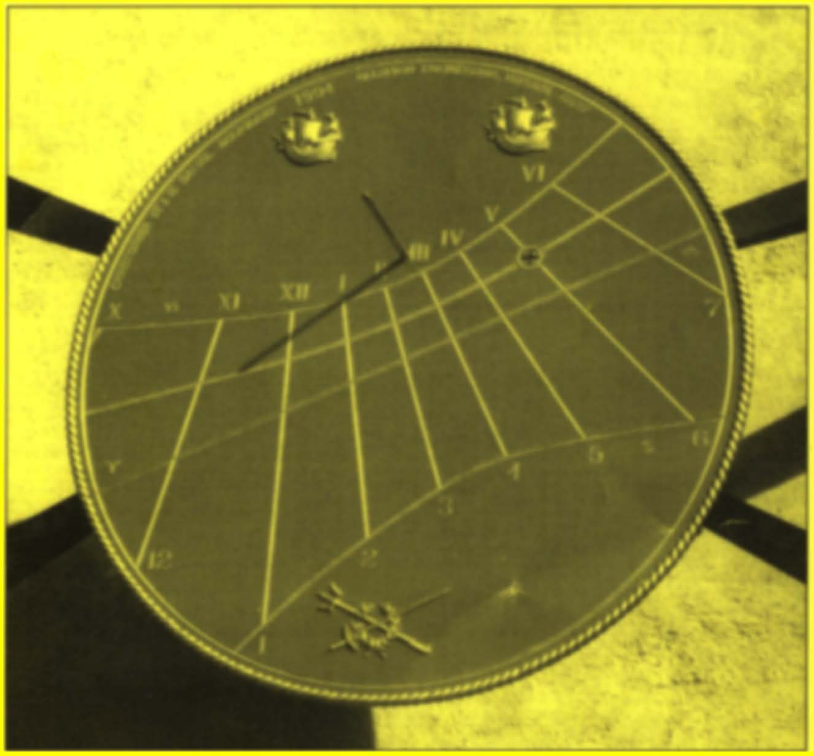
The British Sundial Society



BULLETIN

VOLUME 11 (i) FEBRUARY 1999

Front cover: 'Nelson Dial' Chatham, Kent, with dateline for Trafalgar Day; designed by C. Daniel (Photo: C. Daniel)

Back cover: The Saxon Sundial at St. Gregory's Minster, Kirkdale.

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VOLUME 11 (i) - FEBRUARY 1999

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BULLETIN

OF THE BRITISH SUNDIAL SOCIETY

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VOLUME 11 (i) - FEBRUARY 1999

EDITORIAL

Inspired by handsome colour-photographs of sundials-three pages of them, in the 1996 Sundial Register-I invited several members of known photographic skill to send in Sundial photos. A few (too few) of these offerings appear in this issue, as a colourful celebration of the completion of the first ten years of the Society's life. I did not foresee, when issuing the invitation to photographers, the agonies of selection, and the pain of rejecting many lovely pictures. Another ten-year-celebratory item is the group of contributions headed 'Ten Years Ago': a number of our members who joined the Society in its earliest weeks and months have written to tell us what led them to join the BSS, and to maintain their membership.
We are very grateful to these writers for their slices of nostalgia. As our membership secretary knows, motives for joining are as varied now as they were at the outset.

The time interval between the making of the dials shown on the back and the front covers of this issue is nearly 1000 years. Compared with this, the Sundial Society's life to date is 'short as the watch which ends the night..' Will men still be making sundials and taking time from sunlight and shadows, one thousand years from now?

A note on volume and page numbers

The new system of numbering of issues of the BSS Bulletin (as seen on the cover of this issue) has been set up to simplify the reference, in reference-lists, to articles in the journal. The issues for each year will carry a volume number: all the 1999 issues will comprise 'Volume11', this being the eleventh year of publication of the Bulletin; and page numbering will carry on sequentially throughout the three issues of Volume 11. In addition, on the cover of each issue there will be a lower-case-roman numeral: (Volume 11 (i) Volume 11 (ii) Volume 11 (iii)). Also the name of the month of publication will appear under the year-date. A reference to an article appearing in (say) the October issue of this year might be: Bull. BSS. 11, 135-137, (1999). This reference-list entry carries no redundant information or punctuation-marks. Since there are (and have been for several years) 52 pages per issue, the page number gives sufficient indication that the article is in the third issue of 1999. The addition of the lower-case-roman numeral after volume number is optional, not obligatory.

MEMENTO MORI

ALAN SMITH

In the magnificent 12th century cathedral of Kirkwall, capital of the Orkney Islands in the north of Scotland, is a splendid range of carved sandstone tombstones. The stones were originally set in the floor of the nave, but a wise conservator in the 1850s had them lifted and mounted against the walls to protect them from wear. In date the stones range from the 13th century to as late as 1803, with several from the 16th century, but the vast majority were created between about 1650 and 1700. Altogether there are 60 stones, most being about 6 feet tall, carved in a vigorous and striking style. The inscriptions show that most of the people commemorated were burgesses and merchants of Kirkwall and the surrounding area. The style of the inscriptions, with the lettering carved in rich relief, is unique. The words cover the surfaces with a splendid texture, sometimes the lines being strung along the edges and mixed with geometric and floral patterns, frequently using joined letters, or ligatures, to save space. The quality of these works of art is nothing short of magnificent - an object lesson in graphic design, powerful and significant now as it was in the 17th century.

Many of the Kirkwall cathedral tombstones include the symbols of death in rectangular sunken panels, mostly placed at the foot but in the example shown here at the centre. There are hour-glasses, coffins, turfing irons, spades, skulls and crossbones, fingers pointing to an open book, handbells, crowns, candlesticks with the flame of life (sometimes bent over) and in one example a 17th century, singlehanded clock. But on the tomb of Patrick Prince, merchant of Kirkwall, is carved a SUNDIAL, (the only example I ever saw in the Orkneys!). The emblems of mortality here include, as well as the sundial, a curious and primitive skeleton piercing a two-handled urn with a dart, while a cherub-head blows a call to the life hereafter on a long trumpet which is joined to the urn and the bones. This allegory of the Resurrection is surely enhanced by the presence of the life-enhancing and everlasting sundial, but what is the urn and why is the skeleton piercing it? The destruction and end of mortal sin perhaps?

To judge from the afternoon numerals, just visible on the right of the dial, this must be a representation of an E decliner. Unfortunately the morning numbers have almost completely gone, and the mason had some difficulty in joining the relief-carved lines at the apex! The whole carving of the tombstone is in relief, which is why the sundial lines are not incised.

Included in the inscription is the following verse:-

THIS MONUMENT
DOTH HIER PRESENT

A SUBJECT TO YOUR EYE
FOR PATRICK PRINCE
IS NOW GONE HENCE
AND SO ABOVE DID FLY

HE LEFT BEHIND
5 CHILDREN KYNDE
WITH ALL A MOTHER DEARE
TO HIM AND THEM
IT WELL BECAME
A MOTHER AND A PHEARE*
OBIIT 9 MARCH 1673
AETATIS 31

*comrade

Note: A description and drawings of all the stones is available from the Tankerness House Museum, Broad Street, Kirkwall, Orkney KW15 1DH:
Liz Johnston: '*St Magnus Cathedral Gravestones*' 1994

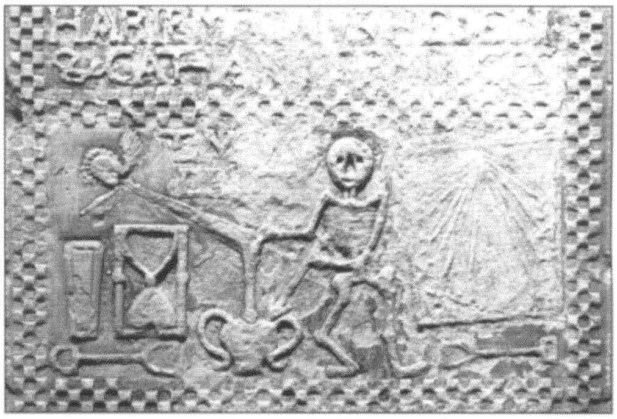

Fig 1. The panel depicting emblems of mortality, <u>including a sundial,</u> on the Tomb of Patrick Prince, mounted in the south nave aisle of Kirkwall Cathedral. 1673 (Partly worn away, in the space between the cherub's head and the skull, are the words <u>TEMPUS ERIT</u>-the time will come)
Width of stone: 860mm,.

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UT HORA SIC VITA

THE GNOMON OF THE NORTH: A NEW DIAL FOR WHITLEY BAY

FRANK EVANS

A large horizontal sundial has recently been erected on an artificial eminence near Whitley Bay, Northumberland. The eminence is the highest point in the Metropolitan Borough of North Tyneside, rising ninety-four metres above sea level; and it was decided by the Borough Council to go for the hundred, calling for a gnomon a further six metres high. The design was undertaken by BSS member Tony Moss of Bedlington, Northumberland, and consisted of a large iron casting for the gnomon, on which were transposed strings of small reliefs representing living objects, created by the children of a local first school. This gnomon stands on a nominally flat, tiled surface with hour lines marked by old railway track. The surface forming the dial plate was in the end slightly coned to allow for rain runoff, which presented computational problems for the dialist; but these were skilfully overcome by Tony Moss, using physical means in the form of a specially made metal protractor bearing a laser gun which could be attached to the style edge to effect the layout of the hour lines.

Fig 1: The gnomon in course of erection

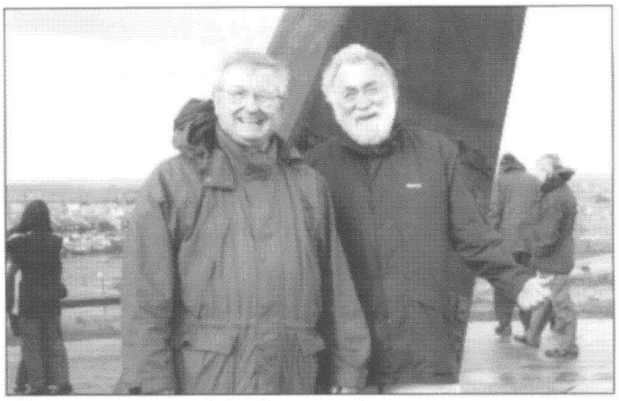

Fig.2: Gnomon of the North: Tony Moss (designer) and David Bellamy at the opening

The funding for the dial was gained competitively by North Tyneside Metropolitan Council through City Challenge, a foundation that derives its income from Government and EU sources. The dial is the centrepiece of a new Country Park aimed at providing an area of high biodiversity in a rather bare flatland. Dubbed 'The Gnomon of the North' in contradistinction to the Gateshead 'Angel of the North', it was declared open (if that can be the right description) upon the removal of an encompassing band of sacking by the eminent conservationist David Bellamy, on 3 November 1998, a day of rain, wind and flying scud. It was pleasing to observe that the small craftspeople from the local school who had provided the patterning had been invited to the ceremony and indeed to the modest buffet that followed.

The dial is a striking construction, its location and sheer size commanding attention.

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SUNDIALS IN ANGLO-SAXON ENGLAND

DAVID SCOTT

The aim of this article and the ones which follow is to examine the sundials from Anglo-Saxon England and to attempt an explanation of their role in everyday life.

The material evidence for time-reckoning in the period is very sparse: twenty or thirty stone dials in varying states of preservation. The documentary evidence is a few references to divisions of the day; so what follows is necessarily largely conjecture. Fig. 1 shows the line and cross-bar arrangement for the best-known survivors from the Anglo-Saxon period and Table 1 gives their locations. It is arranged alphabetically for convenience. It may be noted that no two dials are exactly alike.

The characteristics which distinguish Anglo-Saxon dials from those of the post-Norman period were identified by Green,[1] as definite pieces of sculpture, of good workmanship, with part often carved in relief, usually

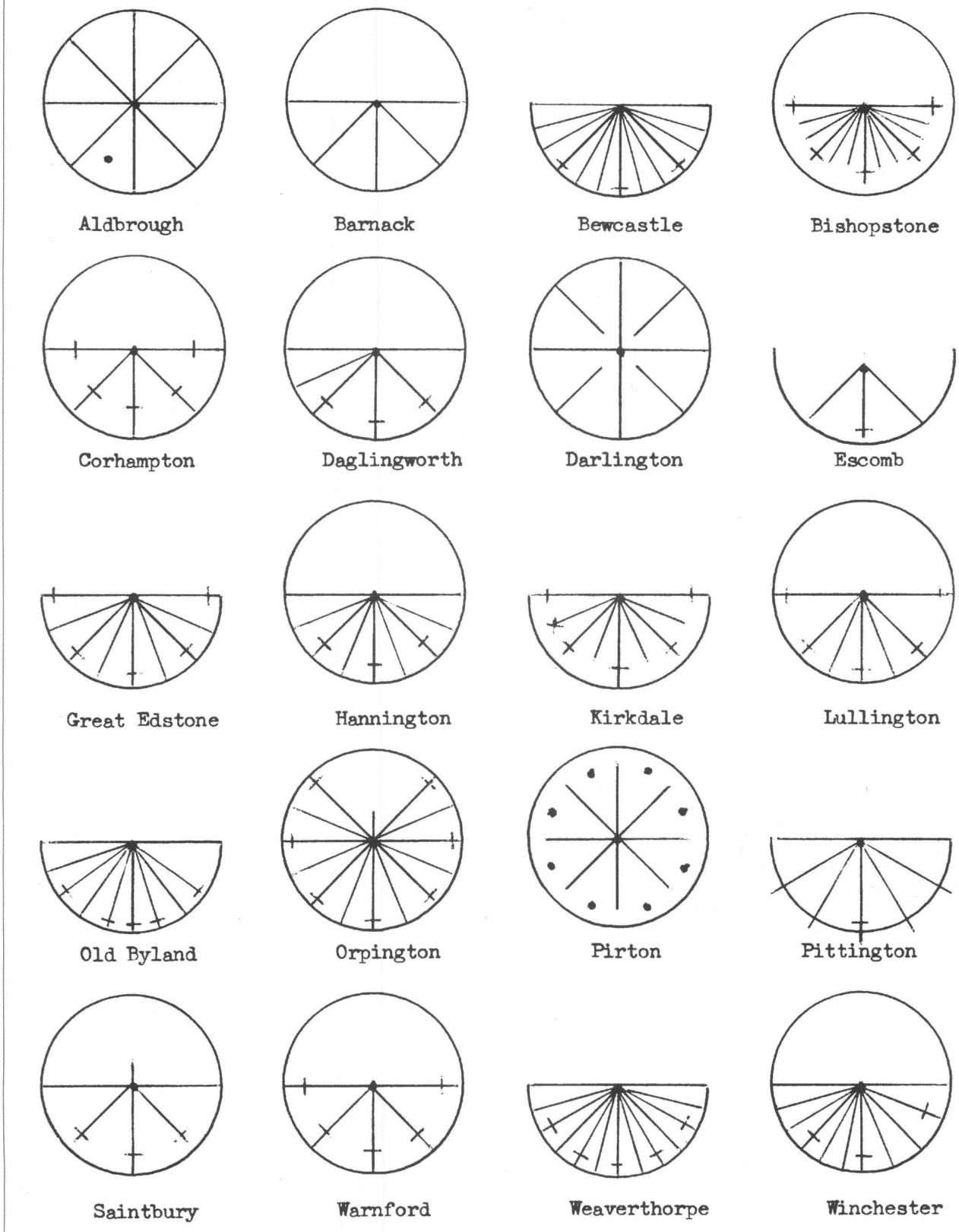
Aldbrough
Barnack
Bewcastle
Bishopstone
Corhampton
Daglingworth
Darlington
Escomb
Great Edstone
Hannington
Kirkdale
Lullington
Old Byland
Orpington
Pirton
Pittington
Saintbury
Warnford
Weaverthorpe
Winchester

Fig 1

	National Grid Reference
Aldbrough, Yorkshire	SE4066
Barnack, Cambridgeshire	TF0705
Bewcastle, Cumberland	NY5674
Bishopstone, Sussex	TQ4701
Corhampton, Hampshire	SU6120
Daglingworth, Gloucestershire	SO9905
Darlington, County Durham	NZ2814
Escomb, County Durham	NZ1830
Great Edstone, Yorkshire	SE7083
Hannington, Hampshire	SU5355
Kirkdale, Yorkshire	SE8785
Lulling_ton, Somerset	ST7851
Old Byland, Yorkshire	SE5585
Orpington, Kent	TQ4666
Pirton, Gloucestershire	SO8847
Pittington, County Durham	NZ3244
Saintbury, Gloucestershire	SP1139
Warnford, Hampshire	SU6223
Weaverthorpe, Yorkshire	SE9670
Winchester, Hampshire	SU4829

Table 1.

enclosed within a double circle or semi-circle, with never more than one on a particular building. If carrying an inscription, this is a sure sign of Anglo-Saxon date.

It is very difficult to arrange dials from the period into chronological order, but it is useful to recognise two stages: the early period of the seventh and eighth centuries, and the later period of the tenth and eleventh centuries. Two dials were dated by Ward[2] : Bewcastle about AD 670 and Kirkdale about AD 1060.

Sundials were introduced into England, almost certainly in Northumbria, during the missionary period of the Roman Church towards the end of the seventh century. We do not know whether they were used in the monasteries at Wearmouth and Jarrow, but some of the early churches in Northumbria were built by Bishop Wilfred about the same time; and a little later when he was in Southern England converting the still pagan people of what is now Sussex, his name became linked with churches in the Meon Valley of Hampshire, where dials of the early type still exist

Again we do not know whether the dials on the lesser churches were intended as symbols of the Christian faith for the illiterate and superstitious peasant farmers, or as time markers for use by the partly educated priest, himself only recently converted from paganism.

To make any kind of sense of the early Anglo-Saxon dial we must refer to the monastic rule of fifth century Italy, when St Benedict drew up a set of Rules, which he called 'A simple guide for the management of monasteries'. Benedict's Rule[3] included stipulated times for prayers during the day: Lauds at daybreak, Prime at sunrise, Terce, Sext and None at the third, sixth and ninth hours of the day, Vespers at sunset and Compline at nightfall In AD 606 Pope Sabinian is said to have issued a decree ordering sundials to be placed on churches, presumably to regulate the times for Terce, Sext and None, the only ones not marked by natural phenomena. The seven times became known as the 'canonical hours', and it should be noted that they were points in the day, and not hours as durations of time as we know them.

The semi-circular Anglo-Saxon sundial with a horizontal gnomon was not a good time-measuring device, even when carefully laid out and facing due south, which was rarely the case. But there was nothing sacrosanct about the points of the day for observing the canonical hours of Terce, Sext and None; the dial was intended merely to regulate them. The problem of sunless days is often raised. After a while daily routine became instinctive to some extent, and when the sun did shine it reaffirmed the otherwise estimated points of the day.

The early dials probably 'depicted' the daylight period, with the horizontal line representing sunrise and sunset, the vertical line midday (the sixth hour), the intermediate hours mid-morning (third hour), and mid-afternoon (ninth hour). They were not intended to measure time, but were more in the nature of indicators, or so it seems. The cross-bars were probably added to stress their canonical significance.

No doubt each little community used its own dial to regulate the times for services, unaware of any difference between itself and other communities, except perhaps when they were within earshot of each other. It is said[4] that the monks of Rievaulx were disturbed by the bells at Byland being rung at times differing from their own. This was probably due to variations in the dials they used to regulate the times, rather than a different time system. It also goes some way to explaining why deviations from a south-facing wall, which was often the case, were unimportant to the individual communities.

We have no evidence to show that anything other than a twelve division day was ever used. Bede prepared a table of shadow lengths in about AD 700 (Table 2) which enabled the point in a twelve hour day to be determined. In his

Hour of the Day	Jan Dec	Feb Nov	Mar Oct	Apr Sept	May Aug	June July
1 or 11	29	27	25	23	21	19
2 or 10	19	17	15	13	11	9
3 or 9	17	15	13	11	9	7
4 or 8	15	13	11	9	7	5
5 or 7	13	11	9	7	5	3
6	11	9	7	5	3	1

Table 2. Length of One's Shadow in 'Feet' at various Hours of the Day at Various Times of the Year. A table said to have been given by Bede about 700AD.

reference to the death of Abbot Coelfrid of Jarrow on his last pilgrimage to Rome, Bede states that Coelfrid was taken ill at about the third hour of the day and died at the tenth hour of the same day [5]. We are not justified in assuming, as some writers have done, that because the canonical hour dial divided the semi-circle into four equal parts it meant that the early Anglo-Saxons had divided their day into four, and that the Church had made the dials to indicate 'tides' in agreement with an existing time-measuring system.

At the end of the eighth century and the beginning of the Danish wars the early Anglo-Saxon period may be taken as coming to an end. During the next hundred years or so many churches were destroyed and their dials with them, some lost for ever but a few rescued to appear on the walls of later churches, giving us problems of identification in after years.

With the monastic revival of the tenth century came new ideas from the Continent. We cannot say just when dials began to re-appear, but the surviving dials seem to belong to the late tenth and the eleventh centuries. The dial at Kirkdale has been much written about, and perhaps as often misunderstood. Part of the inscription reads 'I am the sun's marker at every tide' (or hour), and taken as 'tide' this has helped to perpetuate the idea of the Anglo-Saxon divisions of the day. But if taken as 'hour', it could mean no more than 'every canonical hour' which was the purpose of the semi-circular dial from its inception. The canonical hour lines with their cross bars are still retained at Kirkdale and the additional lines may be no more than intermediate

points between them, and not evidence of a so-called octaval time system. The St. Andrew's Cross on the line below 'sunrise' has been given various interpretations but seems most likely to indicate the time for a religious service. The only other dial which marks this point in a special way is the one at Daglingworth.

Later articles will examine more closely some of the dials with different arrangements of lines and cross-bars, concentric circles, inscriptions and symbols. These are:
Escomb and Corhampton with their Christian and Pagan symbolism
Darlington with its concentric circles
Pittington with its six divisions and unusual line terminations
Aldbrough with its dedicated inscription and curious symbol
Orpington with its enigmatic inscription and unique arrangement of lines.

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A BERNHARDT SUNDIAL IN ISRAEL

M. D. J. ISAACS

Fig 1.

Fig 2.

I was interested in the article on Bernhardt Dials in BSS. Bull. 98.2. I first saw one of these dials in 1980 when I visited the Hebrew University at Rehovoth near Jerusalem in Israel. I was fascinated by it as it was so unlike any other dial I had ever seen. It was made more interesting as it was a memorial to a great British scientist. I enclose prints from the slides I took then.

The dial is mounted on a pillar on a circular plinth, in a small circular plot paved with multicoloured stone slabs and with a curved stone bench at one side. The plinth bears three cast bronze plates, two of which are in English, and the third is in Hebrew. The two Engl;ish plates are the memorial dedication and an explanation of the features of the dial.

The memorial inscription reads:

IN CHERISHED MEMORY
OF SIR HANS KRONBERGER FRS CBE
FROM JUNIS
LIFE IS BUT A BRIEF SHADOW, A POOR PLAYER

Fig 3.

The second section of the plinth reads:
'The time indicated by ordinary sun dials of a flat dial and plain gnomon may deviate by as much as 15 minutes from local time, at certain times of the year. The special shapes of the dial & gnomon in this sun clock ensure that its reading is always correct to within a fraction of minute'

I am unable to read the third section, in Hebrew.

With regard to the two gnomons needed for the dial, we visited Israel in November 1980, and I now realise from the Bulletin article that the gnomon shown in my photos was the incorrect one for that time of the year!

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ASTRO-COMPASS OR HELIOCHRONOMETER

MAURICE J. KENN

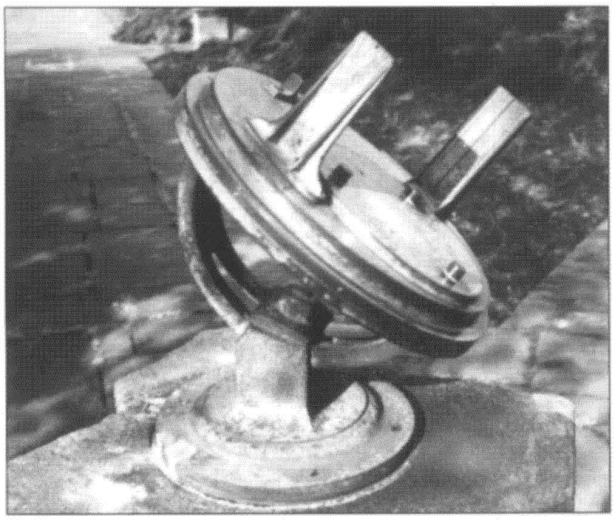

Fig 1.

The Gibbs Universal Heliochronometer, which was first patented in 1906, has been fully described by Th.J.J. Van Den Heiligenberg.[1]

More recently the particular instrument which was installed in 1908, at Dunchurch Lodge near Rugby, has received special mention from Graham Aldred [2], and those B.S.S. Members who attended the Annual Conference at Dunchurch in 1998 will have seen, and used, this instrument, (Fig.1).

Elegant modern instruments of this type are again now available but tend necessarily to be rather costly, and accordingly are perhaps most suited as 'Anniversary

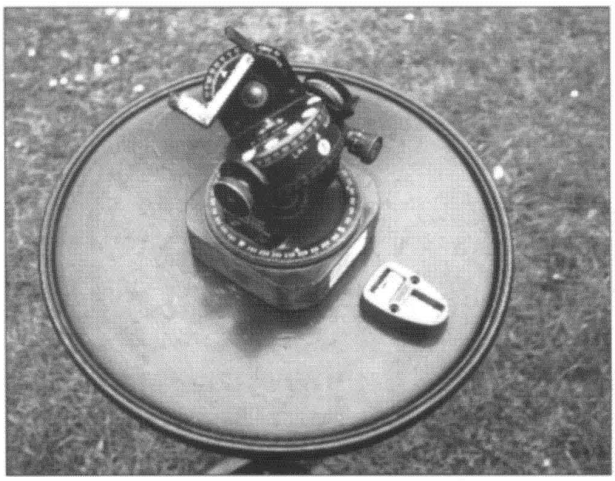

Fig 2.

presents' (cf. the GSD Gunning Sundial).

Adept B.S.S. Members can, of course, make their own version of a heliochronometer and a convenient design has been described by H.R.Mills.[3]

An alternative approach, however, is merely to convert an existing Astro-Compass into a Heliochronometer. For example, the Kelvin-Hughes A.M. MK II Astro-Compass (which was essentially based on the design of A.A.Bumstead) was widely used during World War II by both the Royal Air Force and the American Air Force[4], and many of these instruments still survive.

An instrument of this type can be very readily converted to

a Heliochronometer by providing suitable marked and sited self-adhesive paper 'Hour-labels', above, and adjacent to, the existing 'Local-hour-angle' scale. Declination and latitude adjustments can be made with this instrument and the relevant scales (with also that for local-hour angle) can be read to an accuracy of about one-half of one degree. The heliochronometer can therefore indicate local sun time to within an accuracy of perhaps two minutes or so of time.

Incidentally the A.M. Astro-Compass provides a very ready means of finding 'True north-south line', at any known location, or indeed of finding any other true bearing, for example that of a vertical wall.

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LIFE WITH A HELIOCHRONOMETER

ANN COLVILLE

The discovery of a heliochronometer in the garden at Holehird and its subsequent restoration and reinstallation brought back a flood of memories of a childhood in which such an instrument had been part of domestic life. It was our Big Ben and time clock during the 1939-1945 war. During the summer of 1939 my father was on leave from India and the family lived at my grandfather's holiday home on the west shore of Windermere. When the war was declared in September, my father returned while my mother and siblings continued to live on in the house for the duration of the war and afterwards. Life was, by today's standards, or even the standards of the time, very primitive. The house, built in 1870, was always a holiday home and had never been equipped with the telephone, electricity or wireless. The newspaper arrived by post 24 hours after publication, telegrams were delivered from Ambleside by a boy on a bicycle (9a.m. to 5 p.m. only). Our only neighbours were a tenant farmer and his family, and the gamekeeper to the Curwen Estate.

In 1912 when my grandfather inherited the property accurate timekeeping was becoming more important; trains had to be caught and other deadlines met. To help solve the problem a heliochronometer was purchased, mounted on a slate plinth in the garden and protected from the elements by a glass bell jar. Its alignment and accuracy were supervised by my grandfather's uncle Waynman Dixon, who was an astronomer as well as the engineer who brought Cleopatra's needle to London. Until 1940 and the fall of France, we had no wireless in the house! When one was finally installed the wet battery only just lasted a week if we confined our listening to the 9 o'clock news and one

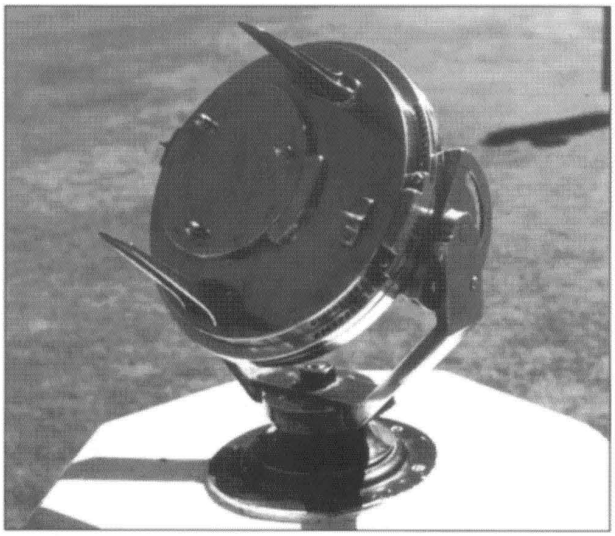

Fig 1. Helio-Chronometer, Garden of Fort, Khyber Pass, N.W.F.P., Pakistan

or two other programmes during the evening. For this reason a careful check of the time was made once a week on the sundial and if possible just before the ritual winding up of the longcase and bracket clocks on a Sunday. It seems that the sun always shone for my mother to check the time so we were sure to catch the train back to boarding school! It seems strange that looking back it seems an idyllic existence but at the time I was rather ashamed of our lack of facilities and I never let any of my school friends know. It would seem that these instruments were owned by several households in the district.; some were just rich men's toys and others were kept for practical reasons. I feel that Holehird must have had both telephone and electricity long before the war.

It was interesting to come across one in 1988 in the garden of the Officers' Mess of the Khyber Rifles on the Afgan frontier. It was beautifully kept and in working order though nobody appeared to know how to use it. My brother and I had a brief moment of glory when we were able to give a demonstration and finally read off a time which coincided with that recorded on the military gentlemen's watches. In our childhood it had always seemed a better check than Big Ben! Alas when the family property was sold in 1957 the heliochronometer went to an uncle in America. I am pleased to say that it is now mounted on a granite plinth in New England and is still in working order though its use is no more than a curiosity.

FOOTNOTES TO 'LIFE WITH A HELIO-CHRONOMETER'

The restoration of the Holehird Helio-Chronometer was made more memorable for me by meeting Mrs. Ann Colville who shares my enthusiasm for Helio-Chronometers. Our subsequent interesting conversations have led to the tracing of two more instruments both of which are well cared for but far away. Mrs. Colville's account of "Life with a Helio-Chronometer" first appeared in The Journal of the Lakeland Horticultural Society, Vol.XIV No. 1, (Nov.1998) and is reprinted here by kind permission of the author and the editor.

This authentic account provides a fascinating confirmation of the accuracy and reliability of the Gibbs Helio-Chronometer. Perhaps, in 1945, the family sundial was the last Helio-Chronometer ever to be used for the purpose for which it was designed. In this respect, although many other Helio-Chronometers were still functioning, it may have been the last "working" instrument in Great Britain. Consequently this may have been the last occasion in this country when any sundial was quite seriously and repeatedly used to "set the clocks".

By an odd coincidence, less than one week later, at the BSS Conference at Dunchurch, BSS Member John Gunning also told me about the instrument in the fort on the Khyber Pass which he had seen some years previously. This is another interesting example of the Helio-Chronometer story, where one of more than two hundred instruments which were installed in remote and often harsh places somewhere on the five continents has survived and is still working after 90 years.

The Gibbs Helio-Chronometer in the fort on the Khyber Pass is the more rare Mk.2 Universal model, described in the Pilkington & Gibbs catalogue as the Empire Model. The universal mounting arrangement is a little less elegant but more robust than the standard Mk.2 Universal model which can be seen at Dunchurch Lodge (see photo BSS Bulletin 98/1 page 16). The Khyber Pass Helio-Chronometer is shown in Fig.1, a remote sentinel, threatened only by the vigour of military polishing!

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A TASTE OF ITALY

JOHN INGRAM

Discovered during a recent holiday in Italy was a fascinating kitchen sundial. The dial can be found at the Villa Quirici, Pedona, Camaiore, near Viareggio, overlooking the Ligurian Sea. The Villa Quirici is a sprawling four-storey edifice dating from the 14th century, whose history and development has included several religious orders, and in particular the sustenance of visitors and travellers. The architecture is very much in the local vernacular.

The sundial can be found outside the kitchen window sill on the first floor, forming a horizontal extension jutting out from the window sill. The present kitchen appears to have been part of the original domestic apartments, and is in the north-west wing. The window giving access to the dial can be seen in Fig.1 above the small terrace to the left-hand side, and again in Fig.2.

Fig. 1 Villa Quirici, Pedona, Camaior, near Viareggio, Italy. The dial is outside the left-hand white window on the first floor, above the railed courtyard on the left of the photo.

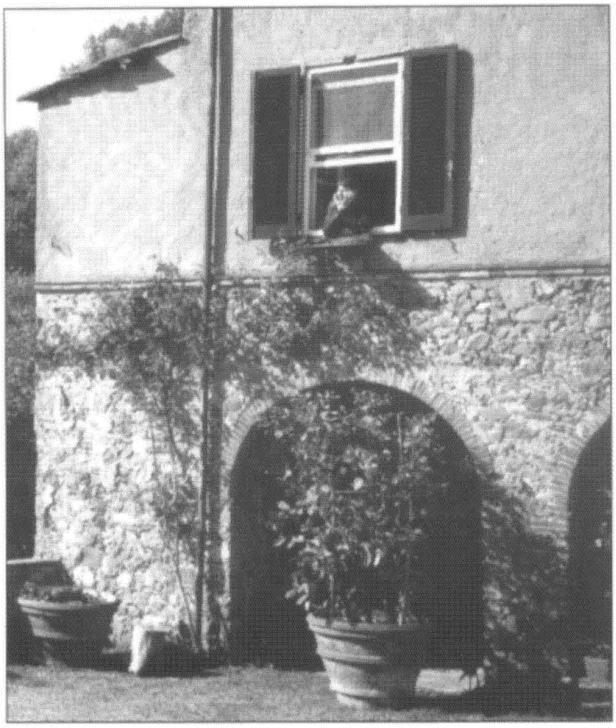

Fig. 2 The edge of the dial-plate is just below the window-sill, and its shadow is cast on the wall below.

The dial itself can be seen in Fig.3. The plate is accurately delineated in local stone from 6 a.m. to 6 p.m. at each hour. The noon line declines at approximately 10° to the wall indicating that the wall declines 10° west of south. There are the rather eroded remains of a border indicating perhaps the quarter and half hours. The plate is supported from the underside by 2 iron brackets in the form of square-section bars. Unfortunately the gnomon has gone. There is no evidence of mottoes, equation-of-time or other furniture. It may be concluded that the dial was very utilitarian.

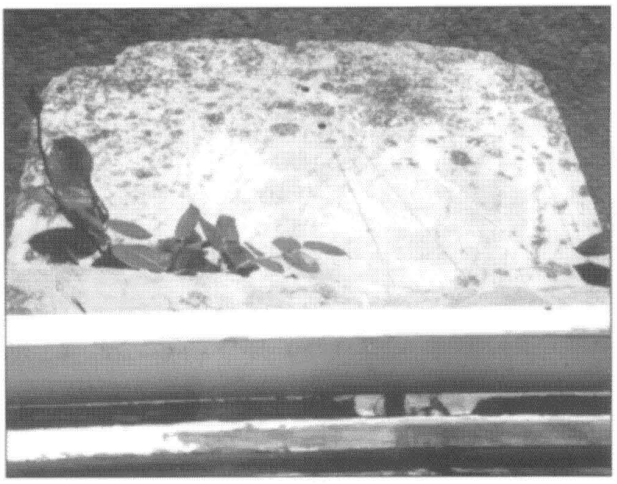

Fig. 3 The dial-plate; unfortunately the gnomon has gone.

Was the dial used for cooking-times in the kitchen? It would have been difficult to time a boiled egg. Or if roasting a joint, what did the chefs do if the clouds came by after they had started? Furthermore, the dial seems to have been overshadowed by the main part of the building until around 10.30 or 11 a.m. so one wonders whether breakfast might have been a variable feast. Although the dial may not be in its original position, it would appear that it was always attached to a wall, since there are no indications of the plate having been mounted on a plinth, column or terrace wall. As often happens with sundials, there are more questions than answers.

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SURPRISES AT HEAVEN'S GATE

MICHAEL CARDEN

Highclere Castle, the seat of the Earls of Carnarvon, is a magnificent Victorian fantasy designed for the fourth Earl by Sir Charles Barry to envelop the earlier Georgian mansion. It stands like a trial run for the House of Commons (which it preceded by a year or two) at the centre of a beautiful Capability Brown park just south of Newbury across the county boundary in North Hampshire.

The first of the Earl's ancestors to live at Highclere was Robert Herbert, a member of the Pembroke family who live not far away at Wilton House near Salisbury. Apart from starting the Georgian replacement of an even older house, he scattered delightful follies around the grounds. Amongst these is a fifty-foot triple arch at the top of Sidown Hill to the south of the Castle. High in the distance the arch is silhouetted against the sky making a gateway to Heaven.

Looking the other way the great central arch frames a superb view of the Castle, and there must have been a favourite family expedition for al fresco meals in the little pavilions which once backed the two smaller arches. When restoring the structure our first surprise was the discovery of a chimney flue leading down from the top of the pediment towards the western arch and, presumably, its pavilion. We fixed a new urn on this topmost point because the design looked incomplete without it. An old print shows

Fig 1. Heaven's Gate, Highclere, Hampshire

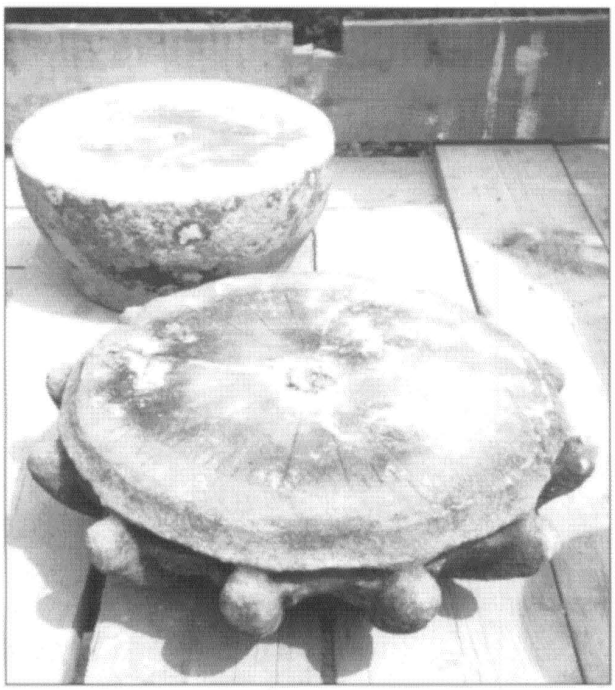

Fig 2. Urn and inverted lid, on the scaffold

an urn here, and now we know it must also have been a chimney pot from which smoke would have wafted on occasion!

The brickwork sweeps down on either side of the pediment, terminating in bases for the two surviving urns. Our second and even more intriguing surprise was the discovery of a sundial on the underside of the lid of the eastern urn. This was in a very precarious state, leaning rakishly to one side and only kept in place by a long and very rusty iron dowel sunk deep into the brickwork. When the urn had been taken down for repair it turned out to be made in solid pieces of stone, the lid separate from the remainder, but all pierced by the same central dowel.

When it had been laid out on the scaffold, we could see that the underside of the lid had been engraved as a sundial. Moreover, a deeper radial groove marked the position of a gnomon. My first theory was that the lid had been made out of an unwanted sundial, defective in some way or, perhaps, not paid for by a defaulting customer. But the shape and carving of the lid with its heavy scalloped edge does not look like a converted sundial table and, on closer inspection, although well executed the engraving appeared too shallow and a little too casual for so substantial a piece of stone.

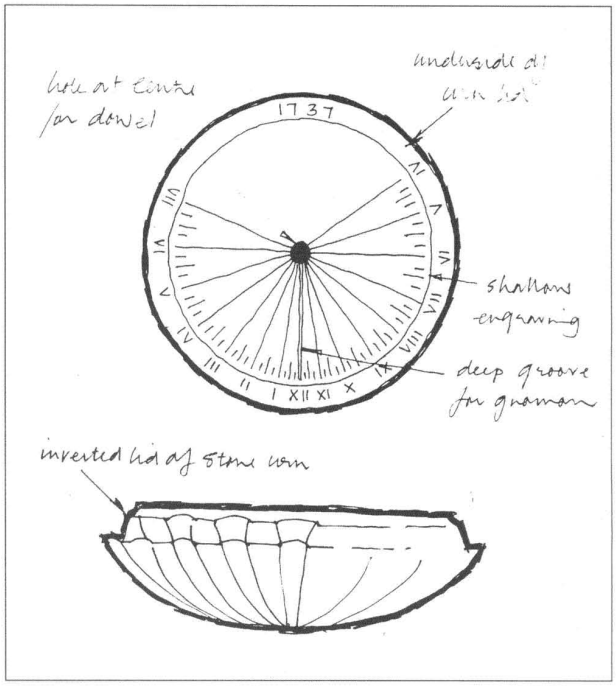

Fig. 3 Drawings of lid and its underside

I now think that the sundial was cut into this convenient flat round surface by one of the masons who built the folly so that he and his mates could programme their day's work. With the prevailing wind in the wrong direction, the top of Sidown Hill is too far from the Castle for the men to have heard the stable bell which would have sounded the hours for everyone else, and the steep hillside is too remote to judge the time by the activities of others.

Two objections have been raised to my theory. The urn would need to have been delivered to the site unusually early to have served as a sundial during construction; but this early delivery might indeed have been necessary because of the weight of the urns, which could then go up more easily, stage by stage with the scaffold. A second

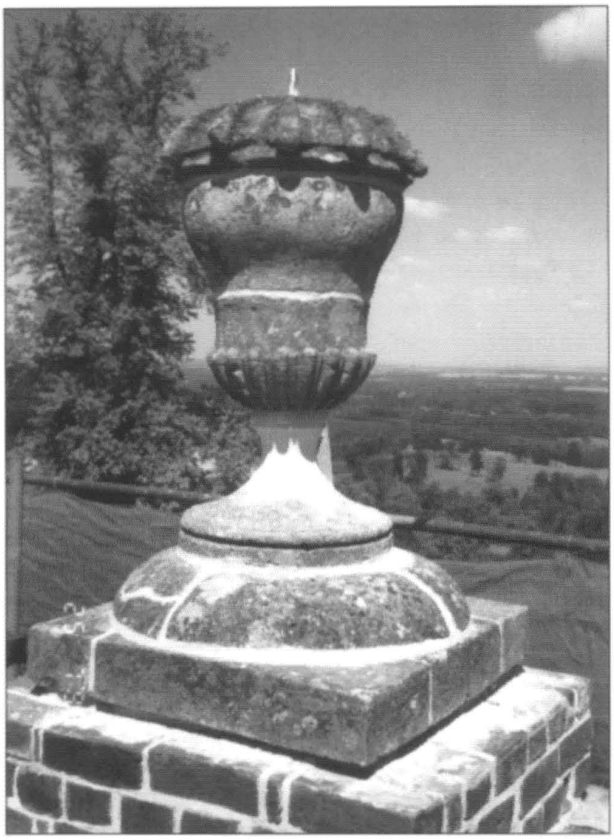

Fig 4. The restored urn in position

objection (according to one of my more cynical friends) is that no workman would have bothered to engrave all the hours when only knocking-off time would have been necessary! But can you think of a better explanation?

There is one other factor to take into account. The keystone of the central arch has beautifully engraved into its face the words ROBERT HERBERT HUNC ARCUM POSUIT AD 1737, implying, I think, the start of the project or the placing of the keystone rather than the completion of the whole structure. The unknown sundial carver also dated his work 1737.

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A CONICAL SUNDIAL: REVIEW OF 2 OFFPRINTS

A Conical Sundial from Abû Mîna,
J.Kosciuk: Bulletin de la Société d'Archéologie Copte, 31, 43-55 (1992)

The Conical Sundial from Abû Mîna,: a second analysis
M.Hüttig: Bulletin de la Société d'Archéologie Copte, 37, 135-141 (1998)

The members of the British Sundial Society who are interested in the history of sundials will probably be familiar with the Hemicyclium, or Dial of Berosus, said to have been invented in the Middle East in the 3rd Century B.C. There are many examples from archaeological excavations; and a description of the dial, with the making of a modern version, has recently been given by Dick Shackleton, (Bull.BSS. 98.2, 40-41, 1998). The hemicyclium carries the hour-lines on the concave surface of the inner side of a quarter of a sphere. The upper edge, placed horizontally, carries the horizontal gnomon at its north point; the gnomon projects above the cavity so that its tip lies above the sphere's centre, and the hour is read from the position of the shadow of the tip. Twelve hour-lines are inscribed on the curved surface, and converge towards the root of the gnomon; and in many instances, day-lines for the solstices and equinoxes join the hour lines.

The Conical Sundial is less familiar to diallists.The work by Gibbs on 'Greek and Roman Sundials' mentions about 40 such dials. Kosciuk, in the paper under review, has listed 7 examples from Egypt and the Sudan, from museums or mentions in archaeological literature. Most of them are derived from excavations in Egypt, and they date, where a date is given, from the first to the third century A.D. In a conical sundial, the hour-lines are inscribed on the inner curved surface of a truncated cone; and according to Hüttig in the article under review, the conical dial was developed from the hemicyclium because of its comparative ease of manufacture, since the generating line of the cone is straight, not curved.

To the small group of Egyptian conical dials listed at the beginning of Kosciuk's article, he has now added a conical dial found in 1985, in the ruins of Abû Mîna, an 'antique pilgrimage centre' situated about 50km SSW of Alexandria, at 30°50'N (Alexandria is at 31°18'N). The sundial (Fig.1) is inscribed on a block of limestone approximately 400mm

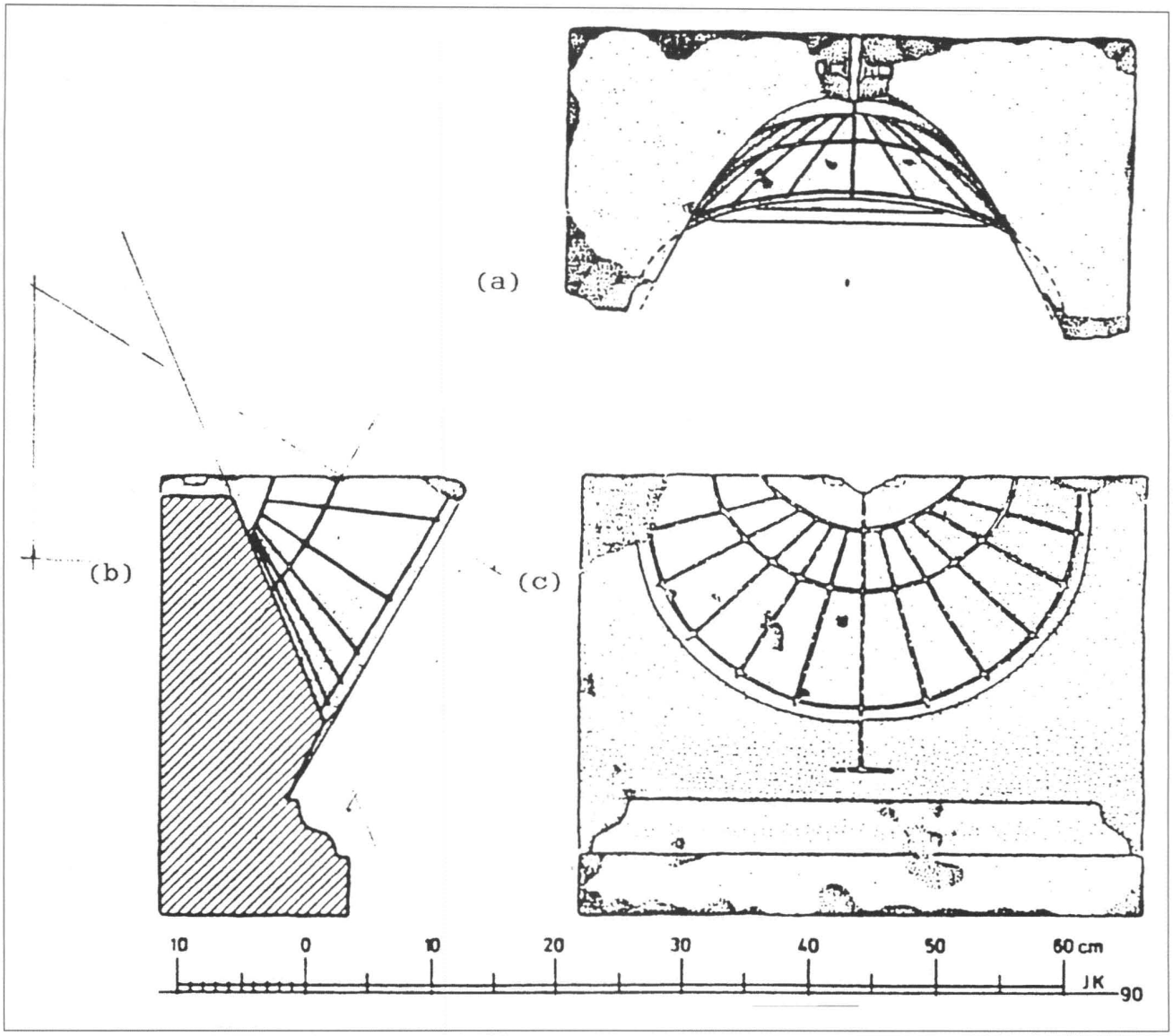

Fig 1. The sundial found at Abû Mîna from (a) top, (b) side, (c) front

x 250mm x 350mm .The base of the block has been carved into a plinth. The noon-line is marked by a small inverted 'T'. A small cavity in the centre of the upper horizontal surface shows where a horizontal gnomon was inserted, and traces of rust indicate that it was made of iron; it was fixed with lead. Day-curves (presumably for equinoxes and solstices) are inscribed parallel with the curved front of the dial face. (A 'development' of the lines is given in Fig.2). In the context of its position when found, archaeologists surmise that the dial fell out of use in the first half of the 7th century, probably during the Persian invasion of Egypt in 619 A.D. During the town's partial repair after the Persian withdrawal (628 A.D.) the dial was not re-erected, but was simply used as a building block for repairing a vault in a cellar on the north side of the main square of the town. The author suggests that its original position was close to the main building, the Xenodochium, in the square, but this is pure speculation.

Kosciuk's paper records careful measurements of lines on the dial face. The seasonal hour lines divide the day curves nearly equally, except that the first and last lines have slightly larger distances. The distance from winter-solstice curve to equinox is less than from equinox to summer-solstice curve, measured along noon line.

Deductions from these and other linear and angular measurements lead the author to the conclusion that the dial was made for the latitude of Alexandria, and stylistic comparisons with other conical sundials found in the Near East suggest to him a date in the 4th century A.D. He also concludes that errors of the cutting of the curved conical surface have led to greater inaccuracy in this dial than that occurring in other conical dials found in antiquity. Hüttig has used Kosciuk's measurements but has interpreted them somewhat differently. In particular he suggests that one or other of the 'solstice' lines may be no more than

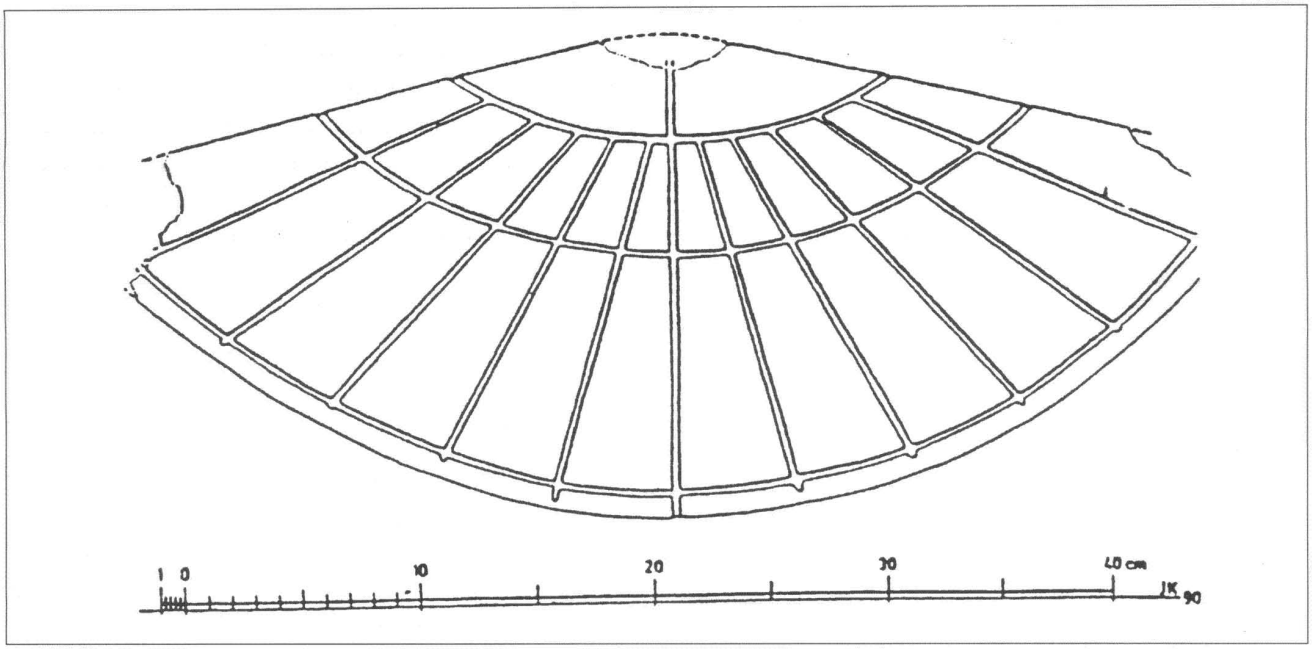

Fig.2. Development' of hour lines and day lines

construction lines used in the lay-out of the hour-lines, and that no astronomical significance can be attached to them. In consequence the designer or sculptor of the dial may have worked more accurately than Kosciuk supposes. Regrettably neither author mentions the place where the dial is now located, but Hüttig suggests (personal communication) that it may be in a museum close to the site of excavation.

These offprints, now deposited in the Society's library, provide diallists with an interesting introduction to a rare type of ancient sundial. They also serve to warn all readers about the limitations and pitfalls of archaeological research.

M.S.

TEN YEARS AGO

The British Sundial Society was founded in the spring of 1989. We recently invited some of the members who joined the Society during the first few months of its existence to tell us what led them into membership, and whether the Society fulfils their expectations. Some responses to this invitation are printed below.

From T.B.Palmer, Maylandsea, Essex:

It all started some thirty years ago when a friend said to me- 'I'm going to learn to sail. Are you coming?' Naturally, I went. We each bought a dinghy and we sailed on reservoirs, then on wide estuaries, in all kinds of weather. My wife fell in love with sailing and this made life infinitely easier-no need to invent excuses for being away for hours at a time.

In time the desire to get something bigger and better than our 14 footer became too strong to ignore. A 24 ft. fin keel, high performing boat came next. We now lived in a village on the River Crouch where yachting is a way of life. When cruising together with friends in the yacht club we tasted the excitement of sailing not only up and down the East Coast but also to France, Belgium and the Channel Islands.

More decisions...

Next was a cruising catamaran, with every extra imaginable. We now had radar, marine VHF radio and every kind of navigational aid. It was time to find out how best to use it all. I enrolled in evening classes leading up to Yachtmaster Certificate which would qualify me to sail the seas out of sight of land. I had entered a new world: a world of charts, weather maps, tide tables, rules for preventing collisions at sea, lights recognition, sea marks, radio procedures, and above all-navigation. Elementary at first, then more advanced; until the day when taking sun sights and looking up the tables I found my position to be 10 miles inland while sailing in the middle of the Goodwin Sands! After that things could only get better. On a sailing holiday in Falmouth I rooted around the interesting little shops and came away with a sextant and copies of Norie's Nautical

Tables and Nicholls' Concise Guide, Vols. I and II (they really are called 'Concise'!) : a total of 1750 pages of utterly priceless distilled knowledge-a large part of it of great value not only to mariners but also to diallists.

It was soon after, that a paragraph in a magazine invited people interested in sundials and the science of gnomonics to contact, etc.... Gnomonics, sundials, spherical trigonometry, azimuths, sun sights, latitude/longitude- they were all kissing cousins, and so my letter to Mr. Young followed next morning.

I eagerly perused the Society's Bulletin, obtained a few books on dialling and had fun making cardboard models from 'Sundials and Time Dials' by Jenkins and Bear. Then I started planning the construction of a 'proper' dial. Unfortunately health problems intervened. I now no longer sail and am unable to use my workshop. My interest in dialling has come down to the reading but not the doing. In this I find the Society's Bulletin of immense value, keeping up my involvement in dialling, if only by means of the written word. My intention of devoting time to the photographic recording of dials has also come to naught, present disability coinciding with retirement from professional photography and an end to darkroom work.

I greatly value my membership of the Society and am constantly amazed at the breadth and depth of knowledge-and ingenuity-of so many members, as shown by their contributions to the Society's Bulletin.

From P.D.Briggs, Cropwell Butler, Nottingham

Though pleased to be a continuing member of the B.S.S. my early enthusiasm, took a knock following the loss of my good pal Noel Ta Bois. My regular meetings with him together with an exciting exchange of correspondence is something I greatly miss. We had great plans, including such things as writing the definitive article on 'The Equation of Time'. We also shared an interest in the Meccano hobby.

Although I attend few B.S.S.meetings, I do enjoy the magazine-the lifeblood of any active society. The practical aspect appeals to me and I have a modest vertical declining dial on my house. I built a Meccano sundial clock some years ago and enclose a short article on it.
[Mr. Briggs' article, reprinted from 'Constructor Quarterly', is to appear elsewhere in the Bulletin-Ed]

From C.D.Lack, Northampton

I first became interested in sundials when I was working in Glasgow in the early 1960's, when I noticed a small vertical dial over a doorway in the city centre. At that time I knew nothing about time zones, latitude, longitude, mean time or apparent time. To sum up, I knew very little about the sun's behavior in the heavens throughout the year.

By good fortune I came across the Mayalls' book on *Sundials*. All my basic knowledge on the subject is due to their book. However my attention then became directed into elementary astronomy.

Later in the decade when working in Birmingham, I bought A.P. Herbert's *"Sundials Old and New"* with the perhaps unusual subtitle of *Or Fun with the Sun* (1967). For me, this is the best book on sundials ever written, a serious book with a lively humorous style: 'an ellipse, which is a circle someone has trodden on' is not untypical of his light touch. I see that it cost me 63 shillings in old money; its second-hand value is now highly satisfying.

In the book he describes several highly original instruments which he had constructed - the Herbert Universal Adjustable Sun Clock, the Herbert Height-Finder, the Cascanio or Compass and Sextant, Clock and Navigator in one. A reviewer in the TLS described him in Aubrey's terms as "a very ingeniose person". Unfortunately I am most impractical and have never constructed any of these marvellous gadgets. Cardboard models which I can make attract every breeze in the garden and get blown into the shade. But Herbert's instruments live in the mind like virtual realities.

When I saw the notice about the proposed formation of a sundial society, I was delighted to join. I remember suggesting that the Society borrow the Latin motto of the Society of Radiographers - Ex umbris eruditio: eminently suitable for both Societies. For me, the Bulletin is a way of keeping in touch with the sundial world. I would not be without it. Unfortunately I have not been able to attend any of the meetings or Annual Conferences but enjoy reading about them.

I hope the Society might do more to encourage architects and authorities, public and private, to find room on new buildings for large eye-catching sundials.

On a wider matter, if the Government on the grounds of safety wish to bring in the advantage of daylight saving throughout the year, we must remember that BST in Herbert's words is "a mortal foe to the dialler". Let me remind members that the Time Zones are an international

agreement of the Washington Meridian Conference of 1884. Greenwich Mean Time or Universal Time is central to navigational tables and almanacs. The Nautical Almanac (HMSO) keeps to GMT (UT) throughout the year. We can do the same while having longer evenings in the winter if an intelligent government would merely stipulate that it will not muck about with the clocks but still keeping on GMT will get everyone in the country to start their day one hour earlier. This was the idea A.P. Herbert put forward in his booklet "In the Dark" (1970) and which he called the "Painless Plan". I hope the Bulletin will spread this plan. Do we want the nation to commemorate the two minutes silence on 11th November when Big Ben is striking twelve? Surely not. And after all the Prime Meridian is one of Britian's glories. BST is confusing; let's drop it.

I would like the Bulletin to give more explanatory articles about the mathematics behind dialling and also keep a watching brief on the world of astrolabes, cousins of our dials.

I would welcome space for advertisements relative to the Society's aims. I believe our late lamented editor was not in favour of adverts but where else would we expect to find them?

All in all the Bulletin serves its readers well-floreat.

THE BLAZEFIELD SUNDIAL

DESIGNED AND CREATED BY D.J. BUSH AND P.H. RACK 1997

The photograph shows a vertical, almost direct south, sundial made in 1997 and attached to a barn wall in Nidderdale, North Yorkshire, at Latitude 54° 05′ N. Longitude 1° 48′ W. The wall actually declines from true South by 3.3° E., and the dial's markings are calculated accordingly.

The dial is constructed of a four-foot square of 20mm thick plywood, edged with a hardwood moulding, painted with three coats of primer and three of undercoat, decorated with exterior quality gloss paint and finished with three coats of yacht varnish. It is attached to the wall by six expanding Rawlbolts positioned to enable final horizontal and vertical adjustments to be made *in situ.*

The style was made in wrought iron to the designers' exact specification by a local craftsman.It stops short, by a few inches, of actually entering the board at the dial's centre. This means, of course, that a few minutes are lost from early morning and late afternoon ; but this hardly matters since both East and West horizons are pretty hilly! A "runner" in the shape of an adjustable disk on the style traces the solstitial and equinoctial lines.

The four decorative figures at the corners of the board represent (1) a cockerel, (2) a stylized sun, (3) a lamb with a sprig of thyme in its mouth, and (4) a Yorkshire rose. The cockerel and the lamb symbolize the agricultural function of the building, situated in sheep-farming country. The cockerel is placed near the 6.00 a.m. position on the dial for obvious reasons. The sprig of *thyme* in the lamb's mouth may be considered a bad pun on *time*, but actually this emblem has a venerable history. It was the emblem of the London Foundling Society, and is said to have been created for the Society by Hogarth. In 1779 the Society's Foundling Hospital near Pontefract, in Yorkshire, was bought by Quakers and became Ackworth School, and the lamb (with sprig of thyme) became, and remains, the badge of that school.

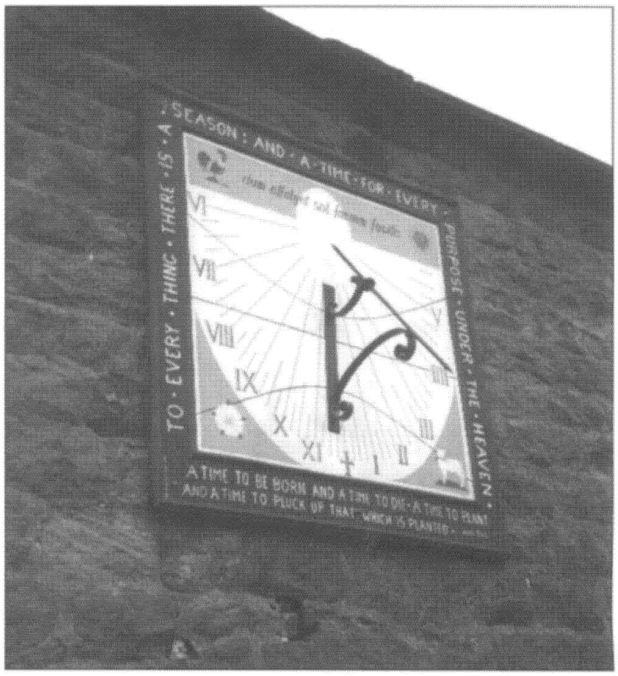

Fig. 1

The motto within the frame of the dial is the opening lines of the well-known verse from Ecclesiastes, and reads :

To everything there is a season, and a time for every purpose under the heaven. A time to be born, and a time to die : a time to plant, and a time to pluck up that which is planted.

The shorter Latin motto across the top reads : *dum effulget sol faenum facite*. Latin scholars will have no difficulty in appreciating the relevance of this on a barn which until recently was used for storing hay.

The designer and maker of this sundial will be pleased to receive comments and questions from anyone interested. Enquiries should be addressed to Donald Bush, 36, Villiers Road, Woodthorpe, Nottingham NG5 4FB Tel. 0115 952 0648. Anyone wishing to visit the dial should make contact in advance, since it is located on private property in a remote location which is difficult to find without guidance.

THE ALTITUDE SUNDIALS OF HUMPHREY COLE

DENYS VAUGHAN

(First published in *Making Instruments Count,* ed. by R. G. W. Anderson et al., Variorum, 1993)

This paper examines two instruments by Humphrey Cole which were acquired by the Science Museum in the mid 1980s and which have altitude sundials of an unusual kind.

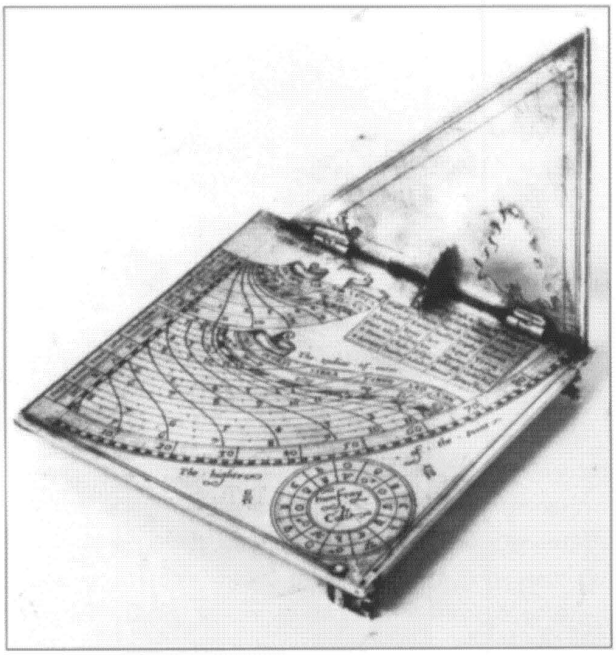

Fig. 1 Horizontal altitude dial by Humphrey Cole in the collection of the Science Museum, London, (1985-100).

The first instrument is the small dial in silver, signed 'Humfray Colle', which was described in detail by Kathleen Higgins in *The Connoisseur*[1] and which appears as No. 4 in Gerard Turner's list of Cole's extant instruments.[2] This dial is not dated but by comparing the signature with that on other dated instruments by Cole, Higgins was able to assign a date between 1568 and 1569. At first sight the triangular gnomon (Fig. 1) suggests that it is a horizontal direction dial but the shape of the hour lines and the scale marked 'the highte of the sonne' show that it is an altitude dial. There are two sets of hour lines, one indicating planetary or unequal hours, and the other showing equal hours. Each set of hour lines is associated with arcs, which mark the position of the sun in the zodiac at intervals of ten degrees. This allows for the declination of the sun and is used with a table (engraved on the other side of the dial) which lists the dates of the sun's entry into the signs. The dial was constructed for the latitude of London, 51° 30′, and these figures are marked on either side of the roundel containing the signature. The dial stands on three feet, two of which act as pinhole sights (Fig. 2). An alidade, which traverses a quadrant scale marked in degrees, is pivoted at one of the sights.

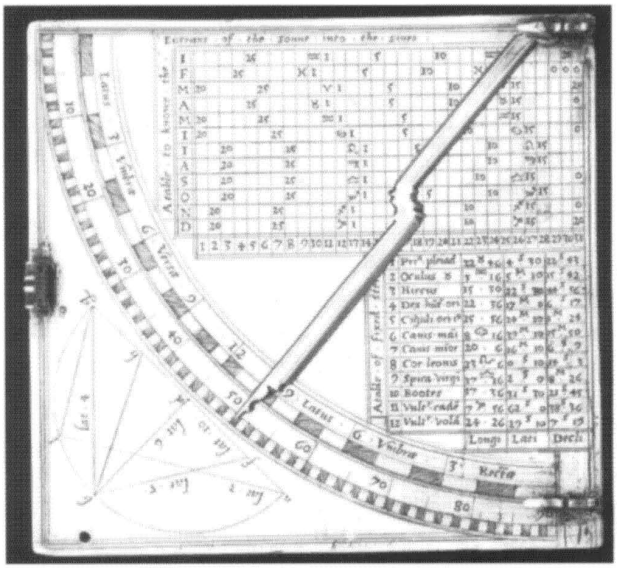

Fig. 2 The underside of the dial shown in Fig. 1.

Higgins (see Ref. 1) suggested that the sights and the alidade were used to determine the height of the sun and that this information was then transferred to the other side of the instrument to read the hours in the following way. The dial would first be oriented so that the shadow cast by the inclined edge of the gnomon indicated the height of the sun on the quadrant scale. The hours could then be read off at the point where this shadow crossed the appropriate zodiac line. The gnomon is being used merely to project a straight line on the plate, a function that could have been performed more easily with an alidade or even by a taut thread. It seems unlikely that an instrument maker of Cole's ability would construct a gnomon simply for this purpose and as we shall see the gnomon does in fact play a more important role in the operation of the dial.

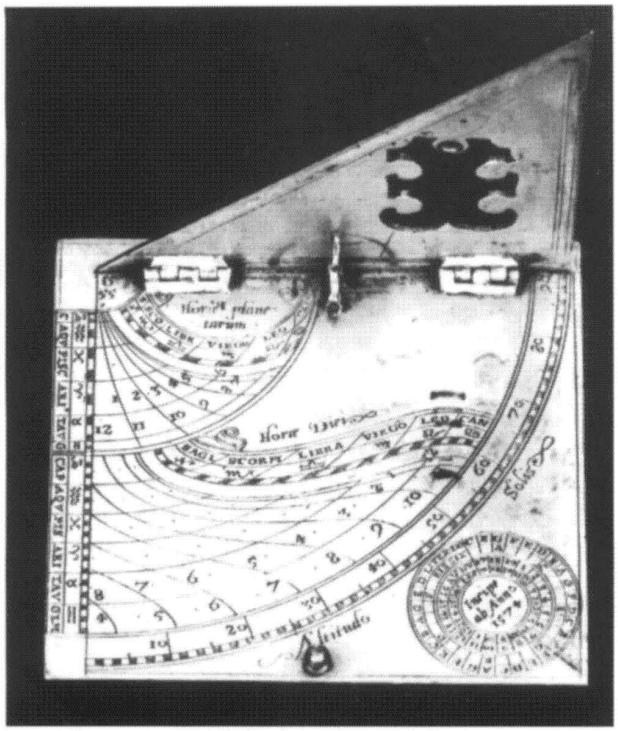

Fig. 3 Horizontal altitude dial by Humphrey Cole in the collection of the Kunstgewerbemuseum, Berlin, (K.4670).

Fig. 3 shows an apparently similar dial, also by Humphrey Cole and dated 1574, in the Kunstgewerbemuseum in Berlin[3]. This dial is intended for use in latitude 55°, but the interesting feature of this instrument is that it has another dial on the reverse side (Fig. 4) constructed for a latitude of 52°. It should be noted that the gnomons in both instruments are all right-angled isosceles triangles. The Berlin dial must operate in a different way to that described by Higgins as it has no sights or alidade to measure the height of the sun. It can be proved by a simple geometrical construction that if the dial is oriented so that the shadow cast by the vertical edge of the gnomon is parallel to one side of the square plate, the shadow of the inclined edge of the gnomon will always indicate the height of the sun on the quadrant scale (Fig.5). The hours can be read directly at the point where this shadow intersects the arc giving the position of the sun in the zodiac.

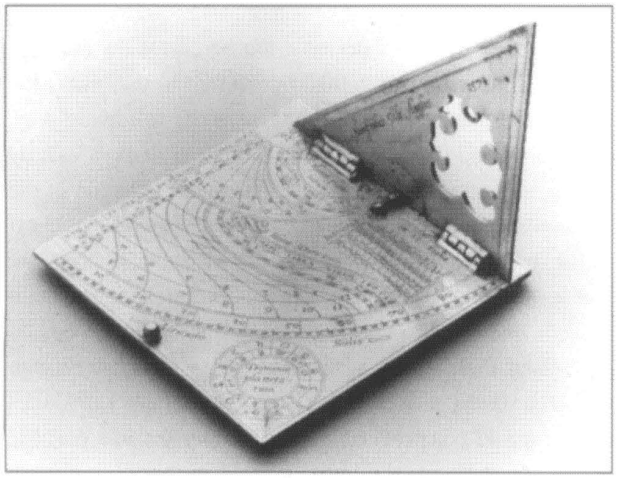

Fig. 4 The reverse side of the dial shown in Fig. 3.

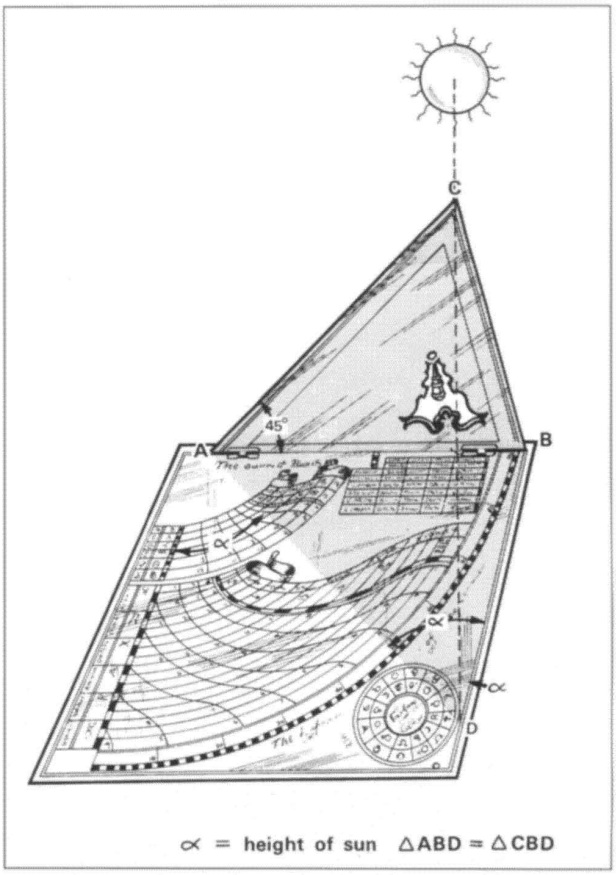

Fig. 5 Diagram showing the mode of operation of the horizontal altitude dial.

I am grateful to Francis Maddison[4] for drawing my attention to the similarity of this dial to the shadow instrument of Pedro Nunez. Nunez's original shadow instrument[5] was devised to determine the position of the meridian so that the variation of the magnetic compass could be measured. This was achieved by observing the azimuth of the sun at two points of equal altitude on either side of *noon*. The bisector of these azimuths then gave the position of the meridian. Nunez claimed that his instrument was an improvement on that of Filipe Guillem as it could measure the altitude of the sun in addition to the azimuth: but the instrument which he described required the altitude to be measured separately using an astrolabe. A second version of the shadow instrument appeared in Nunez's *Opera* of 1566[6] and it is this instrument which measures the altitude of the sun in the same way as the Cole dial. The second shadow instrument is also described in Nunez's later work *De Arte Atque Ratione Navigandi Libri Duo*[7] which is cited by Maddison (see Ref. 4). Cole would have been aware of this work either directly or through John Dee who was a respected friend of Nunez.[8] He has therefore taken an existing method of measuring the height of the sun and used it to construct a dial by adding hour lines and making allowance for the declination of the sun. On the

present evidence this type of dial appears to be unique to Cole.

The second instrument acquired by the Museum was an unrecorded surveyor's rule in brass, signed Humphrey Cole and dated 1574 (Fig.6). Three other surveyor's rules are known (see Ref. 2) but this is the only example with a dial. The dial, which is shown in detail in Fig. 7, appears to be a conventional vertical plate altitude dial and the Sale Catalogue[9] suggested that it was once associated with a horizontal pin gnomon, presumably mounted in the hole in the centre of the hinge. However the position of the hour lines is inconsistent with this hypothesis and requires the gnomon to be inserted in a hole which is present in one of the arms of the rule. This arm would be held horizontally and directed towards the sun, as shown in Fig 8, and the hour read at the point where the shadow crosses the appropriate zodiac line, as in the previous instrument. In 1598 V. Pini described a dial in the form of a crucifix which operates in this way.[10]

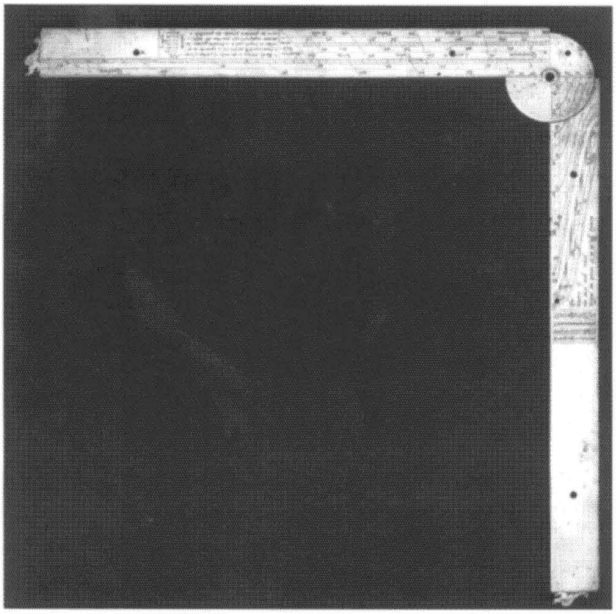

Fig. 6 Surveyor's rule by Humphrey Cole in the collection of the Science Museum, London, (1984-742).

However in this instance a gnomon is not essential as the rule would originally have been fitted with two pairs of sights and the other arm has a *quadrans* (quadrant) scale reading to sixty-five degrees (Fig. 6). It seems more likely therefore that a plumb line was suspended from the hole occupied by the gnomon in Fig. 8, so that the dial operated in a similar way to an horary quadrant, as shown in Fig. 9 (the constructions shown Figs 8 and 9 are equivalent and the dialling scales would be identical). Because the dial is not quadrant shaped the hours are read at the point where the plumb line intersects the appropriate zodiac line and not by means of a bead on the plumb line, as in the conventional quadrant dial.

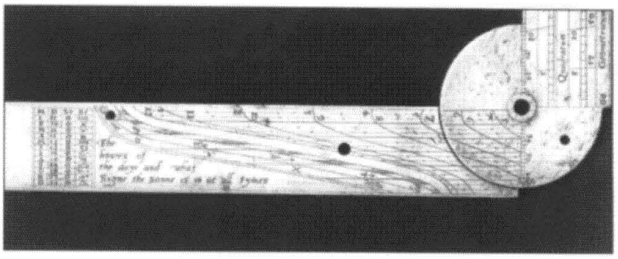

Fig. 7 The altitude dial on the instrument shown in Fig. 6

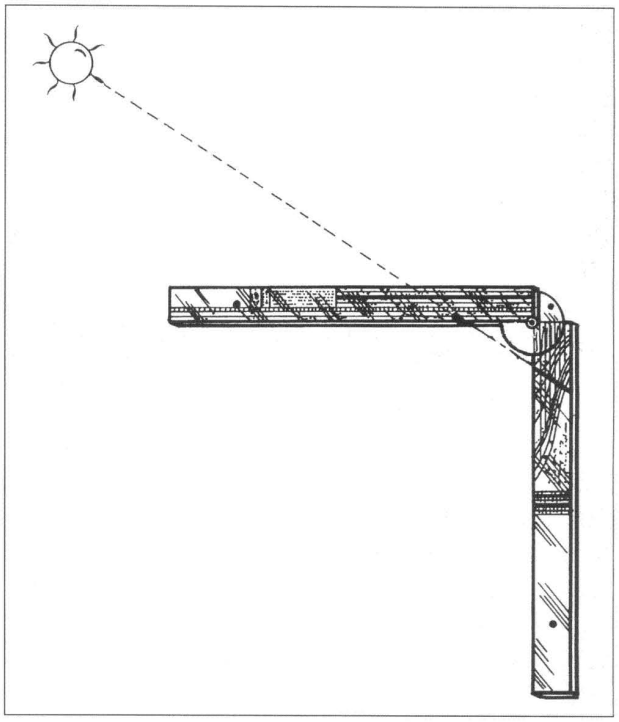

Fig. 8 Diagram showing how the dial on the surveyor's rule might operate with a gnomon.

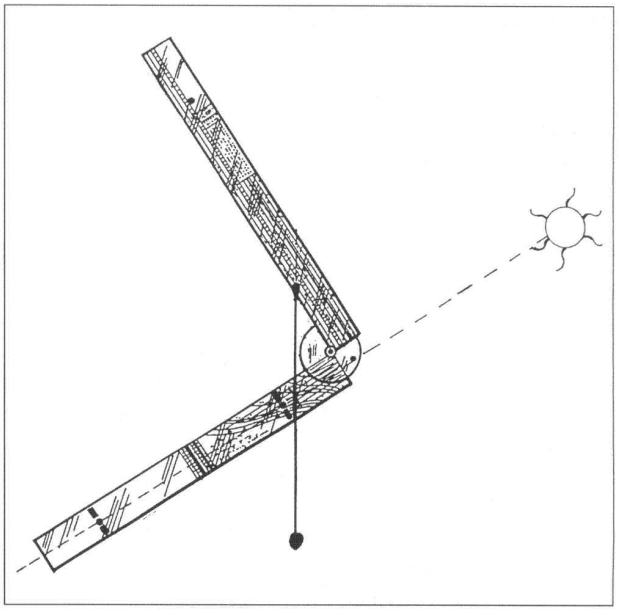

Fig. 9 Diagram showing the probable mode of operation of the dial on the surveyor's rule.

Measurements of the hour lines at the tropic of cancer indicate that the dial was made for use in a latitude of 52° while measurements on the hour lines at other points on the zodiac are grouped around 53°. This variation is perhaps surprising in an instrument made by a maker who has a reputation for precision, but it should be borne in mind that a dial is not an essential feature of a surveyor's rule and in fact the other rules by Cole do not have dials. It could be regarded as a *jeu d'esprit* on what is otherwise a very functional instrument. This might account for the cavalier fashion in which some of the hour lines have been drawn, as for example the fifth hour line which dips as it approaches the tropic of cancer suggesting that the engraver was correcting an error so that he could finish at a marked point on the zodiac line.

The other dials by Cole which have survived (see Ref. 2) are conventional ring, equinoctial and horizontal dials and it is only in the examples discussed here that he has ventured outside what was the usual practice at that time. In both instances he has adapted existing methods of measuring the altitude of the sun to construct novel dials. On the present evidence the horizontal plate altitude dial appears to be unique to Cole. As it does not fit into any of the categories devised by Higgins[11] in her classification of sundials it is suggested that a new sub-section for horizontal plate dials should be included in the section for altitude sundials with gnomons. The dial on the surveyor's rule can be regarded as a variant of the horary quadrant.

ACKNOWLEDGEMENTS

I am grateful to Dr T. Hausmann of the Kunstgewerbemuseum in Berlin for Figs 3 and 4. Figs 1, 2, 6 and 7 are published by permission of the Trustees of the Science Museum, London. It is a pleasure to record my thanks to Mr V. K. Chew, formerly of the Science Museum, for help with translations and many discussions on dialling.

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7) P. Nunez: *De Arte Atque Ratione Navigandi Libri Duo*, Coimbra, 1573. For an English translation of the section dealing with the shadow instrument see L. de Albuquerque in A. Cortesao: *History of Portuguese Cartography*, Coimbra, II, 1971 (pp. 397-9).

8) D. W. Waters: *The Art of Navigation in England,* 2nd ed., London, 1978 (p.94).

9) Sotheby's catalogue: *Important Instruments of Science and Technology 1550-1950,* London, 12 June 1984, lot 329.

10) V. Pini: *Fabrica de gl'horologi Solari,* Venice, 1598 (p.41)

11) K. Higgins: 'The Classification of Sundials', *Annals of Science,* **9,** 342-58 (1953).

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London SW7 5NH

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GLASS SUNDIALS

ALLAN A. MILLS

Refractive sundials are defined as that class of dial where the light rays outlining the shadow of the gnomon are refracted by entry into a transparent medium of substantially greater refractivity than air before falling upon an appropriately calibrated dial. Horizontal dials refracted by water have already been considered, with 'bird bath' and 'chalice' dials as practical examples.[1-4] However, there is no reason why transparent solids should not be employed, glass and perspex[5] being obvious candidates.

The familiar horizontal dial has been made the foundation of glass paperweight sundials for use on a window sill or desk with a southerly aspect. (Fig 1). The dial pattern reproduced below lends itself to reduction and multiple photocopying to form the basis of unusual gifts, for moulded blanks of various shapes are inexpensively available from glass-engravers' suppliers. A disc (70 mm nominal outside diameter), an oval, and a six-pointed star were chosen from a catalogue.[6] All had cavities about 1.2mm deep formed in the base.

It is necessary to know the maximum thickness of glass from the top of the cavity to the apex of any shape. This is most easily determined with 'repeating calipers' (Fig 2), a steel rule or conventional vernier gauge being applied between their outer tips. (This useful device does not appear to be commercially available nowadays, but is easily made oneself.) Very conveniently, all the chosen

Fig 1. Double Horizontal Dial, Stanford Hall, Warwickshire (Photo: M. Kenn)

Fig 2. Glass Window Dial, The Weavers' Company Almshouses, 17th Century (Photo: C Daniel)

Fig 3. Horizontal 'arabic' dial, Hydrographic Office, Taunton, designed by C. Daniel (photo: C. Daniel)

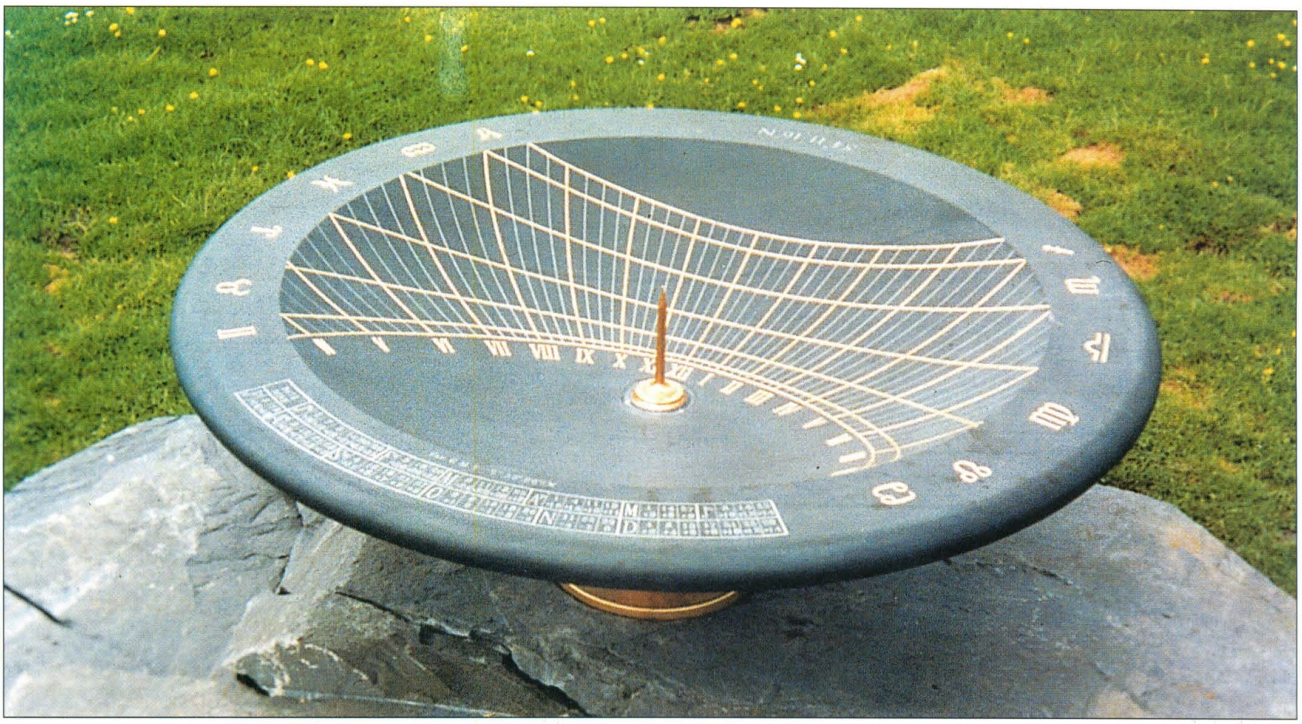

Fig 4. Dial at Holker Hall, Cumbria, designed by M. Lennox-Boyd (Photo: R. Sylvester)

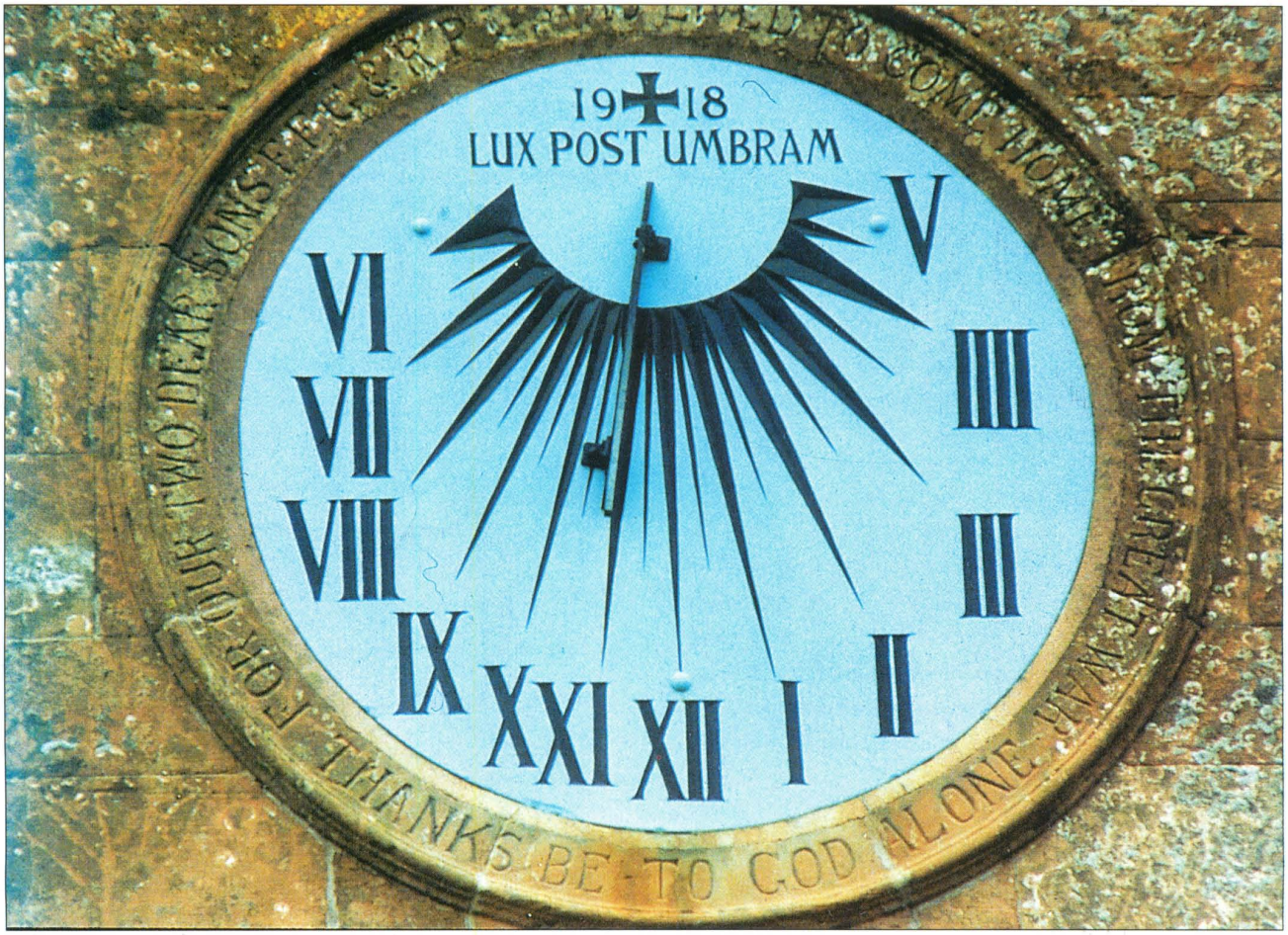

Fig 6. Wall Dial, Kirkandrews-on-Esk, Cumbria (Photo: R. Sylvester)

shapes proved to be 20 mm thick in glass. (Others are not.) Using a refractometer, the refractive index of the glass was found to be 1.515 in all examples: this is a common figure for ordinary soda glass. For comparison, perspex has an index of 1.49.

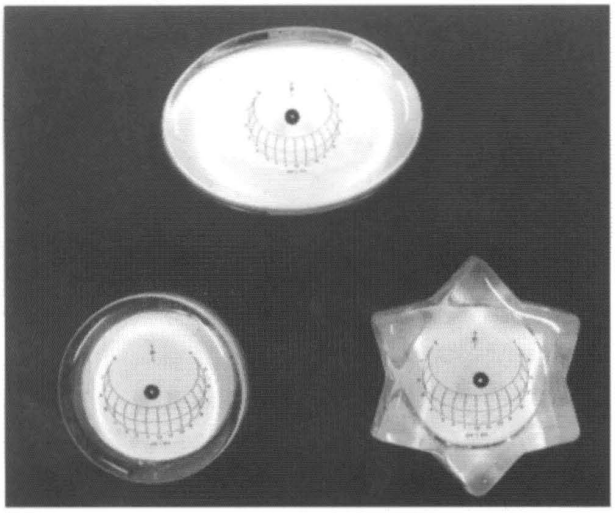

Fig 1 Various glass paperweight sundials.

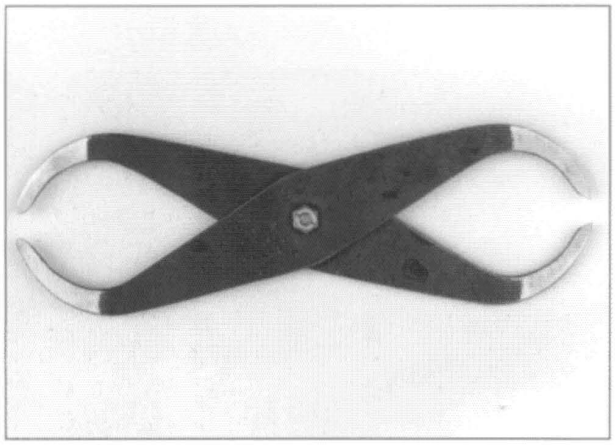

Fig 2 Repeating calipers. The limbs in this example are 19 cm long.

Calculation of the dial pattern

We are not creating a precision instrument, so a nominal latitude of 52.5° will serve from 50-55° N and cover England, Ireland, Netherlands, Belgium and North Germany. For the same reason the equation of time may be neglected, and the longitude correction and Summer Time approximated by rotating the finished object around a vertical axis.

The calculation of the position of the sun on the celestial sphere requires two basic equations of spherical trigonometry[7,8,9]

I) $\tan Z = \sin H/(\sin \phi \cos H - \cos \phi \tan \delta)$

II) $\sin A = \sin \phi \sin \delta + \cos \phi \cos \delta \cos H$

where:

Z = Sun's azimuth from south
H = hour angle, 0° at noon
ϕ = latitude of the site of observation
δ = Sun's declination (0° at the equinoxes, ±23.5° at the solstices)
A = Sun's altitude

Calculations were made for the shadows thrown by a pointed vertical gnomon 100 mm high at a latitude of 52.5° N, taking hour angles 15° (1 hour of time) apart at the equinoxes and solstices. The symmetrical nature of the pattern halved the task. The only modification from the standard procedure was then to note that, when passing from air of refractive index 1.00 to a medium of refractive index η, a ray will be bent towards the normal as shown in Fig. 3. By definition:

$\eta = \sin i / \sin r = \cos A / \sin r$

$\therefore \sin r = \cos A / \eta = \cos A / 1.515$

for the glass used here. From this equation the angle r may be found. The decreased distance η from the base of the gnomon then follows from:
$l_\eta = 100 \tan r$

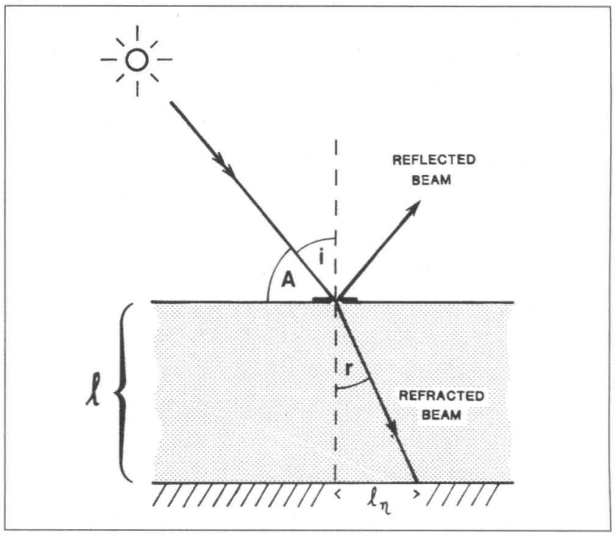

Fig 3 Refraction of a ray of sunlight when passing from air to a denser medium.

In this way the refracted dial pattern shown in Fig 4 was laid out. It has a characteristic crescent shape that is considerably more compact than the corresponding grid in air for the same height of gnomon. Of course, it would have

n quicker to use a sundial programme on a computer ed to a printer - but perhaps understanding would be !

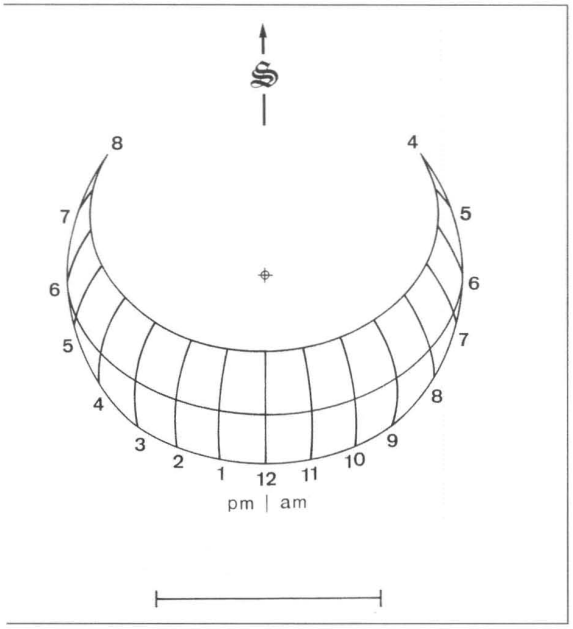

Fig.4 Refracted dial pattern for latitude 52.5°N and ractive index 1.515. The bar represents the 'height of the gnomon' in glass of this type

struction

ıotocopier with facility for reduction enabled the master to be copied so that the bar representing the height in s of the gnomon was 20 mm long. (The distance veen the 'horns' of the crescent was then 28 mm.) les 54 mm in diameter were then described about the ral mark (the 'base of the gnomon') so that, when cut the paper dials fitted the cavities of the disc and star rweights. A template was required for the oval version. antique' cream paper gave a good appearance.

ıperture in a shadowing disc (equivalent to the point of maginary gnomon) must be added at the apex of each rweight. A sharply defined 1 mm hole in a thin opaque 5 mm in diameter was desired. Eventually, this was factorily achieved by sticking a piece of vinyl lating tape across the blank, cutting a hole at the exact metric centre of the latter with a sharpened brass tube, then applying a thick coat of black cellulose paint. r a few minutes, when the laquer had become viscous, ape was stripped off to leave a circle of paint. A central was then cleared with a cocktail stick. Finally, the opriate paper dial (backed with cardboard) was ted in the cavity and sealed in place with a cover of adhesive green felt. A dial is shown in operation in Fig

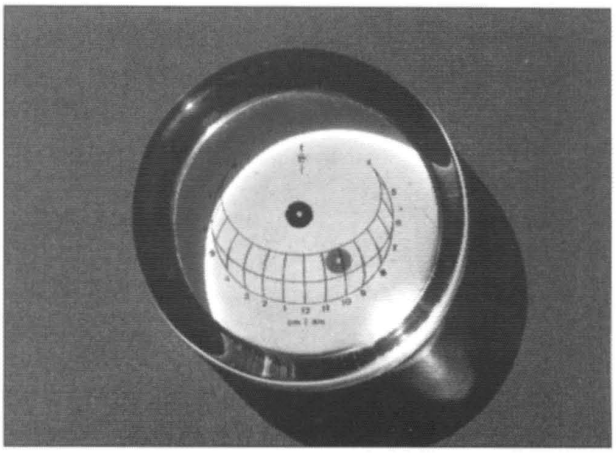

Fig.5 A glass paperweight sundial in operation

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3. A A Mills, 'Refractive Sundials', *Bulletin of the British Sundial Society* 96.1 34-35 & 49.

4. A A Mills, 'Chalice Dials', *Bulletin of the British Sundial Society 95.*3 19-26.

5. A solid acrylic pocket dial was produced by the Dutch *Zonnewijzerkring* to celebrate their 15th anniversary in 1993. It is illustrated in John Moore, 'Portable Dials-Miscellany', *Bulletin of the British Sundial Society* 96.3 *2-5,* fig 11.

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DIAL DEALINGS

MIKE COWHAM

With the Summer lull now over, sales are resuming in all of the major auction rooms. The sale at Sotheby's on 28 October, was particularly strong in globes and sand glasses but they also had 17 sundials to offer. Some of these are worth a particular mention.

The first dial to come under the hammer was an oval silver dial by Nicholas Blondeau. It was dated 1683, but more importantly, the maker gave his address as *'Milano'*. Blondeau had formerly been recorded as working in France, so an address in Milan suggests that he worked there for a short period. According to Sotheby's, this dial is the only record of his working in Milan. This address is also new to my database. The dial itself was nicely made, with a simple pin gnomon and was complete with its carrying case.[Fig. 1].
Sold for £3450

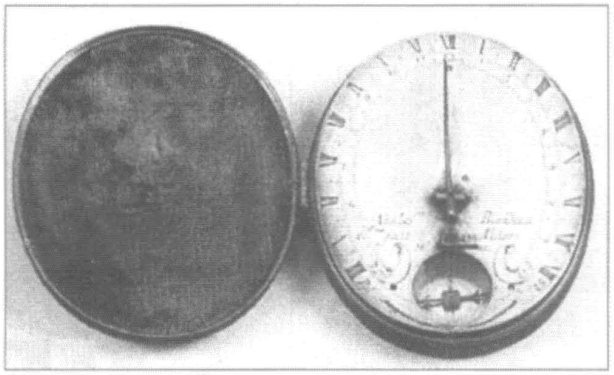

Fig 1

A fruitwood pillar dial with a paper scale signed 'W. Burucker in Nuremberg', c1800, had two very unusual features. Its base could be unscrewed revealing a small floating card compass. In addition it had a small spy glass stored in its body. [Fig. 2].
Sold for £2240

A noon cannon dial of '1755' was signed by 'I. Albrecht In Hannau'. Its circular marble base was charmingly decorated with a hunting scene.
Sold for £830

There were two universal equinoctial ring dials on offer, the more interesting one by R(ichard) Rust, London, was dated by Sotheby's as 3rd quarter 18th Century.
Sold for £2010

Of two ivory dials, one was rather special being a multiple dial or compendium, and was dated '1620'. It is unsigned but the work has been attributed to Pierre Dujardin the elder. [Fig. 3].
Sold for £7820

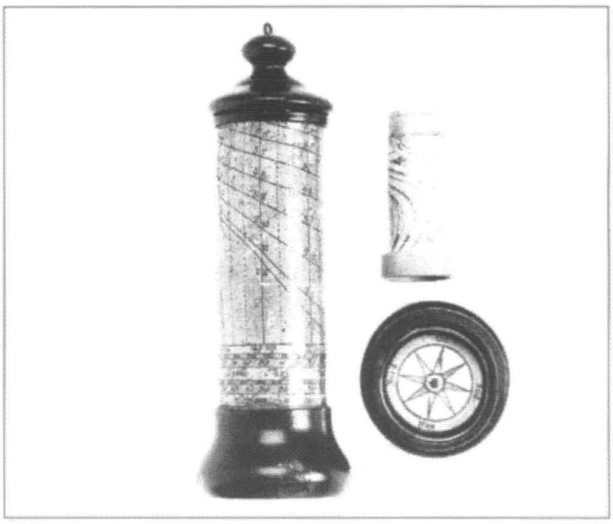

Fig 2

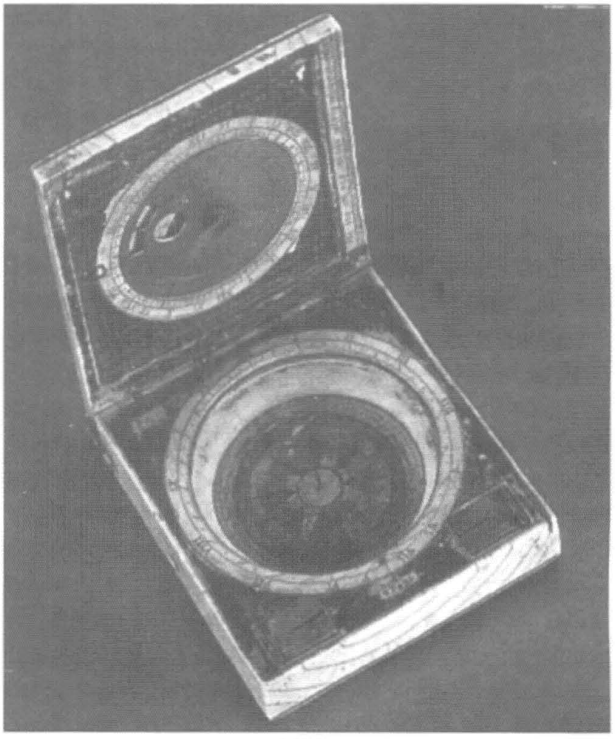

Fig 3

It is interesting to note that 3 garden dials by, S. Saunders, Edmund Culpeper and John Bells - 1731, failed to reach their reserves.

A few days later, 3 November, Sotheby's held a sale of Scientific Books - from the library of a French gentleman'. Amongst these books were many on the subject of dialling. The following list shows some that will be of particular interest to dialists.

A first edition of the work by Dom François Bedos de Celles - La gnomonique practique, ou l'art de tracer les cadrans solaires avec la plus grande précision.
Sold for £360

There were two copies, 1709 and 1725 of Nicholas Bion's - Traité de la construction et des principaux usages des instrumens de mathematique, which has a large chapter on dialling. (Note that for the English speaker, the translation by Edmund Stone, 1758 or the facsimile edition of 1972 by Holland Press is highly recommended, and may still be found in some antiquarian bookshops for less than £100.)
Sold for £900 & £420

William Leybourn, - The art of dialling, 1669.
Sold for £750

Sebastian Münster, - Compositio horologiorum in plano, muro, truncis, anulo, con concavo, cylindro & variis quadrantibus, cum signorum zodiaci & diversarum horarum inscriptionibus, 1531.
Sold for £6400

Giovanni Padovani, - Opus de compositione et usu multiformium horologiorum solarium, 1570.
Sold for £1050

Samuel Sturmy, - The Mariner's Magazine, ... , including a section on dyalling, 1669.
Sold for £4400

Johannes Taisnier, - De usu annuli sphaerici libri tres in quibus quiquid ad geometruae perfectionem requiritur continetur, 1550. In three parts, with the second part devoted to the spherical ring dial.
Sold for £4200

Christoff Zwicker, - Compenduim horologicosciotericum et geometricum, oder kertzer Begriff von Abtheilung allerhand Sonnen Uhren dadurch zu unterschieden in welchen zeichen die Sonne sey, 1647.
Sold for £1400

The sale at Christies on 17 December was ideal for buying last minute Christmas presents! There were certainly some presents that I would have welcomed.

The sale included a total of 30 sundials! There is not space here to describe them all, so I will pick out only those that were rather different.

A very rare Cruciform Dial, in gilt brass signed 'Carolus Platus Fa. Romæ ãno do 1598' attracted a lot of attention. This type of dial is so rare, and they are seldom offered on the open market. It was engraved with the latitudes of 15 towns, mostly in Italy. [Fig. 4].
Sold for £4470

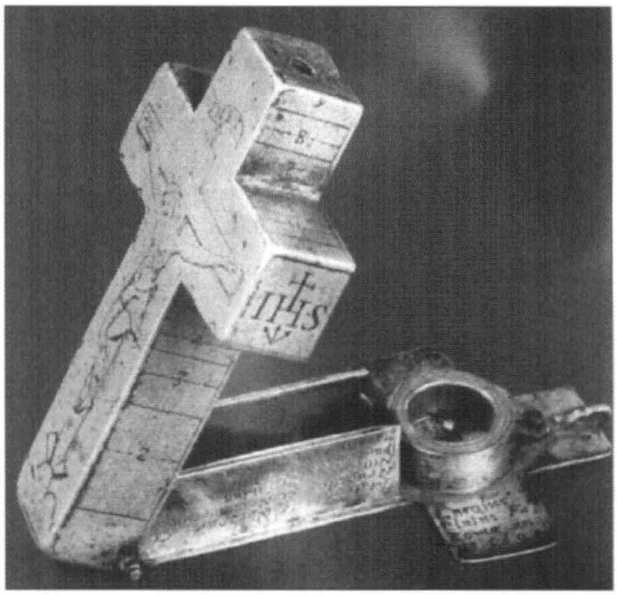

Fig 4

A silver plated Compass Dial, unsigned, but engraved in Russian. A catalogue note suggests that this dial may be of English manufacture.
Sold for £1530

A similar dial, this time of Russian manufacture, was included.
Sold for £825

There were two far eastern dials, one a Chinese Pin Gnomon double faced sundial in stone and the other a Korean gilt brass String Gnomon Dial, 19th Century.
Sold for £2350 & £1175

There were three Noon Canon Dials, but one was somewhat different to the normal pattern. This consisted of a rectangular base with mounted canon, but it also had a flagstaff with compass points around its pole, plus markings of signs of the zodiac. Unfortunately its gnomon was missing. It was a very interesting find. [Fig. 5].
Sold for £3290

Many Members who visited the BSS Conference last year at Dunchurch will remember the Heliochronometer in the

gardens. This was in relatively good condition, considering its long exposure to the atmosphere. These dials are quite commonly found, but are often in quite poor condition. The one offered by Christies was by *'ROSS LIMITED, 111 NEW BOND STREET, LONDON. W.'* and was in almost mint condition. It looked as if it had never been placed out of doors.
Sold for £1120

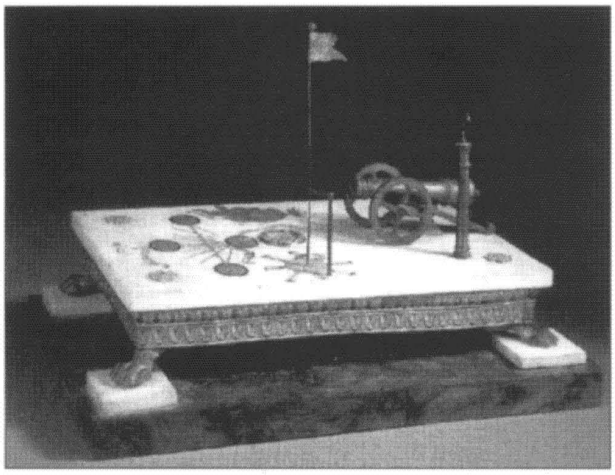

Fig 5

The final 'gem' on offer in this sale was described as 'A Rare 17th-Century German silver equinoctial compass dial' and was signed *'Johann· Wilhelm· Schultze· Kasell· 1688· 51·G:'*. The dial had an unusual swing out hour scale and a folding quadrant shaped gnomon. The dial was housed in a wooden screw lid case.
[Fig. 6].
Sold for £4110

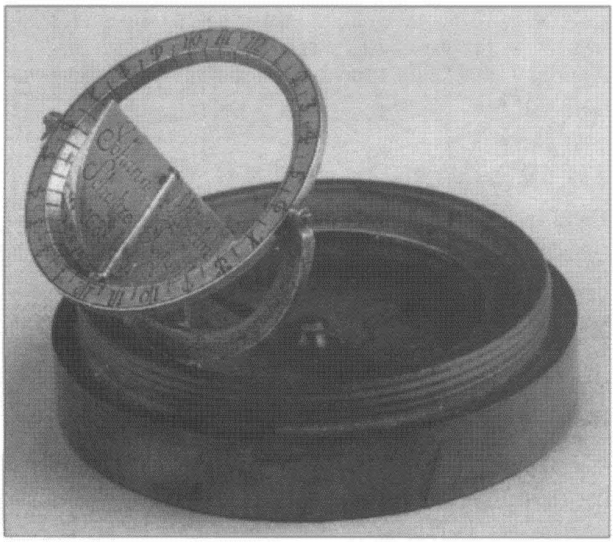

Fig 6

We all hope one day to find a bargain dial, and if you, like me, scour antique shops, you will occasionally come across one that is impossible to resist.

Unfortunately many garden dials are to be found with mottoes like *'Time Flies'*, *'Tempus Fugit'* or even worse - my pet hate! - *'I Count Only Ye Sunny Hours'*. These should immediately be discounted. However, there may possibly be a 'right' dial with these markings somewhere. Keep your eyes open, just in case.

I was in a local antique shop recently, and was asking the proprietor if he ever has any sundials. As he was explaining that he sometimes sees them, in walks a man who has been hunting for 'treasure' with his metal detector. Amongst his box of goodies, I spied quite a nice ring or poke dial. [Fig. 7]. I left the shop for the proprietor to negotiate for the goodies, and returned an hour later to be offered the ring for just £30. Although it has some corrosion around its suspension loop, it is virtually intact, and can be dated around 1700. It is certainly before 1752 because its calendar scale shows the Vernal Equinox at about 11 March. This purchase shows that if we look diligently enough, then we may still find good dials at affordable prices. Good hunting.

Fig 7

CALENDAR FOR SALES in 1999.

Note that some of these dates are tentative and may change. You are advised to contact the various salesrooms to verify the dates given.

Christies South Kensington.	Jeremy Collins - 0171 321 3149 15 April, 10 June, 9 December
Sotheby's	Catherine Southon - 0171 293 5209 27 April, 2 November
Philips	James Stratton - 0171 629 6602 ext 364 9 March, 15 June, 14 September, 7 December

Bonhams	Jenifer Middleton - 0171 393 3950 Sale dates still not firm but April 13, July 6, December 16.
Scientific Instrument Fairs,	Radison SAS Portman Hotel, London. Peter Delehar - 0181 866 8659 26th Fair - 25 April, 27th Fair - 27 October.

ACKNOWLEDGEMENTS.
I would like to thank the following for their permission to use photographs reproduced above. Sotheby's for Figures, 1 to 3, and Christies South Kensington for photographs of Figures 4 to 6.

EDITOR'S NOTES

1, The **Newbury BSS Meeting** of 1999 will take place on 22 May 1999. The venue has been changed; it is to be Mary Hare Grammar School for the Deaf. The current newsletter gives a sketch-map.

2. The picture 'Beata Beatrix ' by D.G.Rossetti, which includes a sundial, was the subject of an article by Denis Schneider in Bull.BSS 97.4. Readers may like to know that this painting is currently on view in London at the Lord Chancellor's residence, House of Lords, Palace of Westminster. The painting is part of the standing collection of the Tate Gallery in London.

3. We have received from N. Severino some comments on items in Bull BSS. 98.3:
(i) Page 21: 'Italian' and 'Italic' have the same meaning, in relation to 'hours'.
'Italian' hours are counted from sunset, 0-24. At a time half-an-hour after sunset, a bell was struck for prayers in churches. Any sundial used in connection with prayer-times in churches was called 'ad usum campanae' (for the use of the bell).
(ii) Page 24: 'Problematic dials' Signor Severino considers that the dial in the figure declines south-west, which would explain the reference to 45o west. He also states that the numbered hours, 14 to 23, are Italian hours which start from sunset, so '14' would be (for us) about 8 a.m. and '23' about 5 p.m. This is clearly a sundial 'ad usum campanae'. The line with zodiac signs is unexplained; the signs are those of Libra and Aries.

4. The Editor apologises for a wrong attribution of the cover picture of Bulletin 98.2 The photograph of the sundial on the Ponte Vecchio in Florence was not taken by Shaul Adam. The Editor hopes to be able to trace the sender of this photograph, received as a Christmas Card in December 1997.

READERS' LETTERS

C.K.AKED - A TRIBUTE FROM CATALONIA (LETTER ADDRESSED TO THE CHAIRMAN)

It was with greatest sorrow that we learnt of the passing of Mr. Charles Aked, vice-chairman and editor of your bulletin, with whom we had the chance to establish a relation in different occasions.
There is no doubt that Mr. Charles Aked was an exceptional contributor to BSS and the one who fostered your magazine at its very first steps, which were unquestionably the hardest ones and therefore Mr. Aked will leave his deep imprint on it.
We are greatly saddened to hear of the loss of such an extraordinary specialist and polemicist in gnomonics. We will really miss his articles and his opinions.
We, our society and myself, send you and the BSS the most sincere condolences in your very sad loss. May he rest in peace.

Josep Maria Vallhonrat
President, Societat Catalana de Gnomònica
Atenes 3, 08006 Barcelona, Spain

COPING WITH THE EQUATION OF TIME

The eternal problem of the Equation of Time may be tackled in various ways:

(1) Supply a corrective curve or table.

(2) Use a gnomon of complex shape.

(3) Tweak the dial occasionally, to agree with clock-time.

Option 3 has some appeal in modern times, as we all have accurate clock-time available.

In the case of an equatorial dial, the adjustment is easily made, provided the structure allows the rotation required. But a vertical or horizontal dial is difficult to tweak. This point was illustrated by A.P. Herbert[1] who attributed to Mrs H. the suggestion that such a dial might be adjusted by rotation (the "Housewife's Trick"). Unfortunately this produced a time increment which was not constant throughout the day. What the Housewife *should* have said was "rotate it about the gnomon". This gives a true correction, but is awkward to apply. However, in the case of a dyptich dial it is more feasible - see Drawing. The (non-folding) diptych has a rigid gnomon rod supporting the dial at two points, and allowing it to be turned around the rod for time adjustment. Setting the dial to clock-time will of course take in BST, and also correct for any longitude mismatch. As a non-portable device, I would suggest a broader than usual diptych, so that the hour lines from 9 a.m. to 3 p.m. are unbroken.

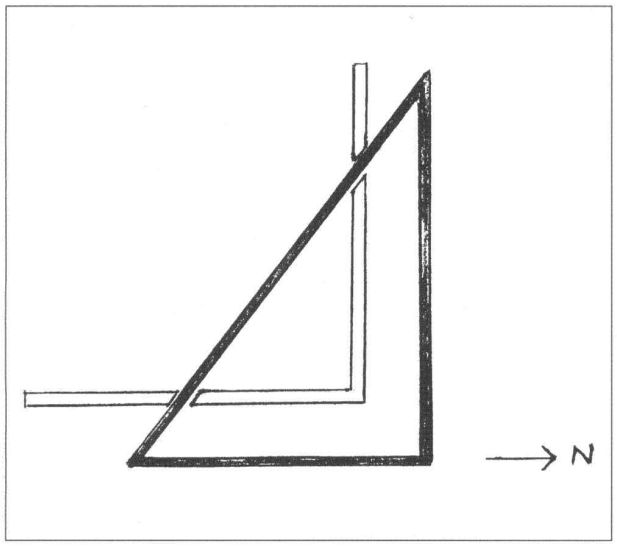

Fig 1 Non-folding diptych dial, rotatable about its gnomon

REFERENCE:

1. A.P. Herbert, *Sundials Old and New*, Methuen, London, 1967

John Singleton
The Old Coach House
Salcombe Road
Newbury, Berks, RG14 6ED

FOOTNOTE:

Since writing the above, I have been notified of the existence of a horizontal dial designed and made by R. de E. Atkinson, set up in Indiana, USA, which is adjustable on a polar axis for equaton-of-time correction. (See H.C. Hazelrigg: "The Atkinson Sundial at Indiana University", *Sky and Telescope*, 57,138-140(1979).)

THE SUNDIAL AT LLUC, MALLORCA

(Mr.C.Lack, whose enquiry about this dial appeared in Bull.BSS, 98.3 p.22, has forwarded to us this letter which he received from the designer/maker of the dial.)

I have read p 22 of BSS.Bull. 98.3 where you make comments on this dial. Thank you very much for your kind opinion of it.

Several explanations are necessary to understand this 'complex' of sundials. There are 5 sundials on this monument, which are intended to reveal the history of Majorcan sundials. At top left, you can find the Middle Ages canonical hours, as they appear elsewhere. At lower left, the Babylonian/Majorcan hours are designed; these hours were a correction of the ordinary Babylonian, so that they vary from 9 whole hours during winter (10th December) to 15 hours during summer(10th June). In the centre you see an ordinary declining-vertical sundial, where 11´32´´(G) inscription means the *time* (it is not an angle) between Lluc and Greenwich. The sentence MULIER AMICTA SOLE ("a woman robed with the sun") is taken from Revelation (12.1) because Lluc monastery is dedicated to Our Lady. Finally, the two sundials upper and lower right correspond to the mean legal time in Lluc for the different seasons; so there is half an analemma for each half-year from solstice to solstice

If you consider that this explanation could be interesting for others, I have no objection to its publication in the Bulletin.

Rafael Soler Gaya
O7001Palma de Mallorca

BATEMAN BERNHARDT

In the October Bulletin, p.21, Kevin Karney cast doubt of whether or not Bernhardt first designed this form of dial. (Although not stated, Karney is referring to a note by Margaret Stanier[1]). It is perfectly true that the article by Brix mentioned by Karney gives the derivation of the solid gnomon to give correction for the equation of time[2]. However, the Bernardt dial had been made by then, and had been referred to some 15 years earlier as a 'prize-winning dial'.

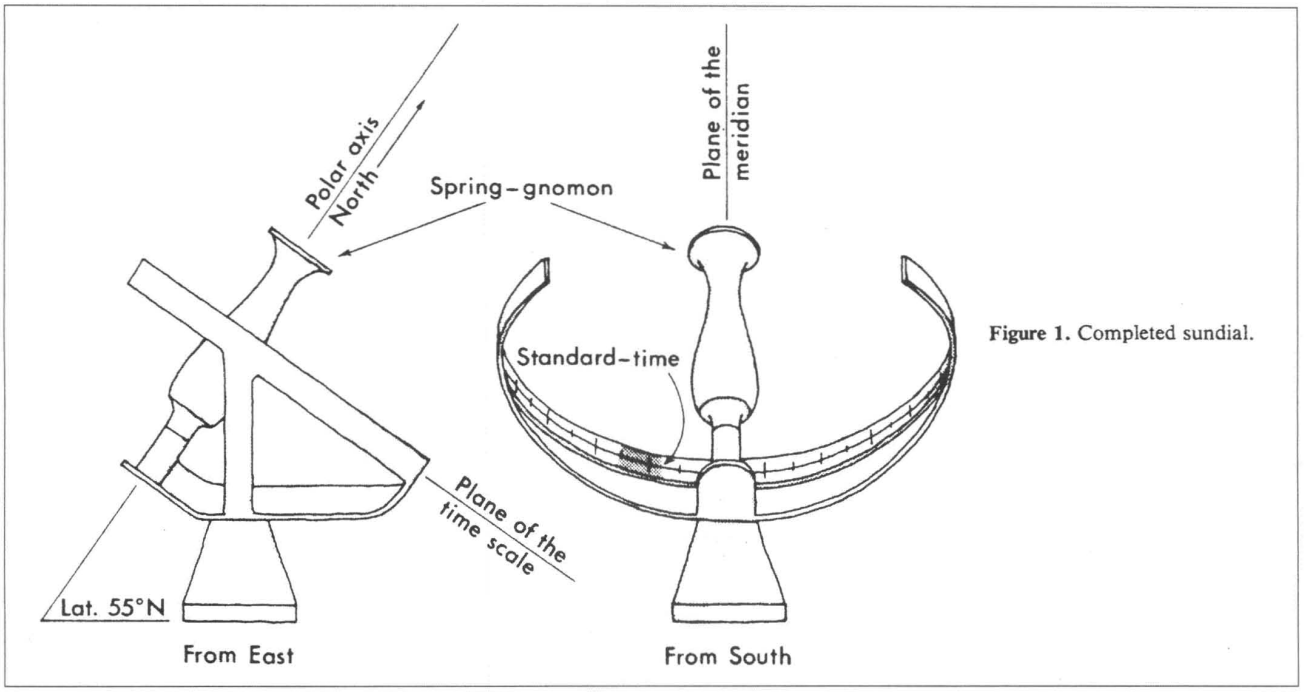

Figure 1. Completed sundial.

Fig 1

In 1966 Hermann Egger of Zurich gave results of a competition in the journal 'Sky and Telescope'[3]. I quote 'On page 220 of the October 1965 issue, this magazine announced my informal design competition entitled "The Sundial of the Year 2000". This contest closed July 1st this year and the following three entries have been selected'. Egger goes on the give a brief description of the Richard L.Schmoyer equatorial dial that has a wavy gnomon top correct for the equation of time. (The Schmoyer dial was first described in the Scientific American, October 1959, and may be seen in some detail in Frank Cousins' book on sundials[4]). Another prizewinner was Gilroy Roberts, again for an equatorial dial. The gnomon was in the form of a solid analemma and was very similar to that of the 1892 Oliver dial, again illustrated by Cousins.

Egger then describes 'Martin Bernhardt's Sundial', rather implying that Bernhardt was the sole designer. The clever sculptural form allows the winter sun to shine through the wing openings. A further reference to a Bernhardt dial predates the Brix article. A photograph of such a dial is shown in an attractive and pictorial book on meteorology published in 1973; the book was translated from German as part of an international set of books for schools.[5].

The sketch below shows the Brix design and clearly shows the similarity of one of the seasonal gnomons to the Bernhardt design. The sketch has been reproduced together with its statement 'Completed sundial'. Brix gives the mathematical derivation and includes a scale drawing or graph of the outline of the two seasonal gnomons. This is helpful but in the copy of the journal I consulted the faintly drawn outline had not reproduced very well. Despite the detail given by Brix and the statement 'completed sundial', in the text he says 'One example of a *realizeable* (my italics) though not very artistic solution for latitude 55°N is shown in figure 1...'. The concluding remarks also reinforce the point that the dial was *never actually made*.

I realise that I have not been able to give a definitive statement as to whether Bernhardt or Brix was the first to have *designed* this type of gnomon, and I believe there is a need for a little more research.

REFERENCES:

1. Margaret Stanier: 'Bernardt Dials' *Bull. BSS*. 98.2 16-17 (1998)
2. H.Brix: 'Another Standard-Time Sundial' *Journ. British Astronomical Society*,92 16-21, (1981)
3. Hermann Egger, 'Results of Sundial Competition' *Sky and Telescope*, 32 256 (1966)
4. Frank Cousins, *Sundials*, John Baker, London, 1969
5. Heinz Wachter, *Meteorology: Forecasting the Weather*, Collins, 1973

Douglas Bateman
4 New Wokingham Rd, Crowthorne, Berks
RG45 7NR

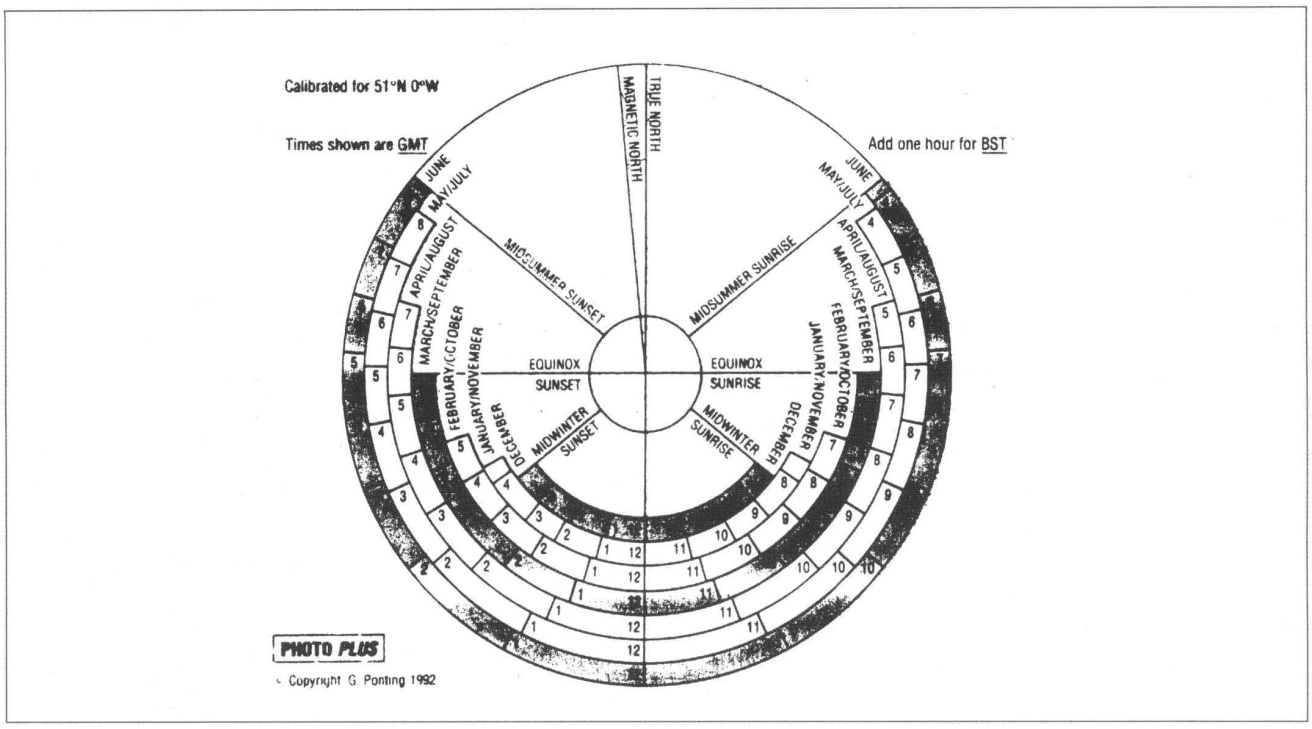

Fig 1

SUNDIAL/SUN-COMPASS CARD

Correspondence on the subject of the Eureka credit card compass in BSS. 98.2 and 98.3 has prompted me to dig out my own Eureka card and to discover – kept with it – its long-forgotten variant. This was given away a few years ago with a photographic magazine and its purpose was to enable photographers to pick the best time of day to achieve optimum illumination (i.e. direction of sunlight) when photographing various scenes and in particular architectural subjects.

Like the Eureka, this one has a dual personality, serving as a compass when the exact time is known, or as a sundial when aligned correctly with either true or magnetic North. Comparing their layouts it becomes clear that its accuracy is superior to that of the Eureka. A matchbox on end serving as the gnomon, as suggested by Mr.Colin Thorne, seems ideal.

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Maylandsea
Essex, CM3 6AW

RESTORATION

The issues of restoration come up frequently in my work on the repair of historic buildings. Much of the approach is not directly relevant to sundial repair because buildings are not instruments, but I do believe that there is a very good lesson to be learned from the thinking involved.

Most of this thinking was developed over a hundred years ago by William Morris when he created the Society for the Protection of Ancient Buildings (SPAB). He was energised by the Victorian taste for exposing rubble masonry walls, which means that all the Frescos which adorned English church interiors have gone.
However, Morris put down a manifesto which is still relevant today. Primary to this approach to the repair of historic artefacts was the need to judge in individual cases what should be done. And by implication those given authority to exercise their judgement should have requisite experience.

The sensitivity needed in the thinking (behind repair or restoration) and the execution, need to be at the same level, or the result will not be adequate. Conservation, Repair or Restoration is not in the scientific world, and there is no 'right' nor 'wrong'; but any approach requires knowledge and experience.

To me it is almost logical that members of the BSS should equally be members of the SPAB as the appreciation of our inheritance applies equally to both. (Membership Secretary of SPAB, 37 Spital Square, London E1 6DY).

Peter Ayley
09 000 Serres sur Arget
France

'TIPPLE TIMES'

As the BSS will be celebrating its first decade in 1999, members may find my most recent sundial of interest, and relevance, as shown in the photograph.

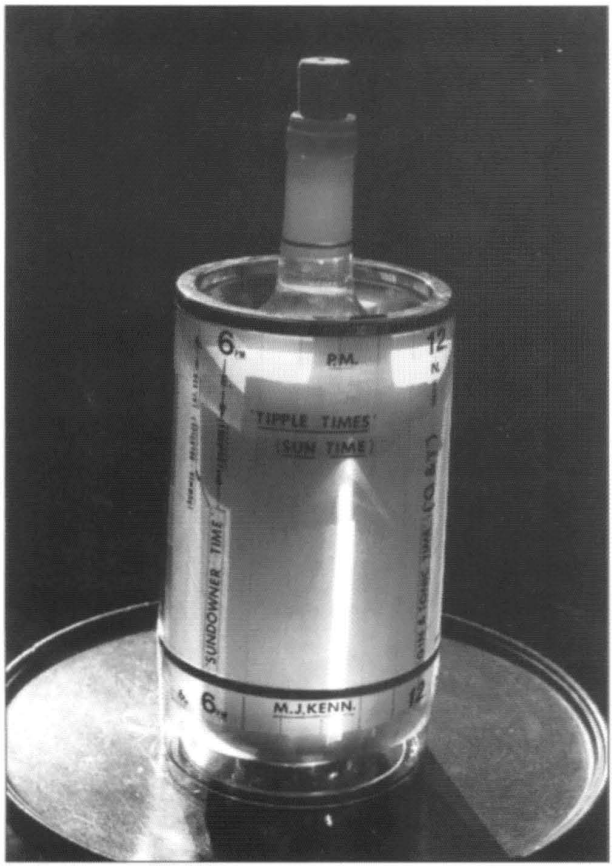

Fig 1

This sundial indicates only two significant times; 12 noon and 6pm, ie. 'Gin and Tonic' and 'Sundowner' Tipple Times respectively.

Maurice J. Kenn
38 Corkscrew Hill
West Wickham
Kent BR4 9BB

OUR HERITAGE-SAFE IN THEIR HANDS?

The sundial in my photograph is not exactly 'heritage', being of modern manufacture, but it surely deserves a better fate than to be rendered useless by the National Trusts's attempt at restoration.

Fig 1 The National Trust's (re)- setting the style at Blickling Hall, Norfolk

John Moir
24 Woodcote Road
Wanstead, London E11 2QA

THE SUNDIAL CLOCK

PAT BRIGGS

(Reprinted by permission from *Constructor Quarterly*, 22, 25, 1993)

The discipline of modern day life demands a constant time measuring process, and with the world wide adoption of mean time and the twenty-four hour time zones it is easy to believe that this is 'real' time. However this is 'man-made' time, whereas the phenomena of day and night, the seasons, our calendar etc, are ruled by the sun's position, not the pulses of a quartz crystal.

Nothing in nature is constant, and no one solar day equals the next so that our watches rarely, if ever, agree exactly with the sun. Nevertheless, the humble sundial, when correctly delineated and aligned, will always indicate local solar time. The shadow cast by the gnomon displays the

uneven progress of the sun throughout the year, and we can say that this in reality governs our lives.

Owners of sundials often strive to make them produce Greenwich Mean Time. However solar time is of much more interest in my opinion so I adopted the reverse process and the clock illustrated produces the latter from the former. The photograph was taken at SkegEx'93 and shows the clock in skeleton form, constructed to fit neatly below a small glass dome. It is driven by a mains synchronous motor hidden in the base. The lower main "dial" indicates G.M.T. whereas the upper with yellow hands shows the time by sundial at my home village of Cropwell Butler, Nottinghamshire, which lies almost 1° West of the Greenwich meridian. The mechanism can be adjusted to operate for any longitude-position of latitude does not matter.

The difference between local mean time and true solar time is known as the "Equation of Time". It can be shown correct to within ½ minute as the sum of two sinusoidal components, the variable being the sun's mean longitude (which has the period of the tropical year). This is zero at about March 21st, (the Spring Equinox) and increases daily by 360/365-1/4 degrees. One component is due to the inclination of the earth's axis with a period of six months and has a maximum value of ± 10 minutes. The other with a period of a year results from the earth's elliptical orbit with a maximum value of a little over ±7 1/2 minutes. They are 78° out of phase and their combined sum rises to about 16½ mins. in early November, when the sun is fast over the watch.

In the clock the Equation of Time correction is obtained by the use of two small cranks in correct phase, one rotating in six months, the other in a year. These are linked by levers at the back of the clock which sum the action. The resultant is applied to a Worm which in addition to the normal rotation to drive the sun hour hand, has the linear motion like a rack to add or subtract the Equation of Time as it varies throughout the year. Making the fixed adjustments for longitude east or west of Greenwich and also for British Summer Time, if applicable, will result in the sun hands indicating solar time, even if the skies are overcast!

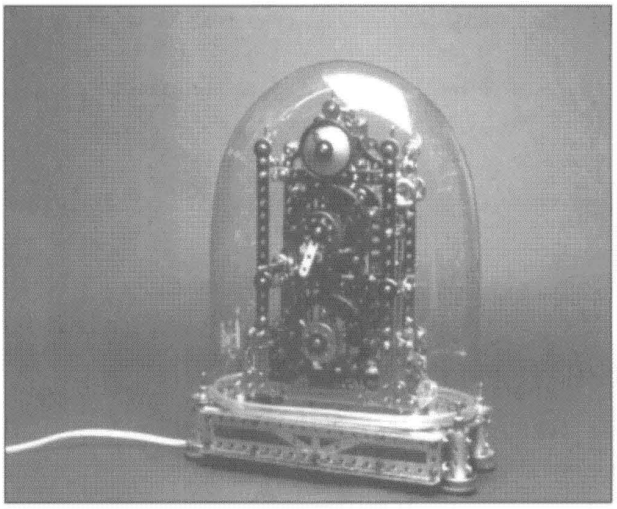

Fig 1

I consider that when making astronomical clocks with long period action, interest must be added by including something with visible movement. The small uppermost dial therefore indicates seconds.

P.D.Briggs
The White House, Radcliffe Rd
Cropwell Butler, Notts. NG12 3AG

THREE SUNDIALS IN SERBIA

DR. MILUTIN TADIĆ

Fig. 1 Wall Sundial on the building of the secondary school of Strpce, at the extreme south of Serbia.

Material: Marble plate 120 x 85 x 3 cm; brass rod gnomon 35 cm x 8 mm diameter

Day lines: (i) Winter solstice.
(ii) Birthday of Serbian geographer Jovan Cvijić 1865-1927), after whom the school is named.
(iii) Day when the battle of Kosova occurred in 1839 between Serbian and Turkish armies. The whole Serbian army was killed and it is a tragic event in Serbian history.

Motto means **S**hining **S**un **S**hines for **E**veryone. It is a varient of a well-known sundial motto.

The first and third words are turned over the vertical axis to get four Cyrillic letters 'S' (Cyrillic 'S' = C), as on the traditional Serbian coat of arms.

Fig. 2 Wall sundial on the wall of elementary school in Valjevo

The sundial has dial-plates for standard central European time and for day-light saving time. The shadow also shows noon in: Dehli, Moscow, London, Azores, and Rio de Janeiro.

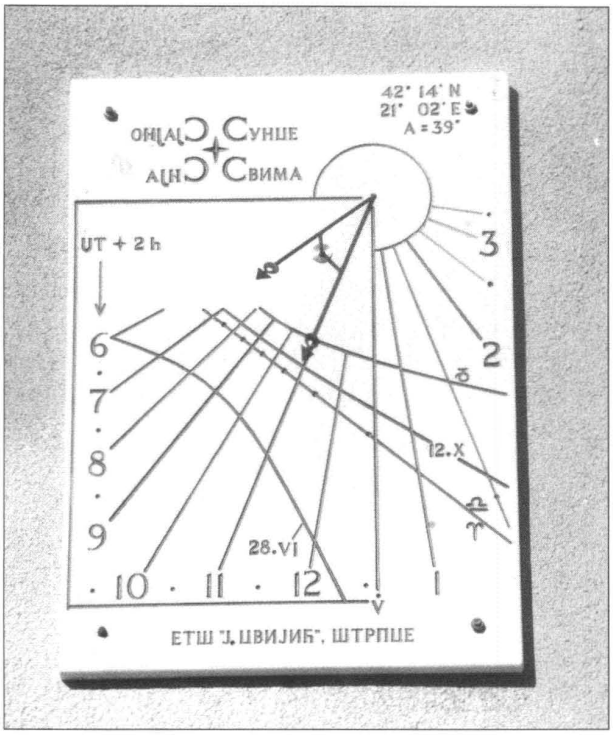

Fig 1

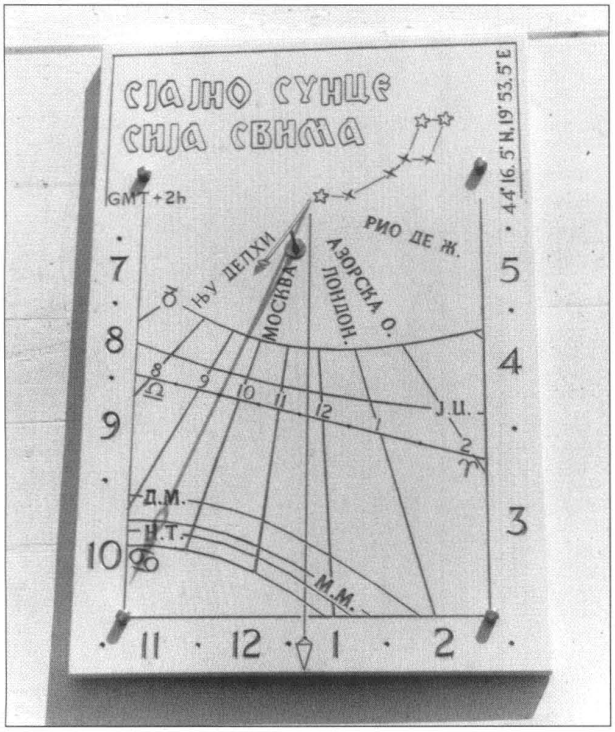

Fig 2

In addition to the day-lines for equinox and solstices, there are day-lines for the birthdays of famous Serbians.

(i) Jovan Cvijić (1865-1927) - 12 October; the greatest Serbian geographer; main works, 'Das Karst-phanomen' and 'Balkan Peninsula and South Slavic Countries'.

(ii) Desanka Maksimović (1898-1994) - 16 May; the greatest Serbian poetess.

(iii) Milutin Milanković (1879-1958) - 28 May; Serbian scientist, author of astronomical theory of climate changes, confirmed by contemporary research; main work, 'Kanon der Erdbestrahlung und seine Andwendung auf das Eiszeitenproblem'

(iv) Nikola Tesla (1856-1943) - 10 July; an inventor of genius in electrical engineering.

Motto: Shining Sun Shines on Everyone

The dial was placed in position in 1988, on the occasion of the hundredth anniversary of the birth of Desanka Maksimović, the Serbian poetess.

Fig.3 Wall Sundial in Lesak (pronounced 'Leshak').

The motto SUNCE MESAK --- OVDE LESAK means 'Sun, smile, Here is Leshak'

In Serbian the motto rhymes. A similar motto for the town of Carlisle would read 'Sun, smile, Here is Carlisle'

Fig 3

SHADOWY SECRETS: THE LURE OF THE OBSCURE (PART 2)

JOHN MOIR

In part 1 of "Shadowy Secrets" (Bull.98/3), I looked at some of the ways that imagery, symbolism and puzzle devices have been used to provide an extra dimension to the appreciation of sundials. The examples I gave showed, I hope, the problem facing the designer wishing to incorporate such features into his/her work. There is a narrow dividing line between an ingenious dial and one so devious that only its designer can appreciate it.

In discussing the subject, it is convenient to group the dials into categories, and since I ended Part 1. with examples of **False Identity,** I will continue with two dials which have long assumed another persona.

Fig 1. shows a bowl dial (equatorial) with a stout vandal-proof gnomon. I like to think that, sometime in the distant past, somebody (a Vandal, perhaps) succeeded in breaking off the gnomon of such a sundial. Realising its potential for grinding food he took it home, and thus the pestle and mortar were born. The dial shown here is in the Physic Garden at Hitchin Museum, Herts, and refers to the local plant-based drugs industry, in which the pestle and mortar were used.

Fig. 1. The Hitchin Museum Sundial

Several years ago a book was published, entitled "101 uses for a dead cat". I can't recall whether its author recognised the gnomonic potential of an inanimate cat, but designer Joanna Migdal certainly did, and the result is shown in Fig 2. This memorial to the late Noel T'a Bois, at the Margaret Centre, Leytonstone, depicts the two Ward cats which, with their strange antics, helped to lighten the burden of the patients. Besides establishing the true Destiny of the cat, Joanna has produced a poignant memorial to a dedicated diallist.

Fig.2. The Noel Ta'Bois Memorial Sundial

Not only 3-D objects such as cats, but also certain 2-D images, namely **Logos and Insignia,** almost cry out to be converted into sundials. Two of these are shown in Fig 3. The Horniman Museum logo was adapted to a double polar dial by "lifting" the verticals of the "H" out of the surface as it were, thus creating 2 gnomons. Two overlapping hour scales were positioned along the horizontal bar of the "H". The wording on the logo was then replaced with an anagrammatic Motto.

Question 1. Can you make a motto from the 27 letters of the inscription? (My own solution is given in the Answers, which can be found at the end of the article.

The City of London insignia (Fig 3.) proved equally easy to adapt, resulting in the sundial "morph" shown in Fig 4. The blank top right-hand quarter provided a convenient space to put the E.O.T graph.

Fig .3. A logo and insignia awaiting conversion

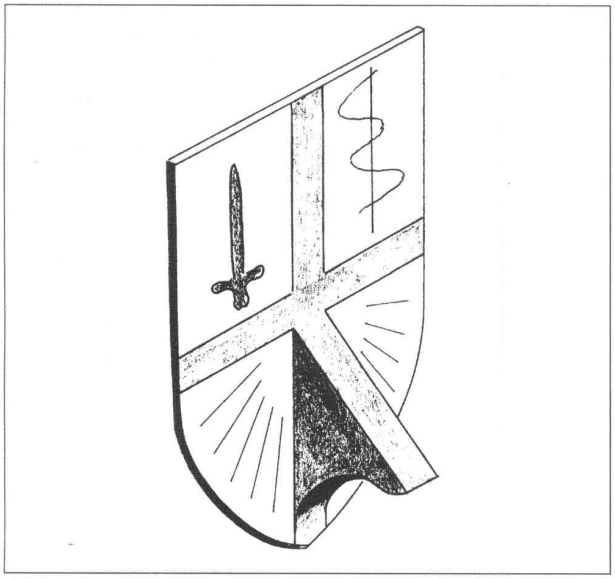

Fig .4. Converted insignia of City of London

In my next category, the use of **Codes,** I would first like to look at the horizontal dial in Fig 5. which is also based on the Horniman logo. Apart from noting the tilted "H" of the gnomon, the viewer may be puzzled by the presence of Morse Code, so

Question 2. What does this coded message signify?

Far removed from Morse is the colour code used in snooker to give the balls their scoring values. The writer's "snooker-time" sundial, Fig 6. uses the balls to indicate the hours. The total value of the 15 reds and six colour balls is 42-just enough to mark the hours in two-hour intervals, provided that 6 a.m. is omitted (No problem, as snooker players will be abed at that early hour).

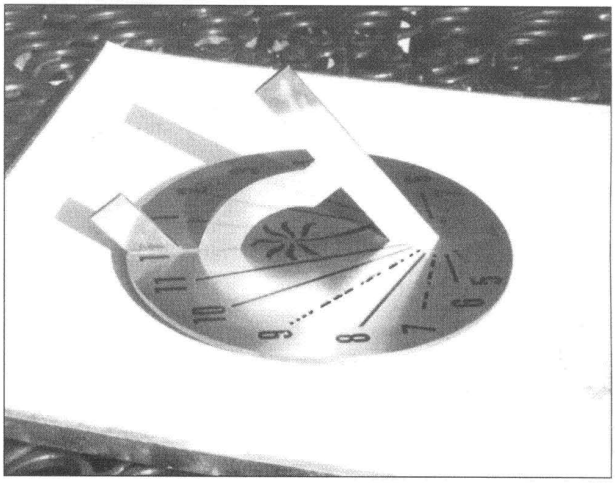

Fig .5. A "Coded" Horizontal dial

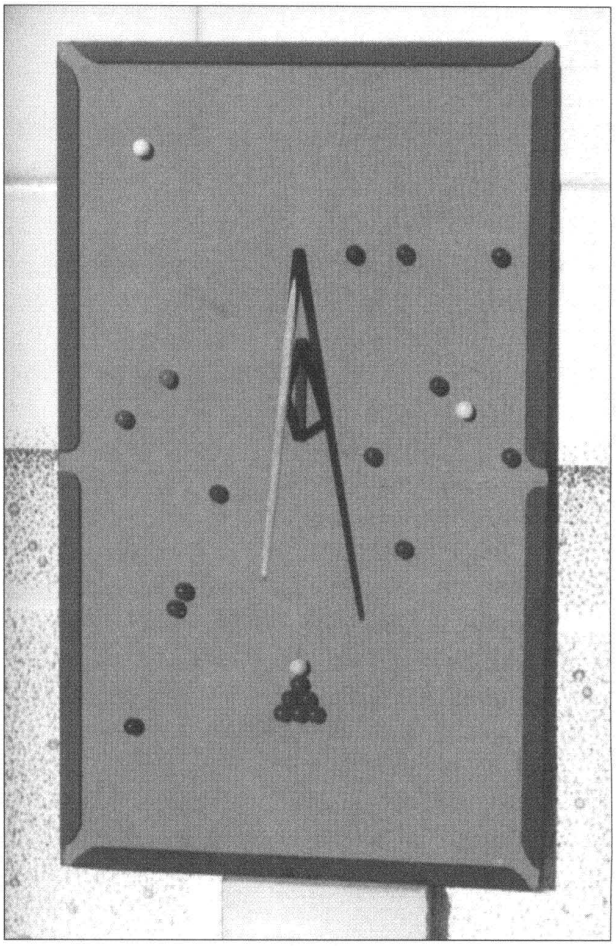

Fig .6. A "Coded" Vertical dial (not for the colour blind)

Question 3. What colours are used for each indicated hour? (For non-players, red, yellow, green, brown, blue, pink and black score 1,2,3,4,5,6 and 7 respectively).

Inevitably I find I am using examples from my own dials, but this is because I know them best. To redress the balance, and to introduce another category, **Analogy,** let us look at Fig. 7., a West facing fibreglass sundial made by Harriet James. This adorns the house of diallist/railway enthusiast John Ingram (see Bull. 97/1 p.49). The rules of perspective require that the distance between sleepers reduces as they recede into the distance. Similarly, the geometry of a West-facing dial produces parallel hour lines that get closer together towards the gnomon. The analogy is cunningly exploited in this dial.

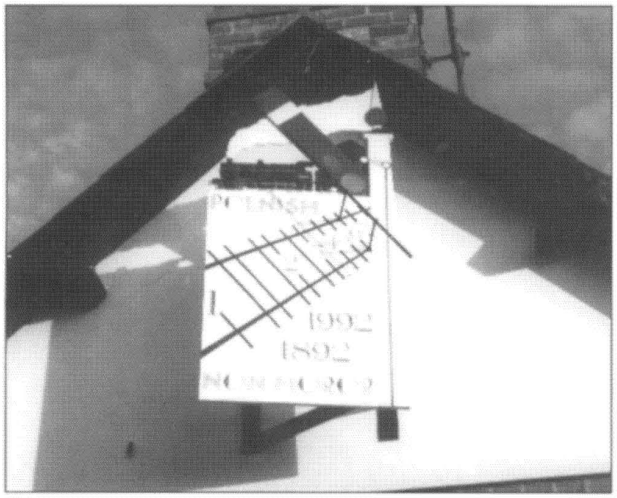

Fig .7. Use of analogy- Railway lines

Another imaginative use of analogy can be seen in Fig. 8. Tony Baigent described his dial, "Gregory" in Bull.98/3, but his treatment of the E.O.T. curve is worth repeating. The hair-line becomes the curve, the month lines become hairs, and the fast/slow minute lines are furrows on the brow. It must be stressed that designers are not given such analogies on a (dial) plate, so to speak - they have first to be recognised, then exploited.

Many diallists like to incorporate **Commemorative Dates** into their work. A particular declination line is highlighted so that when the shadow of the gnomon's tip or notch-point falls on the line it is time to celebrate a birthday, wedding or maybe some more arcane event. Strictly, there is only a 50/50 chance of it being the right day, since in any year the sun will be at a given declination on two distinct occasions. Anyone setting a date for a second marriage might usefully opt for this alternative date, to avoid the cost and trouble of changing the celebratory line.

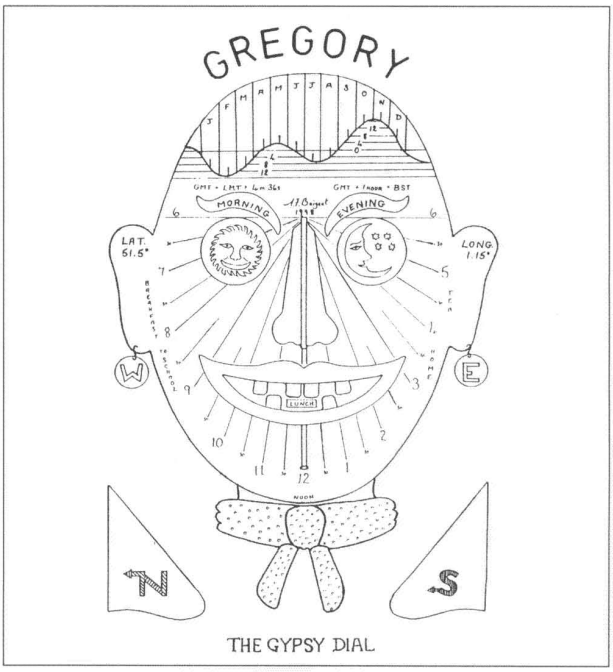

Fig .8. Use of analogy- Hair lines

Tony Baigent has kindly provided an account of a commemorative dial he recently made (Fig 9). Of it, he writes:-

Fig .9. Eagle and dragon- but who is the dragon?

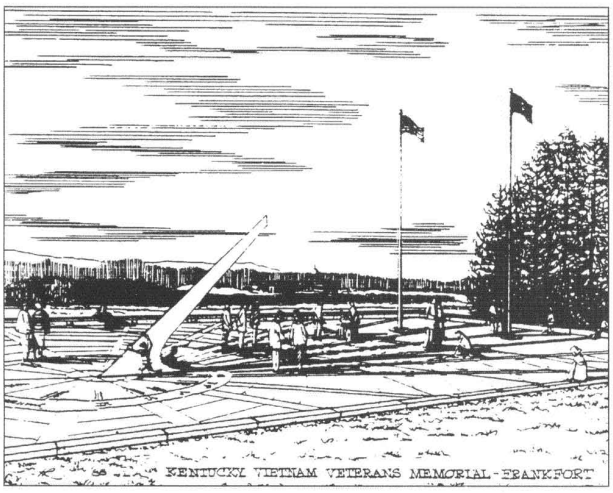

Fig.10. Vietnam Veterans Memorial

"The gnomon has a cut-out of an eagle, and in the lower R.H. corner is a dragon. On 23rd March the illuminated eagle moves down the dial face and takes hold of the fiery dragon with its claws By some coincidence the 23rd March is our wedding anniversary. People often ask if the dragon and bird represent anyone?.... no amount of torture would make me divulge the dragon's identity".

Striking a more serious note is the Vietnam Veterans Memorial sundial, Fig. 10., described by Charles Aked in Bull. 93/1. The plaza is inscribed with the names of Kentuckians who died in the war, so arranged that the shadow of the gnomon's tip falls on each name at their date of death. The names of 23 "missing in action" are inscribed behind the gnomon, where its shadow never falls.

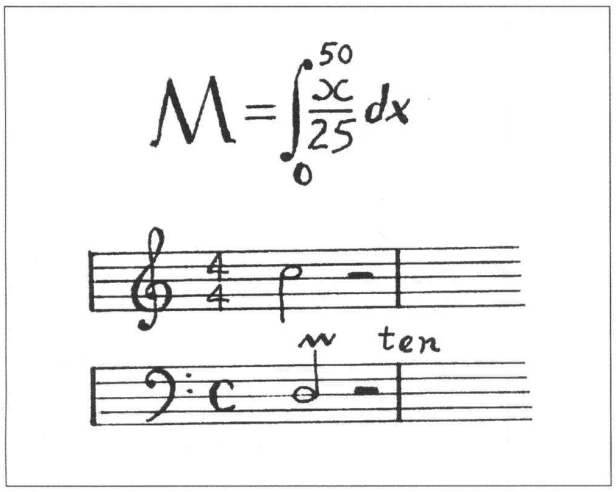

Fig. 11. Marj is 50-mathematically and musically

There is no better way to round up this probe into Shadowy Secrets than to consider a dial made by David Brown as a 50th Birthday present for his colleague, Marjorie Cross, whom he describes as a "square" mathematician. The dial bristles with allusions to her initials, **M.D.C,** her age, **50, Square numbers,** etc,. Its shape is a cuboctahedron, which has 8 triangles, 6 squares, 12 vertices and 24 edges. Guess what that totals? Yes-50 ! Of its 4 dials, the E and W facing have gnomons whose heights are **50**mm and **4**cms. The dial was cut from a **36**cm cube, leaving **25**cm shorter edges. It would require a whole article to do justice to this most inventive of sundials. In the meantime, have some fun with:-

Question 4. What allusions can you discover in the two motifs taken from the dial, shown in Fig.11 ?

Acknowledgements: My thanks to John Ingram, Tony Baigent and David Brown for photographs and descriptions of their sundials. If anyone knows of other dials in a similar vein I should be glad to hear from them.

John Moir
24 Woodcote Road
Wanstead
London Ell 2QA

Answers:

(1) ...and hours run mad e'en as men might.

(2) The name "Horniman", in Morse occupies the 9 and 7 hour lines. (The gardens opened in 18**97**).

(3)

	8 a.m.	Blue, green
	10 a.m.	Black, 3 reds
	12 a.m.	Pink, 6 reds
	2 p.m.	2 reds
	4 p.m.	red, yellow, red
	6 p.m.	Brown, 2 reds

(4) The maths:- M(arjorie) = $(50^2/(2 \times 25) - 0) = 50$

The music:- Two (musical) scores + ten(uto) = 50

Mordent sign (M) and D + C notes = initials MDC

4/4 (Upper stave) = square(s)

C (Lower stave) = surname, Cross

NEW FOR 1999

A NEW combined subscription has been agreed by the North American and British Sundial Societies. Payment can be made either in pounds sterling or in US dollars, and gives approximately a 10% total reduction for one year. If successful the combined subscription will be continued in subsequent years. **PLEASE NOTE THAT PAYMENT IN OTHER CURRENCIES CANNOT BE ACCEPTED FOR THIS OFFER - PAYMENTS IN POUNDS GO TO B.S.S. - PAYMENTS IN DOLLARS GO TO N.A.S.S.**

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	U.K. addresses (MUST pay in pounds)		Addresses outside U.K. but NOT North America	
	BSS Individual	**BSS Family**	**BSS Individual**	**BSS Family**
NASS Print or digital	£40	£44	£44	£47
NASS e-mail only	£30	£34	£34	£37
NASS Print and digital	£46	£50	£50	£53
NASS Print and e-mail	£42	£46	£46	£49

We regret that BSS members who have a 5-year subscription cannot use this combined facility this time. Further offers are being discussed.

SUBSCRIPTION RATES IN US DOLLARS

	North American addresses (MUST pay in dollars)		Addresses outside N. America but NOT U.K.	
	BSS Individual	**BSS Family**	**BSS Individual**	**BSS Family**
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NASS e-mail only	$56	$61	$56	$61
NASS Print and digital	$70	$75	$79	$84
NASS Print and e-mail	$65	$70	$74	$79

Addresses outside **BOTH** North America (U.S.A., Canada, Mexico) **AND** the U.K. can pay **either** in pounds **or** dollars.

~~~~~~

SEND POUNDS TO: BSS Treasurer, 45 Hound Street, Sherborne, Dorset, DT9 3AB, England

SEND DOLLARS TO: Frederick W. Sawyer, NASS, 8 Sachem Drive, Glastonbury, CT06033-2726, U.S.A.

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The separate subscriptions to both Societies remain as before.

If you live in the U.K. you must pay in £ - if you live in North America you must pay in $.

GRAND AUCTION 1999
SATURDAY 1ST MAY

A feature of the last four BSS Conferences has been an auction of dialling, horological and astronomical books and ephemera, and dials, conducted by our Chairman with aplomb, and considerable financial benefit to the Society. Items for sale came from members, and other sources.

Until now, it has not been possible for members not at the Conference to take part. For 1999 our Tenth Conference, it has been decided to let the whole membership take part, both as sellers and buyers.

A catalogue will be published well in advance of the auction and postal (and even telephonic!) bids will be accepted. Some items have already been received and are summarised below (also see below how to get a full catalogue).

We therefore ask members who wish to sell items through the Conference (which is an annually unique gathering of potential buyers) to let us know what they have to send, or bring, as soon as possible, and in as much detail as possible, so that the full catalogue can be suitably informative.

We can sell on a shared basis (50:50 or 75:25 BSS:donor) if you wish. We will make arrangement to collect items in UK if you cannot bring them. Please notify the Treasurer, or any Council member, of your intended offering.

Full catalogue and bidding

Catalogues will be available from the Treasurer to any member who asks for one and who preferably sends stamps to the value of 46p also! All members registered for the conference will get one.

A catalogue of the first 50 or so items already received is available, and can be asked for now. Anyone asking now will get up-dates until 3 or 4 days before the Conference.

Advance bids can be made on the form with the catalogue and sent to the Treasurer. The Treasurer will

(a) keep all bids confidential,
(b) not be bidding on his own behalf(!)
(c) bid on your behalf only to the price necessary to obtain the item in question even if your bid is higher.

Telephone bids to the Treasurer will be accepted in April 1999 only.

Some items (all with dialling content) already received:

1. Catalogue of auctions and exhibitions profusely illustrated. (10 items)
2. 20 cent. dialling, astronomical history of time and horological books (14 items)
3. 19 cent. astronomical gnomonic horological and history of science books (5 items)
4. French scientific books on astronomy, history of science and horology; one limited edition (5 items)
5. Catalogues of dials in N. & S. Devon, Surrey, Sussex (4 items)
6. Historical lists of watch and clock makers (2 items)
7. Dialling books in Spanish, German, Czechoslovakian (3 items)
8. Bound volumes of Clocks Magazine (1988-1998) (10 items)
9. Inventory of the navigation and astronomy collections in the National Maritime Museum (2 items)
10. Miscellaneous pamphlets, booklets etc. all on dials (8 items)
11. Large collection of dial photographs.

R A Nicholls (Treasurer)

NORTHAMPTONSHIRE

FRANK COE

Previous articles in the Bulletin[1,2] have listed the references to sundials for a number of the counties covered by the 'King's England' series of books edited by Arthur Mee and published in the 1940's. The articles note that such references might point to dials not yet catalogued in the BSS Register, those that have perhaps totally disappeared and maybe indicate the extent of deterioration over the span of 50 years to the present. It was also noted that the listings differed from county to county - presumably depending on the particular interests of the compilers, and were by no means exhaustive.

I have a copy of the 1947 volume for Northamptonshire which shows these limitations and the compilers were evidently rather more interested in history and people than architectural detail. Nevertheless numerous references to dials can be compared against entries in the 1996 BSS Register.

In the BSS Register there are 86 entries for Northamptonshire. Eleven of these are mentioned in the Arthur Mee book and there are references to nine further sundials which either no longer exist, or, by a visit to the locations, might perhaps be matched to the more rigorous listings in the Register. These nine are given in Table 1. There are also references to 28 'mass' or 'scratch' dials and these are summarised in Table 2. Most of the references relate to churches or churchyards, sundials on houses and stately homes seem unworthy of mention even though, as the BSS Register shows, they definitely existed.

REFERENCES

J.P.Lester: 'Kings England" Bull.BSS. 96.2 34-37 (1996)
J.Davis: 'In Arthur Mee's Footsteps' Bull.BSS. 97.2 40-44 (1997)

41 Woodlands Park
Blairgowrie PH1O 6UW
Perthshire

TABLE 1.
Sundials mentioned In Mee's "Northamptonshlre" but not appearing In the 1996 BSS Register:
Gretton sundial on cottage chimney
Litchborough sundial on buttress with inscrlption "On this moment hangs Eternity"
Manholm south wall of thatched farmhouse, 19th century dial.
Newnham churchyard memorial to WW 1
Pacton 1756 dial in gable of 15th century porch
Steane dial with two faces, private chapel of Steane House
Upton (by Peterborough), curious Bishop Dove sundial in orchard of Old Dove House, now a farmhouse.
Watford gable of church porch
Little Brington 'sundial found last century and dated 1617 with the stars and stripes now set at Althorp House'

TABLE 2.
Mass dials mentioned In Mee's "Northamptonshire":
Aldwinkle
Barnack
Castle Ashby (2)
Collingtree (2)
Courteenhall
Earls Barton (2)
Geddington
Hemington
Islip
Litchborough (5)
Moreton Pinkney
Titchmarsh
Ufford
Werrington
Aston le Walls
Brockhall
Cold Ashby
Corby
Croughton
Everdon
Harpole
Hinton in the Hedges
Kislingbury
Lowick
Polebrook (4)
Towcester(2 , one inside one out)
Wakerley
Winwick

JOURNAL REVIEW

COMPENDIUM: JOURNAL OF NASS

Volume 5 no.3 (September 1998) opens with a poem 'Witch's Sundial' written by a woman on a search for her forebears in Scotland, who finds, in the grounds of two ancestral Castles, sundials inscribed with the names of 'one of the Dalrymple Women', and one ancestress who 'was thought to be a Witch'.

Steven Woodbury's 'Sightings' section gives photos and history of three dials-vertical, horizontal and equatorial-in Maryland.; the horizontal one, an octagonal slate dial-face, also appears on the front cover and is particularly pleasing. J.M. Bores of Madrid extends his 'conical gnomon' sundial design, set out in the June Compendium, to applications for sidereal time, and to equatorial and polar dials. Harold Brandmeier offers us a way of designing dials based on matrix analysis. Fred Sawyer, ever ingenious, gives us designs using ptolemaic co-ordinates, including a 'hectemoros' dial for local mean time. Most of Fred Sawyer's dials start life on thick cardboard, but his 'hectemoros' now exists as an inscribed metal plate 6"x 4".

Finally we are invited to produce offerings for Steven Woodbury's collection of limericks about sundials or diallists.. He gives an example: 'While carving a sundial in slate,/I pensively ponder its fate/ In a garden in Kent/ Of an ignorant gent/Who assumes that it always runs late' If rhyme eludes you, try offering George McDowell a 'Haiku': defined as 'an unrhymed poem of three lines, 5, 7 and 5 syllables respectively , and referring in some way to a season of the year':

'Both paths of the sun
I show. Noon's shortest shadow
Marks the end of fall'.

Volume 5 no.4 (December 1998) starts with an interesting description of an equatorial dial of which the gnomon is a rectangular metal plate with an analemma cut-out along its length. The plate is made to swivel about suspension points at each end so that it can face the sun directly at any time or date. The edges of the cut-out are engraved with dates and months. The observer places a finger on the inside edge of the cut-out, moving it until the shadow of the finger touches the time-line of the equatorial ring, when his finger will be over the current date on the gnomon. So there is a built-in EOT correction for the hour reading.

In Steven Woodbury's 'Sightings' we find photos and descriptions of three College Campus dials: University of Wisconsin at Milwaukee, Planetariun of Chapel Hill, North Carolina, and an unusual design at Worcester Polytechnic Institute, Worcester, MA.

Fred Sawyer's interesting design for a polar dial with equally-spaced hour-lines exploits the properties of the cycloid gnomon. It is based on a Dutch design published in July 1980, and also makes use of the scallop-edge shown in C.M.Lowne's 'Reflecting Sundials' in *Bull BSS* 98.1. Ray Lowry's 'Equatorial Dial with Split Analemma' also reveals interesting possibilities.

There is a delightful short article with several photographs by Mohammed Bagheri on 'Iranian Sundials', providing evidence that our hobby has followers in the Near East.

Finally this issue concludes with a spirited and well-illustrated account of the NASS Fourth Annual Conference held for a weekend in September 1998 in Seattle WA. The weekend included a tour of 8 Seattle Dials in Colleges, Schools, Parks and the Pacific Science Centre.

M.S.

Softly dawn's shadow faintly forms,

Unnoticed it steals through our early hours.

Now gradually stooping beneath the sun,

Day's meridian moment met-each his own.

Ineluctably eastwards it stealthily creeps,

Aslant it stretches as if to its rest,

Lingering uncertainly as light and life fade.

Frank Poller

HEMICYCLIUM: RATAE

The photo shows a modern re-creation of the seasonal-hour dial that might have once stood in the forum of Leicester, known as 'Ratae' to the Romans. Sculpted from honey-coloured Clipsham stone, it is 32" wide, 29" high and 25" deep, and weighs nearly $^1/_2$ ton. The bronze gnomon is 12" long, equalling the radius of the hemispherical bowl.

This dial may now be seen in the Jewry Wall Museum in the city. It will form part of the Leicester Time Trial, to be opened in 1999 to be ready for the New Millennium. By then, special lighting will have been installed to show how these dials indicated both time-of-day and time-of-year.

The project has been funded by the Royal Society and the British Association Awards Scheme, financed by the Millennium Commision.

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

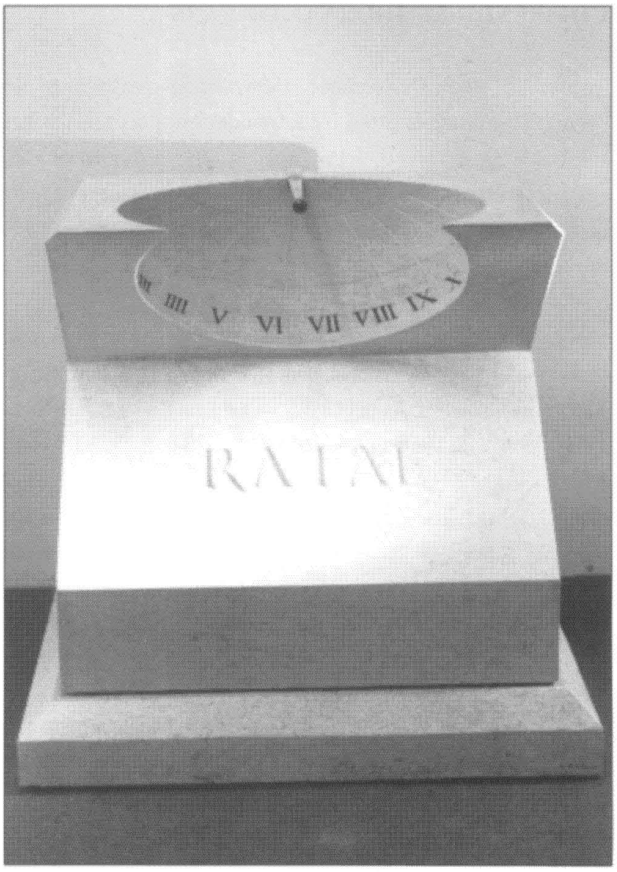

Fig.1. Hemicyclium Ratae

SNIPPETS

COLIN McVEAN

[Extract from: 'The Diary of a Victorian Squire', by David Verey.] Writing to his son from Nice in 1890, he says:

"You never saw anything so confusing as the clocks here. The sun arrives here 20 minutes before it gets to Paris because we are so much to the East. But the Railway insists on having the clocks kept to Paris time and the town are equally determined to have the clocks correct by solar time, so the clocks have two hands, one steel and the other brass, and one is twenty minutes before the other."

[Some farming friends of mine have the Prime Meridian running through their farm]

The Prime Meridian

Major & Mrs. Robert Henderson
Live right on the Greenwich meridian
And have planted many trees
To mark the line of Nought Degrees
Their cattle do not understand
The value of th'encircling band
And munch away with satisfaction
This philosophical abstraction

C.McV.
Gearings, London Road
Fairford, Glos, GL7 4AW

SCOTTISH LIGHTHOUSE SUNDIALS

One of 15 sundials used on Scotland's lighthouses when they were manned is given a time-check in Edinburgh before being auctioned.

In 1998 the last manned lighthouses around the coasts of the British Isles were finally automated.

(Photo: Ian Rutherford; reproduced by permission from 'The Scotsman' 18 Sept 97; sent to us by our member M. J. Kenn)

A FIXED PILLAR DIAL

JOHN SINGLETON

This device is related to the well-known Shepherd's Dial, but does not require rotation of the cylinder when taking a reading. The radial gnomon at the top of the cylinder is retained, and is orientated to give the shortest (vertical) shadow, the tip of which indicates the time (See Fig.1)

The dial is calibrated by noting that the shadow length is proportional to the tangent of the sunís altitude, while distance round the cylinder is proportional to azimuth.
Altitude (A) is given by:
$\mathrm{SinA} = \sin\phi.\sin\delta + \cos\phi.\cos\delta.\cosH$

Azimuth(AZ) is given by:

$\mathrm{SinAZ} = \cos\delta.\sinH/\cosA$

where ϕ = latitude, δ= declination and H = hour angle.

The curves for London (ϕ = 51.5o N) are shown in Fig.2, which represents the flat sheet to be wrapped round a cylinder. The length of the gnomon (from cylinder surface to tip) is equal to one unit on the vertical scale.

The contours are very nearly straight lines, in contrast to the extremely non-linear curves for altitude dials. The Shepherd's Dial has the advantage, for a portable device, that it is unnecessary to know where North is. On the other

hand, the fixed pillar dial is able to distinguish between morning and afternoon.

The Old Coach House
Salcombe Road, NEWBURY
Berks, RG14 6ED

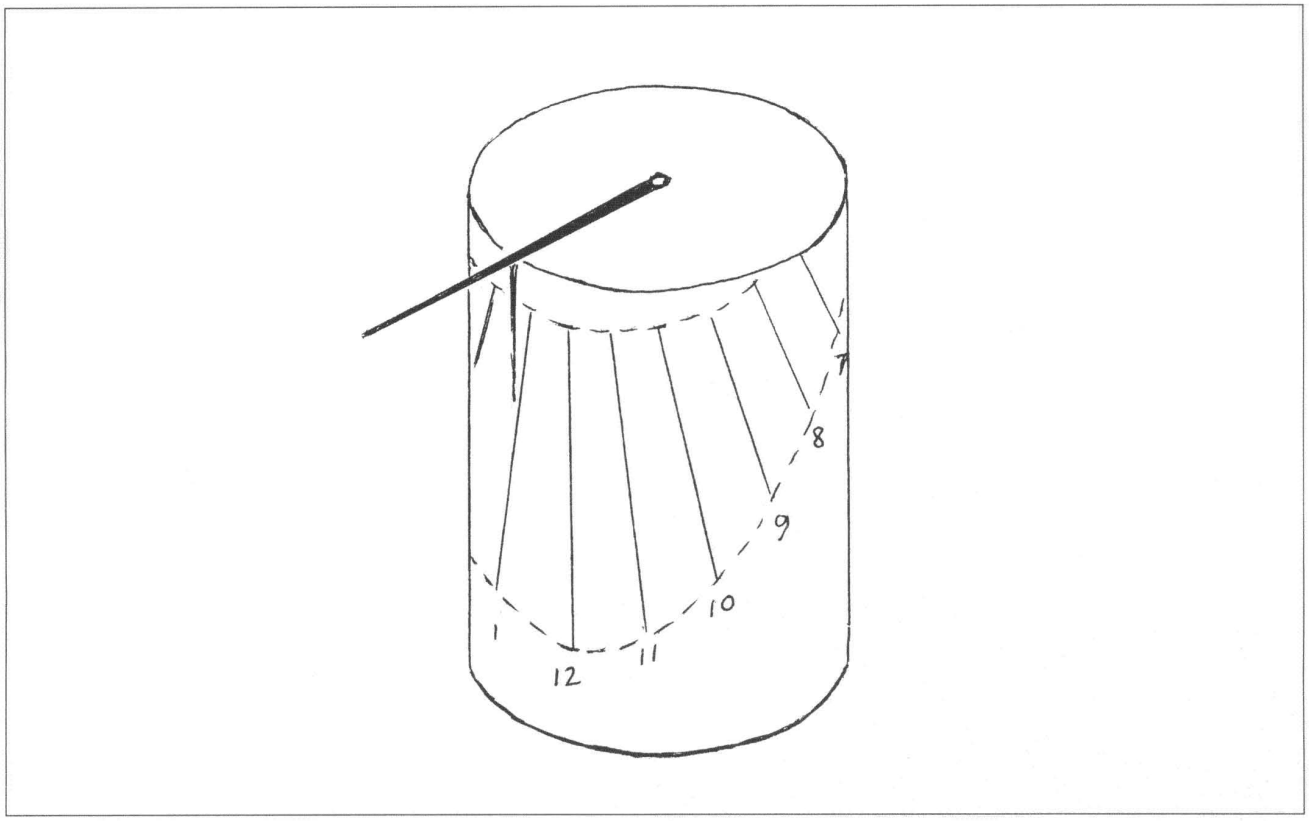

Fig.1. The fixed pillar dial

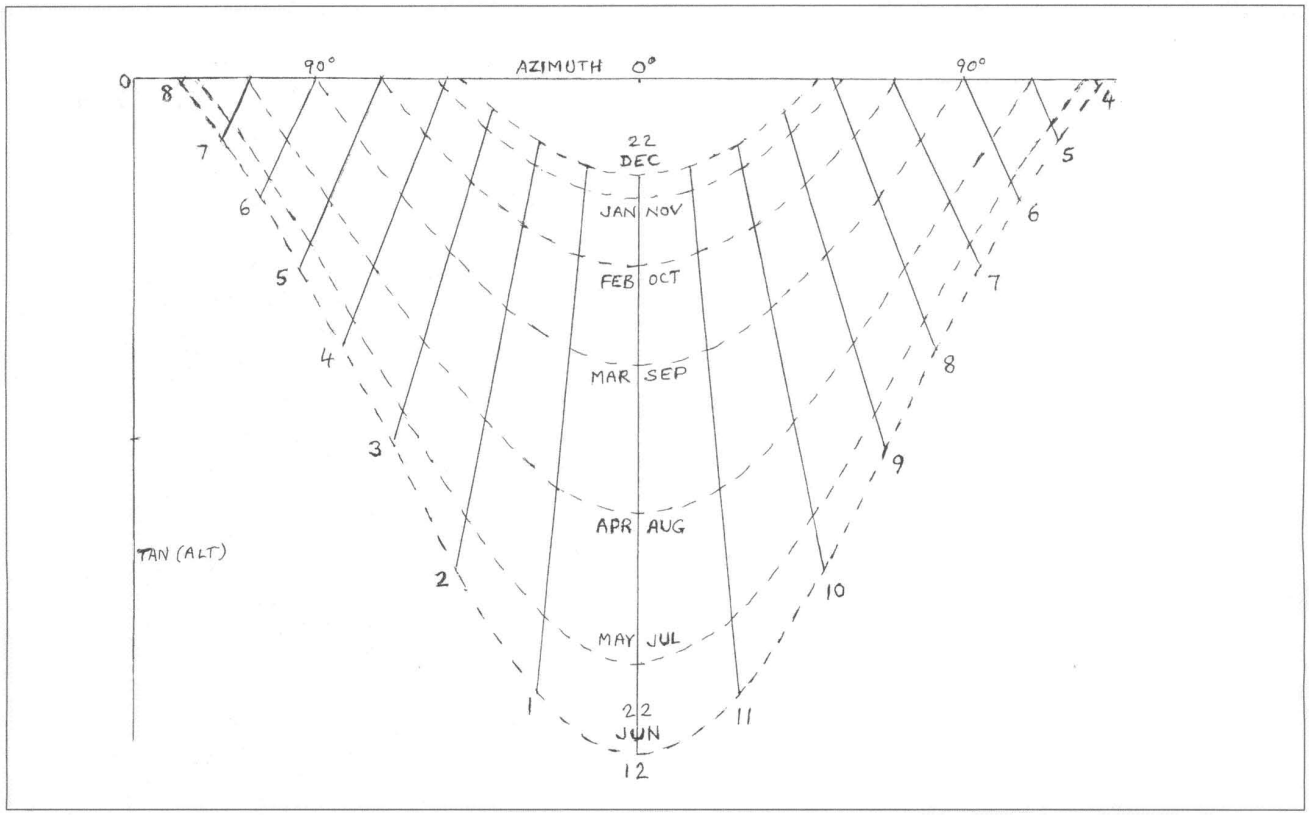

Fig.2. Pillar dial hour lines, London 51.5° N, 0°W

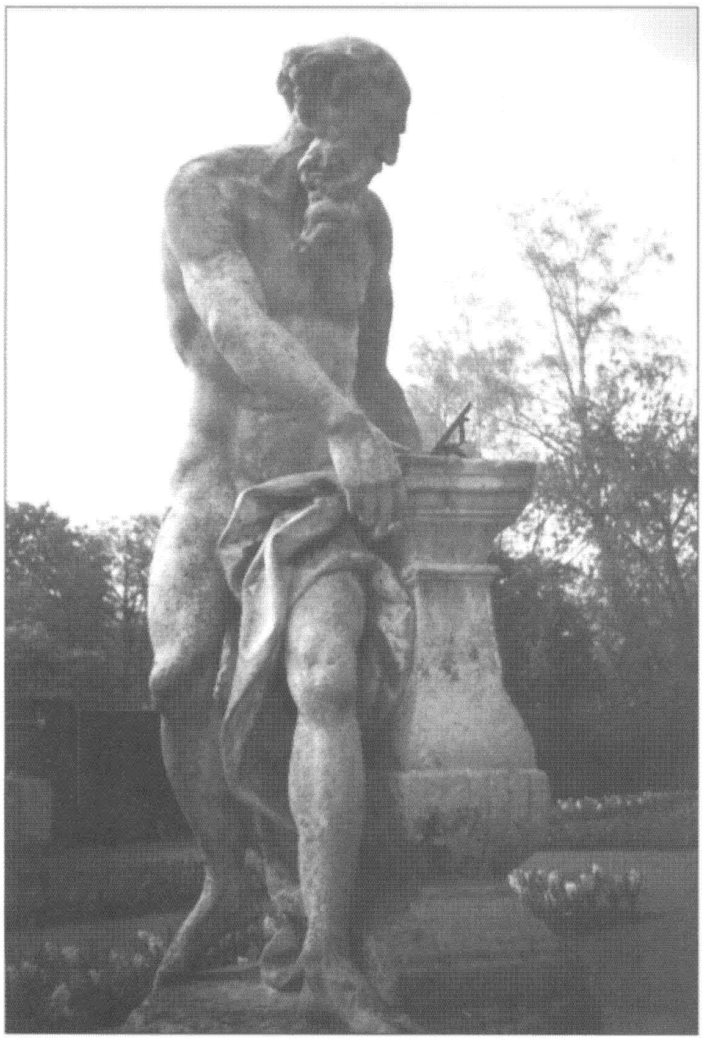

Fig.1. Horizontal Dial supported by Father Time, Anglesey Abbey, Cambridgeshire (photo, M. S.)

Fig.2. Glass Window Dial, Homberg, Germany (photo, S. Adam)

Fig.3. Mass Dial, All Saints Church, Kenton, Suffolk (photo, J. Lester)

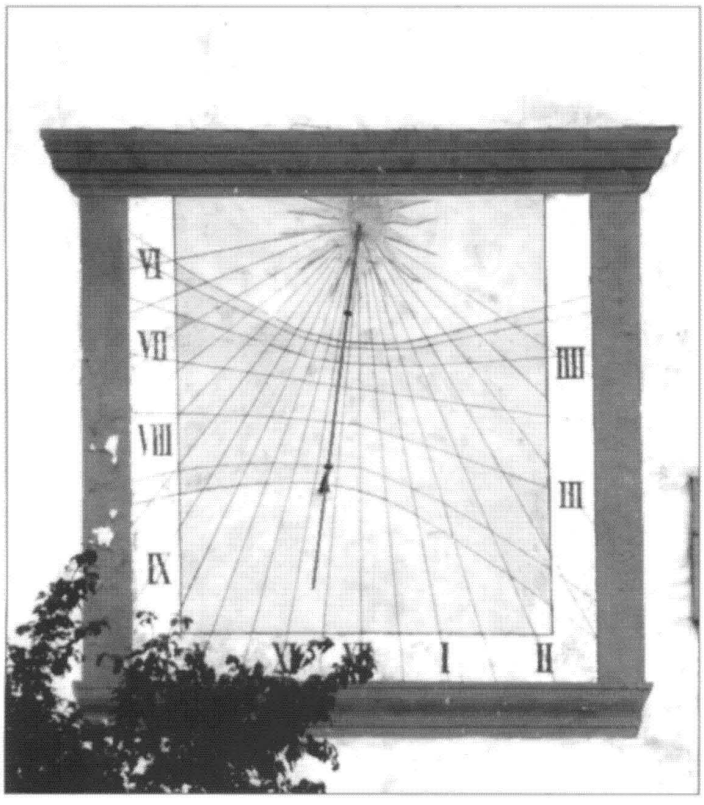

Fig.4. Wall Dial, Eberach Monastery, Germany (photo, S. Adam)

Fine Instruments of Science & Technology

AUCTION IN LONDON: 27TH APRIL 1999

We are now accepting entries of Scientific and Medical Instruments to include in this sale
Closing date for entries: 19th February 1999

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Catherine Southon
0171 293 5209

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