The British Sundial Society

BULLETIN

VOLUME 16 (ii) JUNE 2004

Front Cover: Dial at Southern end of Sandringham House, Norfolk [Photo, the late C. K. Aked]

Back Cover: Dial at Capúchin-Abbey, Wesemlin, Lucerne [Photo, postcard Pfyffer, Luzern]

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BULLETIN
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EDITORIAL

In this issue we print the annual reports made by the members of Council to the general membership; a 'statutory requirement', but routine housekeeping tasks may not make for interesting reading, (pp73-76). Much better is the lively account by Tony Wood of the goings-on at the Annual Meeting, in Oxford, (pp83-86) which included the visits to sundial workshops, and the dramatic unpacking of the Wynne Dial at Blenheim. One cannot help feeling sorry for those organisations whose AGM have no provision or pretext for interesting or colourful displays or exhibitions. The Oxford meeting was particularly colourful because large transparencies of stained glass window dials had been fixed up against the huge window at one end of the dining hall.

Professional Sundial makers are invited to take note of the Reader's Letter. A job which is a routine bread-and-butter matter for them is important to all of us, for keeping the documentary record straight.

MAGNETIC AZIMUTH DIALS

MIKE COWHAM

The Magnetic Azimuth Dial had its heyday around 350 years ago. Since then it fell out of use, but I hope through this article to re-kindle the idea and hope that some of our intrepid diallists will take up the design for the future.

Why did it go out of fashion? Well, it didn't quite go out of fashion but due to its reliance on an accurate compass pointing to True North such dials were only really feasible at the time when Magnetic Declination was around zero. The last time that this was the case in London was around 1660[1] as the declination slowly swung from East to West. It continued to swing West for another 160 years before reversing and will, in about 21 years time, again swing through zero towards the East. Therefore we are approaching an ideal time for the re-introduction of this fascinating dial.

The majority of extant Magnetic Azimuth Dials were made in Dieppe from ivory by makers such as Bloud, Senecal and Crucefix. These are frequently called Ivory Diptych Dials, which really is a misnomer, although many of these dials also included a String Gnomon Diptych form of dial, as well as Polar and Equatorial Dials. So, exactly what is the Magnetic Azimuth Dial? For the moment I will take the Dieppe type as my example. The dial would be set up horizontally such that the shadow from its vertical lid would fall exactly over its base: Fig. 1. This is really the reverse of what we would normally expect from a Diptych Dial as the Sun is apparently coming from the opposite direction. With the dial so aligned the South end of the compass needle will point to the correct time on the elliptical chapter ring in the compass bowl: Fig.2. Naturally this would only work on a particular date so the chapter ring would need to be moved as seasons changed. This was simply done by making it slide along its N - S axis as dates changed. The Dieppe model was adjusted from beneath where a volvelle could be rotated, setting the current date against a hand pointer: Fig. 3. What is unseen is on the back of the volvelle where an eccentric groove has been machined. It is a small pin from the sliding chapter ring that runs in this groove and adjusts its N - S position. This is therefore quite a simple dial to use, but dials of this type are only suitable for one fixed latitude. For this reason these dials often include both Polar and Equatorial Dials on the top lid, suitable for use over a wide range of latitudes.

A somewhat different form of Magnetic Azimuth Dial was made in London at about the same period. It was seldom made just as a sundial but was frequently part of some surveying equipment, namely the Plane Table (then known as a Plain Table). An example of one of these from Bion's book[2] is shown: Fig. 4. The table is placed on a tripod and is set level. A piece of paper is fixed onto its top surface and

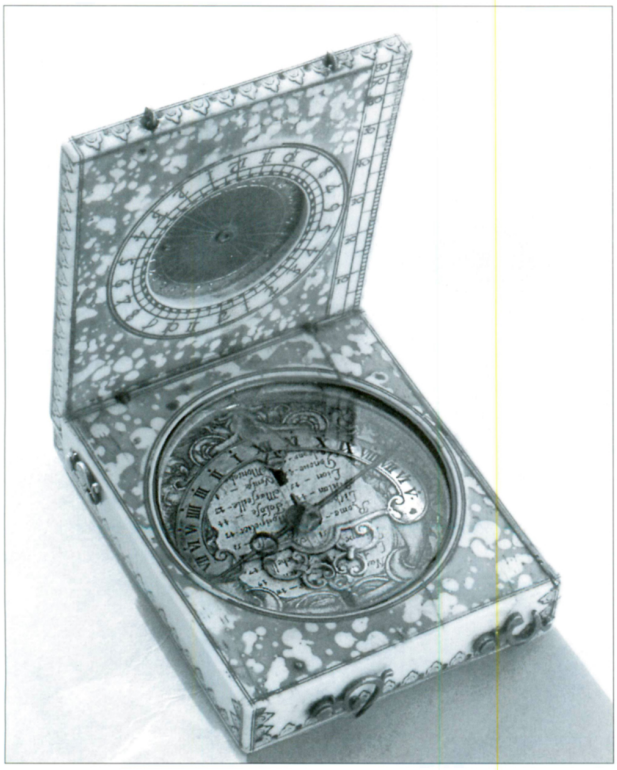

Fig. 1. Dieppe Magnetic Azimuth Dial with shadow of its lid exactly falling across its lower leaf.

Fig. 2. Elliptical Chapter Ring inside compass bowl. The time indicated is 11:10am.

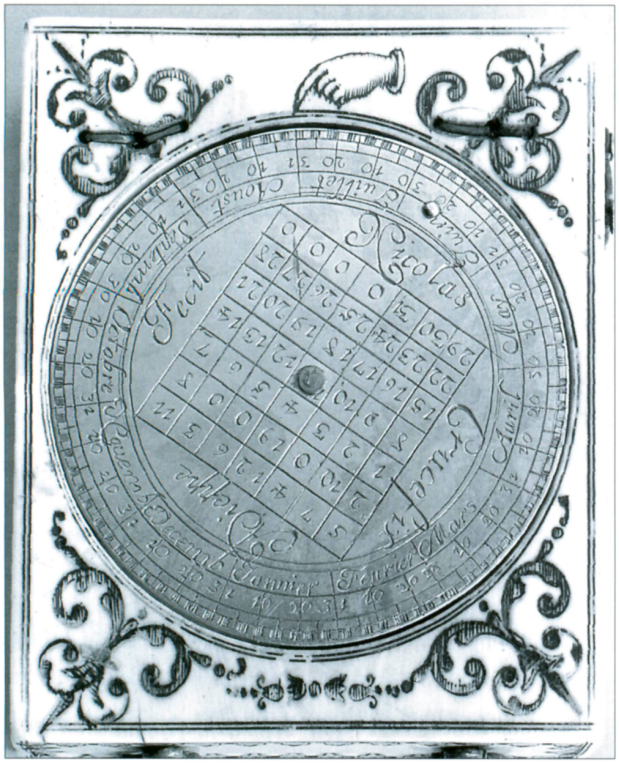

Fig. 3. Date Volvelle on underside of compass.

the alidade (the horizontal arm with sights) is turned to be in line with the feature to be surveyed; often the edge of a piece of land. When correctly aligned a pencil is used to mark a line along the piece of paper. At the far side of the table can be seen a Magnetic Compass. From this the Plane Table could be set exactly N - S giving instant bearings. This was a surveying device that required little knowledge of trigonometry or even mathematics. In fact, it could be used by almost anyone, and each map would automatically be drawn with North at the top.

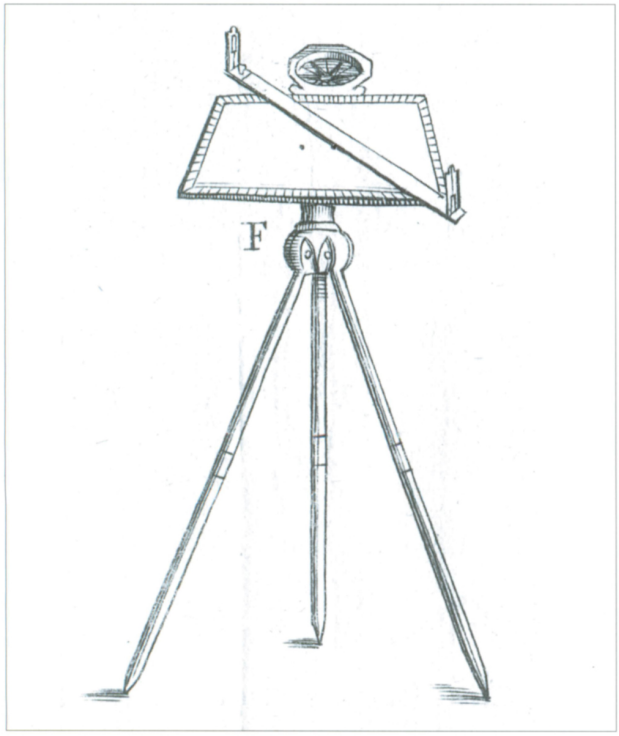

Fig. 4. Plane Table showing its compass mounted at the back.

Most of these Compasses were also marked with a scale for a Magnetic Azimuth Sundial, quite different at first glance to those from Dieppe: Fig. 5. The design seems to have originated with London instrument maker Henry Sutton but in this example Walter Hayes has used Sutton's printing plate with simply a change of Name, Address and Date. To use this dial, all that was necessary was to align the Plane Table with the Sun, probably by using its alidade, and the dial would show the time from the position of its compass needle over the fixed paper scale.

It is interesting to look in detail at the various scales because they have several features that may not immediately be apparent. Around its outside ring are bearings for surveying with respect to North. Note that E and W are reversed because they are to be read from the North-pointing needle. Inside that is a 0° to 360° scale showing true bearings from the compass needle. The next, rather complex scale is marked with hours in both Roman and Arabic numerals, and with concentric circles marked with Zodiac sigils. This is obviously the sundial scale and I will return to it shortly. Inside that is a calendar scale showing the days and months of the year against Zodiac degrees: Fig. 6. Note that the year begins on March 10, the Vernal Equinox, at the First Point of Aries. This clearly shows that it is using the older Julian Calendar, which was not abandoned in Britain until 1752.

We will return now to the sundial scale, as it is this that interests us most. The compass needle will always align itself N - S and with virtually no declination at this period

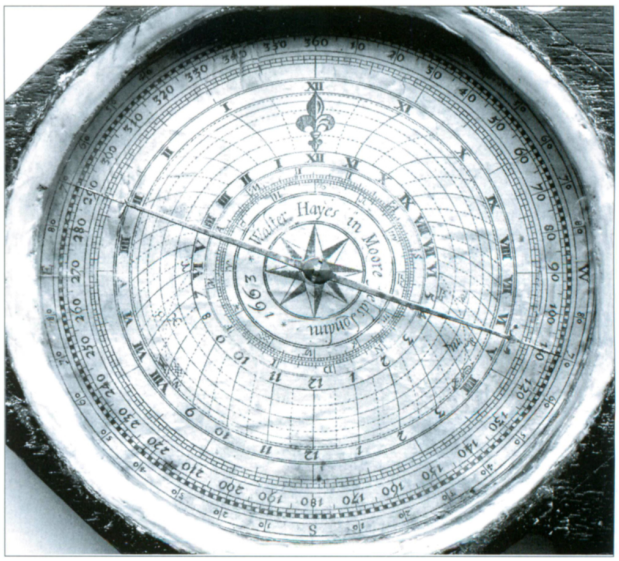

Fig. 5. Magnetic Azimuth Dial by 'Walter Hayes in Moore fields Londini 1663'.

it will be a true alignment. The needle is long and thin, and will cross the scales on both sides of the dial. Firstly, let's assume that the date is 10 April (Old Style). This corresponds to the first day of the Zodiac sign Taurus shown by its sigil of a bull's head with two horns, (refer to the calendar scale: Fig. 6.). We can find this same sigil on the dial scale to the left, (Fig. 5.), between the numerals **VII** and **VI** on the outer scale, referring to the circle about mid-way between both sets of numerals. It is then only necessary to find where the compass needle crosses this circle in the top half of the dial to be able to read the correct time in hours and sub-divisions of half-hours; about 3:45pm in the photograph. For other dates we would use different concentric circles as appropriate or extrapolate between them. Note that the hours are indicated from **IIII - XII - VIII** in Roman Numerals. These are the Summer hours on the dial for a day length of 16 hours.

If we now take a Winter date, say 11 November, this is indicated as the arrow of Sagittarius which may be seen on the dial scale at the lower right near to numeral **IIII**. The concentric ring for this date is near to the outside edge of the dial, (with the sun approaching the Winter Solstice). Again we look for where the compass needle crosses this ring and read out the time, but this time on the lower section of the scale against the Arabic Numerals.

If we wish to construct this type of dial for a period when there is still a slight Magnetic Declination this should be possible by slightly rotating the hour scales with respect to North. (Note that the Declination for London is currently

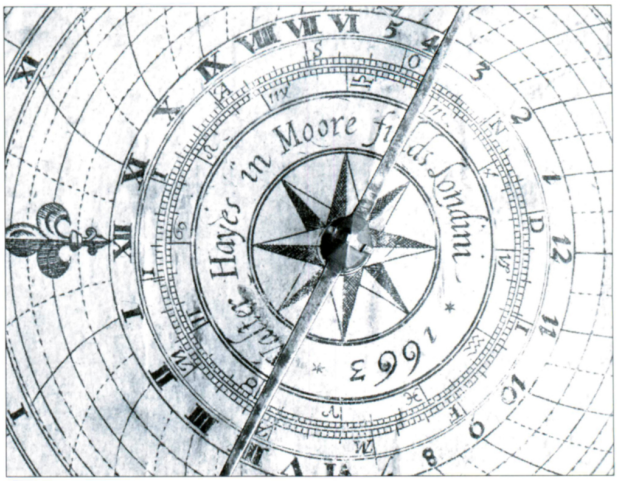

Fig. 6. Detail of the Calendar Scale.

only 2.5° West reducing by 7' per annum.) A fully rotating scale would allow it to be used with any amount of Magnetic Declination. It therefore seems strange that these relatively simple dials have not been made for such a long time.

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2 N. Bion (trans Stone): *The Construction and Principal Uses of Mathematical Instruments.* London, 1758.

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TWO SUNDIALS IN SOUTH EAST ATTICA

E.TH. THEODOSSIOU, AND V.N. MANIMANIS

Abstract

Two modern horizontal sundials located on the eastern shore of Attica, in central Greece, are presented. The one is a donation to St. Pantelehemon's small country church overlooking the Aegean Sea at the beach of Kaki Thalassa, while the other is located at the centre of the main square in the city of Lavrio.

Key words: *sundial: modern, Greece, Attica, Kaki Thalassa, Keratea, Lavrio, sea*

THE SUNDIAL OF KAKI THALASSA

Keratea is a town of southeast Attica, Greece, with a population of 6,700. It is situated in the Lavreotic Peninsula, at a road distance of some 40 kilometres from downtown Athens, on the road to Lavrio (which is 14 km to the southeast). Keratea is a local agricultural centre with several olive-presses, wine and milk products manufacture. In the area of Keratea there are three monasteries. The best-know of the three is the "Keratea Monastery:" i.e. the nunnery of Eisodia of Theotokos Pefkovounoyatrissa (= Virgin Mary the Healer at the Pine Mountain) with more than 250 nuns. It belongs to the schismatic "True Orthodox Church of Greece", whose only difference from the mainstream Greek Orthodox Church is that it follows the "Old" (Julian) calendar in its worship. The convent was established in 1927 by the bishop Matthew Carpathakes, whose body rests there after his hierarchical burial on May 31, 1950.

The Keratea Monastery is located 8 km to the E-NE of the town of Keratea, overlooking the small beach of Kaki Thalassa (= the Bad Sea), hence it is also known as the Monastery of Kaki Thalassa. On a small hillock on this

Fig. 1. Sketch-map of part of coastline of SE Greece

beach there is the small country church of St. Pantelehemon, in the front-yard of which there is a small horizontal sundial.

This sundial, according to the inscription on its metallic tablet, was constructed and donated to St. Pantelehemon's church by Kon. Iak. Tavris (= Constantine son of Jacob Tavris), most probably a sea-captain of merchant ships, in the year 1973. The geographical coordinates of the site are given on the top line of the tablet as latitude 37° 49' N and longitude 24° 2' 3" E, with the curious mistake that the words "ΜΗΚΟΣ" ("LATITUDE") and "ΠΛΑΤΟΣ" ("LONGITUDE") have been interchanged! These coordinates differ by only -9' (corresponding to 17 kilometres) in latitude and +18' 56" (corresponding to 27.7 km) in longitude from the coordinates of the old building of the National Observatory of Athens (19th Century) on the Nymphon Hill, in the Thisseion area of downtown Athens,

Fig. 2. The country church of St. Pantelehemon.

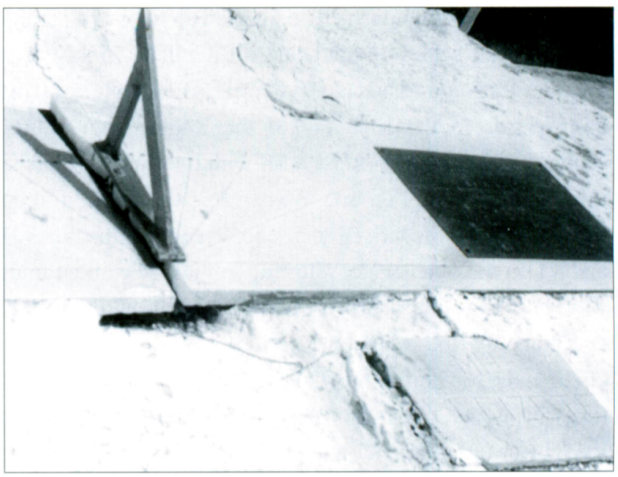

Fig. 3. The horizontal sundial of Kaki Thalassa.

which officially represent the geographical coordinates of the city of Athens. The metallic tablet also gives a table of corrections in 15-day intervals. The language used is the older form of modern Greek (katharevousa), commonly used for inscriptions until the late 1970s, and the inscriptions are all written with capital letters.

The main plate of the dial consists of two marble pieces with the lines and numbers just slightly carved on them, a fact making difficult to discern them in a photograph. The two pieces are united by the gnomon of the dial, and together form a rectangular surface about 27 cm wide and 65 cm long. The gnomon is made of bronze. As a whole, this dial is a rather simple construction placed on a whitewashed table-like base united with the NW wall of the church yard, a wall made of whitewashed cement bricks. The brilliant white resembles the walls of the small islands of Cyclades.

THE SUNDIAL OF LAVRIO

Lavrio is the town closest to Cape Sounion, the southernmost point of Attica, famous for its temple of Poseidon. Today, Lavrio is a town with a population of approximately 8,800. It is located on the eastern shore of the Lavreotic Peninsula, at a road distance of 53 km from downtown Athens, opposite of the uninhabited island of Macronessos (= Long Island). It is not far from the Keratea Monastery described above, so that we were able to easily combine these two visits.

Although the area of Lavrio was well-known for its mineral wealth since pre-classic Antiquity, the modern town of Lavrio is relatively new.

In 1861 A.D. the interest was rekindled for a novel exploitation of the minerals when the Italian industrialist Serpieri realised, being a mineralogist himself, that he could extract metals, especially silver and lead, from the ancient leftovers using the novel techniques of his era. Ancient

Fig. 4. The tablet of the Kaki Thalassa sundial.

Athens owed a considerable part of its power to the silver of Lavrio; the silver "owls", the famous and strong currency of the 5th Century B.C., was helpful in constructing an efficient fleet, which resulted in the final victory against the Persians. The history of the new city of Lavrio began in 1864, when the French-Italian company *Serpieri Roux de Fressynet C.E.* started the creation of an infrastructure in order to exploit the ancient mines of the area. Up to then, there was only a small fishing village, Kyprianos.

The population of the new city was mixed, created by the influx of workers and other employees from both other countries and the rest of Greece. The Italian engineers and foremen, and the Spanish smelters, represented the main immigration from other countries. In 1873 the Greek Metallurgical Company of Lavrio was founded, and in 1875 the French Company of Mines in Kyprianos, creating the first heavy industry in Greece, the largest of its era in all Balkans, and making Lavrio one of the important mining centres of the world. This industrial development, unique for an agricultural country as was Greece in 19th Century, had as a result the careful city planning, with wide boulevards, squares and a good harbour, while Lavrio became a city of many "firsts". It was the first Greek city which used a telephone line (1882) and the first one illuminated with electric voltaic arc lamps (1887). The registering for the shares of the Lavrion companies was the first stock-exchange financial act which took place in Athens and, since there was no stock-market building, it was conducted in the coffee-house *I Oraia Hellas* ("The Beautiful Greece"). The first Greek railway (1884) connected Lavrio with Athens, while in the Lavrio area an extended railway network was also constructed for the connection of the mines with the city and of the various workplaces within the city itself. The birthplace of the first generation of Greek workers, industrial technicians, foremen and syndicalists was Lavrio.

After this rapid development, Lavrio started to decline in the first decade of the 20th Century, initially due to a fall of the international price of lead and finally, and more permanently, due to the exhaustion of the minerals. While industry brought the rise of wealth for a portion of the Greek society, the one-sided, mine-oriented Lavreotic life, especially the life of the workers, was harsh, with heavy work, lack of holidays and low wages. Recently, the truly nice town of Lavrio was proclaimed an Industrial Park to be preserved for posterity, and thus its restored buildings and factories bring to our minds the first industrialisation efforts in modern Greece.

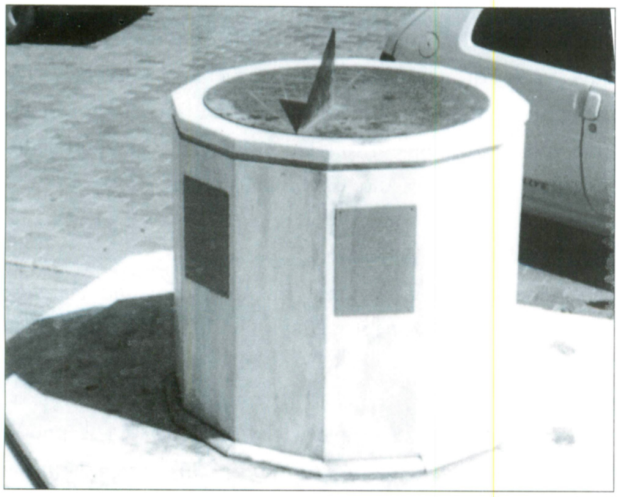

Fig. 5. The horizontal sundial of the Central Square of Lavrio.

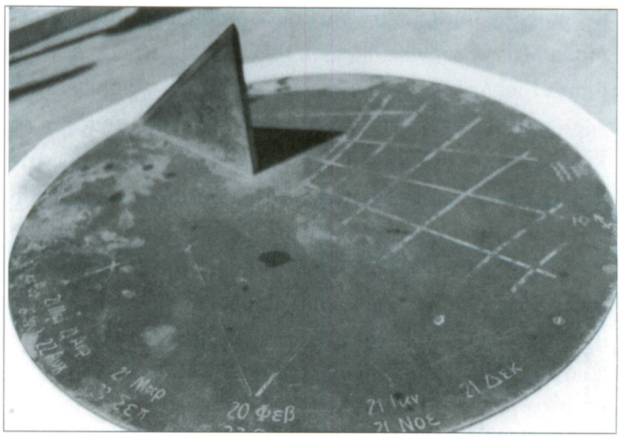

Fig. 6. The plate of the horizontal sundial of the Central Square of Lavrio.

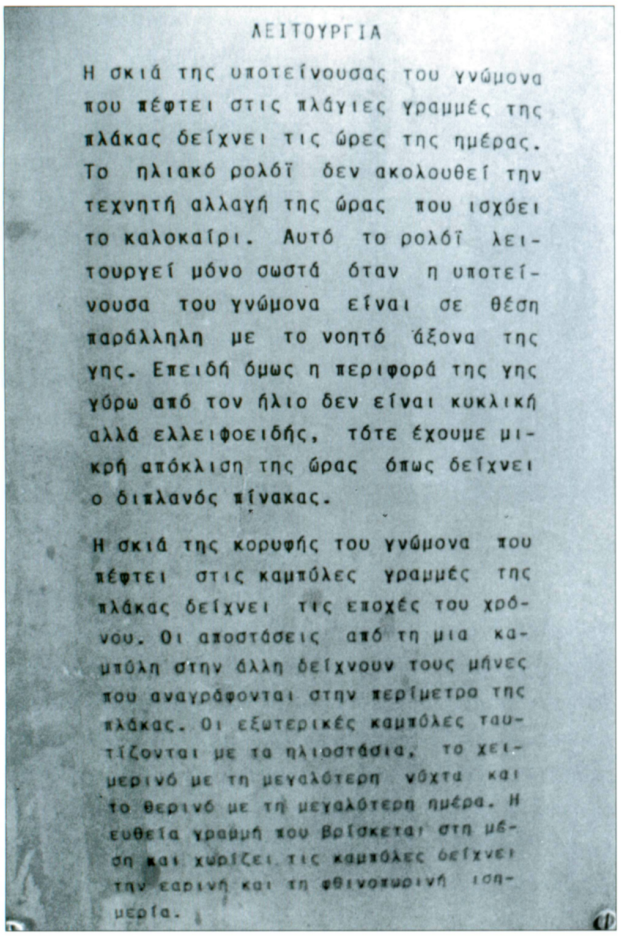

Fig. 7. The Lavrio sundial plaque with a description of how the dial works

In the centre of the long and narrow Central Square of Lavrio there is a horizontal sundial that differs distinctly from the dial of Kaki Thalassa. Its base is a prism with twelve sides, made of white marble. Here the plate is circular and made of bronze; the brazen gnomon looks as an integral part of it. This dial shows also the month of the year, since it has also lines for the determination of the southward extension of the shadow. This type of sundial appears near the end of the classical era of Greek Antiquity, named by Eudoxus of Cnidus *arachne* (spider) due to the web-like appearance of the crossing lines. [A 67-km crater on the north hemisphere of the Moon bears the name of this Greek astronomer of the fourth Century B.C.] The eastern side of the plate bears the approximate dates that correspond to equal altitudes of the Sun, when the shadow follows the respective W-E line (two dates for each line). The western side of the plate bears the symbols of the zodiacal signs where the Sun is during the span between two successive W-E lines. The shadow shown in the photographs shows with good approximation both the date near the summer solstice (July the 4th) and the morning hour, 10:45 Daylight Savings Time.

The inscriptions on the sides of the base reflect probably even more strongly a difference in mentality compared with

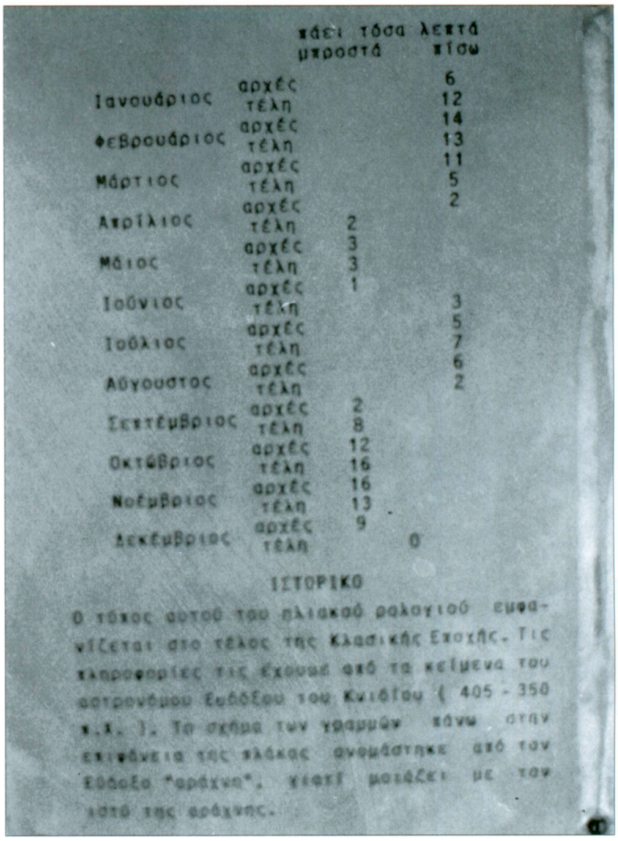

Fig. 8. The Lavrio sundial plaque with the table of corrections and a short historic outline.

those of the Kaki Thalassa dial. In the Lavrio dial, while it is a more expensive construction, there is no indication of the constructor, nor of the year of construction and/or placement; instead, on its first plaque there is a rather detailed description of how the sundial works, indicating an aim for educational function, while the second plaque bears the usual table of corrections and a short historic outline. Both inscriptions are now written in the spoken form of modern Greek language (demotike), which is now used also everywhere in writing, in a common typewriter font (pica) and in lower-case letters. The one-accented writing is indicative of an installation after 1982; on the other hand, the weathered eastern side of the plate indicates at least a few years of exposure. Finally, the fact that here the geographical coordinates of the site are not given reflects one more difference from the somewhat "sea-and-sailor oriented" outlook of the "Bad Sea" sundial.

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AN AZIMUTHAL MEAN TIME DIAL:
DEVELOPMENT OF A SUNDIAL DESIGN

S. HIGGON

I began thinking of this dial at the beginning of the year 2000. The original idea was quite basic as you will see but it gradually developed into what is, I think, a working dial. This development was really a series of small steps, one step leading on to the next, with almost no "design thought" being required from me. The dial comprises a cylinder about 750mm high by 500mm dia. (Fig.1). There would be a twenty-four hour time scale around the body of the cylinder with some form of sun-sight free to move around the scale in order to take the azimuth readings. The readings would, of course, be in terms of hours and minutes rather than in degrees. The time scale would have midnight at the north point and each hour would subtend an angle of 15 degrees. Because of this it made more sense for me to consider azimuth in the traditional way rather than as suggested in the Glossary. The upper part of the cylinder would have a table of correction curves attached to it and from these one could find the correction needed to bring the azimuth reading to mean time.

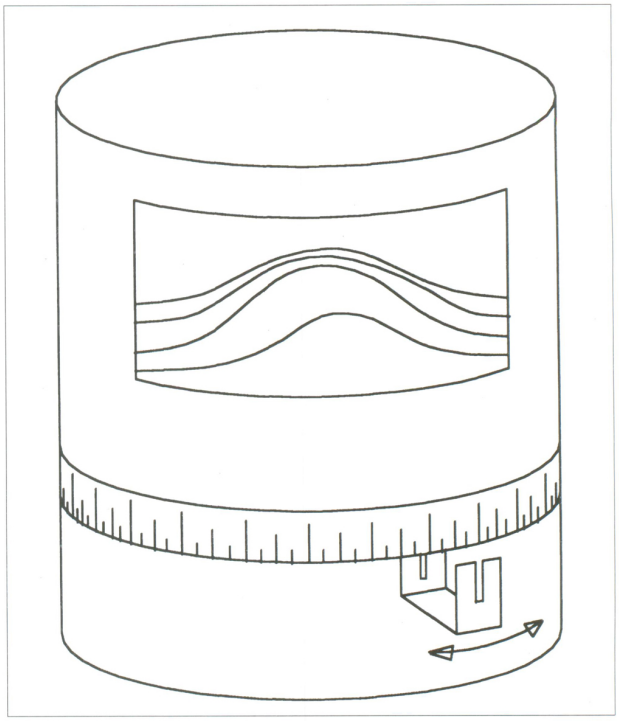


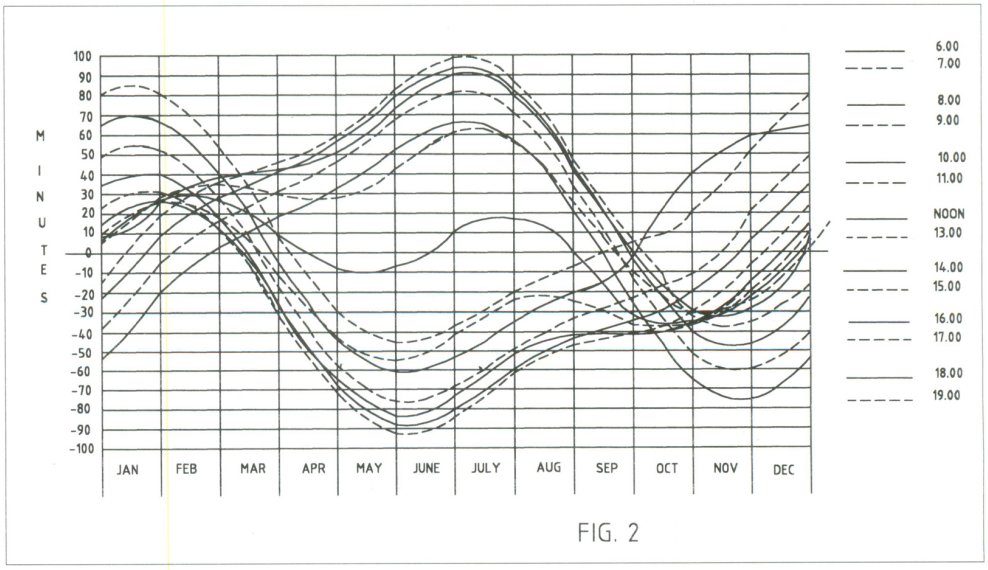
Fig. 1.

DIAL PRINCIPLE

On the first day of July the sun's azimuth at Greenwich at 9am is 111 degrees and this would indicate a time of 7.25 on the dial. A correction of plus 95 minutes would therefore be required for any reading taken at this particular moment. Similarly, at 3pm on the same day the sun's azimuth would be 247 degrees and would indicate a time of 4.28pm which would necessitate a correction of minus 88 minutes.

By finding the correction for each hour of the day a "correction curve" could be drawn and by doing this for the first day of every month a series of curves could be produced that covered the complete year. From these one could, knowing the date, and the time indicated on the dial, find the required correction in order to bring the sun reading to mean time.

I duly produced a set of correction curves. (Fig 2). Looking at this it was obvious that it was far too confusing to find a correction very easily because of the congestion of the curves. I decided to try another route and to construct curves of the months rather than of the hours. This would have two objectives; it would reduce the number of curves to twelve and, of more importance, the curves could be separated into two groups, one group of six months for the first half of the year and another group for the latter half (Fig 3).



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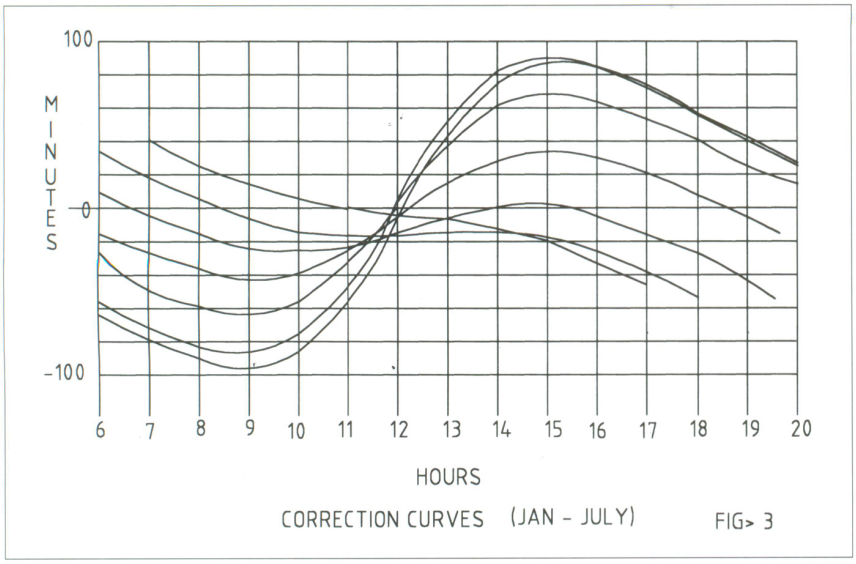
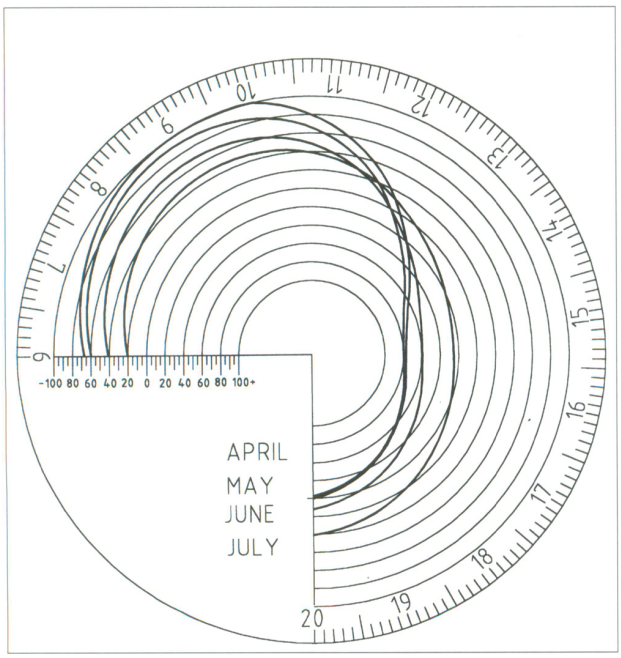


Fig. 3.

This looked far more friendly but left the problem of what to do with the plate that was not in use? In my experience anything put away for safe keeping means never being found again! The obvious solution was to keep the plate not in use inside the cylinder and to ensure that it remained there the cylinder would have to have a "lid" put on top. This solution naturally led to the thought of using the disc itself for the curves. One set of curves could be put on one side of the disc and the second set on the other side and there would then be no loose plate for which to find a home.

I therefore redrew the correction curves in a polar form and the result is shown in Fig.4. Three quarters of the disc was used for the curves and the remaining quadrant for any dial furniture. There was also a time-scale around the perimeter so that the sun readings could be transferred from the body of the cylinder to the disc. To find the correction one would place a straight edge from the centre of the disc to the sun-reading on the perimeter scale and interpolate between the curves for the day of the month. (The curves were given different colours to differentiate them) This position would then be followed around to the correction scale and the reading noted. The "straight edge" was soon replaced by a rotating finger and the correction scale transferred to the face of the finger as in Fig.5. This cleaned up the disc considerably and gave it a more open appearance.

The only problem left seemed to be how to apply the correction once it was found? With the Equation of Time the most one has to correct for is about 15 minutes and this can easily be done mentally in a second or so. With the larger corrections from the azimuth readings this would be more difficult. Who would be bothered to subtract, say, 77minutes from a time of 3.15pm? The solution would have to be some way of applying the corrections mechanically. The method I decided on was to duplicate the scale on the finger and place it on a collar next to the time scale (Fig 6A). This collar scale would be constructed so that a one minute division would be identical in distance to one minute on the time scale. The collar could then be rotated so that the correction scale moved along the fixed time scale and by this means any value could be added to, or subtracted from, the time shown by the sun



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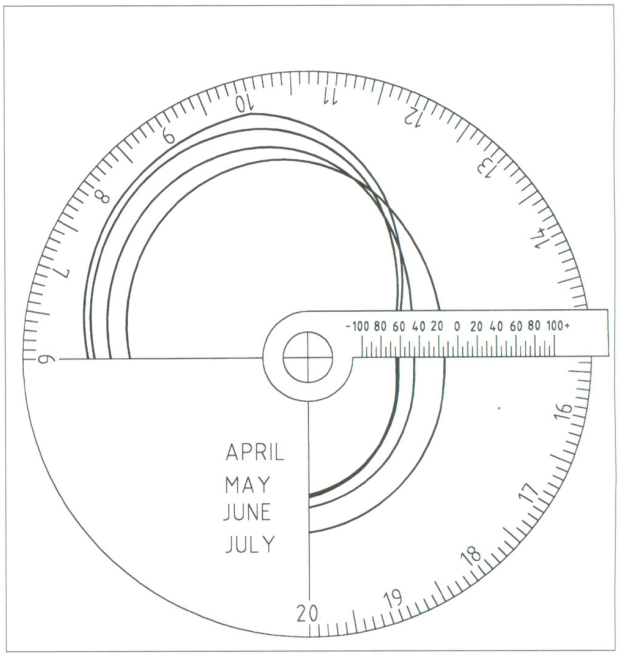

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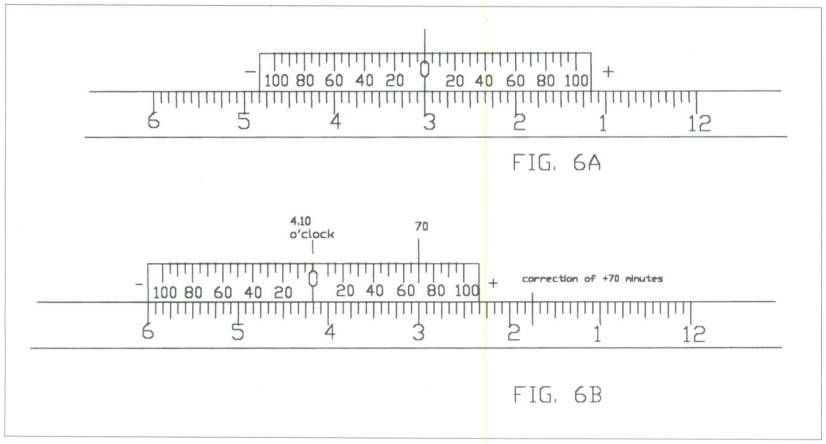

Fig. 6a. & 6b.

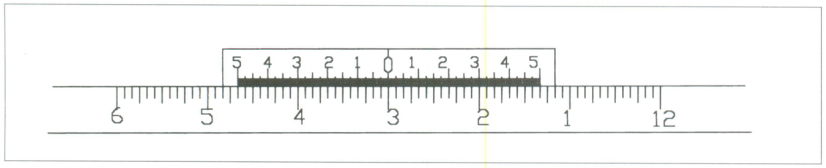

Fig. 7.

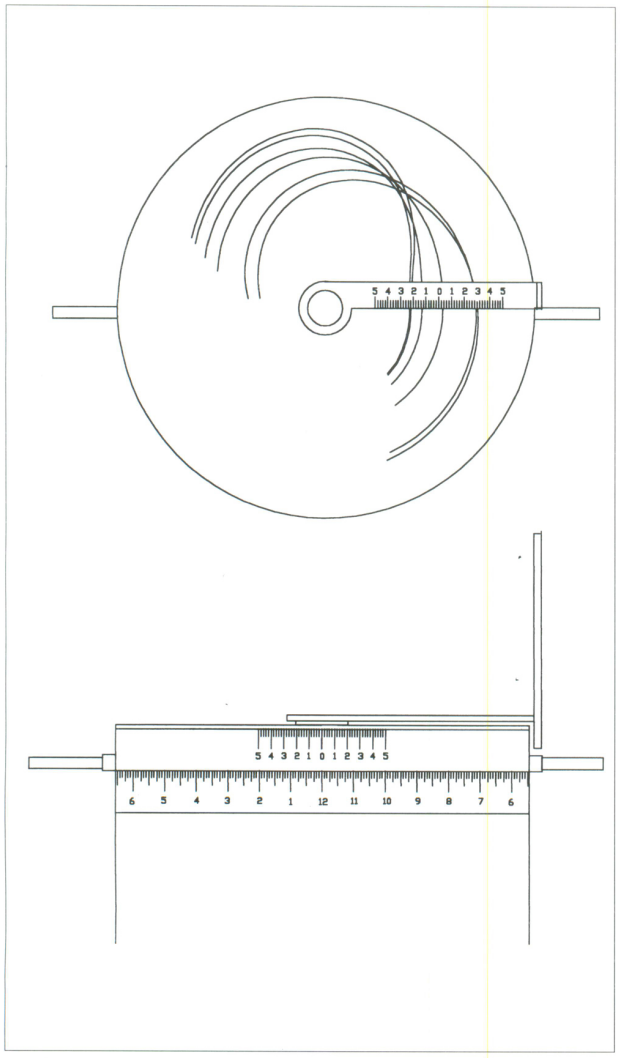

Fig. 8.

reading. Mean time could then be read from the zero on the correction scale. (Fig 6B). Another index line could be positioned on the collar for daylight saving time.

Now that there were two similar scales being used in conjunction with one another they no longer had to be marked in minutes. As long as they were both the same they could be in any units and so they were converted into decimal scales (Fig 7). At this point I also took the opportunity to colour-code them so that both positive scales would be red and the negative scales blue.

Having come this far I decided to make a small 150mm dial to see how accurate it might be. Since it was designed for Greenwich I asked David Young if he would be kind enough to check it out for me since his home almost straddles the meridian. This David kindly agreed to do and found that it was not at all accurate! He suggested that I might have made a correction for the EoT when no correction was necessary and this, indeed, is what I had done!

This meant drawing a new set of correction curves and this time I drew them for my own location in Shropshire with the said inaccuracies eliminated. I made a few other minor alterations at this stage which were shown in a small article in the June 2002 issue of the Bulletin.

A full-size dial now seemed worth pursuing. The only problem was how to orientate it accurately? An error of one degree in the orientation would give an error of four minutes in the time so it was important that orientation was done as accurately as possible. When making the small dial I had mounted the cylinder on a square base plate in such a way that the north-south axis of the cylinder was parallel with the edge of the plate. It was therefore easy to set the dial using the edge of the base plate as a north/south line. This large dial would have to stand alone so there was no straight edge to use for alignment. It seemed that the best way to set the dial might be by means of the sun's solar-noon position. By setting the rotating finger so that it was directly above the 12 o'clock mark on the time scale, and rotating the whole cylinder so that the finger was pointing directly at the sun at solar noon, then the 12 o'clock mark would face due south. To ensure that the finger was in line with the sun a vertical strip could be attached to the end of it, then, when it was pointing to the sun, the shadow of the edge of this strip would fall along the edge of the finger. By

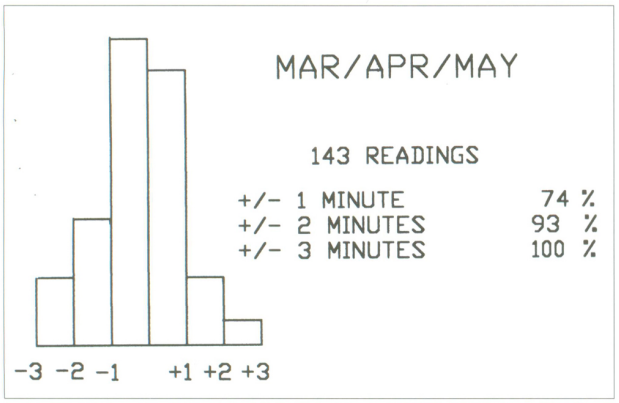

Fig. 9.

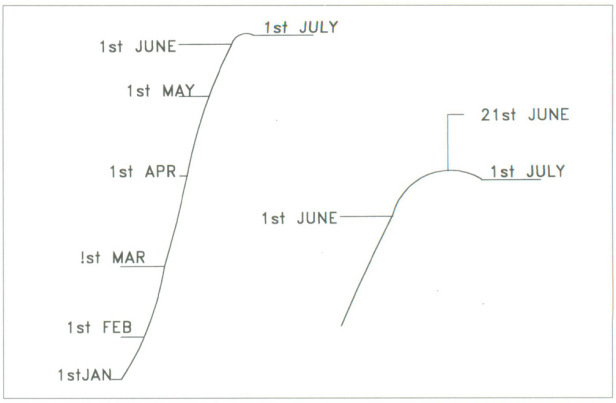

Fig. 10.

using this method it was possible to orientate the dial to within 15 minutes of arc.

A happy thought then presented itself. If this method (using an alignment strip) could be used to position the dial for 12 o'clock it might be possible to use it for any other time reading. The dial was therefore redesigned and the swivelling sun-sight abandoned. The correction curves were redrawn for use by this new method and were plotted from the time of sunrise to sunset. The alignment strip was also extended downwards a short distance to form a new datum for applying the corrections and the collar and time scale were moved to the top of the cylinder. (Fig 8).

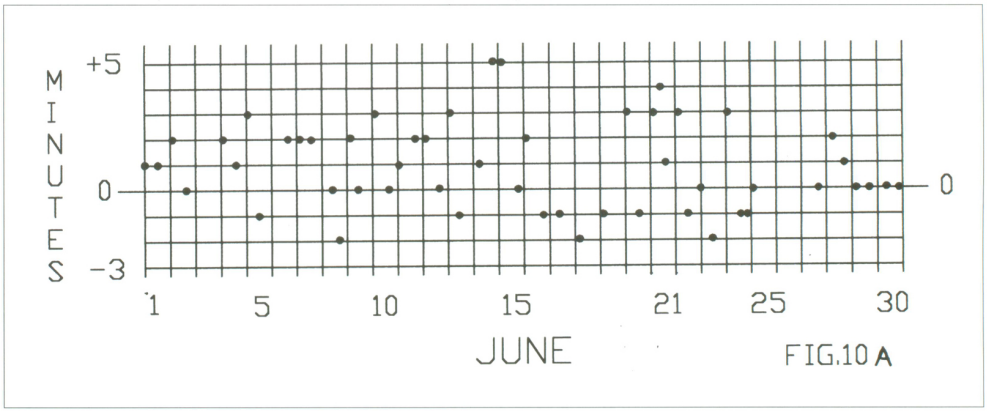

Fig. 10a.

The dial was finished and set up at the beginning of February 2003 and appears to be quite accurate. During the months of March, April and May I took 143 readings at various times of day between 7am and 7pm. The results are shown in the bar chart (Fig 9) where all of the readings came within 3 minutes of mean time. The accuracy depends, to a large extent, on interpolating the date position correctly but the curves are usually close enough together for this to be not too much of a problem.

I decided to treat the month of June separately because of the effect of the solstice. Fig 10 shows a curve for the elevation of the sun from 1st January to the 1st of July. The points for lst June and 1st July are quite close to one another, but the 21st June is at the maximum. Because of this I had been expecting a gradual increase in the error as the solstice was approached followed by a falling off as we came back to 1st July. The chart (Fig l0A) does not show any real difference albeit that there are a few readings over 3 minutes.

This surprised me somewhat so I decided to draw a curve for 21st June to see just where it fitted with those for June and July. To my surprise it was not at a maximum, as I had expected, but lay between the other two curves. To assure myself that I had not made a mistake I drew the curve for the Winter Solstice and that also lay between the curves for 1st December and lst January and was not a maximum as I had expected. I really cannot understand this and would welcome any suggestions as to why this is so.

I now have a stainless steel dial, half a metre diameter and three quarters of a metre high, standing on my terrace and looking for a good home! If anyone can suggest a suitable place for it I would be happy to donate it. A school would seem a good place since its pro-active nature would appeal to young people. If anyone has any suggestions I would be grateful if they would contact me on sundials@ouvip.com with the subject heading "azimuth dial".

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A BURIED SUNDIAL

JOHN DAVIS

Horizontal sundials come in all sizes but the dial in Figure 1, with a chapter ring just 55mm in diameter, rates as the smallest fixed dial I have come across. It was recently discovered buried in the rammed earth floor of a thatched house in Lawshall, Suffolk, by its owners. The house was built around 1550 and the dial is clearly dated 1652. The plate appears to be made of copper and, despite some corrosion, the engraving is still extremely crisp, leading to the view that it was buried quite soon after it was made; it has evidently not undergone a long period of weathering. The house was owned during the 17th century by several generations of Hammonds, a well-respected local family who later served as churchwardens at the nearby All Saints' Church. It is presumed that it was a member of this family who either lost or buried the dial.

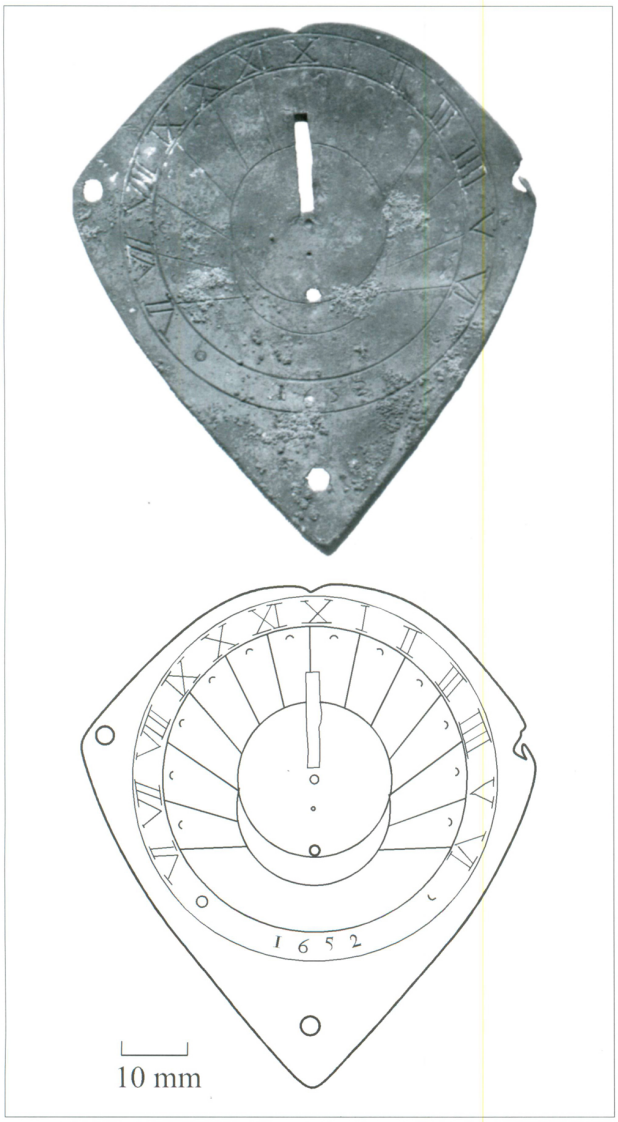

Fig. 1. The Lawshall dial: (top) photograph and (bottom) drawing.

The most significant feature of the engraving is the design in the centre, showing two overlapping circles. Although a circle is commonly used on dials to terminate the inner end of the hourlines, the overlapping circle forming a crescent

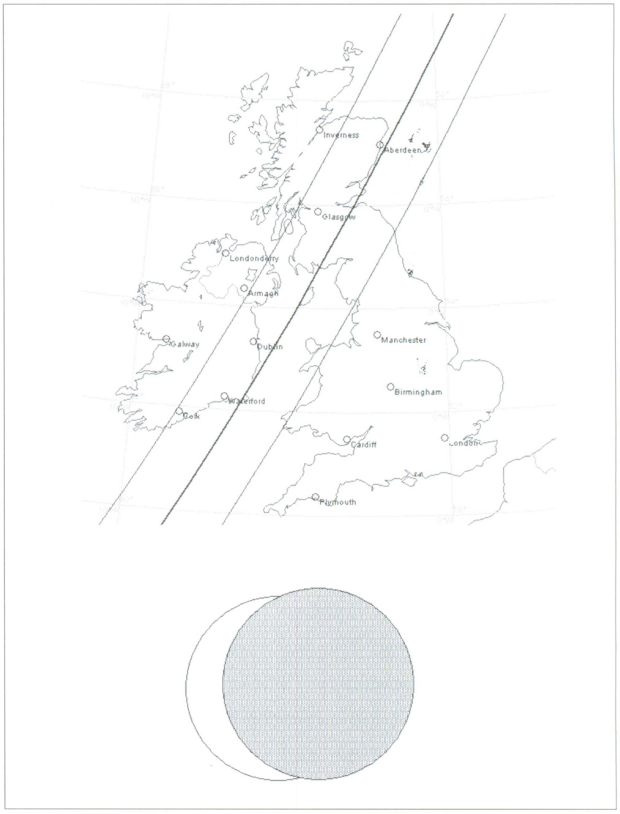

Fig. 2a. (top) The path of the total solar eclipse of 29 March 1652, as plotted using SkyMap Pro, and (2b) appearance of the sun and moon from Suffolk 12 minutes from maximum coverage, as calculated by StarryNight Pro. Courtesy of David Le Conte.

is unusual. On the morning of 29 March 1652 (Julian calendar) there was a total eclipse of the sun which was visible from Britain. Figure 2(a) shows that the path of totality missed most of England but a coverage of 93% would have been visible from Suffolk, giving an appearance (Fig. 2(b)) very similar to the design on the dial. Although this could be a coincidence, the likelihood is that the dial was made as a form of memento of the eclipse, which would probably not have been predicted in a country area. A contemporary report[1] said *"....the country people tilling, loosed their ploughs. The birds dropped to the ground"* and a Dr. Wyberg, observing from Carrickfergus, Scotland, wrote *"...(the Sun was reduced to) a very slender crescent of light, the Moon all at once threw herself within the margin of the solar disc with such agility that she seemed to revolve like an upper millstone, affording a*

pleasant spectacle of rotatory motion.". The eclipse clearly made a deep impression on many people: John Milton explicitly mentions an eclipse in his 1667 Paradise Lost[2] and again, four years later, in Samson Agonistes[3]. The All Saints', Lawshall, Register[4] contains an anonymous attack on the "sinister" Rector Richard Brabon, who had died in 1629, which includes the passage: *"Speech suffers eclipse because he suffered so shameful, or so daily an eclipse. Don't you know what follows an eclipse? A fearful monster, huge, misshapen, deprived of sight".* The probate inventory for a member of the Hammond family (Robert) shows that he died on 21 April 1652, less than a month after the eclipse. It is no wonder that people of the time thought that an eclipse was a bad omen. Was the dial made in the period between the eclipse and Robert Hammond's death and then buried, or was it made specially after his death? – it is unlikely that we will ever know. Although the probate inventory includes "a quantity of brass and pewter", there is no mention of a sundial!

An attempt to analyse the angles of the hour lines in order to determine the design latitude of the dial was thwarted by a slight inaccuracy in the engraving, resulting in the morning half of the dial being offset by around 2mm from the afternoon half. With such a small dial, all that can be said is that the dial appears to have been properly delineated for England. The dial indicates the half-hours by means of small crescents. These may be improperly formed impressions from a circular punch but the fact that they face the centre of the dial suggests that the effect is intentional. Noon is marked by an X instead of XII and it seems that the engraver made the X the wrong side of the noon line so that it did not allow him room to complete the full numeral. The Roman numerals feature the wide-angled Vs and Xs characteristic of the period and the date is very neatly engraved in Arabic numerals just 2.5mm (1/8") high, again in the standard style. The shield shape of the dial is unique in my experience and suggests that the dial might have been engraved on a piece of copper which had previously served another purpose. Certainly, the indentation near noon seems to have been made to remove the remains of a damaged hole. The plate is slightly dished (concave towards the top) which may be the result of an earlier function. The slot for the missing gnomon is over 2mm wide. There is no sign that a gnomon of this width has ever been attached to the dialplate and it is possible that the tenon of a thinner gnomon was passed through the slot into the surface underneath.

The dial leaves several unanswered questions but it was certainly an interesting find – the owners are now hoping that the gnomon might turn up one day!

EPILOGUE

The tradition of celebrating eclipses with sundials did not end in the 17th century. Fig.3 shows part of a dial I made for the silver wedding anniversary of some friends in Devon. Their anniversary was just one day before the eclipse of 1999, so one "diamond ring" graphic could stand for both events. Unfortunately, the dial did not bring the hoped-for cloudless sky for eclipse watching.

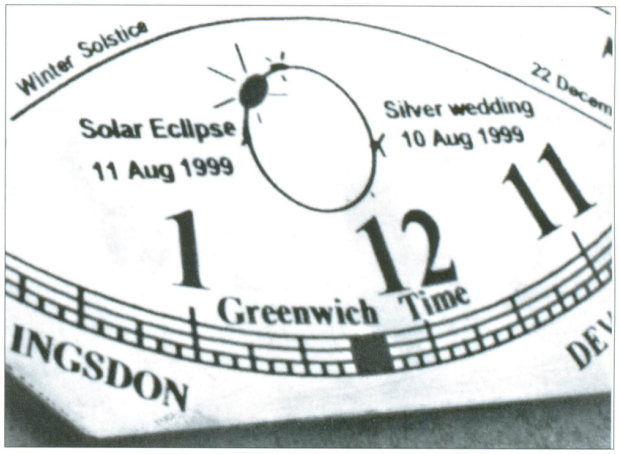

Fig. 3. Details of a brass horizontal sundial celebrating the 1999 eclipse and a silver wedding anniversary. The dial incorporates the longitude correction for Devon.

REFERENCES AND NOTES

1. S. Williams: 'UK Solar Eclipses from Year 1 to 3000', Clock Tower Press (1999). See also the NASA Quotations web site at : www.mreclipse.com/Special/quotes.html.
2. "All her Original brightness, nor appear'd
   Less then Arch Angel ruind, and th' excess
   Of Glory obscur'd : As when the Sun new ris'n
   Looks through the Horizontal misty Air
   Shorn of his Beams, or from behind the Moon
   In dim Eclips, disastrous twilight sheds
   On half the Nations, and with fear of change
   Perplexes monarchs. Dark'n'd so, yet shon
   Above them all th' Arch Angel :"
   John Milton: *Paradise Lost,* Book I, lines 587-600 (1667).
3. "O dark, dark, dark, amid the blaze of noon,
   Irrecoverably dark, total Eclipse
   Without all hope of day!
   O first created Beam, and thou great Word,
   Let there be light, and light was over all;
   Why am I thus bereav'd thy prime decree?
   The Sun to me is dark
   And silent as the Moon,
   When she deserts the night
   Hid in her vacant, interlunar cave."

John Milton: *Samson Agonistes* (1671). The reference is to Samson's blindness.
4. F. Holmes: 'The history of the parish church of All Saints and the parish of Lawshall' (1975).

ACKNOWLEDGEMENTS

It is a pleasure to thank: Mr & Mrs B. Harber for permission to describe their dial; David Le Conte for the eclipse calculations and quotations; Piers Nicholson for making me aware of the dial.

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THE WAYFARER'S CLOCK – REVISITED

J. WALL

My article under this title in the B.S.S. Bulletin of December 2003 has prompted quite an interesting correspondence and 'Wayfarer's Clock' is my translation of the Latin superscription HOROLOGIUM VIATORUM on the Anglo-Saxon sundial at Great Edstone, North Yorkshire). I am especially indebted to a French member of our Society, Denis Schneider, who has kindly sent me a copy of an article 'St Willibrord's Calendar and its Astronomical Sundial' by a Swiss scholar Barbara Obrist, published in *Archives D'Histoire Doctrinale Et Litteraire Du Moyen Age,* volume 67 (2000), pp.71-118. This is a highly academic work that is relevant to our Wayfarer's Clock on three counts.

First, the article is accompanied by a reproduction of another diagram produced on the continent, almost identical to the examples from Basel and Laon reproduced in my article, in which the magic words HOROLOGIUM VIATORUM appear again as a superscription. (Figure 1). In addition, in the central medallion, the figure of a man holding a stylus is depicted. This reinforces my conclusion that this type of diagram (a table that gives the lengths of a man's shadow at different times of the day and different months of the year, for the latitude for which it is computed) is a true sundial analogue. The MSS to which it is appended is dated c. 820 AD, that is after the similar Basel MSS that remains (in my words) 'the earliest representation of sundial-analogue in literature'. Barbara Obrist confirms that it belongs to a series of cosmological illustrations, written c. 800, of which 'it appears to be the oldest instance'.

Secondly, the author dates Willibrord's written calendar and the diagram appended to it (Figure 2), which she describes as a HOROLOGIUM, to the early 8th century. That *would*

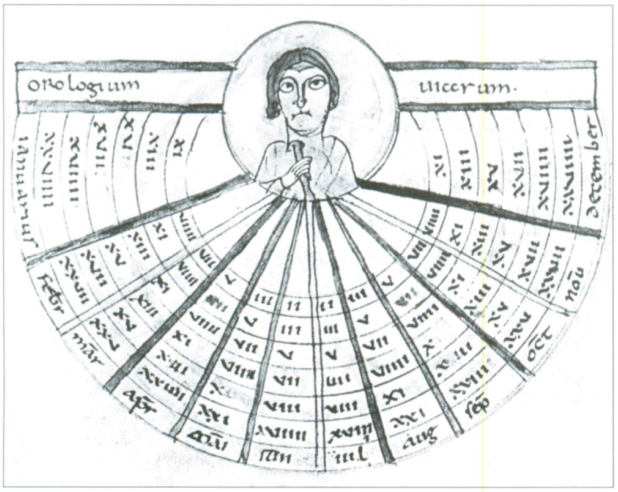

Fig. 1. Munich, Bayerische Staatsbibliothek, clm 14456, fol. 70r. From Regensburg, around 820.

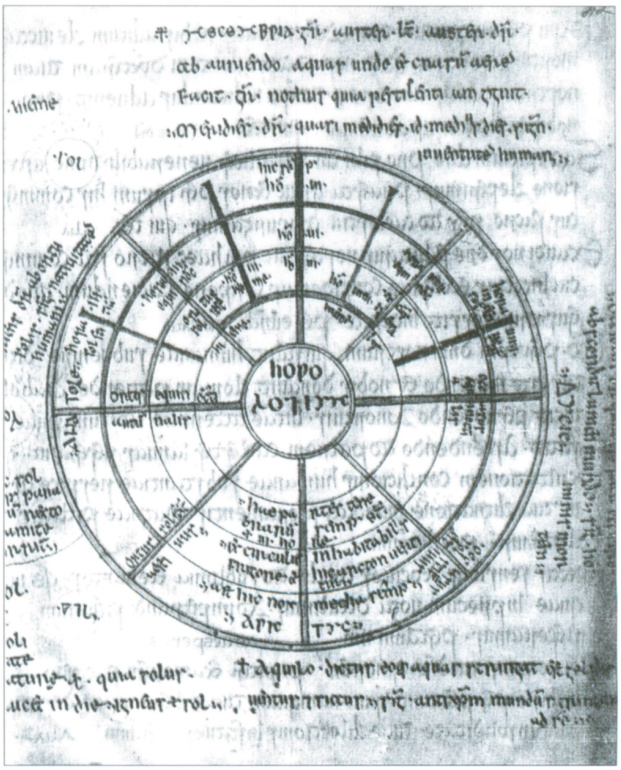

Fig. 2. Paris, BnF, lat. 10837, fol. 42r. From Echternach, first half of the 8th century

seem to cast doubt on my assertion that the Basel example is the earliest diagramatic sundial-analogue. Not so! - as we shall see. (The Anglo-Saxon St. Willibrord (658-739) was a near contemporary of St. Boniface (680-754), and like him engaged in a mission to convert heathen Saxons in Germanic lands on the continent)

It is important to recognise that although Barbara Obrist refers to Willibrord's diagram as a HOROLOGIUM, she does so in a rather different sense to the commonly accepted definition - a time measuring device. And although she describes it as a Sundial in the title of her article, it is decidedly not a sundial in our sense of the term.

What then was the function of Willibrord's diagram? It consists of a circle with a central medallion in which is written the Latin word HOROLOGIUM, but transliterated into Greek letters. Between the medallion and the circumference there are eight radii at 45° intervals, representing the cardinal points of a compass. Their purpose is to indicate the direction of sunrise and sunset at different seasons of the year. In addition there are three concentric circles on which are marked out, schematically, the different lengths of the day and night at the Solstices and Equinoxes at the latitude for which the diagram was computed. The diagram as a whole, therefore, has an ecclesiastical purpose: It serves as an aid in determining the all-important date of Easter. (Barbara Obrist writes of the Venerable Bede, for example, that 'He was interested in HOROLOGIA as measuring instruments for an essential reason, the determining of the correct date of Easter, and thus of the spring equinox'). Whatever else it was, it was not intended to be translated into a device for the measurement of or indication of the time of day - a sundial.

Fig. 3. Mosaic (0.85 x 0.85 m): Naples, Museo Archeologico Nazionale (mv. 124545).

Thirdly, Barbara Obrist makes the point that Bede (664-735) 'showed so little interest in pictorial representation that he even stripped the figures from his reworking of the Isidorian *De rerum natura*. And, although he frequently mentions *horologia* in his computistical work, no reference to a pictorial type reminiscent of the one added to the calendar of Willibrord is found'. That does seem to cast doubt on my assertion that the term HOROLOGIUM VIATORUM appearing on diagrams was transmitted to the continent through the agency of one or more of Bede's students/disciples at Jarrow. Again, not so! Bede's students did not necessarily share their master's aversion to illustrations, and as Barbara Obrist herself points out, such diagrams were transmitted independently of the written works (such as Willibrord's Calendar) to which they were often added at a later date.

The article is accompanied by 15 illustrations, 14 of which reproduce diagrams or 'horologia', dated variously from the first half of the eighth century to 1077, that is from the Carolingian or Early Medieval period. The exception is very relevant to our pre-occupation with sundial history. It depicts a mosaic, now in the National Archaeological Museum in Naples, from the villa of T. Siminius Stephanus in Pompeii. It is a copy of uncertain date of a Greek original, probably 4th century B.C. The mosaic (Figure 3) portrays an outdoor scene in which a group of philosophers are engaged in vigorous debate. Behind them, high up on a column, there is a rudimentary stone vertical semi-circular sundial with 12 hourly divisions of a kind with which we are familiar from the Anglo-Saxon period. It 'offers a rare example of the type of object that lies behind the schematic medieval reproductions' described above. Barbara Obrist cites this in support of her contention that the exemplars for Carolingian and Early Medieval HOROLOGIA derive from ancient classical Graec~Roman models, for which written intermediary stages of transition, together with ancient illustrations that might have accompanied these descriptions, have entirely disappeared. Of course, I am bound to seize upon this as supporting evidence for my supposition that there were probably prototypes for Anglo-Saxon sundials in Roman Britain. ('The Search for Pre-Saxon Sundials', *B.S.S. Bulletin,* Volume 12 (ii), June 2000, pp.91-95).

One sentence in Barbara Obrist's article is of especial importance in the context of our 'Wayfarer's Clock' at Great Edstone: 'The sundial (sic) of the Basel manuscript appears to be derived from one Roman exemplar, illustrating, as far as can be judged from its caption, what

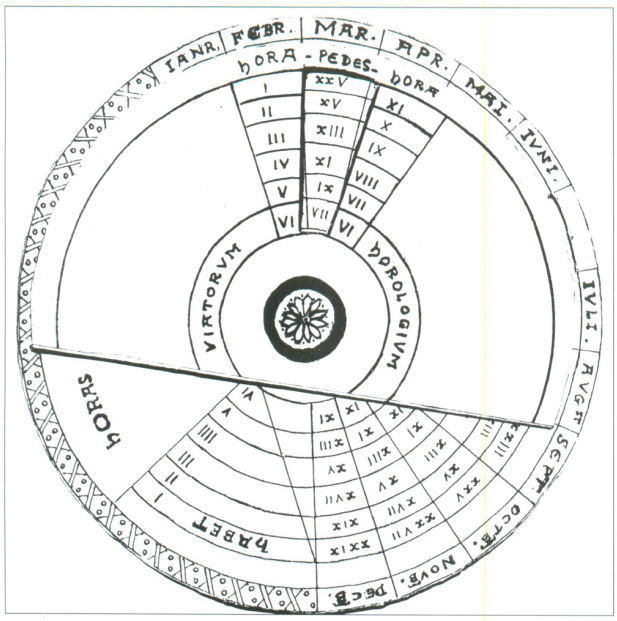

Fig. 4. Mock-up of Horologium device based on diagrams in Thorney Island MSS, fol. 37, now in Library of St John's College, Oxford, by kind permission of Mr. Walter Wells.

once used to be [called] a *traveller's sundial*, a horologium viatorum' (italics mine). It is her translation of horologium viatorum as *traveller's sundial* rather than *wayfarer's clock* that is significant. I am sure that she is right in stating, in effect, that that the diagram in the Basel MSS is a representation of a table that could be used to construct a portable device, carried by travellers in northern latitudes, to determine the time, during any day of the year, by measuring the position of a man's head shadow. (This is precisely what an analemmatic sundial does, that is a sundial drawn out on the ground for which the observer acts as a gnomon). This suggestion is echoed by another correspondent, David Scott, who writes: 'I imagine that a copy of the diagram, or one of the tables arranged vertically, would have been carried in England during the Anglo-Saxon period by those people who travelled around the country: Bishops... priests from minsters visiting other churches, and members of the royal families who were constantly on the move'.

Another correspondent, Walter Wells, has gone one step further. He has sent me just such a device, his own meticulously crafted mock-up, that I will use and treasure, I hope for many years to come. It is based on tables, similar to that in the Basel diagram, in the so-called Thorney Island MSS (1102-1110), now in the Library of St John's College, Oxford. Walter writes: 'the folio includes a pair of rotae to show the variation of shadow lengths with the canonical (?) or unequal hours and the months of the year. I have constructed a card model where the two rotae [shown in the MSS] are pivoted together, but you will see that I have improvised an altered semi-circular rota. It is mounted on the reverse side of the original and pivoted so that it can rotate about the circular rota, with a sector cut away to reveal the shadow lengths for one month at a time. Similarly the figures for one month at a time, as shown on the authentic side of the semi~circular rota, can be seen in a cut-away sector from the reverse side of the circular rota'. Walter's device is highly ingenious, as is apparent from my photograph (Figure 4).

Two Latin inscriptions appear on the Thorney Island MSS: CONCORDIA XII MENSIUM IN HORIS and those magical words HOROLOGIUM VIATORUM. Just as the inscription at Great Edstone is the only example in stone of HOROLOGIUM VIATORUM, to my knowledge, so the example in the Thorney Island MSS is the only written example from the Anglo-Saxon period.

So we end where we began, with the sundial at Great Edstone. Its designer, who was probably also its sculptor, was surely a genius. He was responsible for a momentous step in the history of dialling in Britain. With profound insight he took a title hitherto applied to a *portable* device, the 'Traveller's Clock', and for the first time inscribed it permanently on a *fixed*, vertical stone sundial, on a remote Yorkshire church. In so doing he gave HOROLOGIUM VIATORUM a new meaning - the *traveller's* clock for a privileged few became and remained the *wayfarer's* clock for the benefit of all who passed by. And that is as good a definition of a sundial as you are likely to get.

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A VERY RARE 20-INCH SUNDIAL BY THOMAS TOMPION WITH ORIGINAL SCULPTED PEDESTAL ATTRIBUTED TO JAN VAN NOST, ENGLISH, CIRCA 1700
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A PAIR OF DIALS IN VENDÔME, FRANCE

K.H. HEAD

At the start of one of the caravan touring holidays which my wife and I took in France, our first overnight stop from Caen was Vendôme (Loir et Cher), a charming town on the River Loir. (That is not a spelling mistake). The valley of the Loir, in that area, is delightful, in many ways more attractive and interesting than its better-known near-namesake into which it flows. Probably the town's greatest monument is the west façade of the Abbaye de la Trinité, which is a riot of flamboyant gothic tracery and carvings in stone.

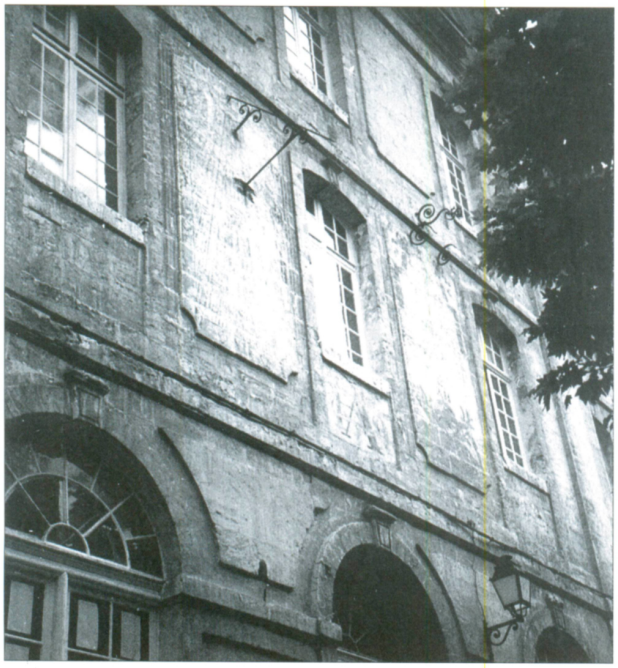

Fig. 1. The pair of dials over the door of the Museum of Vendôme. France

On the south side of the Abbaye is the Museum, which once must have been a splendid building but now looks sadly neglected. Above the main doorway, either side of a window, are raised panels forming two types of sundial (Fig 1). The left-hand panel consists of a conventional south-facing vertical dial, and is fitted with an inclined gnomon, apparently of wrought iron painted black. Photography was difficult because of an excess of both trees and clouds, but I managed to obtain a picture of it with a shadow (Fig 2) during a brief burst of sunshine.

The right-hand panel (Fig 3) seems to be inscribed only with a noon line and analemma curve, with some decorative markings. Apart from three supporting pieces, the gnomon seems to be missing. I wondered whether this would have taken the form of a plate with a hole for projecting a 'pinhole' image of the sun, to act as an indicator of solar noon - and the date.

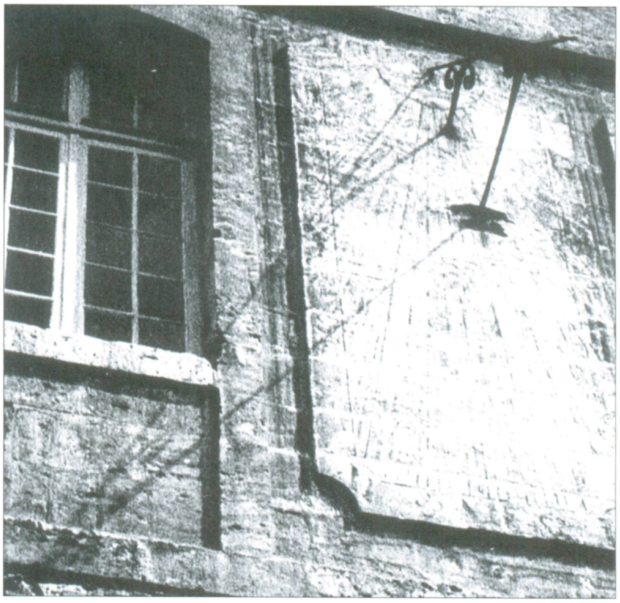

Fig. 2. Sundial with shadow, about 10 a.m.

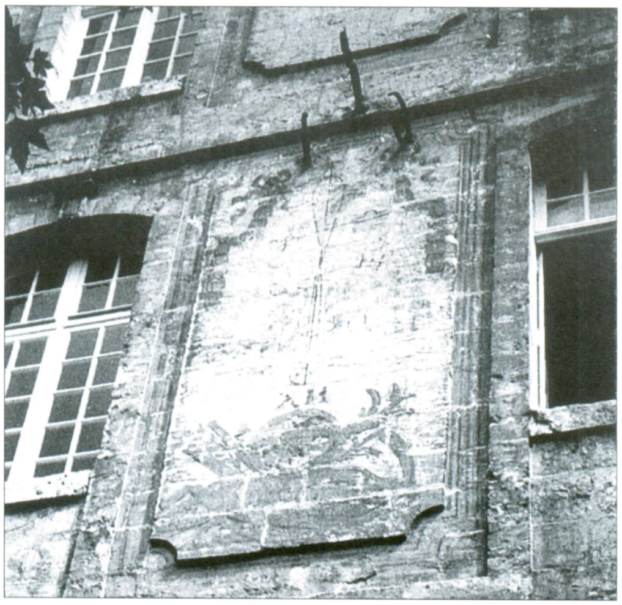

Fig. 3. Noon line with analemma

I was unable to obtain any more details about this interesting pair of dials. If anyone has any more information, a further contribution to the Bulletin would be appreciated.

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CENTROVALLI

THERE ARE EVEN MORE SUNDIALS IN THE CENTROVALLI!

GERALD STANCEY

[Our member Gerald Stancey is a tireless searcher for sundials having a railway connection. He has found among the small railway lines on the Swiss/Italian border a rich, hunting ground; so we may look for some more reports from him, from this region next year. -Ed]

In my previous articles (1,2) I referred to the wonderful dials that can be seen from the train when travelling on the Centrovalli railway line in northern Italy. This line runs between Domodossola and Locarno.

Due to the kindness of Snr F Banardi, Il Presidente, Comunita Montana Valle Vigezzo, I have now learnt that there are 104 dials in this area of which 80 per cent are dated post 1900. Many of these dials are the work of Dott. Arch G Bonzani who made the dials on the station at Re.

Figures 1-3 show three sundials illustrated in a booklet about this valley's Railway.

Needless to say I am now making plans to visit this area in 2004.

1. Stancey G. 'More Railway Sundials' Bull BSS 14, 42
2. Stancey G. 'More Sundials on the centrovalli Line' Bull BSS 15, 17

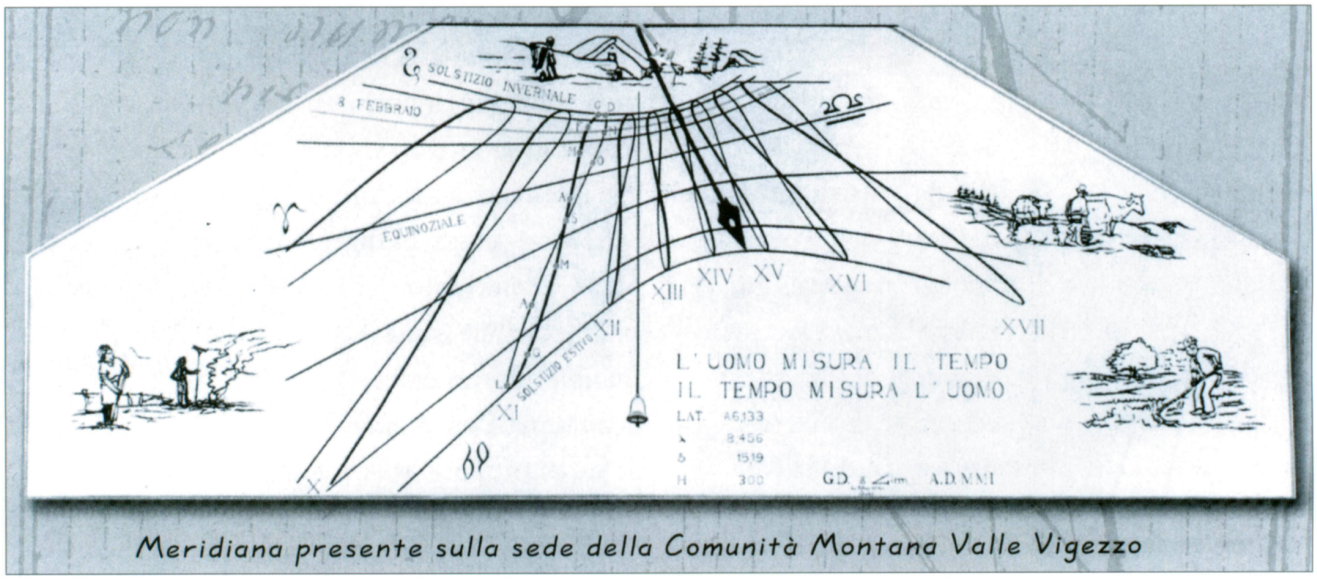

Fig. 1.

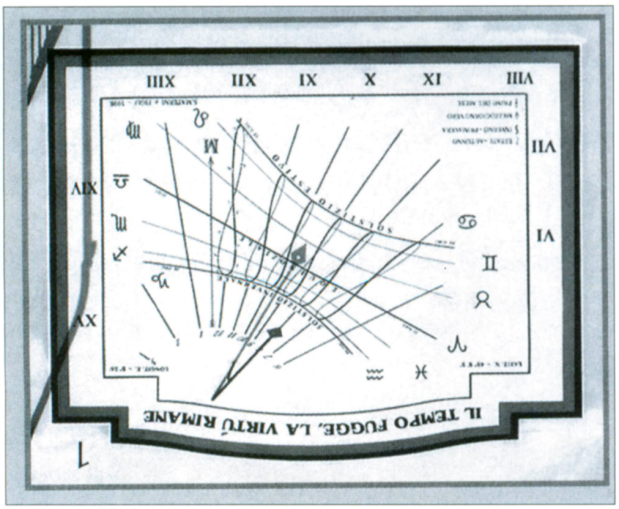

Fig. 2.

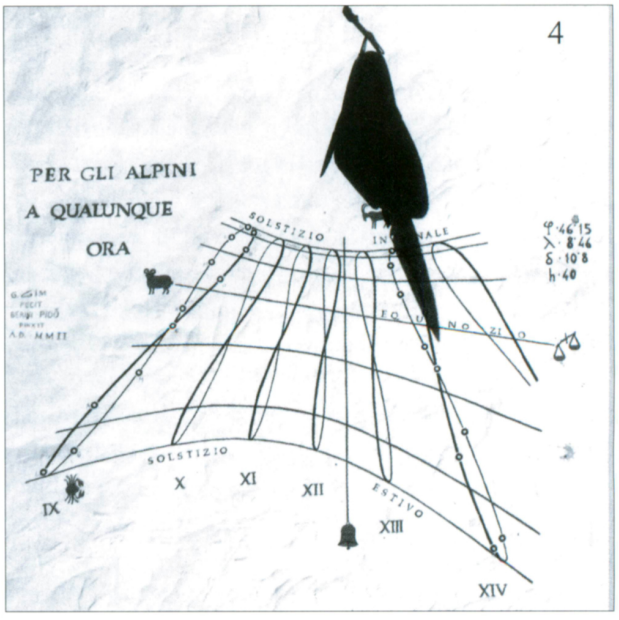

Fig. 3.

AN ASTROLABE FROM THE ITALIAN ALPS

Guido Dresti, Rosario Mosello*
Corresponding author: r.mosello@ise.cnr.it

Devised over 2,000 years ago, developed and adapted to various practical ends, among them the determination of latitude for ships at sea until replaced by more modern technology, the astrolabe has lost none of its fascination even in the 21st century. Recent studies (e.g. D'Hollander 2000) are the result of in-depth research on the few extant examples of astrolabes preserved in museums such as the British Museum in London and the Institute and Museum of the History of Science in Florence, while new models are being made by enthusiasts, both amateurs or scientific researchers (examples of recent astrolabes can be seen on the web site http://astrolabes.org/astrolab.htm).

This article describes an astrolabe made by one of the authors (Guido Dresti) as part of an extensive collection of portable sundials, each one unique. The various parts of the astrolabe are illustrated in Figure 1; the photograph shows the back and front of the instrument; and Table 1 gives its main specifications.

Made in 2002, this planispheric astrolabe is set for the latitude of Craveggia (46° 14' E), a village at 900 m a.s.l. in the Ossola Valley, in the Western Italian Alps.

The instrument was designed using the EXTRACAD 5 programme, produced by FINSON (Milan). The lines on the 2 mm-thick brass plate were engraved with a carbide-tipped cutter. The numbers and letters were engraved chemically with acid, the rest of the metal being protected with wax. Polishing and finishing were performed by hand using the finest sandpaper.

The parts making up the astrolabe are:

The **mater** ("mother"), a brass disc into which are fitted the plate and the rete . The outer rim of the mater is engraved with the 24 hours of the day at intervals of 15^m and marked off in degrees (360°) on the outermost edge (the limb).

The **plate** is engraved with the lines of the local horizon (see Table 1) as well as the temporary hours: zero indicates sunrise, the sixth hour midday and the twelfth hour sunset. These are also called "unequal" hours, because they vary according to the season.

The **rete** is a disc with the projection of the celestial sphere on the plane of the equator; its name (Latin for "net") derives from the fact that parts of it are cut away so as to reveal the underlying plate. The lines on the rete and the stars marked on it are listed in the table. A circle representing the ecliptic shows the degrees of the zodiac. 19 of the brightest stars most easily seen at our latitudes are indicated on the rete by dots. The list of these stars is given in Table 2.

The **rule** rotates around the celestial north pole; its function is to collimate the various circles, the horizon, the tropics, etc so that the time can be read on the outermost part of the mater (the limb), or to measure the right ascension and declination of a star, etc. The outer part of the rule is marked with the northern and southern declination from +70° to –23,5°.

The **back** of the astrolabe shows on its outer part three scales (one divided into degrees, a calendar scale, and a zodiac scale), the unequal-hour lines and the shadow square, with the umbra recta and the umbra versa.

The **alidade** on the back of the instrument serves to calculate height (of a building, or of the sun, which was used to calculate time). It has two holes for alignment, one for observing the stars, the other for the sun. The alidade rotates around the centre of the astrolabe, which is the projection of the celestial pole.

Centuries of history and the whole of the starry sky concentrated into a round brass disc only a few centimetres in diameter: what better reply could we give anyone asking what is the sense of an astrolabe in the 21st century?

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ACKNOWLEDGMENTS

Mrs Sandra Spence kindly translated the text.

Front of the astrolabe

Mater

Diameter	Limb division		Thickness		Material
296 mm	Degrees	Hours	Internal	External	Brass
	360° divided in 4 sectors of 90 °	24 hours divided in 2 sectors of 12 hours	2 mm	6 mm	

Plate

Diameter	Lines	Type of hour	Material	Latitude	Thickness
250 mm	- Horizon - Twilight - Almucantarat (each 3°) - Azimuth (each 3°) - Meridian - Zenith - Equator - Tropic of Capricorn - Tropic of Cancer - Pole - Hours	Unequal (0 – XII)	Brass	46° North	2 mm

Rete

Diameter	Stars	Lines	Material	Thickness
240 mm	See Table 2	Tropic of Capricorn Celestial pole Ecliptic Zodiac	Brass	2 mm

Rule

Length	Width	Declination	Material	Thickness	MOTTO
290 mm	12 mm	0°-70° Northern | 0°-23,5° Southern	Brass	2 mm	Faber est quisque fortunae

Back of the astrolabe

Diameter	Thickness	Functions present	Type of hour	Shadow square	Material
296 mm	2 mm	- Unequal hours - Scale of degrees - Calendar scale (months) - Zodiac calendar - Shadow square	Unequal (0 – XII)	Division in 12^{esimi}	Brass

Alidada

Length	Width	Thickness	Material	Division
287 mm	15 mm	2 mm	brass	23.5° - 0° - 23.5°

Whole instrument

Diameter	Thickness	Weight
296 mm	16 mm	3.160 kg

Table 1. Technical aspects of the different parts of the astrolabe: a mater, b plate, c rete, d rule, e back, f alidade

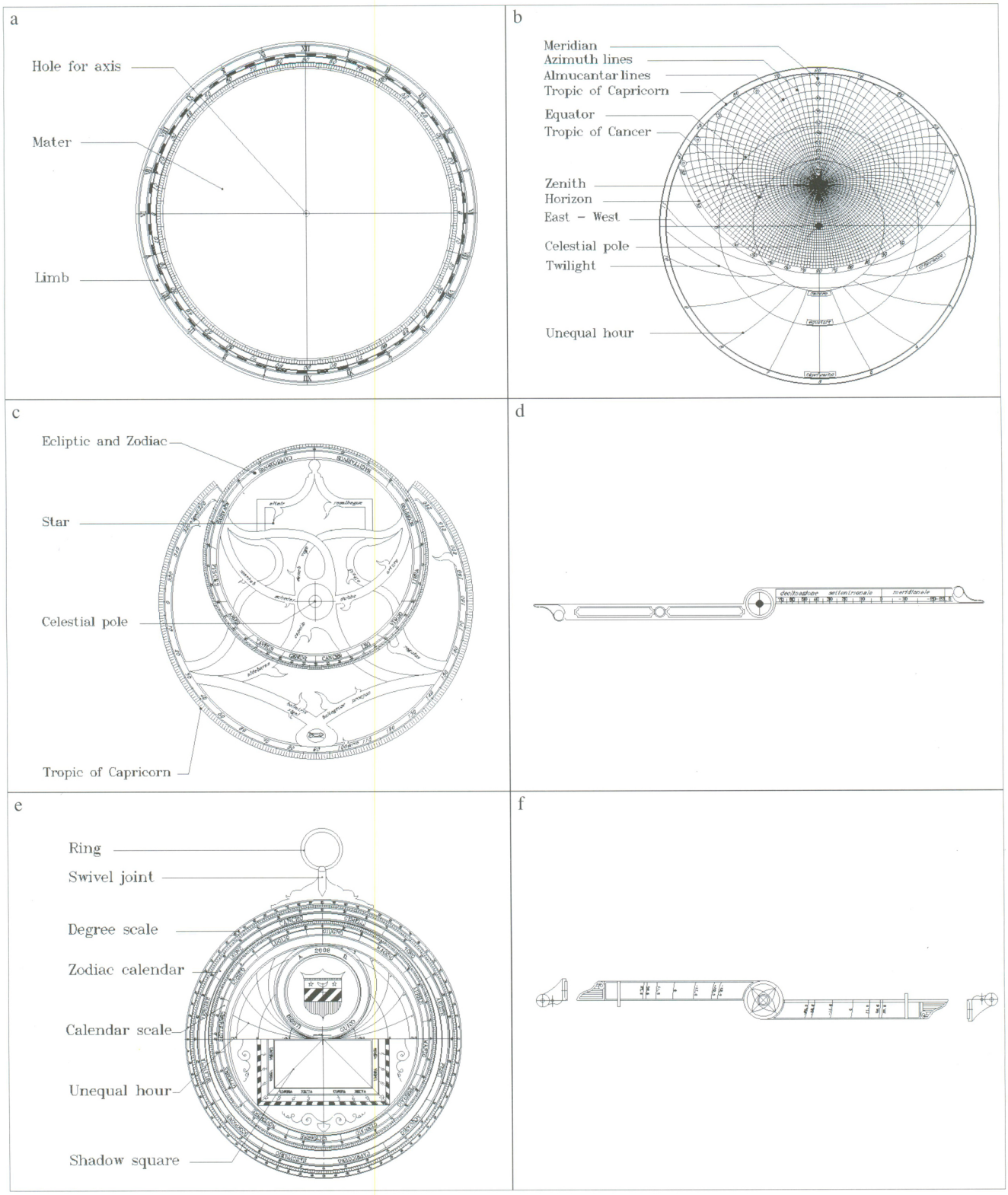

Fig.1. Parts of the astrolabe: a mater, b plate, c rete, d rule, e back, f alidade.

Front

Back

Times	Constellation	Right ascension	Declination	Magnitude
α ALTAIR	AQUILA	19^h 50^m 55^s	08° 52' 34"	0.77
α ARCTURUS	BOOTES	14 15 48	19 10 07	-0.04
α DUBHE	URSA MAJOR	11 03 54	61 44 05	1.80
α MARKAB	PEGASUS	23 04 54	15 13 17	2.49
α ALDEBARAN	TAURUS	04 36 05	16 30 55	0.85
γ BELLATRIX	ORION	05 25 17	06 21 08	1.64
α BETELGEUSE	ORION	05 55 20	07 24 26	0.50
α PROCYON	CANIS MINOR	07 39 27	05 13 05	0.38
α REGULUS	LEO	10 08 32	11 57 09	1.35
α DENEB	CYGNUS	20 41 32	45 17 28	1.25
α SPICA	VIRGO	13 25 21	-11 10 37	0.98
δ DENEB ALGEDI	CAPRICORN	21 47 00	-16 08 00	2.9
α VEGA	LYRA	18 37 02	38 47 11	0.03
β RIGEL	ORION	05 14 41	-08 11 54	0.12
η ALKAID	URSA MAJOR	13 47 39	49 17 54	1.86
α RASALHAGUE	OPHIUCHUS	17 35 04	12 33 29	2.08
α CAPELLA	AURIGA	05 16 54	46 00 04	0.08
α SCHEDAR	CASSIOPEIA	00 40 41	56 33 13	2.23
α SIRIUS	CANIS MAJOR	06 45 17	-16 43 10	-1.46

Table 2 List of the brightest stars at a latitude of 46° included in the rete.

The Authors

Rosario Mosello has been a member of the Sundial Section of the Italian Amateur Astronomers' Association since 1996. He has been involved in the Association's project to draw up a national register of Italian sundials, with responsibility for cataloguing the dials in the Verbania Cusio Ossola province. In his book "Sundials in the Alps. The Ossola Valley" (in Italian, extended English summary and translation of figure and table captions) he describes the dials existing in the small towns and remote villages of a territory of 1600 km2, and comments on the period of their construction, the buildings on which they are mounted, the technical and artistic skill they display, their state of conservation, the history and social organisation of the villages. He has also written papers on gnomonics for specialist journals, focusing on the links between sundials,

which are often neglected and not even recognised as such, and the history of the building or the territory where they are located.

Rosario Mosello is a chemist working in the field of environmental research, specialising in water chemistry, atmospheric deposition and lake water pollution, at the Institute of Ecosystem Study of the National Research Council, Verbania Pallanza.
His e-mail address: r.mosello@ise.cnr.it

Guido Dresti, now retired, has been interested in gnomonics for more than 10 years, and has been involved in restoring old sundials and constructing new ones primarily in the Ossola Valley (NW Italy) and the nearby Canton Ticino (Switzerland). However, his major interest is researching, studying and reconstructing old portable dials and astronomical instruments. He has a wide variety of artefacts to his credit, including models of astrolabes, altitude dials (shepherd's, Capuchin, Regiomontanus), polyhedron dials, azimuthal dials (analemmatic and Foster-Lambert) and many more; the materials he uses are brass, copper and marble. He also works with other diallists from the Ossola Valley. He recently collaborated on the book "Meridiane in Val Vigezzo", describing an agreeable tour in search of sundials in the picturesque villages of the stupendous Vigezzo Valley. He regularly takes part in the activities of the Sundial Section of the Italian Amateur Astronomers' Association.
His e-mail address: cla46@ciaoweb.it

The paper was translated by Sandra Spence, who has lived in Italy for over 25 years and never tires of the sunshine after the overcast skies of her native Scotland.

REFLEXIONS ON TRUE NORTH, LARGE DIALS AND THE APPARENT SUN

P. POWERS

It is always very satisfying if one can establish true North by the traditional equal-angle method but sadly in Britain the opportunities for this can be rare indeed. The more so if a large dial has to be set up since the inevitable constraints of builders, architects and long distances all contrive to require the process to be completed on or around a particular date and, for some reason on a date that is usually nearer to midwinter than midsummer with all of the bad weather implications that that brings! It is therefore usually necessary to fall back upon higher technology and there seem to be as many different approaches to this as there are dial designers.

I take no credit for the novelty of this approach to the problem of establishing true North to a precision and with an accuracy necessary for the setting up of a large dial but I have not seen it set down in this particular way and thought it might prove to be of interest to others who might be faced with the problem of delineation and construction of a large dial. Of course the details have to be tailored to the dial type but here I refer to the problem as it relates to a 12metre diameter horizontal dial erected as part of the Millennium redevelopment of a Northumbrian public square[1] .

After the land has been cleared and is horizontal and firm, a vertical cylindrical pole some two or more metres in height should be firmly erected and set in concrete just South of the dial centre. A scaffolding pole is usually sufficient although the diameter should be chosen so that at the time of the measurements there will be a sufficient umbra within which to mark the centre of the shadow on a few convenient sunny moments during the day and at a moment noted each time to the exact minute for example by use of a mobile phone and the 'speaking clock'. Referring to the plan view in Figure 1, the pole is represented at P. A particular distance (say ten metres) is then measured out from the pole's centre along the line of the shadow to establish point B. The distances BN and PN of the right angled triangle PBN are calculated from a knowledge of the sun's azimuth at the time of the reading (here azimuth from the North has been assumed). Thus two arcs can be drawn and a marker inserted into the ground at their intersection N. The line PN then represents one measure of the line of true North. A mean of several such lines then gives the best line on which to orient the dial. The system is simple, requires no angles to be measured or constructed and merely requires linear measurements to be made.

Considerable precision may be obtained by this method. The main difficulties stem from the problems of

- locating the centre of the shadows umbra with sufficient precision;
- properly measuring distances from the centre of the pole, given that the shadow length may not be very long,
- possible errors on uneven ground from measuring out of the horizontal plane; and
- an inaccurate estimate of the *apparent* azimuth of the sun.

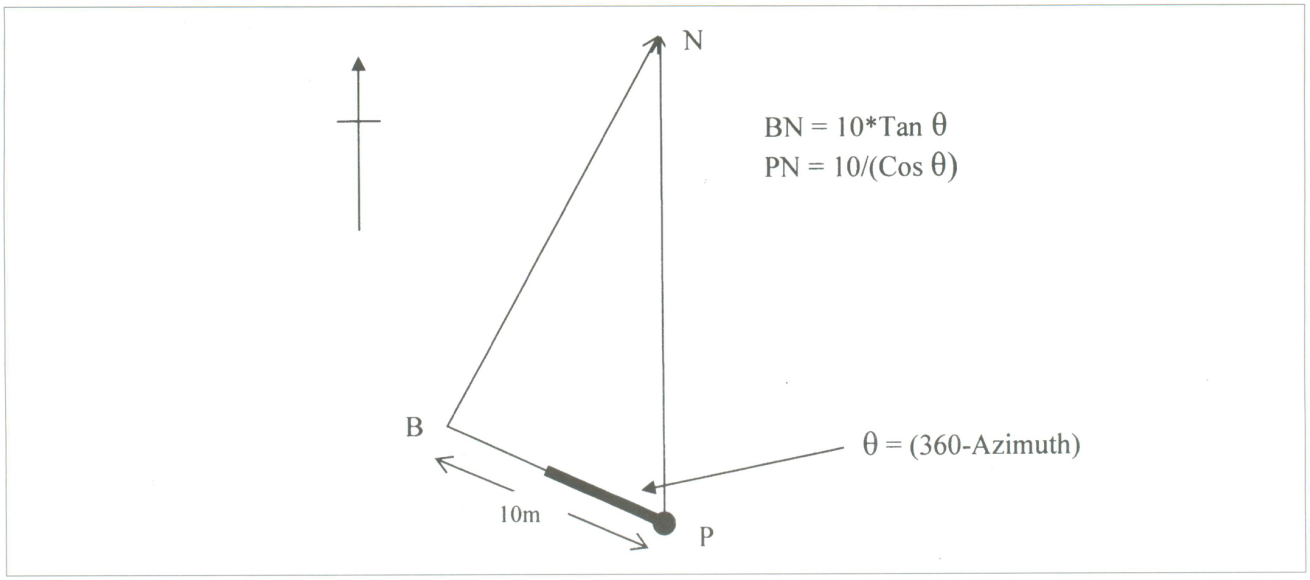

Fig.1.

The first three of these are problems of precision well known to most diallists and each will have their own approaches to them. It is this last difficulty that will now be examined in more detail since it, of all the sources of error, can less easily be reduced by operational practice. It is an issue of accuracy of calculation rather than of precision of measurement.

It might be thought that it is only of importance to reduce each error to a figure comparable with the others. However errors in dialling have an unreasonable habit of becoming cumulative. As a consequence it is always good practice to pay attention to all opportunities for error and aim to keep every one to as low a level as may be sensibly possible.

The estimation of the sun's position is a case in point. In determining North by the above method and, when using a ten metre base, the length of the arc from P to N can frequently be of the order of 15 metres and a marker can easily be placed to within 1 cm at such a distance. This corresponds to an angle of precision of just over 2 minutes of arc or 0.04 degree. Thus we may say that if possible we would like to use values of the sun's azimuth accurate to this value or better. It is easy to show that a similar accuracy might be required of the sun's altitude if the proposed dial is to use a nodus to show declination.

Astronomers calculate the sun's position to the greatest accuracy by using the VSOP 87[2] theory. However this involves over 2400 terms and is wholly impracticable for normal use by diallists. What is more to the point though is that it delivers the true astronomical position of the sun but what is needed for North determination is the *apparent* position of the sun at the dial's location. Jean Meeus[3] has derived an abbreviated set of terms from the VSOP87 theory and developed corrected conversions to local azimuth and altitude. Despite their being abbreviated, these terms nevertheless only involve a discrepancy of not more than 1 arc-sec between the years -2000 to +6000. Even after making the necessary corrections for refraction and parallax the results are still highly accurate for times not close to sunrise and sunset. If the VSOP87 theory can be said to be the Platinum standard of reference then this abbreviated set of terms can be regarded as the Gold Standard for diallists.

Fortunately for most of us, this 'Gold Standard' theory is available to all via a web site which was set up specifically as an aid for sundial construction. The *Solar Calculator* makes use of Jean Meeus' formulae for nearly all its calculations including date conversion, equation of time, solar coordinates, horizontal coordinates, correction for atmospheric refraction etc. It is thus among the best available at this time for dial calculations.

But what really is the benefit of going to such lengths when other approaches might be easier to use? After all, the *Solar Calculator* does require that connexion be made to the Internet for it to be used and this is not always convenient. Some diallists might instead prefer to use software that already runs offline on their PC or laptop without the need for an Internet connexion.

Of the many such that are available, the NASS *Dialist's Companion*[5] (v1.1b, a Shareware product) and *WinEphem*[6] (v1.9, Freeware) are probably two of the best known. Of course one might also consider using the equations and tables given in Waugh's book[7] within a spreadsheet of one's own design..

It is interesting to make a simple comparison of the performances of these systems against those of the Solar Calculator as the reference. By way of illustration rather than as an exhaustive comparison, this has been achieved here by plotting the sun's position for the whole of 2003 for Lat 52°:30'N, Long 00°:00'W at 30 day intervals from the 15th January and using the same time of 10:00am GMT for each point. A time of 10:00am was chosen so as to generally avoid much need for reliance on corrections to altitude for refraction.

The *Dialist's Companion*, which also uses some of Meeus' equations and *WinEphem*, based on P Duffett-Smith's earlier work, are both standalone products that readily give solar azimuth and altitude data. The Dialist's Companion of course does very, very much more for the diallist than WinEphem but the latter is additionally useful as an ephemeris for the planets and some stars.

Figures 2 and 3 below show the respective differences of these two products from the *Solar Calculator* over the year 2003.

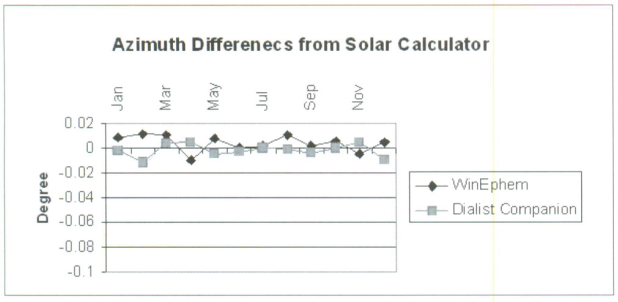

Fig 2.

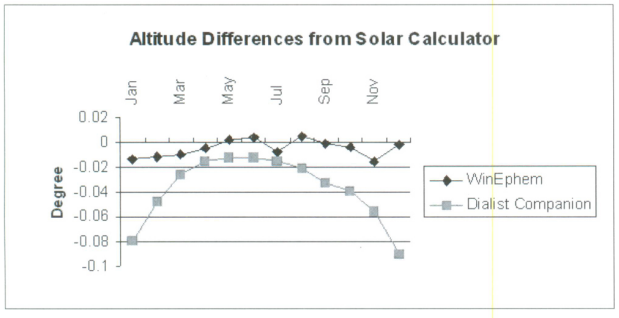

Fig 3.

Both *WinEphem* and the *Dialist's Companion* have excellent correlation in azimuth and hence can most certainly be used for the establishment of true North to the accuracy mentioned above. Where altitude is concerned however, there appears to be a greater variation from the Dialist's Companion in the winter months which may be a consequence of the fact that this product only makes its (optional) refraction adjustments to the total time correction and not to its calculations of solar altitude.

Perhaps one of the main disadvantages of both WinEphem and the Dialist's Companion for the establishment of true North is that they are only easily useful for noting a small number of individual measurements, one at a time. This is especially the case with *WinEphem* since it yields its data only in degrees and minutes rather than decimals of degrees.

In attempting to lay out true North for a large dial in difficult conditions it can often be useful to be able to prepare beforehand a listing of the positions of the sun at many times of the day. Indeed in situations where adverse weather can be foreseen, I have sometimes found it necessary to prepare tables of the sun's position - together with the associated arc lengths for determination of true north - for every minute of one, or even more, working days ahead.

The *Solar Calculator* in its Text (rather than its HTML) output mode, is particularly suited to this approach as, of course, would be the development of one's own spreadsheet using the equations given in Waugh. However as may be seen from the plots below, Waugh's simplistic formulae yield considerable differences from those of the *Solar Calculator.* It is sometimes asserted that better accuracy can be obtained from Waugh's equations if the instantaneous values for the Equation of Time and/or the sun's declination at the time of the observation are introduced rather than the single 'daily' values given in Waugh's tables. The graphs in Figures 4 and 5 show that this is only marginally the case and that no matter what approach might be used, Waugh's formulae can yield an error of up to a degree in both azimuth and altitude at certain times of the year.

All in all the use of the *Solar Calculator* is to be preferred for the development of pre-prepared tables of the sun's

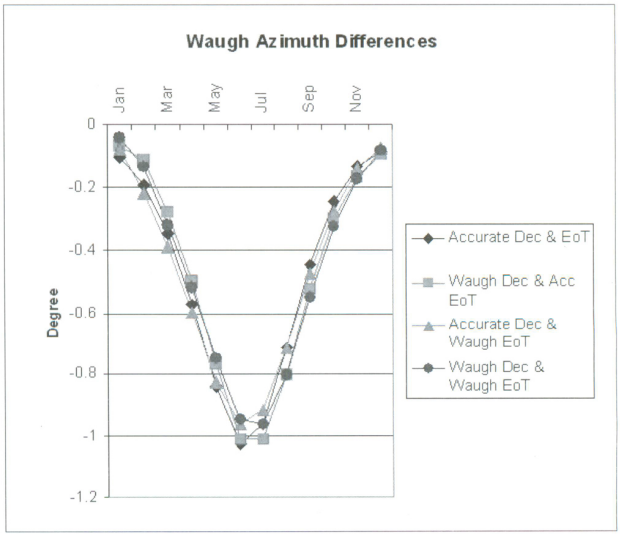

Fig 4.

position and of the necessary meridian construction arcs if one is trying to set up a large dial.

We have discussed the precision of measurement but we have not been able to do other than take on trust the accuracy of the calculation of the sun's coordinates using the *Solar Calculator*. The real success of this approach can only be judged once the dial has been installed and all of the errors, not only including those of delineation but also those even less controllable ones of construction, have been combined.

So how did it all work out for the Northumberland Dial? Readers may judge for themselves from the fact that when using the approach described here and with data from *Solar Calculator*, true North was established successfully one

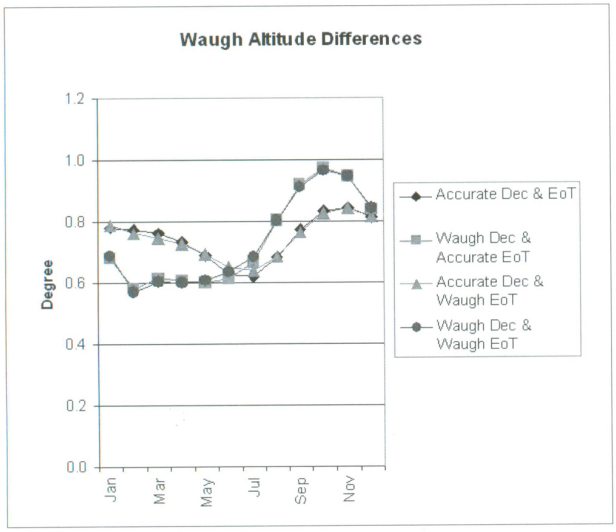

Fig 5.

wet November day on the basis of only two shadow measurements. Indeed, both of those had to be taken within 20 minutes of each other because the sun was only to be seen for a few minutes in a three day period. In the event the dial has proved to be accurate to 15 seconds. A tribute not only to the accuracy of Solar Calculator but perhaps even more so to the builders who were responsible for the site construction and for the installation of the gnomon.

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MINUTES OF THE 15TH ANNUAL GENERAL MEETING OF THE BRITISH SUNDIAL SOCIETY HELD AT ST ANNE'S COLLEGE, OXFORD, 18 APRIL 2004

1. The meeting was opened by the Chairman, Christopher St J H Daniel, at 9.03am. About 70 voting members were present.
2. Apologies were received from Edward Martin.
3. The minutes of the 14th Annual General Meeting held in Yarnfield on 27 April 2003 (which had been published in the Bulletin, June 2003, pp78-84) were adopted, as proposed by Piers Nicholson and seconded by Jim Holland. The archive copy signed by the Chairman.
4. There were no matters arising.
5. **Secretary's Report and Reports from other members of Council**

Secretary: Doug Bateman.
Liaison. Since the last AGM I have dealt with 88 enquiries by letter, quite a number by e-mail, and a few by telephone. Many have sought advice about setting up dials or information about dials in their possession. Whilst we are therefore helping to 'educate the public' as part of our charitable status, few of the enquiries lead to membership. *Conference 2004, 16-18 April.* This, our 15th annual conference, has lived up to its international scope by attracting 30 delegates from overseas. At the time of writing, a total 126 are listed as wishing to attend. While the programme has sought to preserve a British element, many of the lectures will be given by the overseas visitors. Conference 2005, 1-3 April. Royal Holloway College, Egham has been booked. The architecture of the main building is particularly striking, and in keeping with the Victorian styles, it is tempting to see if we can make this conference something of a 'period' event.

Advertising: Mike Cowham. A minor success for the Society was the sale, by means of a flyer in the Bulletin, the remaining high value books from the Rodber donation. Otherwise few advertisements have been placed in the Bulletin. Conversely, we are now looking into ways of promoting the Society, ideally by articles in publications or paid advertisements in journals such those by the National Association of Decorative & Fine Arts Societies. Offers of assistance from members will be very welcome.

Reference Library: Graham Aldred. The BSS Library now has 376 books and documents on dialling and related topics. It is located in the Bromley House Library in the Centre of Nottingham and all members of BSS are eligible to use the facilities of this interesting building, with fine clocks, and a working meridian line. The library acquires 2 or 3 new books per year in addition to the bound copies of the Bulletin and the Compendium. The Analemmatic Sundial Source Book edited by FW Sawyer and published by NASS has been received recently. This and some other books, including other appropriate material donated by members, will be catalogued and sent the Library shortly.

Dial Reports submitted to the registrar are bound in groups of 250 and we will start to locate these in the Library. This will enable any member to access the actual reports written by the recording member(s), which often have considerably more detail than is given in the Register of Dials.

Restoration: Graham Aldred. There have been very few calls or contacts with only one telephone enquiry recently seeking advice on how to find the elusive meridian. No subsequent follow up. However although the Society is not always informed, dial restoration does occur, particularly when the owners can fund the replacement of a stolen dial by making an insurance claim. Efforts are ongoing to obtain lottery funding for the restoration of the St Katherine Cree dial, London. This pilot may then be used to obtain lottery funding for other worthy sundial restoration projects.

Mass Dial Group: A.O.Wood. The Database/Register is set up and tested to its current development state. The final table and links (bibliography) have now to be implemented. The database is very easy to use and incorporates pictures - this was out of reach when we originally started.

As the corpus of mass dials is essentially a 'closed' one (but readily accessible), we hope to be more inclusive than the Fixed Dial Register in that Museum holdings (3 so far) will be included and book references also so that current status can then be established. Publication in CD format and 'short form' booklet is envisaged.

Reports continue to arrive, mainly from our regular observers: Ian Butson, John Lester and Lyn Stilgoe together with the NADFAS Church Recorder Groups. Internet response from our webpage also provides 'one-off' reports which are welcomed and encouraged. An appeal in

Country Life Magazine also brought in a small crop of reports as did the spin-off from the Northants WI millennium survey.

The problems of archiving Saxon dials and Edward Martin's holdings remain. Commercial archiving is now a promising possibility for all dial records. It is to be hoped that publication of the Mass Dial Register may help to resolve the situation with regard to Edward's holdings of Society reports. (Considerable health problems preclude Edward's active involvement currently.)

Museums Survey, First Year: A.O.Wood. Following the suggestion at Yarnfield that we try to discover museum holdings of sundials and associated artefacts the Survey is now in operation. The larger known collections (Greenwich, Science Museum, Oxford and Cambridge) are well documented and have not been approached. So far, seven 'phases', each of about fifty museums/stately homes, have been implemented. Each phase very roughly covering a specific area e.g. phase 7 - East Anglia.

Some postage costs have been met by including Leonard Honey's advertisement leaflets.

Response rates are above 70% and several interesting dials and related items have been uncovered. Information on Makers is passed on to Jill Wilson and information on working dials passed to Patrick Powers for registration or record updating. This is essentially a long term project with around 2000 establishments to contact. It is hoped a summary of results can ultimately be published but as yet there is no firm commitment to do so, the records currently being held on an enquiry basis with information appearing in the Newsletter.

Thanks to all members who have followed up museum reports.

Editor: Margaret Stanier. Since the last AGM, four issues of the Bulletin have appeared: June, September and December 2003, and March 2004. Thanks to all the writers and photographers who made this possible. The December issue was a disaster, and for which the editor can only apologise. Before long it will be possible to obliterate (by means of a sticker-erratum-slip) the erroneous date on the cover and title page.

There are tentative plans to change the printer-firm for the Bulletin; the current printers are rather pricey, and other possible firms are being scrutinised, with the help of the Treasurer, Mike Cowham and Patrick Powers. It is important to ensure continuity: if a change of printer is made, there will be no great alteration in appearance and style of the publication.

I keep a friendly eye on the Society's other publications. Jill Wilson's book about Dial Makers is a useful and important publication. Jill is receiving more names in readiness for some future edition, and is pleased about this. Jane Walker's new edition of 'Make a Sundial' has a blue cover but the original recognisable cover-picture. It will probably continue as one of our best-sellers.

Membership: Kevin Barrett.
State of Membership. 27 new members have joined during the year which is an improvement on the 19 of previous year.

The new arrangements for payments for USA members are working well and received a good impression from members in USA. The new credit card payment scheme has been very beneficial for members in Europe and Asia and will help to gain new members over the next year. Information has indicated that we would certainly have lost members without this feature. Further 5 yearly memberships will have run their course this year and hopefully the credit card system will eliminate the loss of members on renewal. The five year scheme has now only a few members in it.

Membership numbers have remained reasonably steady this year and with hope may increase this year. We have a proposal to mail past members who reside abroad with new schemes as many dropped membership because of the difficulty of making payment.

General Membership statistics. Current membership is 512 down from 528 last year. Rejoiners 0; new Members 27.

Sundial Refurbishment Lottery Funding and St Katherine Cree refurbishment. Some survey work has been undertaken and Lottery application document has been prepared and about to be submitted. We have expanded the proposal for funding to create a scheme to enable others to have a guidance document and information to easily arrange future refurbishments.

Fixed dial register: Patrick Powers. The early part of the year saw a further delay in getting data into the Society's Database.

Following the change of policy to keeping dial collections together in the archive the Northamptonshire WI Collection has been entered and with it some 200 or more 'new' dials have been identified in that County.

The next edition of the Register will be published later this year. Because of the large number of additional reports that have recently been received this will be published in two glue bound volumes. Hard backed editions will also be available to special order though of course, at extra expense. It has been decided also to publish a more portable Short Form Register that will give only limited information but which will contain all the Register in a single A5 volume. Later, the Society intends to issue the full Register on CDROM.

The problems with the Society's PC have also meant that the work on the development of a sister database for use in Mass Dial recording has also been delayed. It is hoped to be able to have this operational shortly.

Exhibitions: David Young. The Society continues to maintain a presence at various events such as the National Science week at Greenwich in March, and we were invited to show at a recent British Horological Society 3-day event.

The BSS Web site: Peter K Scott. The BSS web site is being maintained and kept up-to-date during the period of awaiting a successor. The site remains an important part of the Society's 'presence' and brings many enquiries.

Internet: Piers Nicholson. Traffic is still very high at 65,000 page accesses a month. The two sites are complementary to one another, and both help to create an awareness of sundials, sundial trails and related societies.

Newbury 2003: Peter Ransom & David Pawley. The day's proceedings began with a one minute silence in memory of Tony Baigent who had sadly passed away. Mike Shaw started off the talks, followed by Peter Ransom. Tony Wood and Piers Nicholson then spoke before lunch. During lunch we talked and watched the dials at work in the near equinoctial sunshine. Back again we had a world premiere performance of "The Old Sundial" by David Brown accompanied by David Pawley on piano, the audience providing the chorus. Doug Bateman showed us a magnetic compass from a ship's binnacle purchased at a clock fair. The last "sit-down" event of the day was a video film showing David Pawley's work as a tower clock maker. Doug Bateman then took the opportunity to thank all those who helped to book and organise the smooth running of the Newbury meeting including Elspeth Smith of Rogers Turner Books and Wendy Turnham. Members' exhibits as usual provided a great deal of interest, and the following showed their wares: Chris Lusby Taylor, David Brown, Ray Ashley, John Davis, Bill Hitching, Maurice Kenn, Mike Shaw, Heiner Thiessen, Ben Jones, Sue Manston, Margaret Stanier, John Moir, Peter Ransom, Tony Wood, Harriet James, Dave Pawley and Martin Jenkins.

Publication sales: Margery Lovatt. BSS publications have trickled out steadily throughout the year but the problem of storing the increasing volume of BSS bulletins has become acute. Three members, John Davis, Patrick Powers and Piers Nicholson have kindly offered to take a car load or 10 boxes and David Young transported the first batch last week to Ipswich for me. This will clear space for a while but how best deal with 1,500 plus back issues long term needs to be considered. Any ideas welcome.

Postal costs have crept up again so after our AGM in Oxford, publications prices will have to rise to avoid losses. A new price list will appear in the next bulletin.

The reports were unanimously approved by a show of hands.

6. Treasurer's Report: John Davis. *(Supplement to the balance sheet.)* I took over a set of well-ordered books from the previous Treasurer, Gerald Stancey, who is thanked for his good work, in May 2003. Two new financial facilities have been introduced during the year: the ability to take credit/debit card payments and a dollar account in the USA (courtesy of Dr. John Schilke). The accounting is now performed electronically (with hardcopy backup).

The Report and Accounts show an overall increase in funds of £3.8k over the year. However, this looks deceptively good because it includes advance income from the Oxford Conference and Gift Aid, and does not show payment for the December Bulletin. Without these exceptions, our expenditure is exceeding income by between £1k and £2k p.a.. Plans are in hand to reduce our expenditure to match income, which has fallen due to a reduction in membership. The main item is to find a cheaper printer for the Bulletin, which currently consumes 85% of our subscription income. It is not proposed to increase our UK subscription rates. Small increases are, unfortunately, needed to our overseas subscription rates to account for increased postal costs which mean that these members are currently subsidised by the UK membership.

The report and balance sheet was unanimously approved by a show of hands, and the balance sheet signed by the Chairman.

8. Election of Officers

Chairman, Secretary and Treasurer. The Chairman (C Daniel) had been proposed by P Ransom and seconded

by M Shaw: the Secretary (D Bateman) by T Belk and I Wootton, and the Treasurer (J Davis) by I Wootton and T Belk. There being no other nominations the Chairman declared those proposed duly elected.

Members of Council. M Stanier, K Barrett, A Wood and P Powers had been proposed and seconded by P Ransom and M Shaw. G Aldred had been proposed by T Belk and seconded by I Wootton. There being no other nominations the Chairman declared those proposed duly elected.

Checking the accounts. The Treasurer believed that J Moir was prepared to be nominated for checking the accounts. Proposed by J Lester and seconded by P Nicholson, J Moir was duly elected.

Co-opted members. Last year P Nicholson and D Young had been co-opted to provide expertise on the internet, exhibitions and tours. The Chairman stated that both are likely to be co-opted for the coming year.

9. Any other business There was no other business and the meeting was closed at 9.12am.

A Bateman,
Honorary Secretary

A SQUARE DIAL OF 1709

LEE BORRETT

I should explain a little about the dial. It is a 3.5 inch square horizontal Sundial, made of cast/hammered bronze/brass. Its Latitude of 53.7 degrees would suggest that it was made for the areas of Liverpool/Manchester or Leeds/Bradford. I bought the dial some three years ago, not only because it is in very good condition but also because I liked the mystery that it had two different sets of initials, and was dated 1709; plus the fact that I only had to pay £30 for it.

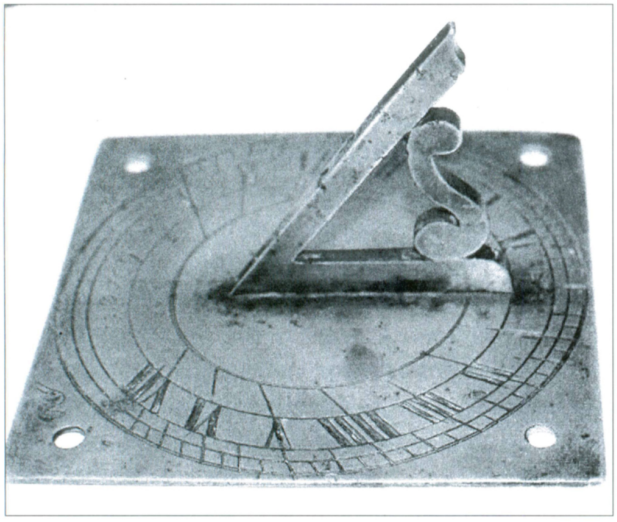

Fig. 1. The square dial

I contacted the BSS and asked them if they could help me identify the initials etc. Patrick Powers was most helpful. I got the feedback that although from the pictures I had sent the dial did indeed look genuine, the feeling was that it was probably made by a provincial clockmaker by the name of D.T. who had made it for J. A. in 1709. One reason why it was thought to be by a clockmaker was that there was no noon gap, which is a fairly common feature on early clockmakers' dials. But although the BSS could not help me identify the maker's name, I was told to look in all the

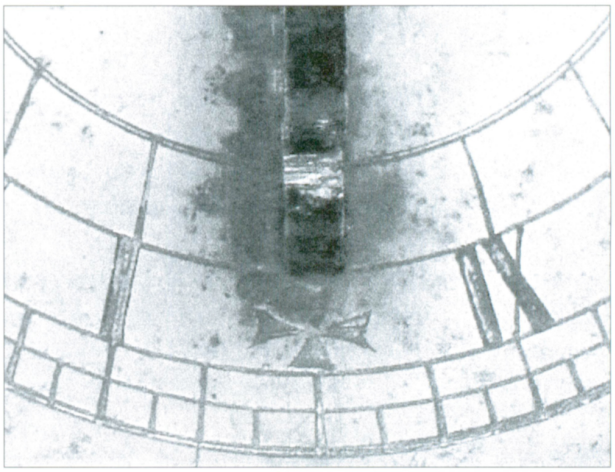

Fig. 2. The square dial

relevant clock books etc. This I did but had no joy and came to the conclusion that it would always remain a mystery.

However, about a year ago having shown the dial to a clock collector friend of mine from Lancashire, I was surprised to hear that he thought he knew who had made the sundial. He showed me a book entitled 'Clockmakers of Northumberland' by Keith Bates.

In this book much is written on a clockmaker called Deodatus Threlkeld who was born 1657. He was a clockmaker in Newcastle-upon-Tyne from 1680 and died in 1733. Apart from a fantastic 1680s clock by him (partly professionally engraved) illustrated in the book, there is (also illustrated) a longcase clock by him c1730 that has been signed on the clock dial-face by Threlkeld himself (D. Threlkeld). Well, to our amazement the very distinctive D. and T. on the sundial are very similar to the D and T on the clock dial-face that was executed some twenty years later. Compare Figs 3 and 4.

Fig. 3. Date and maker's initials of square dial

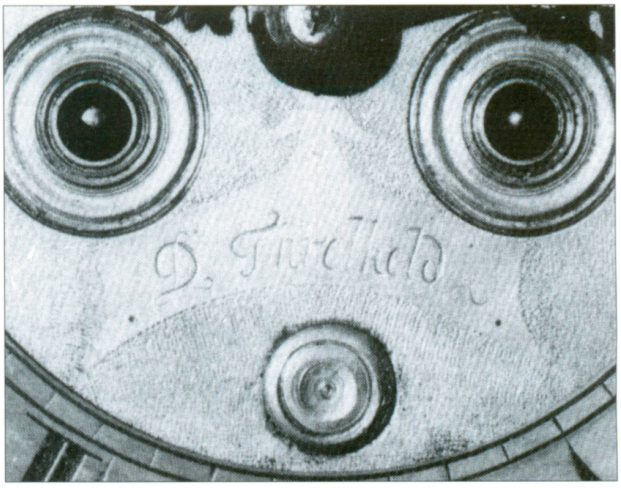

Fig. 4. Portion of clock face of 1730, signed by D Threlkeld

I contacted Keith Bates author of the book and asked him what he thought. He agreed that the dial was likely to be by Threlkeld and that he probably supplied it to the customer with a clock.

However it is impossible to be certain that the sundial is engraved by the same hand as on the clock dial though such an idea is quite plausible.

I am looking into possible J. A's for whom the dial might have been made, within some 70 miles of Newcastle; but my investigation will probably take years. I will need some luck if I am ever to solve the puzzle.

You would have realised that I am no expert on the subject. This article for the BSS Bulletin is written in the hope that readers may not only find it interesting, but someone may even bring to light some information that may help me. Yes, in a way it is an SOS article.

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VARIETY IN UNIFORMITY:
AN OXYMORON

A. CAPON

Like many other dialling enthusiasts, whenever I'm travelling about the country I keep my eyes peeled for sundials. In this way, over the years, I've seen and photographed several hundred.

One of the joys of looking at sundials is the enormous variety of designs, shapes, sizes and materials used in their construction, meaning that one rarely sees two identical dials.

An exception is the dial pictured in Figure 1. In my travels I've found examples of this dial in a number of widely scattered locations (see Table 1.) and from references in the pages of the Bulletin (96.1 page 7 fig.6 and 97.2 page 43 fig. 12) it appears that other BSS members are encountering examples in their researches also.

In his excellent article, "In Arthur Mee's Footsteps", in the 97.2 Bulletin, John R Davis offers a number of observations about this dial:

1. That it is of cast metal construction.
2. That it is mass produced (but to a good standard of quality)
3. Although the dial faces are identical there are differences in the gnomons.

In addition to Mr Davis's points (with which I agree) I would offer some of my own:

1. There appears to have been little attempt at precision in the delineation of the hour lines i.e. only the whole hours are marked and these with rather broad lines.
2. By my estimation over half of the dial face is devoted to the 'decoration' i.e. the flower and foliage motifs, the two lions and the six robed figures standing in archways.

Fig. 1. Dial at Holy Trinity Church, Ettington, Warwickshire

Fig. 2. Dial at Les Granges Manor, St Peter Port, Guernsey

DIAL NO.	LOCATION	REFERENCE
1.	Sundial Cottage, High Street, Pembroke, Pembks.	Seen and photographed by author.
2.	Charlecote House, nr Stratford-upon-Avon, Warwks.	Seen and photographed by author & BSS Bulletin, March 2003, front cover.
3.	Les Granges Manor, St Peter Port, Guernsey.	Seen and photographed by author.
4.	Church of the Holy Trinity, Ettington, Warwks.	Seen and photographed by author.
5.	Private house, Bullring, Deddington, Oxon.	Seen and photographed by author.
6.	Buttress of the church, Kirkby Malzeard, Yorks.	BSS Bulletin, 96.1 page 7
7.	Parish church, Quidenham, Norfolk.	BSS Bulletin 97.2 page 43

3. This suggests to me that the dial was designed more as an ornament than as a functioning dial.

None the less, the more examples I find of these dials the more intrigued by them I become and so I would be delighted to hear from anyone with information which might help to answer the following questions:

I. When were they made?
2. Where were they made?
3. What are the meanings (if any) of the motifs on the dial face?

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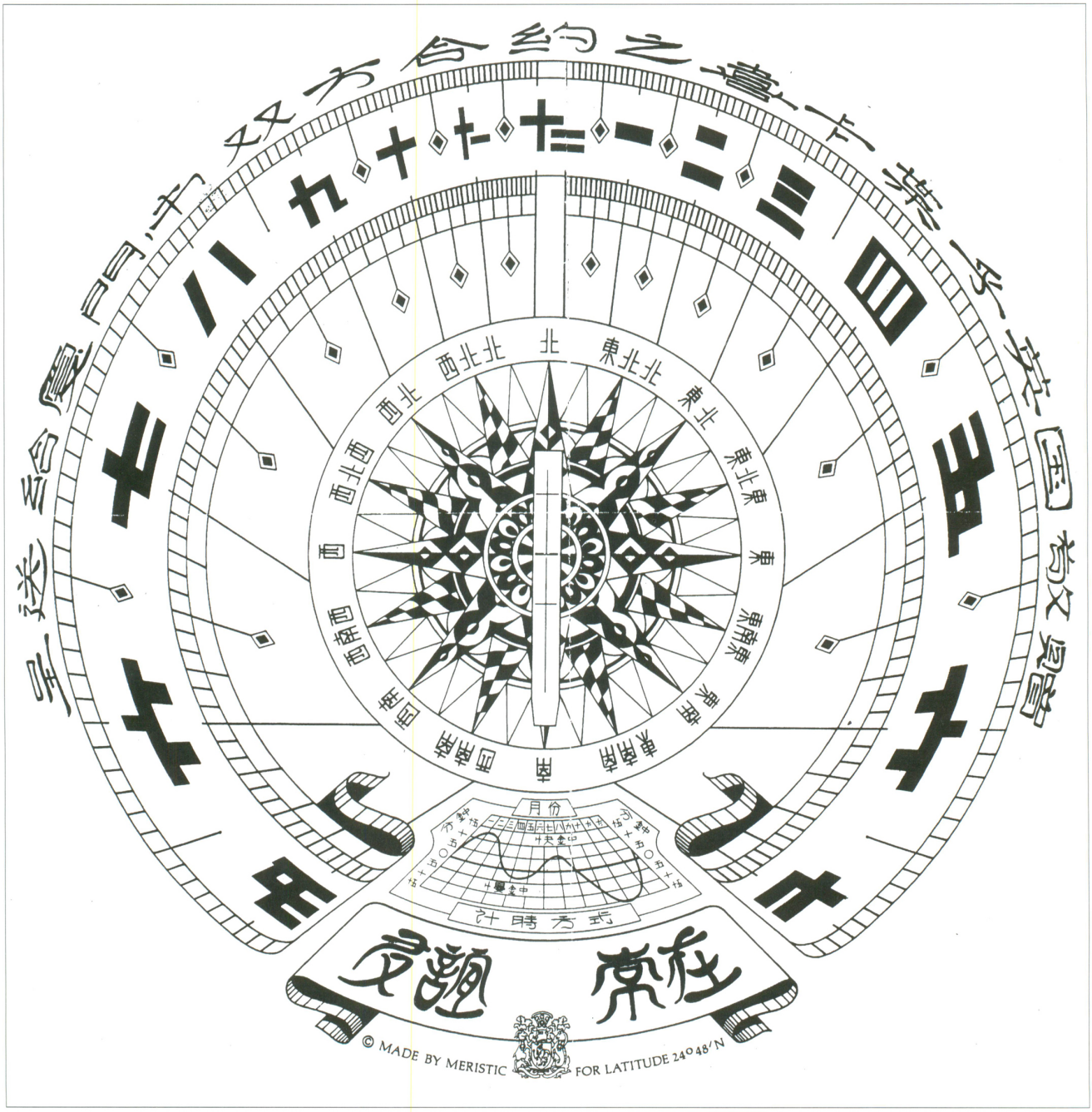
CHINESE DIALS

TONY WOOD

In Mike Cowham's 'Dial Dealings' in the March Bulletin he expresses a wish to know more about Chinese dials.

Here's a straightforward horizontal for starters – no comments – have fun sorting out the numerals and directions. Mah-Jongg players should note that Chinese diallists at least get the cardinal points in the right place!



Tony Wood
Churchdown
Gloucester

OXFORD 2004
15th ANNIVERSARY SUNDIAL CONFERENCE

To mark the fifteenth anniversary of the Society it was decided that the Annual Conference be declared International. The conference extended over three days, attracted an array of overseas speakers and the largest attendance yet. Television coverage, no less; and Norwegian Radio also featured their delegate in an early morning interview.

FRIDAY

The opening lecture was by our Chairman, Christopher Daniel who gave a review of one of his particular enthusiasms, stained glass dials. He has tracked down no less than 56 in Britain - historically - but many are no more.

The early Nailsea Court (Somerset) dial was discussed in detail, featuring a skylark. This dial was particularly described as a precursor to copies appearing in the United States.

The appearance of a fly (a pun on 'time flies') on no less than thirty examples ensured the establishment of a tradition lasting to today with the further embellishment of painting the body and wings on opposite sides of the glass to improve realism.

Chris was followed by his opposite number in the North American Sundial Society, Fred Sawyer, who has been an enthusiastic attender and contributor at our Conferences.

Fred seems to be able to construct a dial to record time from almost any starting point; this time his Helical Polar Dial using a wire over a meridian scale proved to be fully versatile for various latitudes and longitudes with a few sliding scale adjustments and, using two helices, self orienting.

Deciding it was all getting too complicated, the equinox version was selected as basic and a equation of time correction produced – over ±100 minutes! By limiting the slide scale adjustments to twice a year however, an acceptable range for the Equation of Time correction was eventually obtained.

After the lecture and in recognition of Fred's support over the years he was elected a Vice-President of the Society and was presented by our Chairman with a tie and badge.

Still in the realm of sundial mathematics, Silas Higgon described his Azimuth Mean Time Dial which incorporates a correction scale adjusted by reference to a movable arm with a date scale moving over an equation of time graph in polar form. The graph is in monthly sections and a lengthy trial period involving 143 readings produced a maximum error of three minutes.

All this was before lunch!

From France we welcomed Mme André Götteland and Jane Walker read a summary of the research she had carried out for her book on Meridian Lines. Over a thousand have been described in twenty-five countries, mainly continental Europe; they are rare in Britain but we have one or two still, including of course Greenwich. The associated analemma was first used in 1725 and now is a common feature of 'noon-line' dials. The very specialist reflecting meridian is apparently Italian in origin.

Still French but this time Canadian French, André Boucher from Quebec and its 'Commission des Cadrans Solaires du Québec' gave a survey of local dials. Two are recorded as arriving in the early days from Britain and provided models for 'home grown' dials. In the twentieth century some dials have arrived as gifts from Britain. Apparently there are no vertical dials, the fine horizontals which appeared being concentrated in the 'Golden square mile of Montreal' and a goodly selection appearing in and around McGill University. In the last two decades innovative dials have appeared, as they have worldwide.

The Commission has produced a beautiful History and Register in colour of the sundials in the province of Quebec.

Exploring novel approaches to sundial design was the theme of Chris Lusby-Taylor's talk.

The use of modern developments such as fibre optics and even motors was considered and he produced a fair array of 'out of the ordinary' dials. Dials capable of: switching between GMT and BST, displaying hours and minutes, and producing a stationary shadow were among those described. Bifilar and equinoctial 'inside out' dials featured as well and finally, shaped dials in the form of a faceted helix or fluted spiral were described *and* were on display also. Lots of lateral thinking here.

"Photographing" the Rowley double-horizontal at Belnheim

We were invited to a Reception at the Museum of the History of Science and managed to fill it with our numbers. Stephen Johnston, the Assistant Keeper and Acting Director greeted us and gave us a brief history and then we all explored and admired the collection, covering all branches of science and finding the occasional item that took us back to our schooldays!

Still in Friday and more lectures after dinner.

Our guests from Japan gave three short PowerPoint presentations with Professor Akio Gotoh presiding.

1) The Kanayama Megaliths comprise a group of stones with markings indicating use as time tellers or calendar markers. The alignment of gaps between the stones with the solstice or equinox was photographed over a six year period and comparison made with Stonehenge but it was not certain whether the boulder arrangement was natural or arranged. A visitor centre demonstrates the variation in the sun's positions through out the year.

2) The Edo period (1600 – 1867). Unlike Europe with its many church dials necessary for religious timekeeping the principal Japanese dials of this period were 'travellers' dials' and were frequently made of paper in the form of a horizontal altitude dial pointed in the sun's direction and reading the shadow position of a turned up tab. There were six tabs covering the months of the year and six corresponding scales on the main horizontal part of the dial. Needless to say they were 'ephemeral' and only a few original ones have survived into Museums.

3) Into the modern era, Japanese craftsmen, aided by current technology have produced many imaginative dials, frequently quite large and all beautifully constructed and finished. A later lecture discussed these in more detail.

The day finished with a reincarnation of John Blagrave in the form of Peter Ransom to talk about his life and work as a mathematician and dial maker. Having had the fortune to have access to the library of Sir Thomas Parry he went to Oxford and became a surveyor and author. His 'The Art of Dyalling' was a significant early treatise on the subject but no known dials of his have been recorded.

SATURDAY

John Davis delivered the lecture prepared by himself and Michael Lowne. He gave a comprehensive survey of the double horizontal dial design with particular reference to the work of Henry Wynne.

Wynne was in the line of the great 17th century 'classical dial makers', being apprenticed to Ralph Greatorex and later having as an apprentice Thomas Tuttell. Based in London and becoming Master of the Guild of Clockmakers he was a versatile maker of instruments of superb quality, many of which survive today. John's display in the 'technical area' featured an almost life-sized replica of one of Wynne's dials.

From Norway, Johan Wikander gave the Society's first full lecture on mass dials.

Johan has long had an interest in cartography and the compass markings found on coastal rocks in Norway. Some similarities exist between these and horizontal mass dials, indeed occasionally there is doubt as to what a marking may be. Horizontal and vertical mass dials are found in Norway and Sweden; the vertical form is more usual elsewhere although a few horizontals exist in the British Isles. The dates of the Norwegian examples accord well with those in other European countries.

Yukio Ono from Japan continued on from the earlier lecture by Professor Gotoh and concentrated on modern Japanese dials.

It is a surprising fact that only one fixed dial is recorded in Japan in 1872 – well into the 'modern' era. Only a few appeared in the early twentieth century but in the latter half a program of sundial introduction into public parks and schools was implemented by the Ministry of the Interior.

In addition to skill in design and construction a feature of

many of these dials is their size with 51 rated as 'very large' and with 221 being between one and two metres in size. There is a Sundial Park, the Nihon Hidokei Park, and Minami Village in the Gifu Prefecture boasts an entire building in the form of a sundial.

Technical innovation by Hideo Uehara is in the form of an equatorial dial which is claimed to be accurate to *ten* seconds *and* 'adjusts for varying differences in the atmosphere'.

Japan had 553 dials at the last count and ranks them as attractive additions to the landscape which are to be encouraged.

Paolo Albèri-Auber from Italy introduced us to The Emperor Trajan's nose (altitude dials) and his mouth (hemispherical scaphe dials) and proceeded quickly to Antonius Pius and the Antonine Column in the Circus Maximus, well known but so far not described in detail.

Paolo's lecture subject however is still with us at the Kunsthistoriches Museum in Vienna in the form of a small box with four engraved discs which can hang on a peg therein. By selecting a disc appropriate to the location an altitude dial was available – in principle. The discs labelled for Rome and Alexandria are well preserved. The discs not in use could be used as 'packing' on the peg to allow for the time of year – it all sounds a bit hopeful but experiments with a gnomon hole simulated by a small 'camera obscura' box confirmed that this dial, dating from the second century A.D., would indeed tell the time with reasonable accuracy. Its design would seem to need a book of instructions however so although small and ingenious it might not have been of great practical use.

The Andrew Somerville Memorial Lecture delivered by Dr Ken MacKay is the subject of a separate article.

Two visits were arranged for Saturday afternoon. We had to choose between the workshops of David Harber and Joanna Migdal and the magnificence of Blenheim Palace with dials by Rowley promised.

The workshops, conveniently situated close together in the beautiful (and sunny) Oxfordshire countryside populated by Red Kites and Buzzards, were in contrasting styles. David's is a small factory with ironwork, brasswork and engraving tables abounding; Joanna's is more a craft workshop with maquettes of previous dials (one for George Harrison) and the current one only in situ.

Both, however, had an old dial in 'for restoration' and each had a maker's name for us to convey to Jill Wilson for the Biographical Index.

Jill herself was at Blenheim, where, to everyone's excitement an original John Rowley double horizontal was produced from a packing case unearthed specially for the Society's visit and had apparently been forgotten (as was the enclosed bill) for some years. We hope our visit will result in this fine dial standing with its sisters in the sunshine for the rest of its days.

And so to the Banquet – at which our Patron, Sir Mark Lennox Boyd, as a capable diallist, gave not a lecture but a short address; thereby ending an exciting day in the Society's history.

Sunday was down to work again; arriving a few minutes late I found the A.G.M. signed, sealed and certified and trust 'our affairs are in order'.

The nocturnal is an instrument for telling the time at night. It works by sighting on the pole star and the 'pointer' stars of our most prominent constellation - The Great Bear / The Plough / Charles's Wain and as such is outside the realm of gnomonics and sciagraphics. I suspect however it will find a home within the Society as a time-teller.

Dr Turner, President of the Scientific Instrument Society, spotted that some nocturnals from Bergamo in Italy, especially those made by Falconi (c1600) were different from the design usually regarded as 'universal' i.e. could be used anywhere. Specifically they used Italian hours which

In the workshops

commenced at sundown and divided the night into equal intervals, thereby changing in length throughout the year. They were thus latitude specific and by no means universal. Another earlier variation is that the 'little bear' constellation was sometimes used and means that a nocturnal should be closely examined to determine its mode of use and classified accordingly.

Tony Belk then gave a talk on 'a graphical method for designing any planar dial – no maths needed'. It did need a few sheets of paper, a prepared Wolff Net and a transparency or two however. – A book of instructions as well, but familiarity would speed matters up and it is indeed a *relatively* simple method of dial construction and provides declination lines and other information in addition to the hour markings.

From Austria, Walter Hofmann (teller of tales, mathematics teacher and Sundial Tour Organiser) gave a brief history of the Austrian Sundial Society and then described some of the country's early dials.

The earliest are mass dials like others found in many European countries and certainly dating back to the thirteenth century. Kassel and Rodingstadt were two of the five dial locations noted so far. The oldest dial extant with a surviving gnomon is fifteenth century. Specifically, dated dials from 1472, 1486 and 1494 are still around, the latter two being painted dials, a familiar style in Austria. The direct south 1494 dial has lines above the 6 – 6 horizontal. In Vienna, the oldest so far known is 1554. The wire gnomon appeared in 1579 and became a common feature, unlike in Britain where a solid triangle was more usual or France where a sunflower spotlight and noon line became popular.

A cheese store in Italy was an unlikely source of inspiration for a sundial but Ricardo Anselmi spotted its potential. Built in the late 19th century with a conical roof of 30° pitch and 5.4metres (~18ft) diameter, Ricardo placed a gnomon at 91° west and delineated accordingly. The result, in addition to being a triumph of mathematics, is a striking and colourful addition to the corpus of sundial types and great fun!

Our Secretary, Doug Bateman, still had enough energy left to deliver a beautifully illustrated talk on this well known 'stained glass' analemma. Well known but not readily accessible as it lies deep in the scientific complex formerly known as the Royal Aircraft Establishment, Farnborough. As with stained glass it is viewed from inside the building but the glass is etched, there are no colours and the noon is marked from a plain disc spotlight shaped to give a good circle shadow on the glass.

And so we come full circle (eighteen lectures later) from Chris Daniel's opening theme of historical stained glass dials to John Carmichael's talk on modern stained glass dials.

He opened by giving us a view of his impressive collection of photographs of stained glass dials and his website (www.sundialsculptures.com) is well worth a visit (109 dials). His display stand also merits a mention as the photo collection was mounted above his 'tools of the trade' for current dial production.

At the end of his lecture, the Society presented St Anne's College with a John Carmichael stained glass dial which was accepted by Dr Ann Pasternak Slater, the Curator of the College's Art Collection.

It remained only for us all to go on a ramble of the sundials of the Oxford Colleges. As we were in the wettest place in the U.K. that afternoon then those dials must await another day. However, thanks to our overseas speakers, St Anne's College and above all Doug Bateman, we left Oxford with a glow of international success.

A.O.Wood
Churchdown
Gloucester

READER'S LETTER

For Register, please

The membership of the BSS includes many who design and manufacture sundials of excellent quality. I have found a number of these and have been surprised that they are not already recorded in the Register. May I appeal to those who make or design sundials on a commercial basis, to send details of them to the Sundial Register rather than wait for dial recorders to find them? I realise that some of their clients would not wish to have the precise location of their dials recorded but here is already a means of dealing with this problem. The Sundial Register has always been an excellent document but if it is to become anything like a complete one, information about new or hitherto unrecorded dials does need to be supplied by members. So, if you have any data please don't keep them to yourself but share them with us all.

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BOOK REVIEWS

GUERNSEY SUNDIALS
David and Dorothy Le Conte
Published by La Societe Guernesiase,
St. Peter Port, Guernsey. GY1 1UG

This small A5 sized booklet only comprises some 48 pages yet and at last, it starts to fill a void that has existed for far too long regarding the sundials of the Channel Islands. It is only since 1990 that the BSS Register has recorded the presence of any dials in Guernsey and this work finally brings the existence of the dials of that excellent Island to our attention.

Now, it is common knowledge that for any Englishman to comment on anything emanating from the Channel Islands is to place himself seriously at risk of referring to these Islands as a part of the UK (which they most certainly are not!). They are formally called the *Crown Island Dependencies* and (just about!) form part of the *British Archipelago of Islands*. I shall stick with that – rightly or wrongly and, if wrong I shall beg forgiveness in due course!

For mere UK mortals trying to understand where these dials are on Guernsey there are two small problems, namely that the locations of the public dials are not marked on any map in the book and, furthermore, that Guernsey does not use the UK OS National Grid. Indeed none of the Channel Islands do, as far as I know. The various Islands have instead developed their own grid systems. Jersey's is quite different from Guernsey's too. All understandable when you realise that the Channel Islands have their own individual independence and additionally (and ever since 1066) generally see the UK as an acquisition of theirs rather than they as one of the UK. So, such 'mere mortals' as we in England, Scotland, Northern Ireland or Wales should therefore rely on good old Latitude and Longitude unless we happen to be on the Island and actually have one of their own maps in front of us.

Although written rather more for the Islander than the tourist, this isn't a work that simply describes the dials that can be seen by any visitor; it also touches on some that are privately owned and not open to the public's gaze. Additionally it covers the history and development of dials and the terminology that is used to describe them. With nearly 40 photographs and something like ten diagrams it is not only a useful work, it is a scholarly work as well.

Those Guernsey church dials that can be dated are mostly shown to be from the 1680s and later. However it is intriguing to see suggested that one of them at least, that on St Saviour's Church, might date from the 16th Century at the latest and even be similar to one at Chartres Cathedral..

For my preference and trying to think of the non-dialling purchaser, I felt that the reader was rather precipitated into the early chapter on the *History and Development of Dials* and I would have liked to see some illustrations in that chapter to introduce the reader rather more slowly. It isn't always easy from a textual description alone to imagine the 'L' shaped shadow clocks that were used by the ancient Egyptians!

The final two chapters describe how a Guernsey resident can devise their own dial whether it be an Horizontal, Direct South facing Vertical or an Analemmatic Dial and details are given of the care needed when setting up such dials.

Any book review should consider all aspects of a publication. There is the occasional oddity in *'Guernsey Sundials'*, perhaps arising from the patois used on the Island, like the use of the (less common) word *Donjon* for a castle's keep. But there you are; it all adds to the delight of this little book even if it did send me to my dictionary!

Sadly, a few of the photos are rather too small and of too weak a contrast for them to show real detail – a case in point being the nocturnal and portable dials of Castle Cornet.. Nonetheless, for those with more youthful eyes than I (or those actually like me but with magnifying-glasses in hand!) most show the details that you need.

An excellent glossary explains the terms used though I personally would have preferred to see terms explained (or references made to their explanation) as they are introduced. *'Equation of Time'* is one such; first mentioned on p21 yet barely explained in the glossary and only fully explained on pp 29-33.

For me too, the *Guernsey Liberation Monument* is much understated in this booklet – undoubtedly because of the modesty of the author who played such a large part in its design. Yet, this has to be one of the most important modern sun monuments in the British Archipelago. (Have I got that right?) It is one I would love to see – especially (in sunshine!) on Liberation day itself, May 9th - and it should be better publicised. All diallists should surely place this on their must-see list. Rarely does any sundial of any sort and

regardless of age, reflect the suffering, heroism and subsequent delight and freedom of the people it serves.
But these are all very minor criticisms which in reality do not detract from what is, after all, an excellent work which should intrigue both the holiday visitor and the diallist alike.

Patrick Powers

BSS SUNDIAL GLOSSARY, SECOND EDITION, *editor John Davies.*
British Sundial Society; £15 UK, £17 Europe, £19 USA all incl. p&p; 84pp A4 2004. ISBN 0 95184046 0.

The first edition of the glossary has proved to be most valuable for anyone who wished to understand the "abstruse, antiquated, dialectal or technical terms" used by sun dial enthusiasts. It also acted as an introduction to the way in which all the other disciplines impinge on the study of sundials. Four years later the second edition is published, again edited by John Davies and considerably enlarged with double the number of pages. It is a significant advance on the first edition.

The A to Z entries now take up 36 rather than 24 pages and contain a number of very clear illustrations. There are some seven hundred entries and all are cross referenced with preferred symbols, abbreviations, and pronunciation. It is a veritable storehouse of dialling information, with references to other sources for a fuller description of the terms. Clear distinctions are made between apparently similar terms such as accuracy, resolution and precision of a sun dial. The Glossary has done a great service to the standardisation of the symbols and technical terms used in dialling. The sections on co-ordinate systems, and types of day, dial, hour and time are most valuable, allowing a comparison within the section without having to turn throughout the whole glossary. Many more diagrams have been included which illustrate and clarify the definitions. These are particularly useful in discriminating the various types of dial.

The main difference in the two editions is the inclusion of eleven pages of brief biographies. These are of over 100 of the main characters who have contributed to the development of dialling over more than two millennia. I found them a fascinating collection, and again a number of portraits are included to add interest. It is intriguing to see the contributions to dialling made by people who are much better known for other achievements. The Venerable Bede, Tycho Brahe, Chaucer, Fourier, Benjamin Franklin, Huygens, Mercator, Wheatstone and Sir Christopher Wren are all featured.

The Equations section has been expanded to include more dial types, and is now supplemented with very clear diagrams. The hour line angles and nodus shadow point position for all the standard dial types are given. There are additional formulae for instance on the equation of time and the sun's declination and refraction.

The Chronology has been extended, and includes calendar, clock and sundial information. It covers a period of 11,000 years but concentrates on the second millennium AD. This combined with the biography section is a very useful resource.

There are also nearly three times as many Appendices, one of which enables one to distinguish between an imitation, a copy, a replica, a forgery and a fake. Many are concerned with historic information on time reckoning and calendars in ancient civilisations. There are also tables of sun's declination and equation of time.

This edition is subtitled "A sourcebook of dialling data" , a description which it amply achieves. If for data we read information it is certainly true that anyone interested in sundials who wishes to be well informed must have a copy on their bookshelf.

Tony Belk
Shrivenham

VIDEO REVIEW

TIME IN SUFFOLK
VHS video, privately produced by *K. Rickwood*, running time: 12 minutes.
Available from 28 King Harold Rd, Colchester, C03 4SB. Price £7.99 + p&p (£1.50 UK: £2.25 Europe: £4.25 RoW).

Ken Rickwood describes himself as a lapsed member of the BSS who has combined his interests in cycling, sundials and film-making in this gentle video. It shows the history of sundials, from a (probable) Saxon dial through mass dials and scientific dials to the latest mean time dials by means of a cycle ride around the sunny lanes of Suffolk. As a Suffolk resident myself, I much enjoyed these reminders of my local dials and the game of identifying them before the commentary gave the location. This was not always clearly given - on one occasion relying on a fleeting glimpse of a

church noticeboard - but anyone wishing to explore the trail should be able to find the dials with the help of a gazetteer and the BSS Register. The target audience for the video is mainly a general one rather than sundial experts and I would expect it to be a useful introduction to dials for local history groups and the like. It deals with the development of time-keeping systems with good local examples and nicely simplified explanations.

I counted fourteen dials of a wide variety of types on display. Most of these are reasonably well known ones and have been chosen for their interest and accessibility. Some are particular favourites of mine, such as the 1650 vertical declining dial on the Moot Hall on the seafront at Aldeburgh. The camerawork is generally very good but on this occasion it was unfortunate that the date was just off the bottom of the screen.

Another favourite is the church at Witnesham, where a stone vertical south dial is accompanied by a one-handed clock and a mass dial. I was pleased to see that the bees nesting behind the dial, described in Arthur Mee's 'Suffolk', are still in evidence but disappointed that there was no mention of the fact that some dials decline whilst the Witnesham one is wedged out to face south. This really is my greatest criticism of the video as a diallist - there is far too much footage of Ken getting on and off his folding bicycle and pedalling along the lanes and not enough description of the actual dials and how they work. I did come across one potential new entry for the BSS Glossary: a 'private' dial as a term to describe a common horizontal dial.

It is too easy to be critical of others' efforts and to compare an enthusiast's video with the productions of the BBC. Whilst Ken's presentations to camera are rather stilted, they do convey his interest in the subject and I am sure that even the astronomers can forgive him statements such as "Nature does not work in a regular way" when referring to the Earth's orbit. I can recommend the video as value for money and a good introduction to the dials of Suffolk.

John Davis

THE FIRST DIAL AT CHASTLETON HOUSE, OXFORDSHIRE

A.O.WOOD

Chastleton House in Oxfordshire came into the care of the National Trust in 1991 and they 'have been careful not to over-restore'.

They have, however, recently removed ivy and foliage from the walls and in so doing have revealed three sundials carved into quoin stones at south west corners.

The first to be made is shown in fig. 1 and is dated 1612, probably on completion of the house. Immediately apparent is the use of 'X2' for noon – certainly unique to my knowledge. Further observation reveals lines above the horizontal, not unique but unusual in a serious dial; also the horizontal line is V – V, 5 a.m. to 5 p.m. which is reasonable for an east declining dial as this indeed is. The gnomon support hole is along the noon radial direction and is therefore offset eastwards, i.e. in the wrong direction. Noon itself, of course, should be vertically below the gnomon root. The noon offset implies that the original gnomon may well have been horizontal.

Whilst casting such a critical eye over the dial we may not have noticed the numerals, read from the inside from 3 a.m. to 8 a.m. and certainly for 5 and 6 p.m.; the remainder read from the outside. Perhaps this is permissible on occasion to make reading easier; but it then becomes apparent that his 7 a.m. is rendered IIV, 8 a.m. is IIIV and 6 p.m. is IV.

I have uncharitably described it as 'a right pig's ear' but suspect the maker may have been the architect who didn't bother to read the available books. The circular format is reminiscent of mass dial practice, a rectangular format being used by anyone following the constructions outlined in contemporary works on dialling.

Thirty-seven years later, the dials were 'done proper' on the west staircase projection in the form of another east decliner and high up round the corner a west decliner (fig. 2), proudly attributed to TG – but unfortunately we don't know he was; only that his dials would now tell the right (17th century) time.

Thanks to Louise Skinner, the House Steward for all the help given during the visit to look at their dials. Grateful acknowledgements also to the National Trust. Thanks also to Gary Marshall, N.T.Archeologist, who supplied the drawings.

A.O.Wood
Churchdown, Gloucester

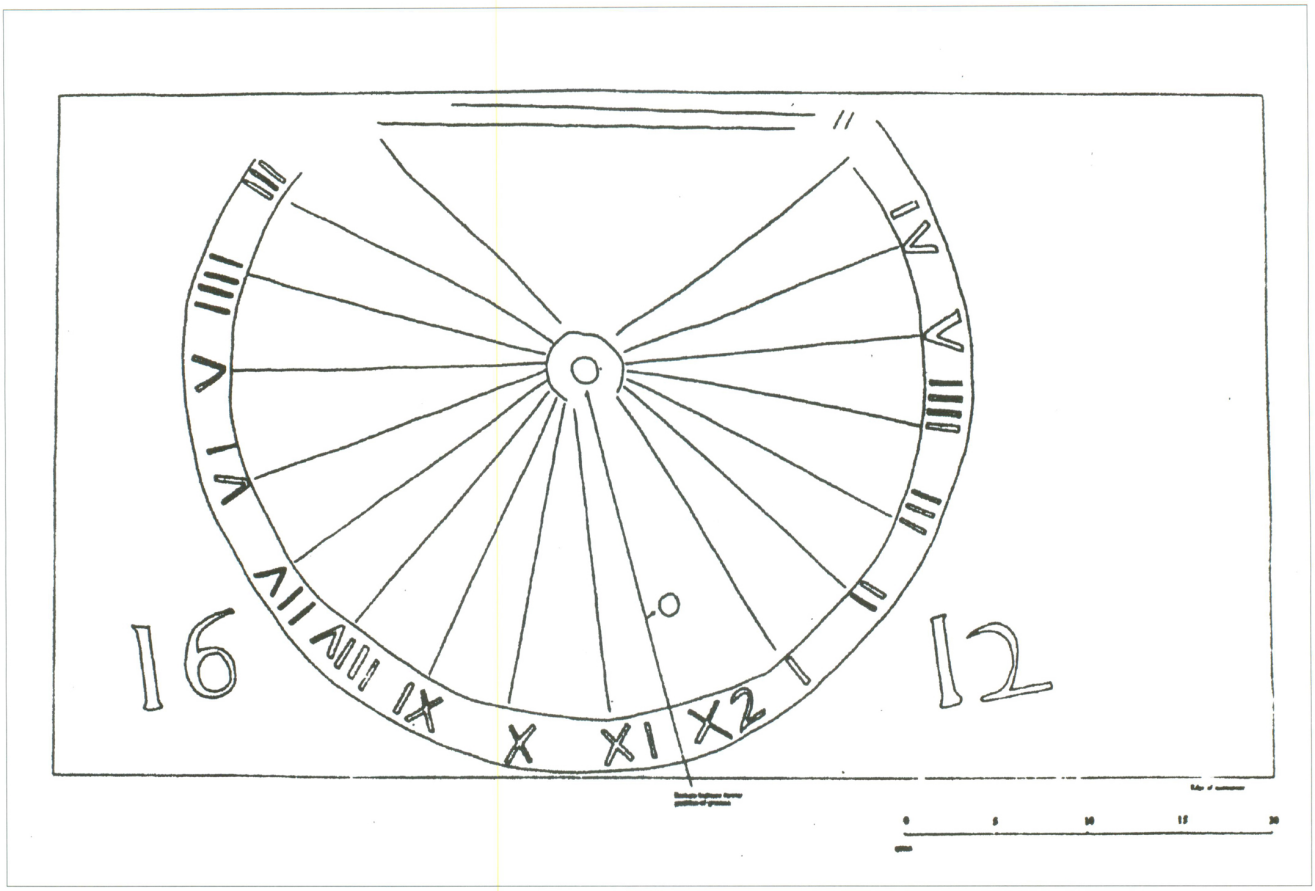

Fig. 1. Sundial face found on the south-west corner of the House.

Acknowledgements to The National Trust.

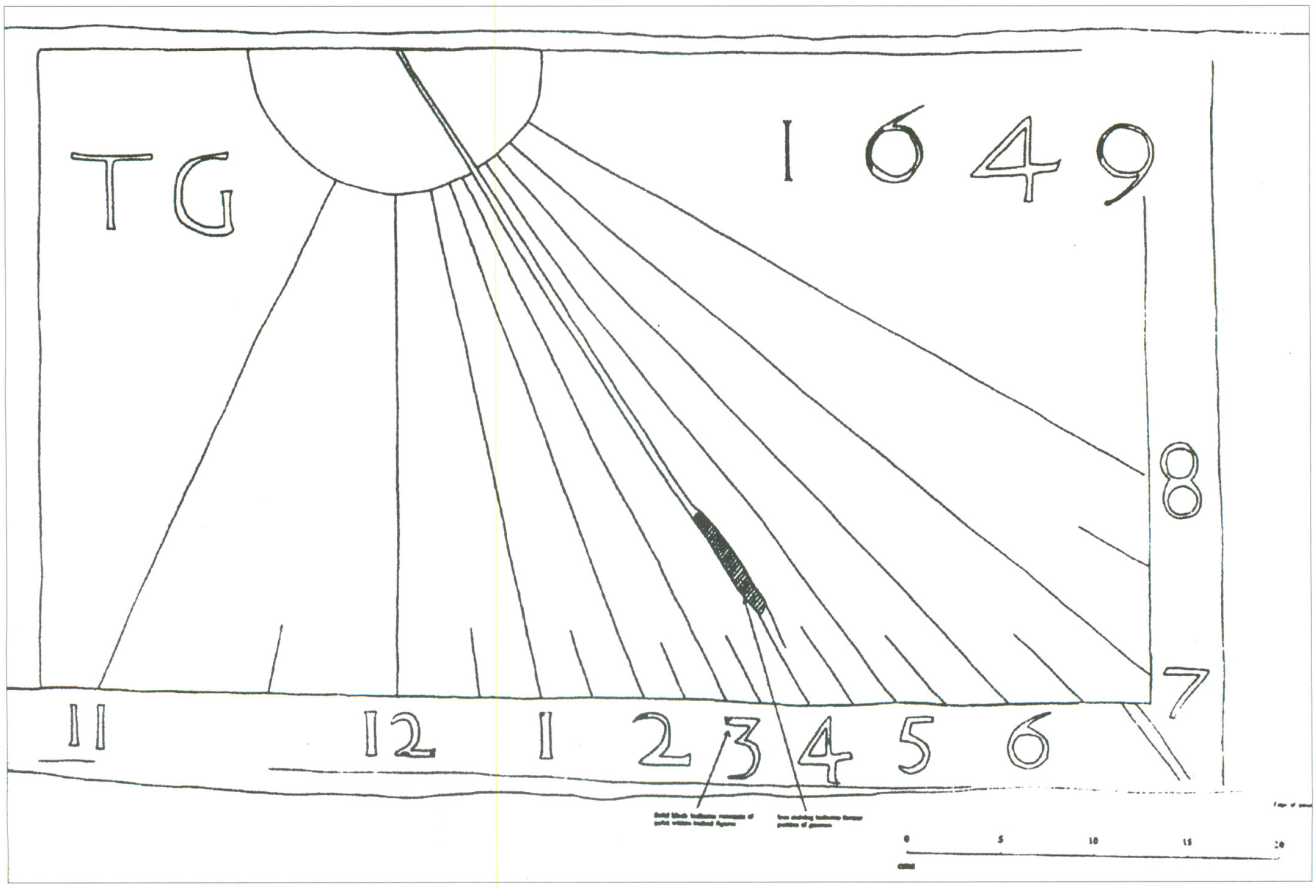

Fig. 2. Sundial face found on the south-west corner of the west stair tower.

Acknowledgements to The National Trust.

BLENHEIM PALACE

Fig. 1. The Packing Case

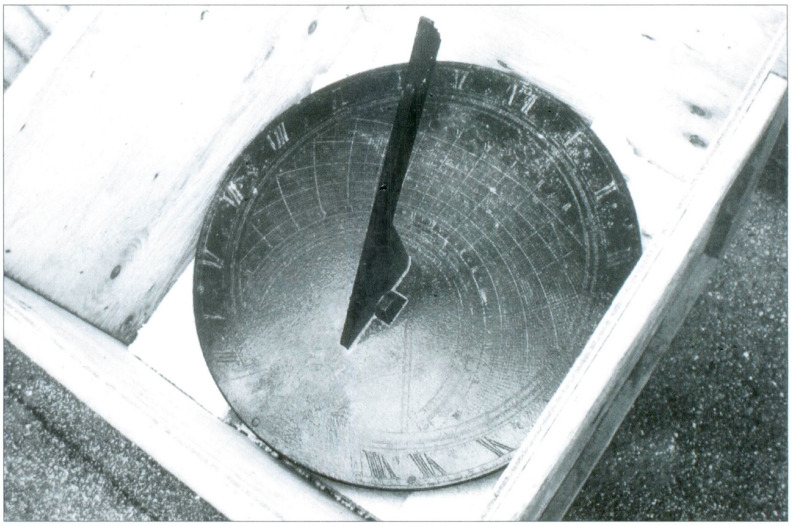

Fig. 2. Sundial in Packing Case

Fig. 3. Sundial out of Packing Case

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