painting 'Phaeton asking for the chariot of Apollo' (c. 1630-35) Father Time is depicted in the background as a winged old man, biting some unclear attribute which he holds in his hand. (illustrated in Lippincott, p.87). This is clearly an allegory of Ovid's *Tempus edax rerum* - 'time devours all things' - which appears as a motto on so many British sundials. (The legend of Saturn eating his own children was interpreted by later Medieval writers as an image of how Time eats away at all that it creates).

Poussin's preoccupation with the theme of time is also expressed in the eponymous painting 'A Dance to the Music of Time'. In the right foreground a winged Father Time sits playing on a lyre while at his feet two small *putti* play with two symbols of the *vanitas*; a soap bubble pipe and an hour glass. (illustrated in Lippincott, p.174).

We have anticipated somewhat the development of the image of Father Time in the later Middle Ages, when it comes into its own. Initially this can be attributed to a widespread desire to provide illustrations for Petrarch's *Trionfi*, 'Triumphs', composed between 1340-70, both in the text itself and a multitude of large-scale murals and tapestries, and other objets d'art. Petrarch's Father Time, however, has come a long way from the original concept of a benign agricultural deity. He is old and bent, often standing only with the aid of crutches. He has a bald pate but retains a forelock - hence the expression 'to take time by the forelock'. He is winged to illustrate how *tempus fugit* or 'time flies'. He carries either a large scythe or a sickle. It is true that originally this may have been intended as a farming implement wielded by the Greek agricultural god Kronos, but with Petrarch it takes on a completely different role. At some time during the Middle Ages the scythe and the sickle became the attributes of 'the grim reaper' - death. So Father Time becomes as a god whose task is to cut short the lives of men. Father Time is a destroyer.

It is only in the later medieval representations of Father Time that he acquires the attributes of the hour-glass or the clock. It is a matter of speculation why hour-glasses in particular, which had existed as time pieces for centuries, should make a sudden appearance in the iconography of time at this stage. The most plausible explanation is that with the widespread migration from the country to the towns, urban populations, being divorced from the natural timekeepers of the Sun, Moon and Stars, required hour-glasses and clocks to regulate their days.

The first mention of Father Time in English literature is in a work by Stephen Hawes titled *The Pastime of Pleasure*. This first appeared in 1509 and is usually cited from an edition of 1517. 'Sodeinly came Time in breuiacion whose similitude I shall anone expresse. Aged he was, with a beard doubdless of Swalowes feaders'. The concept of Father Time was therefore well established when Shakespeare makes reference to him in two plays. First, in *The Comedy of Errors* published in 1590: Dromius of Syracuse says 'by a rule as plain as the plain bald pate of Father Time himself'. (II, ii, 71). Again, in *Troilus and Cressida* published in 1606, Ulysses says 'Time hath, my lord, a wallet at his back, Wherein he puts alms for oblivion'. (III, iii, 145). By 1711, when Joseph Addison wrote *The Spectator*, Father Time had long acquired the two customary accessories: 'Equipped (like the figure of Time) with an hour glass in one hand and a scythe in the other'. (63, p.114).

It is curious that sundials, which had for centuries been the accepted and utilitarian recorders of the passage of time, and which even in the later Middle Ages, with the advent of clocks, were not by any means ousted from that role, do not figure as attributes of Father Time, with these sole exception. It is this circumstance which makes our trio of sculpted Father Times unique. To my knowledge, this group constitutes the only instance in European art of Father Time dependent on what is the single, infinitely variable, and fascinating subject of our Society - the ubiquitous sundial.

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3. Nicholas Goodison, *English Barometers 1680-1860* Cassell & Co, London, 1968
4. Information kindly provided by Mr. D. Scott-Kestin of Kirkbymoorside.
5. Kristen Lippincott, *The Story of Time*, (National Maritime Museum,) London, 2000
6. Stephen Hawes, *The Pastime of Pleasure*, London 1509 (1517), C. iv. A later edition of 1555 was titled *The*

histeie of graunde Amoure and la bell Pucel, called The pastime of pleasure. Reproduced by the Percy Society, 1845.

For a short account of the life and work of John Nost, see Robert Gunning, *Dictionary of British Sculpture, 1660-1851*, London, 1968, pp.279-82.

SUNDIAL STAMPS

PETER RANSOM

I will collect anything that has a connection with sundials. Postcards, crested china, cigarette cards, bookmarks, biscuit tins, rulers, newspaper cuttings – you name it and I'll collect it! It is a lot cheaper than the real thing and it also means I get to view many dials.

A few years ago I had the good fortune to start corresponding with Herbert Rau from Berlin. We exchange postcards and various odds and ends, and he sent me a copy of *Catalogo de Sellos con Relojes de Sol y afines* (1995) by André Majó Díaz from Barcelona. I am not sure of the exact title of the pamphlet, but it looks like a catalogue of sundial and related instruments on stamps. There are 8 pages of text and two colour pages featuring some of the

stamps listed on the printed pages, so I decided to start collecting them much to the chagrin of the family. Space is much at a premium in our house due to my collecting habits. Fortunately a few stamps do not take up much room. (But all the books I collect do!)

With the help of Herbert Rau I acquired the set of 1983 East German stamps, two of which are featured here.



Fig.1 Horizontal sundial of 1611 on an East German stamp of 1983



Fig.2 Noon gun and horizontal sundial of 1800 on an East German stamp of 1983. Note the latitude of 51° 13' 48"

The first one shows a horizontal sundial of 1611 and the other shows a noon gun (*Mittagskanone* is literally midday cannon) from 1800. The detail is incredible. On the horizontal dial the Roman numerals can be picked out, and on the noon gun the figures 51 13 48 are shown, which I

presume is the latitude for which it was made. Dresden is $51^{\circ} 5'$, and Leipzig is $51^{\circ} 20'$, so it comes from somewhere between these two latitudes (but the country is not given). At the bottom of each stamp is *Staatl. Math-Phys. Salon Dresden*, which I presume is something to do with the state run Mathematics and Physics museum at Dresden. *Tischsonnenuhr* appears to mean table sundial according to my daughter's German dictionary.

Karl Schwarzingger very kindly provided me with four Austrian stamps featuring or connected with sundials. One stamp commemorates Peter Anich (1723 - 1766) who is associated with dialling in Austria. The picture illustrated here shows detail from the 1990 stamp commemorating 850 years of the Gumpoldskirchen.



Fig.3 Detail of the dial on the church illustrated on the stamp commemorating 850 years of Gumpoldskirchen.

The actual diameter of the circle is 2.0 cm.

There are two dials, one without a gnomon that declines to the south east from the marks on the dial, and the other which appears to decline to the south west.

Marjolein Kool, an eminent doctor in the field of mathematical history provided me with four stamps from The Netherlands. Three of them feature the Nieuwekerk at Amsterdam, a church I have visited twice, and which has two dials. The best of the three stamps is the 1948 one shown here. The other two stamps were issued in 1980 and 1981. The large vertical south dial at the apex can be clearly seen, but there is also a smaller one on the eastern of the two buttresses just below halfway down.

By far the most interesting sundial stamp from The Netherlands was issued in 1991. To the casual observer this is a farmyard. To the diallist it is far more! The shadow of the roof crosses what appear to be hour markers in the courtyard, so the roof's shadow marks the passage of time. As the roof does not appear to be inclined, I am unsure about the accuracy of this 'dial'!



Fig.4 Two vertical dials on the Nieuwekerk, Amsterdam are featured on this 1948 stamp from The Netherlands.



Fig.5 Down on the farm the shadow of the roof is used to indicate the passing of time on this 1991 stamp from The Netherlands.

Of course stamps are small, but the detail is there. The Gumpoldskirchen stamp is 4.2 cm by 3.0 cm (1 5/8" by 1 1/4") according to my Sundials Rule(r)! To get the detail I photographed them with my manual SLR camera fitted with extension tubes. This allows the user to get very close to focus in on small objects, so the stamp fills the frame. The circle on the Gumpoldskirchen stamp has a diameter of

2 cm. On the print it is 13 cm, giving an enlargement factor of 6.5. The negatives were then developed as 7" by 5" prints, and it is these that appear here. I then scanned the stamp images and enlarged them on the computer to allow me to print them as A4 size. These were exhibited at the BSS meeting at Newbury in September 2000.

and I am grateful to Eric Hignett for his help in searching Stanley Gibbons Simplified 2000 stamp catalogue for the appropriate SG numbers. Both catalogue numbers are given here.

The stamps catalogued in Díaz's list are, as far as I can translate, as follows. He uses the Yvert stamp catalogue,

Country	Year	Yvert/SG	Value	Commemoration
Austria	1908	134/205	5kr	Anniversary of Franz Josef I
Austria	1990	1826/969	5s	850 years of Gumpoldskirchen
Bhutan	1991	285/927	25nu	Marvels of the world
Central Africa	1990	390/-	120f	World Cup
China	1953	995/1604	800\$	Scientific instruments
China	1958	1165/-	4c	Imperial Palace dial
China	1962	1431	20c	Imperial Palace dial
Congo	1992	956/1309	200f	Philatelic exhibition 92
Cuba	1973	1675/2031	3c	Anniversary of Copernicus
Cuba	1973	40/2033	30c	Anniversary of Copernicus
Denmark	1995	?	5.5kr	Tycho Brahe
Dominica	1986	894/993	5c	Halley's comet (Jaipur dial)
Dominica	1986	926/1032	5c	Halley's comet
Dominican Republic	1931	16-21/300-308	10c etc	Solar quadrant of 1753
East Germany	1972	1480/E1512	15p	Terrestrial globe, Dresden
East Germany	1983	2441/E2515	20p	Horizontal dial, Dresden
East Germany	1983	2442/E2516	30p	Equatorial dial, Dresden
East Germany	1983	2444/E2518	85p	Noon gun horizontal, Dresden
Ecuador	1949	514/901	10c	Monument on the equator
Ecuador	1962	397-8/1218-9	1.3,2s	Prince of Edinburgh's visit
Ecuador	1976	626/1652	2s	Conference of Ministers
Ecuador	1976	27/-	5s	Conference of Ministers
Ecuador	1988	79/-	100s	Centenary of D. Juan Bosco
Formosa	1963	11/472	6d	Views
Formosa	1992	2030/2100	5d	J. A. Schall von Bell
France	1947	783/1012	10f	UPU (Place de la Concorde)
France	1969	1582/1814	45c	Bourg-en-Bresse church
Germany	1984	1057/-	80p	Day of the stamp
Great Britain	1990	1493/1525	37p	Armagh observatory
Guinea	1975	?	200e	Barcelona Football Club
Guinea	1975	47	60e	Barcelona Football Club
Italy	1980	1466/1697	150L	Villa B. Maser, Treviso
Italy	1989	1808/2023	400L	?
Jaipur	1947	54/74	1a	Solar observatory
Liechtenstein	1977	622/678	50c	Castles
Liechtenstein	1978	637	1F	Edifices
Maçao	1989	605/711	7.50p	Portuguese presence in China
Maçao	1989	12/-	7.50p	Portuguese presence in China
Maldives	1986	1053/1153	4r	Halley's comet (Stonehenge)
Maldives	1994	?	25Rf	Stonehenge
Malta	1995	-/1003	25c	Antique dials
Namibia	1991	656/569	35c	Meteorological service

Netherlands	1948	494/669	20+5c	Nieuwekerk, Amsterdam
Netherlands	1980	1131/1336	60c	Nieuwekerk, Amsterdam
Netherlands	1981	1145/-	65c	Nieuwekerk, Amsterdam
Netherlands	1991	1375/1612	75+35c	Farm
North Korea	1992	101/3169-73	50ch	Solar system
Peru	1953	108/788,836	various	Solar observatory
Poland	1980	2516/2691	2.50z	Sandomierz
Poland	1980	?	2z	Sandomierz
Poland	1980	?	2.50z	Sandomierz
Portugal	1972	1139/1451p	3e	Buildings
South Arabia	1968	97/- (a pair)	15f	Holbein's The Ambassadors
South Korea	1988	1405/1834	80w	Dedication to science
Spain	1992	2812/3183	27+5p	Barcelona Olympics
St. Vincent	1988	1053c/1139	1.50\$	The Armada (a compendium)
St. Vincent	1992	?	50c	Discovery of America
St. Vincent	1993	249/-	6\$	Walt Disney
Sweden	1977	964/924	1.10k	Uppsala university
Sweden	1986	1364/1292	1.70k	Anniversary: Swedish Academy
Togo	1970	689/772	20f	Anniversary of O.N.U.
Togo	1973	779/946	40f	Anniversary of Copernicus

Please realise that I cannot guarantee the catalogue numbers or translations, so if you use this list to order from a stamp dealer, don't hold me responsible for any mistakes!

I now have the stamps from The Netherlands, East Germany, Austria and GB. If you can help with any of the others I would be delighted to hear from you!

Author's address:
29, Rufus Close
Rownhams
SOUTHAMPTON
SO16 8LR

TWELFTH ANNUAL CONFERENCE OF THE BSS, YORK, 27-29 APRIL, 2001

REPORT BY WALTER WELLS

After a rather protracted season of grey skies and flooded meadows it was a joy to find ourselves in warm spring sunshine at last in the purheus of York Minster. The College of Ripon and St. John provided an excellent set of rooms to house our activities together and over the weekend we fed well and in the best of company. As we assembled on the Friday there was a general exchange of news and opinions between friends of long standing and also an opportunity to meet the newer members. In fact the attendance this year was the highest to date and one welcomes the ideas which newcomers bring to the Society

The official business of the conference was opened with a welcome from Chris Daniel. It was good to meet members from all parts of the country as well as those who had travelled from more distant places in Europe and North America. He also congratulated Doug Bateman and Richard Crossley who had organised the meeting and had

planned the expeditions we should be making to visit sundials in the City and the nearby countryside.

The opening talk was given by Allan Mills, who took as his subject the Time Trail which he developed for visitors to Leicester at the Millennium. It takes one through the whole range of devices from the Water Clock used in ancient Egypt to the seaman's sand-glass and from the classical bowl dials of Rome to sundials and the development of mechanical clocks. Much research and experiment has gone into the preparation of the 'Trail' and not all of it is obvious to the beholder. Allan confessed to us that the replica of a charming 17th. century church clock which he has installed at the Guildhall is now rather daringly regulated by concealed electronics!

John Davis followed with a fascinating account of the discovery of a pair of very early wooden dials at Ipswich,

that had been concealed beneath a later pair which was recently disturbed for refurbishment. This led to much speculation about the sequence of events, the probable dates and the reason for the reconstruction.

Saturday morning gave us three important talks. Fred Sawyer, our chief mentor from the States, expounded brilliantly a graphical technique practised by Samuel Foster at Gresham College, London, over three centuries ago. The scaled diagrams which enabled Foster to lay out the lines on a sundial constitute what a mathematician of today would refer to as a nomogram, generally thought of as an innovation of the 20th. century. However, results that we are able to get from numerical tables would have been obtainable then by using these diagrams; but construction of the scales must have been a real challenge!

Later in the morning we came to the Andrew Somerville Lecture, given this year by Dr. Jim Bennett, Keeper of the Museum of the History of Science at Oxford. First we had the good news that the expanded and redesigned display of the astrolabes and sundials is imminently ready for reopening and will be accessible each week from Tuesday to Saturday. The restructuring and rearrangement of the collections has been a rather protracted task and we look forward to being able to see them again. Indeed, as the speaker put it, it was the use of these instruments that led to great developments in scientific thought of the 16th and 17th centuries.

The main subject of the talk was the successful interpretation and attribution of an Italian renaissance artefact which came to light during the reassessment of the Museum's treasures. The speaker gave a description of his search for the identity of its maker and the clues which led him to the city of Florence, where he discovered the real person behind the signature - a highly respected Benedictine abbot called Miniato Pitti, at the time of Cosimo the First.

Between these two talks, as a complete contrast, David Young brought us down to earth with the rather challenging question: "How accurate is your sundial?". He gave a careful assessment of the different errors produced by mistakes in the design, siting and orientation of practical sundials. The reassuring conclusion seemed to be that on fairly small-scale instruments minor failings can be acceptable. But woe betide the maker of a large sculptural piece who does not keep a firm hand on the final stages of setting it up!

On Saturday afternoon the members were able to take full advantage of some glorious weather by making a tour of villages to the east of the city, where some remarkable examples of nineteenth century dialling are to be seen. Our guides were able to identify the makers of the dials that we saw and to comment on their contrasting lives. We were impressed when we heard of the invoice for £9.00 for the elegant dial supplied with a matching clock for Heslington



Fig.1 Dial by William Walton on the front of a cottage at Seaton Ross (photo: D. Bateman)



Fig.2 Members examining a horizontal dial in the churchyard at Osbaldwick (photo: R. Sylvester)

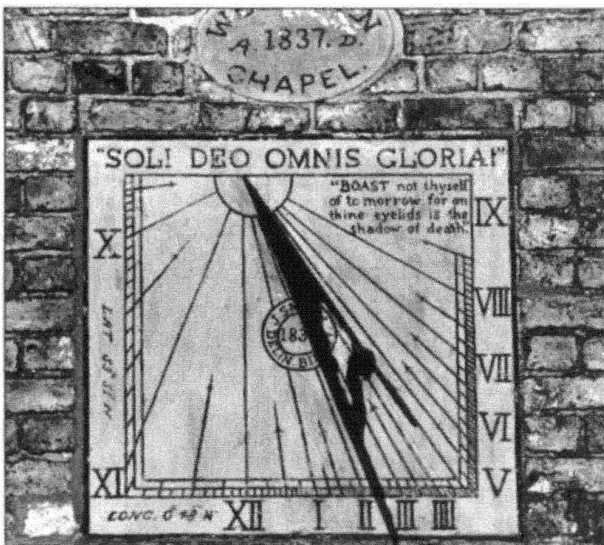


Fig.3 Dial by John Smith on Wesleyan Chapel, Bielby (photo: R. Sylvester)

Hall by Thomas Cook, the leading instrument-maker of his day. We were also rather envious of the cottager in Seaton Ross whose house frontage is a mere adjunct to William Watson's giant-sized vertical dial. At the little church where he was buried we were charmed by the blossom on the cherry trees and happily joined in an impromptu hymn around the organ which David Pawley was able to try out, with the approval of a most hospitable church warden. Another dial which especially caught our eyes is nicely

placed on the front of the former Wesleyan chapel at Bielby. Some of us were struck by an unusual pairing of mottoes on its face, stirring a memory of the handsome pedestal dial at Crantley Hall, Ripen, where we met in 1995. This was justified when we realised that they were both by the same hand, that of John Smith, who was a life-long collector of improving texts.

After a convivial conference dinner that evening we proceeded to the auction of a great variety of sundials and dialling literature, including a facsimile copy of Foster's Art of Dialling. Armed with the circulated catalogue and with a team of quietly efficient clerks and porters the Chairman dealt briskly with competing offers from the floor, and was able to announce a grand total of sales amounting to over £1000. (Incidentally, who did get the teapot?)

On the next and final day of the conference we enjoyed three more excellent presentations. Tony Belk got us thinking, with descriptions and pictures of two unorthodox artefacts which he had come across and thoroughly investigated. A wonderful motorised device erected in the station courtyard at Amersfoort: in the Netherlands is programmed to indicate the exact position of the Sun as it moves across the sky and simultaneously register the time on a digital clock. The design of the movement to allow for the daily and seasonal changes must have been pretty fiendish! The other device was a large-scale group of standing stones erected for the Millennium near Wantage. Each stone in turn presents a channel for the Sun's rays to be directed at a target at the centre of the group. This sounds most unusual and a visit to Ardington should be interesting.

Next, Piers Nicholson explained how he took up the challenge to design a Millennium Sundial for the City Guild of Tylers and Bricklayers and had his idea of a polar dial extending to east and west of the gnomon approved and erected at three key locations. Then he introduced Lt. Ccl. Ian Ogden R.E. who gave a splendid account of the whole undertaking for which he became the sole manager - from the selection of bricks and the appointment of skilled craftsmen to the final provision of a military band and the refreshments at the inauguration ceremony, which had to be staged, rain or fine, on a specified date. It could have all gone terribly wrong but of course it did not.

Our last talk was a lively account by Professor Jim Matthew of the University of York, of the career of Thomas Cooke, and of the contributions made to optical instrumentation by the famous firm (Cooke, Troughton and Simms) which he founded in York. This Yorkshire maker of

telescopes, microscopes and surveyors' equipment made possible many of the achievements in science and engineering spanning nearly two centuries

Finally, members took part in the Society's AGM and were given a chance to observe the enormous amount of time and expertise that goes into the day-by-day running of our affairs. One is very grateful to the officers for what they have achieved and for the ever-expanding service they are providing.

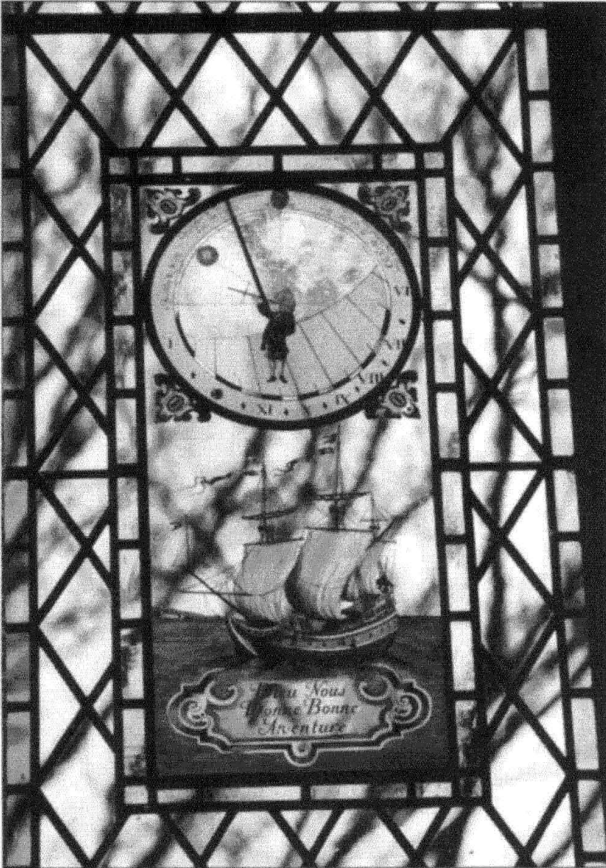


Fig.4 Painted glass dial designed by C. Daniel, Merchant Adventurers' Hall, York (photo: R. Sylvester)

Before the conference dispersed, there was a well-planned tour of the sundials in the city itself. Our guides, professional historians, were two of the City's official 'Yorkwalk' guides, Warwick Burton and Jonathan Tummons. They had been briefed about our interests, and they took us immediately to the most distant of the planned sundial places, from which we gradually walked back to our College. We first saw the handsome modern glass-window dial, designed by Christopher Daniel and inserted in 1998, in the Hall of the Merchant Adventurers. We lingered for some time in this beautiful and historic building. Next we saw a historic Henry Gyles glass dial in Grays Court: no gnomon, but with a pretty centre panel of cornflowers. In the Deanery, in Minster Yard, is a not-very-old armillary sphere; and there are 2 dials (one a Mass dial,) on the Minster itself. A polyhedral dial (one upside-

down gnomon!) stands on a pavement near the west end of the Minster. In the public Art Gallery there is another Henry Gyles glass dial, in good condition, though without the gnomon in place.

We went away after a most interesting and enjoyable weekend. Thank you to all the speakers for all they gave us, and especially to Doug Bateman and Richard Crossley, and to the College, for splendid organisation. Our only regret was for the shortness of our stay, which made it difficult to do justice to the fascinating display of exhibits brought by members.

A SUNDIAL'S VIEW OF ITS WORLD

I do love standing in this shining space
waiting patiently to be noticed,
hoping to be admired

Here comes a chubby child
who wants to climb my base,
peek at my face, tweak my nose.

That young couple strolling arm-in-arm
seem taken by my charms but can only
guess at my purpose; a clock will serve them better.

Oh look! Here comes a flock of scholarly eccentrics,
ready to measure my angle.
Odd, they all carry umbrellas and keep an eye
on the passing clouds.

One lady wants my photo, says she likes my style.
Her husband mentioned my famous maker's name.
They want to use my classic shape for future sculptures.

Nearby I spy a gentleman with a pen and paper
It looks as if he's making a picture of *me*.
He knows I am a prime example of my type.

Now I am working to best advantage,
telling natural time to those who understand me.
My daily work is most fulfilling, counting sunny hours.

*Mrs Jackie Holland
Wilmette, Illinois, USA*

MINUTES OF THE 12TH ANNUAL GENERAL MEETING OF THE BRITISH SUNDIAL SOCIETY HELD AT THE COLLEGE OF RIPON & YORK ST JOHN, YORK, 29 APRIL 2001

The meeting was opened by the Chairman, Christopher St J H Daniel, at 12.20pm. Approximately 90 members were present. Apologies were received from Julian Lush, Mr and Mrs McVean, Dr Jenkins and Michael Maltin.

The minutes of the 11th Annual General Meeting held at Cirencester on 2 April 2000 (which had been published in the Bulletin, October 2000, pp 121 - 123) were adopted and the archive copy signed by the Chairman. There were no matters arising.

SECRETARY'S REPORT

Individual Council Members do much of the work of the society, and their reports are given separately. The Secretary's main roles are liaison with the general public, organising the annual conferences, and supporting administration. However mention should be made of another excellent and successful one-day meeting at Newbury organised by our member David Pawley

Liaison. Since the last AGM I have dealt with 113 enquiries by letter and a small number by telephone. Some enquiries have come from freelance journalists researching on sundials, although many now go straight to the web sites. Reactions from the public range from amazement that there should be such a Society, support for our objectives, and gratitude for information received.

Conference 2001. York was the chosen venue and has proved very popular with a record attendance of 105, in spite of the limitations for the accommodation. The lack of en-suite rooms caused many members to choose local bed and breakfast for their overnight accommodation. Nevertheless, 61 are staying in the college. An extra feature is a walking tour of the centre of York to see several dials, and no less than three on stained glass. Unexpectedly, the opportunity for an auction arose, and the programme was adjusted to suit.

Conference 2002, 19-21 April. Council decided it was time to have a conference nearer to the West Country, and after reviewing several potential locations in terms of cost and suitability, the Crossmead Conference Centre in Exeter has been booked. The centre offers a mixture of double, en-suite and standard rooms, and we will be the sole occupants.

Conference 2003. A suggestion has been made that we make an effort for a more formal conference, possibly with speakers from overseas societies, to be held in, say Oxford. This is being met with some enthusiasm, and preliminary soundings are being made.

Constitution and Council meetings. The Society has been running very successfully for 12 years, but is has been considered prudent to review our constitution, and possibly, the formal make-up of the executive roles of Officers and Trustees. A good measure of agreement has been reached by a small sub-committee for changes to the Constitution. These have yet to be finalised before being put to Council and then (during 2001) for approval by the members. Perhaps the most difficult compromise, and nothing to do with constitutions, is the organising of meetings for widely scattered officers, their travelling time, and cost to the Society. Only two council meetings have been held, although much use is made of the telephone and e-mail in overall management of the Society.

Leaflets and lectures. I have chosen to include in my report reference to the up-dating of much of the material sent to the general public. These are in the A4 bi-fold format, and cover 'Designers, Consultants and Makers', 'Some useful books on sundials', 'Notes and Hints for Dial Recorders', and one in colour about the Society. These have arisen from original material by David Young, publishing work by Patrick Powers, and editorial inputs from Margaret Stanier, Christopher Daniel and myself.

Lectures given by members are an important element of passing on information about dials and the Society. This list is not exhaustive, but in the last year at least 20 lectures have been given by 6 members of Council. No doubt other members of the Society gave, and continue to give, this valuable service.

Discussion. There was some discussion about the standard of accommodation (student rooms without en-suite facilities). The Secretary replied by saying once the decision had been made some 18 months ago that York would be chosen centre, the Askham Bryan agricultural college, the University, the College of Ripon and York St John (York and the campus in Ripon) were all asked to submit quotations. The agricultural college could not satisfy

the dates, and the other three locations were visited. At a Council meeting in Cirencester, the current location was chosen owing to its cost and prime location close to York Minster (and convenient for a proposed walking tour), even though this went against wishes expressed at other AGMs to upgrade the accommodation. It was also pointed out that at Cirencester, where there was a choice of accommodation, a third selected the standard rooms. For this conference, just over 60% were in the college and many were satisfied. However, the concern was noted, and for 2002, the accommodation will offer a mixture of standard and en-suite. After this discussion, the report was adopted.

TREASURER'S REPORT.

The Treasurer reported that the accounts had been prepared to the standard required by the Charity Commissioners. The Treasurer said that it had been necessary to increase subscriptions to maintain our sound financial position and to fund the increase in numbers of bulletins published from three to four a year. The 5 year subscription scheme, which is now being phased out, makes direct year-on-year comparisons meaningless. In a discussion about Gift Aid, the Treasurer explained the importance to the Society, and answered some of the points of confusion. Regarding events such as conferences, these were costed so as not to make a loss. For the sales of publications, the Treasurer thanked Margery Lovatt for all her work, and the only reason for making an apparent loss is due to the sales of the heavily subsidised Register. For publications as a whole, the stock is valued at zero (until sold) as it does not affect cash flow. The Treasurer expressed his thanks for those who benefit the Society by donating lecture fees or similar expenses to the Society.

As regards expenses, the Bulletin was quite a high cost, and officers had quite high expenses. However, the Treasurer was anxious that officers do indeed claim fully to avoid the situation of a sense of false security if members were not aware of the true cost (excluding man hours) of running the Society. Also it is essential not to deter members on modest incomes from standing for office.

The award scheme had been more expensive than expected, but over 5 year intervals, such schemes are not too excessive. The future costs of the library should be about £100 p.a.

Accountants are no longer needed by the Charity Commissioners for a society of our turnover, which will give savings of about £400 a year. On the other hand the internet fees are high, but this area is a source of new members. A new expense is the premium for third party insurance.

In response to a question about the joint NASS subscription, the Treasurer said that previous treasurers had found it difficult to administer: however, he would try a 'favour' scheme (to be announced in the Bulletin) where he would take NASS subscriptions in pounds sterling up to a certain date, then write one Dollar transaction. There being no more comments or questions about the accounts, they were accepted by the meeting and signed.

A full statements of the BSS Accounts is appended to these Minutes.

REPORTS FROM OFFICERS OF THE COUNCIL

Advertising: John Churchill

The first advertisements to be carried by the Bulletin were published in the February 1998 issue. Since then every issue has carried some advertising.

Various forms were offered to prospective advertisers, namely basic display in size from full-page (A4) down to 1/8 page. This proved to be the most popular, followed by fliers in which the advertiser supplied a batch of 600 ready printed sheets for insertion in the Bulletin.

Small "ads" for publication in the Bulletin have attracted very little attention.

Perhaps the most important consideration is whether the service has generated a worthwhile benefit to the Society. The gross income for the full period February 1998 to the present was £1,424. The final net income after deducting costs of printing, promotion, and general office costs was approximately £570. ie. 40%.

Promotion has been conducted by postal circulars and reminders, followed by personal contact via the telephone. The latter is the most effective, but is the most time consuming. Is there someone who is prepared to take this on?

Sundial Makers' Biographies Project: Jill Wilson

I now have information on some 2049 makers, most of whom precede 1920/22 when sundials began to be thought of as just another ornament by most purchasers. The Biographical Index is still being compiled and will include known and probable makers plus a handful of others from the earliest times until c. 1920. Information on historic makers and their dials is still being collected and is welcomed. Any queries received are answered if possible - otherwise the named maker gets added into the records as previously unknown.

Reference Library: Graham Aldred

The BSS Reference Library is housed at Bromley House, Nottingham and is available for use. Currently there are over 240 books and leaflets on dialling or related topics. A further 100 books are catalogued and prepared for delivery. Some administrative revisions to structure of the catalogue have been agreed with the Librarian at Bromley House. Currently the books are not located in a very favourable position and have had to be distributed to different locations due to the variation of book size and the lack of adjustable shelving. Nevertheless BSS does have a Library that is available to members and one which contains dialling works that are not generally available. There are plans to relocate the books and house them altogether on more appropriate shelving. As this will require some structural changes to an existing room we must be patient. It is hoped to publish the catalogue in the near future and this may encourage more BSS Members to enjoy the Library and our books.

Restoration: Graham Aldred

As explained previously, the Society as a body does not carry out Restoration of Sundials. We do however give advice and encourage individual members to participate in the work in their own right. The year 2000 awakened an interest in Time Telling and often an old sundial became the focus for a commemoration. Many new sundials have been constructed and fortunately their instigators have frequently sought the technical advice of BSS members. There is a growing awareness of the Society in matters of sundial restoration and new construction and this recognition of expertise is encouraging. As to specific dials restored I am aware of three: a Pilkington and Gibbs Heho-Chronometer, a large Vertical declining Dial and a horizontal Melvin Dial. No doubt there are others in early stages that are not yet reported. The full statistics are never easy to achieve because of the protracted time scales of restoration.

Mass Dial Group: A.O.Wood

Progress has continued with preparation for a Register of Mass Dials. Checking reports and sorting into county order is continuing and is nearly complete. Reports are being received steadily, a fruitful source being the NADFAS Church Recorders who have been alerted to look out for mass dials. An important extension, of considerable interest historically and geographically, has been the receipt of several reports from both France and Germany. The provisional specification for the Register has been made but implementation has been delayed by Patrick Powers' commitment to the Fixed Dial Register, the upgrading of his computer and by delays in transferring records from Edward Martin.

Two or three requests for conservation advice have been received and answered; also we have noted some 'restorations' and made the Society's views known, that at Crewkerne church in Somerset being of some concern and generating considerable correspondence.

Saxon dials still pose a problem; currently they are double registered (sometimes). Since there are relatively few, perhaps a concerted effort should be made to get them all fully documented. An important event has been the publication by Bob Adams of the complete Mass Dials of Lincolnshire - illustrated in colour. This magnificent achievement will provide a signpost for the Register mentioned earlier; in particular, publication on a county basis, with additional text-only and CD versions is now probable.

Education: Jane Walker

Make a Sundial. In the period since the last A. G.M I have sold 72 copies of *Make a Sundial* and now have 12 books in stock. During this time I have answered queries from schools and others involved in sundial projects and have organised one school Sundial Day.

I had planned to have a new edition of *Make a Sundial* well on the way by this time. However, a major problem has been that the original book was compiled using *Pagemaker 3* and stored on floppy discs using *Apple Mac* technology which I can no longer access on my computer. I have received considerable help from members with superior technological skills. Peter Ransom kindly spent time attempting to open the discs on which the book was stored but the method proved very time consuming. Patrick Powers came up with a way of scanning the pages in a form which I can edit, and progress should now be made. I have had two further offers of help with editing but am still open to new ideas for the content of the book.

I should like to improve the appearance of the book by some use of colour but any system I have investigated will be considerably more expensive.

The book was compiled by a team of members half of whom were employed in education. It required a great deal of effort and enthusiasm and the project was successful mainly because we were familiar with what goes on in Schools. The original team is no longer operative and it is now ten years since I retired from teaching. I therefore feel it is time for someone else to take over as Education Officer and that such a person may well wish to start by writing a new book or by having a major input in the updating of *Make a Sundial*.

I will continue in the post until the 2002 A.G.M so that a new member may be found and will press on with the work of updating. If necessary, I will arrange for another short run re-print to satisfy demand until the new version is ready.

Newsletter. The job of Newsletter Editor is becoming less onerous as I am now compatible with most contributors and so am saved the task of typing their contributions. If there are no complaints I shall continue with the present format although I would like to have more contributions from the membership as well as the regular input from Council Members.

Sweatshirts. A local (to me) supplier has been found who will supply the same brand of sweatshirt at the same price as we have had before.

The BSS Website: Peter K Scott

It was my great privilege to be offered the post of BSS Webmaster in December of last year and to be allowed to take over the day-to-day management of the BSS web site. My predecessor, Ian Wootton, had already done a fantastic job in designing and setting up the site from scratch, and it was with some trepidation that I took over the responsibility knowing that the high standards of the Society would have to be maintained.

Not wanting to drastically change an already established and useful site, I initially introduced a number of minor improvements to the layout of the site in order to speed up the loading times and to assist with the general page navigation. I know from the comments that I have received by e-mail that many of the members have benefited from these changes.

In general I have left the main structure of the site unchanged (if it ain't broke don't mend it.) with only minor improvements being made to some of the individual sections. The already popular OE Dial of the Month - page has been expanded a little to include more detailed information on each dial featured, and more recently a OEMotto of the Month' feature has also been added. The excellent Sundial Glossary section has been made more prominent on the home page and is now featured as a virtual encyclopaedia' of sundials in an effort to stimulate interest for non-members.

Wherever possible I have tried to make Council members and officials more prominent throughout the site so that BSS members can understand the hard work that they carry out in their relevant fields. Each sub section of the site therefore has a brief text introduction by the relevant

Council member. Some Council members even have photographs in their own section to aid in the identification process and to make the site a more personal experience for the person browsing.

Although the site exists primarily to serve the members of the Society I have also added a number of educational items for non-members in an effort to nurture their interest in sundialling and hopefully convince them to join the Society.

A full on-line index of Bulletin articles is currently under construction, which will help BSS members to find important articles. This facility should be completed by the end of the Summer 2001 (Many thanks to Andrew James for his help with data entry on this). Other changes include, a full text search system for the site, Newsletter articles now on line with an archive system in place, dial recording forms on-line, and a full listing of BSS recommended books and publications.

It is my intention to further expand and improve the BSS website throughout the rest of the year and to maintain the high standards that have been set. I welcome comments and suggestions from members so that I can ensure that the site is kept up to date and in line with member expectations.

Editor: Margaret Stanier

Since the last AGM three issues of the Bulletin have appeared: June and October 2000 and March 2001 The March 2001 issue was 44 pages and, it is hoped, the first of a quarterly series. Members are sending articles and other material for the Bulletin in sufficient amount and variety, and the Editor is particularly pleased to receive writing or photographs from members who have not previously contributed.

Other material published by the Society this year has been a couple of folded leaflets, one on 'Dial Makers' and one on 'Useful Books on Sundials'. An informal Publications Committee is envisaging the possibility, in the coming year, of producing a few 'Sundial Trails' leaflets for some of the Trails already available on the Sundials on the Internet website.

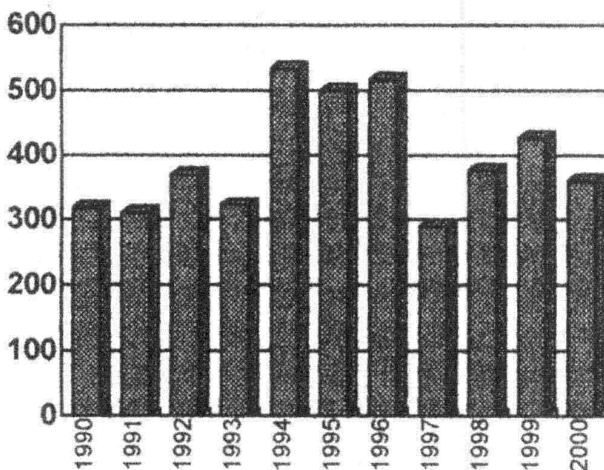
Membership: Robert B Sylvester

The main change since last year is a slight reduction in numbers (with last year's figures in brackets). The total is 637 (649) of which there are 609 (621) subscribing members. Of these, the global distribution is 445 in the United Kingdom, 69 in Europe, 72 in North America, and 23 across the rest of the world. Of the 28 non-subscribers,

these include our patron, president and recipients of complimentary Bulletins and copyright libraries. Many of the new members have come to us via the internet, but most important, word of mouth helps to recruit new members!

Fixed dial register: P.Powers

One of the most important events of 2000 has been the Success of the Third Edition of the Fixed Dial Register which went on sale at the 2000 Conference and quickly sold out. Since then a 25% reprint has sold out as well. A further reprint may be commissioned if enough interest is expressed at this year's conference.



As may be seen in the chart below the level of submission of dial sightings by recorders over the past few years is being maintained. Whilst appearing to have fallen slightly in comparison with 1999, the number of sightings in the most recent completed year always shows a decrease since at this time of year there are always records to be entered for dial sightings made by recorders in the previous year.

Last year I reported on the proposed millennium project being undertaken by the Northamptonshire WI to locate all the sundials in that county. This proved to be a great success and the Society has been presented with two large binders containing forms and photographs for 262 dials, many of which were unknown to us before. One lady also presented us with a record book of dials that had been offered for sale in the County in the early part of the last century. When entered, all these records will certainly enhance the above graph for the year 2000.

The Register currently has over 4100 dials recorded by nearly 5500 reports. There is an unusually large backlog of forms even setting aside the large influx from Northamptonshire. This level of interest is very gratifying but it does mean that the next edition of the printed Register will certainly extend to two volumes and consideration is being given to ways in which the Society might also be able to issue the Register via CDROM in PC

and Macintosh readable form. Trials are expected to be started soon.

In the past year the pages on the Society's web site that are devoted to the Register have been updated and extended and it is hoped to be able to continue this in the coming period.

In particular errors, omissions, duplications and other errata found by Members in the Third Edition of the printed Register are reported there.

Dial recording by our Membership has now been carried on for many years and although we have an impressive list of known dials in the British Isles we have also reached the point where nearly 950 dials have not been 'seen' by one of our recorders for over ten years! A printed listing of these rarely seen dials is available for perusal at the 2001 Conference and it would be appreciated if Members could send in reports for any that may be near them.

Finally can I say that the information in the Register is available to all Members not just those who do such a stalwart job of recording them? Please get in touch if I can be of assistance in answering any query you may have or if you wish to record a dial and have not done so before.

Exhibitions: David Young

At a recent Council meeting it was agreed that we should purchase a second hand exhibition 'tower' with display panels which can be dismantled for transport in a car boot. The panels will be adapted for our use and will be available for the major exhibition. However there will still be the need for help in staging the smaller; 'village fete' or 'town show' type of display. To meet this need I have devised a mini exhibition pack which can easily be sent to any destination by post at short notice. This latter will be on display at the York Conference.

Sundial Safaris. The proposed Wales tour in September this year has been booked by 35 members and detailed arrangements are going ahead for what we hope will be an interesting and successful program Some double rooms are *still* available in the hotel so there will be room for one or two couples if they apply straight away.

We now have enough members for the tour to Austria in 2002. The date has been fixed for the first week in June. I am sure that members of the Austrian Sundial Society will make us most welcome. There is limited room for further applications.

Internet: Piers Nicholson

Sundials on the Internet (Soti) continues to reach out to an ever-widening audience. Pages/month have gone up from 9,000 in mid 1997 to 24,000 in mid-I 998 and 37,000 in mid-2000. In 2001 they have increased from 41,000 at the start of the year to 51,000 now.

Pages connected specifically with the Society are running at 1,500 a month (with "Make a Sundial" accounting for about 550, and the index of Bulletin articles about 350). Full statistics about every page on the site are posted at www.sundials.co.uk/stats.htm

A major initiative in the last year has been the Sundial Trails competition, which got 5 entries, and has aroused a great deal of interest. Entries were from Malta, France (Finistere), and two from the UK. Judging was assisted by members of the Society and the clear winner was The Guernsey Sundial Trail by David and Dorothy le Conte. This is posted at www.sundials.co.uk/~guernsey.htm

Soti has been sponsored by The Society since its inception. The amount of financial support has been steadily reducing over the years. Soti publicises the existence of the British Sundial Society and its website to many more people than would be possible in any other way, and will continue to do this far into the future (since Soti will continue to recognise its debt to the Society for its support in 1996 and 1997 when the Internet was young. The Society continues to support Soti which furthers the educational mission of the

Society to promote public awareness of sundials, and which helps to recruit new members for the Society.

Since these reports had been received in advance, there were no questions. However, Mr Powers wished to point out that the Register, after one year, was no longer being offered at the subsidised price and members would now have to pay the full printing cost (although at no profit to the Society).

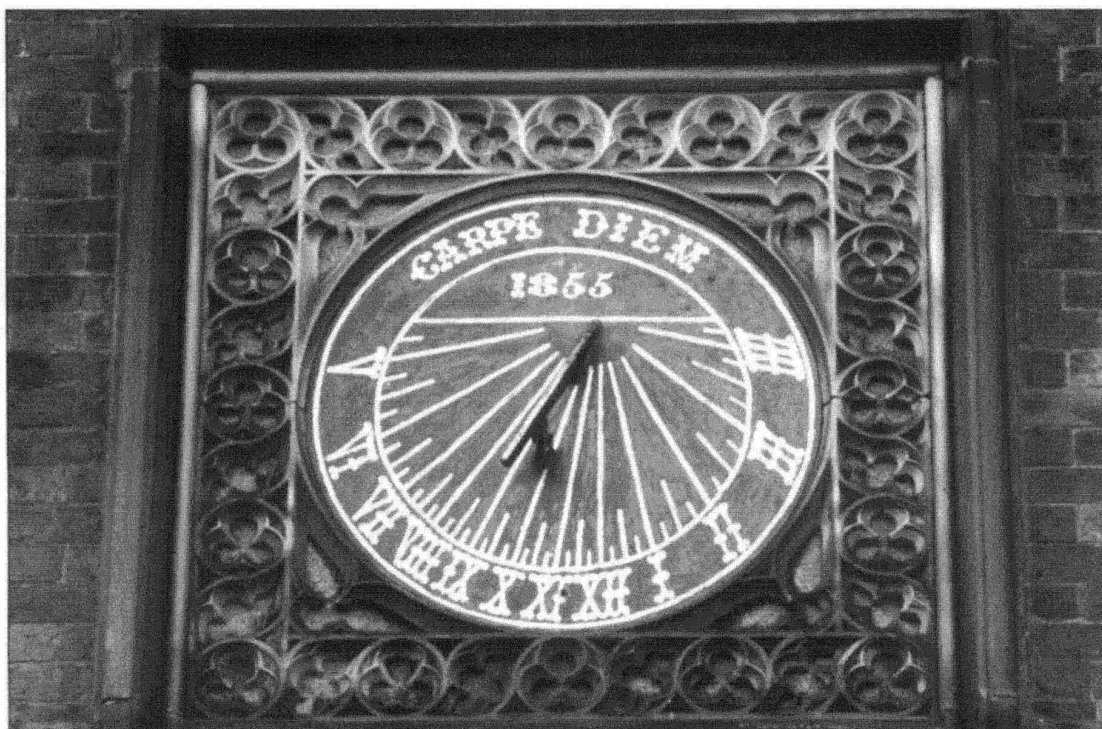
ELECTION OF OFFICERS

Nominations had been received, duly proposed and seconded, for all the posts except for advertising and archival records. All those nominated were elected en bloc, and are listed inside the rear cover of the Bulletin.

ANY OTHER BUSINESS

Mr Kenn wished to record that he considered that the lecture programme and the AGM had been well chaired, and complimented the Council members on their efficient and well organised running of the Society. Mrs Walker similarly wished to record the considerable efforts by Anne Somerville in maintaining archives and general support. The Treasurer pointed out that we need to elect a person for the formal checking of the accounts. Tony Ashmore was willing to continue with this task, and was duly elected. The meeting was closed at 1 pm.

D A Bateman, Honorary Secretary



Sundial in Heslington Hall, York (Photo: R. Sylvester)

BRITISH SUNDIAL SOCIETY

**ACCOUNTS FOR THE YEAR ENDED
31 DECEMBER 2000**

STATEMENT OF FUNDS (£)

Year ending 31 December	1999	2000
Current account balance	2,208.34	1,703.12
Deposit account balance	637.47	12.76
Charities Office Investment Fund	27,278.27	21,588.94
TOTALS	30,124.08	23,304.82

Reduction in funds during the year	6,819.26
Income received during the year	49,280.04
Expenses incurred during the year	56,099.30
Excess of expenditure over income in the year	6,819.26

Income	1999	2000	Expenses	1999	2000
Subscriptions	12,048.10	12,096.97	Bulletin	8,787.10	10,239.82
Covenants	781.78	720.00	Officers	2,980.67	3,582.07
<i>Sub-totals</i>	<i>12,829.88</i>	<i>12,816.97</i>		<i>11,767.77</i>	<i>13,821.89</i>
Events	17,464.00	29,815.90	Events	15,486.48	30,557.93
Sales:			Sales:		
Books, etc (ML)	734.70	3,423.25	Books, etc	334.87	5,500.30
Education (JW)	212.00	582.56	Education	162.67	291.19
Advertising (JC)	723.50	272.40	Advertising	68.60	69.90
Misc (DY)	251.00	126.50	Misc	0.00	0.00
<i>Sub-totals</i>	<i>1,921.20</i>	<i>4,404.71</i>		<i>566.14</i>	<i>5,861.39</i>
Awards	297.95	370.00	Awards	0.00	3,110.09
Donations	125.00	393.30	BH Lib	395.00	681.15
Auction	691.00	125.00	UKIC	31.00	31.00
Interest	1,481.21	1,325.96	Accountants	381.88	387.75
Misc	0.00	28.20	Misc	831.74	83.00
			Internet	417.50	608.63
			Insurance	0.00	183.75
			Somerville	120.00	0.00
			Dial Reg.	2,073.33	772.72
<i>Sub-totals</i>	<i>2,595.16</i>	<i>2,242.46</i>		<i>4,250.45</i>	<i>5,858.09</i>
TOTALS	34,810.24	49,280.04		32,070.84	56,099.30

STOCKS HELD AT YEAR END

Bulletins	2330
Sundials of Australia	4
Cornish Dials	10
Ancient Dials of Ireland	58
Fixed Dial Register	12
BSS Glossary	35
Cambridge Sundials	80
Postcards	4586
BSS Badges	89
Bookmarks	31
Society ties	11

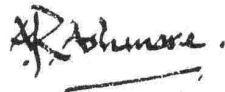
Notes to the accounts

1. The accounts are prepared on a payments and receipts basis. That is, money is booked when it is received or spent. This is in line with the Charity Commission's guidance.
2. The year-end funds are held in an approved investment account as well as a current account. They also include £4,794 which represents future subscriptions already paid by members paying under the five year scheme and £823.30 in the Andrew Somerville Memorial Fund.
3. These include the AGM, Scottish Tour, etc. Meetings and conferences are priced not to make a loss.
4. Stocks of ties, bulletins, etc are valued at nil as it is difficult to see that they would have any value in the event of the society being wound up. This does not impact our cash flow.

Treasurer: G. P. Stancey



Checked by: A. R. Ashmore



READERS' LETTERS

FINDING A NORTH-SOUTH LINE

In the June issue of the Bulletin, W.S.Maddux gives a clear account of two good methods of determining a N—S line for positioning a sundial. The only problem is that a light breeze can sometimes annoyingly disturb the plumbline at the critical moment. This is obviated by literally damping the bob by surrounding it with a jamjar and adding sufficient water to cover.

A.A.Mills
Astronomy Group
University of Leicester
Leicester, LE1 7RH

MORE DOUBLE HORIZONTAL SUNDIALS

In the June 2001 Bulletin of the BSS, Michael Lowne lists over 2 dozen examples of double horizontal dials. It gives me pleasure to inform readers that the collection of the Adler Planetarium & Astronomy Museum [A.P.& A.M.] in Chicago contains another 4 such instruments, which I list below in the manner of the article.

Charles Bloud (fl.1653-1680):
Undated
Ivory diptych form
(A.P.& A.M. Chicago, DPW-19)

Jonathan Gill (fl.1707-1716):
1716

Octagonal copper plate, 20.8cm across, with brass gnomon,
for latitude 54° 00'

(A.P.& A.M. Chicago, W-96)

Thomas Tuttle (fl.1693-1702)

Undated

Brass

(A.P.& A.M. Chicago, W-48)

Elias Allen (fl. 1606-1654)

Undated

Bras, 35.5 cm diameter

(A.P.& A.M. Chicago, A-379)

Marvin Bolt Ph.D.

Associate Curator, History of Astronomy Dept.

Adler Planetarium and Astronomy Museum

1300 South Lake Shore Drive

Chicago, Ill. 60605, USA

NOCTURNALS

The article 'A Stardial' by Sven Larsson in the Bulletin vol.13(ii) June 2001, describes an instrument which may be used as a nocturnal. The study of nocturnal instruments complements that of sundials and forms an extension to the aims of the Society. A brief description with illustration is given in the book 'Mapping Time' by Dr. E.G.Richards which is mentioned by C.D.Lack in his letter in the same issue of the Bulletin. Another reference is 'Antique Scientific Instruments' by Gerard L'E.Turner, (Blandford Press, 1980)

George Duckworth

76 Livesey Street

Rishton, Blackburn,

Lancs, BB1 4DY

BOOK REVIEW

The Universe Unveiled. Instruments and Images through History, by B. Stephenson, M. Bolt & A.F. Freeman (Cambridge University Press), 2000. Pp. 152, 23.5 x 23.5 cm. Price £19.19 (hardbound; ISBN 0 521 79143 X).

The pictures are beautiful, the colour is stunning, the production quality is impressive, and each page of this delightful book reveals yet another group of historical astronomical instruments, book plates, and sky maps that I would love to have adorning my home and office. But it is not to be. They are of 'museum quality', and far beyond the pocket of a mere toiler at the chalk face of UK tertiary astronomy education.

The Universe Unveiled. Instruments and Images through History is built around 270 images of artifacts, maps, and book illustrations in the collection of the Adler Planetarium and Astronomy Museum in Chicago, USA. The brief accompanying text is written by three curatorial members of the museum staff.

The book clearly has two readerships. The first consists of the awe-inspired visitors to the museum, who want a lavishly illustrated memento of their trip and a reminder of the wonders that can be enjoyed again on their next visit. The second readership consists of members of the general

public and the worldwide community of amateur and student astronomers who are looking for a colourful and succinct introduction to the influence of small-instrument design on the progress of both didactic and experimental post-Copernican astronomy, coupled with interesting and frequent excursions into the splendours of the iconography or relevant texts and cartography.

To this end, the authors have not produced a dry catalogue, replete with instrumental dimensions, materials of construction, makers' names, places of manufacture, and modes of operation. Instead the book's nocturnals astrolabes, globes, armillary spheres, star charts, book plates, sextants, backstaffs, orreries, sundials, surveying instruments, clocks, planetaria, and telescopes skilfully illustrate the story of how mankind came to understand the positions and movements of the diverse objects that occupy the heavens above. In *The Universe Unveiled* the reader is transported back to the days of splendour and astronomical triumphs. Time and time again the sheer beauty of these 13th to 19th century artifacts makes you despair of the mundane nature of the objects we surround ourselves with today.

I enjoyed the book greatly and recommend it strongly. But I cannot make my mind up whether the omission of titles against each illustration is a good thing, because it helps the flow of the text, or, by forcing the reader to turn to a six

page complete listing at the back of the book, is annoyingly irritating. Personally I would also have liked more details about the objects and plates that are shown.

Reprinted by permission from 'The Observatory' vol. 121, June 2001

David W. Hughes

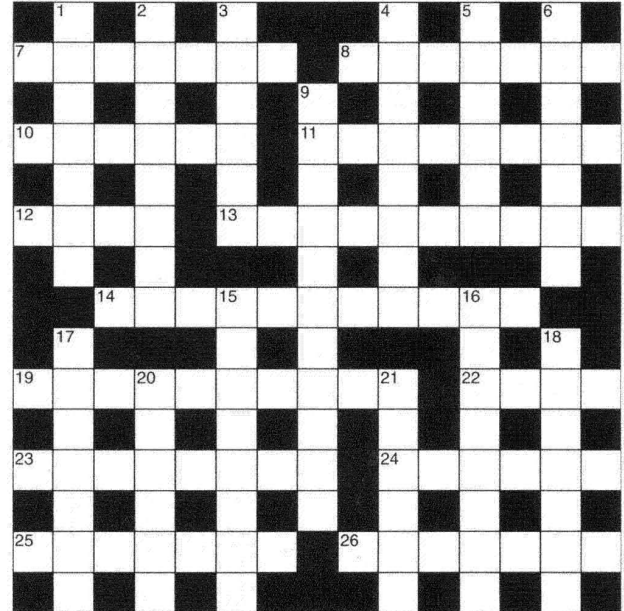
CROSSWORD

ACROSS

- 7 I defy an organisation to deliver good dialling weather (4,3)
- 8 Tiller girl could take this to head for the sun (3,4)
- 10 Artefact goes with a sundial, takes two days to make (6)
- 11 Midday indicator (4,4)
- 12 Power initiating auto corrected digital clock (2-2)
- 13 A cut of beef; an aspect of the Mirror but not of the Sun! (10)
- 14 Bad share day, looks bad for dialling too (5,6)
- 19 The sun goes round the other way in this country (3,7)
- 22 Twelve (o'clock) in Scotland (4)
- 23 Equal to the sun's diameter! (3,5)
- 24 Body seen in the distance takes a turn around the sun (6)
- 25 A month when sun-time is fast (7)
- 26 Direction of travel, as shown by sun compass perhaps (7)

DOWN

- 1 A folding dial (7)
- 2 Sundial on a wall (8)
- 3 Where BSS badges are found (6)
- 4 Vast area to navigate, so note each clue (3,5)
- 5 Famous clock maker --- Tompion (6)
- 6 A fair old state for the sun to be found in (7)
- 9 Elliptical dial, often with a human gnomon (11)
- 15 Ship's supplier of canvas, rope and possibly sextants (8)
- 16 Type of sundial used by shepherds (8)
- 17 Kick around always following the sun, in the Lake District (7)
- 18 Dials in France (7)
- 20 Gem for a ring dial perhaps, made from zinc or what? (6)
- 21 Aerial components which can double as sundials (6)



J. R. Singleton,
Newbury, Berks

CROSSWORD SOLUTION

ACROSS
 7 Fine day, 8 The helm, 10 Statue, 11 Noon mark, 12 AC-DC, 13 Silver-side, 14 Black Monday, 19 New Zealand, 22 T'wai, 23 Two radii, 24 Saturn, 25 October, 26 Heading.
 DOWN
 1 Dipych, 2 Vertical, 3 Lapels, 4 The ocean, 5 Thomas, 6 Florida, 9 Analematic, 15 Chandler, 16 Altitude, 17 Keswick, 18 Cadrams, 20 Zircon, 21 Dishes.

THE EYE OF TIME

AN ANALEMMATIC NOON MARK

This sculpture, in a modern idiom, also serves an ancient and practical purpose. It acts as a 'noon mark', an early form of sundial that registers both an important time of day - the instant of noon - and the time of year. All cultures have needed to keep track of both cycles of time, for agriculture on the one hand and daily life on the other. Even into the 19th century people would observe a noon mark to check on their unreliable clocks and watches.

Nowadays we use a fictitious 'mean sun' crossing the Greenwich meridian to define civil time. The elliptical nature of the Earth's orbit, and other factors, then cause the real sun to appear to vary back and forth about its average position. This variation, plotted against the changing apparent height of the noon sun as the year progresses, gives a figure-of-eight shaped endless curve known as an 'analemma'.

When the spot of sunlight thrown by the aperture falls on the incised analemma it is noon - or 1 pm British Summer Time. The position around the loop is an indication of the date.

Very few noon marks now exist, and they are confined to vertical or horizontal planes. This is believed to be the first three-dimensional design.

A.A.Mills



*An analemmatic noon mark on a curved receiving surface.
2 metres high, in Portland stone*

*Designed by Allan Mills (copyright reserved)
Sculpted by Fairhaven of Anglesey Abbey Ltd
Commissioned by, and exhibited at, the Garden of Art,
Delvys, Gestingthorpe, Essex.
Ref: Bull. BSS 199 11 (ii) 62-69*

THE GATTY FAMILY - PART 3

*'Serene he stands amid the flowers
For him dull days do not exist* *And only counts life's sunny hours.
The brazen faced optimist.'*

Motto carved on a stone now inside Bradfield Church, near Sheffield.

MIKE COWHAM

THE TALENTED GATTYS

The first two parts of this series outlined the life of Mrs. Gatty with details of her books and in particular her Book of Sun-dials. In this third part I am giving brief details of the lives of some her children. Several of these have shown the same flair for writing as she did.

The article concludes with notes about other authors who were influenced by 'The Book of Sun-Dials'.

JULIANA HORATIA EWING (1841-1885)

The Gattys most famous child was Juliana Horatia. She was to become an eminent childrens book writer. From her early days in the Gatty nursery she had shown a talent for story telling. She had always been a sickly child, and was the ideal candidate for her mother Margaret's interest in homeopathic medicines. Her first story was published in 'The Monthly Packet' in 1861. Her most famous story, Jackanapes, traces the life from birth to death of a soldier.

On 1 June 1867, aged 26, she married a soldier, Captain Alexander Ewing A.P.D., who had been born in Aberdeen in 1830. He was immediately posted to Frederickton, New Brunswick in Canada where the couple spent the next two years. During this time Julie continued to write stories, particularly for 'Aunt Judy's Magazine', edited at that time by Margaret Gatty. Her letters to friends were full of her new experiences in Canada. When they returned, Alexander (Rex) was posted to Aldershot. Rex was a talented musician, and is mainly remembered today for writing the tune for the hymn 'Jerusalem the Golden'. Julie's health eventually deteriorated and she was unable to follow Rex to his later military postings in Malta and Ceylon. In 1883 they retired to Trull near Taunton. Julie died of cancer, whilst visiting Bath, on the eve of Ascension Day (May 13) 1885 and was buried at Trull two days later. Her grave lies close to the stocks beneath a yew tree. Her books continued to be published in new editions, illustrated by several important artists. Many have a Preface written by Horatia, her sister, often giving valuable insights into their earlier family lives. A memorial window to Juliana is in Ecclesfield church.

REGINALD ALFRED GATTY (b1844)

Reginald was the eldest surviving son. He was to become

Rev. Reginald Gatty being given the living at Bradfield, also in the Parish of Ecclesfield, by his father Alfred. He was particularly interested in local archaeology, writing several articles about it. He contributed a chapter to his father's book, 'A Life at One Living', and wrote a 'Guide to Ecclesfield Church and Priory'.

HORATIA KATHERINE FRANCES EDEN (1846-1945)

Details of her life as co-author of the later editions of 'The Book of Sun-Dials', and her life as a headmistress have already been given'.

SIR ALFRED SCOTT SCOTT-GATTY (b1847)

Alfred was their second surviving son. He was also a talented musician and, in his younger days, wrote music for publication in 'Aunt Judy's Magazine'. He later set many poems to music and published them through Boosey & Co. He studied Genealogy and Heraldry at the College of Arms in London. In 1892 he took the additional surname Scott in memory of his grandfather, Nelson's chaplain, Alexander John Scott. He was knighted in 1906 and became Garter King of Arms. Note that occasional writers refer to Margaret Gatty as 'Margaret Scott Gatty'. The addition of Scott to her name is completely erroneous.

CHARLES TINDALL GATTY (b1851)

He became curator of the Museum in Liverpool and has written several books on historical subjects.

WORKS INSPIRED BY THE BOOK OF SUN-DIALS

Margaret Gatty's book became well known, and is referred to by many later authors. She was one of the first to take up the subject of sundials, and although several others have written further books on the subject, none have really achieved the fame that she did. Some of these books by other authors are shown in Fig. 1.

A Book of Old Sundials & their Mottoes

This book illustrated by Warrington Hogg was first published in 1914. Its text is by Launcelot Cross and a further eight full colour illustrations are by Alfred Rawlings. The drawings that Hogg did for the book are bold and distinctive, mostly being dated around 1892.

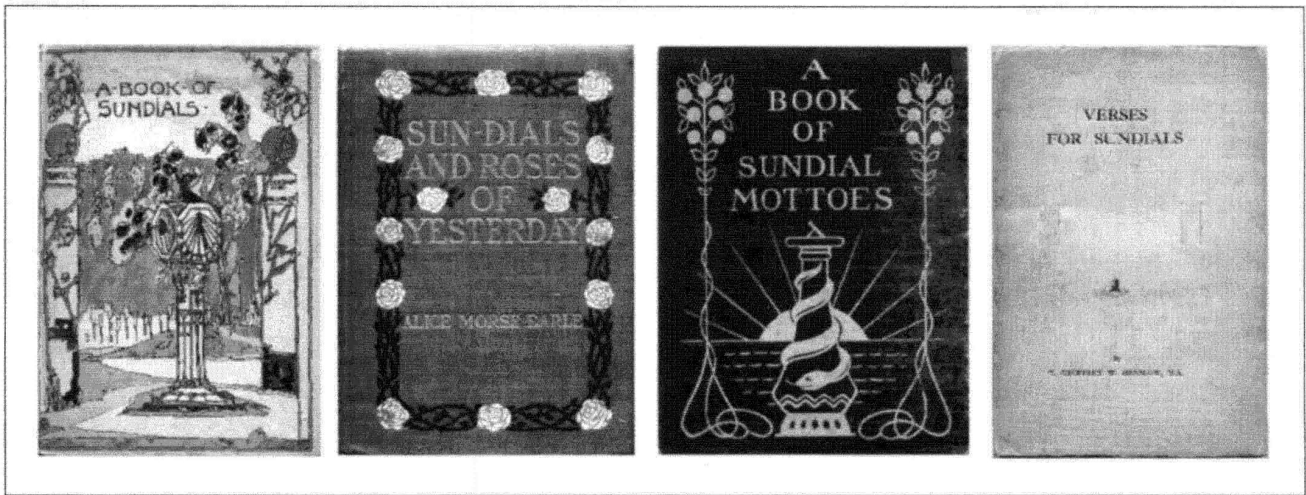


Fig.1. Some other Books inspired by The Book of Sun-Dials.

Eden & Lloyd in the Gatty Fourth Edition used several of these drawings. The book is particularly attractive with its Art Deco cover.

Sun-dials and Roses of Yesterday

Alice Morse Earl, of Brooklyn, New York, published her book in 1902. Like the Book of Sun-Dials it too contains a section on mottoes. In addition there are some photographs and drawings of various types of dial, usually placed in ornamental garden settings. There is a chapter on Portable Dials. Its many fine pictures are taken from the collection of Lewis Evans. Alice Morse Earl writes, "*Readers of this book owe to Mr. Evans a debt of cordial thanks; for through his generosity I am enabled to make this chapter the most fully illustrated chapter on portable dials ever printed in English, or I believe in any language; and illustrated, too, with the rarest and most beautiful examples of their kind.*"

A Book of Sundial Mottoes

Alfred H. Hyatt compiled these mottoes in a little book, devoid of illustrations apart from its cover. It has a four page introduction by A.M., (presumably Alice Morse), and at the back a section 'In Praise of Sundials', with sundial quotations from a few well known authors. From the Essays of Elia by Charles Lamb he quotes: "*What a dead thing is a clock, with its ponderous embowelments of lead and brass, its pert or solemn dullness of communication, compared with the simple altar-like structure and silent heart-language of the old dial!*"

Ye Sundial Booke

Written by T. Geoffrey W. Henslow, M.A., Fig. 2., and published in 1914, with a later edition in 1922. It is a collection of his verse to go with sundial drawings by Miss D. Hartley. Thomas Geoffrey W Henslow was born at the rectory of Zeals St Martin in Wiltshire, the son of the rector². His book has 366 drawings, apparently one for



Fig.2. Photograph of T. G. W. Henslow taken from Ye Sundial Booke.

each day of the year; the 366th entitled 'Original Sketch for a Leap Year Dial'. It is a rather odd work consisting mostly of one dial sketch per page and followed by a short verse. He ends his book by adding 14 pages of two line mottoes, such as: -

*"A circle, a gnomon, a shadow, a look,
Are worth more to men than the leaves of a book."*

*"Keep working,
No shirking."*

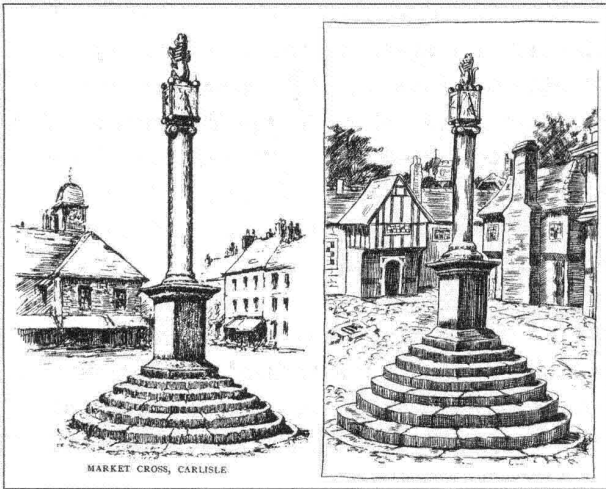


Fig.3. Dial at Carlisle as illustrated in Eden & Lloyd and Henslow.

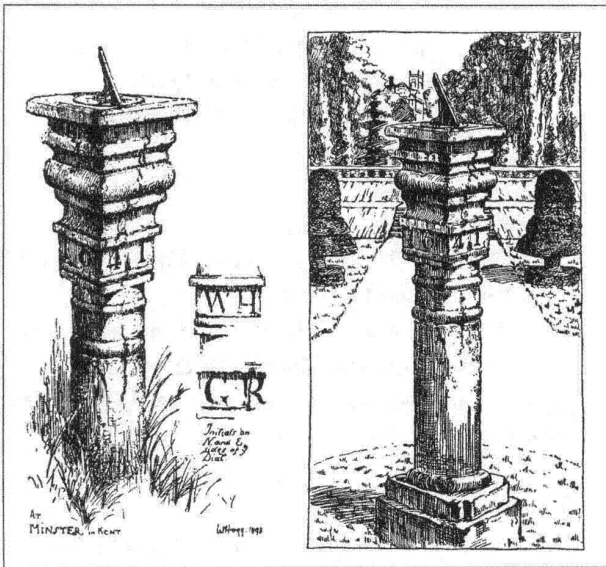


Fig.4. Dial at Minster in Kent, as illustrated in Warrington Hogg and Henslow.

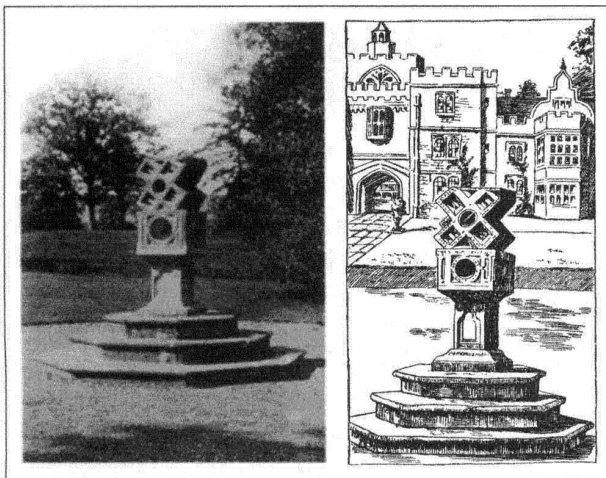


Fig.5. Dial at Moccas Court, Herefordshire as illustrated by Eden & Lloyd and Henslow.

Of particular interest in this book are the drawings, done by Miss Hartley. She has worked from illustrations in other

books such as 'Eden & Lloyd' and 'Warrington Hogg' reproducing almost perfect copies of their sketches, but adding a completely false background. Therefore many of the famous dials that we know are shown in totally inappropriate locations. I have been lucky enough to find an album containing almost 100 of the original pen and ink drawings done by Miss Hartley for this book. The drawings all appear in the book, with the exception of two. For comparison purposes, I have illustrated some of these drawings against the originals from which they were taken: (Figs. 3, 4 & 5.) Some of these pictures were compared in an earlier BSS Bulletin.³

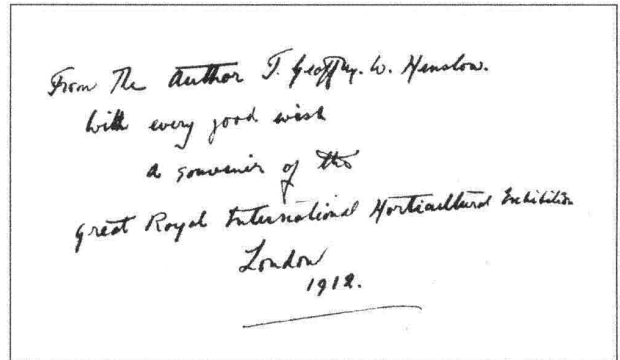


Fig.6. Signature of T. G. W. Henslow from a copy of his 'Verses for Sundials'.

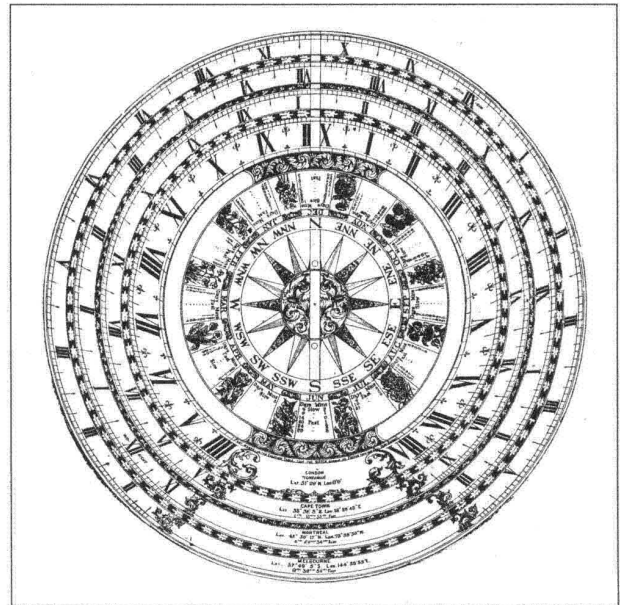


Fig.7. The drawing of a garden dial by Francis Barker & Son of Clerkenwell with compass rose, equation of time and alternative hour scales for London, Cape Town, Montreal and Melbourne.

Prior to Henslow's 'Ye Sundial Booke' of 1914, he had published a shorter soft cover version with the title 'Verses for Sundials - Part 1'. It may have been issued in 2 or 3 parts but I have seen only Part 1. My copy is signed by the author as a 'souvenir of the Great Royal International Horticultural Exhibition': (Fig. 6.) Its covers have slots

where a decorative ribbon would have been inserted. Its illustrations and verses are the same as in the later 1914 book, but what is more important is that it contains only those drawings that I obtained in the album mentioned above and in the same order. It includes the two drawings that were not used in the later book. One of these shows a sundial plate of a garden dial from Francis Barker & Son, Clerkenwell. (Fig. 7.)

Henslow's talents as a poet leave much to be desired and verses like this are to be found beneath each picture: -

*"Whilst the sun smiles
You can't beat sundials,
For your watch it may stop,
Or, still worse, be in pop."
T.G.W.H.*

POSTSCRIPT

In writing this series of articles about the Gatty family my researches have taken me across much of the United Kingdom. At almost every turn I have found more information. In the course of my research I have found two others with a keen interest in the family, particularly their literary talents. I have also made contact with the Gatty 'family historian' who remembers Horatia and her husband when they lived in London.

Margaret Gatty clearly stated that she did not want anyone to write her biography. This request was partly respected by her family, but many snippets of her life will be found in their books and in 'Aunt Judy's Magazine'. In 1949, Margaret Gatty's granddaughter, Christabel Maxwell, published her book 'Mrs Gatty and Mrs Ewing' which gives

a valuable insight into the lives of both mother and her daughter, much of this information coming from family records. I have drawn much information from this book but have also sought out much original information from Church Records, Public Record Offices, Street Directories, Newspapers, Letters and the 1881 Census. There was also much information that I gained from church monuments, buildings and gravestones.

The quest for this information has been long and protracted, and still there is much to be found. There are pieces of information that seem to come to a dead end, but one day the next link may be found. In particular Eleanor Lloyd, often referred to as 'our good friend' in Gatty family books has proved most difficult to track. I have found her living with her mother and sisters in Killinghall near Harrogate following the death of her father. When her mother died in 1881 the girls apparently moved on. This link is most important, for at this time Eleanor was collaborating with Horatia Gatty (Eden) in later editions of 'The Book of Sundials'.

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ILLUSTRATIONS

Books by Warrington Hogg, Alice Morse Earl, Alfred Hyatt and Geoffrey Henslow.

TUDOR DIALS IN IPSWICH

JOHN DAVIS

INTRODUCTION

When the Ipswich quayside was redeveloped in the 1920s and several Tudor warehouses and other buildings were demolished, the Ipswich Museum was given the opportunity to recover much of the fine carved wooden posts, arches and other fittings which they contained. These items reflect Ipswich's often forgotten wealth and boat-building prowess at that period. Amongst them was a diptych pair of vertical declining dials which were built into a dormer structure of a building known as Smart's Wharf, facing into a courtyard and approximately south-facing. A painting of this courtyard and the dials had been made a couple of decades earlier by William Corder, an Ipswich architect and amateur painter; a reproduction of the

painting is shown in Figure 1 and the original is held by the Ipswich Museum. When the dials were removed, an amazing discovery was made - the visible dials covered, and were supported by, an earlier pair of dials. These earlier dials, which had been remarkably well protected by the later ones, are now on display in the Museum, and the later ones are held in store. Corder also painted the dials in more detail (Figure 2a) and it has been possible to use this painting to reconstruct the appearance of the original dials (Figure 2b). The style of carved wooden head which appears on the dormer structure below the dials, and of other carvings from the archway which the Museum possesses, has been put at around 1600 which, together with the fact that the dormer is part of the roof and was probably

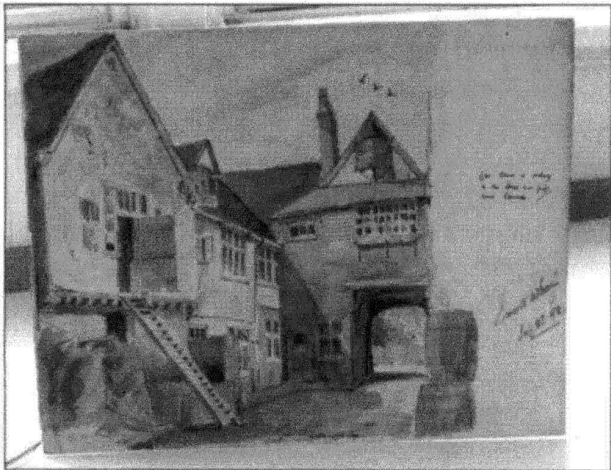


Fig.1 William Corder's 1898 painting of the inner courtyard of Smart's Wharf, looking north from the River Orwell. The original is held by Ipswich Museum.

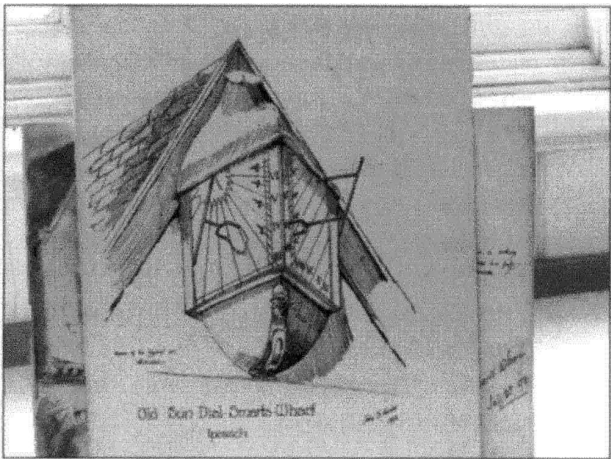


Fig.2 (a) The replacement dials as drawn by William Corder in 1898.

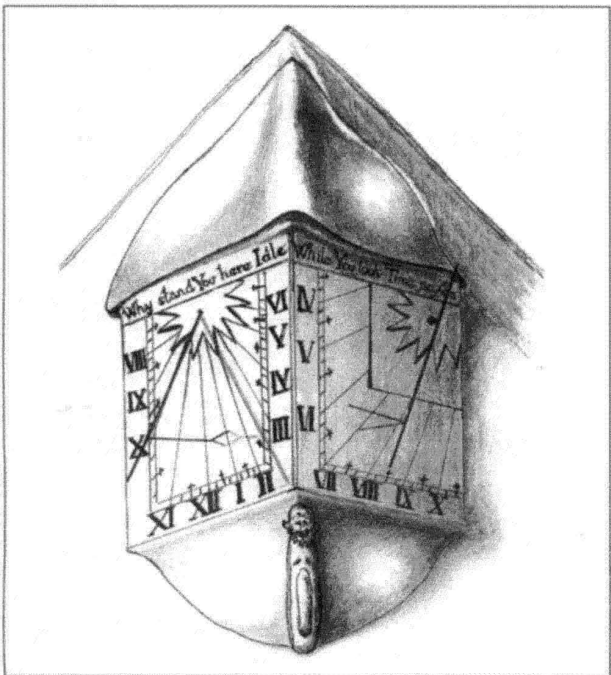


Fig.2 (b) A modern drawing by Pamela Cooke, reconstructing the likely appearance of the original dials.

erected to support the dials, strongly suggests that the dials are contemporary with the building.

THE DIALS

Both sets of dials (which will be referred to as "original" and "replacement" in this paper) are made from wooden (probably oak) panels approximately 1180 x 850 mm in size and around 40 mm thick. Each board comprises three planks. The boards have been carefully mitred where they meet each other and the wall and, except for the physical

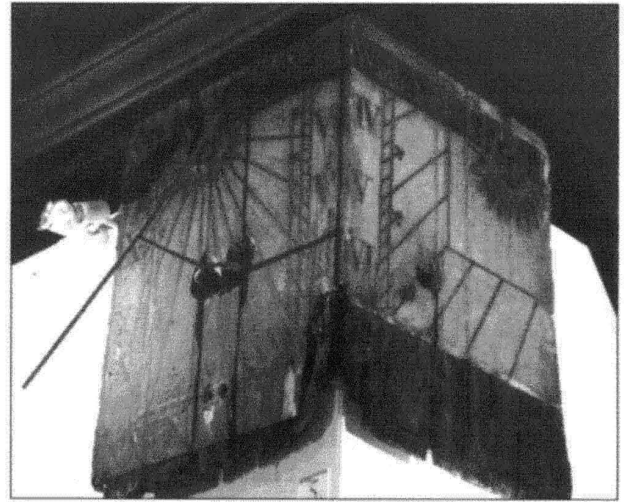


Fig.3 (a) Photograph of the original dials, now in Ipswich Museum.

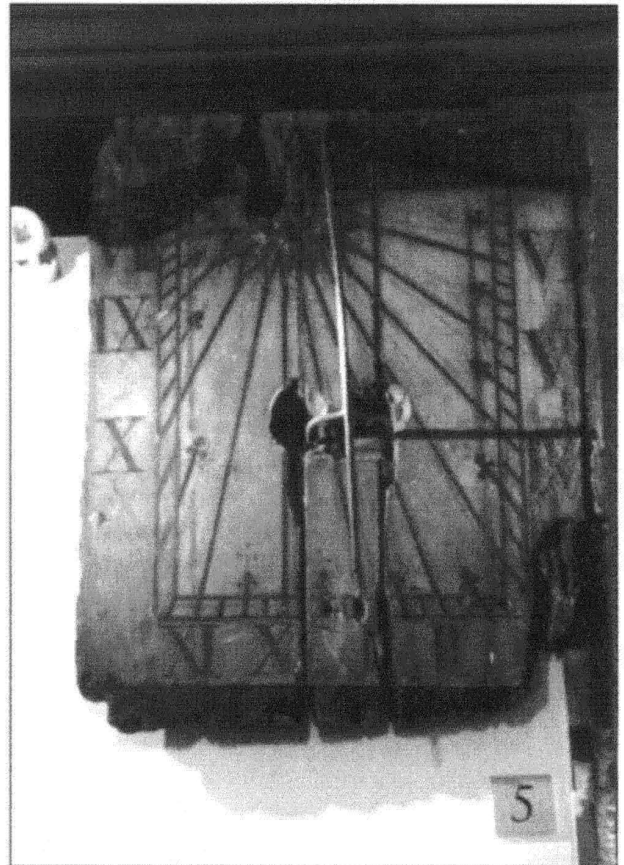


Fig.3 (b) Photograph of the original dials, now in Ipswich Museum.

damage caused by the gnomon fixings, are in remarkably sound condition despite some splits. The original dials (Figure 3) still show most of their original paintwork, with black lines on a slightly pink background, this being a traditional Suffolk house colour. The Sun emblem, and the motto, are gilded. The motto, running across the top of the two dials, reads

Why stand You here Idle While you look Time pa[re]s

This is a good example of the "Protestant work ethic", and is a reminder that Ipswich was staunchly Puritan at that time. Another form of this motto, in the common vernacular, is the famous "Go about your Business" at nearby Clare, and it contrasts well with the contemporary Latin mottoes found on many Catholic churches. The style of the lettering used for the motto clearly indicates the early date of the dials.

The original dials are scarred by approximately circular gashes which were clearly made to provide space for the gnomon fixings of the replacement dials. They also show evidence (Figure 4) of at least one repainting, and it is clear that the delineation was gradually lost with this process. This gives an indication that the later ones were made in order to recover the timekeeping accuracy. The loss of paint along the bottom third of the SE dial is unexplained as it was fully covered by the replacement dial and the area of loss is sharply defined.

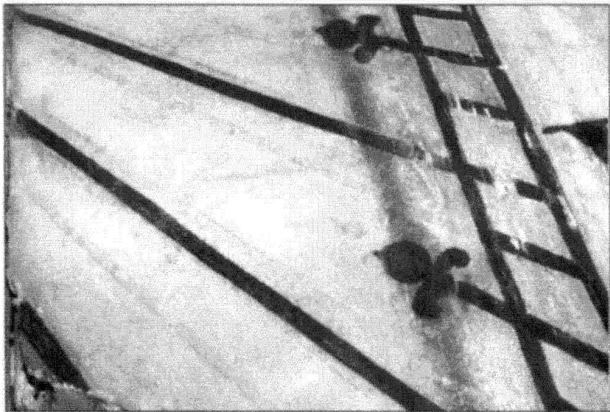


Fig.4 Close-up photograph of the original SW dial, showing evidence of repainting.

The replacement dials (Figure 5) have now lost the majority of their paint-work, indicating that they were probably exposed to the elements for a much longer period than the original ones. This suggests that they were probably installed in the mid-1700s, when the accuracy of dials was of most significance. It is clear that their maker was taking no chances of the delineation being lost this time, as the hour lines have been left raised by carefully cutting back the whole of the field region by around 2 mm, again showing the woodworking competence available. The

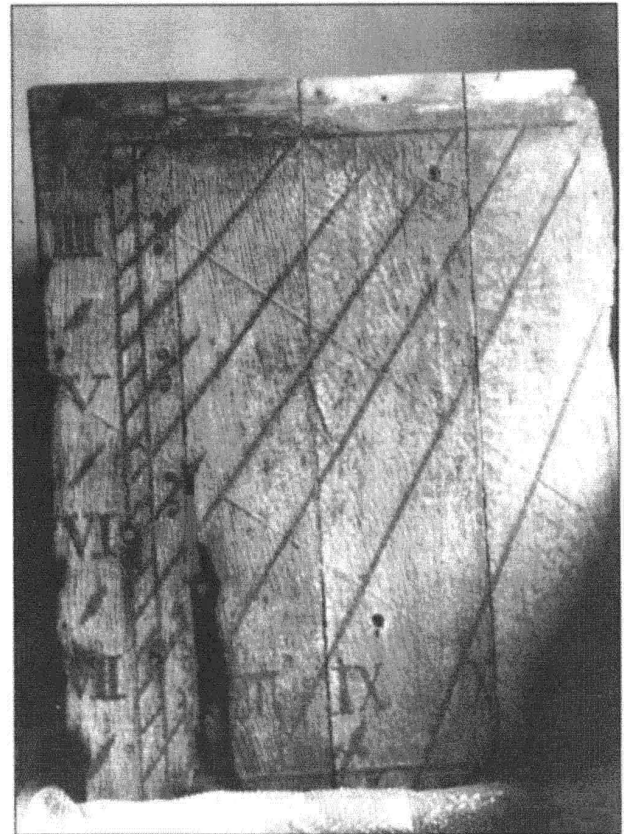


Fig.5 (a) Photograph of the replacement dial in a Christchurch Mansion (Ipswich Museum) storeroom.

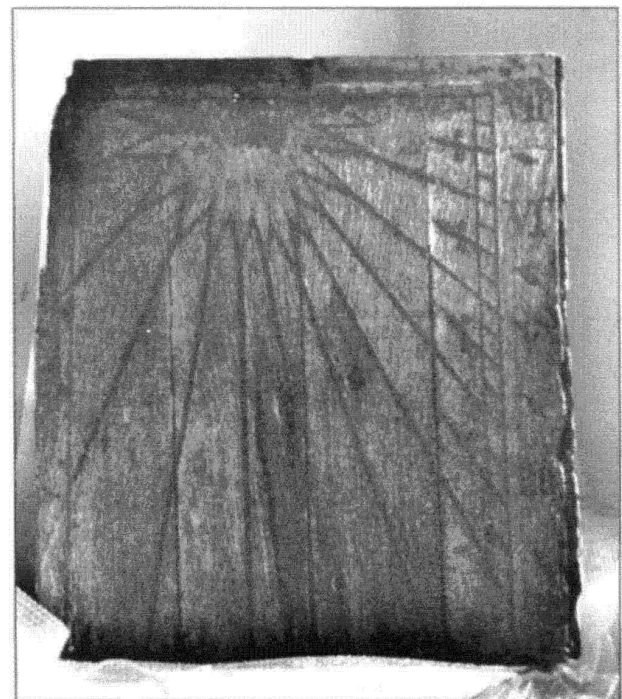


Fig.5 (b) Photograph of the replacement dial in a Christchurch Mansion (Ipswich Museum) storeroom.

dials are plainer than the originals, with only a simple stylised sun motif and no motto. The main differences between the two sets of dials are listed in Figure 6. It is interesting to note that although the original dials used the

"IV" form of the Roman numeral, the replacement ones used "IIII". This is contrary to the often-held view that the IV was a later introduction. Three faint diagonal lines, running top left to bottom right, can be seen on the south-east face. These are painted only and not in relief, and were initially thought to be declination lines. However, their spacing does not support this hypothesis and they do not appear in Corder's painting, so it is thought that they were merely construction lines to assist in the laying out of the hour lines. The iron gnomons of the replacement dials, as painted by Corder, are still held by the Museum although the one for the south-west face has been temporarily (mis) placed on the original dials and can be seen in Figure 3.

Original	Replacement
motto	no motto
IVIII	
Painted lines	Raised (carved) lines
Gilded Sun (both faces)	Stylised Sun (SW face)
Half hours:	
Three dots (early)	Fleur-de-lis
Fleur-de-lis (later)	
Inaccurate (later repaints)	Accurate

Fig.6 A table showing a stylistic comparison between original and replacement dials

Careful measurements have been made of the angles of all the hour lines on all four faces. Since the latitude for

Ipswich is accurately known ($52^{\circ} 4' N$), this allows a regression analysis to be performed to recover the design declination for each face. It also allows the accuracy of the delineation to be observed. These results are shown in Figure 6, where the error in the angles of the hour lines (i.e. measured - calculated) is shown for each of the hour lines, and for the optimum declination. It can be seen that the declinations are $18^{\circ} \pm 0.25^{\circ}$ for the south-west faces, and $-72^{\circ} \pm 0.25^{\circ}$ for the south-east faces. The fact that these declinations produce an included angle of 90° confirms the accuracy of the original calculations, and the validity of the method. The wall on which the dials were fixed would thus face -27° (east of south), which is in approximate agreement with early maps of Ipswich which show the layout of the principal buildings. It is also clear that the replacement dials are far more accurate than the original ones, at least in the state of their final repaint. Measurements have also been made of the gnomon from the replacement SE dial. It consists mainly of an iron rod approximately 12mm in diameter, but slightly smaller at each end. Its height above the dial face is 362mm at the top support and 510mm at the lower one, giving a style height (or angle) of 10.7° . This compares favourably with the predicted angle of 10.96° for an ideal dial with this declination.

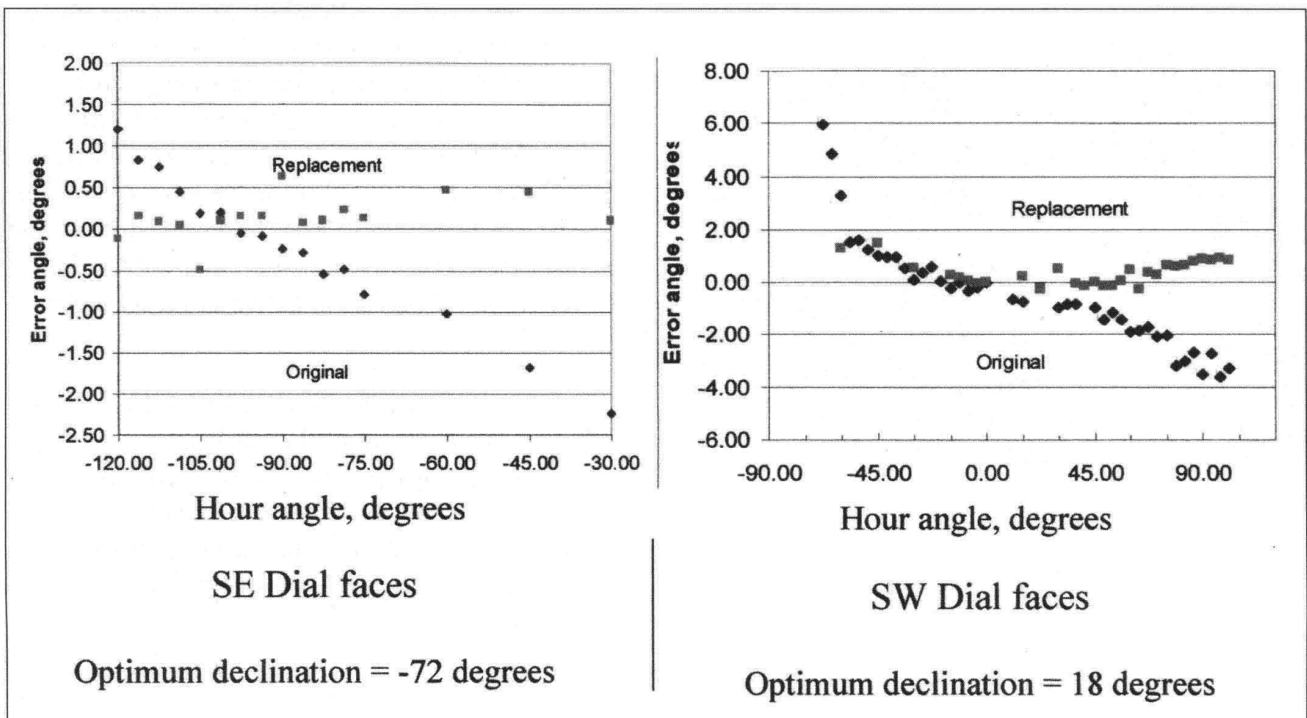


Fig.7 Analysis of the hour line errors for all four dials, as a function of the hour angle. Error angle is defined here as the difference between the ideal angle of the hour line (measured from the noon line) and the angle measured on the dial. The declinations have been chosen to minimise the root mean square errors.

WILLIAM SMART, HIS CONNECTIONS, AND TUDOR IPSWICH

William Smart was a wealthy draper and a Bailiff of Ipswich, and part of the new Puritan elite. He owned a major set of warehouses on Key Street (or Quay Street) in Ipswich which continued to bear his name until they were demolished. He was a major benefactor to the town and, although probably not highly academic himself, greatly interested in learning³. He funded a scholarship for boys from the Ipswich Free Grammar School to attend Pembroke College, Cambridge. His will of 1599 set up the first public library in England, and 100 books and a Fellowship were endowed to Pembroke College. As a result, he is depicted as a benefactor of that college in the stained glass window of the Christopher Wren chapel there, as shown in Figure 8. This likeness also includes his wharf on the River Orwell (although unfortunately the dials cannot be seen), his coat of arms, and his books. Since the chapel was completed in 1666, well after Smart's death, it is likely that the likeness was created by copying a painted memorial him which is in Ipswich's civic church of St. Mary-le-Tower⁵. This church also had a large imposing dial, now unfortunately lost⁷. The possibility exists that Smart's dials were designed for him by a contact at Pembroke College. However, the College was largely ecclesiastical at that time, and a search of its archives has not revealed any evidence; certainly, the first Smart Fellows at Pembroke showed no sign of mathematical abilities.



Fig.8 Detail of the stained glass window at the east end of the chapel at Pembroke College, Cambridge, showing William Smart in academic robes.

Smart's will also made provision to support the Ipswich almshouses started by an earlier Ipswich merchant called Henry (or "the Great") Tooley⁴. The rebuilt almshouses still exist in Ipswich (Figure 9). Tooley died in 1551 and his memorial⁵ is in the St. Mary Key (or St. Mary-at-the-Quay) church⁷, almost opposite the site of Smart's Wharf. He was related by marriage to Sir Thomas Gresham, the founder of the Royal Exchange and originator of Gresham College, the home of much significant sundial development. In his will,



Fig.9 Tooley and Smart almshouses in Ipswich. The white stones give details of their dates and legacies.

Tooley's only private bequest was "my byeggest Standyng Cuppe of Silver and gylte with the Cover of the same to my friend Thomas Gresham". Tooley, like Smart, also had warehouses in Key Street and he even owned a ship which he used for trading with ports in the Bay of Biscay, the Low Countries, and also Iceland.

On the opposite side of Key St. to the position of Smart's Wharf, and near to the St. Mary Key church, is all that remains of Cardinal Wolsey's proposed Ipswich College, which he intended to provide students for Cardinal College (now Christ Church), Oxford. Wolsey is Ipswich's most famous son, and the foundations and gateway for his college here were built in 1528. His fall from grace, and death in 1530, meant that the Ipswich College would have been no more than a dismantled ruin when Smart was a young boy. Wolsey, of course, had an interest in dialling though his connection with Nicholas Kratzer, whom he employed as the "deviser of the king's horologes" and who built a famous dial at Corpus Christi College, Oxford¹. We can only regret that there was to be no Kratzer dial at Ipswich College.

An Ipswich contemporary of Smart who would have had the ability to design dials was Thomas Eldred. He is usually described as a ship's chandler, and he lived very near to Smart's Wharf. In 1588 he completed one of the early circumnavigations of the globe, sailing with Cavendish through the Straits of Magellan². He had this feat commemorated by a carved and painted wooden fireplace. Eldred's house has been demolished but the fireplace is now in Christchurch Mansion. One of the three painted panels shows Eldred using a cross staff to take a sighting of the Sun or stars. A similar fireplace, made for one of his relatives and once at a house named Olivers⁵ near Colchester (Essex) is believed to show Eldred using a mariners' astrolabe for the same purpose. A man with these skills would certainly have been able to design a declining dial.



Fig.10 Thomas Eldred using a cross staff. One of three painted wood panels from his fireplace, originally from his house in Quay Street and now in Christchurch Mansion (Ipswich Museum).

William Smart represented Ipswich as a member of the Elizabethan Parliament of 1588^o. In 1603, a few years after his death, Ipswich was represented by Sir Francis Bacon who was also the town's MP in 1611, before going on to represent several other constituencies, including Cambridge University. Bacon, who later became the Lord Chancellor (and Viscount St. Albans), came from the famous Norfolk family who produced several Norwich MPs and also, in Sir Nathaniell Bacon, the Recorder of Ipswich in 1642. Sir Francis had studied Natural Philosophy at Trinity College, Cambridge, over the period 1573-5, and later went on to make a major contribution to the philosophy of science. He would certainly have been capable of sundial design, although the author knows of no dials attributed to him.

CONCLUSIONS

The survival of painted wooden dials on the outside of a building for 400 years is remarkable. The importance attached to dials during that period of history is clear from the efforts made to maintain them and to enhance their accuracy. The finer details of their design remain to be discovered.

ACKNOWLEDGEMENTS

It is a pleasure to acknowledge the help and support of David Jones (Ipswich Museum) in gaining access to Smart's dials and the archive records. Peter Jones (now at Bury St. Edmunds Museum) first made me aware of the dials. The staff at the Suffolk Record Office, Ipswich, have also been extremely helpful in researching their origins. Miss J Ringrose, the Pembroke College archivist, kindly answered my questions there. The permission of Ipswich Borough Council Museums and Galleries to publish figures 1, 2a, 3,4,5 and 10 is gratefully acknowledged.

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THE STEREOGRAPHIC PROJECTION AS A GRAPHICAL METHOD FOR DESIGNING SUNDIALS

PART 2: DECLINING AND RECLINING VERTICAL AND DOUBLE HORIZONTAL SUNDIALS

TONY BELK

INTRODUCTION

In part 1 it was shown¹ how a stereographic projection of the sun's directions through the day and year on a plane containing the **EW** axis and the celestial pole can be used to design graphically any horizontal or south facing vertical sundial for any latitude in the world. It was also shown that the hour angles, the solstice and equinox lines and the hours of the sun's illumination of a south facing dial at the summer solstice can all be found graphically. In part 2 the graphical design of declining, reclining and declining reclining dials is covered for all latitudes. The sub-style angle and style height can be found graphically for all dials. Oughtred's use of the stereographic projection of the sun's directions on a horizontal plane for double horizontal dials and the use of the stereographic projection to determine the azimuth and altitude of the sun at any time and latitude is also covered.

Every plane has a unique pole which is the direction at right angles to the plane. In the stereographic projection the pole lies on the perpendicular bisector of the chord subtending the projection of the plane and at 90 degrees from the plane.

4. DECLINING VERTICAL DIALS

If the dial face is vertical but declines from true south by angle **D**, the great circle representing the plane of the dial face must be drawn to allow for the plane's declination. **H** is the horizontal direction where the declining vertical plane intersects the horizontal plane, shown as a dashed line, at latitude **L**. The plane of the dial face is drawn on the projection through the vertical direction **P** and the horizontal direction **H** which is angle **D** from direction **E**, as shown in fig 8. This is achieved by marking **P** and **H** on the tracing paper. Place the tracing paper on the Wulff net (as shown in Fig.2 of Part 1 *BSS.Bull.* 13, 87) and select the great circle joining **P** and **H**. This plane goes through points **U** and **V** on the circumference of the projection and is shown on fig 8. As in the case of the south facing dial the angles between the hour lines can be read from the intersections of the plane **UPHV** with the hour lines on the projection. Also as for the south facing dial in fig 5 of part 1 the equinox and solstice lines can be found by reading the

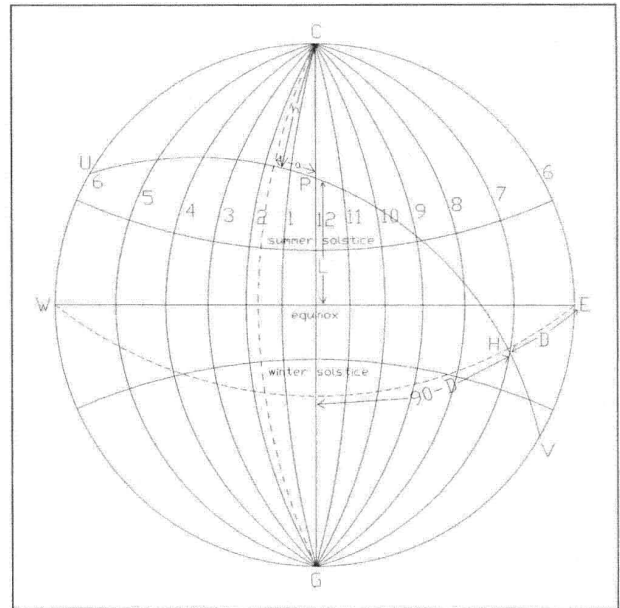


Fig.8 Construction for declining vertical sundial. **H** is the horizontal direction in the dial plane and **P** is the vertical direction. **WHE** is the horizontal plane and **UPHV** is the declining vertical dial plane. **L** is latitude, **D** declining angle, **a** sub-style angle and **h** style height.

angle around the hour line great circles between the solstice or equinox line and the dial plane. The direction of the gnomon is **C**.

There are two ways of producing a gnomon for a declining vertical dial. The plane containing the vertical direction **P** and the gnomon direction **C** makes an angle of **90-D** with the declining vertical plane. Hence the gnomon with a style height of **90-L** can be fixed to the 12 hour line with its plane at an angle of **90-D** to the vertical plane of the dial. Alternatively the sub-style is the direction along which the plane perpendicular to the dial face and containing the polar gnomon intersects the dial face. For the declining dial in fig 8 the pole of this plane is where the declining dial plane **UPHV** intersects the equatorial plane **WE**. The plane of the style is shown as a dash-dot line in fig 8 and the sub-style angle is **a**. In this case the style height is **h** and the style plane is perpendicular to the dial face. In addition fig 8 shows that at the summer solstice the sun will not shine on the dial until 8.50 am, but stays on it until after 6.00 pm.

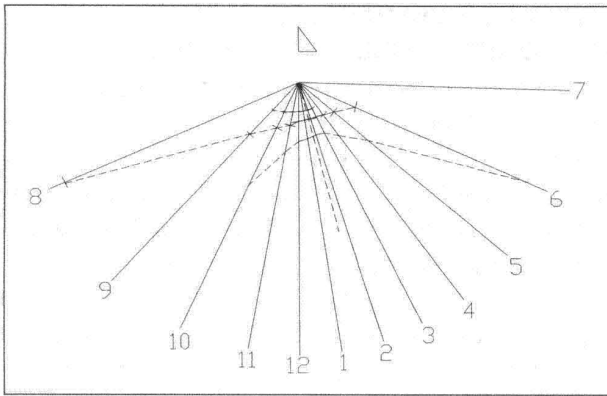


Fig.9 Declining vertical dial drawn from fig 8. The sub-style is shown dashed. Winter solstice, equinox and summer solstice lines are shown dashed.

In the same way as fig 5 was constructed from fig 4 of part 1, the declining vertical dial fig 9 has been drawn from fig 8. The hour line for 12 is vertical and the solstice and equinox lines are constructed as described in Appendix 2 of part 1. The sub-style is marked with a dashed line on fig 9.

5. COVERING MORE THAN TWELVE HOURS

The projection in fig 3 of part 1 which represents the direction of the sun throughout the day and year apparently only covers the hours from 6.00 am to 6.00 pm. However the stereographic projection can be used to cover longer periods. Fig 4 of Part 1 shows a horizontal sundial at latitude L . During the summer the sundial can be used before 6.00 am and after 6.00 pm but it is not apparently shown on fig 4. If a projection is drawn of the other or night-time hemisphere on the same plane containing the celestial pole it will have the form of fig 10. The horizontal plane continues beyond W of fig 4 and appears in the upper

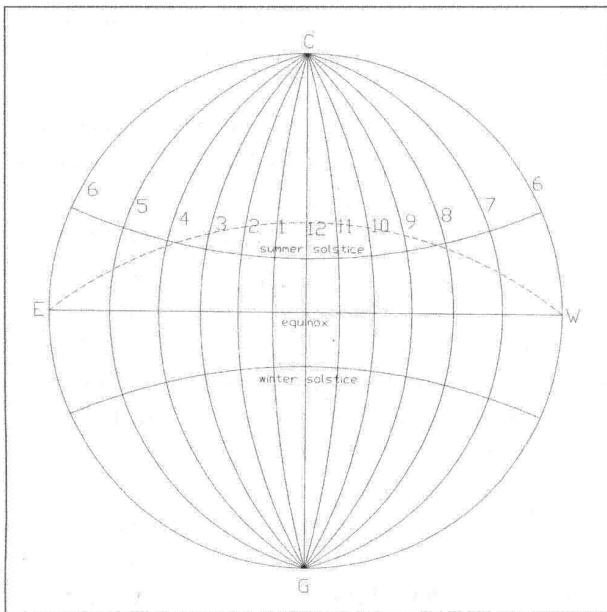


Fig.10 Night time projection to complement fig 4 of part 1. 12 is midnight and the dashed plane is the horizontal plane.

half of the projection in fig 10. The number 12 on fig 10 now represents midnight. For the case drawn the summer solstice sun rises at 3.50 am and sets at 8.10 pm. On inspection it is clear that fig 10 is simply fig 4 inverted and relabelled. This means that the same information as is on fig 10 is carried in fig 4 if it is inverted and relabelled. Hence the full 24 hours can be covered by one projection.

This can also be applied to fig 8. The direction U is the exact opposite to the direction V . If the projection of the declining vertical plane is followed from P to the left it apparently terminates at hour 6 at the direction U . Because the direction U is the exact opposite or negative of direction V , the plane beyond U can be considered as the plane to the left of V if the projection were inverted and relabelled. Similarly the intersection of the summer solstice and 6 pm hour line is diametrically opposite the winter solstice and 6 am intersection. This can then be considered as the extension of the projection to the left of U in the inverted projection and the declining vertical plane intersects the solstice line at 6.25. This means that the sun ceases to shine on the declining vertical dial at the summer solstice at 6.25 pm.

6. RECLINING VERTICAL DIALS

If the plane of the dial is sloping through angle R from the vertical but is South facing the plane is drawn through the points E and W and the point Q which is at angle R from the vertical direction P as shown in fig 11. The dashed line is the horizontal plane and L is the latitude. This is done by finding on the Wulff net the great circle joining E , Q and

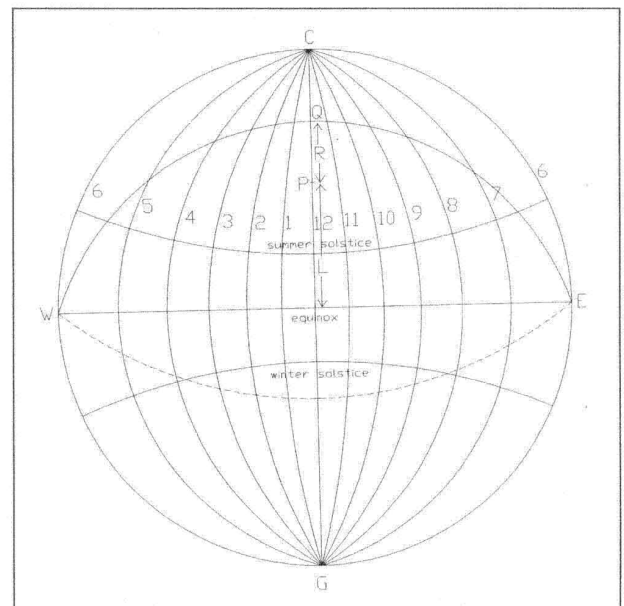


Fig.11 Construction for south facing reclining dial. Dashed line is horizontal plane, L is the latitude, P is the vertical direction and R is the reclining angle. WQE is the reclining dial plane and the style height is the angle QC .

W. Again the direction of the gnomon is **C** and the dial can be constructed in the same way as for the dial in fig 5. The style height is **90-L-R** and the style plane is vertical and perpendicular to the dial face.

If the plane of the dial is declining from due south by angle **D** and is also reclining from the vertical by angle **R** a vertical declining plane is first drawn as in fig 8. This plane is then rotated about the horizontal axis **H** through angle **R** to give the declining reclining plane required. This is achieved by drawing the vertical plane perpendicular to **H** and through **P** shown as **NM** on fig 12. To do this arrange the Wulff net so that its polar axis cuts the direction **H**. Draw the great circle that is 90 degrees from **H** by counting 90 degrees along the polar axis of the Wulff net. Measure the reclining angle on plane **NM** from **P** to direction **T**. The reclining declining plane **JK** can then be drawn through **H** and **T** using the Wulff net the result being shown in fig 12. Angular measurements can now be taken from fig 12 to construct a reclining declining dial and to mark the equinox and solstice lines using exactly the same construction as for fig 5 in part 1 of this article. The direction of the gnomon is **C**. Using a similar construction to that for the declining dial, the pole of the plane perpendicular to the dial face and containing the polar gnomon is the direction along which the dial face **JTHK** intersects the equatorial plane **WE**. The plane of the style is shown with fine dashes in fig 12, the sub-style angle is **a** and the style height is **h**.

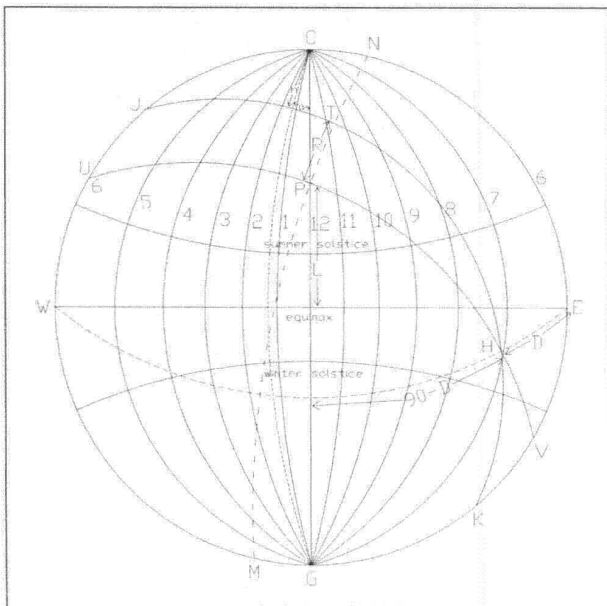


Fig.12 Construction for reclining declining dial at latitude **L**. **H** is the horizontal direction, **P** is the vertical direction and **WHE** is the horizontal plane. **UPHV** is the declining vertical plane and **JTHK** is the declining reclining dial face plane. **MPTN** is the plane perpendicular to **H**. **D** is the declining angle, **R** is the reclining angle, **a** is the sub-style angle and **h** is the style height.

7. DOUBLE HORIZONTAL DIALS OR OUGHTRED'S HORIZONTAL INSTRUMENT

If the construction shown in fig 4 of part 1 is modified to include declination lines spaced at 2 degree intervals the result is shown in fig 13. Also included are two great circles marked for the 1st, 11th and 21st of each month enabling the sun's declination to be read graphically. In order to make a horizontal dial which can be used with a vertical gnomon the sun's directions can be projected onto the horizontal plane at the latitude **L** of interest. This can be achieved by

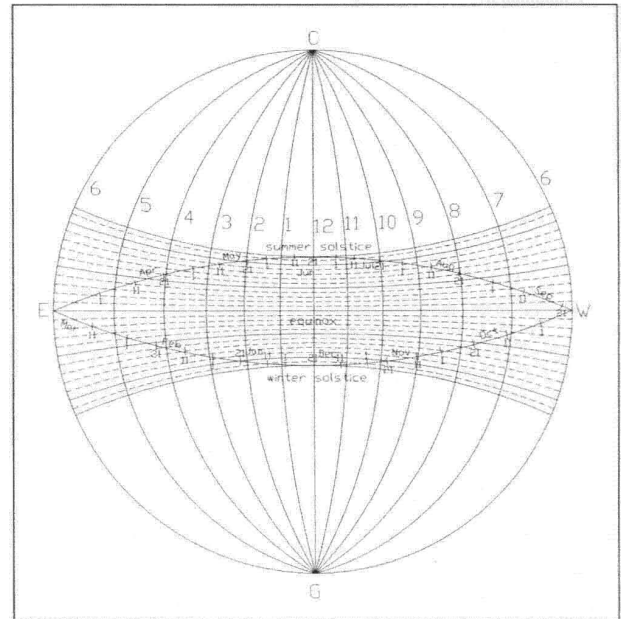


Fig.13 Stereographic projection of sun's directions throughout the day and year on the plane containing the celestial pole and the **EW** axis. **C** is the celestial pole, 6, 7, 8, 9 etc. are hour lines. The arcs between the summer solstice and winter solstice lines are declination lines at 2 degree intervals. The two horizontal great circles carry marks for 1st, 11th and 21st of each month indicating the sun's declination.

rotating fig 13 about the direction **EW** through the latitude angle **L**. To rotate the projection about the **EW** axis the Wulff net is placed so that all the great circles run from **E** to **W**. Any direction on the projection can now be rotated through the required angle by moving it along the small circle on the Wulff net on which it lies, counting the angle as it crosses the great circles. If fig 13 is rotated about the **EW** axis in this way through the angle of latitude **L**, a projection such as fig 14 results. Fig 14 is drawn for latitude 51.5 degrees.

Oughtred' called this the 'Horizontal Instrument' and he used it for many purposes. Apart from telling the time one can measure the altitude of the sun, the declination of the sun, sunrise and sunset every day, and the sun's azimuth all at the latitude for which it is constructed. He also showed how to use it to find the declination of a wall and for the

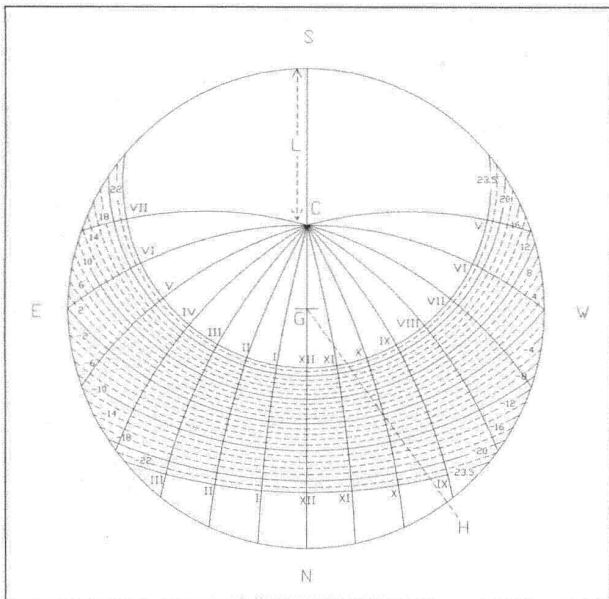


Fig.14 Stereographic projection of sun's daily and yearly directions projected onto a horizontal plane at latitude L of 51.5 N. G is the centre and vertical direction and C is the celestial pole. Roman numerals are hour lines and arabic numerals are sun's declination angles. GH is the direction of the shadow of a vertical gnomon at G at 10.00 am at the equinox, 10.40 am at the summer solstice and 9.20 am at the winter solstice.

graphical design of a sundial with a dial plate at any inclination for use at the latitude for which the instrument was drawn. Finally and possibly most importantly "by eye and view only to behold and comprehend the course of the sun both for his annual and diurnal motion".

With a vertical gnomon this projection can be used as a freestanding horizontal sundial or as part of a double horizontal sundial such as that designed by Oughtred at Drumlanrig Castle in Scotland (SRNO 0897). In either case the vertical gnomon is placed at the centre of the projection G . The plane containing the vertical direction and the sun's direction is a radius of the projection and is the shadow plane. This cuts the hour lines at the current time for the current declination. Oughtred drew two curves on his Horizontal Instrument enabling the declination at any date to be read easily. These curves are the ones that have been included in fig 13. For the example shown in fig 14, if the shadow falls along the line GH and the sun's declination is zero, the time is 10.00. However at the summer solstice the shadow GH indicates a time of 10.40. At the winter solstice the shadow would be in the same position at 9.20.

Fig 14 has been drawn with only the hour lines for simplicity. With this size of projection 10 minute lines could be drawn whose separation would be similar to that of the two degree declination lines.

The way in which Fig 14 can be used, as proposed by Oughtred, to design a horizontal dial or a declining vertical dial at any inclination for use at the latitude for which the figure is drawn is as follows. The hour lines intersect the outermost circle of fig 14 at points which subtend the correct hour line angles at the centre for a horizontal sundial with a sloping- polar gnomon. A south facing vertical dial is represented by the great circle EGW and the hour line angles can be read using a Wulff net as described in Part 1 of this article. A declining vertical dial is represented by a great circle through G making the declination angle D with the plane EGW . A reclining declining dial is represented by a plane based on the declining plane but offset from direction G by the reclining angle R . This can be drawn with the Wulff net and the hour line angles read as for all the other dials described. Oughtred also noted the azimuth angle of the sun on the outer circle of the dial shown in fig 14. This is used with the vertical gnomon at G and is scribed with 0 at E and W and 90 at N and S. Oughtred also used these scales to measure the altitude of the sun when the instrument was suspended in a vertical plane.

8. THE MATHEMATICAL JEWEL

An alternative use of the stereographic projection was proposed by J Lynes³ based on the 'Mathematical Jewel' invented by Blagrave in 1585⁴. This is a stereographic projection of the sun's directions on the NS vertical plane including the north celestial pole. With a transparent overlay pivoted at the centre of the projection the altitude and azimuth of the sun can be determined at any time and date at any latitude. One can also find the times of sunrise and sunset every day at any latitude. This is of obvious value in architectural work, and as an astronomical aid as it is a form of astrolabe. This can all be achieved with the use of a Wulff net and a projection of the same form as fig 13 but on the NS vertical plane and labelled accordingly. It would be possible to design a horizontal or south facing reclining dial using this approach, but the design of any kind of declining dial requires a projection on the EW plane containing the celestial pole as described in section 4 above.

CONCLUSION

This article shows how a stereographic projection allows one to visualise the sun's changing directions through the day and year. Used with its three dimensional protractor, the Wulff net, it is possible to design graphically any planar sundial at any inclination and any latitude. The hours of sunrise and sunset at any time of year and any latitude can easily be read and the hours of the sun's illumination of any flat surface. The altitude and azimuth of the sun at any season and latitude can also easily be found. This can all be

done graphically, as John Blagrave wrote in 1585 "without any whit of that great toyle by synes supplements, tables, proportions, Arithmetically calculations, and such like." Once the use of the projection has been mastered, the hour line angles of any planar sundial can be found in a few minutes and the sundial drawn out.

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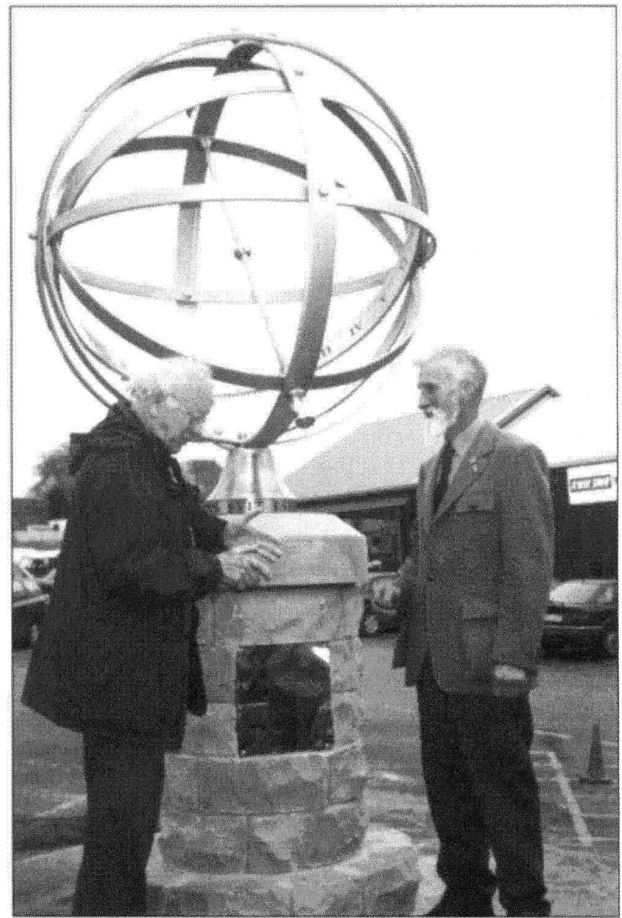
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ARMILLARY SPHERE IN CHEADLE, CHESHIRE

The armillary sundial in the photograph was recently placed in the main car-park belonging to the Town Council of Cheadle, Cheshire. On 4th May 2001, the dial was unveiled by the BSS President, Sir Francis Graham-Smith, seen on the left in this photograph. He is accompanied by Mr. James Plant, designer and maker of the dial. Mr. Plant, a local blacksmith and amateur astronomer, made the dial out of iron cart-wheel tires as used to reinforce wooden cart-wheels

The sundial commemorates the Millennium. It also acknowledges the work of a distinguished local astronomer, Miss Mary Adela Blagg, 1858-1944. Miss Blagg was a gifted selenographer in the early part of the 20th century. She assisted in the collation of the list of lunar formations in 1913, for which, in January 1916, she was elected a Fellow of the Royal Astronomical Society. For her services, Miss Blagg has her name assigned to a small lunar crater in the Central Sea or *Sinus Medii* area of the moon's surface. Her work is acknowledged in the monthly notices published by the Royal Astronomical Society, Vol. 105 (1945)

(Thanks are due to the local historian Mr. W.G.Short for this information)



Cheadle Armillary Sphere, with Sir Francis Graham-Smith, and maker, Jim Plant.

A TIMEPIECE THAT CAN'T GO WRONG

HERBERT WRIGHT

The article below, sent to us as a photocopy by our member Frank Poller of Wantage, first appeared in a magazine 'The Countryman' in Autumn 1948. It is of course out-of-copyright. It is republished here with the knowledge and approval of the present editor of 'The Countryman'.

There are two drawbacks to most sundials; they work only part of the time, and when they do work they are generally wrong always wrong, in fact, except on four days of the year. The best of the dials will range from fourteen minutes slow to sixteen minutes fast at certain times, and, if it is

sited west or east of one's meridian, it will be additionally slow (or fast) by a minute for approximately every ten miles in our latitudes; but my dial was not open to either criticisms. Given sunshine, it told correct clock time the year round. It worked only part of the time, it is true, but I had no other timepiece that worked at all, for I was then in the Japanese internment camp at Lunghua, in China. In such circumstances the sundial, long degraded to a mere garden pretty-pretty, recovers its old dignity and worth becomes a solar chronometer, correct to a couple of minutes day in day out, and with no moving parts to go wrong. A solar chronometer is nothing new, of course, and there are several types which tell the 'mean', or true clock, time from the sun's shadow with greater accuracy than does mine on its present scale. But most of them are scientific instruments with moving parts which need adjustment before sighting. I wanted a fixed dial which would tell me the right time at a glance throughout the year.

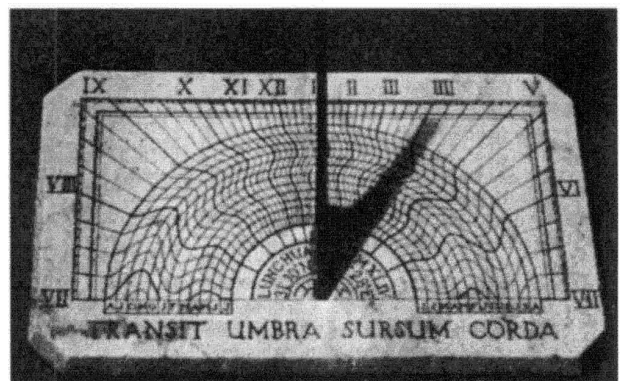
My answer to the problem, shown in the accompanying photograph, certainly makes a rather pretty pattern - I can see it, vastly enlarged, as a mosaic floor to a sun-porch - and the principle is a novel one, I am now told. It took me four months to devise and a year to make, an absurd length of time, but when I started I knew neither the elements of celestial phenomena, nor how to use my own hands. I thought I knew three things: but two of them proved to be wrong, and the other I did not understand. I believed that the sun always rose in the east, and was always due south at noon. I had been told also that sundial hour-lines varied with one's latitude, and that 'Tan. H=sin Lat x sin h' whatever that might mean.

The first thing was to learn elementary trigonometry. On this subject I had once achieved no marks at all in a school examination, and I now knew even less. Under the new spur, however, once I had been let into the secret (hitherto carefully shielded from me) of what sines and tangents really were, it proved a fascinating pursuit. In due course my angles were worked out, a chance page of an old local directory having furnished our latitude and longitude. I had found also absorbing reading in the astronomical and nautical tables of a 1938 'Whitaker's Almanack'. One way and another I learn't quite a bit of elementary astronomy, and I can think of no subtler bait for the young student than to instigate him to make his own sundial and to understand what he is doing. It will lead him down all manner of by-paths of knowledge 'Whitaker' gave details of the Equation of Time - that varying number of minutes by which sun and clock differ throughout the year. It was then only a matter of transferring the tables to the dial in some visual form. My solution seems fairly obvious, though later on I produced something much more

accurate, on a different principle entirely, out of a half-empty tin.

I made the dial from a broken slab of marble which I found serving as a drain cover. It was a softish marble, dangerously brittle but easily worked, and there was one straight edge. I squared the slab roughly with a cold chisel made out of a bit of reinforcing steel from the ruins, then trued up and polished the edges with a brick and spit.

The surface was already smooth, and I scribed the face with a broken hacksaw blade, sharpened to the point. There then remained only the style, the traditional motto, and the mounting. The ruins yielded a suitable straight edge, but the eighth-inch slot to mount it in was a more difficult matter with the tools available. We had a dentist in camp, and I persuaded him against his better judgement to let me loose one afternoon with his drill and biggest burr. Neither of us was pleased with the result, and a month of two of hand scrapping was needed to finish the job. The legend is a formal rendering by another of my rough idea that as the shadow passes on, so in due course would the shadow under which we then happened to lie. The Japanese commandant demanded a translation, deliberated, and let it pass.



The sundial safely home in Norfolk

The dial is calibrated for Tokyo time, the equivalent of Shanghai summer time, which we kept all year round, with one o'clock at noon. It is also compensated for the fact that Shanghai is located 1° 28' east of longitude 120° E, on which China coast time is based. This is how it works. The roman figures tell 'apparent' time that is sun time. To read 'mean', or true clock, time, first locate the date, as near as may be (each semi-circle represents a month of the year, as lettered at the foot), and then follow it up with the eye along its semi-circle until it meets the shadow. From that point of intersection of shadow and date, follow the nearest wavy line outward to wherever it may lead, and that is the time by the clock, as exact as you care to make your reading. Mid-month dates and interline readings can be located without difficulty and with very little error. In the photograph sun time is 4.20p.m; but if the date were

November 1, it would be only 4.00 by the clock; if February, 4.30.

Since bringing the dial home I have adapted it for English use. It keeps perfect summer time here in Norfolk, and all

that was necessary was to tilt it through $21\frac{1}{2}$ degrees. The motto, I find, needs no alteration.

THE TWENTIETH CENTURY

We can now look back over the whole of the 20th Century. Most of us may have personal remembrance of at least half of it, and we may recall the years with enjoyment, thankfulness or nostalgia. What has this last century given to us diallists? We all have our favourite modern sundials: The Dolphins? The Scaphe of Holker Hall? The Multiple Dial over the Gate of Honour? We all know that modern techniques and materials have aided the construction of present-day sundials: laser-cutting of metals, computer-controlled engraving, epoxy-resins for moulding can be

used for dials as for other manufactured objects. But in the years 1901 to 2000, what new concepts or really original designs have been put forward, in the Art and Science of Dialling?

The Editor would welcome short articles, illustrated or not, suggesting the main contributions to our study made in the last hundred years.

M.S.

SUNDIAL OR GARDEN ORNAMENT

MAURICE KENN

An *Armillary Sundial* recently advertised by various garden centres as "*Classic Art For Your Garden*" is modestly-priced and not unattractive. Upon inspection, however, the dial is found to be made for use at Latitude 38° N, or so.

For use in the United Kingdom the sundial needs either to be suitably tilted, as shown in Figure 1; or more sensibly to have: (i) its "Main Body" physically removed with a hacksaw; (ii) the vertical arc drilled at the location of the previous weld, now removed; and (iii) the dial attached, by

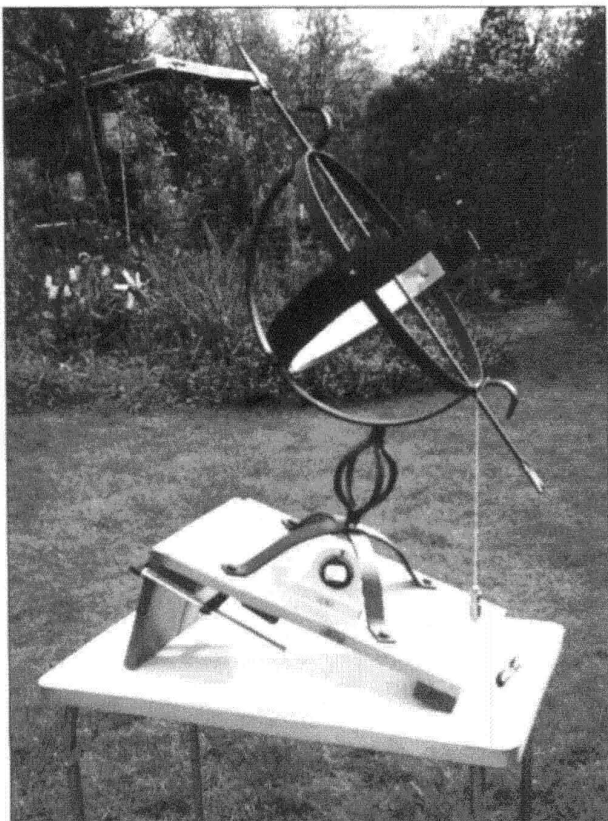


Fig. 1.



Fig. 2.

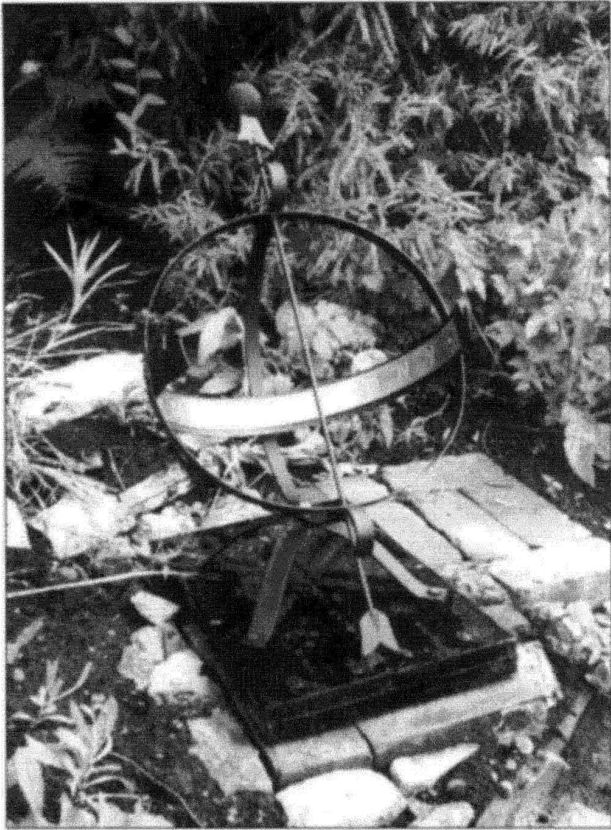


Fig. 3.

mean of a suitable bolt and nut, to the wrought-iron feet, as shown in Figure 2.

This modified sundial will then, when correctly oriented, indicate local solar time at Latitude 52° N or so.

Clock time can accordingly be ascertained from a knowledge of the Equation of Time and the local Longitude. Figure 3 shows the *equatorial dial* in use.

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A HORIZONTAL DIAL FOR THE UK

JOHN SINGLETON

This dial can be used anywhere in the UK to show GMT (subject to the equation of time). It uses a gnomon rod mounted at an angle of 53 degrees to the dial plate, the whole thing being tilted slightly to adjust for other latitudes.

In the diagram (Fig 1), each concentric circle is effectively a dial for a different longitude, and various cities etc, are designated on the appropriate circles. The gnomon is rooted at the common centre point, and the rod lies above the noon radius of the zero-longitude circle. This radius will point to the north when the dial is correctly orientated. (The minimum gnomon length is given by $0.95R$, where R is the radius of the outer circle.)

The dial is based on the equation: $\tan(\text{hourline angle}) = \sin 53 \cdot \tan(H - \theta)$, where H = hour angle and θ = longitude (west). (Using this formula, subdivisions at intervals of 15 or 20 minutes may be calculated, and marked by dots.)

To facilitate tilting, a square dial plate is suggested, with sides running north-south and east-west. The angle of tilt is given by $53 - \phi$ where ϕ is the latitude; e.g. for London ϕ

= 51.5 degrees, so tilt angle = 1.5. The southern edge is therefore raised by $L \sin(1.5)$, where L is the side-length of the plate. When ϕ is greater than 53 degrees, the northern edge must be raised.

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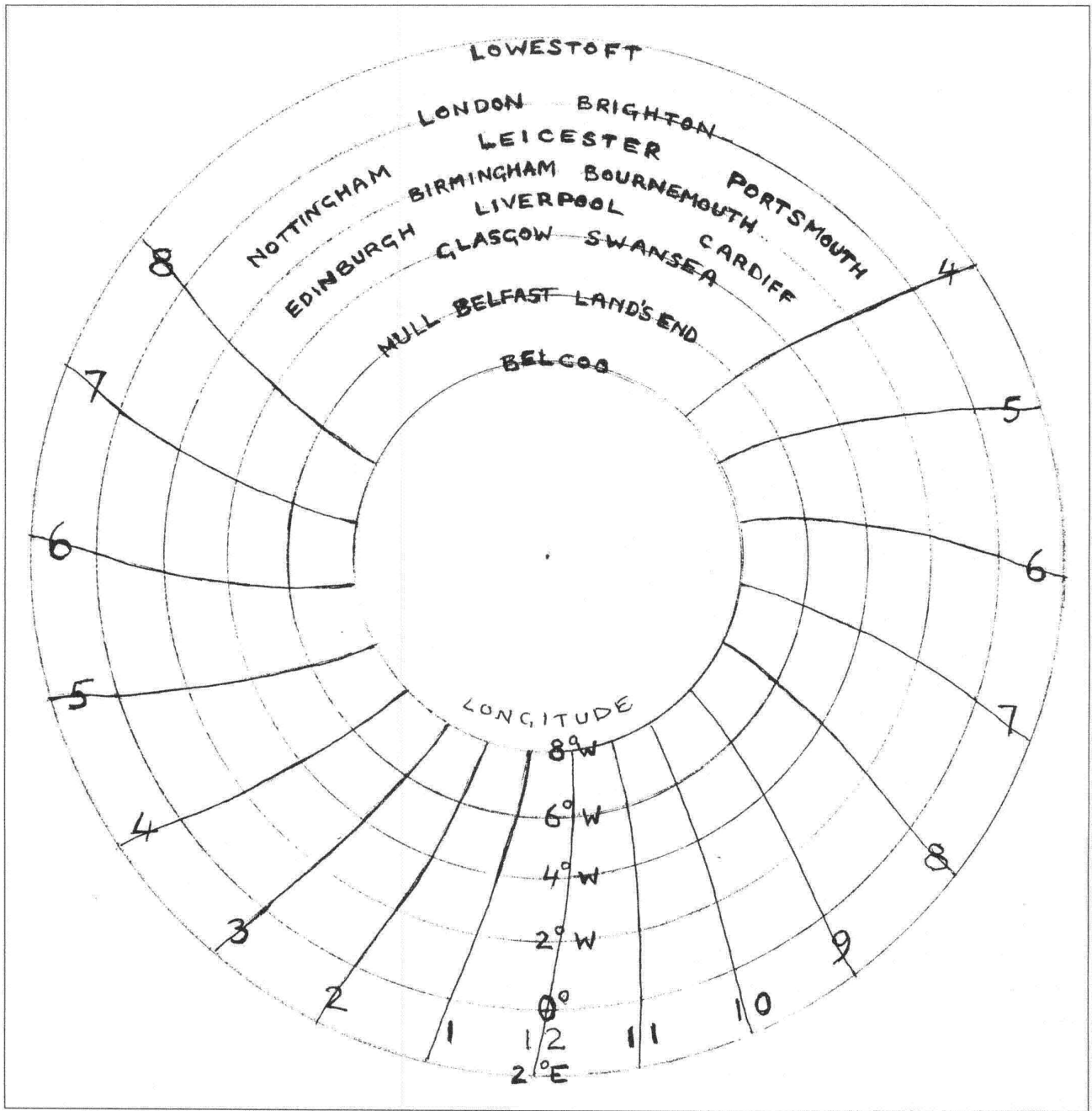
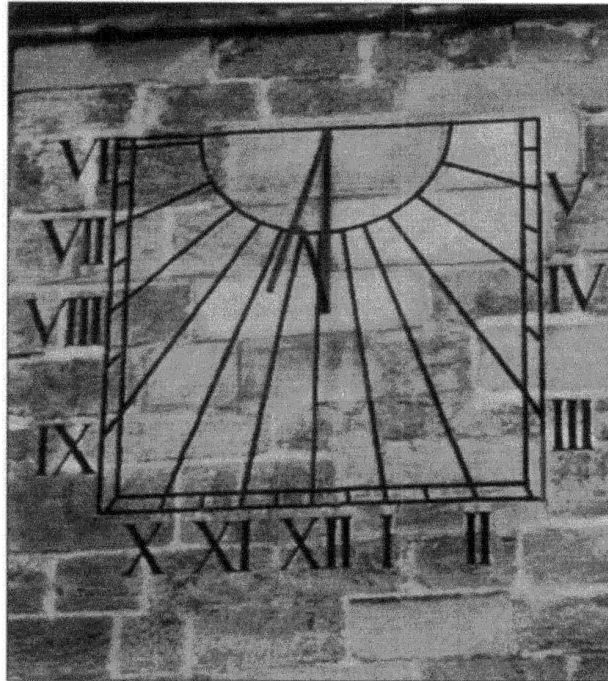


Fig. 1. UK Horizontal dial, gnomon angle 53 degrees



*Vertical dial of 18th Century on Ripon Cathedral
(Gnomon restored by Christopher Daniel 1992)*



*Wall Dial in Winterbourne Gardens University of Birmingham,
designed and made by Hamit James 1997.*

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