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HONORARY OFFICIALS OF THE BRITISH SUNDIAL SOCIETY

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DIALOGUE - NEWS ITEMS

ANTIQUÉ CLOCKS

This magazine has carried the banner of gnomonics for the last decade which should have been carried by another journal which shall remain nameless. The flagship of the *Antique Clocks* dialling fleet is "The Sundial Page" originated by the late Noël Ta'Bois, a great dialling enthusiast, and now contributed by our member Christopher Daniel.

The May issue edition [page 38] is entitled "Parts of the Furniture", dealing mainly with the Greenwich sundials on the wall of the Old Royal Observatory and declination furniture which enables the indication of the sun's entry into the different signs of the Zodiac to be seen throughout the year. This is a relic of the past, astrology and astrological predictions were of great importance [if of little practical significance].

With the June issue *Antique Clocks* reverted to its old [and more proper name] *Clocks*. On page 50 and under the title of "Nothing New", Christopher Daniel describes the functioning of the Dix/Wall heliochronometer devised in the late 1970's. The title arises from the very similar device invented by William Molyneux, described in his *Sciothericum Telescopium ...* Dublin, 1686.

The July issue still bears the new [old] name, and on page 52 is another contribution by Christopher Daniel - "Artistic Licence" which details an unusually delineated vertical dial which has been deliberately distorted to make it look balanced [and prettier]. In practice this is of no account since an indication is never made on the part of the dial in error.

Clearly, as the August issue shows, the name is now permanent [until the next change]. On page 52 Christopher Daniel gives a thumbnail sketch of the first Astronomer Royal, the Reverend John Flamsteed (1646-1719). The interest here lies in the production of the first accurate tables for the Equation of Time, and also the account of Flamsteed's dialling interests.

As members will have seen by the Index of Sundial Entries for *Clock/Antique Clocks* in *BSS Bulletin* 89.1 [pages 4-8], this series is building up into a unique and informative collation of dialling information. It would be an excellent idea to reprint all this in the form of a book, which up to now would encompass a total of about 150 pages!

Clocks/Antique Clocks/Clocks is to be congratulated for the contributions to dialling, a minority interest at the time of the introduction of the "The Sundial Page".

FÖLE ÉS ÉG 90/7

The July 1990 issue is a two page article "Årverésre keroult egy tudományos mükincs" - [Auction of an Art Treasure of Science], giving some details of the items sold at Christie's Kensington sales rooms, but devoted mainly to the 1462 Regiomontanus astrolabe made for and dedicated to Cardinal Bessarion at Rome, which was sold on 28th September 1989. A colour illustration of this is shown on the front cover, with two further illustrations in the text. Immediately following this is a short piece by the same author on the Seven Dials Monumental sundial, complete with a photograph taken by Dr. Anita McConnel. The text is Hungarian. The journal was supplied by our member Lajos Bartha.

HOROLOGICAL JOURNAL

The July issue contains a short article entitled "Golden Hours ..." by Charles Aked, a short introduction to the world of gnomonics, pages 18-20, with five illustrations ranging from the Bewcastle Cross sundial to a group of early 18th century portable dials.

ALTE UHREN

The Society "Freunde Alter Uhren" in Germany has an active Sundial group and the annual publication for 1990 has about half its pages devoted to articles on dialling and allied subjects.

Schriften der Freunde Alter Uhren, Band XXIX 1990
(Text in German)

1. Old Scientific Apparatus J. Hugin
2. Reflex Sundials René J. Rohr
3. Prehistoric Calendar Astronomy H. Hinrichs
4. A Simple Calculator for Horizontal Sundials
Manfred Schütze
5. Calculating Mean Time for Sundials Heinz Schilt
6. Old English Window Sundials Hans Behrendt
7. The unusual Sundials of Jacques Ozanam as
travelling Sundials Walter Elsner
8. The map of the World as Astrolabic Sundial
H. Sigmund
9. Mean Time over 100 years Hans Siegfried
Klausmann
10. The First Diallist Heinz Schumacher

COMPUTER PROGRAMS

A number of special computer programs are now available to members of the society for a relatively small charge. The programs are designed to run on IBM PC's or compatibles that have CGA EGA or VGA graphic adaptors. They come on a single 3.5" 720K disk, or on two 5 1/4" 360k disks (Please specify when ordering) and are available from Peter K. Scott, 38 Exford Drive, Brightmet, Bolton, Lancs, BL2 6TB, who is handling the distribution on behalf of the society.

The disks contain programs from both British and foreign authors, that can calculate the hour lines for most of the popular types of dials, and include routines that actually print out the dials on your printer. To briefly summarise the programs.

ZONWPLT: A suit of programs from F.J. de Vries of the Netherlands that calculates and prints out dials of all types, including dials marked with various hour numbering systems and analemmas. It also handles some of the lesser known types of dials such as mirror dials and submerged dials.

EQUADECL: A program to print out and display an equation of time and declination chart for any year.

KRATZER: A program to calculate and print out the hour lines for any type of dial including reclining and declining dials.

DIALDRAW: A program for Amstrad PC1512 or PC1640 owners that runs under GEM and will print out a horizontal sundial (8 inches square approx) with quarter hour divisions and hour numbers.

The concession price to British Sundial Society members is £8.00, the price to non-members is £20.00.

B.S.S. 1991 CONFERENCE

It was the wish of Andrew Somerville that we should hold the next B.S.S. Annual Conference in Scotland and this was agreed in principle at the Council meeting held in June 1990. A recent meeting [held 23 August at Chingford] led to the provisional programme detailed here.

Accommodation will be in the Pollack Halls residence of the University of Edinburgh, where a provisional booking for 50 members has been made. A deposit per head is required, so those wishing to partake must include a deposit of £20 per person attending as soon as possible. *It will be first come, first served.* Application to be sent to the Secretary, Mr. David Young.

Tentative timetable:

Thursday 4th April - Afternoon

Arrival in Edinburgh and Registration.

Evening

Dinner plus informal get-together and talks.

Friday 5th April - Morning

Lecture programme, to be arranged.

Afternoon

Coach trip to see Scottish Renaissance Dials.

Evening

Informal slide shows or lectures.

Saturday 6th April - Morning

Lecture programme, to be arranged.

Afternoon

Visit to the Royal Scottish Museum and walking tour of city dials.

Evening

Discussion period and members meeting.

Sunday 7th April - Morning

Second B.S.S. Annual General Meeting.

Noon

Formal close of meeting.

Mr. Mike Cowham is in charge of the Conference arrangements and Dr. David Gavine is the local liaison officer arranging the local events in Edinburgh. Mrs. Anne Somerville will advise on the Scottish Renaissance Dials tour.

The full cost of attendance at the Conference will depend upon the number of nights accommodation, but is expected to be about £80 total per person for the full period, the balance to be forwarded by 14th March 1991. The cost for attending the Conference alone, without accommodation, is £10, and *any paid-up member of the BSS may attend the Annual General Meeting without any charge being made.* Refunds will be made subject to the usual conditions but as much notice as possible should be given to allow others to fill the vacancy. Please note that the Society accepts no responsibility for accidents which occur during the course of the Conference, insurance against these must rest with the individual, it is not included in the price shown.

A fuller and more detailed programme will be issued nearer the date of the Conference. Those wishing to deliver lectures and/or exhibit material and photographs, or conference suggestions should get in touch with Mr. Cowham, giving a brief resumé of what they wish to submit. The decision of the Conference Committee in respect of these matters will be final.

Addresses: Mr. M.J. Cowham, The Mount, Toft, Cambridge CB3 7RL. 0223-262684.

Mr. David Young, Brook Cottage, 112 Whitehall Road, Chingford, London E4 6DW. 081-529-4880.

IMAGES OF TIME

29 NOVEMBER 1990 - 6 JANUARY 1991, AMSTERDAM

'Images of Time' is an exhibition that examines time both in itself (what is time?), and in its manifestations (what effects does it have?). Starting with the origins of time at the creation, it will present historically and topically different ideas that have been held about time at different periods and in different societies. It will illustrate the ways in which time has been conceived, counted and measured, tracing the development of ever more accurate machines for keeping time whether in its largest or smallest machines for keeping time whether in its largest or smallest units. An extensive series of instruments will be shown, but so also will the use of absolute time by

modern scientists to detect rhythms in other living things which differ from those of the clock time used by modern society. Examples of such different times will be displayed, as will be the ways in which the human sense of time has developed, and how time, particularly past-time, is used and misused for artistic, cultural, and ideological purposes.

'Images of Time' will be held in the Nieuwe Kerk, Amsterdam. It is organised by Mindz ass. by for the Stichting Tijd voor Tijd with the help of Vincent Icke, H.F. Bienfait, and Willem Dijkhuis as scientific advisors, and of Anthony Turner as historical adviser.

GLASS WINDOW DIALS: VIDEO BY HANS BEHRENDT

Hans Behrendt of the German Arbeitskreis Sonnenuhren has prepared two VHS videos from colour slides of glass dials, which he will be glad to supply to anyone interested. Both have commentaries (in German) describing the dials and their history.

Part I "Historic Glass Sundials" includes 7 dials from Germany, 6 from Switzerland and one each from Austria and Poland. Playing time 56 minutes.

Part II "Old English Window - Sundials" includes the 48 known glass dials in England (many taken from the photographs of Chris Daniel) and lasts 90 minutes.

A third part on modern glass dials is in preparation. Enquiries as to cost etc to:
Dipl. Ing. Hans Behrendt, Hochstr 13, D-8990 Bodolz-Lindau (B), W. Germany.

THE HAMPTON COURT DIAL OF JOHN MARR, 1631. (Part 1).

A.R. SOMERVILLE

John Marr, Mar or Mair, was a famous dial-maker of early Stuart times who has been referred to in previous articles (Bull. 89.1.16 and 90.2.8). In 1631 he erected a dial at Hampton Court which is surely one of the most elaborate ever made, even more so than Gunter's Whitehall dial of 1622 or Francis Hall's glass dial of 1673, and his description of it in Royal MS 17 AV (British Library) is very thorough, running to 75 folios (i.e. 150pp) of about 6" by 4", bound (with other unrelated items) in leather. As far as I know, it has not appeared in print before. The handwriting is very neat and legible (though there is evidence of more than one hand), but any words which I have not been certain of are enclosed in square brackets. I have retained the original spelling, capitalisation and punctuation as far as possible and the folio numbers are given in the margin. Folios 2-3 contain a dedication to Charles I and 4-7 a table of contents, which are not reproduced. Owing to its length it will have to appear in 5 instalments, of which this is the first.

ROYAL MS 17 AV: JOHN MAR, CIRCA 1631 (British Library)

The Description and use of such lines and circles are as drawn upon ye stone-dialls in his Maties garden att Hampton Court.

Wheare are delineated (both in concave Hemiſpheares and upon plaines) all the circles of the ſpheare both greater and lesser, incidont or belonginge to the whole Art Gnomonique - ſhewing manie and divers propositions of the ſpheare to bee performed or known both by the ſhaddowe of ye Sunne and without it. Wth ſeverall other concluſions concerning time and ſhadowe necessarie to bee knowne being both pleaſant and delightfull to ſuch who are mathematically affected.

Described by Jo. Mar.

8 THE DESCRIPTION AND USE OF SUCH LINES AS ARE DRAWN UPON THE STONE DIALLS IN HIS MATIES GARDEN AT HAMPTON COURT.

The forme or faſhion of the ſtone upon wh theſe Dialls are drawn is called by the Geometricians a Priſme being composed vizt two octagons and eight parallelograms.

Upon one of the octagons it ſtandeth and the other being placed parallel to the Horizon hath cutt into the ſame, a concave hemiſphere.

The eight Parallelograms, all of them are [erect] plaines, ſtanding perpendicular to the Horizon whoſe faces doe reſpect the eight principall windes, that is, one of them looketh juſt South, one North, one Eaſt and one Weſt, and one Southeaſt one Southweſt, one Northeaſt and one Northweſt. Upon the upper parte of each of them is deſcribed a Diall upon a plaine and in the lower partie is cutt a concave Hemiſphere, And this ſerveth for the generall deſcription the perticulers doe followe.

THE DESCRIPTION OF THE HORIZONTAL CONCAVE.

This Hemisphericall concave (being of itſelf a perfect halfe round) repreſenteth unto us that halfe of the heavens wch is ſeen above our Horizon. And that part thereof wch is conteyned betweene the two great redd lines upon the white ground (whereon the multitude of lines are drawne) repreſenteth ſomuch of the heavens as is conteyned betweene the two Tropicks, for the loweſt of thoſe redd lines repreſenteth the Tropicke of Cancer ☊ and the uppermoſt the Tropicke of Capricorn ☋. Also, as betweene the Tropicks the Sunne hath all varietie of motion, ſoe upon this white ground the point of the ſtile (or gnomon) maketh all varietie of ſhadowe, and not elſewhere for without theſe Tropickall circles the ſhadowe of ye point cannot be ſeene.

10 The blew part of the concave without the tropicke of Cancer ☊ (whereupon the conſtellations of the ſtarres are painted) and likewise without ye tropicke of Capricorn ☋, repreſenteth that parte of the heavens wheare ye ſunne never commeth.

The Gnomon that belongeth to this concave, the edge thereof that inclineth to ye North, repreſenteth the Axis of the world and the ſhadow thereof ſheweth the time of the daie.

The other edge that ſtandeth perpendicular from the center repreſenteth the Axis of the Horizon, whoſe ſhadowe ſheweth the Azimuth of the ſunne and the ſhadowe of the point onelie ſheweth the reſt of the concluſions.

11 The edge of the concave repreſenteth the circle of the Horizon, and the other ſeverall circles deſcribed within it, may bee knowne by their ſcituacion and collours.

The Equinoctiall is that redd line wch paſſeth from the eaſt to the weſt, through the middle of the white ground havinge on the lower ſide thereof theſe numbers written, 10, 20, 30 etc to 180. And back againe on the upper edge thereof, theſe numbers 190, 200, 210 etc to 360.

The other circles that paſſ from Eaſt to Weſt (parallel to the Equinoctiall) are the Parallels to the Sunne's declination or Arcs of his daillie motion. fore the further they bee diſtant from the Equinoctiall upwards, they ſtill decrease in length, untill they come to the ſhorteſt of all wch is the Tropicke of ☊. And the further they bee diſtant downwards they ſtill increase in length, untill they come to ye longeſt of all wch is the Tropicke of Cancer ☊.

12 Nowe theſe parallels are drawne at ye diſtance of one degree aſunder and they are blacke lines except everie fifth wch is a redd line, for the more facillitie in nombring of them. The numbers that doe belong unto them are ſett near the meridian from ye Equator on either ſide towards ye Tropiques thus

5.10.15.20.23.30.

Likewise the circles of Altitude, wch (from the antient Arabians) are called Almicantars, they are also drawne at one degrees distance, and they bee those yellow lines wch are parallel to the Horizon whereof everie fifth passeth without ye Tropique of Cancer ☊ on either side, and are numbered theare from the Horizon downwards thus 10.20.30.40.50.60/

The Azimuths (or verticall circles) are the blew lines wch are drawne from the Center towards the Horizon.

13 The Judaicall (or the ould unequal) howers, called by some the planetarie howers or might fittie be called (as I thinke) the Ecliptique howers. They are those greene lines that passe from the Tropique of Cancer ☊ quite through the white ground and a little without the Tropique of Capricorne ☋ where they are numbered with numerall letters upon a scroull thus: I II III etc to XII.

That line wch is drawne from the South to ye Northe (whereon the Gnomon is sett) is the Meridian line, And likewise in this Diall it is ye Azimuth of south and also the sixt Judaicall hower.

The rest of ye redd lines wch are drawne on either side of the meridian (quite through the white ground) are the hower lines and those wch show the compleat howers are quite continued over ye blew (in white lines) onto the Pole of the world, wch is the pointe where ye highest edge of the stile standeth. Now everie one of these compleat howers is divided into 15 equall partes, by other intermediate lines whereof everie fifth is somewhat bigger then the rest, and the space between each of them signifies 4 minutes of time.

14

OF THE ECLIPTIQUE

There is in this concave (besides these) two semi-circles the one of them is drawne from ye west end of the Equator (and touching the Tropick of Cancer ☊ at ye meridian) unto the East end thereof. The other of them is drawne from the East end of ye Equator, backe again unto the West and thereof and to meete the tropique of Capricorn ☋ at the Meridian. These two semi-circles doe serve to make upp the whole Ecliptique line.

15

This Ecliptique line is divided into 4 quadrants and each quadrant into 3 signes and each signe into 30 degrees with little small strokes over this arte, whereof the fifts and tenths bee longer than the rest and at the beginninge of everie 30 degrees is put the

character of the signe wch is proper to that place. As the first quadrant passinge from the Equinoctiall at ye West, to the Tropique of Cancer ☊ at the meridian, conteyneth Aries ♈, Taurus ♉, Gemini ♊ and there is answering unto it without the Tropique of Cancer ☊ the springe quarter (or season) of ye yeare.

The second quadrant passage from the Tropique of ☊ at the meridian to the Equinoctiall at the Easte conteyneth Cancer ☊ Leo ♌ and Virgo ♍ and hath answering to it (as before) ye summer seasonn of the yeare.

16

The third quadrant passage from the Equinoctiall at the East to ye Tropique of Capricorn ☋ at ye meridian conteyneth, Libra ♎ Scorpio ♏ and Sagittarius ♐ and hath answering to it without the Tropique of Capricorn ☋ the Autumnal seasounn of ye yeare.

The fourth and last quadrant from the Tropique of ☋ at ye meridian to the Equator at the West, conteyneth Capricorn ☋ Aquarius ♒ and Pisces ♓ and hath answering unto it (as before) the winter seasonn of ye yeare.

17

Also the whole circumference of the Equinoctialle circle being divided into 24 equall partes is numbered in white letters, neere the intersections of the principall meridians with the Artique circle beginning at the Equinoctiall Colure of Aries ♈ (wch is the six a clocke hower line) and soe continued round according to the succession of signes for finding the right ascension of the sunne and everie pointe of the Ecliptique and of the Starrs in the Concave.

OF THE CONSTELLATIONS IN THE CONCAVE

Moreover in the great concave (between the Tropiques of Cancer ☊ and the Artique circle are drawne and painted these constellations of the starres following: vizt Orsa Major Orsa minor, Cepheus Cassiopeia Draco and some parts of Perseus wch constellations are adorned with all the principall fixed starres that doe belong to each of them, sett accordinge to their due declination and right ascension. Their right ascension in howers is known by the forsaid numbers next the meetinge of the principall meridians with the artique circle and the odd minuts of time by an arithmetically number annexed to each of them. Their use is to knowe ye hower of the night by the starres.

(To be continued)

SUNDIALS IN THE AFTERNOON

A meeting has been arranged at the Parish Church Hall, Crowthorne, Berkshire, for Saturday, 10th November 1990, commencing at 2.00 p.m. Doug Bateman will give a talk, illustrated with slides, on the restoration of the sundial at Dial House, Crowthorne. This is a rare form of vertical declining dial with an analemma at each hour mark. Dial House is now a private hotel and restaurant and is situated at 62 Dukes Ride, Crowthorne. The dial is on the front of the hotel and can be seen from the drive, if not from the road.

Christopher St. J. Daniel will give a short talk on the original maker of the dial, Joseph Alfred Hardcastle, and refreshments will be available at a moderate charge.

It would be appreciated if those members wishing to attend would write or telephone Mrs. Jane Walker [Crowthorne (0344) 772569] so that some idea of the number attending may be known. An SAE to Mrs. Jane Walker, 31 Longdown Road, Little Sandhurst, Camberley, will bring you a map showing the exact location of Crowthorne, the Church Hall and, of course, the Dial.

ON REFLECTED CEILING DIALS

RENE R.J. ROHR

Stories about Isaac Newton (1643-1723) relate that when still a boy and living in the house of his grandmother, he used to lay a small mirror horizontally on a southern windowsill and enjoy reading the time of day, and even the date, shown by the reflected sunbeam in the network of lines he had correctly drawn on the ceiling and walls of his room. A similar story is told about Christopher Wren (1632-1723) the builder of St. Paul's Cathedral in London. But rumour has it that Copernicus had done so centuries earlier, and most certainly others as well. All of them, while playing, had experienced a new way of telling time that sooner or later was to interest those concerned with gnomonics. This science, at that time, was part of University mathematics teaching and in Newton's day it had reached a level so satisfying that for many decades no new working principles were to appear; in fact, only in our century were hitherto unknown ideas brought forward, though these were usually too mathematical to be within reach of the general reader.

More often than not reflected ceiling dials must have been made for reasons of entertainment or prestige, if not even boasting, as in the case of the most intricate example of the Palazzo Spada in Rome, discussed later.

Most of the older books on gnomonics were written in Latin but one of the first in Continental Europe to be published in the vernacular was the *Gnomonica Universalis* of 1675, written in German by Johannes Peter Stengel [1]. Its chapter on reflected dials tells the reader that these dials "*are no other things than horizontal dials*

lifted overhead and looked at from below". In Stengel's old German, words appear which are no longer used, and this brings about difficulties in understanding and sometimes lack of clarity.

The lines for a ceiling dial are identical to those for a horizontal dial at the same latitude, but the problem with drawing it is that the centre of the dial lies outside the room and is inaccessible. Other than the lengthy process of marking by observation of the spot, the simplest method is to start by drawing a meridian line on the ceiling, passing vertically above the mirror. Knowing the height of the ceiling above the mirror, the position of the equinoctial can then be calculated and it is drawn at right angles to the meridian. If the position of the origin is now calculated, the hour line angles from the meridian can be found as for an ordinary horizontal dial; their tangents will give the spacing along the equinoctial and their complements the angles from the equinoctial.

As the mirror is moved closer to the ceiling, more lines can be accommodated, but the depth of the room will limit the period of the year for which the dial can be read. This can be overcome to some extent by carrying the lines down the back wall and Fig. 1, taken from the Frenchman Antonine Emmanuel Maignan's *Prospectiva Horaria...*, published in Rome in 1648 [2], shows the relationships involved. He has drawn a horizontal dial on the floor whose centre is on the extension of a line joining the mirror to the centre of the ceiling dial and whose lines then connect with those on the wall and ceiling.

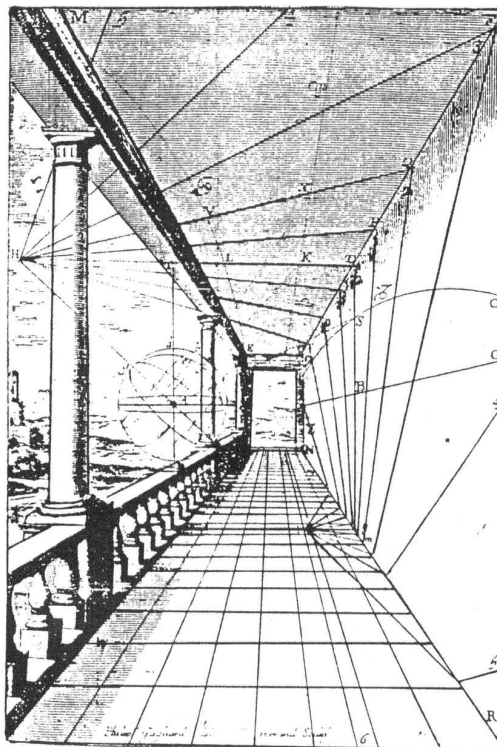


Fig. 1 The theory of the reflected ceiling dial according to Maignan.

Possibly when in Avignon the author may have known another famous Latin book on dialling by the celebrated German Jesuit Athanasius Kircher, with a title of similar length beginning “*Primitiae gnomonicae catoptricae ...*” [3]. Born 1601 in Geisa, a small place in Thuringia, Kircher had been teaching in Germany but went to Avignon for fear of the terrors of the Thirty Years War (1618-1648), which was then raging. Later on he was a teacher of mathematics in Rome where he published a

number of books on various sciences and died in 1660. As a scientific author he is looked upon as one of the most productive of his time. He may never have taken part in laying out dials - his book includes a well-known engraving (Fig. 2) showing a reflected ceiling dial to be used in Avignon which is very unlikely and even incorrect in some of its details. It most probably served as a teaching aid or possibly only as decoration in the observatory that had been set up by Kircher in Avignon.

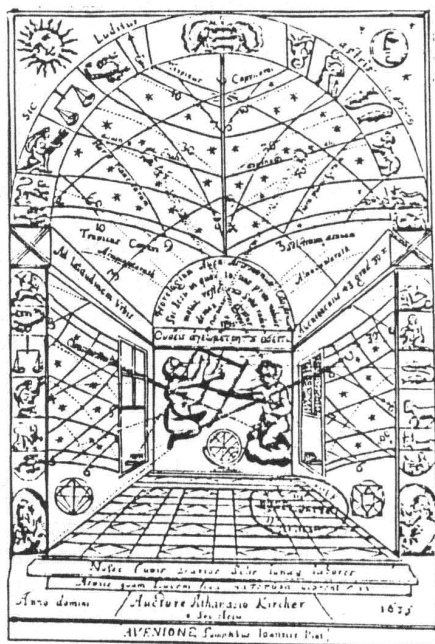


Fig. 2 The fantastic reflected dial in the engraving of Kircher's book. All the elements of the room are disposed in symmetry with regard to the meridian plane. At the base of each door, two mirrors of unequal inclination simultaneously send light patches on to wall and ceiling dials.

The best known and often mentioned reflected ceiling sundial [4, 5, 6] was painted in 1673 on the walls and ceiling of the stairwell in an ancient Jesuit convent in Grenoble, now used as a college (*Lycée Stendhal*, Figs 3, 4, 5). Its author was the Jesuit Bonfa, born in Nimes, who lectured in theology and mathematics in Avignon where

he may possibly have known Kircher. At one time he worked in collaboration with Cassini and later was appointed manager and teacher at the Ecole d'Hydrographie des Galères de Marseille (The Royal Galley Navigation School). He died in Avignon in 1724.

The list of known reflected ceiling dials is rather small.

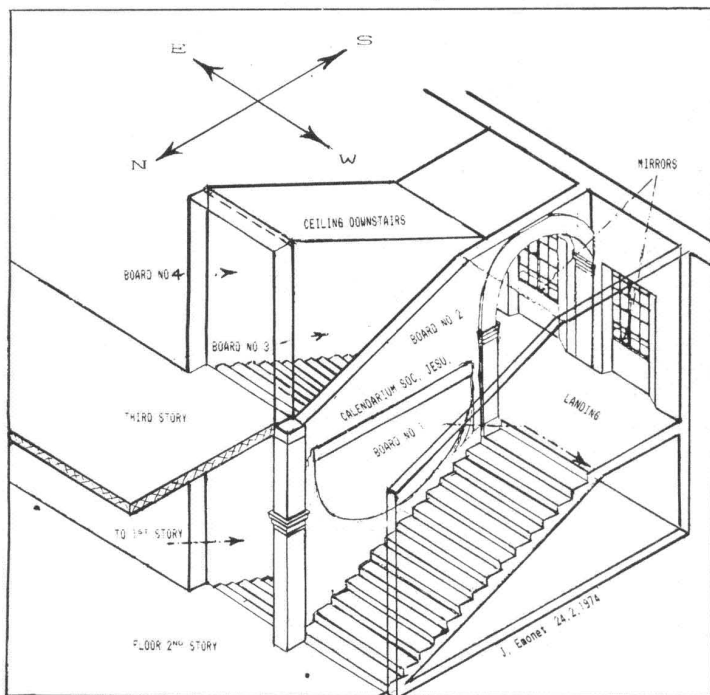


Fig. 3 The disposition of the walls and ceilings bearing Father Bonfa's reflected dial in Grenoble (by the late engineer J. Emonet).

That of really old ones still existing could possibly be surprising. Their laying out not only required an appropriate room, but also an innate gift for planning in three dimensions.

Furthermore, builders were sometimes asked to create special arrangements, as our second example will prove. Some 40km westward from Grenoble the village of Saint-Antoine-en-Vienne (or en-Dauphiné) would scarcely ever have seen a tourist if a magnificent and historic basilica did not tower above all its homes. Not only is this basilica adorned with a beautiful and almost scenic frontage, but it is the remainder of an old abbey which for seven centuries had belonged to the Antonines, a renowned order devoted especially to nursing the victims of the terrible St. Antony's Fire (Ergotism). The order disappeared partly because the illness grew less and less common towards the end of the 18th century. But history holds that thousands of pilgrims had crowded the abbey in its time and among them, the local saying goes, there have been kings, emperors and even popes. For reasons peculiar to the local Antonines they were in possession of every means possible for knowing the time, whether day or night, rain or not. They accordingly used sand-glasses and clepsydras, some of the latter even striking the hours; faded remnants prove the former presence of sundials, and it is said that there was even a mechanical clock presented by King Charles V. The big head of a nail in the floor of the basilica is a noonmark touched by a sunbeam on the days of Candlemas (2nd February) and St. Martin (11th November). On some other festivals noon is given by the shadow of a cutout pigeon in an equilateral triangle or by some similar means. But the most remarkable and best preserved item is a very odd and old, reflected sundial. It has been laid out in the winding stairs of a hexagonal tower built against the steeple. Turning up left-handed, the stairs get sunlight through a succession of narrow vertical slits or loop-holes in the wall, four of which were formerly provided with cups containing water or perhaps mercury. As the sun made its daily

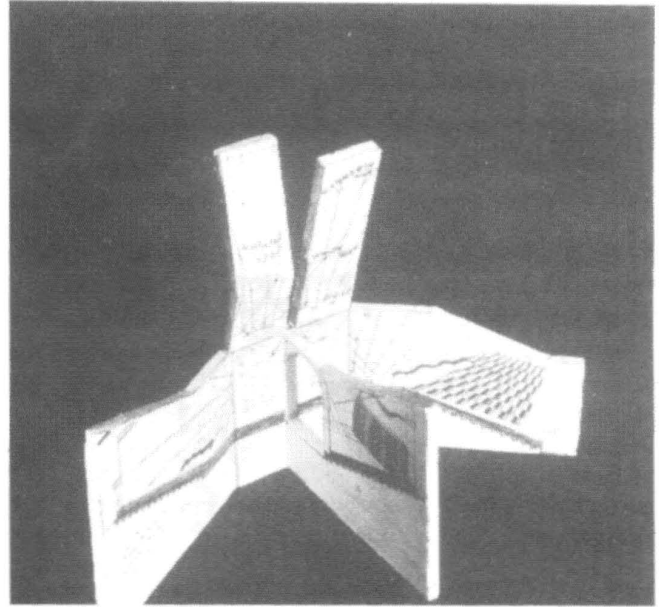


Fig. 4 A model of the dial in Fig. 3 opened outward (by J. Emonet).

course, a ray of light entered the slits in succession and was reflected against the inner walls, the steps and the central column of the spiral staircase. Each of the four slits rising from southeast to southwest serves its own sundial on which the ascending visitor can discern coloured lines for normal, Italic and Babylonian hours as well as others. The whole design extends over 27 steps and covers in all some 25 square metres, and, as in Grenoble, the lines are respectively black, red and yellow (Fig. 6). This may possibly suggest that the two were made by Bonfa, though nothing relevant to the origin or age of this dial exists; as usual all the documents concerning the convent disappeared during the Revolution.

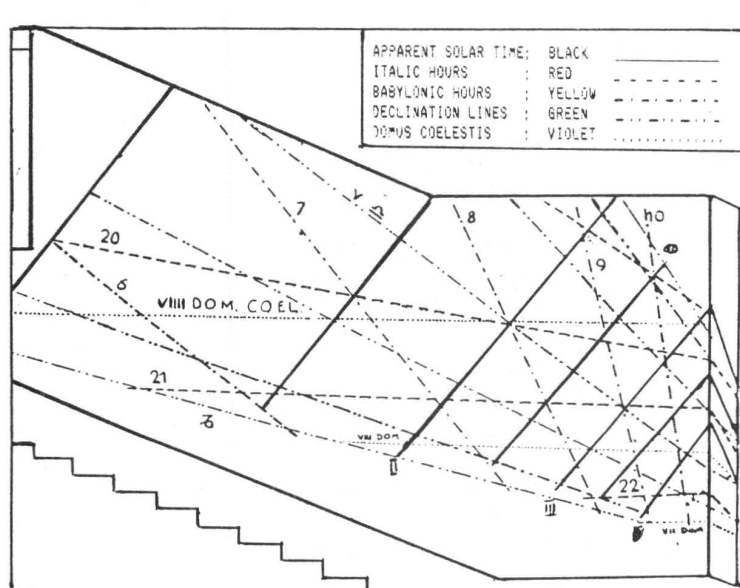


Fig. 5 The part of the Grenoble dial drawn on the east wall (left in Fig. 4).

The narrowness of the place puts amateur photographers into trying situations; flashlights and special lenses have to be used. At all events a visit will be worth-while ("vaut le voyage" as Michelin has it) and it can easily be combined with nearby Grenoble.

Finally, I have lately had information that a similar staircase reflected dial exists in the Gothic church steeple of an ancient Commanderie (i.e. seat of a religious order of knights) in the village of Saint-Sauveur-la-Foucardière, near Châtellerault, in the Vienne Department. It raises the number of known reflected sundials in France to three. More may possibly still exist.

In 1495 Charles VIII, King of France, wanted a French church to be built in Rome. This was done and some convent buildings were added later; all of it remains to the present day the property of a French congregation (Les Dames du Sacré Coeur). The church is well known - the Chiesa Trinità dei Monti - and the convent has been for centuries a sort of French college where selected members of various religious orders used to be appointed as lecturers.

One of them, a mathematician, was the above mentioned Antonine, Emmanuel Maignan, a native of Toulouse, who shared his activities between Avignon and Rome. In 1637 he took advantage of the position of a corridor situated above the convent cloister to lay out a reflected ceiling dial of a particular kind, which is still in excellent condition. The ceiling and walls carry a multi-coloured and complicated network. The whole place, where even the waterbowl has not been removed from the windowsill, bears the name of the *Gallery of the Astrolabe* (Figs. 7, 8, 9); visitors are welcome and are shown round without difficulty.

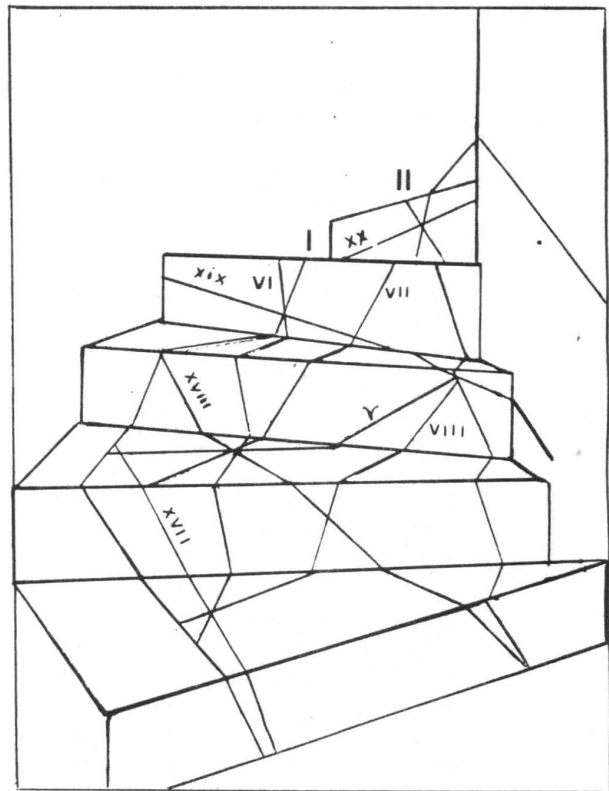


Fig. 6 Saint-Antoine-en-Vienne. The southwest reflected dial drawn on the spiral staircase (one of four dials).



Fig. 7 Trinità dei Monti, Rome. The Gallery of the Astrolabe. The reflecting mirror is on the sill below the twin shutters which, when closed for easier observation, have a small opening at the base to admit the light ray. The un-numbered lines on the walls belong to various, differently coloured, families of curves.

Reflected ceiling dials were then something new and were looked on as the latest fashion. A brilliant pupil of

Maignan, Father Jean-François Nicéron (1613-1646) became an enthusiast.

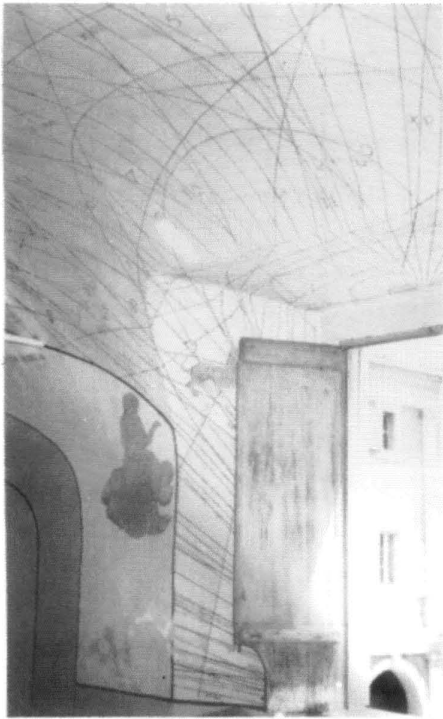


Fig. 8 *Trinità dei Monti. View of the ceiling and east wall inside the window shown in Fig. 7. The almucantarats are visible from 40° to the zenith (90°), the point on the lintel where the azimuths join. Clockwise, to the left, the symbols of Virgo and Leo are visible. Left of Virgo, in the vault, the extreme eastern geographic name: Molucca Insulae.*

He published a Latin book with the significant title *Thaumaturgus Opticus* [7] in which these dials were given due consideration. When he died, little more than a youth, reflected dials bore his name in Auburne (near

Perpignan), Toulouse, Bordeaux and in some Roman palazzi. Maignan himself had one more drawn in a different part of the Trinità convent.

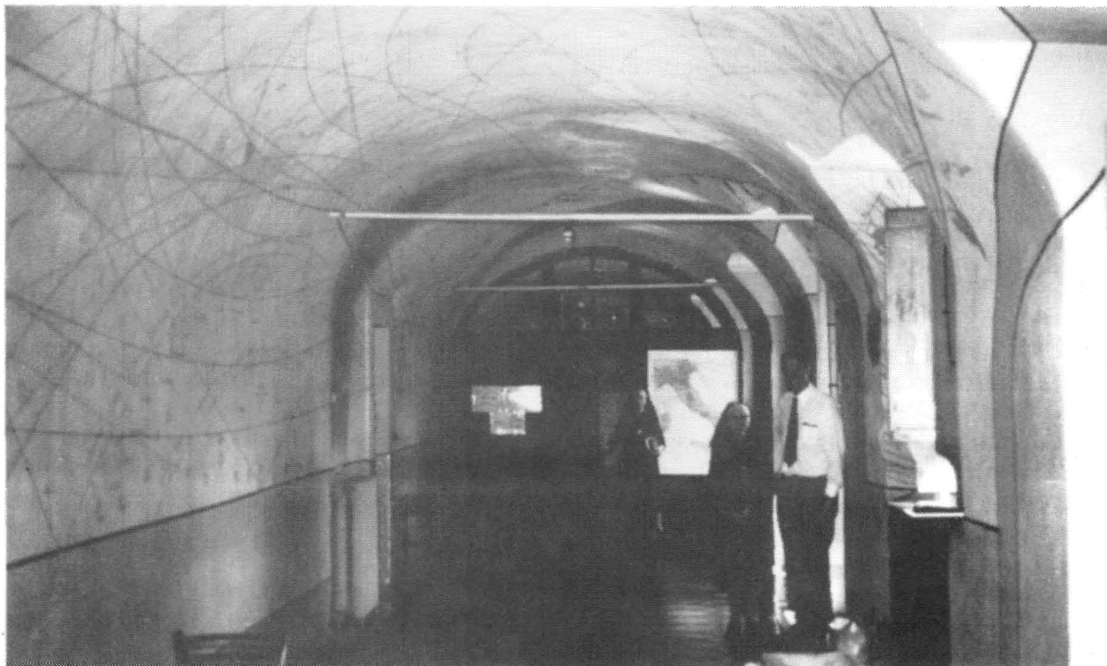


Fig. 9 *Trinità dei Monti. The Gallery proper, the main information is given on the ceiling and the part of the wall in front of the window. (Photographs in Figs. 7, 8 & 9 by Dr. Margaret Folkard, Adelaide, S. Australia).*

His book has an engraving (Fig. 10) showing a cloister-gallery where a reflected dial drawn on the vaulted ceiling

is discussed by a group of men. I have made the utmost effort to find this cloister and its dial - which perhaps

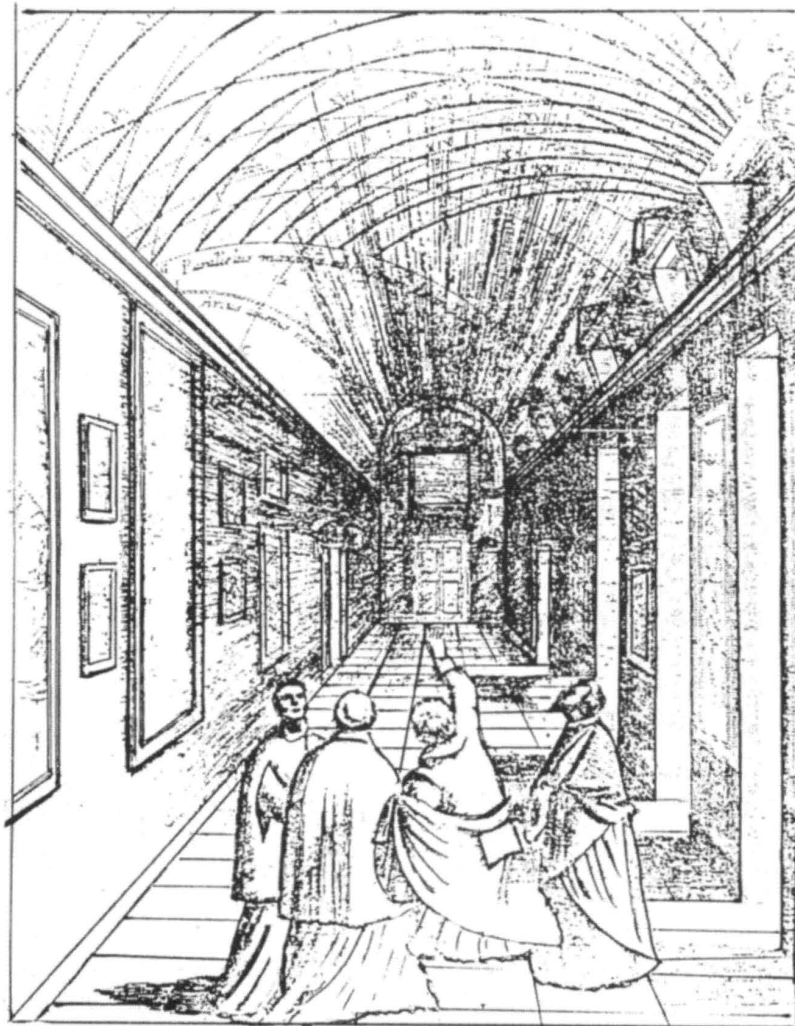


Fig. 10 The enigmatic reflected ceiling dial from an engraving in Maignan's book. The question is: did it ever exist? It possibly did, and may even still do so in some unknown abode.

never existed; I failed, but on the way I came on another exceedingly remarkable Roman dial made by Maignan in 1644 near Capo de Ferro, in a building called Palazzo Spada. Its variety and also the confusion of its networks make it one of the most complicated dials ever built. The palazzo once belonged to a Cardinal Spada, a well-known Maecenas, who had asked Maignan to lay out a most complete and, if possible, a universal reflected dial. Maignan made it a masterpiece of complication! Once more its abode is a gallery with a mirror on the wall facing approximately southeast. The ceiling between this wall and the vault of the gallery has a cylindrical profile and the intersection of the two differently arched surfaces forms a continuous curve on which the dial lines are broken. As usual the various families of lines are drawn in different colours.

Each of the figures 11a, b, c and d shows two families, but it must be kept in mind that the four drawings are to be superimposed into one and seem simultaneously - an

entangled maze is the result! And in addition it will fall short of the real dial in lots of details. In the poorly lighted room it can only be arduous to distinguish from each other the lines of local time, Italic, Babylonian and Biblical hours, the zodiac and lines of extreme moon declination ($\pm 28.5^\circ$), the *domus coelestis*, azimuths, almucantarats and hyperbolas for the days of an even number of daylight hours. There are names of cities and countries from Java to Chile correctly inserted in the hour lines for the purpose of showing longitude and time-difference. Time, moreover, can be obtained by observation of the moon using adequate mural volvelles.

The question is: could Spada find his way in all this!

I have not found any information regarding reflected dials from those old days in countries outside France and Italy. My list only amounts to five dials, but all of them are inside buildings and not visible from the streets. There are in Europe thousands of cities and villages - how many more of these dials may be awaiting discovery?

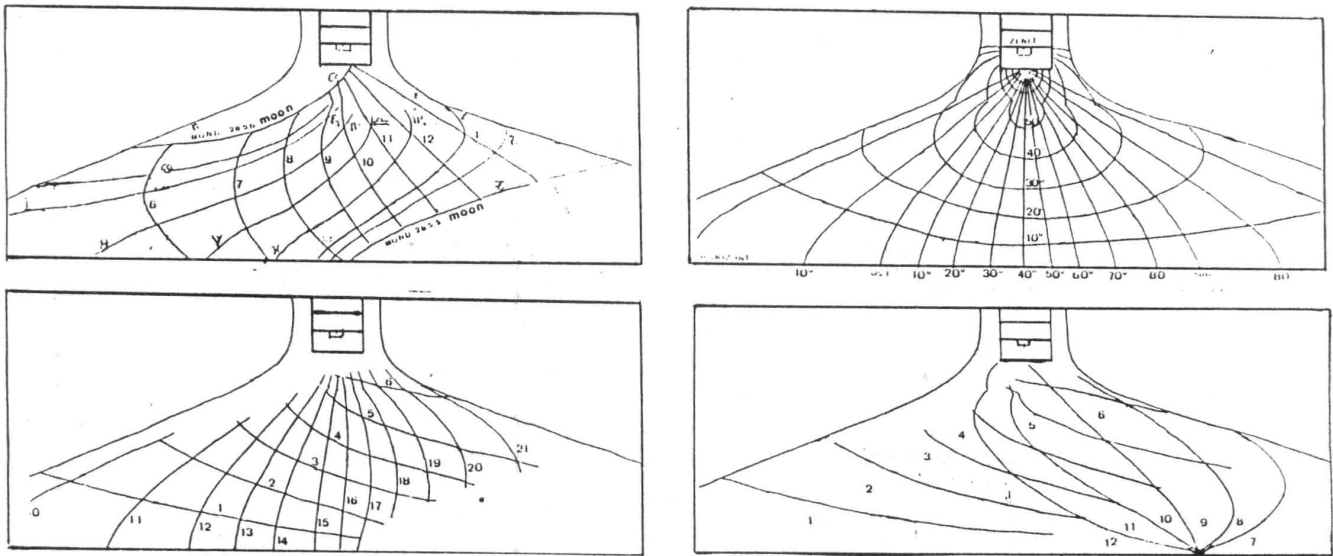


Fig. 11 Palazzo Spada: a) Lines of apparent time and declination.
 b) Italic (10-21) and Babylonian (1-6) hour lines.
 c) Almucantarats and azimuths.
 d) Biblical hours (1-6) and Domus Coelestis (7-12).

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NOTE:

The story of Newton's ceiling dial may well be apocryphal. It is mentioned in Mrs. Gatty's *Book of Sundials*, 1900 ed, p136, where she says that Newton painted a dial on the ceiling at his grandmother's [Mrs Ayscough's] house at Market Overton and adds "the house in which Mrs Ayscough lived was pulled down some years ago, but the piece of plaster with the dial face upon it has been preserved, and is kept in the house built upon the old site". I recently visited Market Overton and found the house said to be Newton's grandmother's. The

lady who lives there now told me that the house was rebuilt in 1866 and that she knew nothing of a ceiling dial. The curator at nearby Woolsthorpe Manor, Newton's birthplace, and Mr. Ken Baird, who have studied Newton's early life, say that there is no evidence that Newton's grandmother, or Newton himself, ever lived at Market Overton, so that if he drew a ceiling dial in his boyhood it would have been at Woolsthorpe and there is no record of one there. The story could have arisen from the account of the antiquarian William Stukeley, who knew Newton. Writing about 1727 he says "how diligent Newton was in observing the motion of the sun especially in the yard of the house where he lived, against the walls and roofs, wherein he could drive pegs, to mark the hours and half hours made by the shade which from some years' observations he had made very exact, and anybody knew what o'clock it was by Isaac's dial as they ordinarily called it". This was not a reflection dial of course and it would be interesting to know where Mrs Gatty got her story about the piece of plaster from the ceiling being preserved!

In the darkest corner of Colsterworth Church, behind the organ, there is a stone dial set upside down in an alabaster frame with an inscription saying that it was cut by Newton with his knife at the age of 9. It was brought from Woolsthorpe Manor last century and at first sight the lines look very improbable, but Dr Allan Mills assures me that it is a seasonal hours dial corrected for the declination of the wall from which it was taken. Quite an achievement for a boy of 9!

There is an account of a "Reflective sundial" at Milcote Hall in *Trans. Birmingham Archaeol. Soc.* 1953 and I would be glad to hear from anyone who knows whether it, or any other ceiling dial in Britain, still exists.

A.R. Somerville

THE SPHERICAL SUNDIAL

I never travel much further away than a day's walking distance from where I live, but I receive correspondence from all parts of the globe. A frequent variety of package, whether posted in Australia, continental Europe or indeed in some (to me) inaccessible part of these Islands, consists of a letter accompanied by a photograph of a Sundial which the Author of the letter has either seen or made: if the latter category applies then the dial in question is nearly always an Armillary Sphere; a skeleton Globe with a central axis casting its shadow on a broad equatorial band marked with the hours on its inner surface. I must confess that I have never in the past bothered much with such things, as my main interest is in planular dialling, but the persistence of such arrivals has been one factor in encouraging me to look more seriously at the concept (leaving the Armillary Sphere itself in the safe hands of those who already fully understand, upon their own evidences, its function) of the Spherical Sundial of Historical Dialling. The spherical quality of the Heavens was probably comprehended long before the spherical quality of the Earth came to be appreciated; and although, in accordance with the Hermetic principle "as above so below", the two ideas became inextricably linked, any talk of 'The Sphere' (without qualification) implied the Celestial, rather than the Terrestrial, and carried with it the notion of perfection and transcendence. It is recorded that one Greek Philosopher (can any Classicist give me the reference?) thought so much of 'the Sphere' that he gave orders for his own tomb to be constructed in that form; whilst a 'noble Roman' (I think Julius Cæsar) was long thought to have actually attained this by having his ashes inclosed within a bronze ball on the top of an Egyptian Obelisk now standing in St. Peter's Square in Rome (when examined in the 16th Century the ball was found to be empty).

'The Sphere', as projected onto a Plane or other surface, whether by Orthography, Stereography, or the plain Gnomonic projection is the fundamental principle of all Dialling, and fundamental principles are neglected to our cost!

Edmund Chambers, in his *Book of Days*, makes casual mention of a Market Cross surmounted by a Sundial "of the simplest kind", a perfect stone sphere painted with a broad equatorial band containing the full 'double twelve' cycle of 24 hours, arranged in such a way that the edge of the Sphere's natural shadow marks the time on both of its sides. The device seems so simple that one readily doubts its veracity: surely this simple marking, although obviously correct at the Equinoxes, will be 'out' when the Sun is at or near its maximum declination? Simple geometrical analysis readily dispells this doubt.

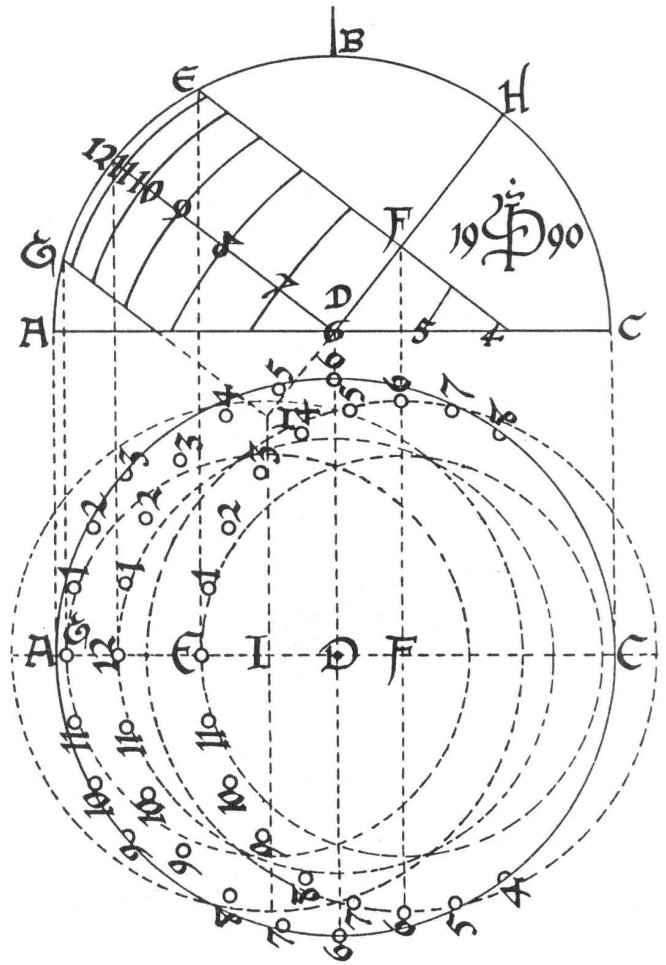
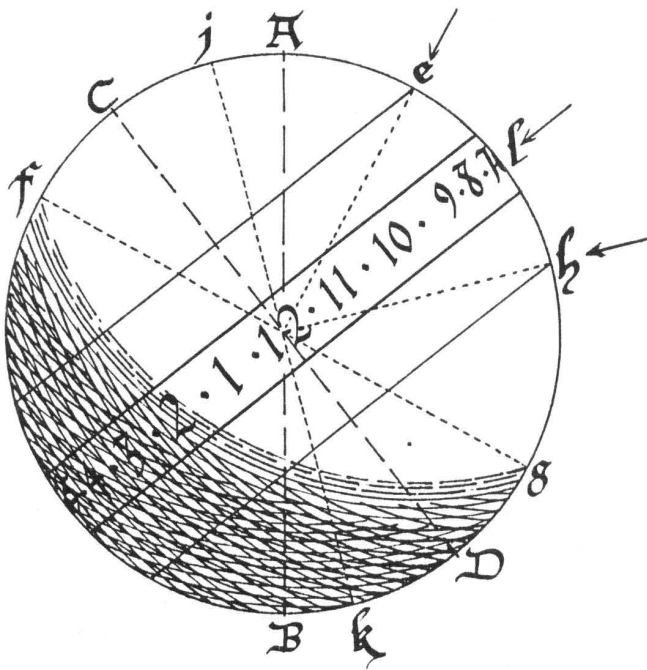
AB is the Vertical Axis of our Sphere. CD is its Polar Axis (Angle C-12-A being the complement of the Latitude), with the numbered Equatorial Circle at right angles to this. When the Sun's rays, at 12 o'clock on the days of the Equinoxes, strike the Sphere perpendicularly at point l, the edge of the Shadow will be CD: when, at the Summer Solstice, the Sun's rays strike the Sphere perpendicularly at point e, the edge of the Shadow will be fg: when, at the Winter Solstice, the Sun's rays strike the

Sphere perpendicularly at point h, then the edge of the Shadow will be jk. It will readily be seen that all of the Shadows cross in the centre of the 12. This principle applies for every one of the Hours in the circle; and the Dial is therefore completely accurate. Certain people, the sort who worry their heads about incorporating 'corrections' for Longitude, the Equation of Time, and Refraction, not to mention 'Summer Time', will wish to 'discuss' the 'indistinct' quality of the edge of a spherical shadow; but then, in the 'immortal phrase', "they would wouldn't they"! Chambers speaks of this type of dial as a commonplace, and one wonders why they are no longer apparent to the sight. The clue lies in the use of paint. The former presence of a painted planular dial can always be sussed out from its surviving gnomon (or fixing holes for a gnomon): the simple spherical dial, painted but not incised, leaves no such clues. There are still plenty of stone spheres about!

In the further recesses of the old Dialling Books one finds frequent mention of this sort of spherical Dial, generally elaborated into a likeness of the Terrestrial Globe, from which one may determine the time in any part of the world. Leadbetter, in his *Mechanick Dialling*, suggests that provision of a pin gnomon at each pole, serving a pair of small Equinoctial Dials; but these are scholarly concerns and detract from the basic simplicity of the device, which has a lot in it to recommend itself to stonemasons, who often wish they could make Sundials, but are frightened off by the Trigonometry usually involved. It is worth pointing out that a simple cylinder, tilted to the angle of the Axis of the Earth at the place in question, works as well as a full sphere.

The earliest generations of modern Diallists, those who published in the 16th Century and their predecessors, had a very different notion of a spherical sundial from the above, and a very queer one at that. The Concave Hemisphere, Scaphe or Hemicycle, is the most ancient form of Sundial known: it goes back to Babylon. What one has (fundamentally) is an hollow bason with a pin gnomon fixed in its centre (in the hemicycle projecting from the edge) with its point at the geometrical centre of the concavity and its height equal to the radius of the same. From this point are projected all of the Day Curves and Hour Lines required, and the shadow of the point will track them accurately at every time and season. Because the Concave Hemisphere is a mirror image of the Great Hemisphere of the Heavens above, these Days Curves and Hour Lines (in the Northern Hemisphere) will lie towards the North. At some point in the past some clever fellow (surely not a clever lady at this period!) has taken it upon himself to turn this logical Concave Hemisphere (as it were) inside out to produce the Convex Hemisphere (or 'Sphere' as it is usually styled and frequently illustrated) shewn.

On the Dome ABC point A is to be towards the North and point B towards the South (*sic*). The Latitude is HDC (also *sic*), the Day Curves and Hour Lines lying towards the North (a third *sic*!) A pin gnomon is perched perpendicularly on point B, at the Apex of the Dome: no amount of geometrical analysis wil determine its 'correct'



length, since its point can never track any of the curves marked upon the Dome's surface; one even hesitates to specify "Adequate but non-specific" (an irritating phrase to the meticulous ego!). The careful balance of the Concave Hemisphere is quite lost here, and the only ratio to survive the mauling is the Azimuth: the Shadow cast by the pin gnomon at B will accurately lie across, or point to, the requisite correct point on the graticule of Day Curves and Hour Lines; or, rather, it *would* do so did not the shadow cast by the Sphere's own rotundity so effectively get in the way! One wonders how such an ineffective kind of Sundial ever progressed beyond the stage of Philosophical speculation. That it did do so is attested by surviving examples (i.e. the dome on the top of the 'Madeley Court Sundial' described by Dr. Somerville in the inaugural issue of the British Sundial Society's *Bulletin*) and records of others (i.e. those of Nicholas Kratzer's full Sphere atop his formerly existing erection at Corpus Christi College Oxford, which Dr. Pattenden has published), together with their ubiquitous presence in the works of Münster, Finé and others, who published in the 16th Century. The better sort of Spherical Dial I have never come across in works of this early period.

Now here is a peculiar thing: if one takes the coördinates of the 16th Century Convex Sphere and

projects them (by ordinary orthography) onto the Horizontal Plane represented by ADC, a most interesting concatenation of planular points emerges. The three sets of concentric circles are the major and minor axes of three Ellipses of Hour Points (the Major Axes of the two tropical Ellipses, for the benefit of those who can't suss this for themselves, are represented by the oblique distance EF on the upper part of the diagramme; surely everything else is 'clear!'); and these ellipses, with the central gnomon continued down to D, form a rudimentary Analemmatic Sundial. And more than this: the Zodiac Scale, suitable for setting the gnomon for use on the Equatorial Curve only, is already inherent in the projected Scale IDF. Remembering that the Analemmatic Dial first began to get about at the very period when the Gnomoned Dome began to go out, one might well speculate as to whether this was not, in fact, the means by which the Analemmatic Dial was first discovered, whether by Samuel Foster, or by a Continental predecessor. The transcendent, but unutilitous, Sphere collapses into the mundane, but effective, Plane: a lesson surely for all of us!

Peter I. Drinkwater 1990.

MINIMUM LENGTH OF GNOMON

“How does one calculate the length of a gnomon for a sundial?”, a question of similar kidney to the ‘classic’ “How many beans make five with a pea amongst them” (the answer of that is *said* to be “A bean and a half, a bean and a half, half a bean and a bean and a half”, or (perhaps more to the point) “How long is a piece of string?”

One must say, first of all, that there is no very obvious geometrical relationship between the length of the Gnomon of an horizontal dial and the diameter of its dial plate (who says that it is going to be round: why not square, diamond or oval?). Mr. Sylvester’s Diagramme, if taken seriously, would produce a ‘messdial’ (to coin a term or adapt an old one) upon which most of the hour lines have ‘no place to go’; and I do not think that this is at all what our inquirer has in mind! It also fails (again if the diagramme is to be taken seriously: ‘angle B’ (I would style it ‘angle ABC’) is not that of the maximum altitude of the Sun compatible with the angle of gnomon shewn) in the apparent aim of its construction: to insure that the shadow of the tip of the gnomon never falls within the circle of the dial plate. As shewn, at the time of the Sun’s maximum altitude (maximum northern declination) the shadow of the gnomon’s tip would fall, at midday, on point D.

Clearly what is required is *not* “the ratio of the length of the gnomon to the diameter of the dial plate” but “the ratio of the length of the shadow-casting edge of the gnomon to the distance between the edge of the dial plate (along the Noon line) and the root of the gnomon”. Before this can be determined, however, one first needs to know where the root of the gnomon is to be located; since

the opposite edge of the dial plate has been demonstrated not to be suitable. Again there is no real sound geometrical ratio: many diallist have placed the root of the gnomon half-way between the centre of the dial plate and its edge, or half way between the centre of the dial plate and the most internal of its concentric engraved circles: which is as good as being quite arbitrary. There exists, however, a pseudo-geometrical method which consistently presents itself in mediæval MS and early printed dialling tradition; and works effectively enough at Latitudes which are decently higher than Latitude 30° (at which Latitude Mr. Sylvester’s “messdial” will present itself!)

On a dial plate whose radius is EA (and EB) make the angle FBE equal to the colatitude of the place in question and set off the radius EB along BF to determine point F. Draw the line HFG through point F at right angles to line FB: point G is the root of the gnomon. Set out the angle HBF equal to the obliquity of the Ecliptic (one might just as well assume that this is 23½°, ‘everybody else’ does): line GFH is the length of gnomon required. Everything else should be ‘quite clear’. If you want to tangle with trigonometry then the formula

Cosecant of Latitude times Radius of Dial Plate
will give you the distance GB. And the formula
(Cotangent of Latitude plus Tangent of 23½°)
times Radius of Dial Plate

will give you the distance GH.

But, ‘when all is said and done’ Mr. Sylvester’s final solution is the best. Spot on sir! You got there in the end!

Peter I. Drinkwater 1990

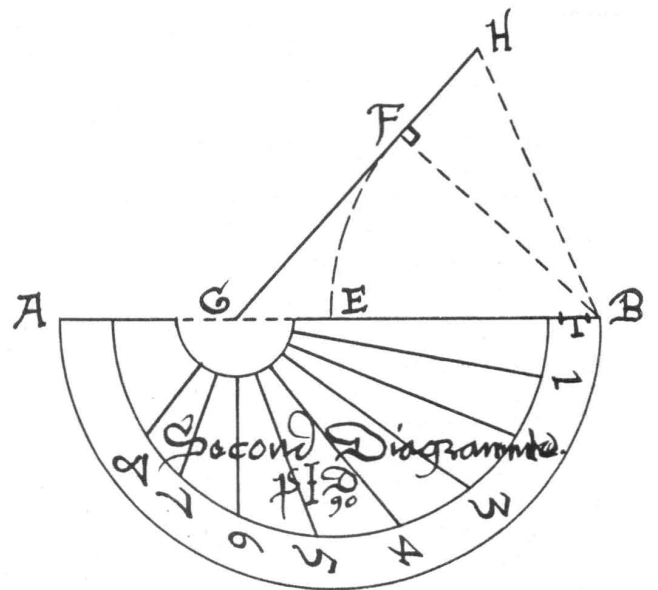
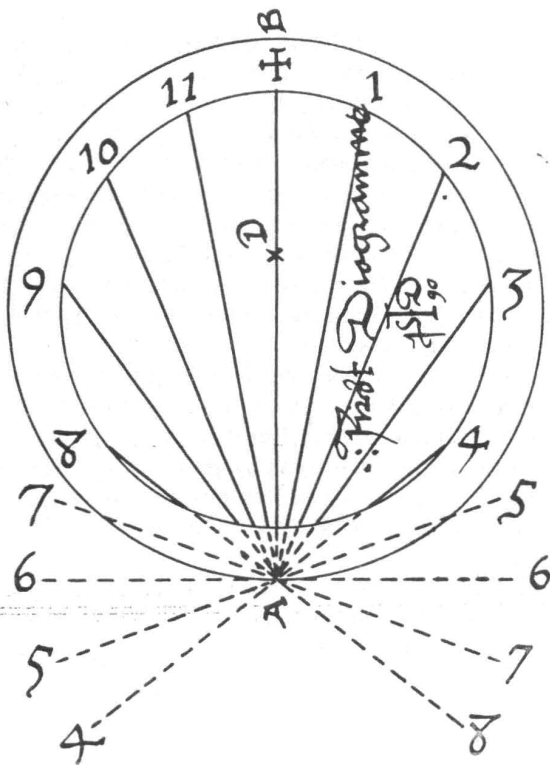


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Note about the BSS computer special interest group

At the late Dr. Somerville's suggestion, James Taylor wrote to a number of BSS Members in April 1990 asking them about their uses of computers for sundial design and calculations. Most replied, and later some other members, and indeed non-members from France and Germany sharing the same interest, gave a brief outline of the machines and software they have written or use for these purposes. The total was about a dozen people.

A short report has been sent to them in August 1990, and a copy supplied to the Editor of the BSS Bulletin (the last not for publication, but for availability if any other Members are interested).

In brief the most used machines are IBM compatible computers, with a minority using a wide variety of other personal computers. Some respondents use two or more different machines for different sundial-related purposes.

James Taylor has asked respondents how they would suggest pursuing their interest in common; and has suggested that one way might be to get together, with appropriate computers, to demonstrate what they have and take a look at what others have, in a London location in May 1991, perhaps using the occasion of a sundial exhibition he is getting together.

SEASONAL-HOUR SUNDIALS FOR THE BRITISH ISLES (50 - 60°)

Before the mechanical clock became well-known in the 15th and 16th centuries people used the old method of dividing the sunlit day into twelve equal parts: this duodecimal system goes back through the Romans, Greeks and Egyptians to the earliest Mesopotamian civilisations. These intervals are not constant, being of greater duration in the long Summer days and shorter in Winter, so they are called SEASONAL HOURS. The day began at sunrise, half-way through the morning was the end of the 3rd hour, midday marked the end of the 6th hour, half-way through the afternoon was at the end of the 9th hour, and the day (and the 12th hour) ended at sunset. A very practical system for agricultural communities with no good source of artificial illumination!

The 'time of day' in seasonal hours was measured by various forms of sundial with horizontal or vertical shadow-casting gnomons, of which only the TIP was the operative index. Ancient peoples appear to have laid out the accompanying dial patterns by various procedures - some more accurate than others - but always divided the hours by straight lines. Modern spherical trigonometry combined with computer graphics has proved that the boundaries are in fact shallow curves, although the departures from linearity are very small at latitudes less than 45°. The following pages show accurate seasonal-hour sundials for the range 50-60°, which covers the British Isles.

VERTICAL DIALS

These have been calculated for upright, truly south-facing walls. The 50° dial includes the numeration for the northern hemisphere: southern dials are mirror images. The distance of the point of the horizontal peg-gnomon from the dial plane is always $\frac{1}{5}$ of the length of the long axis of the surrounding box. The resemblance to the 'scratch dials' found near the south porch of many of our older churches is not accidental!

The dashes mark the 'equinoctial line' followed by the shadow of the tip of the gnomon at the equinoxes, when the seasonal hour becomes identical with our more familiar 'equal' hour.

HORIZONTAL DIALS

These have been calculated for a level horizontal plane surrounding a vertical pointed pillar - an 'obelisk'. Curvature of the hour lines is much more obvious than with the vertical dials. The 50° dial shows the numeration for a northern hemisphere site: it must be reversed in the southern hemisphere. The short dashes mark the equinoctial line.

Horizontal seasonal-hour dials tend to be very large compared with the height of their gnomon. Note should be taken of the fact that these diagrams are not all drawn to the same scale: the height of the shadow-casting tip above the dial plane varies between $\frac{1}{20}$ and $\frac{1}{50}$ of the length of the long axis of the surrounding box.

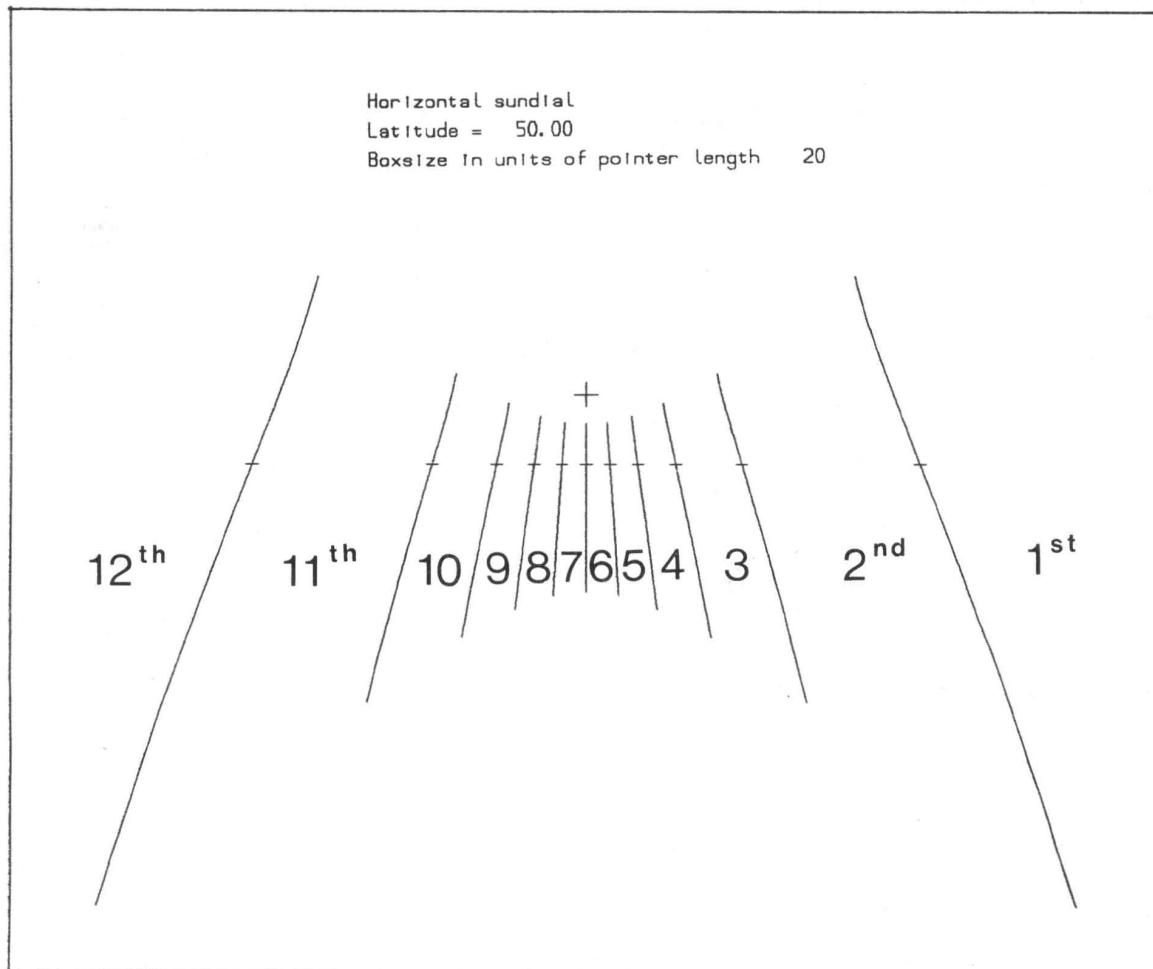
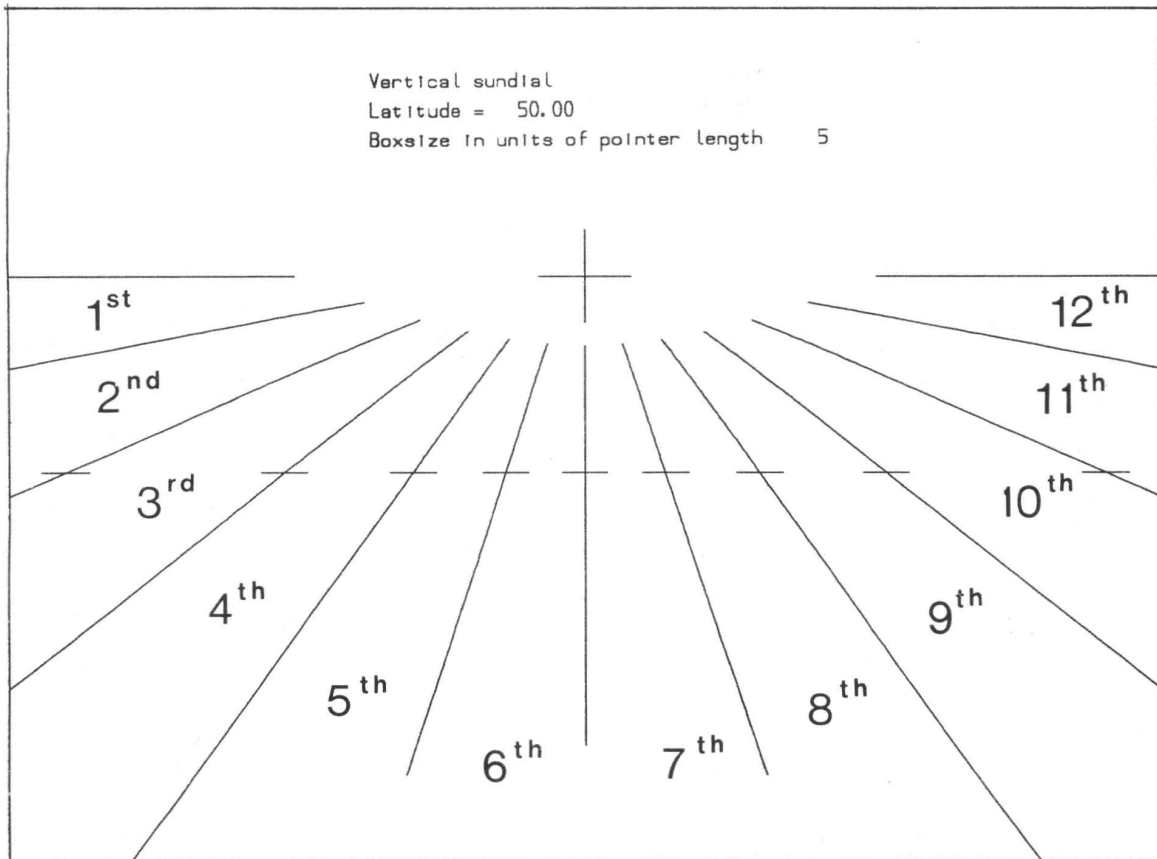
PRACTICAL DIALS

The pattern for the latitude nearest to a given site may be mounted on a plywood panel, and a nail driven in from the rear so as to protrude the required amount then gives a convenient gnomon. Any pattern may also be enlarged (on a photocopying machine or otherwise) and will still work accurately provided the length of the gnomon is found as a fraction of the long axis of the box surrounding the enlarged dial. A correctly oriented dial should display a shadow point following the equinoctial line at both equinoxes, and crossing the seasonal hour lines at intervals equal to our modern hour.

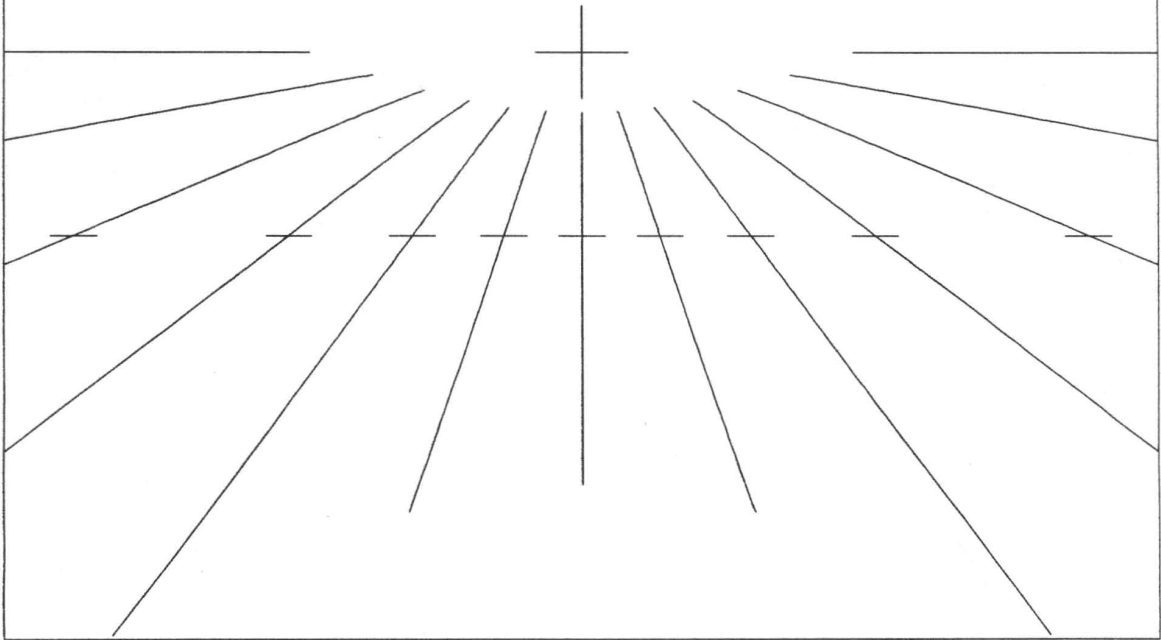
Of course, as for any sundial, a really accurate instrument should be computed for the site where it is to be installed. I am willing to do this for any member of the British Sundial Society who writes to me giving details of his exact latitude, whether a horizontal or vertical dial is required, and enclosing an A4 size stamped addressed envelope.

An extensive review of seasonal-hour sundials is scheduled to appear in *Antiquarian Horology*.

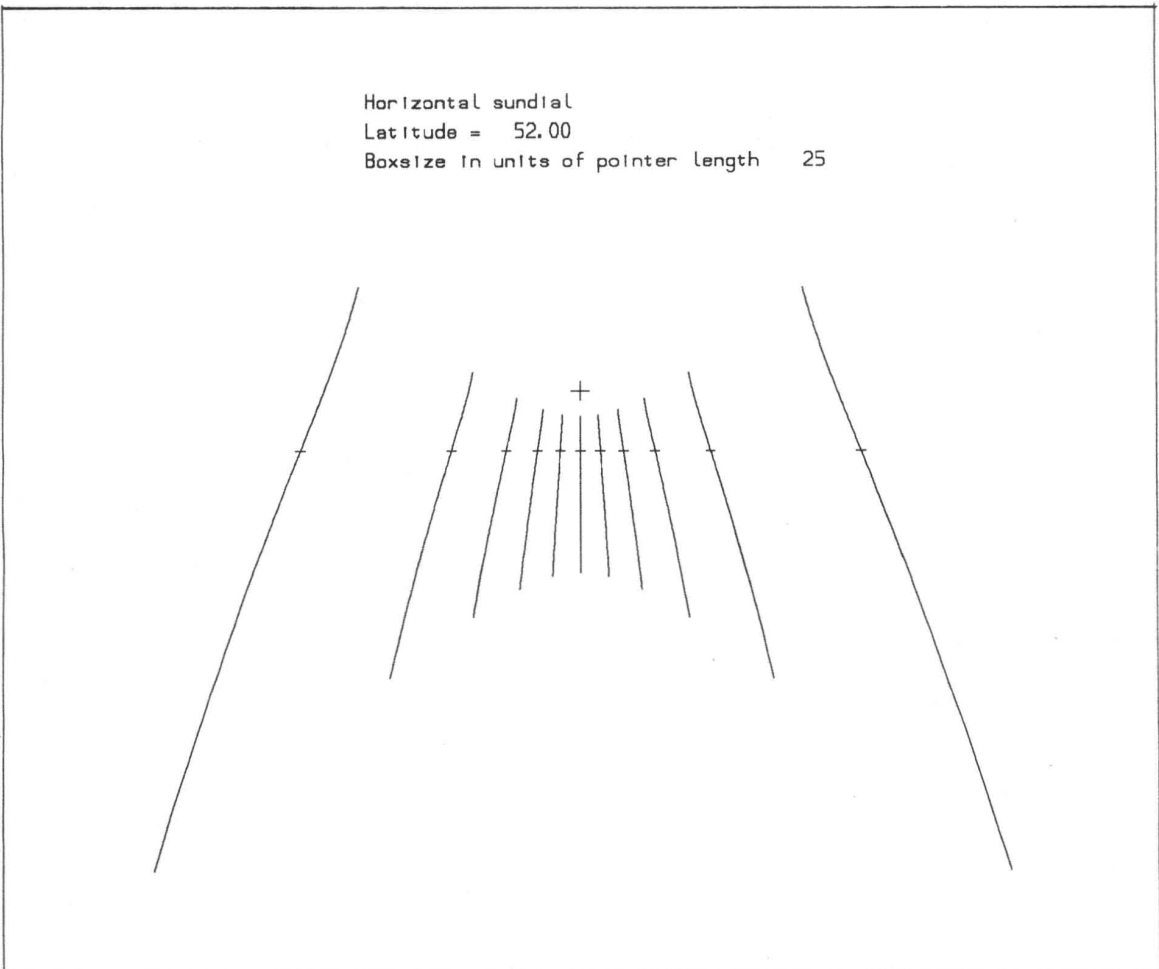
Allan Mills
Astronomy Group, The University, Leicester LE1 7RH.



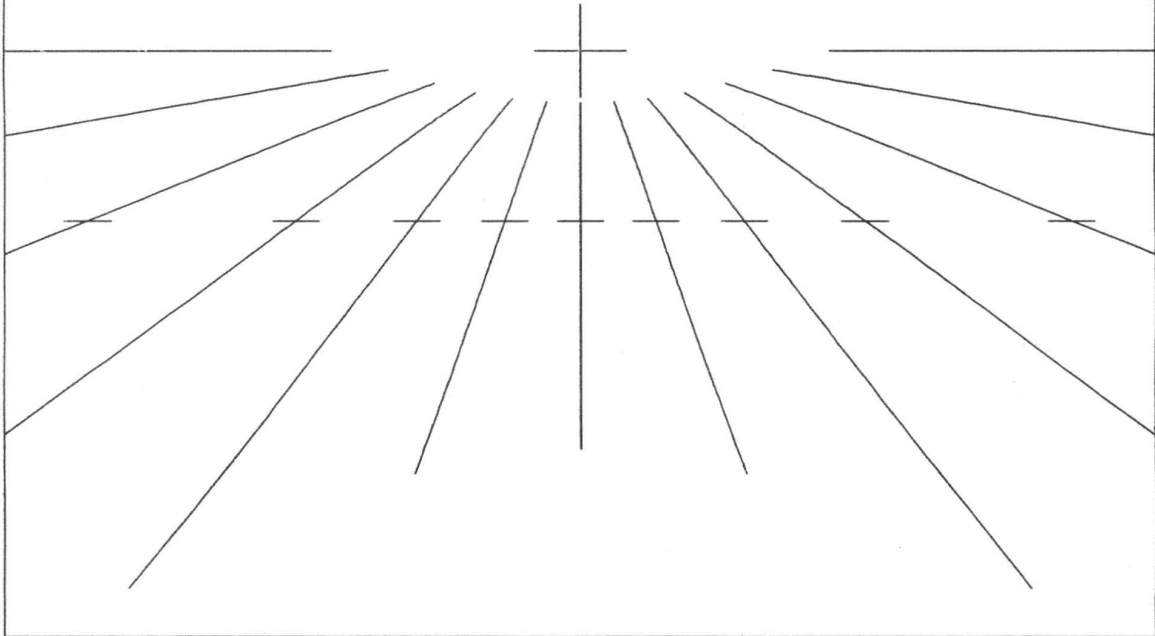
Vertical sundial
Latitude = 52.00
Boxsize in units of pointer length 5



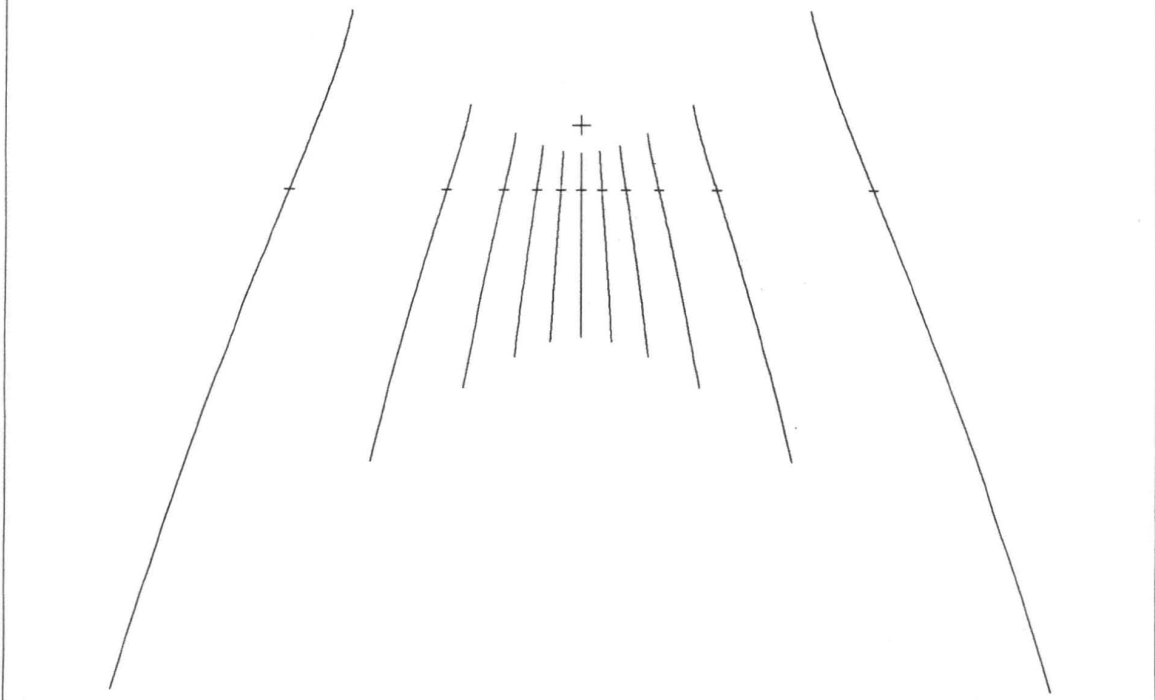
Horizontal sundial
Latitude = 52.00
Boxsize in units of pointer length 25

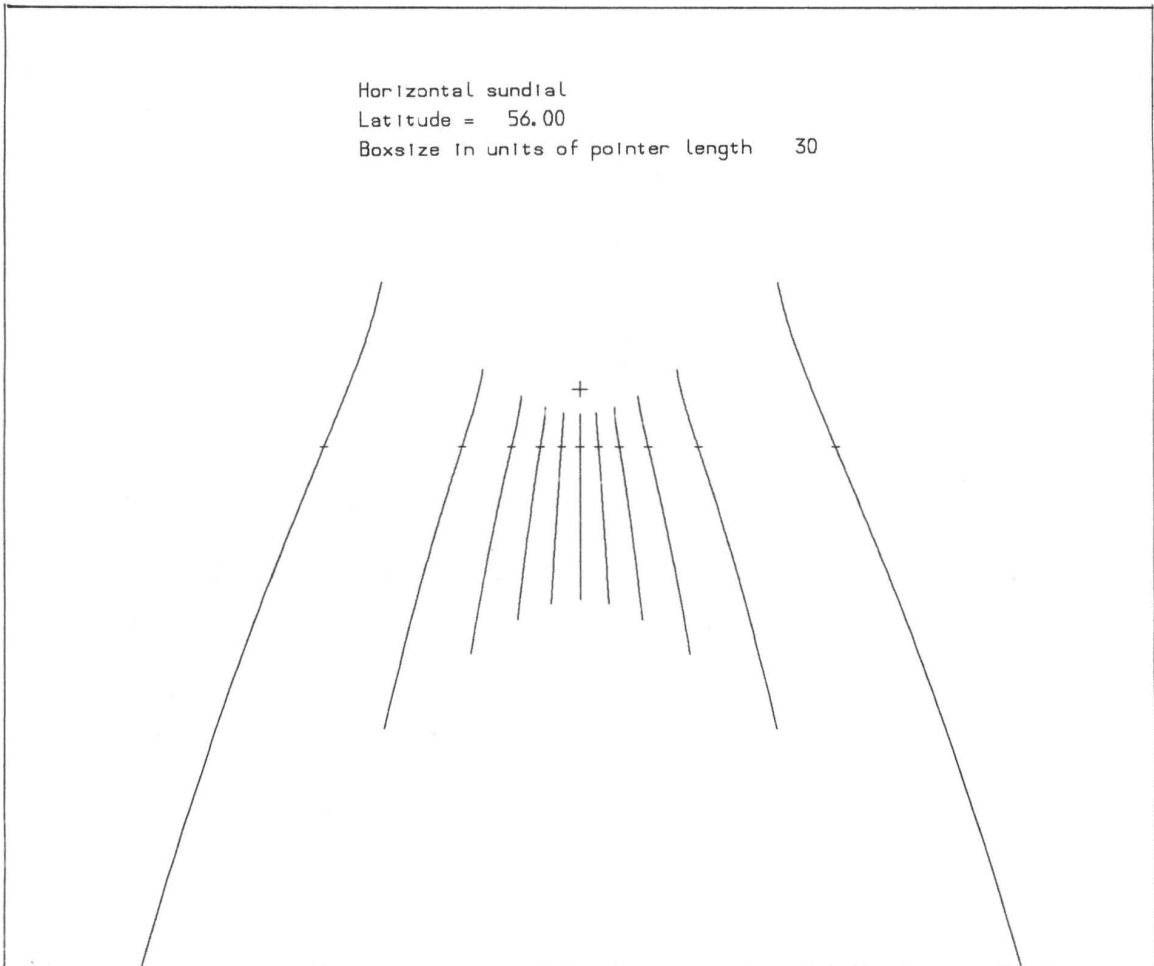
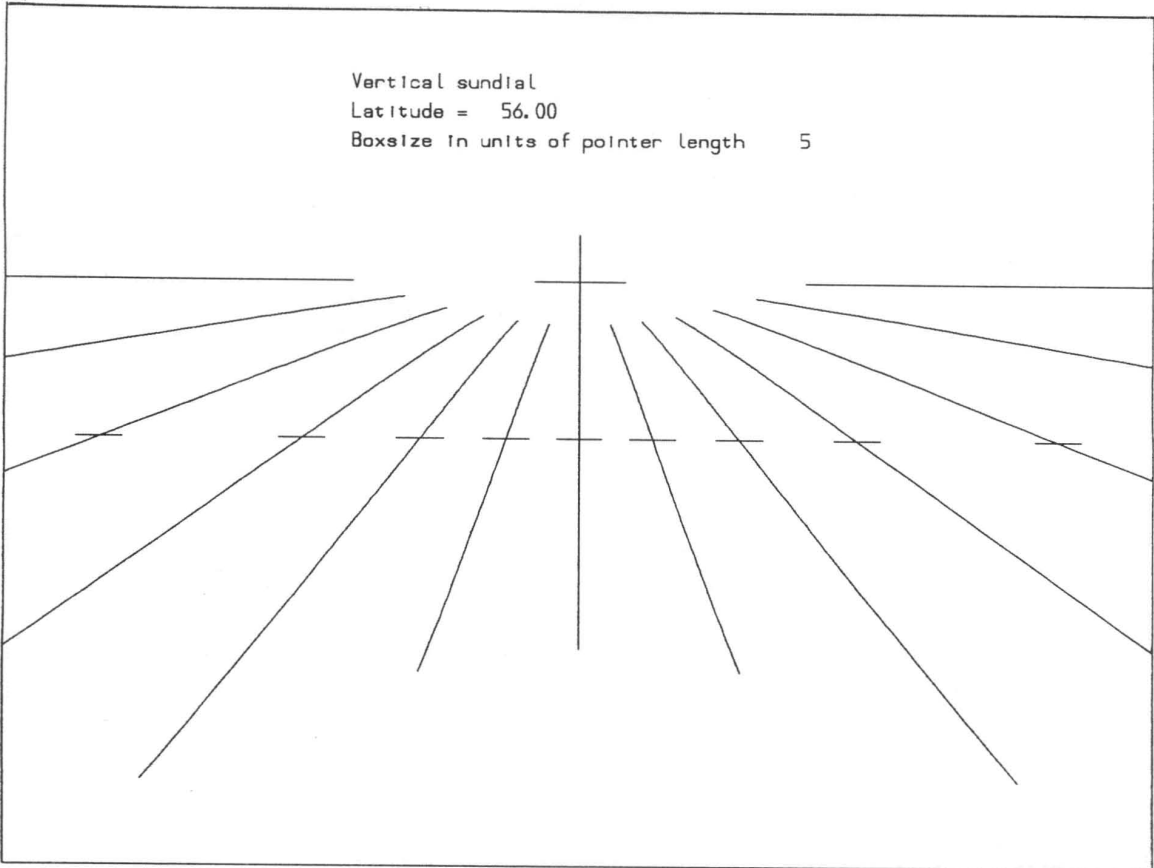


Vertical sundial
Latitude = 54.00
Boxsize In units of pointer length 5

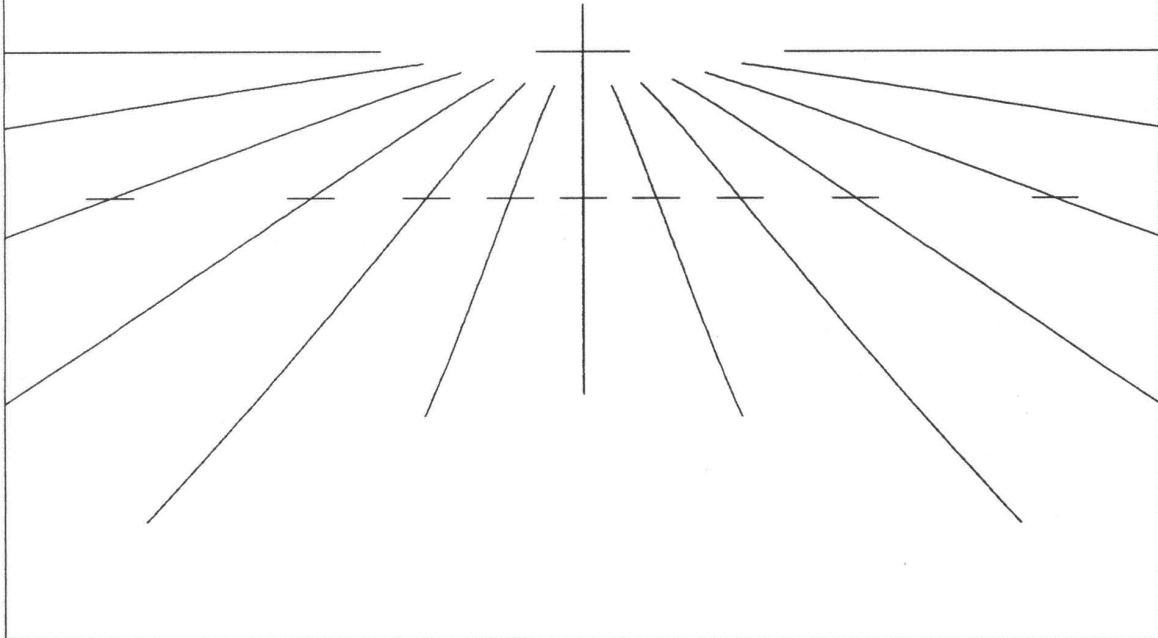


Horizontal sundial
Latitude = 54.00
Boxsize In units of pointer length 25

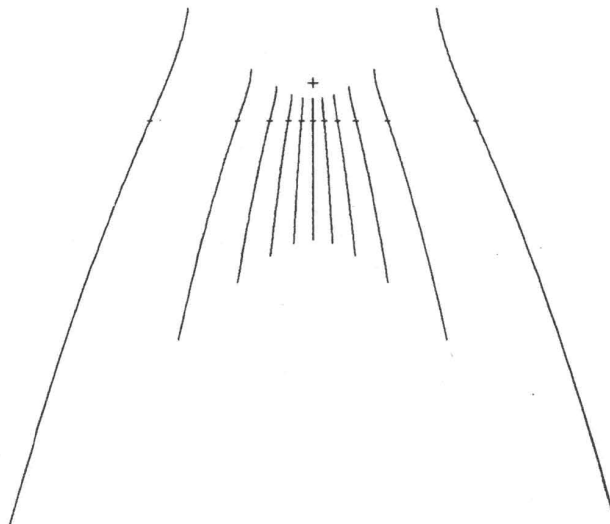




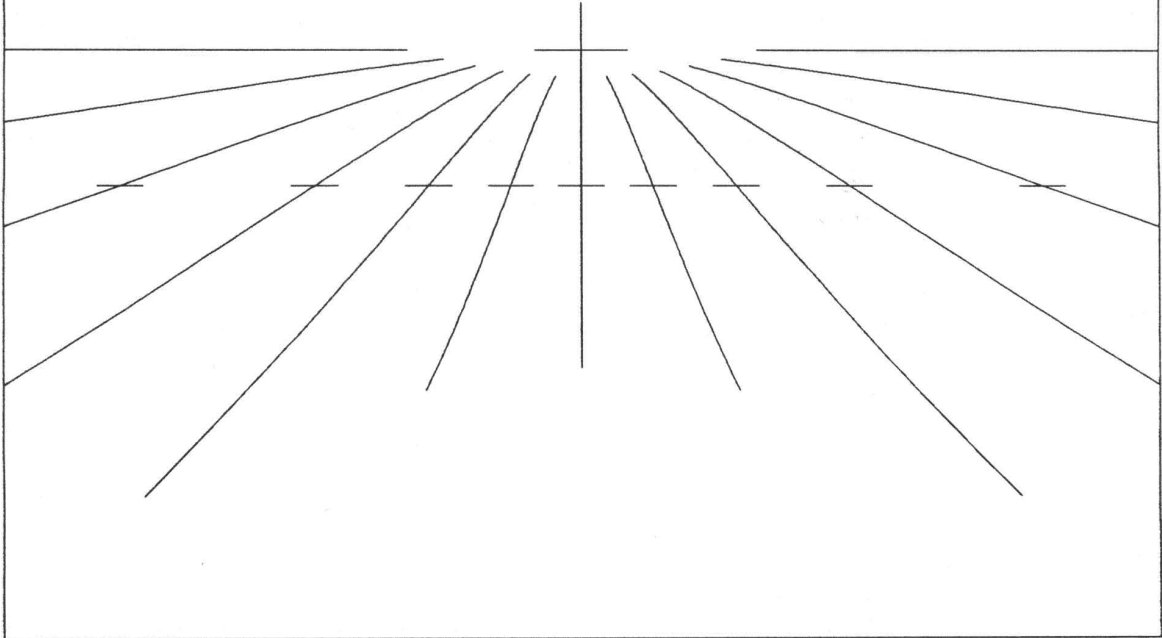
Vertical sundial
Latitude = 58.00
Boxsize in units of pointer length 5



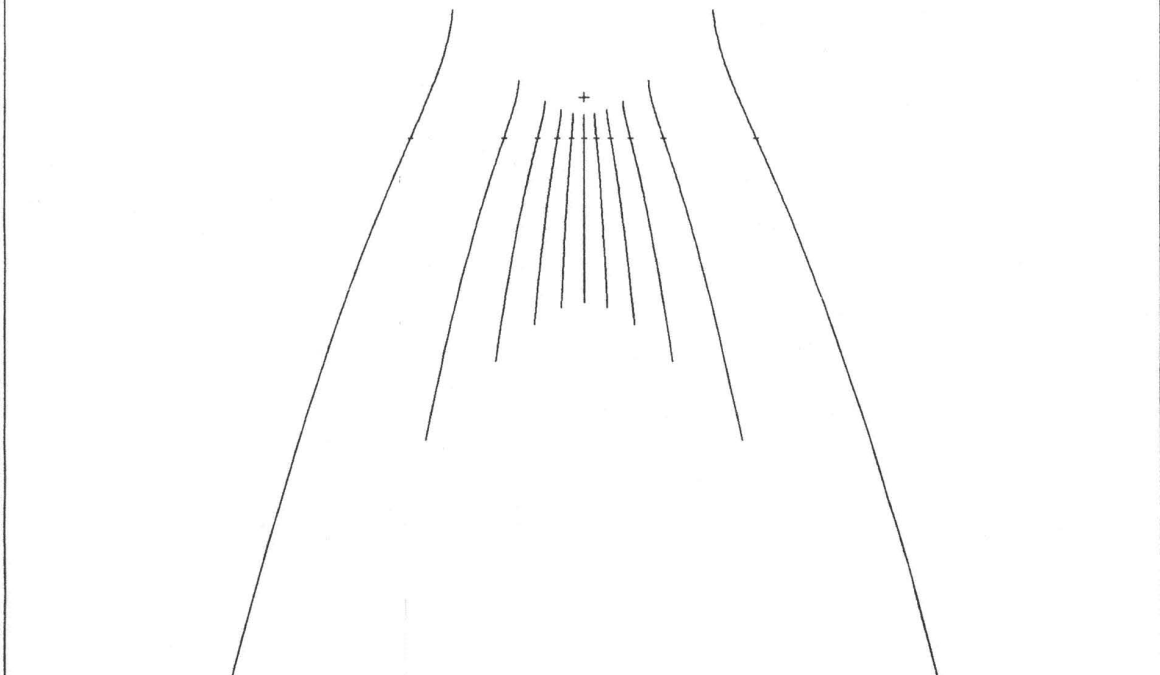
Horizontal sundial
Latitude = 58.00
Boxsize in units of pointer length 50



Vertical sundial
Latitude = 60.00
Boxsize in units of pointer length 5



Horizontal sundial
Latitude = 60.00
Boxsize in units of pointer length 50



DR. ANDREW R. SOMERVILLE
A PERSONAL APPRECIATION BY CHARLES K. AKED

My first meeting with Andrew Somerville was at the lecture he gave on "Sundials of Scotland" to members of the Antiquarian Horological Society at the Science Museum, London, on 20th February 1986. This, together with his later articles on sundials in *Antiquarian Horology*, was the stimulus which led me to deciding that a dialling group within the AHS would be appropriate.

After waiting to see if someone else would take the initiative, I contacted David Young, a great friend of Andrew Somerville, and so we three corresponded to the point when we agreed to publish a joint letter, inviting those interested in dialling to reply to any one of the three signatories to the letter. This letter was composed by Andrew and was the first step in the process of restoring gnomonics to its proper place in horology. It can only be said that the response from AHS members was disappointing.

A first meeting of the original proposers was held at David Young's house at Chingford, Essex. After much debate it was decided that a sundial group would be feasible if we could get at least fifty members, and this group would be for those interested in sundial research at an academic level. However a number of those who would be most valuable as members had declared that they would not join the group if membership of the AHS was a prerequisite condition, and as these outweighed the number of AHS members signifying their willingness to join, the formation of a group within the AHS seemed doomed to failure. Andrew stated that he saw no reason against going it alone but we should put it off for another year when the prospects might be brighter. My own view was that, having seen the years slip by without anything tangible resulting, the time was already ripe and whilst I had done my best to get the group within the AHS, I now proposed that a new independent society be founded there and then. This was supported by David Young, and so at midday on 5th May 1989, with some misgivings about the possible viability, the British Sundial Society was born. This was not completely out of the blue because behind the scenes Andrew had been busy laying the foundations and thus the new society was able to function from the very beginning, with Lord Perth, a friend of Andrew's already having promised to be our Patron. There was no difficulty in choosing a Chairman, and Andrew became the first.

By June 1989 the first British Sundial Society *Bulletin* was printed and delivered. It has 24 pages, the major article included was on the Madeley Court dial, Shropshire, by Andrew. Only one hundred copies were printed but vanished immediately. Andrew threw himself wholeheartedly into the work of consolidating the Society, and within a few weeks of its formation, he put into effect his grandiose scheme for a weekend Gnomonics Conference at Oxford.

An ambitious programme was prepared by Andrew, lectures, tour of the Oxford College sundials, visit to the

Museum of the History of Science, and an exhibition of members' work and photographs. How all this was to be fitted in the space of two days did not seem to bother him at all, however he received the most splendid support from David and Lilli Young who prepared the presentation packs for the participants, attended to the registrations, placards and notices, and the thousand and one other little things so necessary to run a conference properly and smoothly. Under Andrew's chairmanship the whole programme unfolded smoothly and steadily without the slightest hitch. The lecture he gave on "17th and 18th Century Scottish 'Symbolic' Dials", his own special field, was a model of preparation, lucidity, and delivery, with beautiful slides taken by himself. At the end of his lecture there was a spontaneous and well-deserved round of applause from an appreciative assembly.

No sooner had the conference ended, and without leaving Exeter College, Andrew called a meeting of the newly appointed Council to outline his more ambitious plans for the future of the Society, including Education, Computer Dial Listing, and a bigger and better Conference which he would like to be held in Edinburgh in 1991. These plans were further consolidated at the Council meeting held at his house at Higher Poynton on Sunday, 10th June; when he and Anne entertained about fourteen guests. The following day, Andrew, David and Lilli Young, and myself visited Jodrell Bank to discuss Andrew's proposals with the Astronomer Royal, Sir F. Graham Smith, and his assistant Ms Sylvia Chaplin for and outdoor exhibition of the history of dialling.

It is an absolute tragedy that such a fine and dedicated person should be taken from us when at the very height of his success in his dialling endeavours.

I personally thought Andrew was a typical Scotsman and a trifle dour at our first meeting. In the course of later meetings and through correspondence, I soon realised that he had a puckish sense of humour and a razor sharp intellect, together with a mastery of the subject of dialling far beyond the majority. Yet he was, at the same time, a most modest and unassuming man, generous with his advice and his time, tolerant of those who were ignorant or in error. I, for one, will greatly miss receiving his cheerful letters, his telephone calls, but most of all the loss of someone to whom one could turn for advice and decision on any dialling question.

To mark his great contribution to the art, plans are already in hand to provide a permanent memorial to his memory. These will be revealed when there is an opportunity to discuss these at a full Council meeting. And I would also like thank all those who have written to me personally about Andrew after the receipt of the sad news, these letters show that my thoughts are reciprocated in their generous comments about him. There can be no finer tribute to his memory than so many mourning his passing.

Charles K. Aked, 30th June 1990.

SOME SUNDIAL SAFARIS WITH ANDREW SOMERVILLE

G. R. HIGGS

My diary entry for 30 August 1984 reads "Met Andrew and Anne Somerville at Kenbridge".

In the ten volumes of 5-year diaries started by my late wife at the time of our marriage in 1941 there are only a few entries of more significance for me than that one, although this first entry did not start me off on sundials, in fact sundial interest occasioned the meeting.

It came to pass thus. When I retired 25 years ago from a working lifetime of designing and building electric locomotives, we returned to my native haunts where we had converted a farm cottage with an acre of garden and an open southern exposure, just asking for a sundial.

This I produced in the form of an 18 inch armillary dial with an equation correcting gnomon in the form of an analemmatic body. The device elicited interest from various friends, and in particular Mr. Hean, Superintendent of Threave Gardens, of the National Trust for Scotland. At his request I re-gnomoned and set up two dials - a vertical and a horizontal - in the Gardens. Some time later he took me to the Trust Gardens at Culzean Castle to discuss how to refurbish the large lectern dial there. It has 51 faces and weighs three hundredweights [about 150 kilos]. Most of the 25 copper gnomons were missing and 300 years of weathering had removed many of the hour lines. My advice, given with some trepidation, was to ship it to my home and allow me a few months to re-gnomon it, plus calculate and scribe the missing hour lines.

It was while this massive polyhedron was in my garden that I read Andrew Somerville's letter in the *Scots Magazine* asking anyone with knowledge of interesting Scottish sundials to let him know of them. I wrote, sending photographs of "my dial", and had an immediate and enthusiastic response, including a photocopy of page 427, Volume V, of MacGibbon and Ross, showing an apparently identical dial at Calder House. Then followed arrangements for the Kenbridge meeting. Incidentally, subsequent study of National Trust records disclosed that the "apparently identical" dial was in fact the actual dial from Calder House, which had "changed address" in 1971.

Andrew and Anne spent four days here exploring 18 dials between Mull of Galloway and Dumfries, most known to Andrew from old records, and some of which I had knowledge. This set the pattern for subsequent visits as part of the annual Somerville Sundial Safari, when we explored more sundials and widened our interests to include historical and geological sites in which this district is rich. The most productive of these visits were the first, and the last only a few weeks ago.

As students of sundials well know, these dials - even massive ones - have very little security of tenure, frequently being moved from place to place, sometimes over very long distances. Recently I was involved in the "forcible repatriation" of a brass dial, engraved with 32° North latitude hour lines, to Louisiana, where it has now settled down very happily.

On the first day of the Somerville's first visit I took them to Hensol House, where Admiral Sir Nigel and Lady Henderson were happy to show their large 57 face lectern dial. Over coffee and before seeing the dial Andrew described his previous day's frustration at failing

to find a large polyhedral sundial described by MacGibbon and Ross as being in Lainshaw in Ayrshire. Imagine his great surprise when his hostess said "Drink up your coffee and come and see it; it was brought here 70 years ago by the then owner of both estates".

For me the Hensol visit was of special significance since Sir Nigel asked me to have the dial in my garden workshop to refurbish it. This I did over a period of several months. It involved the making of 19 gnomons in copper, and in solving the declining/reclining problems described by Thomas Digges as "most difficile and conteyning most art" (see *Bulletin* 89.2). From markings on the dial pedestal and the study of estate papers, Lady Henderson (a member of the British Sundial Society) dates the sundial to about 1670.

Another "missing person" quest during this visit was at Castle Wig in Wigtownshire. The Castle was destroyed by fire some 50 years ago. Rumour had it that part of the dial had been built into a new wall, so much time was spent on our knees, not in prayer, but looking for stones with interesting markings. In fact Andrew ran it to earth much later in a public park in Aberdour, Fifeshire.

Yet another errant dial in which Andrew involved me is the cube sundial described in MacGibbon and Ross as located at Meadowbank, near here. The occupier, a friend of mine, insisted that he had no sundial and invited me to come and see for myself. On Andrew's next visit we went there, and whilst I hunted for my friend, Andrew found the dial built into a rockery. The top gnomon was gone and the hollow contained soil and a plant, presumably thyme!

The owner was delighted at the find and made a plinth for the dial, meanwhile sending me the dial to have a new gnomon fitted. While working on it, I was surprised to find the top and base were not parallel, the latter having been chipped away by 4°. It would therefore appear that the dial gnomons and lines had been made for a more northerly site, for example Orkney. On removal 4° south to Meadowbank, the base had been changed by this amount to make the dial feel at home in its new location. Now, surprisingly, the owner is moving to Perthshire and the dial is going there too, so it will have to change, once more, its outlook on life, this time back 2°.

Another hands and knees episode had Andrew, Anne and me on all fours round the big dial at Glamis Castle. This 300 years-old dial stands 21 feet high and has 84 faces. The four main dials are vertical and carried by four large lions rampant. The north lion had carelessly lost its gnomon, for which I made and fitted a replacement two years ago. On this occasion our interest was in the Equation of Time figures carved all round the octagonal base, corrections being given for every third day throughout the year. The figures were barely legible because of lichen growth, and the three of us were busy (with the Castle's permission) brushing them clean. The disclosed figures did not, however, agree well with those in our tables, for the interesting reason that the 17th century diallists had not been converted to the Gregorian Calendar at the time of cutting the figures.

Our very last outing together was only four weeks before Andrew's death. After an overnight stop with me, Andrew and Anne took me on a four day tour involving

Edinburgh, Drummond Castle obelisk; and culminating at Dunphail near Inverness, where Andrew saw for the first time "in the flesh" the bronze obelisk presented to Sir Hector Laing on his retirement. It was cast by sculptor Gerald Ogilvie-Laing at his foundry to Andrew's design.

The obelisk is a truly remarkable creation, in conception, design and execution, the final result is one of which Andrew had every right to be proud, and in which Anne can have abiding satisfaction. Its height is about 6½ feet [approximately 2 metres], it has about 50 faces, each showing its own gnomonic feature, eg Babylonian and Italian hours, and time elsewhere in the world in the places where the owner had his business interests.

Between visits Andrew and I conducted a lively, if

desultory correspondence under the heading "Gnomonic Gnus", in which we discussed any new dials we had seen or heard of, and any new ideas. On one occasion I told him of the window dial I had "invented" with my friend David Gulland, glass engraver and fellow member of the British Sundial Society. The idea was that a small spot on a window pane cast a shadow on a vertical glass panel, engraved with hour and declination lines, and mounted quite close behind the pane, thus indicating the time. Andrew replied promptly with a photocopy of Ozanam's *Mathematical and Physical Recreations*, published in 1708, describing much the same thing.

Truly, there's nothing new under the sun.

Kirkcudbright, 15.7.1990

BOOK REVIEWS

Cadrans Solaires de Précision - Notions théoriques et réalisation à l'aide de l'informatique. [Precision Sundials - Theoretical ideas and practical realization with the help of data]. Yves Opizzo, 159 pages, profusely illustrated plus line diagrams. Published by Masson, Paris, 1989. 9½ x 6½ inches. Glossy thin card cover, French text. ISBN 2-225-81806-1. Price not known.

A sundial book with an unusual presentation, it is divided into two main parts, first the theoretical principles, which include a sketchy outline of the main types of dial; and second the practical realisation of such principles in the sense of solutions - not the actual making of dials. A number of appendices follow, with a sign of the time in the inclusion of computer program listings for calculating the exact delineation of many types of sundial.

The author, in his foreword, writes of his little book designed to fill the gap between the simple and complex works found in abundance these days. But he firmly bases his final solutions on his computer approach.

His first chapter quickly moves into space to give an outline of the complex paths woven by the moon, earth and sun, ending with the constellation signs of the Zodiac. Evidently the ancient link between astrology and astronomy is too strong ever to be broken.

Chapter two is concerned with the variable length of style, latitude and longitude, inclination and declination, and finding the meridian. Chapter three deals briefly with the mathematical formulae, before going on to deal with the various types of dial in Chapter 4, the treatment being quite brief and uncluttered with detail.

The second part of the book opens on page 43, beginning with the calculation of hour lines, declination and so forth. Whilst there are five chapters, they are quite short, in fact one is only one page in length! By page 54 these are ended and the first of a series of Appendices is reached. This gives the diagrams for the delineation of five dials given in Appendix 2, in the form of about fifty pages of tabulated figures derived from a computer printout. Appendix 3 lists the program for a Modula

Program for dialling calculations and a Basic program for gnomonic declinations. Additional diagrams are given in Appendix 4, a total of 23 based upon a latitude of 47° and longitude 2° east of Greenwich.

In his one-page conclusions, the author hopes that he has helped his reader to discover the infinity of dialling [which is the attraction of the subject today]. A very useful five page Glossary is included, and a two-page simplistic bibliography but which has the useful feature of classifying the books in order of importance, ie simple, reference, essential, and so on. On the final page details are given of how to obtain a 5¼ inc disc for the IBM MS-DOS 360 kilobyte program, calculated details for dials when the basic information is provided, ie precise latitude and longitude, declination and so on. Actual plans are supplied to an A3 size.

Yves Opizzo is an amateur astronomer, and has been a professional gnomonist for some years. His text, by the way is interspersed with examples of dials in Germany and the Black Forest. One can only say that the small offset litho illustrations do rather less than justice to the dials themselves and the book itself, whereas the line diagrams, although often miniscule, are quite clear and legible.

For most English readers the French text will be a stumbling block. The computer programming can be tackled without the understanding of much French, providing a French/English dictionary is at hand. This book firmly links the oldest scientific instrument for the measurement of time with the latest calculating instruments, although the latter are only a means of calculating otherwise tedious mathematical steps with great speed and absolute accuracy. This last is the true purpose of the book, the delineation of precision sundials. Your dial may be set out perfectly to the nearest second, but if you can only read to the nearest minute or five minutes because of a slightly fuzzy shadow, exactly what is one trying to achieve? There seems to be a moral here somewhere.

Charles K. Aked. 24th July 1990

The Ancient Sundials of Scotland, Dr. Andrew R. Somerville. 32 + 104 pages, 17 illustrations, plus engraving on cover and title page. Published by Roger Turner Books Ltd., London, 1990. Soft grey card covers. Price £12.00.

One of the not-to-be-forgotten events of the 1989 Oxford Dialling Conference was to be presented with a copy of this book with a dedicatory inscription on its title page. It will remain a treasured possession and a constant reminder of a truly fine person and friend. It was the lecture on Scottish Sundials given by Andrew in February 1986 which provided the catalyst to the events which led to the foundation of the British Sundial Society.

Amongst the neglected treasures of Scottish history and art, the subject of the monumental sundials unique to Scotland is an outstanding example. Unrecognized by the vast majority, uncared for through the centuries, it is a miracle that so many have survived. Thanks to the research and pioneering efforts of Andrew, these dials are now being recognized as worthy of conservation to preserve them for future generations.

The book is divided into two main parts, first the reprint of his article in the *Proceedings of the Society of Antiquaries of Scotland*, Volume 117, (1987), pages 233-264, secondly a word processor compiled Catalogue of Scottish Sundials filling 104 pages to replace the former microfiche format of the original.

A short introduction leads to twelve pages of actual dial descriptions, and on to the history of these dials, continental influences, symbolism and, most importantly, conclusions. Summarized listings of the dials by county and type follow, these were intended to supplement the microfiche catalogue but still remain useful with the printed catalogue. The original article ends with acknowledgements and a useful biographical list.

If the constraints of present-day finance were not so restrictive, no doubt this work would have been

expanded into a much larger volume, much to our benefit. It therefore does not entirely supersede McGibbon and Ross, or Ross's own treatise, first printed in the *Proceedings* ... over one hundred years ago. In this the sundials were illustrated by engravings, so the present work with photographs is superior in giving the appearance of these superb structures. Ross, being an architect, was more meticulous in giving dimensions, so is not completely superseded. Ross was unable to give exact answers to the problems posed by the unique branch of dialling developed in Scotland and nowhere else. Andrew had advanced our understanding further with this suggestions and conclusions, although no categorical solutions have been propounded.

It is, nevertheless, true to say that there is no overall treatment of any class of sundials specific to a particular country which has reached the completeness of detail presented here, in spite of the very great advances in gnomonics in the last few decades. The completeness of Andrew's research programme is unmatched by any undertaken by any other group. It will be a long time before another student can expand the boundaries reached in this work, and no future researcher will do this without absorbing the contents of this work first and being in the author's debt.

No one considering himself a diallist can be without a copy of this book in his gnomonic library, and if interested in Scottish sundials, it is quite indispensable as a *vade mecum* in the field. Diallists must therefore count themselves fortunate that the vast knowledge of Dr. Somerville in this area was recorded in print before his untimely death. It is a worthy memorial to his efforts in this long-neglected branch of dialling, not forgetting the unstinted help of his wife Anne and his great friend George Higgs.

Charles K. Aked

This review was unavoidably held over from the previous Bulletin No. 90.2

NOEL TA'BOIS

Many members will know of Noel Ta'bois for his contribution to the 'Sundial Page' in *Clocks* magazine and of his death early in 1988. The Society has now received a gift of his entire collection of sundial slides illustrating over 750 dials. These had been left to his friend, our member Mr. Pat Briggs, who has generously

donated them to the Society. I am pleased to say that Mrs. Margaret Ta'bois has joined the Society and has given me access to his many sundial documents and notes and kindly asked me to keep any the Sundial may wish to have. We are most grateful to both members for these gifts.

TO THE PROFESSIONALS!

The Society receives many requests from the public for information as to where to buy a sundial for their house or garden. The list of makers originally compiled from members application questionnaires is now out of date. In order to compile a new comprehensive list, so that we can recommend appropriate local sources to inquirers, would all those who would like to be included please write to me giving the following information.

Name, address and telephone number

Types of dial supplied

Can you make and supply to customers design?

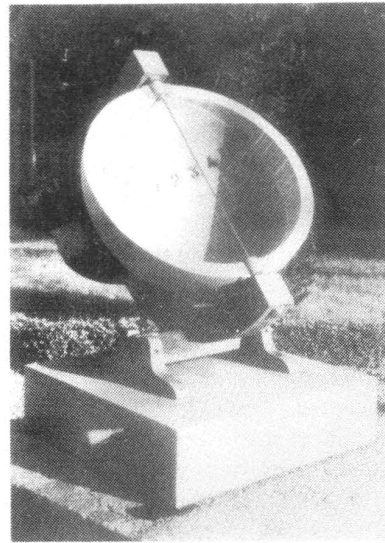
Do you supply plinths for free standing dials and do you offer a complete installation service?

Please send this information to me together with any literature you have available on your products. We would like to have your permission to photocopy part or all of such literature if required.

David Young

Q FOR QUESTION BY GEORGE WOODFORD

EDITOR'S NOTE: Mr Woodford is a constant correspondent and interested in the educational side of dialling. In the recent Brescia exposition he won third prize in the didactic section with the example of his work illustrated here. The explanatory text which he supplied with his model is repeated in its original form of the ever-useful question and answer approach. He is the inventor of an instrument called "Sunscan", whose development costs were paid for by the NRDC [National Research and Development Council of Britain], and protected by patent. He is now connected with *Noble Science* in France, creators and constructors of imaginative monumental sundials in Europe, presently building what will be the largest sundial in the world at Evreux in Normandy. The ingenuity and beauty of their dialling designs have to be seen to be believed. *Brookbrae*, the British firm, won *ex aequo* First Prize in the artistic section of the same international competition at Brescia - "Le Ombre del Tempo [The Shadow of Time]."



spaced at 15° of longitude, unlike the seasonal hours of the ancient and medieval world.

- Q. *What sort of sundial is this?*
- A. A *didactic* sundial, [didactic - "meant to instruct, having the manner of a teacher"] (Concise Oxford Dictionary) but not to give more than essential information, rather to help towards understanding of how time is derived from the sun. To do this it copies the geometrical relationship of the earth to the sun.
- Q. *Why a hemisphere? The earth is a sphere.*
- A. You can imagine it completed by a transparent second hemisphere so as to be a sphere like the earth. But we need a shadow inside the bowl to tell the date and the time. This shadow is cast by the bead at the mid point of the style, the centre of the complete sphere. This shadow registers a latitude (or declination) which gives the date and a longitude which gives the time of day. Imagine the ray of the sun to the bead. It has to come through the imaginary hemisphere first and would strike its surface at the corresponding but invisible longitude and latitude which is the invisible longitude and latitude of the sun in the Celestial Sphere.
- Q. *You are going too fast. I can see you have to have a bowl to have a visible shadow inside it.*
- A. Yes, that is a wonderful trick discovered in Egypt and used in ancient Greek and Roman civilisations. The shadow of the bead moves in the bowl to correspond exactly with the sun moving across the bowl of the sky, but it is a negative version of the sun, a shadow not a light, low in summer, not high like the sun, moving daily from west to east [instead of from east to west].
- Q. *Any difference between this dial and the Greek dials?*
- A. Mainly the inclination of the bowl to face towards the sun's path.
- Q. *Does that make it a better model of the earth in its relation to the sun?*
- A. Quite right! And also a dial so inclined measures constant hours, each of them represented by lines
- Q. *I see the bowl can be rotated on its axis. Is that to represent the earth's daily rotation?*
- A. No. The bowl is taken round every day with the earth through day and night and so automatically rotates with the earth in respect to the sun, and during the year it moves round the sun and so is given an annual rotation which determines the latitude of the bead shadow.
- Q. *But why is it then independently rotatable if it shares the earth's daily and yearly rotation relative to the sun?*
- A. So as to regulate it to tell conventional time. Our clocks do not keep pace exactly with the sun. So this sundial, which does keep pace with the sun, must be put back or forward occasionally if it is to indicate clock-time. To accord with the time changes of summer and winter, the dial too, like ordinary clocks, must be put forward or back an hour. Also if the dial is moved to another place at a different longitude, this displacement must be compensated for by rotation. The dial is similar to an old-fashioned grandfather clock which is put forward or back a bit if it is not on time, and with the sundial you do it by rotating the bowl a little to make it face a bit more east or west.
- Q. *Why does clock time not keep pace with the sun?*
- A. Because clock time is constant and is now determined by a group of atomic clocks. The sun's pace across the sky varies with the earth's distance from the sun, being faster in winter than in summer. It also varies because the sun rises to the summer solstice and falls to the winter solstice; thus its daily path is not absolutely perpendicular to the longitudes [except at the equinoxes]. These effects are small during the day but considerable over a season.
- Q. *In spite of this the dial requires to be reset to time only infrequently?*
- A. Yes. But the dial must be set up correctly in the first place. The infallible test for this is that the bead shadow should, on any one day, register almost exactly the same latitude [declination] all day long.

PROFILE - CHARLES K. AKED - EDITOR

Originally intended to pursue a career in chemistry and received training as an industrial chemist. The 1939-46 war intervened and caused a five year spell of service in the army, serving with REME in Radar and Communications.

Following demobilisation joined the family jewellery business in Rhyl but left after a year to join a research team working on naval communications, specialising in high power transmitters and advanced radar techniques. After forty years with the Royal Naval Scientific Service, retired as Principal Scientific Officer in 1984. Approximately thirty scientific papers contributed to the *Royal Naval Scientific Journal*.

A life-long interest in horology led to joining the Antiquarian Horological Society in 1962, being invited to join its Council shortly afterwards. Filled many honorary posts including Curator of the AHS collection, Librarian, Chairman of Publications, Book Review Editor, etc. Edited and published about thirty books and off-prints for the AHS, plus editing horological books for various publishing firms. Founded two groups within the AHS, becoming the first Chairman of the Electrical Horology, and the Restoration Groups, and initiating the successful exhibition of electric clocks at the Science Museum 1977.

Elected a Fellow of the National Association of Watch and Clock Collectors in America in 1979, and awarded Certificates of Commendation for contributions to horology. Was on the Editorial Committee for many years and is on the Library Committee of the NAWCC. Contributor of over 300 articles on horology to many of



the world's horological journals, but much material still remains unpublished. Presently Editor of the British Sundial Society *Bulletin* and *The Clockmaker*.

One of the founder members of the British Sundial Society and a Council member. Main interest is in the history and development of dialling. Has produced a listing of over 3,000 dialling works and references, plus publishing many articles on dialling, or including some aspect of dialling, such as the detailed analysis of the painting "The Ambassadors" by Holbein the Younger, 1533, see *Antiquarian Horology*, Volume X, No. 1, pages 70-77.

The photograph above was taken by Mr. Mike Delaney, 16th March 1990, on the site of the analemmatic dial installed by Brookbrae at the Thorpe Park leisure centre near Staines.

THE FORGOTTEN SUNDIAL

I was set, when young, just here,
My dial was both bright and clear,
People often glanced at me,
Wondering what the time might be.

Through changing season, rain or snow,
I was expected here to show,
The changing time, though no one cared
How Time changed me when not repaired.

Then one day, by chance, near by,
There fell a seed from out the sky,
Which in Spring, the following year,
Completely changed my whole career.

At first it seemed so small and green,
Amongst the grass it grew unseen,
Until the day its topmost leaf
Dappled shadows, dark though brief.

Ere long it grew so strong and tall,
I lay forgotten 'neath its pall,
Just another stone it would appear,
Should anyone by chance draw near.

Now green canopied above, and I below
Almost forget that which I used to show,
Just as folk now pass me by,
Unseen, neglected, lost though nigh.

Sometimes shafts of sunlight fall
Through the leaves and I recall
How once I worked the entire day,
With not a moment spent in play.

But quite the worst, and what I fear,
Is hearing voices drawing near,
"Who placed a dial 'neath this tree?
In constant shadow, as you can see".

If only I could state my case,
When set upon this ornamental base,
Long before this tree you see,
Slowly took the light from me.

And how I long to see the day,
When someone has the sense to say,
"Why don't we move the old dial here,
Where the Sun shines always clear?"

Once more to feel the sun upon my face,
Fresh winds and shadows set apace,
The open sky above quite blue,
Instead of lit by greenish hue.

Perhaps in heaven high above,
That pinnacle of hope and love,
Some corner may be set aside
For the souls of sundials to abide.

LETTERS TO THE EDITOR

A GEOMETRIC PUZZLE

Some Digges at Mr Higgs by Mr F J de Vries of the Netherlands:

Bulletin 90.1 contained the dial of Thomas Digges, with a suggested construction and a method to calculate declining/reclining dials. Whilst the described method is correct. I would like to make some comments because the method can be simplified.

First I present the definitions for the method about to be described:

Inclination of the dial = i the zenith-distance of a gnomon placed on the dial; or the angle between the horizontal plane and the back of the dial-plane.

$$0^\circ \leq i \leq 180^\circ$$

Declination d of the dial = the azimuth which it faces. South = 0° , West = 90° , and so on.

$$0^\circ \leq d \leq 360^\circ \text{ or } -180^\circ \leq d \leq 180^\circ$$

The longitude correction is t_s

In Mr Higg's method the proposed dial is first translated from A to C, where it then faces West. This step is unnecessary because all the calculations can be done using triangle BAA':

Given

- side AB = $90^\circ - \vartheta$
- side AA' = $90^\circ - i$
- angle A = d

To calculate:

- ϑ' [new latitude]
- d' [new declination]
- t_s [longitude correction]

$$\cos(90^\circ - \vartheta') = \cos(90^\circ - \vartheta) \cdot \cos(90^\circ - i) + \sin(90^\circ - \vartheta) \cdot \sin(90^\circ - i) \cos d$$

So ϑ' is known

$$\sin(180^\circ - d') / \sin(90^\circ - \vartheta) = \sin d / \sin(90^\circ - \vartheta)$$

$$\sin d' = \sin d \cdot \cos \vartheta / \cos \vartheta'$$

So d' is known

$$\sin t_s / \sin(90^\circ - i) = \sin d / \sin(90^\circ - \vartheta')$$

$$\sin t_s = \sin d \cdot \cos i / \cos \vartheta'$$

So t_s is known

But in my opinion it is much easier to translate the dial to a plane where it becomes a horizontal dial. The dial is therefore translated in the direction it is facing and the angle of the translation equals the angle of inclination i .

In this case only the new latitude ϑ' and the longitude correction t_s have to be calculated, the new value for the declination is not required. Additionally the final calculation of a horizontal dial is easier than the calculation of a vertical dial, since we can use the formula; $\tan z = \sin \vartheta' \cdot \tan(t - t_s)$.

$$\cos(90^\circ - \vartheta') = \cos(90^\circ - \vartheta) \cdot \cos i + \sin(90^\circ - \vartheta) \cdot \sin i \cdot \cos(180^\circ - d)$$

$$\sin \vartheta'_a = \sin \vartheta \cdot \cos i - \cos \vartheta \cdot \sin i \cdot \cos d$$

So ϑ' is known

$$\sin t_s / \sin i = \sin(180^\circ - d) / \sin(90^\circ - \vartheta')$$

$$\sin t_s = \sin i \cdot \sin d' / \cos \vartheta'$$

So t_s is known

Another problem remains with the method, as well as my own, how to place the calculated dial on the plane at the original site when it is not known where the substyle or the meridian lies, for we only know a horizontal or vertical line in that plane. I calculate the angle b between the vertical line and the substyle using the formula:

$$\sin b = \cos \vartheta \cdot \sin d / \cos \vartheta'$$

With these remarks I hope to make a contribution to Gnomonics.

F J de Vries.

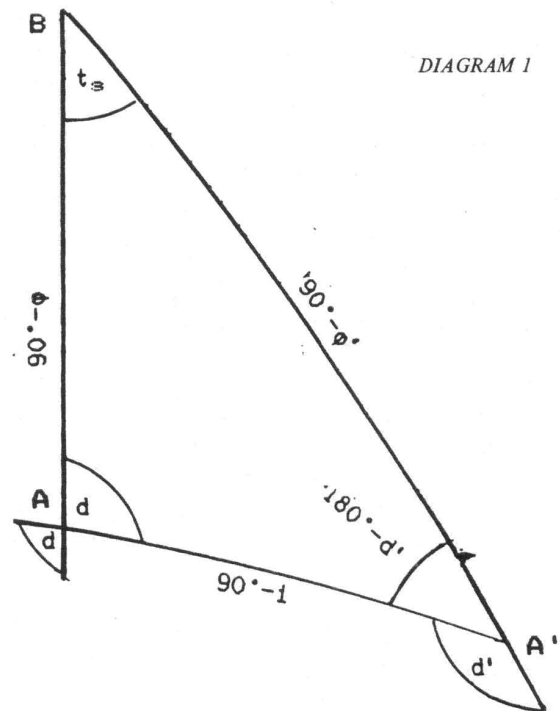


DIAGRAM 1

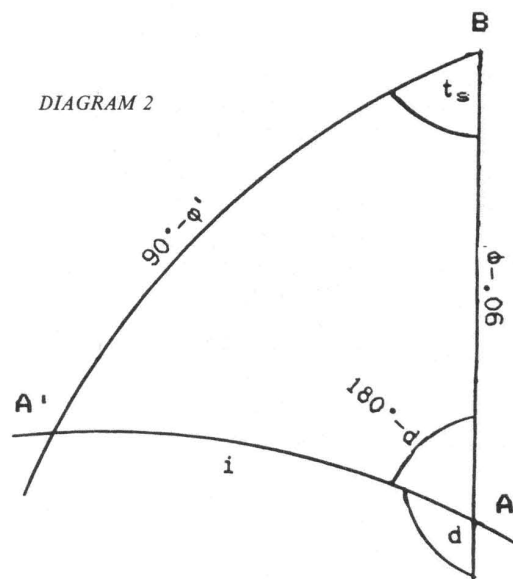


DIAGRAM 2

ANDREW SOMERVILLE MEMORIAL FUND

Many letters have been received from members of the British Sundial Society following the tragic death of our Chairman. Many of those who knew him have expressed a desire for fund to be set up in his memory, and indeed some generous contributions have already been received. The fund is now officially open and our treasurer will be pleased to receive contributions to the fund, large or small. Suggestions have already been received as to the form the memorial should take, but further ones will be

most welcome. All of these will be considered at the ext BSS Council meeting, and the result of the deliberations will be announced as soon as possible.

David Young, Secretary.

Treasurer: Mr. R.G. Thorne, 15 Chesterfield Road, Laira, Plymouth, Devon PL3 6BD. Please make cheques payable to "The British Sundial Society, A.S. Memorial", separate from any other payments which may be included.

MAKING A START CONSTRUCTING A SOUTH-FACING VERTICAL DIAL

Our Society has a very varied membership and includes some learned diallists to whom many of us look up to in some awe, however a higher degree in mathematics is not necessary to make a start in dialling. One good way of beginning is to use the straightforward method described here for setting out a dial suitable for a true south-facing wall. The materials adopted for use are left to the individual's choice. The method is suitable for use at any latitude and is quite good fun to do, it reminds you of your school geometry lessons and homework.

You will need a large sheet of paper, a pencil, ruler and protractor. Are you sitting comfortably? If so follow the simple instructions below, step by step:

1. Draw the lines AB near the top of the page, and CD parallel about $\frac{2}{3}$ down the page.
2. Draw OE at the centre at right angles, and extend to the bottom of the page.
3. Draw the broken line OF with angle AOF equal to the angle of latitude (ie $51\frac{1}{2}^\circ$ for a London site).
4. Draw a line from E to meet G on line OF, and with a pair of compasses transfer this distance from E to G on the extended line below E to form point H.
5. Draw the angled lines from H at 15° intervals to meet line CD.
6. Number the hours 9, 10, 11 ... 1, 2, 3 as in the diagram and draw the hour-lines from O to meet these points.
7. Draw the vertical lines AC and BD to form the rectangle of your dial plate.
8. To include the remaining hours, draw the line EB crossing the hour-lines at J, K and L in the diagram.
9. From L, lay off along EB the distance KL at point M. Again from L, lay off the distance JL at point N.
10. Draw in the afternoon hour-lines 4 and 5 from O through M and N. The 6 pm clock line is the horizontal line OB.
11. The morning hour lines are drawn symmetrical with the afternoon lines and the 6 am line is the horizontal line OA.
12. If desired, half and quarter hours can be estimated and marked in as shown.

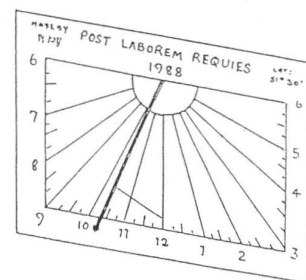
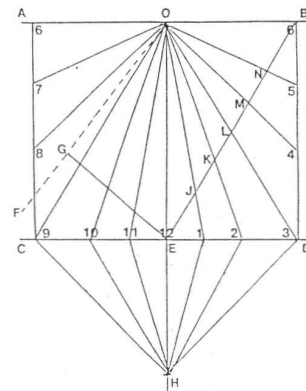
The gnomon can be a rod extending from O in a downward direction 51.5° from the HORIZONTAL, ie 38.5° [90° - Latitude of site] from the vertical dial plate. Alternatively it can be in the form of a solid triangle with its base on OE.

You can try your dial out as it is with a cardboard gnomon, but for a proper job you will need to transfer the

hour-lines to a permanent plate [or paint them on the south wall of the house!], which can be, of course, of any size of shape. Don't forget to add your name or initials, the date of making, and a suitable motto. You may add the latitude it was made for if you wish, and add any other dial furniture that takes your fancy. On the successful completion of this project you have automatically become a diallist, but will require more tuition to become a gnomonist or sciagraphist.

FOR ABSOLUTE BEGINNERS ONLY

Don't forget that your sundial will tell you 'local solar time' which will generally be different from 'clock time', not only because of British Summer Time being in force during most of our sunny hours, but also because of the distance you may be from the Greenwich Meridian and the variable factor known as the 'Equation of Time'. I shall write about this in the next issue to enable you to add a correction table or graph to your dial.



A COMPLETED DIAL, Having made this, do as the motto says!

MURAL SUN-DIALS.

Suitable for Churches, Houses, and Public Buildings.

When ordering Mural Sun-Dials the correct aspect of the wall should be sent, as the accuracy of the dial depends upon the figures given. We prefer to ascertain this ourselves, as we then alone stand responsible for the whole of the work. Charges for this upon application.

Prices and Illustrations of any of the following Instruments sent upon application:-

- ANEROID BAROMETERS (High-class) For the HALL, LIBRARY, etc.
 - AGRICULTURAL DG.
 - BAROGRAPHS.
 - CATTLE GAUGES.
 - CLINICAL THERMOMETERS
 - CYCOMETERS.
 - DRAWING INSTRUMENTS.
 - DAMP DETECTORS.
 - HORSE MEASURES.
 - HEIGHT RECORDERS, for Motor Cars & Aeroplanes.
 - METEOROLOGICAL INSTRUMENTS.
 - OUTFITS FOR PRIVATE OBSERVATORIES.
- A small quantity of Stone from the undermentioned Historical Buildings on hand:-
- CRIPPLEGATE CHURCH, CHINGFORD OLD CHURCH, CONWAY CASTLE.
 - NATLEY ABBEY.
 - OLD GREYFRIARS MONASTERY, OLD NEGATE PRISON, OLD NEW BRIDGE, WIMBORNE HOUSE, etc.

SUN-DIAL & WIND VANE COMBINED.

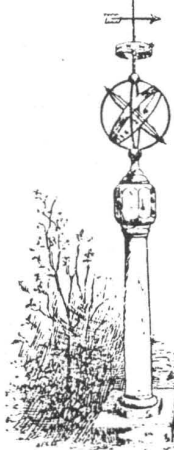


Fig. 7.
Price complete as illustrated .. £18 0 0
Do. of Dial & Vane, without Pedestal £10 10 0

Prices and Illustrations of any of the following Instruments sent upon application:-

- PEDEMETERS.
- RAIN GAUGES.
- READING GLASSES.
- SUNSHINE RECORDERS.
- SUN-DIALS & PEDESTALS (All kinds)
- SPEEDOMETERS for Motor Cars.
- POCKET ANEROID BAROMETERS (With Patent Metallic Thermometers).
- THERMOMETERS, GREENHOUSE AND GARDEN, and all kinds.
- THERMOGRAPHS.
- TRAVELLERS', TOURISTS', AND EXPLORERS' SCIENTIFIC OUTFITS.
- TURRET & OTHER HIGH-CLASS CLOCKS.
- WIND VANES.

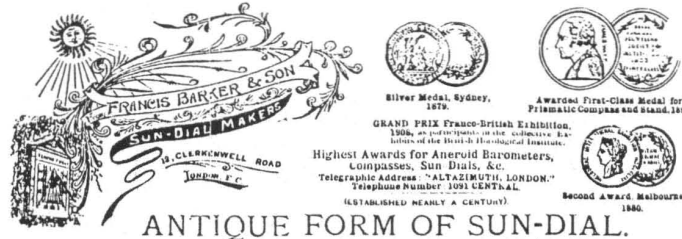
A small quantity of Oak Wood from the undermentioned Historical Buildings, on hand:-

- BLUCCOAT SCHOOL, CHINGFORD OLD CHURCH, CONWAY CASTLE, OLD GREYFRIARS MONASTERY, OLD CURIOUSITY SHOP.

The above Stone and Wood, and also any other from historical places, or any relic of interest can be mounted up to suit customers' requirements.

ILLUSTRATED BOOKLET WITH DESCRIPTIVE ARTICLES ON THE ANEROID BAROMETER, MAGNETIC COMPASS AND SUN-DIAL, POST FREE ON APPLICATION.

FRANCIS BARKER & SON, Ltd.,
SUN-DIAL AND SCIENTIFIC INSTRUMENT MAKERS,
"SUN-DIAL HOUSE,"
12, Clerkenwell Road, London, England.



ANTIQUÉ FORM OF SUN-DIAL.

Mottoes suitable for Sun-dials.

- "Anyddal yd flowers, I tell ye hours."
 - "Now it yesterday's to-morrow."
 - "Let others jell of storms and showers, I'll only count your sunny hours."
 - "Lead, kindly Light."
 - "New roses come new roses go, But I go on for ever."
 - "A lumine mottoes" (Moved by the light).
 - "Sola et aris opus" (The Work of Sun and Art.)
- Other Mottoes submitted, if desired.



Mottoes suitable for Sun-dials.

- "Time wanes away as flowers decay."
 - "Time and Tide tarry for no man."
 - "Non rego nisi regar." (I rule not if I be not ruled.)
 - "I count the bright hours only."
 - "When the Sun you cannot see, No man putteth trust in me."
 - "Tempus fugit." (Time flies)
 - "The Sun is the Light and Glory of the World."
- Other Mottoes submitted, if desired.

ANTIQUÉ PATTERN FORTLAND STONE PEDESTAL, 3ft. high, without circular base stone, with 9-in. brass circular dial plate, without equator table, similar to above illustration .. £6 5 0
Ditto, ditto, 3ft. 3-in. high, with 12-in. circular dial plate, ditto, ditto .. £7 7 0
This pedestal can be supplied in STONITE at 20% each less.

CHARLES LAMB ON SUN-DIALS.

"What an antique air had the now almost extinct sun-dials, with their moral inscriptions, seeming coeval with that Time which they measured, and to take their revelations of its flight immediately from heaven, looking correspondence with the fountain of light! How would the dark lowly soul imperceptibly on, watched by the eye of childhood, eager to detect its movement, never caught, rise as an evanescent cloud, or the first arrests of sleep.

"Al! yet doth beauty like a dial-hand, Steal from his figure, and no pace perceived! What a dead thing is a clock, with its ponderous envelopments 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! It stood as the garden god of Christian gardens. Why has it almost everywhere vanished? If its business use be superseded by more elaborate inventions, its moral uses, its beauty, might have pleaded for its continuance. It spoke of moderate labours, of pleasures not protracted after sunset, of temperance and good hours. It was the primitive clock, the horologe of the first world. Adam could scarce have missed it in Paradise. It was the measure appropriate for sweet plants and flowers to spring by; for the birds to apponish their silver warblings by; for flocks to pasture and be led to hold by. The shepherds 'carved it out quantity in the sun,' and, turning philosophers by the very occupation, provided it with mottoes more touching than tombstones."—*Life*.

PAGES FROM A FRANCIS BARKER & SON LTD. SUNDIAL CATALOGUE

Mrs. ALFRED GATTY, in her interesting Book of Sun-Dials, writes as follows:—

"There is no human invention more ancient or more interesting than that of the sun-dial; so ancient, that the exquisite essayist, CHARLES LAMB, says: 'Adam could scarce have missed it in Paradise' and so interesting that we may be sure that man's first want, after supplying the cravings of hunger, would be to invent some instrument by which he could measure the daytime into portions, to be allotted to his several vocations.

"'Please, Sir, what's o'clock?' is the child's enquiry, as he 'tents' his mother's cow in the last pastures; and the hardy backwoodsman, heaving out a settlement for himself in the primeval forest, leans on his axe, and looks to the sun's position in the heavens for information how soon he may retire to his hut for food and sleep. Time is a blank if we cannot mark the stages of its progress; and it has been found that the human mind is incapable of sustaining itself against the burden of solitary confinement in a dark room, where you can take no note of time. The great Creator, who made the sun to rule the day and the moon and stars to govern the night, has adapted out nature to those intermitting changes, and implanted in us an immediate desire to count how, drop by drop, or grain by grain, time and life are passing away."

"The first notion of dissecting time would of course be suggested by a tree, or a pole stuck in the soil, the shadow of which moving from west to east, as the sun rose or declined in the sky, would lead men to indicate by strokes on the ground the gradual progression of the hours during which the daylight lasted. Further observation would discover that if the pole slanted so as to point to the north star, and ran parallel with the earth's axis, a sun-dial was constructed that would measure the day. But the fixing of a complete instrument, varying in its lines and numbers, according to the locality and whether horizontally or vertically placed, would be a matter of progressive astronomical and mathematical calculation, which only the scientific could accomplish, long after the rude art of uncivilized man had discovered the means of ascertaining mid-day, and dividing into spaces morning and afternoon.

"As clocks were erected in the church towers, or showed their faces in the market places, the vocation of the learned dialler gradually ceased. The old dial may still retain its footing in the quaint yew-tree'd garden, or may stand conspicuously in the churchyard; but few consult it as an oracle, and it rather lingers superstitiously amongst us as a memento of the past. It has nevertheless to many minds a touching interest, it has drawn forth maxims in the form of mottoes, and it would be like discarding wisdom were we not to preserve and cherish these.

"But if these dials tell us after all
We are but shadows on Life's sunny wall,
They're not least point us, with a hope as bright,
To that good land above where all is light."

H. V. T.

Sun-Dials form an ornamental, attractive and useful adornment to Gardens, Parks, Terraces, etc., by reason of their Charm, Sentiment and Moral Inscriptions, and when made mathematically correct, are infallible time-keepers for setting the clocks of the house by; also very suitable, with appropriate motto or inscription, as a memorial or to commemorate any special event.

Suitable Mottoes, Inscriptions and Coats-of-Arms can be engraved to order, or suggestions carried out.

When ordering kindly state locality or latitude where dial is to be fixed.

Full Instructions supplied for Fixing Dials, or Competent Workmen sent to set them within the United Kingdom. Travelling Expenses, Ac., extra.

Old Dials Restored and Renovated by Experienced Workmen.

Sets comprising Twenty-eight Ordinary and Six Coloured Photographic Slides of interesting and unique Sun dials erected in different parts of the world, with Copy of Lecture on same by the Rev. C. Butler, of Shanlin, Isle of Wight, for use in Private and Public Schools, Universities, Polytechnics, etc., etc. Set of Slides and Copy of Lecture, £2.

Above Set and Lecture can be lent for Philanthropic purposes, etc. Terms by arrangement.

The first edition of "SUN-DIALS AND BOOKS OF YESTERDAY," by Mrs. ALICE MORSE EARLE, numerous illustrations, 10/6, postage extra.

"THE BOOK OF SUN-DIALS," by H. K. F. EDEN and ELEANOR LLOYD, consisting of over 500 pages, containing numerous illustrations, mottoes and inscriptions, 31/6, post free.

Fully Illustrated Pamphlet and Price List of other Forms of Sun-Dials
Post Free upon application.

BEST BRASS HORIZONTAL DIAL PLATE, Without Equation Table.



Fig. 2.
Brass Plain Horizontal Sun-Dial, to Illustration, divided to 5 minutes, Open Gnomon, but without Motto.
10 inches diameter .. £3 0 0
12 " " " .. £3 18 0
15 " " " .. £6 5 0
18 " " " .. £8 10 0
Dial with Solid Gnomon, less engraving, 10-inch, £2 14 0. 12-inch, £3 7 6.
Horizontal Slab Sun Dial, 12-inch, £2 0 0. 15-inch, £3 0 0.

SUN-DIALS are very suitable as a Memorial, or to commemorate any special event.

SPECIALISTS IN DIALLING.
All Dials made Mathematically correct to Latitude.
Dial Plates and Pedestals made to any design.
Mottoes, etc., extra according to length and style, also size of Dial Plate.

Latitude, Longitude, and Height above Sea Level of place where fixed, can also be engraved on Dials.

BEST BRASS HORIZONTAL DIAL PLATE, With Equation Table in Columns.



Fig. 3.
Brass Horizontal Sun-Dial, with Equation Table in columns, divided to 5 minutes, Open Gnomon, as illustration, but without Motto.
10 inches diameter .. £5 10 0
12 " " " .. £6 5 0
15 " " " .. £8 5 0
18 " " " .. £11 10 0

THE NEW PEDESTAL, FITTED WITH ARMILLARY OR GLOBE SUN-DIAL.

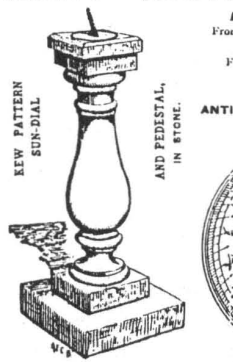


Fig. 4.
Being fac simile of Sun-Dial made up of Balusters from Old New Bridge. Height, 3 feet 2 inches; Base Stone, 14 inches by 14 inches. Price, complete, with 8-in. Brass Dial .. £5 0 0
Above in STONITE .. £5 0 0
Price of Original Balusters of Old New Bridge, sent upon application.

A few Restored Sun-Dials, From £1 10 0 to £5 0 0 each.
Also Pedestals, From £2 10 0 to £10 0 0.

ANTIQUÉ DESIGN SUN-DIAL IN BRASS.



Fig. 5.
Brass Sun-Dial, as illustration, divided to 5 minutes.
8 inches diameter .. £12 0 0
9 " " " .. £15 0 0
10 " " " .. £22 0 0
12 " " " .. £33 0 0
MOTTOES EXTRA.

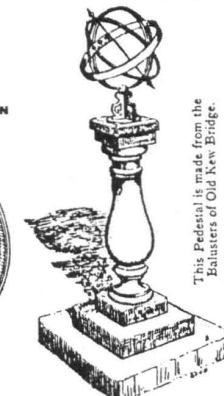


Fig. 6.
New Pedestal, 3 ft. 6 in. high, with Brass Armillary Plate fitted with Brass Globe. Height, 3 ft. 6 in. £18 10 0. Do. do. with an. Horizontal Dial, £18 10 0. Do. do. without Base Stone or Inscriptions Faint .. £7 10 0.

THE NELSON TOUCH?

March hares are soon followed by April and its rituals, as this sequence from *The Times* [sent by Mr. J.W. Dickson] amply demonstrates. Most of us at one time or another have dreamt up some gigantic spoof, usually [and fortunately] too late for delivery at the latter end of the Ides of March for publication on 'All Fools' Day', and equally [and mercifully] forgotten before the next annual rash. Not many of us can emulate Richard Dimpleby in his classical television scene of bringing in the harvest from a grove of spaghetti trees. Great pleasure is derived from pulling the wool over the eyes of people [the more intelligent those spoofed, the better]; yet often amongst the distorted warp of reasoning a golden thread of weft appears. All the letters below are headed - "A Nelsonian sundial". Naturally, in the presence of Horatio Nelson [and deferentially doffing our caps], we must expect the Royal Navy to be in close attendance.

From Commander T.V.G. Binney, RN

Sir, At the scene of the Discoverers monument in Lisbon, many will have seen the beautiful map etched into the surrounding marble, showing the voyages of exploration of the brilliant Portuguese navigators of the 14th and 15th centuries.

A British version is suggested by the photograph in today's *Times* showing Trafalgar Square from the top of Nelson's Column, with the shadow of the column clearly displayed on the square below.

The column provides the hand for a giant sundial with below, on the surface of the square, hour markings - of course - but also, correctly placed in time between 21 noon (the start of the Battle of Trafalgar) and 5 p.m. (its finish), the key events in the progress of the battle inscribed. Thus would Trafalgar Square celebrate not only Britain's most illustrious admiral, but also, in the same scenario, his most famous victory.

Let us hope this can be done in good time before 2005.

Yours faithfully, GILES BINNEY, Oaks Down, Lower Durdord Wood, Petersfield, Hampshire, April 6th. (Printed in *The Times* 19th April).

On the face of it a most laudable proposition. It occurred to the writer that another famous conquest could be included, one which Nelson himself might judge his most glorious victory, that of Emma Hamilton. On second thoughts it most probably took place during the hours of darkness, when no sundial is truly at its best, and hence cannot be included without turning Nelson's Column into a moon dial as well. It would probably require an Act of Parliament to disturb such hallowed ground, and what would be the financial liabilities incurred by such a scheme? The much more moderate project of the Seven Dials monument [not too far away], has cost approximately £200,000 to date. One might also mention that sundials, with rare exceptions, do not possess hands; therefore hands off Nelson's column as a sundial. Can we really tolerate our greatest Naval hero, even in effigy, being reduced to the status of creating shadows?

This evoked a first response as follows:

From Mr. W. Davidson

Sir, Whilst I applaud Commander Binney's idea (April

19) of turning Trafalgar Square into a giant sundial, I fear it will not work. For a horizontal dial (Trafalgar Square) we would need a gnomon set at angle to the horizontal equal to the latitude of its location, approximately 50°.

Yours faithfully, W. DAVIDSON, Glebe Cottage, 8 Short's Lane, Beaminster, Dorset.

This is a much more serious matter. The Royal Navy would never agree to putting Nelson's nose out of joint, at least not to that degree of list. There would probably be representations from foreign states complaining that their tourists were having to keel over to gain even a glimpse of their naval hero. It would be a great shame if Nelson were toppled off his perch as a result, when Napoleon's fleet singularly failed to achieve this in his lifetime. We British do not want Nelson knocking off his pedestal. Furthermore it would become a perch, uncomfortably included, it is true, for the numerous feral inhabitants of Trafalgar Square; and a temptation for those who have ambitions to conquer the north face of the Eiger. Fortunately Mr. Davidson is evidently writing of a column on the Continent (or possibly the English Channel) since London is approximately at the latitude of 51.5°, with Nelson's Column sited at slightly less than this value.

Readers of *The Times* therefore waited with bated breath for a reply to this. It was not long in coming. The second letter on this, published for 8th April is given first, so on with the motley:

From Mr. Peter Mottly

Sir, If a horizontal sundial needs its gnomon to be set at an angle (W. Davidson, April 25), perhaps Commander Binney should re-think his Nelson's Column idea and present it to the town council of Pisa?

Yours faithfully, PETER MOTTLEY, 9 Aston Close, Pangbourne, Berkshire.

This is not really a sensible suggestion at all for several reasons. First, why should the Italian authorities commemorate the Battle of Trafalgar events at the base of the tower of Pisa? Secondly, as Pisa is located at a latitude of approximately 41.8°, the tower of Pisa requires much more tilting than it has at present, and it may be many centuries before it reaches this angle if left to its own devices. Thirdly, there are usually so many tourists at the base of the tower that all indications would be obscured during sunny hours. Methinks a jester is at work here, with what is apparently a sound proposition being presented tongue in cheek, as a red herring.

On the same date and preceding the above:

From Mr Quin Hollick

Sir, Commander Binney's general idea (April 19) on turning Trafalgar Square into a commemorative sundial is perfectly feasible, leaving the monument as it stands.

The appropriate shadow would be cast by the top of Nelson's hat. His hat would form the tip of an otherwise imaginary gnomon which would be at about 50° [not again] Mr. Davidson's letter (April 25), the bottom of which would be at a point about 120 feet (depending on the exact height of the top of his hat) south of his column. This would be where the hour-lines would converge.

During the summer months, Nelson's hat would happily cast the correct shadow on to the hour-lines within Trafalgar Square; but for most of the winter months, due to the size of the square and the surrounding buildings, it would not work.

Yours faithfully, QUIN HOLLICK, Brock's Close, Swayne's Lane, Comberton, Cambridge.

The use of a point, even when represented by the top of Nelson's hat, placed on the polar axis indicates the writer has knowledge of the art of gnomonics, so we must take off our hats to Mr. Hollicks's suggestion. His observation also shows he recognises the limitations on any dialling scheme laid on the floor of a square closely surrounded by buildings, even those of moderate height, as at Trafalgar Square. There is a little ambiguity introduced by his modifying phrase in parentheses, whereby the uninformed reader would not be able to decide for certain whether the point 120 feet south of the column, or the base of the column formed the focii. It is, of course, the former.

Lastly we have a modicum of praise, and use made of the suggestion to form a vehicle for a favourite topic of the writer:

From Lieutenant-Commander R. Eyre-Tanner, RNR

Sir, Your reader's suggestion (April 19) for using Nelson's Column as a sundial is brilliant. However a word of warning - times during the Battle of Trafalgar were highly inaccurate. Whilst researching for my Nelson's birthday lecture in Portsmouth last year I found the following:

After fixing the ship's position at noon chronometers, being most valuable, were stowed below. In place of these navigational timepieces hour-glasses were used. During the heat of the battle the timekeeper had other distractions, like fighting boarders, and thus forgot to turn the hour-glass on the hour.

At the end of the engagement L'Achille (not to be confused with HMS Achilles) blew up. Those who had not been deafened by the roar from broadsides and heard this terrific explosion recorded its time. HMS Neptune, 4.30; Agamemnon and Britannia, 5.30; Tonnant, 5.40; Prince, 5.50; Spartiate 5.45; and Polphemus 7 p.m.!

Yours aye, ROBIN EYRE-TANNER, (Historical Officer), c/o HMS Wessex, 50 Berth, Southampton, Hampshire, May 10.

It is hoped that the writer of the statement (not the writer of the letter) had a knowledge of history better than that relating to the use of marine chronometers. Marine chronometers were always kept below, and the exact time of noon, as determined by sighting the sun, was noted on a deck watch and conveyed to be compared with the chronometers below. There were two types of time-glass used on naval vessels, those for measuring out the watches with a duration of an hour, or even four hours. The noon observation allowed deck-watches, officers' pocket watches and the large sand-glasses to be set to local time. The chronometers were never touched except for winding daily by the appointed officer, and

represented the time at the port of departure or some other chosen longitude representing zero (these events were before the adoption of Greenwich as the prime meridian). The glasses for the navigational measurements, ie for counting out the log, had a duration of a minute, or some multiple of this, and were called running glasses. All these glasses were measuring durations of time, and were not acting as timekeepers.

Whilst the writer is aware of several clocks which have actually taken lives, this is the first time that he has read of a timekeeper being engaged in battle. The English language is full of ambiguities, and it seems, from the Oxford English Dictionary that both the instrument and the person whose function it is to maintain the standard of time in his charge, are equally time-keepers or timekeepers.

From the times quoted any technically minded person would have no hesitation in throwing out the two extreme times and taking the mean of the remaining seven values, ie 5.37 p.m. Only one timekeeper appears to have forgotten to turn his glass on the evidence presented, the other readings would be well within the accuracies of the glasses after five hours of running, but these were probably taken from officers' pocket watches anyway as one cannot interpolate between turnings of the glasses except very approximately. It would not be surprising either if the officers' watches were plus or minus ten minutes of the true time after five hours from being set and subjected to the disturbances of the battle. Since the Battle of Trafalgar took place some $1\frac{1}{2}^{\circ}$ east of the longitude of Greenwich, the local time was some six minutes slower than in London. Allowance must also be made too for the Equation of Time, which on 21st October, the date of the battle, amounts to some 15 minutes fast of mean time. So the generally accepted time of termination of the battle is in the right area, not that the explosion on board L'Achille signalled the end of the engagement.

Perched where he is, no doubt Nelson is aloof from it all, worried more by the close proximity of his egesting flying neighbours than the possible shadow of his hat upon the plane bearing his supporting pedestal. No representation of the events at Trafalgar, even if etched into the finest marble and accompanied by a few hour lines visible in summer, are going to look at their best for long under a constant rain of droppings from above from those daily taking Nelson's message too literally - "England expects ... that every ... shall do his duty".

It is, to say the least, surprising that more use has not been made in the past of columns, pillars, and obelisks for the purpose of indicating solar time. Even the huge Egyptian obelisk in St. Peter's Square, Vatican City; or the obelisk in the Place de la Concord in Paris, are bereft of the necessary markings to make them useful; and these are in large open spaces. Most of the columns in London are surrounded by other edifices, or at an impracticable site, e.g. Cleopatra's Needle on the north bank of the Thames.

Charles K. Aked