The British Sundial Society

BULLETIN

No. 96.3 OCTOBER 1996

BULLETIN 96/3 - OCTOBER 1996

CONTENTS

COVER ILLUSTRATION
A rare and unusual carved Scottish stone Triangular Sundial, ornamented with lead putti and dated: 1731. Height 3' 6½".

B U L L E T I N

OF THE BRITISH SUNDIAL SOCIETY

ISSN 0958 - 4315

ISSUE 96.3 - OCTOBER 1996

EDITORIAL

Members will notice some slight changes in the format of this Bulletin. For some time it has been difficult to list the contents of the Bulletin in the space available on the inside front cover with the continuing additions to the BSS Council. All such administration details are now consigned to the inside rear cover, and a certain amount of redundancy removed as a result.

Dr. David Boullin made several suggestions to the Editor in a recent communication, including the point that there was no Editorial included in the BSS Bulletin.

The present Editor has always favoured a "low profile" approach, never having considered an editorial, for originally a regular journal was not envisaged, merely a newsletter which would be more flexible and responsive to topical information. However, it is a fact of life that all similar society journals carry an editorial, in which the Editor highlights selected issues in accordance with his personal view.

Comments on the Bulletin, suggestions for improvements, brickbats and bouquets, all are grist to the Editorial mill. Some improvements, such as the introduction of colour, are greatly desirable but impracticable because of the cost. Any increase in the cost of production would naturally mean an increase in the subscription rates, a subsequent fall in the membership, and possible loss of viability of the Society itself. It is a very delicate balance in the economic climate of today and an increase in subscription may be difficult for our older members to find.

This is a suitable opportunity for the Editor to express his grateful thanks to all those who have given freely of their time and effort to provide the multitude of fascinating articles which have appeared in the Bulletin since June 1989. He is constantly amazed at the diversity of approach to dialling, and the in-depth knowledge displayed by ordinary BSS members.

It is, of course, these scintillating contributions which have made the BSS Bulletin one of the foremost dialling journals in the world today. Long may it continue to be so, but we cannot afford to rest on our laurels for too long because the standard of gnomonic journals throughout the world improves daily.

It will not be out of place here to mention the sterling service of Stratford Repro in the production of the Bulletin at a very modest cost, plus the regular despatch of the Bulletin to members all over the world.

Thus endeth the first Editorial.

Charles K. Aked
Honorary Editor

PORTABLE DIALS - MISCELLANY

JOHN MOORE

This series on Portable dials has covered most of the more popular types still to be found in museums and private collections. It has also included some of the rarer and unique examples that are sometimes met. Inevitably, certain types have been omitted, and some of these are now described.

INCLINING DIALS

These dials are very similar at first sight to the 'Butterfield' dial. Generally, they are octagonal and were mostly made in France, by the same makers who would have made the 'Butterfields'. Instead of having a tilting gnomon for latitude correction, the inclining dial has a hinged dial plate with a fixed angle gnomon. This plate may be tilted to cover a useful range of latitudes. The advantage of this method of correction is that there is no longer any need to have several hour scales for the different latitudes as on 'Butterfield' Dials. In effect, the inclining dial is a complete fixed latitude dial that may be adjusted to suit a wide range of locations.[1]

An inclining dial by Edm. Culpeper of London, may be seen in Figure 1. It is made of brass and has a folding gnomon with a fixed angle of 60°. Therefore, with the dial plate horizontal, it is a 60°N horizontal dial. Setting the dial plate at the correct latitude against the calibrated arc on its west side, sets the style parallel to the Earth's axis. With this dial, any latitude may be set between 60°N and 0°. This gives the dial a wide travelling range, covering most of the Northern Hemisphere. At latitudes greater than 60° there are few lands where the travelling gentleman would be likely to visit. The dial could also be used relatively successfully in the Southern Hemisphere, but like most portable dials the main scale would need to be read in reverse. This dial is exquisitely engraved as might be expected from a craftsman such as Culpeper. Its lower plate is simply engraved with his signature. It also contains an inset compass with a fine wheatear pattern around its circumference. The underside is reserved for a list of 20 European towns and their latitudes which range from Cadiz, 36° to Moscow, 55° 30'.

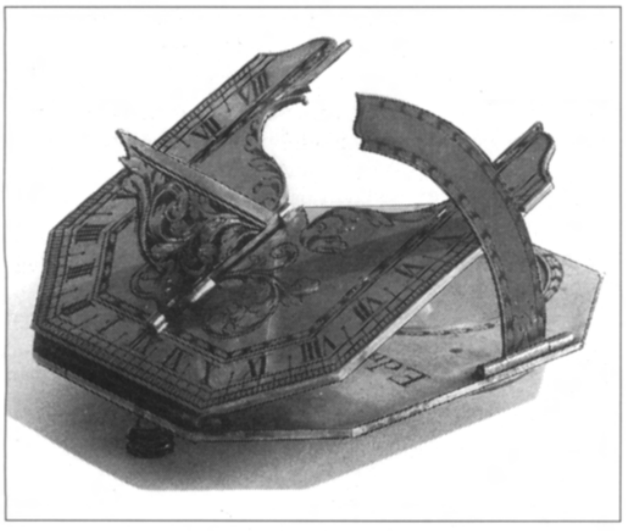


FIGURE 1: Brass Inclining Dial by Edm. Culpeper, London

The French makers of these dials also tended to use 60° for the basic gnomon angle, and included latitude scales down to the equator. An interesting silver dial by Macquart of Paris, (Figure 2), has its latitude arc extended by a further 10° allowing it to be used to 10°S. This would conveniently cover much of Africa and the northern half of South America. It was in these countries, at that period, that the French were particularly active in their exploration. In 1736, the French Academy of Sciences sent out two expeditions, one north to polar regions and the other south of the equator where it was intended to measure an arc of the meridian. Their findings showed that the Earth is somewhat flattened at the poles. It was from this research that the measurement of the metre was originally derived as being one ten millionth of the distance from the north pole to the equator.

FIGURE 2: Silver Inclining Dial by Macquart, Paris

FIGURE 3: Unusual Universal Dial

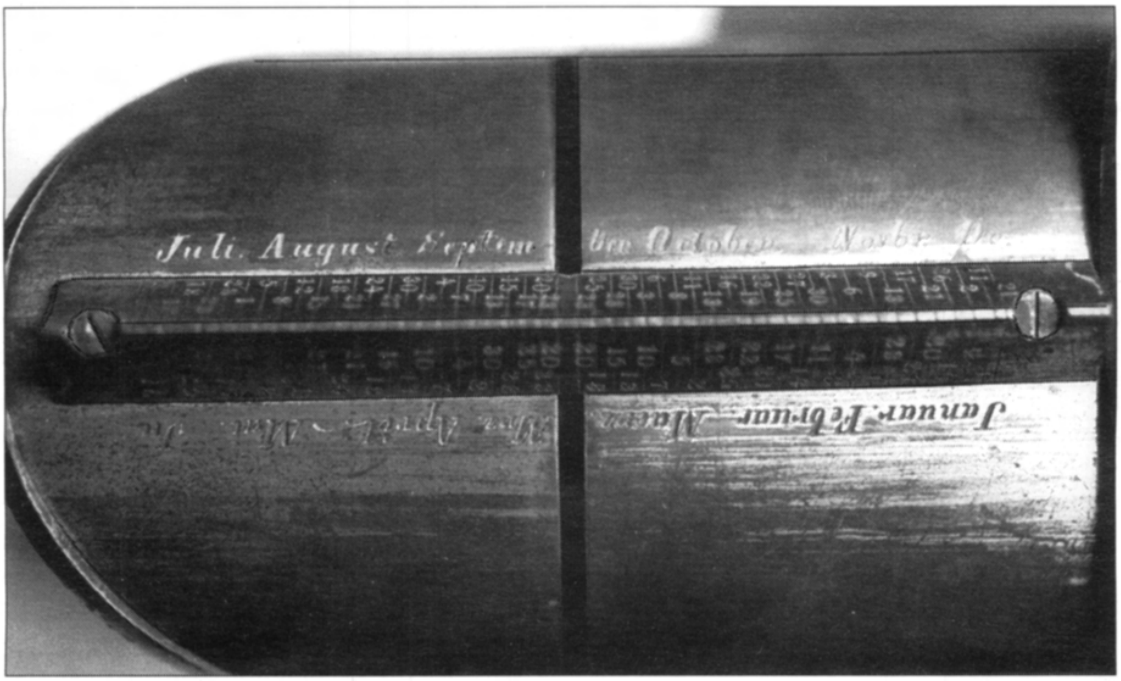


FIGURE 4: Calendar Scale of Unusual Dial

The Macquart dial is actually engraved with the latitudes of some interesting towns around the World including Pequin 40°, Kebec 46° 55', Cap-Vert 14° 43', Ispaham 32° 40' and Siam 14° as well as many of the usual European towns.

AN UNUSUAL UNIVERSAL DIAL

The dial described was found by the author in Florence, Italy. (Figure 3) An identical dial has since been seen in an auction sale.[2] Its principle of operation is quite unusual, but it employs some standard principles. The time recording dial is a standard horizontal dial constructed for a latitude of 45°, but the gnomon is missing in this example. To make it universal, the complete assembly must be tilted so that this dial will move between the horizontal and vertical positions, i.e. from 0° to 90°. The dial is without a compass, but it has a unique method for finding its north - south alignment. The main body of the dial is in the form of a cylinder with a semicircular disc gnomon sitting on it. The shadow from this unusual gnomon is projected on a date scale on the cylinder. (Figure 4) The gnomon's radius is centred on this scale in such a way, that whatever the time of day, its shadow would be in the same position on that cylinder. Therefore, in use, the dial is tilted to the correct latitude, shown on a small pointer below, and the shadow from the large semicircular gnomon is set to the current date by turning the complete dial on its stand. This correctly orientates the 45° horizontal dial for its correct recording of time. The advantage of this type of construction is that the magnetic declination is no longer relevant. It also overcomes the problems found with many self-aligning dials, such as ring dials, where a part of one of the rings can obscure the readings around the equinoxes and around noon. It does, however, still suffer from the problem of knowing whether it is morning or afternoon. This dial is unsigned but appears to be of German manufacture and is possibly dated around 1850.

THE WALKING STICK DIAL

These dials are occasionally found built into the knob of a walking stick. The knob is split so that the top hinges up to reveal a small horizontal dial built over a compass. These were hardly serious instruments, and being so small, of poor accuracy. The vibration of the stick when in use would inevitably damage the compass bearings rendering it useless quite quickly. These dials were made from mid Victorian times and are still being made today and passed off as antique. Caveat Emptor!

COMPASS DIALS

The term Compass Dial is used here to describe the dials made, mostly around 1820, in which the gnomon and dial were mounted on a card with a magnet attached beneath. The card was suspended by a pivot point from below, and due to its bar magnet would act as a compass, thereby producing a self-aligning dial. This type of dial has already been described.[3] As this was such a simple design to utilise, it will be found in various 'instruments'. One of the commonest of these is in the form of a lighthouse. In this, the dial is mounted on top under a dome where the light would normally be so that it could be plainly seen. Vertically, up the stem of the lighthouse would be a small thermometer. These dials would need to be mounted just inside a window, in the sunlight. This situation would give some interesting temperature readings at times. Compass dials were made mostly in England by S. Porter, A. & H. Fraser or Essex & Co. They were also made in Germany but most of these examples remain unsigned. One of the better quality, and somewhat earlier dials by Fraser is illustrated in Figure 5. This dial was made around 1760. Its bar magnet is fitted beneath the dial plate (Figure 6). In this case it is made adjustable for declinations of ±30°. This dial also carries an Equation of Time scale around its fixed outer rim, as well as a scale of degrees to be used with the compass.

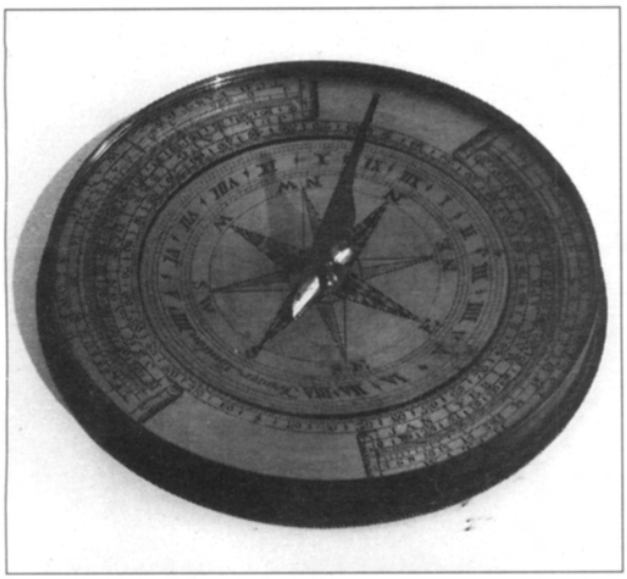


FIGURE 5: Magnetic Compass Dial by Fraser, London

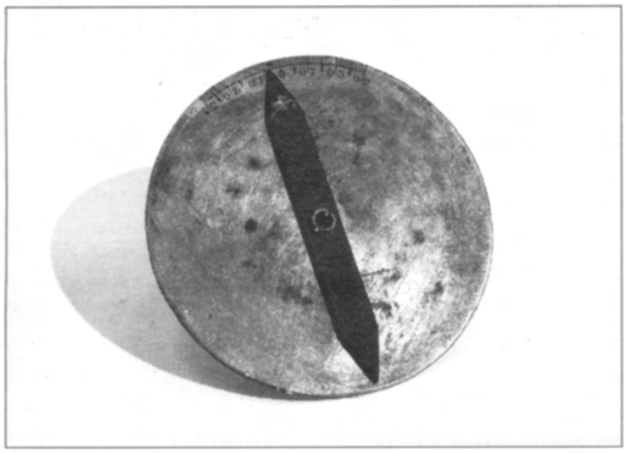


FIGURE 6: Adjustable Compass Magnet of Fraser Dial

FIGURE 7: Equatorial Dial by Kloppenburgh & Cremer

FIGURE 8: Octagonal Dial with Noon Mark by Manche, Paris, 1770

EQUATORIAL DIAL

A form of Equatorial Dial was the speciality of Gerhard Kloppenburg and Gerhard Cremer. Several of these dials are known consisting of a large silvered brass disc mounted on a suitable stand. Few of the stands have survived, but the dial plates are interesting in their calibration and decoration (Figure 7). Being an Equatorial, dial the disc needs to be engraved on both sides, with the top surface being in use during the Summer months, **VER ÆSTAS**, and the underside during the Winter, **AUTUMNUS HIEMS**. Its Summer side carries the most information with hour scales from a half hour before **IIII** to a half hour after **VIII**. The plate is arranged on its stand so that it may be tilted over a range of latitudes effectively covering the whole Northern hemisphere. For each hour the dial shows towns where it is noon throughout the World. The Winter plate carries two names, *Gerhard Kloppenburgh Invenit*^{er} *Delineasit* and in a separate ring *Gerhardt Cremer Sculpsit 1714*. This dial was therefore invented by Kloppenburgh but was made and engraved by Cremer.

NOON MARK

The noon mark is normally found on the walls of a church or as a line inside a church or other public building. In this latter case it is usually known as a meridian line and was used for determining the local noon. Both types are often found on the Continent. In particular, there are several of the south vertical dials to be found in the Alsace region of France4. These are wall mounted on the side of a church, with a vertical analemma for equation of time correction. The gnomon would consist of a disc with a central hole, supported by an arm in front of the dial. A portable dial with similar features is known. This dial, (Figure 8) is octagonal, somewhat similar to a 'Butterfield', with a conventional fixed gnomon for 49°. It is signed and dated, **MANCHE • FECIT APARIS • 1770**. The noon mark is placed at its south end. This gnomon is also a disc. It is placed in front of the vertical noon mark which is simply marked with a **XII**. It lacks the analemma of its larger relatives. To ensure that the dial is portable, the noon dial as well as the conventional gnomon have been hinged to fit into its carrying case. Its maker, Manche, has not been traced in the usual reference works. His dial, although competently executed is not of the normal high quality expected form French makers of the period. The author knows of no other portable dials with this noon mark feature.

POLYHEDRAL & CUBE DIALS

These dials were not really intended to be pocket dials due to their bulk, but were still portable in the true sense of the word. Various polyhedral dials are known, dating from the 16th century. They have been made in various materials, the earlier ones frequently in brass with an overall gilt surface.

In the 17th and 18th centuries, the cube dial became popular and was made in large quantities by David Beringer of Nuremburg. Many dials of this type are still to be found. They were normally made from wood with paper scales pasted on 5 of the 6 sides. The cube itself, was supported on a hinged stalk from a base plate containing a compass. The hinge in the stalk was used so that the whole cube could be tilted to the correct latitude. Figure 9 shows a Beringer dial in ivory or bone. Again, it is made from a wooden cube, and the ivory scales are applied to its outside faces.

The cube has five separate dials on it. On the top is a standard horizontal dial and on its front is a corresponding vertical dial labelled SUD. On both east and west faces the dials are standard east and west straight line dials. On the remaining face, NORD, is a north dial with its 'inverted' gnomon and the signature D. DERINGER. Normally, but missing on this dial, on the east or west face would be an extra scale for latitude read against a vertical plumb line. With the aid of this scale, a wide range of latitudes could be

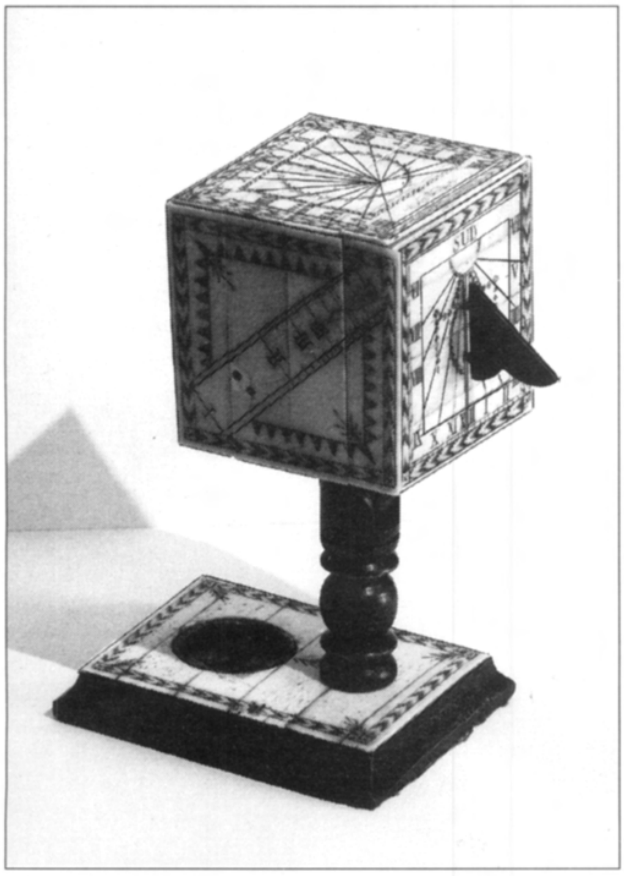


FIGURE 9: Ivory Cube Dial by David Beringer, Nuremburg

accurately set by tilting the dial on its hinged stalk.

WINDOW SILL DIALS

It is sometimes difficult to separate portable dials from some of the very small Garden Dials that are to be found. Some of these have diameters of only 3 to 4 inches. When they are found without fixing holes they are thought to be 'window sill' dials. In practice they were possibly mounted in a conservatory where the gentleman would spend time, possibly tending his exotic plant collection. One small horizontal dial, (Figure 10) is in this somewhat grey area, but is smaller than most, measuring only 2 inches across. Its folding gnomon suggests that this must be a portable pocket dial. However, without a compass for alignment it is relatively useless to its owner as a travelling dial. There is no doubt that it is a serious dial as all of the calibrations are correct and in agreement with each other. Perhaps this is one dial that was actually intended for semi permanent mounting just inside a window?

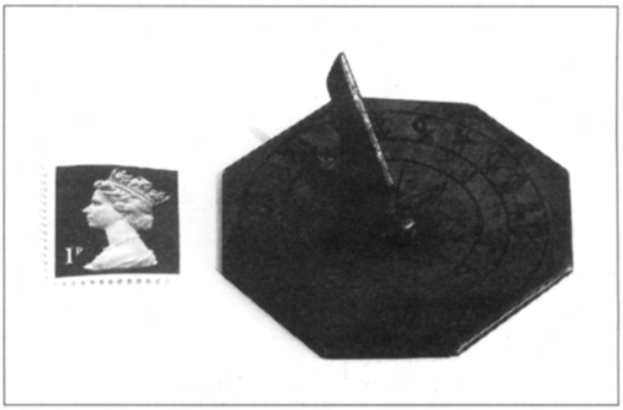


FIGURE 10: Small Brass English Dial

MODERN DIALS

Several dials have been made in recent times as portable dials. Most are well executed and will become the antiques of the future. One dial of interesting concept is that produced by the Dutch Zonnewijzerkring to celebrate their 15th anniversary in 1993 (Figure 11). This dial is 50mm square and 20mm thick and is made from clear acrylic. Its gnomon consists of a circular aperture screen printed on the top surface and the hour scale is printed on a card stuck on the bottom face. This is an interesting concept, in many ways similar to the Cup or Scaphe dials of the 16th century that relied on their water filling to refract the sunlight entering. In this case, the acrylic refracts the gnomon's shadow onto the dial scale below. This dial, although portable is not a true pocket dial due to its lack of a compass for correct alignment and is more suited to semi-permanent mounting on a window sill.

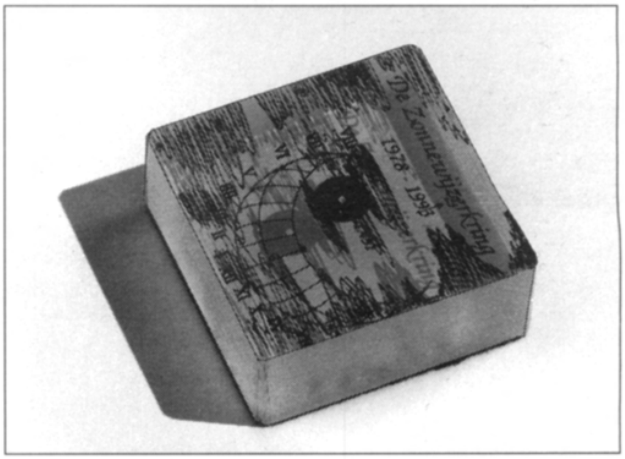


FIGURE 11: Zonnewijzerkring Dial

Continued on page 19 . . .

THE SUNDIAL OF ST. GREGORY'S MINSTER

CHARLES K. AKED

Most diallists content themselves with merely reading about the landmarks in the history of solar time indication, obviously we cannot all afford the money or time to travel to faraway places such as Egypt or China, no matter how keen our interest. Yet many early British examples of dialling are needlessly neglected by sundial enthusiasts. One of the leading authorities on dialling admitted to the writer that he had never seen Bewcastle Cross sundial, or the one about to be described. Possibly it is overlooked because the site is not marked on other than large-scale maps. In fact, before setting out on these excursions, it is just as well to mark up the route to avoid later confusion.

The A170 road linking Scarborough to Thirsk bypasses the village of Kirkby-Moorside about midway between these two towns, just before the village in either direction is a road signposted **"Kirkdale"**. A short run by car takes one to a secluded spot in which lies the beautiful tiny Saxon church called St. Gregory's Minster, see Fig 1. A small car park has been provided for the Sunday congregation, and for visitors' use during the week. The church is in a hollow surrounded on all sides by trees, its churchyard filled with ancient stones which testify to the dead of a millenium or more ago who lie here in perpetual sleep. It is a place long sanctified by religion, time and tradition. There is a ford near the church, but flooded only in wet weather.

St. Gregory was the Pope who sent a mission led by St. Augustine to convert the heathen of Britain in AD 597. The Venerable Bede writes of him in his *History of the English Church*, and of how the Augustine mission fell into disagreement with a mission led by St. Cedd at Lindisfarne, who founded a church dedicated to St. Gregory in AD 654 in an attempt to heal the breach, after he became Bishop of the East Saxons. It has been suggested that this was at Kirkdale, and it is agreed that a church has been on this site since AD 654. A measure of its antiquity is that it was founded before the famous Synod of Whitby in AD 664, at which St. Cedd agreed to the adoption of the Roman Church customs, thus laying the foundations of Catholicism in Britain.

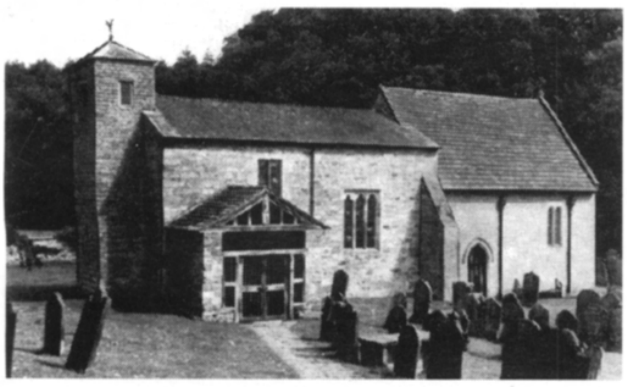


FIGURE 1: St. Gregory's Minster, Kirkdale, Yorkshire. An early 20th century photograph. The 13th century Priest's door can be seen on the right of the buttress, opening into the modern chancel (1881)

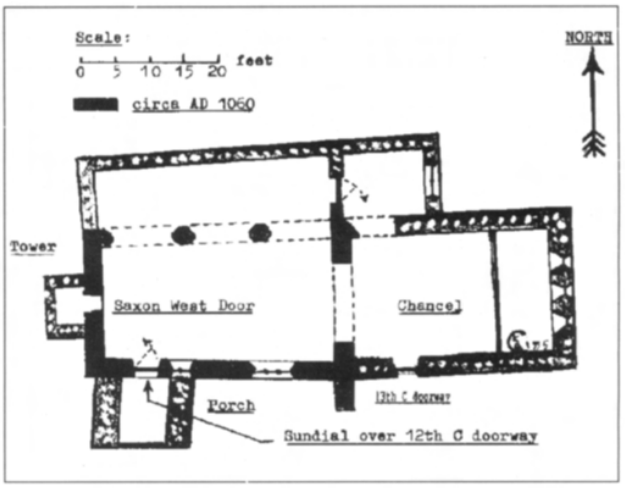


FIGURE 2: Ground plan of St. Gregory's Minster. The black parts represent the original walls built by Orm circa AD 1055 to 1065. It seems the sundial may have been moved to its present position above the entrance during the 13th century enlargement of the church.

These were turbulent times, the Saxons were invaders, they in their turn had to suffer invasion from the Danes from AD 787 onwards, until by AD 866 these had seized York and established a Danish Kingdom. St. Gregory's church was reduced to rubble early in the campaigns, to lie in neglected ruin until a few years before the Norman Conquest in AD 1066.

About AD 1055, possibly a little later, the ruin of St. Gregory's church was bought by Orm, the great landowner of the district. He decided to build a new church on the site of the old to serve the local population as a parish church (and probably as a penance to ensure his soul going to heaven). We have ample evidence of this church for it is recorded in the Domesday book. Kirkby Moorside is recorded as *Chirchebi*, and as having two churches in the Manors of Orm and in Torbrand. The first is St. Gregory's Minster, the latter is the parish church of Kirkby Moorside.

It would, of course, be too much to hope for St. Gregory's Minster to survive the ages unchanged, nevertheless some of the original fabric remains, rather fortunately for our purpose as it so happens. Figure 2 gives the outline plan of the building, with indications of the changes over the centuries. The church was enlarged in 1200, and again later in the same century, when the aisle with its arcade of three bays was added. Much of the nave is as Orm himself saw it, with the magnificent Saxon entrance arch at the west end, see Figs 3 and 4. His walls included much of the stonework from the earlier church, grave slabs, crosses, and other stones. Two of the grave slabs which were in the exterior wall for about nine hundred years were taken out earlier this century and are now preserved inside the church, unfortunately not before the runes carved in the surfaces were lost. They have been identified as those of St. Cedd and King Ethelwald of Deira from the carved runes, present opinion is that this is merely

conjectural. The carvings are beautiful examples of Saxon work.

Some of the thirteenth century work was reincorporated during the rebuilding in 1881 when the present chancel was added, it is of interest in that this included the priest's doorway of the south wall which has several scratch dials. The tower is modern, built in 1827 to replace the earlier wooden belfry. In it are two early bells, one cast circa 1300, its inscription in Gothic capitals is **GREGORI CAMPANAM**, (Gregory's Bell) with a bellfounder's mark of the Agnes Dei (Lamb of God); the other is inscribed + **SANCTE IHS PETRE ORA PRO NOBIS** + (St. Peter pray for us), cast in York between 1400-50, with a bell-founder's mark of three bells. The earlier bell is proof of the continued use of the little church over the centuries, having been commissioned specially for the church. Unfortunately the St. Gregory bell is cracked and cannot now be used.

All those changes resulted in the appearance of the church as it is today, see Fig 5, with the exception of the porch now sheltering the church entrance, erected for a very special reason. It was erected just over two centuries ago, and is feeling its age since the foundations upon which it rests were not as carefully laid as those of the church itself, so the structure is now tilted a little to one side.

Near the ridge of the porch is a modern sundial, with a wooden base and iron gnomon, made and erected by Mr. Wilfred Dowson of nearby Kirkbymoorside, it has no special features however, see Fig 6 for a view of the porch taken in 1908. The time was one o'clock, see also Figure 7.

By contrast, inside the porch is one of the most famous sundials in England. In 1771 the church was having some repairs done which necessitated removing the ancient exterior wall plaster, this led to the discovery of the Saxon dial by the incumbent, the Reverend W. Dade. Mr. J.C. Brooke wrote on this in *Archaeologia*, Volume 5, pages 118-205, published 1779. The dial is shown in Fig 8, it is not easy to photograph it because it is above the entrance door and too high to get a level view without a stepladder; the light inside the porch is subdued, whilst flash gives a flat picture. Most visitors scarcely glance at this historic relic of long ago on their way through the porch. We, in contrast, will pause and consider what information it has to impart to the viewer, directly and indirectly.

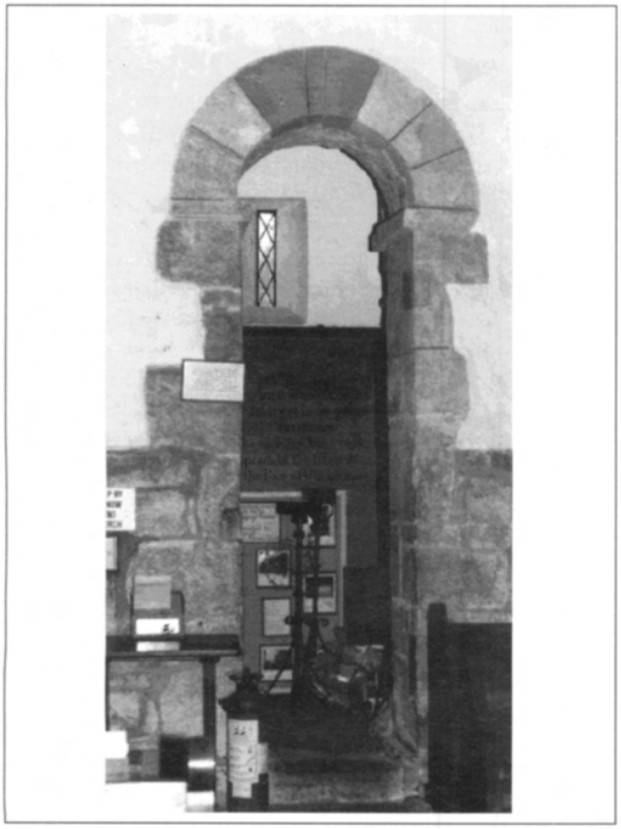


FIGURE 3: The Saxon arch, the original entrance to the west end of Orm's church, a jewel of Anglo-Saxon design. The addtion of a belfry caused it to be replaced by another entrance circa AD1200

The overall size of the stone slab is 213 cm in length, and 42 cm in depth (about 7 x 1·65 ft), its thickness unknown. Its surface is divided into three main panels, the centre panel occupying just over one-third of the length and incorporating a Saxon sundial. A return to this will be made later, for the time being it is the inscriptions in the two outer panels which are of the greater interest. Whether the inscriptions were changed as the mason cut the words, or whether he was unused to carving so many words, is not clear. On the left hand panel the inscription starts off in a fine open style, continuing well spaced, both words and letters bearing traces of Runic influence. The start of the right hand panel augers well, but soons falls into a compressed rendering. The line placed under the dial proper is not part of the dedication, it is part of the dial inscription, but even here the last word had to be abbreviated and placed above the main line, which rather indicated the mason was unaccustomed to setting out such work, rather like a child's approach when given a set piece to place in a given space which is only large enough if set out uniformly. The wording on the two outer panels reads (only approximately for some letters have no modern counterparts):

+.ORM.GAMAL.SVNA.BOHTEN.S.GREGORIVS.
MINSTER.DONNE.HIT.PFS.ÆL.TOBROCAN.

†.TOFALAN.†.HE.HIT.LET.MACAN.NEPAN.FROM.
GRVND.EXPUC.S.GREGORY.VI.IN.
EADPARD.DAGVMING.IN.TOSTI.DAGVM.EORL +

Some of the words are compound, and some of the words, eg "FROM", look almost modern. This word is the only one with a round "O", the others are squares tilted at 45°. Some letters are abbreviations in use at the time. The modern rendering of the dedicatory inscription reads:

Orm, Gamal's son, bought St. Gregory's Minster when it was all broken and fallen down and he let it be made anew from the ground to Christ and St. Gregory in the days of Edward the King and of Tosti the Earl.

Edward, the King, referred to here is Edward the Confessor, later saint, and builder of Westminster Abbey, who was buried there January AD 1066, old-style January 1065/6. Tosti was made Earl of Northumberland in AD 1055, then banished from England for his crimes, including murdering Gamal, the father of Orm. Further historical details will be found later in this article.

The details above indicate that the earliest the sundial could be cut was AD 1055, and the latest AD 1065, and possibly nearer the earlier date since Tosti was not in favour in the latter years of the period concerned.

Returning now to the dial in the centre panel, see Fig 8,

FIGURE 4: The Saxon arch, looking into the church, drawing by author

we find again a lack of precision in setting out the words in the space available. The lower inscription, a continuation of the dial dedication reads:

†.HAPARD.ME.PROHTE.†.BRAND.PRS
Or: **AND HAWARD MADE ME AND BRAND PRIEST**

The last word may be an abbreviation for Provost, since Brand was a provost when the dial was made, becoming Abbot Brand later. Some have translated Hapard as Hawarth, although 'ard' in Eadpard (Edward) is not changed.

Above this is the information on the dial itself, although how many would be able to read it in those far-off days? It modern English it reads:

+ THIS IS THE DAY'S SUN MARKER +
AT EVERY TIDE +

Again this is set out badly, one letter and + sign being placed outside the inner dial ground, and part of the phrase offset below. The whole of this lettering could have been placed within the circumscribed lines of the dial to give a very much neater appearance, thus leaving an uncluttered dial. The illuminated manuscripts of those days are beautiful works of art, so why was the setting of the dial so **"hap haz ard"**? We shall never know now.

On this dial the lines are set out on the basis of the so-called Saxon octaval time system dividing the day and night into eight tides of three hours each, the tides being one quarter of the day or night respectively, ie unequal hours. It is generally held that the divisions between the tides are marked by plain short lines, the longer lines, carrying small cross lines, indicating the half-tide points.

FIGURE 5: St. Gregory's Minster photographed late afternoon January 1992, with hard frost on the ground

The line with a cross X is the **Daeg-mael** line and signifies the start of the Saxon day. On this interpretation the dial actually indicates the last half-tide of the night, and does not include the last half-tide of the day. It would seem to make more sense for the lines with crosses to indicate the end of one tide and the start of another, making the dial applicable to a full day's indications. The hole for the gnomon may be seen at the intersection of the lines, but what form it took and whether it was horizontal or inclined, no one knows. It may have been in the form of a horizontal iron rod anchored by lead in the socket, and if so could only indicate the instant of solar noon correctly on the south-facing dial. (See article on Bewcastle Cross in BSS Bulletins 95.1 and 2).

In every reference to the Kirkdale dial, the subject is treated as though there is nothing left to determine, the original source material is that of "Yorkshire Dials" written by the Reverend Daniel Henry Haigh, published in *The Yorkshire Archæological and Topographical Journal*, Volume 5, 1879. A reading of this long article will suffice to show that much of the interpretation is conjectural. Haigh does state that the lines bearing cross lines divide the tides, which conflicts with the statement in *The Book of Sundials* by Eden and Lloyd, 4th edition, 1900, and this is line with the dial inscription which states - **"This is Day's Sun Marker at *Every* Tide".**

In actual fact the inscription on the dial could never be absolutely true for it was not possible to mount the dial to receive the first morning and last evening rays of the sun, the little church being built in a natural gorge, hence the sun must be at some altitude before it can cast its light upon the church, see Fig 5, this photograph was taken about 2 pm in early January. Whether the church was always screened by trees on the tops of the surrounding heights as now, is not known; but these further accentuate the shading effect of the high ground all round the site. Perhaps the cutter of the dial, or more likely the designer, overlooked this limitation when preparing the dial.

On the assumption that the sundial is genuinely that which is stated upon it, the general shape and size suggest that the lid of a stone coffin may have been adapted by the cutter of the sundial, for such a piece of stone would form a very convenient starting point. As many of the old monuments then erected in the previous three and a half

centuries were utilised as building materials and incorporated into the new church, such an act would not be too improbable. Any convenient block of stone would save a lot of work in quarrying a new piece. If we could see the reverse side, such a theory could be proved or disproved in an instant, supposing the original inscriptions remain, as with medieval brasses which were re-used, it is unlikely the dial cutter would have used it in the manner of a palimpsest, simply because of the amount of work required to erase the original carvings. (A palimpsest is a vellum which has had the original text removed to allow it to be used again for a new text). In passing, it might be mentioned that suitable stone was available quite near to the church site and in fact was quarried up to the nineteenth century.

In 1959 a mould was taken of the panel, from which a number of copies were cast for various museums - Manchester, Oxford, London, and Australia. Since these copies are accurate in the finest detail, inspection of these is far more convenient, and just as good as examining the original, except for the ambience of the actual site. They also have the advantage of preserving the appearance of the dial at the time the cast was taken.

The Historical Review of the Science Museum Time Collection, London, a very useful guide under the title of "Time Measurement", written by Dr F.A.B. Ward; (the first President of the BSS) includes a short note on the Kirkdale sundial, part of which is given here:

"Saxon dials are extremely simple in form and usually consist of a stone slab mounted on a south wall and engraved with a few hour lines on the vertical face of the slab - a horizontal line for sunrise and sunset, a vertical one for midday, and two intermediate lines drawn at about 45°. At the intersection of the lines is always a hole in which the gnomon was inserted, but no example of a gnomon has survived, though fragments of iron have in some cases been found in the hole. It is conjectured that the gnomon stood out horizontally, casting its shadow upon the wall, and dividing the period of daylight into four parts - the four 'tides' into which the Saxons are known to have divided the daylight hours. The horizontal gnomon would show sunrise, sunset and midday correctly, but with the intermediate lines at 45° the day would not be divided into four equal parts, the morning and evening tides being longer than the two midday ones, the difference varying according to the season. It is evident therefore, that only a rough division of the day was required at this period".

Dr. Ward never saw the original dial, only the replica in the Science Museum.

Those readers who know the fundamental principles of dialling will immediately perceive that this explanation is much over-simplified. There are only two short periods of each year at the equinoxes when the sun rises and sets so as to give shadows near to the horizontal line on a vertical dial corresponding to our 6 am and 6 pm (assuming it is able to receive the first and last rays of the sun, and ignoring refractive effects). But who needs a sundial to indicate sunrise and sunset? Observation of these events requires no assistance from instruments, the naked eye suffices. For an expanded discussion of the indications made by a horizontal gnomon on a south-facing dial, please consult the Bewcastle Cross article referred to earlier.

It is quite evident that the makers of these simple Saxon sundials were not as sophisticated as the Greek practitioners of a millenium and a half earlier, the main reasons being the lack of mathematical knowledge and the alteration in the daily change of direction of the sun's shadows in northern temperate zones compared with areas near the equator where the sun changes altitude rather than direction. The ancient Greek sundials could indicate the hours at all times the sun was shining, making use of a horizontal style, the style being roughly parallel with the earth's axis in low latitudes; but the adoption of a horizontal style for a northern dial makes the indications almost valueless for much of the year. Its only virtue is that

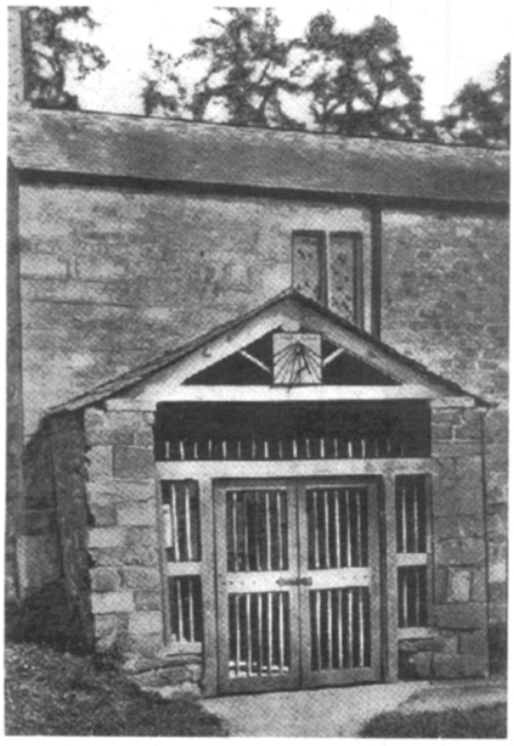


FIGURE 6: Porch St. Gregory's Minster, with modern sundial made by Mr. Wilfred Dowson of Kirkby Moorside. Photograph taken in 1908

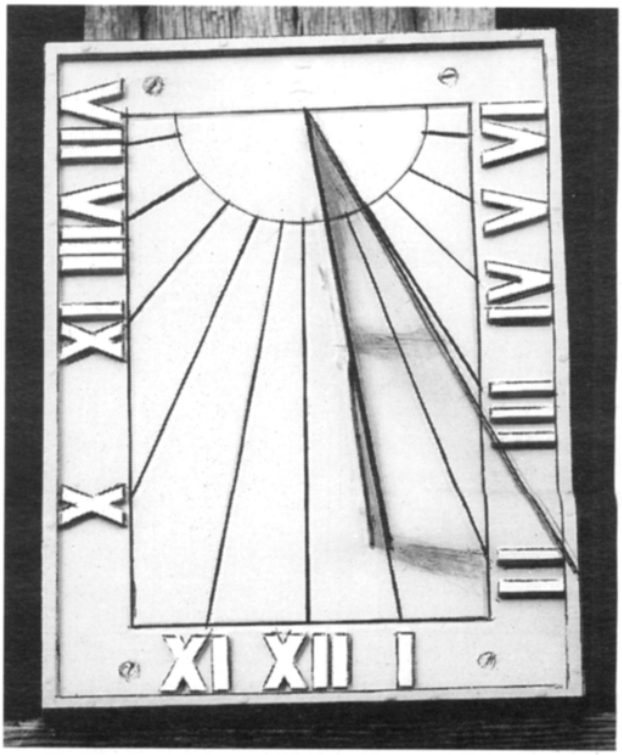


FIGURE 7: Sundial on porch made by Wilfred Dowson of Kirkbymoorside

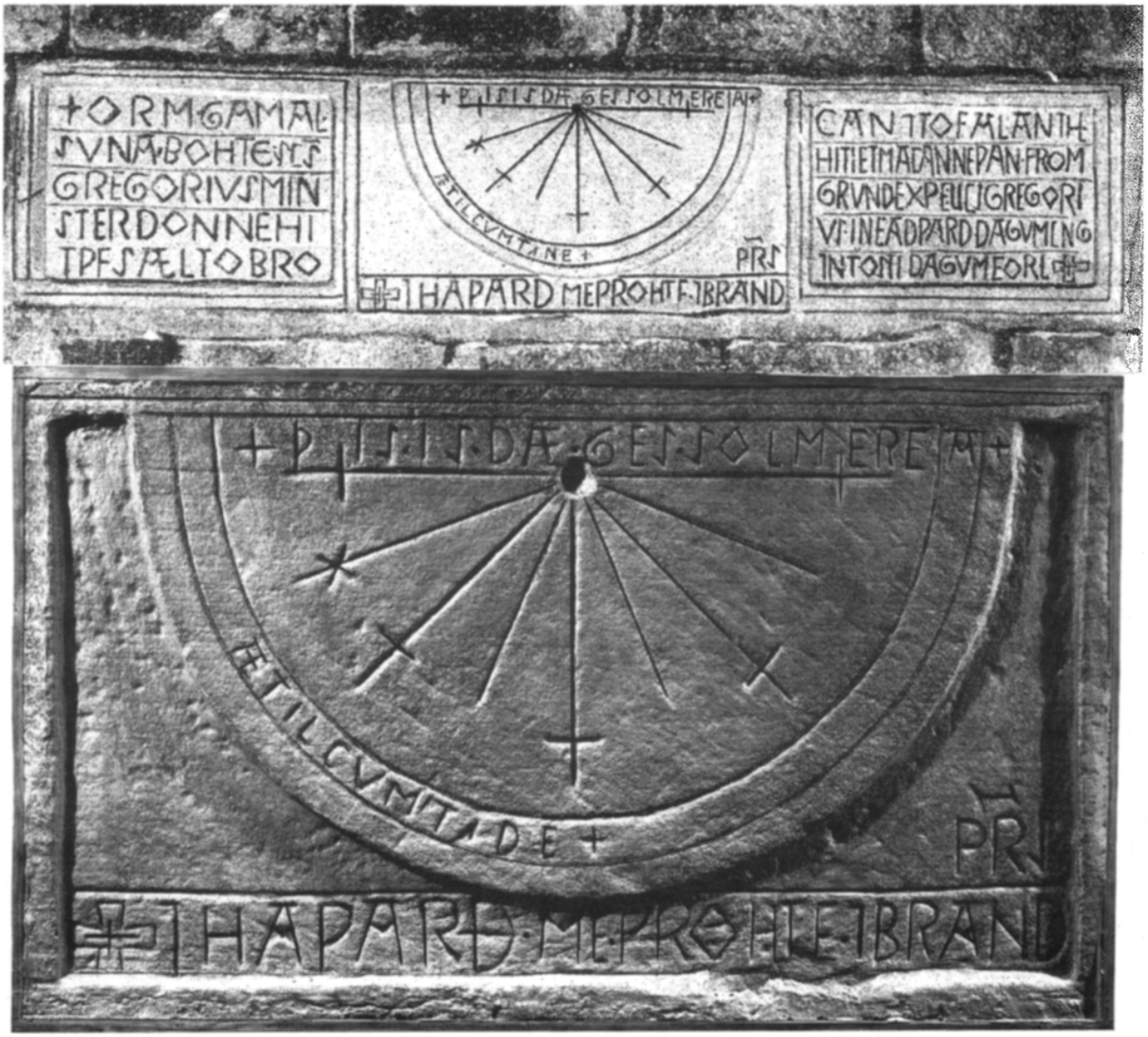


FIGURE 8: The Saxon sundial in the central panel, with an engraving of the whole inscribed stone above. Note that the engraver made a mistake in the substitution of letter N for the letter D in "TIDE". It is shown correctly in Mrs. Gatty's similarly engraved plate facing page 54

the instant of solar noon is always correct. The vertical plane dial also cannot indicate at all times the sun is shining, in summer the orientation of the dial in line with the plane from which it can receive the sun's rays occurs quite some time after the sun rises, and moves out of it some time before the sun sets. In winter the vertical plane dial is virtually useless because of the lack of a sharp shadow from a horizontal style, whilst the indications are wildly inaccurate.

Nevertheless it is also evident that even these rude solar instruments are of a higher technical content than the later so-called scratch, mass, or canonical dials which are often extremely crude in execution and indication. These appeared in the period following the Norman invasion and are evidently an import from the Continent. There are three mass dials at the 13th century priest's door in the modern chancel, see Figure 9 for two of them.

The Kirkdale dial itself does not appear to have been modified in any way, although there is some doubt about the two lines on either side of the noon mark, some effort was made to convert other Saxon dials from tide-indication to the duodecimal time system favoured by the Normans, those with three tide lines requiring trisection of each of the tide angles only to produce a semblance of hour lines (as at Bewcastle Cross), those with half-tide lines being a little more difficult if confusion was to be avoided. One solution was to divide the dial into 24 divisions to prevent the dial being mutilated beyond use, or even removed altogether. There is no evidence that any Saxon dial was ever made originally with duodecimal indications, these being of very little use with a horizontal style, and of little practical significance to the native observer in any case. No doubt those who made use of sundials so long ago had some mental formula to make sense of the whole matter, and at least these dials divided the day into two reasonably equal parts, with complete accuracy at solar noon. They served as time indicators rather than time division instruments. We also have to remember that the Saxons used the ancient unequal hours according to the Venerable Bede, which makes the observation of time from a Saxon sundial somewhat nebulous to a present-day observer.

The writer has never arrived at any satisfactory explanation to the problems which are involved, when comparing these Saxon dial indications with the equal

hours obtained by King Alfred from his employment of tallow candles burning in a horn lantern (according to his biographer Asser), and the sinking bowl method of measuring a period of time (anciently used by the Egyptians for irrigation periods, but which the writer doubts was ever used by the Saxons). Perhaps it is also prudent to bear in mind that for most people at that time, darkness meant an end to daily pursuits, there was no easy means of illumination for the poor, perhaps rush candles for the wealthier, and a fire curfew was imposed.

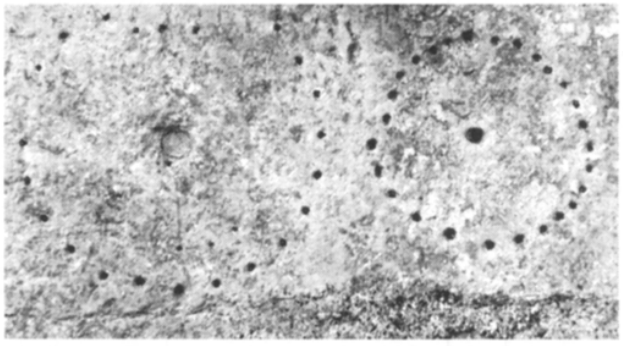


FIGURE 9: Two of the Mass Dials near the 13th century Priests' Door

COMMENTS

The Kirkdale sundial has been the centre of interest ever since its first discovery. Looking through his literature on dialling, the writer has found at least 12 articles on the Kirkdale dial alone, in one written by Mr. A. W. Millar in the 19th century, *Yorkshire Notes and Queries*, Volume 2, page 228, is the following:

"There is no gnomon on dial. The lettering is black on a grey stone, very distinct. The date is 1064 (Rickman). The stone of dial is a coffin lid reversed, the sculptured part hidden in wall. The dial is an eight hours one, which is, I am informed, a peculiar feature of Yorkshire dials ..."

Rather tersely expressed, but the statement about the coffin lid is in line with the writer's own view. It would seem that after the dial's discovery someone painted the lines and letters with black paint, there is no trace of it today. Often researchers would fill in the lines to improve the contrast in trying to decipher the inscriptions, as at Bewcastle Cross, and there was an outcry when a keen enthusiast used whitewash to improve the legibility. The paint always disappears in the fullness of time.

Some consider that the Anglo-Saxons derived their time division from the Norsemen, tide in this context has nothing to do with the sea, it is merely the Saxon term for time. We occasionally make use of their expressions even today in such phrases as noontide (noontime) and eventide. For future reference the list of Saxon tides given by the Reverend Haigh 1 is given here:

Saxon Tide	Present-day Mean Time	
Morgan	4.30 - 7.30 am	(7.30 am Saxon
Daeg-mael	7.30 - 10.30 am	start of day)
Mid-daeg	10.30 - 1.30 am - pm	
Ofanverthr-dagr ...	1.30 - 4.30 pm	
Mid-aften	4.30 - 7.30 pm	
Onverth-nott	7.30 - 10.30 pm	(Eventide)
Mid-niht	10.30 - 1.30 pm - am	
Ofanverth-not ...	1.30 - 4.30 am	

From this table one can see that the noon-line actually divides the midday tide, making the lines with crosses the mid-tide markers, and the minor lines the tide markers. This system allows Saxon sundials to be capable of the proclaimed function, "This is Day's Sun Marker at Every Tide", but half a tide period for the daytime (Mid-aften) is lost at the end of each day, and half a night tide period (Morgan) is indicated at the start. This system was disputed by A. J. Turner 2.

THE SAXON CHRONICLE

Since the article was drafted the writer has examined details in the collection of chronicles known as *The Saxon Chronicle*. The outline of history is given from AD 1, the various accounts either ending abruptly, or imperfectly, the last date being AD 1154. These accounts verify the details on the sundial and mention all the persons except Haward. A summary of the chronology of events from 1055 to 1066 is as follows:

1055 Tosty (Tosti), son of Earl Godwin given earldom of Earl Siward.

1056 Bishop Egelric resigned his Bishopric at Durham and retired to Peterborough Minster.

1057 Earl Leofric died (husband of Lady Godiva of Coventry).

1060 A great earthquake on the translation of St. Martin.

1061 Bishop Aldred went to Rome to receive his pall (symbol of office) from Pope Nicholas, Earl Tosty and his wife also visited Rome.

1063 Earl Harold and his brother Earl Tosty subdued the Welsh people.

1065 The Thanes in Yorkshire outlawed their Earl Tosty, he went overseas to stay with Earl Baldwin. King Edward went to Westminster to consecrate the Abbey on Childermasday, he died on the twelfth day and was the first to be buried there. Earl Harold hallowed king. (From other reports it seems that King Edward was too ill to attend the Consecration Ceremony of the Abbey he had built near the Palace of Westminster).

1066 On the eighth day before the calends of May (23rd April) a bright star with a tail appeared (Halley's Comet) and shone all week. Tosty returned to the Isle of Wight to plunder the south coast to Sandwich. Harold set off to Sandwich and Tosty went to the Humber, was driven out to Scotland where he met Harold, king of Norway and submitted to him. Returning to England they sailed up the Ouse to York. Moving southwards they were confronted by King Harold at Stamfordbridge, where King Harold of Norway and Earl Tosty were both slain. Meanwhile of Normandy landed at Pevensey beach on the eve of Michaelmass, and constructed a castle at Hastings. King Harold and two of his brothers were slain in the later battle. On mid-winter's day William was crowned king at Westminster by Archbishop Alred, Archbishop of York. Leofric, Abbot of Peterborough, who had been in the battle against William, sickened and died at home on Allhallow-mass night. The monks then chose Provost Brand for Abbot, as he was a good

man and very wise. He was sent to Edgar Etheling whom the people thought should be king, thus angering King William, however men spoke on behalf of Provost Brand, he and the king were reconciled, aided by the gift of forty marks of gold from Provost Brand to King William.

1069 This year died Brand, Abbot of Peterborough, on the fifth day before the Calends of December. (26th November 1069).

* * * * * *

REFERENCES

1 HAIGH, Reverend D, H. "Yorkshire Dials". *The Yorkshire Archeological and Topographical Journal.* Volume 5, pages 134-222, plus diagrams. This was long regarded as the definitive treatment on the dials of Yorkshire, it must be regarded as being impermeated with conjecture. York, 1879.

2 TURNER, A. J. "Anglo-Saxon Sun-Dials and the 'Tidal' or 'Octaval' System of Time Measurement". *Antiquarian Horology*, XV, no 1, 76-7. An interesting discussion on time systems in use in Anglo-Saxon England. A very scholastic essay but using negative proofs. September 1984.

* * * * * *

BIBLIOGRAPHY

BROOKE, J. C. "Saxon inscriptions on the church at Kirkdale in Ryedale", *Archaeologia*, Vol 5, pp 118-205, London, 1779.

EASTMEAD, W. *Historia Rievallensis*, pp 357 ff, Cambridge, 1824.

TUDOR, C. L. R. "A Brief Description of Kirkdale Church", with plans, elevations and sections, London, 1876.

FRANK, G. *Ryedale and North Yorkshire Antiquities*, pp 135-143, York, 1888.

TAYLOR, R. V. "Yorkshire Dials - Celebrated Yorkshire Dials". *Old Yorkshire*. Original Series, Volume 1, pages 144-155, c. 1896. This deals with scratch dials, but it mentions a few other types such as the dial on Haworth church presented by Mr. Richard Lloyde of Stanbury in 1726. Most of the outline is taken from "Yorkshire Dials" by the Reverend D. H. Haigh in 1894.

EDEN, H. K. F. and LLOYD, E. *The Book of Sun-Dials*, London, 1900. Brief mention of Kirkdale on p 18, fuller treatment, with illustration, pp 54-5.

POWELL, F. W. *A Short Account of St. Gregory's Minster*, Kirkdale, Leeds, 1909. This gives details of the last restoration of St. Gregory's Minster.

TAYLOR, J. and H. M. *Anglo-Saxon Architecture*, Cambridge, 1965.

PENN, Arthur. *St. Gregory's Minster Kirkdale*, first published 1957, revised and reprinted many times. The last version was produced in 1990 by Richard Fletcher, Senior Lecturer in History, University of York, and published by the Parochial Church Council. On sale in St. Gregory's Minster.

There have been numerous articles on the Kirkdale sundial but there are too many to list here, they are mostly written to meet the popular taste in County magazines.

APPENDIX

If you are interested in the preservation of this beautiful expression of the Christian Faith you can become a Friend of St. Gregory's Minster, Kirkdale, for an annual subscription (£2 in 1992, Life Membership £30, Senior Citizens half-price). A certificate is given, plus a newsletter once a year.

Sir Herbert Read (1893-1968), the well known English poet and art critic, was born near Kirby Mooorside and baptized in St. Gregory's Minster. He spent his early years at Muscoate Grange at Kirkdale. In his autobiography he mentions his recollections of attending the church services at Kirkdale around 1900. In his work *A World within a World*, a collection of his poems, is one entitled "Kirkdale":

KIRKDALE

I, Orme the son of Gamel
Found these fractured stones
Starting out of the fragrant thicket.
The river bed was dry.

The rooftrees baked and bleached,
Nettles in the nave and aisleways,
On the altar an owl's cast
And a feather from a wild dove's wing.

There was peace in the valley:
Far into the eastern sea
The foe had gone, leaving death and ruin
And a longing for the priest's solace.

Fast the feather lay
Like a sulky jewel in my head
Till I knew it had fallen in a holy place
Therefore I raised these grey stones up again.

SIR HERBERT READ

* * * * * *

Such were Sir Herbert Read's feelings for Kirkdale that he chose to be buried in the churchyard of St. Gregory's Minster, yet in his poem is no mention of the sundial which makes St. Gregory's Minster a focal point in the world of dialling. Without this sundial, few would know of St. Gregory's Minster.

The parish of Kirkdale today has a population of about 1600 and comprises the hamlets and villages of Beadlam (part of), Muscoates, Nawton, Welburn and Wombleton. Shipham Moor marks the northern boundary and the river Riccal the southern boundary of this scattered parish.

To complete the picture, there is an oil painting of St. Gregory in the church which appears to be a copy of a major work. The origin of the painting and the painter himself is not known. Together with the other interesting features to be found in St Gregory's Minster, this site is worth devoting a half-day or more to its study. A packed lunch with a bottle of wine is recommended for an alfresco meal but a good lunch can be obtained in nearby Kirkbymoorside.

A POLARIZED SKYLIGHT SUNDIAL

DAVID COLCHESTER
SYDNEY, NEW SOUTH WALES

INTRODUCTION

When light from blue sky is viewed through Polaroid sunglasses it is found that the amount of light the glasses transmit varies with the orientation of the glasses and the part of the sky being viewed. In other words the amount of skylight that is polarized and the plane of its polarization varies from place to place over the whole sky. If the whole sky is systematically scanned in this way it will show that:

1. The sky is most strongly polarized in a band 90° from the sun and stretching across the sky from horizon to horizon.
2. In a plane perpendicular to the line of sight the direction of maximum polarization is towards (or away from) the sun.

Because these orientation properties of polarized skylight are controlled by the sun's position they will change throughout the day as the sun makes its daily trek across the sky. As the direction of maximum polarization is always directed towards (or away from) the sun, this property of polarized skylight can be used in the same way to tell the time as a shadow is used in other sundials. In the region of sky containing the celestial pole the direction of maximum polarization will rotate at a rate of 15° per hour, with the position of local apparent noon being vertical.

CONSTRUCTION OF A POLARIZED SKYLIGHT SUNDIAL

A polarized skylight sundial can be simply constructed from cardboard and a piece of polaroid. The Polaroid Corporation supply plastic Polaroid® sheets which may be trimmed or shaped with scissors or a sharp knife. The sundial consists of a polaroid window set in a disc of cardboard fixed to the end of a short sighting tube aimed at the celestial pole. The window is fixed to the end of the sighting tube in such a way as to allow it to be rotated and aligned in the direction of maximum polarization. The time is read from the alignment of a reference mark fixed to the rotating window with 15° radial hour lines fixed to the stationary sighting tube.

The window is made from a small square of polaroid sheet, one side of which is parallel to the polarizing direction. This square is cut diagonally and one half reversed (figure 1). The reason for this is because gauging the position of maximum absorption (i.e. maximum polarization) is not very precise. However, in this arrangement the window is correctly aligned when both halves transmit light of equal intensity. This can be done very precisely.

The window holder is made from three discs of cardboard (figure 2). The window itself is set in disc 2 and held there by being sandwiched between discs 1 and 3. Disc 1 is glued to disc 2 but disc 3 is free to rotate. Disc 3 is held in place against disc 2 by two sets of four small tabs of cardboard glued to the lugs extending from the circumference of disc 2. The first set of tabs lie flush with the circumference of disc 3 while the second set overlap the edge of it (figure 3). Central apertures cut in discs 1 and 2 expose the window to view. One of the lugs on disc 2, longer than the rest has a reference line drawn on it against which the time is read from the hour lines marked on disc 3.

Disc 3 of the window holder is glued to the sighting tube which is made of a short length of cardboard tube from for example, the tube out of an empty lunch wrap carton. To position the sundial align the axis of the tube parallel to the earth's axis (figure 4). For high latitudes, where the celestial pole is high in the sky sighting up the tube is made more convenient using a small mirror. The sighting tube is not strictly necessary but it does protect the window from stray reflected light allowing the transmitted light through the window to be viewed with less interference.

SOME PROPERTIES OF POLARIZED SKYLIGHT SUNDIALS

Perhaps the most useful property of this type of sundial is that it will operate when the sun is below the horizon, a distinction from all other sundials. In fact the sundial is at its most 'sensitive' when the sun is low in the sky. It will operate successfully in cloudy conditions as long as there is a small patch of clear sky in the region of the celestial pole. This is another useful property. Only a small patch of sky around the celestial pole needs to be visible in contrast to a large expanse of sky needed for other sundials. If the axis of the sundial is positioned vertically it will indicate the sun's azimuth and in this mode becomes a sun compass. If the polarizing window in the set up just described, is rotated a full circle, four positions will be noticed when both halves of the polarizing window transmit light of equal intensity. Thus it is important that when in use the reference line points eastward in the morning, around vertical in the middle of the day and towards the west in the afternoon and evening.

As with all types of sundials, polarized skylight sundials are readily adaptable to a variety of designs limited only by the ingenuity of the diallist. For example polarizing windows made up of a rosette of Polaroid segments arranged in a circle with each segment having a different polarizing direction and incorporating birefringent film such as cellophane offer some intriguing possibilities.

HISTORY OF POLARIZED SKYLIGHT SUNDIALS

Polarized skylight sundials have a legendary origin in the form of a sun compass. Ancient Norse mariners are supposed to have used a 'sunstone' to help them navigate in cloudy weather. It has been suggested that sunstone was a piece of the mineral cordierite. This mineral is pleochrotic, a property that causes light vibrating in one direction to be preferentially absorbed with respect to light vibrating at right angles. Polaroid works on this principle. By viewing a patch of clear sky near the zenith sky through a piece of cordierite crystal and turning it to the position of maximum absorption the old Norse mariners could locate the direction of the sun hidden by clouds.

D.J.F. Arago first reported that skylight was polarized in 1809, but it was not for another 39 years that Professor Wheatstone suggested this property could be used to tell the time. He made this suggestion in a report to the British Association for 1848 (p.10-12). In Frank Cousins' book on

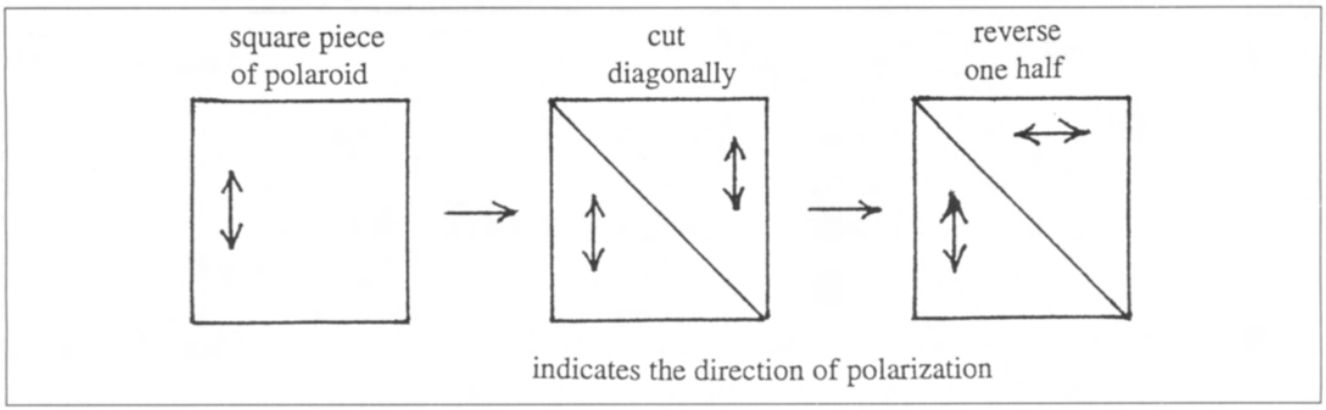


FIGURE 1: The Polaroid Window

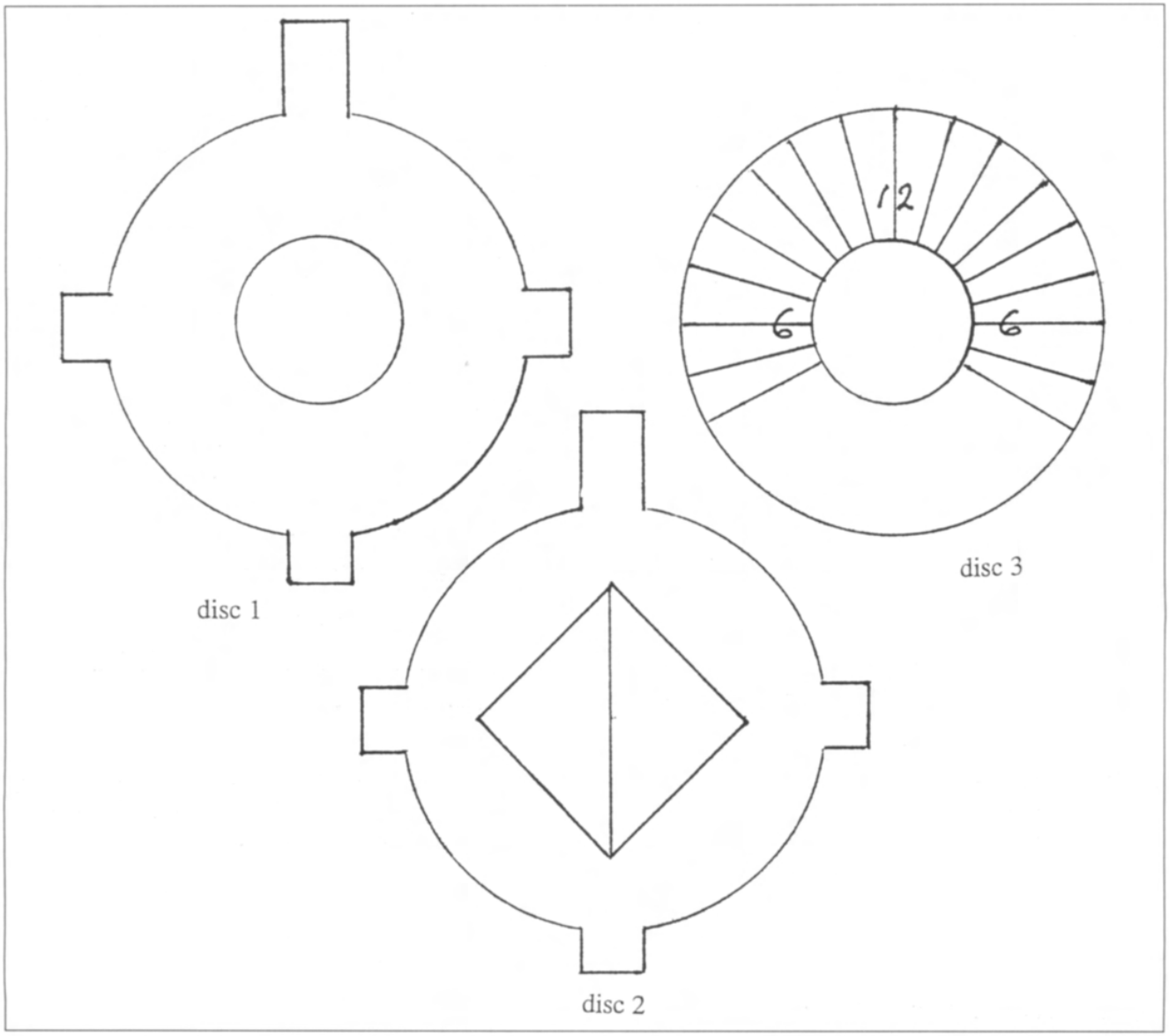


FIGURE 2: Parts of the window holder

Sundials there is a photograph of Wheatstone's 'polar clock' on p.67. These two references are the only ones I know of regarding this method of time keeping.

In Wheatstone's day polarized light was usually detected using a 'Nicol prism' a rather expensive and awkward device to use. This is the probable reason why polarized skylight sundials never became prevalent. With the use of Polaroid for the detection and observation of polarized light, polarized skylight sundials can now be part of every diallist's collection.

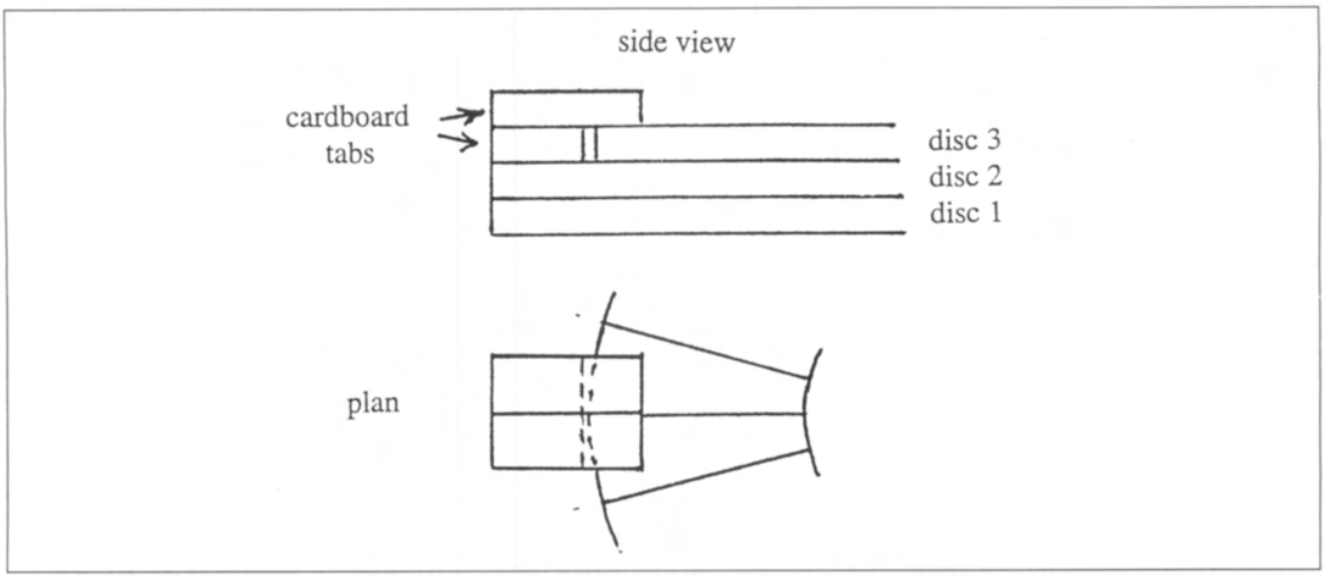


FIGURE 3: Method of assembling window holder

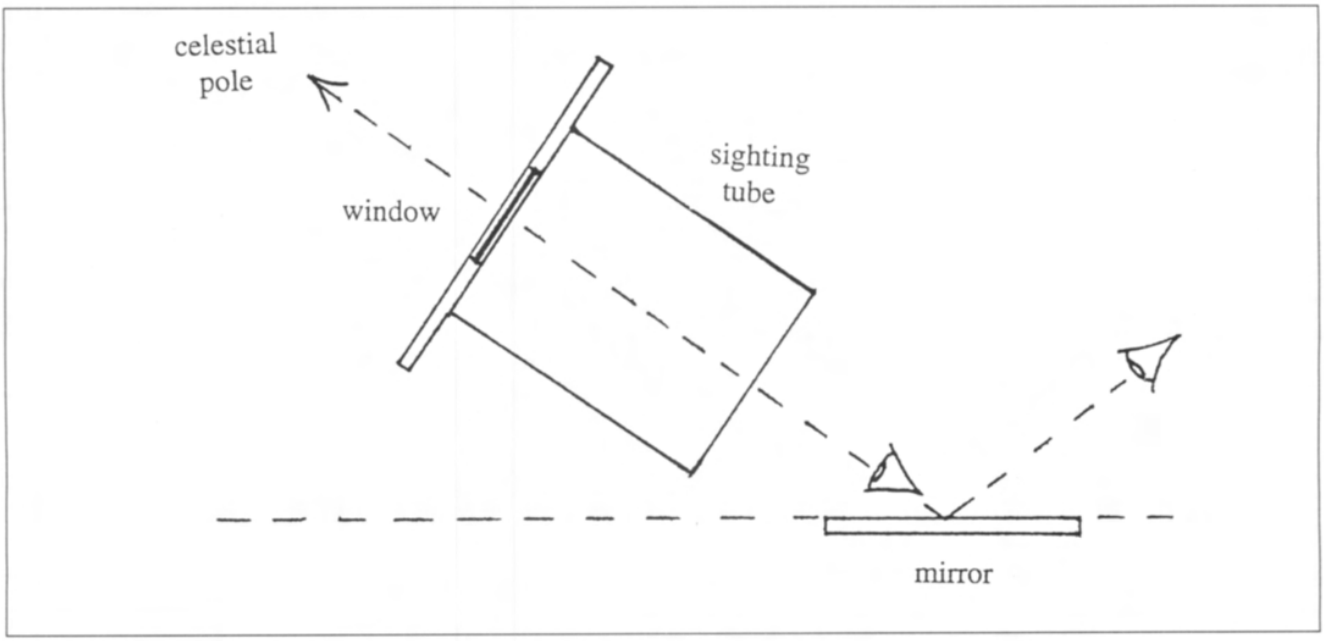


FIGURE 4: The polarized skylight sundial positioned for use

EDITOR: The instrument on page 67 of Cousin's Book is a "Solar Chronometer", see front cover of Bulletin 93.1 and page 30. This uses the sun's image and has to be set for latitude and the sun's declination, hence it is not using polarized light. The "Polar Clock" is described on page 66 of Cousin's book but not illustrated.

THE CROSS DIAL AT BRAMDEAN (Continued from page 20)

Here the west face and dimensions of the dial are shown with the numbers and hour lines that can be distinguished.

The dial is situated at grid reference SU 609278, and the latitude of the dial is 51° 3' north. Since the gnomon must point to the north celestial pole this means that the edges BA, CD, HE, IJ, ... must be inclined at an angle equal to the angle of latitude. Checking this:

$$\tan \phi = SF/FH = (21+7)/(13{\cdot}5+9{\cdot}5)$$
$$= 28/23$$
$$\phi = 51°$$

The only other cross dial listed in the Sundial Register is in the churchyard at Tallreuddyn near Barmouth (it is this one that was illustrated on the cigarette card).

MORE THOUGHTS ON MOONDIALS

DENIS SCHNEIDER, FRANCE

My interest in moondials goes back a long way, and started when I was a dialling novice. I had read Bion[1] and was perplexed about a solution of his (see the diagram in BSS 95.2 - Figure 3, p. 33 and Figure 1 of this article). In fact the hour and moon circles should be centred on that of the dotted circle and not on the point where the style penetrates the dial plate. This dotted circle is the outline of the auxiliary dial shown on the dial face. To turn the plane into a classic horizontal dial other than at the Pole causes errors to arise and gives no corrections. It is necessary to have special dials with equiangular divisions and without declination (Michnik's bifilar sundial - equant dial).

In fact Bion copied the solution of Dom Pierre Sainte Magdelaine's solution[10] which has been commented upon by L. Janin.[5] The past President of the "Commission Cadrans Solaires" of the "Societe Astronomique de France", R. Sagot, assured me in 1985 that my conclusions were correct. The novice I was then began to develop self-confidence, and I researched a great number of documents on moondials. Rear-Admiral G. Fantoni[3] also observed this error (BSS Bulletin 92.1, p. 12). L. Janin is incorrect about Welper[11]: equal divisions for the moon's age instead of proportional divisions are no better.

Comparing an English version (P. Drinkwater - *First Book of Solar Horology*[2] - Proposition XIX, pp. 27-28, and an Italian version, reported from a translation by Cosimo Bartoli[4] (BSS Bulletin 92.1, Figure 4, p. 12), in respect of Oronce Finé's moondial; I came to the conclusion that the English version shows a correct diagram and an incorrect explanation, whilst the Italian version shows an incorrect diagram and a correct explanation. By juggling these two it is possible to have a correct solution from two erroneous ones. Rear-Admiral G. Fantoni wrote to me to confirm that I was correct in my view.

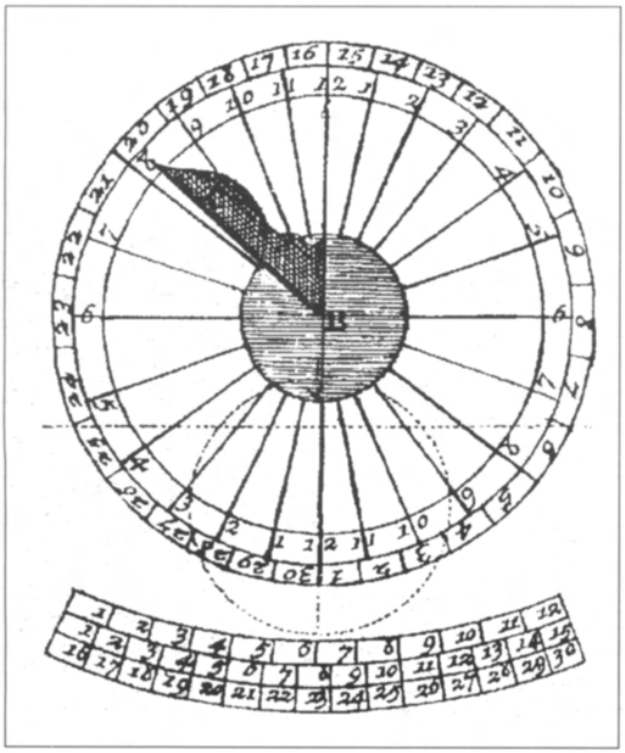


FIGURE 1

Was it possible that I was still correct in comparison with A. Kircher[6]? (See Figure 2.) In 1990 I corresponded with the late Andrew R. Somerville but he did not have the time to spare to give me his opinion regarding the anomalies I had discovered in Kircher's account of moondials. His wife, Anne Somerville then had the kindness to forward my letter to the late George Higgs. He agreed with my findings but could not believe that our conclusions were correct with regard to Kircher (see BSS Bulletin 95.2, Figure 7, p. 35).

Reading Kircher's text, we may suppose he did not recognize the symmetry in the ages of the moon (4-19; 5-20 ...) after the New Moon or Full Moon. Kircher drew two diagrams, disassociating that for increasing age for the Moon from that for decreasing age of the Moon, so as to make it clearer than to put all the information in one diagram. Moreover he obliged his reader to turn the moondial through a half-turn, according to the increase or decrease of the Moon's age in order to create an aesthetic symmetry above and below, without discontinuity in the southern sectors; although the main part is never touched by the shadow of the style.

However southern sectors may be employed to discover in what hour angle the Moon is, knowing the solar hour and the age of the Moon. The solar hour is read and conveyed to the pertinent concentric circle of the age of the Moon. Then the approximate position of the Moon may be read in the outer circle (solar hour). Southern sectors would act as a solar-lunar calculator, and not as a lunar-solar dial.

Alas, the fact is that at the start of the increasing age of the Moon, Kircher used the West sector of the dial, and at the start of the decreasing age of the Moon used the East sector, revealing the inversion of the relevant sectors. Indeed, with the waxing Moon, the Moon shadow will be seen from sunset to moonset. Antemeridian lunar hours are marked by the lunar shadow only after the first quarter of the Moon. With a waning Moon, the lunar shadow is visible from moonrise to sunrise. Post-meridian lunar hours are only necessary around the 15th day (Full Moon), then less and less in proportion as the Moon's phase increases in age. To establish the correct sectors, East must be for the increasing Moon, and West for the decreasing Moon; we must:

1. Either transpose Kircher's figure right to left with the presentation of the hours from midday.
2. Or, give half a turn to the right of the figure, together with the words "Luna Crescent" and "Luna Decrescent" transposed, and of course, the days of the Moon's age.

Either of these operations correctly orientates the sectors over which the shadow of the style passes when exposed to moonlight (see Figure 2).

There is a Lithuanian moondial, dated 1781, in the Historical and Ethnographic Museum, Vilnius, which does not require to be given half a turn at Full Moon, but has, alas, copied the Kircher error, see Figure 3.

Another curious example of the moon shadow over the incorrect sector is shown in the painting by Paul Delvaux - "Les Phases de la Lune, 1939" - "The Phases of the Moon". He shows a crescent Moon about three days old, which produces a shadow of the style at approximately 7 am!

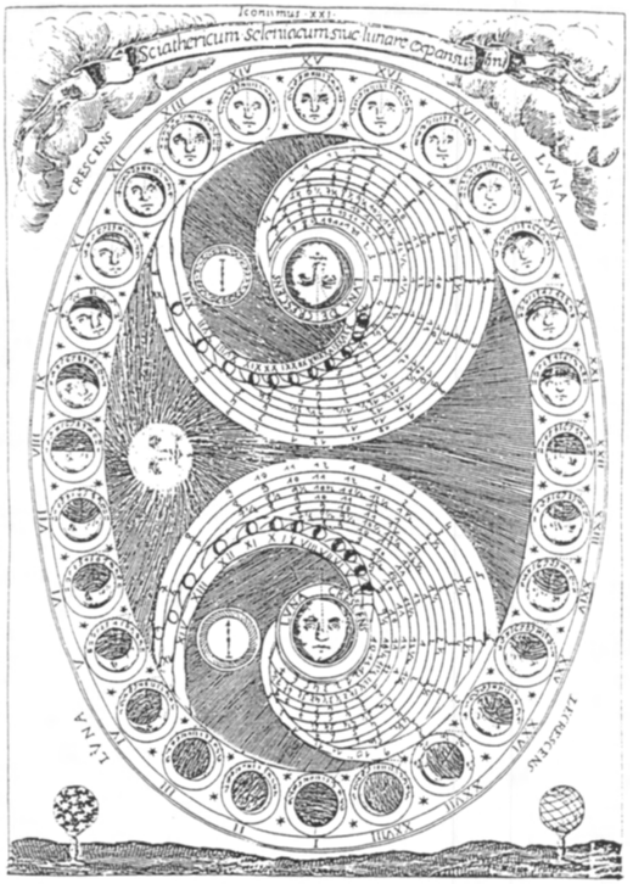


FIGURE 2

unless it is in the Southern Hemisphere - 17.00 hours. Not only that but the light from the moon is very bright for the age of the Moon and the inclination away from the dial. No doubt the artist was a surrealist, see Figure 4, with stars actually shining through the dark body of the moon and the dial divided into 8 sectors of uncertain angular displacement.

But to end with Kircher, he states that to find solar hours from lunar shadows, his reader should consult his *Pragmatia I*, Figure 5. Fortunately he does it differently! And why, in his elliptical disposition of 28 small circular dials, does he not draw the correct number of 30 for the complete cycle of the lunar phases? Finally, on the 3rd, 4th, and 25th days of the age of the Moon, he omits the forward progression of one hour of all the numbers. (Editor: It will be very difficult to sec this in the reproduced figure shown here).

Fortunately, other authors have proposed better solutions for moon dials other than equatorial types. Rene R.-J. Rohr[9] has written about Ozanam's[7] and Bonfa's[8] solutions (see BSS Bulletin 95.2, Figure 4, p. 33 and Figure 6, p. 34). It seems to me that Ozanam's parallels are better for vertical dials, and Bonfa's concentric circles for horizontal dials.

Henry Wynne (second half 17th century) used 15 almost complete circles corresponding to the age of the Moon from 1-15 and 16-30; on his dial at Drumlanrig Castle in Scotland. Actually there are two dials here, the second of which may also be by Wynne also. Instead of aligning solar hours and half hours for the moon-shadows at each age of the Moon, Wynne has engraved full solar hours for each phase in the cycle, creating anti-clockwise spirals of corresponding hours, thanks to the addition of twelve minutes to make up the next full hour. By joining up the corresponding points of similar values, clockwise spirals are obtained, (XII - for example - see Figure 6).

More recently Rear-Admiral G. Fantoni has shown the neatest solution, with only the required scales of hours shown according to the sufficiency of the moonlight, see BSS Bulletin 92.1, pp. 11-15.

René R.-J. Rohr has written that the moondial is the dial of lovers, probably because the night belongs to those who have no need of the precision timekeeping of clocks. Certainly few of these will want me to put more precision into moondials, and who knows, it may be that some of my readers may become lovers of moondials as well as moondial lovers!

REFERENCES

1. Bion, N., *Construction des Instruments de Mathematiques*, Paris, 1709.
2. Drinkwater, P. I., *Oronce Finé's First Book of Solar Horology*, interpreted into English from the Latin copy of 1560.
3. Fantoni, G ., "Moondials", BSS Bulletin 92.1, pp. 11-15.
4. Fineo, O., *Libro Primo*, Cap. XIX, pp. 36-37, Venetia,

FIGURE 3

FIGURE 4

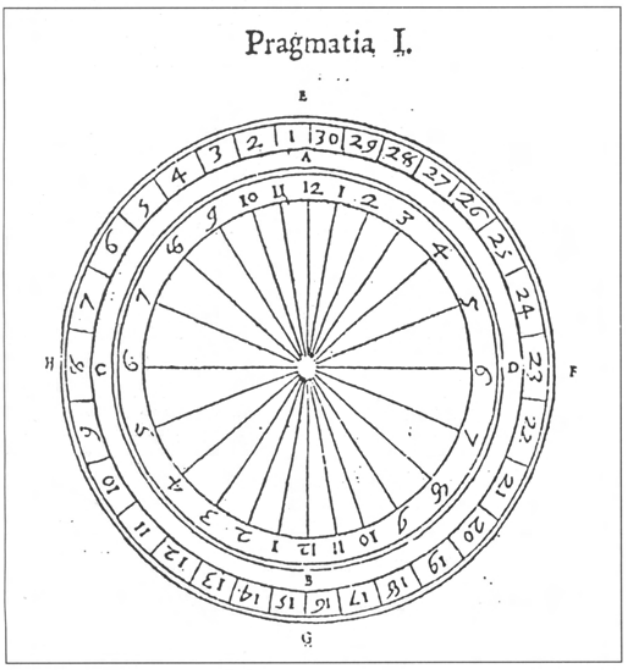


FIGURE 5

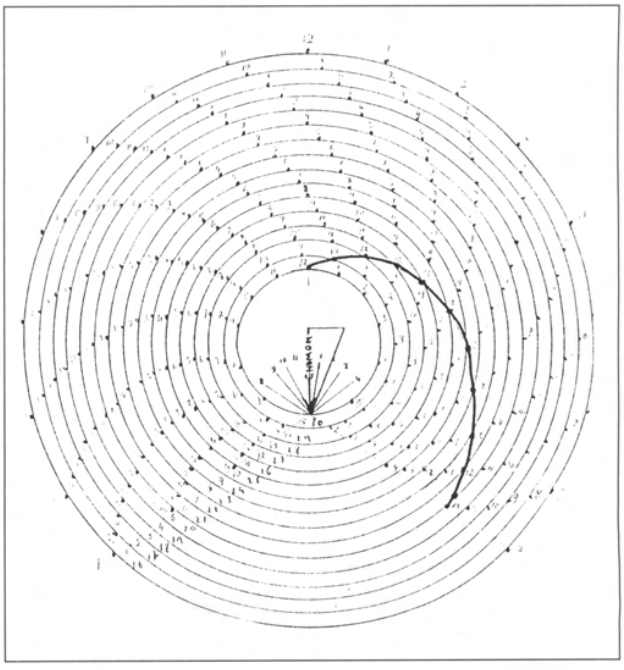


FIGURE 6: Drumlanrig Moon Dials

1587.

5. Janin, L., "Le Cadran Lunaire", *Orion*, No. 140, pp. 3-11, 1974.
6. Kircher, A., *Ars Magna Lucis et Umbrae*, Rome, 1646.
7. Ozanam, J., *Cours de Mathématiques. Traité de Gnomonique*, Paris, 1693.
8. Rey Pailhade de, J., *et al*, "Le Cadran Solaire du Lycée de Jeunes Filles de Grenoble, 1821", *Bulletin de la Societe Scientifique de l'Isère*, Vol. 42, Grenoble, 1921.
9. Rohr, René R.J., "On Lunar Nomograms", BSS Bulletin 95.2, pp. 30-35.
10. Sainte Marie Magdelaine, Pierre de, *Horologiographie*, Paris 1645.
11. Welper, *Gnomonica*, Nuremburg, 1708.

MOON CORRECT ION TABLES

Choice of corrections in Moon tables:

The delay of the Moon with the Sun may be assimilated to the complement (12 hours minus delay), which will be the advance of the Moon with in comparison to the Sun. Thus 0h 48m delay of the Moon on the Sun on the first day of the Moon after the New Moon, may also be considered as an 11h 12m advance of the Moon on the Sun. Adding 0h 48m to the lunar hour, or subtracting 11h 12m, does not change the result (for a 12 + 12 clock hour system) .

In other respects, depending upon whether you want corrections before or after the New Moon, and the disposition of the Moon's age in the tables, you must change the sign of the correction as appropriate. See the attached tables and make your own personal choice.

Corrections to add or subtract from the lunar hour indication - according to the age of the Moon before or after the New Moon (NM) or Full Moon (FM) indicated in the Queens' College Dial, Cambridge, table below the dial are shown in Table IA, and from the reverse sequence of the lower rows shown in Table IB.

A: Corrections involving only one operation, either add or subtract to lunar indication to obtain solar hour.

1 & 3 Corrections to add to lunar hour
2 & 4 Corrections to subtract from lunar hour

B: Corrections, identical for the top and bottom rows, but with inverse signs.

1 Corrections: to add to lunar hour from 1st to 15th day
to subtract from lunar hour from 16th to 29th day

2 Corrections: to subtract from lunar hour from 1st to 15th day
to add to lunar hour from 16th to 29th day

3 Corrections: to add to lunar hour from 1st to 15th day
to subtract from lunar hour from 16th to 29th day

4 Corrections: to subtract from lunar hour from 1st to 15th day
to add to lunar hour from 16th to 29th day

For Lunar-Solar dials, please do not repeat errors three hundred or more years old!

TABLE A1

Days after New Moon

NM +

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
048	136	224	312	40	448	536	624	712	80	848	936	1024	1112	120
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

TABLE A2

Days before New Moon

NM -

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
048	136	224	312	40	448	536	624	712	80	848	936	1024	1112	120
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

TABLE A3

Days after Full Moon

FM +

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
048	136	224	312	40	448	536	624	712	80	848	936	1024	1112	120
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

TABLE A4

Days before Full Moon

FM -

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
048	136	224	312	40	448	536	624	712	80	848	936	1024	1112	120
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

TABLE B1

Days after New Moon

NM ±

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
048	136	224	312	40	448	536	624	712	80	848	936	1024	1112	120
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

TABLE B2

Days before New Moon

NM ∓

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
048	136	224	312	40	448	536	624	712	80	848	936	1024	1112	120
29	28	27	26	25	24	23	22	21	20	19	18	17	16	

TABLE B3

Days after Full Moon

FM ±

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
048	136	224	312	40	448	536	624	712	80	848	936	1024	1112	120
29	28	27	26	25	24	23	22	21	20	19	18	17	16	

TABLE B4

Days before Full Moon

FM ∓

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
048	136	224	312	40	448	536	624	712	80	848	936	1024	1112	120
29	28	27	26	25	24	23	22	21	20	19	18	17	16	

PORTABLE DIALS (Continued from page 5)

ACKNOWLEDGEMENTS

The author would like to thank the Instituto Geographico Militare, Florence, for permission to photograph the dial in Figures 3 and 4.

REFERENCES

1. Cowham, M. J. "Buying a Sundial", The Ten Commandments. *BSS Bulletin,* 93-3.
2. Instrument sale by Sotheby's, September 1995.
3. Moore, J., "London Dialmakers". *BSS Bulletin*, 95-1. Compass Dial by Porter.
4. Rohr, R. R. J. *Die Sonnenuhr.*

THE CROSS DIAL AT BRAMDEAN, HAMPSHIRE

PETER RANSOM

After the pre-Norman dials of Hampshire in the last edition of the Newsletter produced by Mr. Rans I was going to write about the post-Norman dials, or mass dials (sometimes called scratch dials) in this issue.

However, while visiting churches for these relics of time long passed I came across a stunning sundial that left me trembling with excitement when I saw it. Thus we take a quantum leap of a millennium from the dials of the Meonwaras of Saxon Hampshire to the Legges of Victorian Hampshire.

When I glanced round the church yard of St Simon and St Jude's Church at Bramdean I thought I had stumbled across a monument to a mathematician, as the dial looked like a hypercube unfolded to form a cross shaped polycube (see Salvador Dali's *Corpus Hypercubus* 1954 in Martin Gardener's Mathematical Carnival). On reflection it brought to mind a cross dial that I had seen illustrated on a cigarette card (no. 22 of Wills' "Old Sundials", 1928 does anybody have any of these cards they wish to pass on?), and although more complex it did indeed prove to be a rather fantastic sundial.

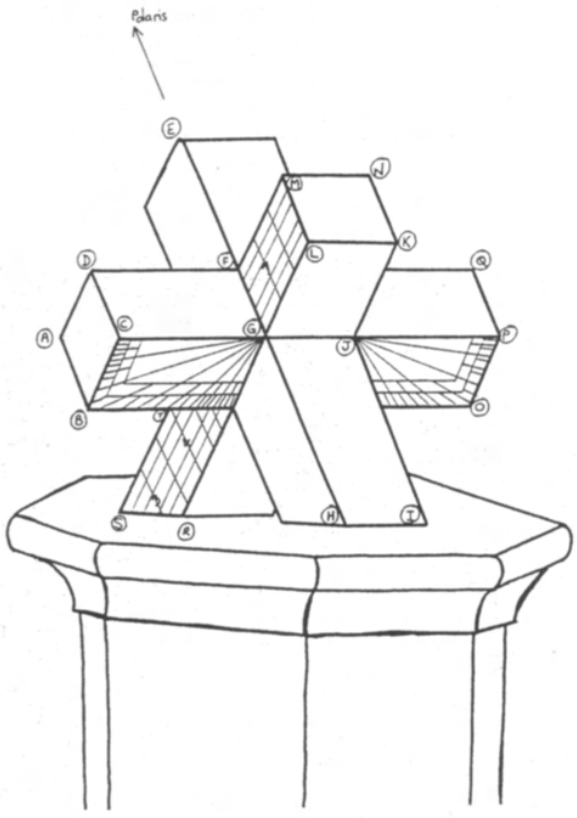


Figure 1: Cross Dial at Bramdean

The monument marks the grave of William Legge, MA (Does anybody have any information about him?), who died November 16th 1872. Dial and plinth (octagonal cross section, 112cm high) are both made from a white stone (limestone? alabaster?) which is obviously liked by the lichens. This obscures some of the detailed markings. At the same time the memorial has had iron railings around it, suggested by the stumps that remain, splayed out at the base.

The illustration is drawn from the angle that shows the clearest faces. The ones underneath the arms of the cross (faces BCG and JPO) have probably survived better since they have been protected from the effects of the weather. The faces TSR and FGLM face due west.

The novelty of this type of sundial is that the shadow is cast by the arms of the cross on the shaft. (In this example however the support arm through EFGHIJ provides extra gnomons.) This is achieved by having the edges BA, CD, HGFE, IJ, KN, PQ all pointing to the celestial north pole (Polaris, the north star, is close enough to this). At local noon therefore all faces are in total shadow, or total sun. As time passes the edge AB will start to cast a shadow on the shaft of the cross. By 4 o'clock it will have risen to the 4 line. At 6 o'clock the sun will illuminate all the face RST and FGLM. During the summer months the edge CD will then cast a shadow on the face FGLM as the evening advances. In the morning, as the sun rises, the edge PQ acts as the gnomon and casts a shadow on the face JKN until 6am. After that time the parallel edge through O casts the shadow on the shaft of the cross.

The planes through AVFQ and BCGJPO are parallel to the plane of the equator (nice bit of geometry there). Between the winter and vernal equinoxes the sun lies below this plane and so will also cause HG to act as a gnomon and cast a shadow on face BCG in the morning; in the afternoon IJ acts as the gnomon and JOP as the dial face. In the summer EF will act as the gnomon on face ADF in the morning and the corresponding line and plane on the other side will act as gnomon and dial in the afternoon. Unfortunately the weather and lichen mean no evidence is visible on the upper faces: I have no doubt that they once existed, KN and LM also acting as gnomons on the faces JPQ and CGFV respectively.

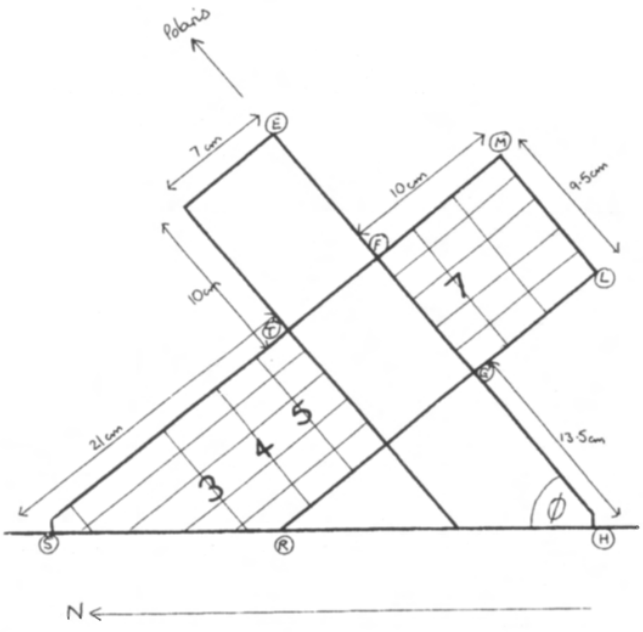


Figure 2: View of West Face

Continued on page 15 . . .

LIGHT DISPLAY SUNDIAL

AVRAHAM AVITZOUR (Har-adar, Israel)

MOTIVATION/PURPOSE OF THE DESIGN

The motivation for the design described below, came out of the ambition to have a sundial with a "hand" made of light (rather than shadow), together with hour scale and hour signs also marked by light patterns (rather than engraved or inscribed). Like most of the author's dials, time adjustability was also an important requirement.

THE BASIC DESIGN PRINCIPLE

The selected solution for the main requirement is the use of circular array of linear collimators, parallel to the earth axis, to produce moving illuminated hour mark - "a hand made of light". To make time adjustment possible, the said array must be based on equatorial basis - "the collimators wheel" (see Figure 1).

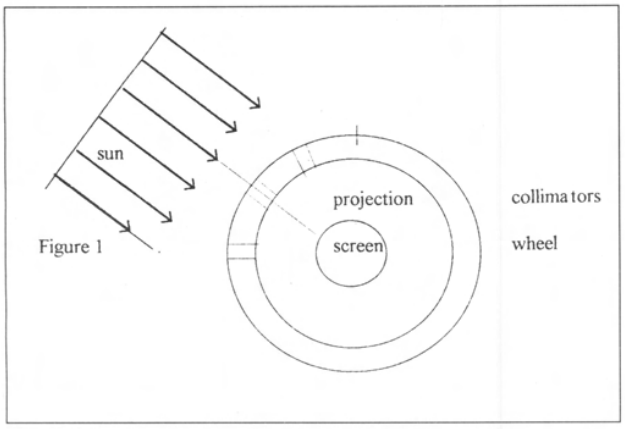


FIGURE 1

IMPLEMENTATION AND OPERATION OF COLLIMATORS WHEEL

- Number of collimators slits: in order to achieve adequate time resolution as well as relatively low complexity, the number of four collimators per hour was selected.
- Constructing the collimator: each one was implemented using two parallel slits, each of which is a gap between two short cylinders of brass (see Figure 2).

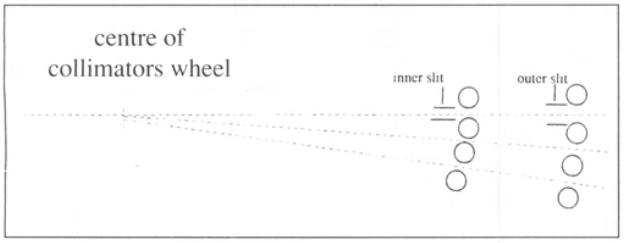


FIGURE 2

The outer slit (cylinders) is longer, so light is allowed through the upper part of the slit from wider angle range (see Figure 3).

Keep in mind that the sun rays are (almost) parallel and observe: The projected image of the upper part of the outer slits circle, is a time scale of hour quarters. The sun rays pass through a specific pair of slits - outer and inner,

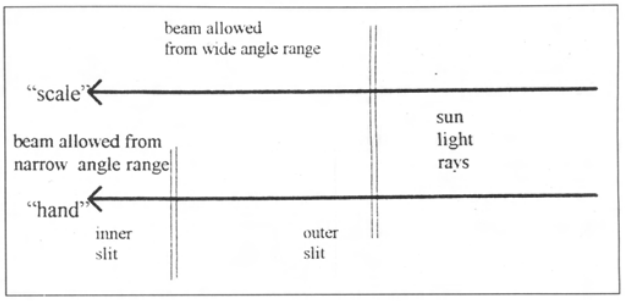


FIGURE 3

together (in series), is allowed only when that pair is in line with the sun direction in the equatorial plane (= hour angle). Those slits image is the "hand". Light through hollow hour (number) signs, located on top of the outer cylinders, is producing the hour number patterns projected on the screen, so the time display is complete.

THE PROJECTION SCREEN

The projection screen has to be a curved surface which (in principle) is concentric with the collimators wheel. While designing the screen shape, one must consider also the place the projected display of time will take - in all seasons.

Two types of projection screen were designed and built:

* *Cylindrical screen* - on a ball-mount to make the screen orientation changeable, for convenient reading of the hour in all sun positions (see Photo 1).

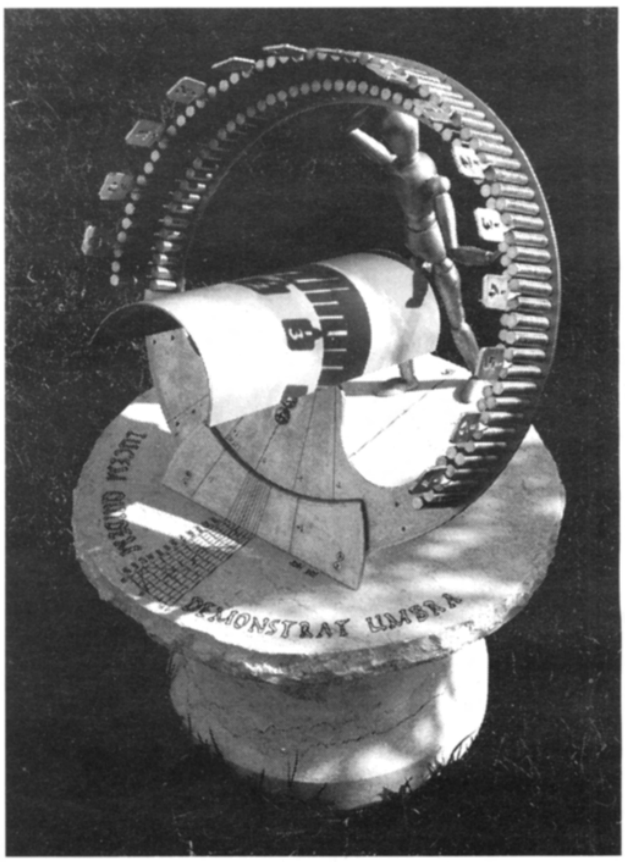


PHOTO 1

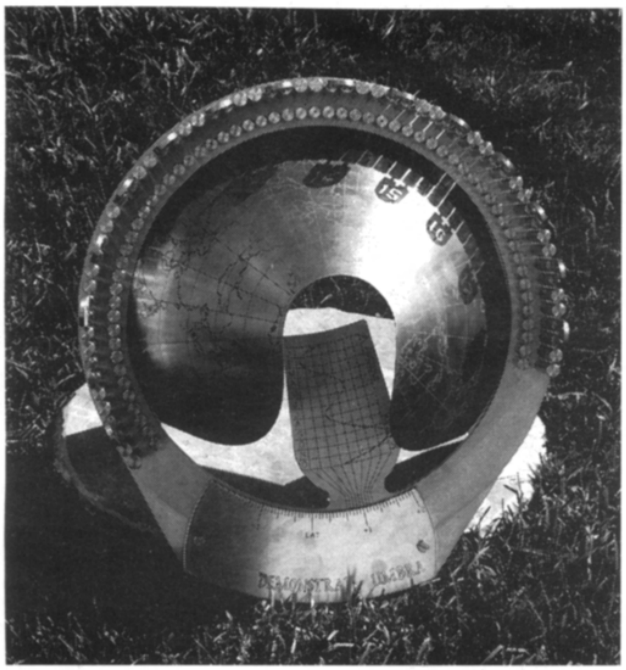


PHOTO 2A

PHOTO 2B

* *Conical screen* (fixed) - which is more clock-like in appearance and makes the reading of the hour from the front direction more convenient. A map of the northern hemisphere (Lambert conical projection) is located on the cone, so the light hand is showing also the temporary noon meridian. (The meridian on earth from which sun is observed at peak of its orbit.) (See Photo 2A and B.)

LOCATION OF THE SUNDIAL

The main options for posting the dial are:

- on a stand on the floor, looking up and north (as in the photographs).
- on a wall, looking down and south (conical screen only).

The first conical screen model - in brass implementation, was showed during the BSS Conference at West Dean College in the beginning of last May and is now located in the front garden of the Israeli Embassy in London.

THE SUNDIAL ON A WET DAY

THOMAS HARDY (1840-1928)

I drip, drip here
In Atlantic rain,
Falling like handfuls
Of winnowed grain,
Which, tear-like, down
My gnomon drain,
And dim my numerals
With their stain, -
Till I feel useless,
And wrought in vain!

And then I think
In my despair
That, though unseen,
He is still up there,
And may gaze out
Anywhen, anywhere;
Not to help clockmen
Quiz and compare,
But in kindness to let me
My trade declare.

NEWBURY MEETING MAY 1995

JAMES C. SLATER

As an exhibitor myself at the BSS meeting, I found the exhibits of the other members quite interesting and took a series of photographs of the various stands. It is not my intention to describe these here but to let the illustrations speak for themselves and demonstrate the wide variety of dialling interests displayed at these meetings. What the photographs cannot show is the wonderful spirit of camaraderie at these gatherings.

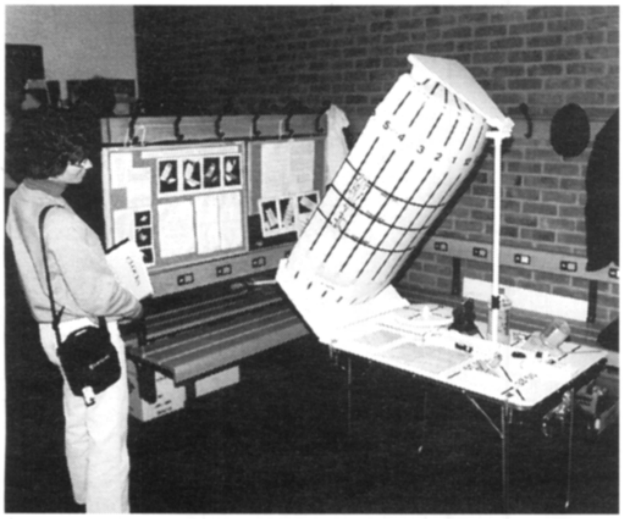


FIGURE 1: Maurice J. Kenn's Translucent Equatorial Dial

FIGURE 2: One of the individual display stands

FIGURE 3: Colin McVean's Noon Gun

FIGURE 4: Colin McVean's Dials and Devices

FIGURE 5: Another wide range of Dials and Devices

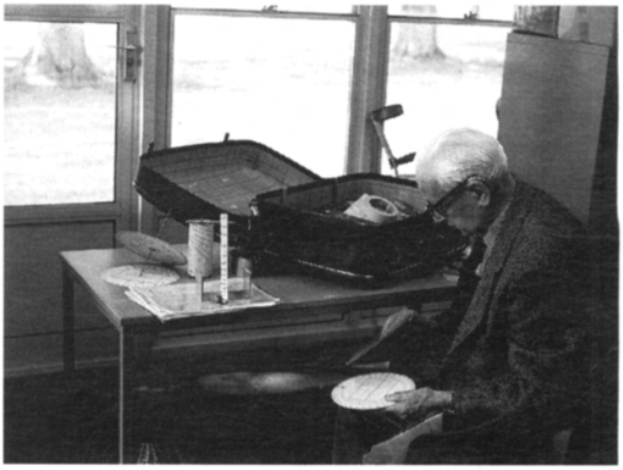


FIGURE 6: Robert Mills deliberating over his dials

EXHIBITS AT GRANTLEY HALL

COLIN McVEAN

The following is an outline of two of the exhibits which I displayed at the Conference held at Grantley Hall, April 1995.

STAR GLOBE

See Figure 1.

This was made from an old soda water machine and it rests on its original base. This base is centred on a painted plywood circular base with the signs of the Zodiac and points of the compass delineated in an annulus. The equatorial ring was cut from copper with a piercing saw and is strengthened by a ring made of marine ply. It is marked with divisions down to 5° intervals, and is supported on brass rod supports.

The globe is divided into 15° intervals of Longitude and 10° Latitude North and South of the Equator. The stars are marked with inset copper rivets and have their individual names engraved on the surface. A copper quadrant is employed to locate the stars.

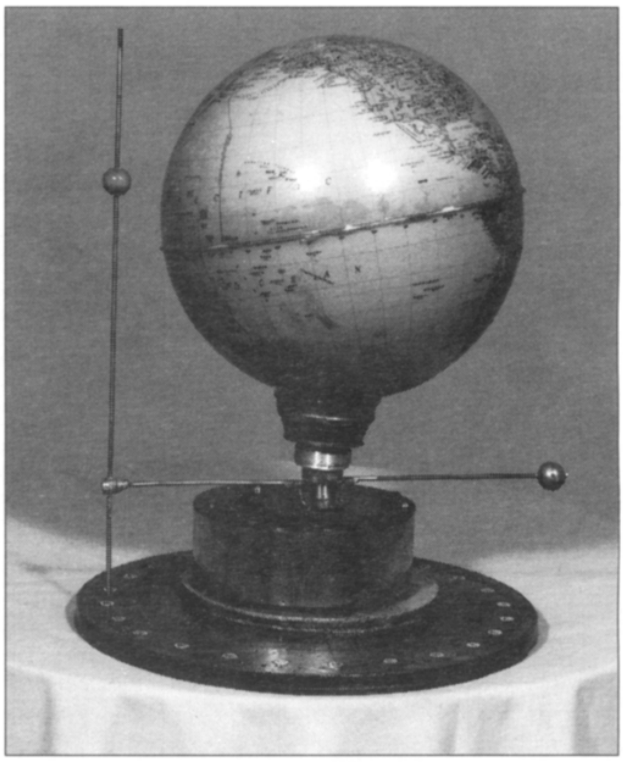
FIGURE 1: Star Globe with quadrant sector.

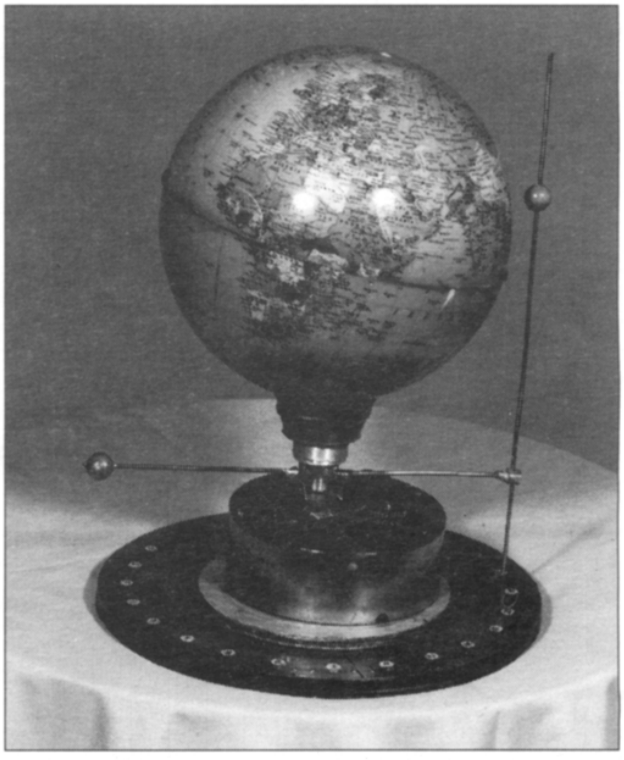
PTOLEMAIC MODEL OF EARTH AND SUN

See Figures 2 and 3.

The driving mechanism is an accurate eight-day clock from a piece of factory equipment used for some electrical function. It is fixed to a varnished plywood base marked at its periphery with the twenty-four hours marked with white inserts. Each hour is divided into 20 minute intervals.

The earth globe is supported on the winding arbor in a cast aluminium cup which was machined to its final dimensions. This allows the globe to be tilted in any desired direction. The bead representing the Sun is carried on a vertical rod attached to a counterpoised horizontal rod which is driven by the clock mechanism. It can be adjusted in height as required and the path of the sun may be shown by setting the globe to any desired declination. The bead may be adjusted to show the height of the sun above the horizon.





FIGURES 2 & 3: Ptolemaic Central Earth with Sun

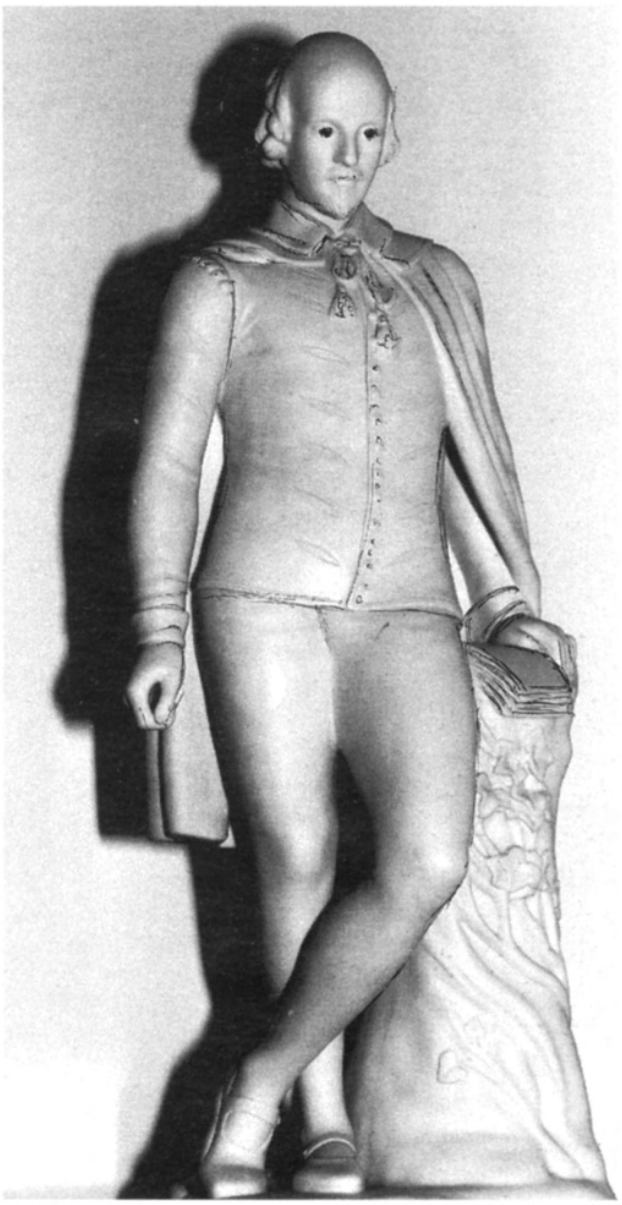
SHEPHERDS' SUNDIAL

C. M. LOWNE

Members may be interested in the following description of South Downs shepherds' sundials, from a book written by Barclay Wills,[1] the Sussex naturalist and artist. The passage is reprinted by permission of the publishers.

> Although I had read of dials cut in the turf in past days, I scarcely hoped to track down much information concerning them, but when Nelson Coppard told me of his life as a shepherd boy, and mentioned a dial cut in the turf for his use at Horton by Michael Blann, I followed the clue eagerly. At a later date Mr. Blann willingly gave me the details of dials which he made.
>
> He had no watch at that time (about sixty years ago), and could not afford to buy one, but he owned a little pocket compass, which he used in arranging the dials. It was quite a business to make this type of clock. His method was to select a flat place where the turf was short, and draw a circle about eighteen inches in diameter. A hole was made in the centre to hold the end of his crook stick. The stick was held perfectly upright, and where it threw its shadow at each hour cuts were made and turf removed - a narrow cut near the stick and widening a little towards the edge of the clock. Sometimes he walked a long way to be on the spot to mark a shadow line correctly at the hour. 'I had two or three of these clocks' he said, 'so that wherever I was I knew the time, if 'twas sunny'. On approaching a 'clock' he stood the crook stick in the hole, perfectly upright, and noted the time. He did not leave a permanent stick there, as it might have drawn attention to the spot. Sometimes the sheep fed over the clock, but if necessary he kept the turf clipped short for his own convenience.
>
> While chatting to George Humphrey at Findon Fair I happened to mention the matter to him, and gathered further information. 'Sundials?' he said. 'Yes, my father made one for me at Selsey, but not a turf one. He made it of clay brought from a distance, and arranged it on a bank. It was just like a clock face and he made it by using his watch and marking on the clay.' This dial not only had hour marks, but a mark for every quarter of an hour, and George used it constantly. The gnomon was not a stick, but a big nail. From this, rows of dots, pricked with the point of a nail, radiated to each division of the outer edge. The sun baked the clay hard, and the dial lasted well. Later his father improved on the dial by constructing a carefully finished one of the same kind in a cheese box and drying it well. This could be carried to any place where they were working, and having been placed in position correctly could be left until they moved to fresh ground.

A dial with a vertical gnomon (measuring the azimuth of the sun rather than the hour-angle) would of course be subject to large errors depending on changes in the sun's declination. For example, a mark laid out at 5 p.m. at the time of the spring equinox would be reached by the gnomon shadow at about 3.40 p.m. at the summer solstice (neglecting the change in the equation of time). Wills' book was first published in the 1930's and refers to a period some fifty or sixty years before then. Perhaps in those more leisurely days a difference of an hour or so wasn't important. Even so, one might think that the farmer would have had something to say if he had noticed his shepherd leaving work over an hour early.



William Shakespeare in contemplative mood

The Shepherd's Dial cut in grass (not the columnar form) is described by that acute observer of life's events - William Shakespeare (1564-1616) in his play, the third part of King Henry VI, Act ii, Scene v, where on the battlefield of Towton the unhappy King soliloquises thus:

> ". . . So is the equal poise of this fell war.
> Here on this molehill will I sit me down.
> To whom God will, there be the victory!
> For Margaret my queen, and Clifford too,
> Have chid me from the battle; swearing both
> They prosper best of all when I am thence.
> Would I were dead! if God's good will were so;

For what is this world but grief and woe?
O God! methinks it were a happy life,
To be no better than a homely swain;
To sit upon a hill, as I do now,
To carve out dials quaintly, point by point,
Thereby to see the minutes how they run,
How many make the hour full complete;
How many hours bring about the day;
How many days will finish up the year;
How many years a mortal man may live.
When this is known, then to divide the times;
So many hours must I tend my flock;
So many hours must I take my rest;
So many hours must I contemplate;
So many hours must I sport myself;
So many days my ewes have been with young;
So many weeks ere the poor fools will ean;
So many years ere I shall shear the fleece:
So minutes, hours, days, months, and years,
Pass'd over to the end they were created,
Would bring white hairs unto a quiet grave.
Ah! what a life were this; how sweet! how lovely!
Gives not the hawthorn bush a sweeter shade
To shepherds looking on their silly sheep,
Than doth a rich embroider'd canopy
To kings that fear their subjects' treachery. . ."

Somewhat later Andrew Marvell (1621-1678), in versifying about the garden, wrote the following:

How well the skilful gardener drew,
Of flowers and herbs, this dial new!
Where, from above the milder sun
Does through a fragrant zodiac run:
And, as it works, the industrious bee
Computes its time as well as we.
How could such sweet and wholesome hours,
Be reckon'd but with herbs and flowers?

It is only by such tenuous references that turf and other vegatative sundials are recalled, for no one appears to have written notes on the actual methods of preparing these all but forgotten dials of the past.

REFERENCE

1. Barclay Wills, *The Downland Shepherds:* edited by Shaun Payne and Richard Pailthorpe, Alan Sutton Publishing, Gloucester, 1989.

SUNDIAL CONSTRUCTOR

DAVID YOUNG

A computer program for the delineation of a variety of sundials working in a Windows environment has been produced by our members E. J. Swingler and S. J. Reeves originally for their own use in their manufacture of stained glass dials. It will shortly be available on a 3½" disc.

User-friendly is a term which those of us with a computer will have heard before, it can be a rather variable term but in the case of this program it means that those of us who use their computer as a useful tool rather than being a technical wizard will be able to get a print-out of the data of their projected dial within a minute or two of switching on, without any hassle at all.

The main 'business' is done on a single screen familiar to Window users. There is a panel for location details where latitude and longitude can be entered by mouse or keyboard, a panel for dial type (horizontal, vertical, including declining types, and polar) and a further one for local, standard and 'summer' time. On operation of the 'Calculate' button you are presented on the same screen with the listing of angles in hourly or fifteen minute intervals, at your choice. A 'chart' button will present you with a picture of the dial including, in the case of declining dials or those with longitude correction, the position of the displaced gnomon. This can immediately be printed out using the 'print' button, or alt P from the keyboard. A unique feature is the ability to transfer the information to a Location Manager data base which lists all the dials in alphabetical order of location and from which you can immediately see or print out the data of any dial previously entered. There is adequate help available from drop down menus although much of it is basic information about sundials of which most users would be very familiar. In my version of the program there are some odd facts not strictly true but I understand these are being corrected.

There is always a down side to any review and there is certainly grounds for criticism in this program. The omission of an ability to print out the actual angles displayed is a serious one and in my advance copy there is some difficulty in entering data using only the keyboard although theoretically this is catered for as letters have been allocated to each operation by the usual method of underlining. There is no difficulty for mouse users. Another problem is in the case of heavily declining vertical dials; those with declinations between (say) 70 to 89 degrees are not adequately catered for, and should be charted in a different way, perhaps by what Waugh would call, the 'unit square' method. Direct East and West dials are fine. The program would be immensely more useful if it included the delineation of declination lines, and the incorporation of analemmatic dials would be useful.

However, I understand that these deficiencies are being tackled and most if not all will be corrected in the version available shortly. I have been told that this will include the addition of declination lines which is good news. Cost will be in the region of £20 which for a very professional looking program is, I think, good value. This disc will be on sale to members in the near future, details later from the BSS Secretary.

ALBERT

COLIN McVEAN

As Albert was walking home one day from work he vaguely noticed a sundial in the park but thought nothing of it at the time. But one sleepless night, he began to wonder about dials and how they were made. The idea grew in his mind and he thought to himself - "Why shouldn't I make one, it can't be too difficult".

His father had always told him to work from first principles so Albert decided that the day must be his first principle. If the day was twenty-four hours long, that meant one revolution of the earth, and that was a rotation of 360°. The obvious place to study this, thought Albert, was the North Pole during the summer, when it would be continuous light throughout the twenty-four hours.

He had heard someone say that there was all time and no time at the Poles but in his heart he did not believe this at all. He had heard of someone doing thought experiments (Einstein? - Editor), so he resolved to do his own. He obviously could not go to the North Pole just like that, but he could send a thought person there instead. It would be very cold and uncomfortable there, so he wouldn't like to send any of his friends there, even in thought, but that left a great many other people.

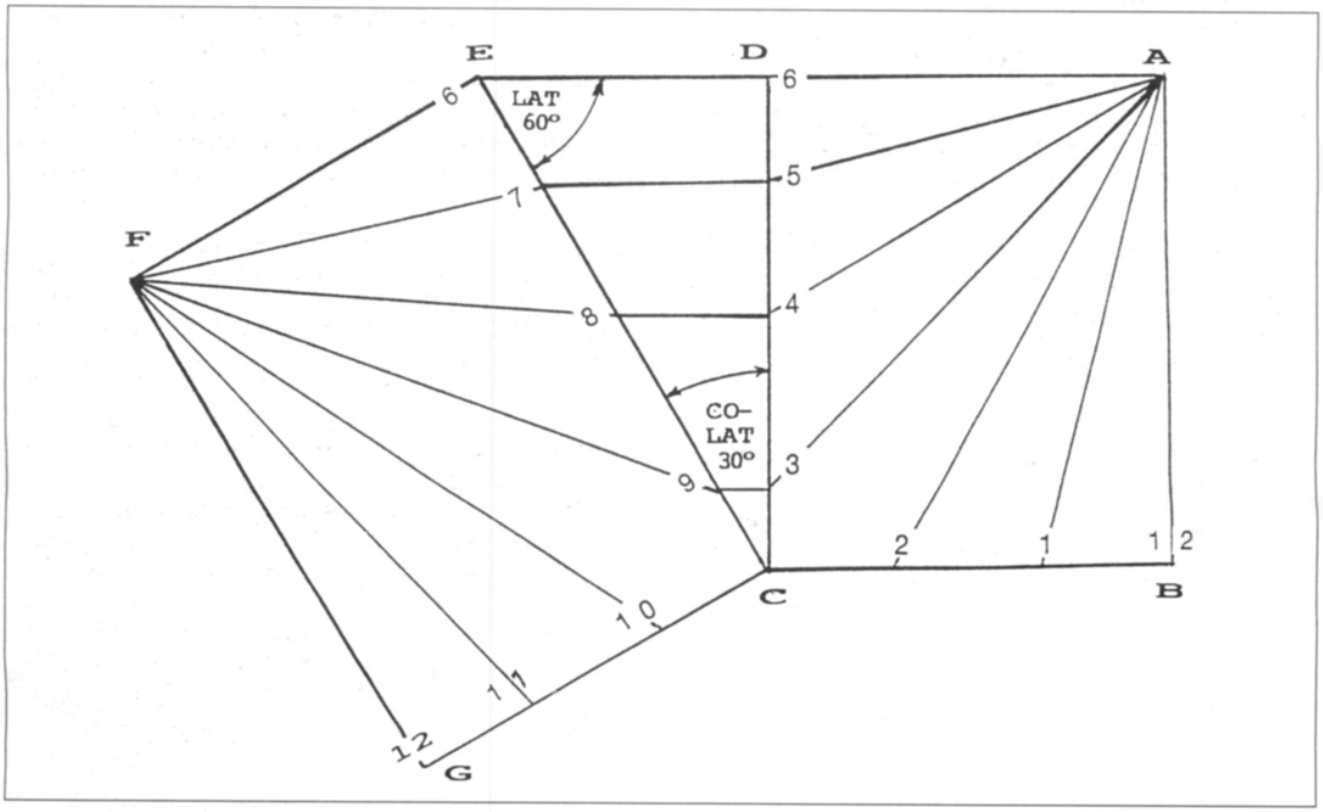
Many of these were employed at Brussels and one more of less would reduce the interference from that source in a small way. He thought of those early foreigners who had introduced unnecessary complication into English life like those with curious names such as Fahrenheit, Hertz, Ohm, Einstein, and so on. In similar fashion he would send his thought person (to avoid discrimination) but ultimately decided to send Dr. Prdexz. Dr. P. for short. If he kept his man at the North Pole for eighty thought years, even though well supplied with food and warm quarters, he would bet that the man would show signs of ageing, thus disproving the "No Time" theory, once and for all. As to "All Time" theory, that was just plain silly because there is all time everywhere.

He gave Dr. P. full instructions to set a vertical pole exactly on the spot of the North Pole and time the movement of its shadow on the surface of the earth. Dr. P., being a scientist had an excellent watch and he was soon able to report that the shadow rotated around the pole at 15° in one hour. This fitted in well with Albert's calculations, so he released Dr. P. from his duties and brought him back home, considerably older than at the beginning of the trials.

Albert was not very good at mathematics, possibly because the maths master at his school used to thrash the boys at the slightest provocation, or even less if he was in a bad temper. The other masters sometimes beat the boys but in a rather half-hearted way as though their hearts were not in it. The maths master made a real professional job of it which put Albert off mathematics and made him take to English.

Albert now made himself a neat little circle of plywood and gave it a central vertical pin. He divided the circular surface into 24 arcs of 15° numbered 0-24. So far so good, but he could see that somehow the instrument would have to be held parallel to the north pole horizontal plane. He was quite at a loss as to how to do this until a friend of his explained that if he elevated the southern edge of the dial until it made an angle equal to the colatitude of his location, that would have the desired effect.

Albert then set his dial with the North/South line in the meridian with a magnetic compass. It was a day in June and Albert lived almost on the Greenwich Meridian. The sun was shining and the shadow of the pin showed something like clock time but an hour slow, due Albert realized through the effect of British Summer Time. He had one of the boringly accurate electronic watches, having made the



mistake of throwing his valuable human wind-up watch away, for it was sometimes fast and sometimes slow.

The sundials that Albert had seen in various places, were all horizontal when he came to think about it, and he suddenly realised that when the sun was below the equator in the winter, his dial was not going to be of much use because the shadow would be gone from the dial surface. Albert pondered on this matter for some days until he had worked out a possible solution. He decided that if he had his dial properly set up and then pushed the centre pin down until it met the ground, it would than act as a gnomon for a horizontal dial. He did the same for the hour marks with rods kept parallel to that pin, they would define the hours from 06.00 to 18.00. To keep it simple he tried this but found he was insufficiently experienced as handyman to make a good job of it.

Still further thought showed him that it could flatten out the dial rather like a kipper, producing the space made by the Eastern edge of the dial and the ground immediately below it, and keeping the angle of co-latitude the same he could construct a horizontal dial around it as follows:

First he drew the eastern half of an equatorial/equatorial dial on an accurate rectangle ABCD. AB was the meridian line from which the afternoon hours 12.00 to 18.00 could be marked. He took an angle of co-latitude of 30° and drew CE. Then he dropped perpendiculars from the hour marks cutting CE. From F he drew hour lines to these marks, EF being equal to AD. Completing the rectangle CEFG, he drew in the lines for the hours 12.00-10.00 as a mirror image of CB, 2 = 10, 1 = 11. The style at an angle of 60° to the horizon would stem pointing North from F.

The most sensible thing that he did next was to join the British Sundial Society where people had proper names like Aked, Daniel, Nicholls, Smith, Walker and Wooton. Every one was very friendly, he saw some beautiful instruments, and they told him all about spread sheets, dial furniture, reclining and declining dials, and so on, until his head reeled.

There will be a further thrilling instalment - "Albert and the Equation of Time".

DIAL MAKERS OF LEICESTERSHIRE

W.D. WELLS

Discovery Park, near Coalville. Carved upon a massive block of slate, measuring 1 metre by 1¾ metres, it carries a Latin motto: 'Sine pede curro - sine lingua dico' and the simple statement: 'William Pearson del(ineavit) 1834'. By referring to the shadow on this dial, with its accurate 5-minute intervals, one could have set one's watch to South Kilworth local time, as indicated by the motion of the sun - always 4 minutes and 26 seconds behind the local apparent time at Greenwich, because of the difference in Longitude. In those days the difference was of importance only to travellers, who would understand and make due allowance for it.

However, some sixty years later, when Leicester acquired one of its best-known public sundials, the intention was not so much to provide a timekeeper as to set up an elegant sermon in stone, illustrating a biblical text. It was in 1897, the year of the Queen's Diamond Jubilee, that a new slate dial was made for St. Martin's Church (now Leicester Cathedral).

The vicar, Dr. Sanders, explained in the parish magazine: 'It was at first intended to make the Dial after the fashion of one of Sir Isaac Newton's, but though the complex geometry and astronomy of Newton's Dial is exceedingly interesting and appropriate for a secular building, it was considered better to make this one more Ecclesiastical in design'. A previous dial had recently been lost when the Vaughan Porch was constructed over the south door and the new one was the work and gift to the church of a well-known Leicester engineer, Thomas Scott Elgood, water-colourist and maker of decorative metalwork.

Thomas Scott Elgood was born in 1845. He was the fourth of ten children in the family of Samuel Elgood, a cotton commission agent who lived in Oxford Street, Leicester. His grandfather, George Shirley, farmed 200 acres in the Liberty of New Parks outside the town and Thomas was evidently inclined towards a practical career. After leaving school he received training in a locomotive engineering works in Darlington and later with an art metal firm in Birmingham. Like several of his brothers and sisters he had an artistic talent and a number of his sketches and water-colours of buildings and scenery have been preserved in the archive at the Leicestershire Museum and Art Gallery.

In 1880 he set up the Leicester business of Elgood Brothers, in partnership with two of his younger brothers. The were in the trade of art-metalwork, locksmiths and builders' ironmongery and various examples of their work can be found in the city. Elgood taught machine drawing at the Technical School and was particularly interested in wrought-iron work, making his own sketches of good examples in the country and giving lectures on the subject. He lived until 1912 with his wife and daughter in a house almost opposite the New Walk Museum. The house has since been demolished.

Elgood's 1897 design of the St Martin's dial comprises a carved and partly gilded slate panel, with a simple bronze gnomon or style, on which is inscribed: "Thos. Scott Elgood Inv: Sc: et Don". The centre of the dial-face forms a Greek Cross, with the symbols of the four Evangelists carved in the sunken panels between the arms of the cross:- the Angel (Matthew), the Bull (Luke), the Eagle (John) and the Lion (Mark). The dial is without precise hour-lines although the margins display the hours in Roman figures. The upper margin carries the motto:- "Coeli enarrant gloriam Dei" (The heavens declare the glory of God). This is a quotation of part of Psalm 19, verse 1 in the Vulgate bible, made familiar to singers in its setting in Haydn's 'Creation' Oratorio. The date MDCCCXCVII is engraved, but not gilded, on the dial.

It is a pleasant thought, as one pauses at the Discovery Park or in the Cathedral precinct on a sunny day, to consider the makers of these harmless and beguiling objects; two men, a lifetime apart, one a scientific parson and the other an artistic engineer, who both understood the moving shadow and the ceaseless rolling of the Spheres.

A TYNESIDE SHIPYARD SUNDIAL

CHARLES K. AKED

Under the identical title, Frank Evans gave an interesting account of the sundial erected on a storehouse in the shipyard founded by John Wigham Richardsom, and of its later "restoration". Since his account, the shipyard, thanks to the British Government, went into liquidation when it failed to secure a contract for a naval vessel.

Apart from an occasional thought as to what could have happened to the sundial in the meantime, nothing could be done about it, for it seemed to have disappeared. The Trinity Maritime Centre, a small museum on the quayside at Newcastle, wanted to preserve it as an historic artefact. For some reason the sundial was not presented to the museum.

In February 1996 the writer was surprised to be contacted by Commander David Harries (R.N. Retired), who requested details of the sundial. In actual fact he already had a copy of Mr. Evans' article and so I could add but little to the information in that, but I did send him a photocopy of some of the pages in Mrs. Gatty which were written by Wigham Richardson. He quoted an estimate of £100-£150 in his letter, but by the time the sales catalogue dropped on my doormat, the sundial was Lot No. 149, with an estimate of £200-£300.

The sale was to be held on Thursday 9th May, only three days after the BSS Conference at West Dean College. The writer had decided to bid for the sundial, and after thinking about it, thought that if he was successful at the auction, he would present it to the Maritime Centre because it seemed that the sundial rightly belonged in Newcastle, not on the wall of a private owner.

Whilst at West Dean College, the writer picked up some flu-like virus and it was touch and go as to whether he could attend the auction on the sales day, however he set off in his car, more in hope than anticipation. Not having seen the sundial itself, it was not known just how heavy it was, and whether it would be possible for him to bring it back home by public transport. Hence the car.

In the intervening period, I had contacted Mr. Evans to inform him that the sundial was being auctioned, and that I intended to get it if at all possible and return it to Newcastle. He was immediately interested in this proposal and very kindly offered financial support. This, plus a small amount from elsewhere, made me confident of being able to secure the sundial at auction. I determined the maximum amount to which I was prepared to go, and from this reckoned on the actual maximum bid I could make in the sales room. Value Added Tax of 17.5% and a Buyer's Premium of 15% on top of the hammer price adds quite a lot, so a little calculation was necessary to determine the maximum bid.

Arriving at the sales room in good time to survey the scene, it was very disappointing to find that someone had broken the sundial into two pieces, see Figure 1, and also wrenched the gnomon off, causing the damage at the fixing holes as in Figure 2. Examining the dial at the fractured edges, it was apparent that it could be repaired without too much difficulty.

The sale started at 10.30 am prompt, and after the first few items had been disposed of, the writer worked out that the sundial, Lot No. 149, ought to come up before his parking time ran out. But the period was fast coming to an end by the time it did and by this time the writer had his mind on traffic wardens, who in Kensington, where the auction rooms are, are known to be very dedicated to their task.

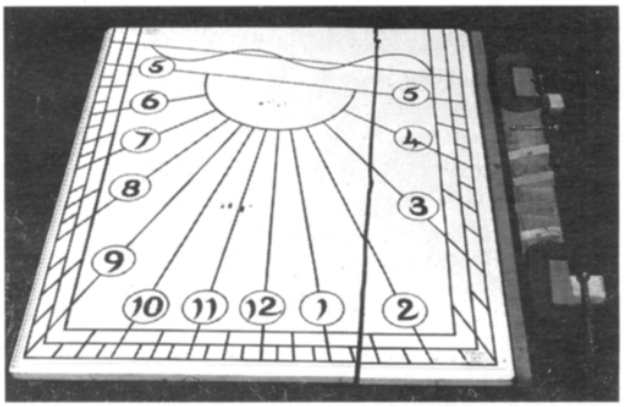


FIGURE 1: The broken sundial as brought back from Christies auction room

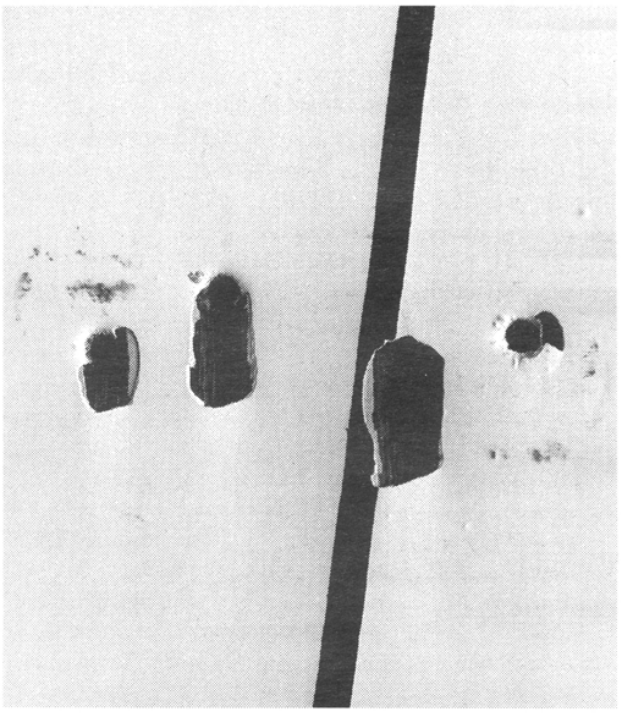


FIGURE 2: Damage to the screw holes by wrenching off the gnomon

The auctioneer offered the sundial to bidding at the maximum estimate without anyone rising to the bait, and eventually, almost in despair, he dropped it to £50. After all, a previous lot, several framed portraits of the Royal Family, had to be withdrawn, as no one would pay even £5 for them! There were a few desultory bids which raised the price to £85, the writer made his first bid of £90, which was followed by a half-hearted opposing bid of £95, and the writer's firm bid of £100. To his great amazement, the rest of those in the auction room, had had enough, and the sundial was his. However the next step was to get to his car before the parking time ran out. Sure enough, on the pavement, a female traffic warden was hovering, pen

poised above the pad. Fortunately two minutes parking time remained and the writer drove off with a derisory gesture, and a feeling of great relief, to find another place.

A veil will be drawn over the rest of the proceedings at Christies although these concerned another sundial. The sundial, in two pieces plus the gnomon, was taken home by a bemused temporary owner, who had spent only a quarter of that which he had braced himself to part with, and only those who know Yorkshiremen, will be aware of the great mental stress that the prospect of parting with their cash causes.

Back at home, the sundial was examined and reported on to Mr. Evans, who on hearing of the cost, made a substantial contribution, and thus reduced the writer's magnanimity considerably. He told the writer not to bother about the broken panel, however, after a few days, the sorry sight could be borne no longer and it was determined to repair it. The greatest problem was the width of the panel (28½ in or 72.4 cm), and the whereabouts of his pair of carpenters' cramps unknown.

It had been decided to put a pair of battens across the width at the rear of the dial in order to prevent it being broken along the grain again. The panel is of mahogany, and it would be difficult to secure such a wide plank of wood today. The battens were fixed to the largest part and extended several inches beyond the smallest part, see Figure 3, with a thick piece of wood fixed to the ends, another free piece of wood of the same thickness as the dial panel being placed against the dial edge.

The two broken edges of the panel were carefully examined to make sure there were no loose pieces of wood, or grit to prevent the surfaces being closed together, and one edge coated with Evo-Stik Resin 'W' wood adhesive. This is supposed to make a stronger joint than the original wood itself and can withstand moisture, yet the surplus is easily wiped off with a damp cloth. The two parts were carefully aligned and then pressure applied by wedges between the end piece and the loose piece, see Figure 3. A couple of "G" clamps and pieces of wood ensured that the front surface of the panel was held perfectly flat.

A few hours later, the glue had set and hardened, leaving the panel almost as good as new, the extension to the battens was sawn off, and the repaired and assembled sundial may be seen in Figure 4. It is, of course, an east declining sundial. It will be seen that the dial is capable of being read to within five minutes.

The top edge of the panel is not shaped as the other three sides, but examination of the oldest photographs available seems to indicate it was made like this originally (for it could not be seen from the ground).

At a casual glance the sundial looks quite good, but the closer one looks at it, the more apparent are the various faults. It is clear that the "restorers" of the sundial knew nothing of the work they were undertaking. The upper curve for the Equation of Time has no months delineated and hence is useless for the intended purpose, the display of the numerals is very poor, the figures themselves are not particularly well executed and the circles drawn round them are an abomination (see Figures 4 & 5) . In addition the subdivision of the hours, particularly on the west side (see Figure 5 again), is not correct; whilst the 5-0-5 line does not go through the foot of the gnomon. There is no evidence that the gnomon has ever been relocated, hence this line is slightly too low. All in all, one would expect an amateur dial restorer to do rather better.

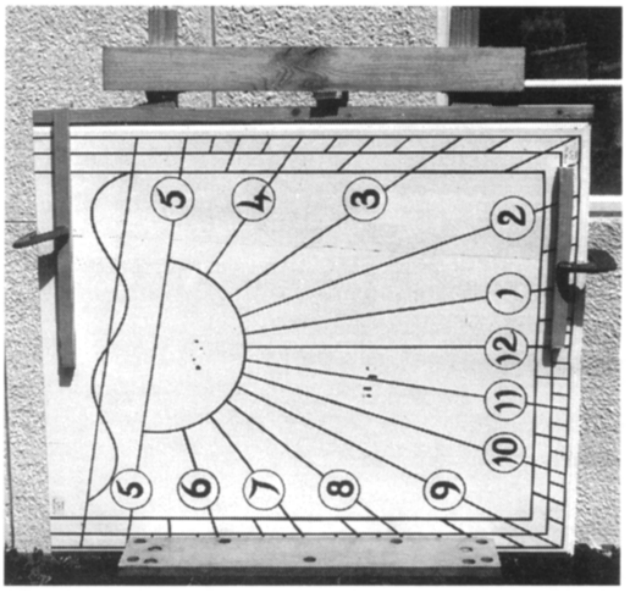


FIGURE 3: The sundial held in a Black & Decker work bench whilst the glue was setting

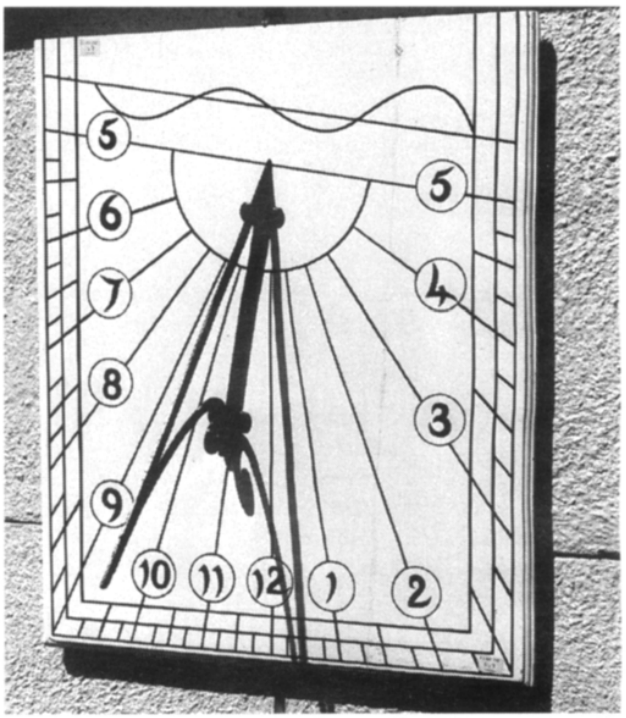


FIGURE 4: The dial re-assembled with the repaired break scarcely visible

A drawing was prepared from the vestiges of the previous painting, and if the measurements taken were accurate (and there is no need to doubt them), then the dial was incorrect previously through repainting. On the drawing the gnomon is referred to as the "Cursor" and is shown to have an angle of 35°2'. My own measurement of the gnomon angle (which naturally is the complement of the latitude) showed it to be 35°. It is not possible to measure it to minutes of a degree since the point of the gnomon and its defining edge are indeterminate. As the latitude of the shipyard is 54° 58', the value of 35° 2' is correct.

What then should be done with the sundial? Leave it as it is as a last memorial to the painters at the Neptune shipyard? or make a fresh start and restore it to what it was

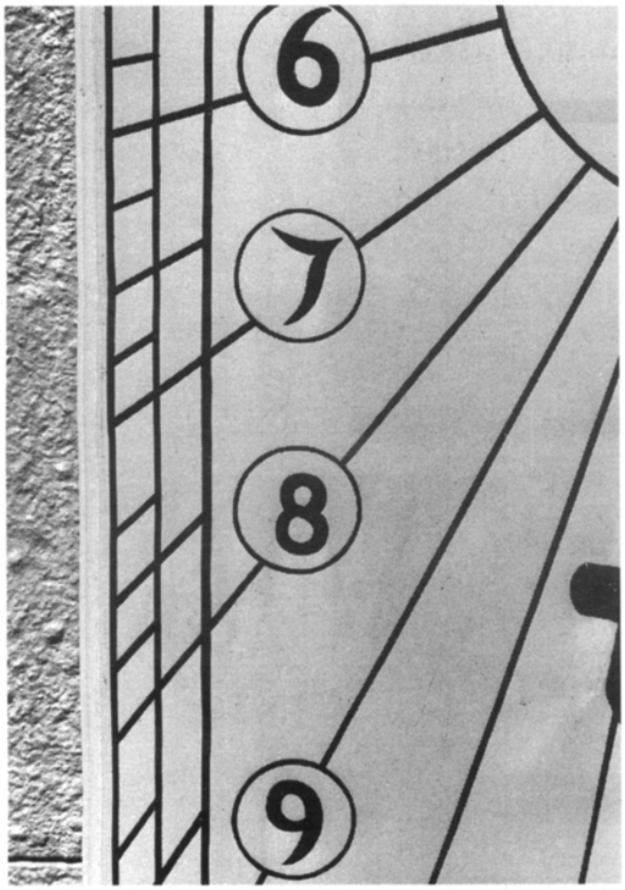


FIGURE 5: The errors in the hour subdivisions are clearly shown here

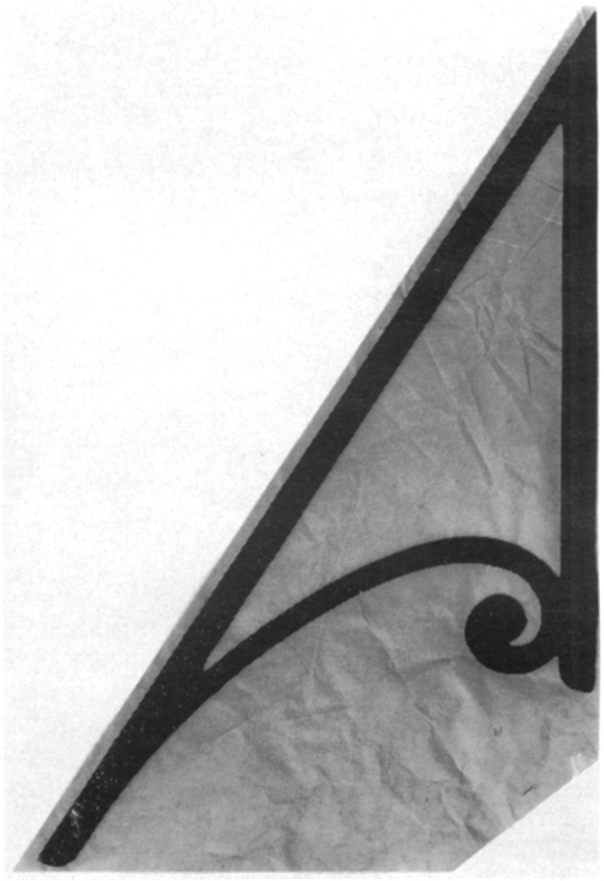


FIGURE 6: The gnomon is of mild steel painted black

as designed by J. Wigham Richardson? To the average viewer looking around the Maritime Centre, there will be total unawareness of any deficiencies in the execution of the sundial, so perhaps it is best left alone. It has already suffered the indignity of being sent to London, broken in the process, and been exposed to the danger of being sent anywhere in the world, and for what? Whoever sent the sundial for sale can have received very little for it after paying all the charges of the auction room and the transport to London. It would have been far better to have presented it to the local museum in the first place. It may be the Equation of Time ought to be restored.

Truth is certainly stranger than fiction, for I never envisaged the sundial which stood for so long above the main entrance to the Neptune shipyard would ever be having a temporary place in my home. By the time this is published, it will be safely back in Newcastle, thanks to the help of David Young who kindly offered to transport it back to back to its natal home.

* * * * *

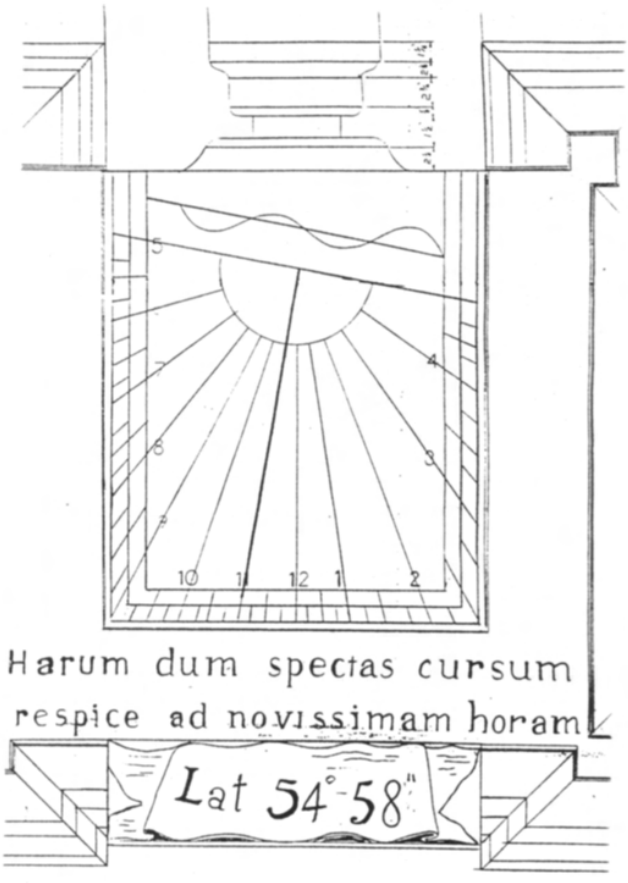


FIGURE 7: Part of the drawing of the sundial prepared by the shipyard staff. The motto, etc, was painted on the surrounding frame.

VERTICAL DIALS OF THE 5-15th CENTURIES

KARLHEINZ SCHALDACH (GERMANY)

The following three theses are primarily in connection with a collection of about 250 known Continental examples, especially illustrated here by German examples. But I suppose, with some reservations, these may be transferable to the British Isles examples with more than 1,500 mass dials from this period.

FIRST THESIS

Not one of the basic forms of medieval sundials was really new when it was scratched or sculpted in the stone in medieval times, they are all actually based on concepts already well-known to the Romans. To express this in another way, the title could equally have have read: "Roman Vertical Dials up to the 15th Century".

I will open the case for this first thesis with discussion of the twelve-divisioned semicircle pattern of dial. One example is shown in Figure 1, a sundial on the St Maria church in Melsungen (Hessen). It is nicely coloured and every second line is accentuated by means of a cross at the end. It exhibits a close relationship with the layout of six-divisioned dials.

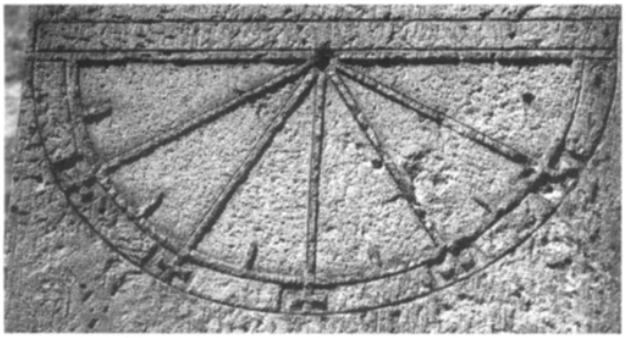


FIGURE 1: St. Maria church, Melsungen, Hessen

The purpose of the twelve-divisioned dials, which is customary in Germany, and is, to modern eyes, of lamentable crudity; is, and I know of no other possible interpretation - to indicate the twelve hours of the Roman day and, where especially marked, the canonical hours. Sharon Gibbs, in her treatise on Greek and Roman sundial, shows that we have got this design not only on medieval, but also on Roman dials.[1]

In this tradition, from the Roman examples to the medieval ones, is the semicircle of the Armenian sundials. Figure 2 shows the sundial from Mškavank (l0th century), but at least thirty other Armenian sundials are known, which were made from the 6th until the 13th century. These are all on churches and are probably the oldest church sundials extant.[2] I say probably because, if you compare the shell-form of the previous one with that of Figure 3, a detail of the floor of San Vitale in Ravenna, you undoubtedly find a similarity. Nor must we forget some early Byzantine sundials, as the example from the monastery of Arbanitochori[3], probably from the 7th century, now preserved in the Archaeological Museum in Istanbul, see Figure 4.

The cultures of both the Byzantine Empire and Armenia were in a state of exchange and great flux at this time. As many Armenian craftsmen in the building trades earned

FIGURE 2: Ani cathedral - 10th century

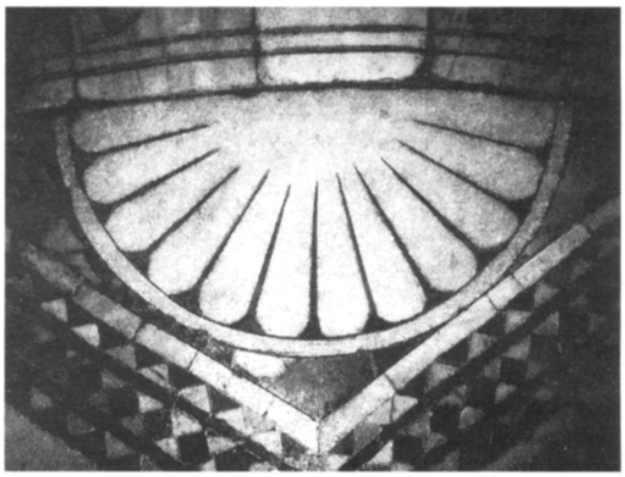


FIGURE 3: Floor detail in San Vitale, Ravenna

FIGURE 4: Byzantine dial, Monastery of Arbanitochori, 7th Century

their wages everywhere in the Byzantine Empire, it may well be that these sundials were made by Armenians. It is hardly possible for me to make a strict division between Armenian and Byzantine sundials because both were derived from the same source - the ancient ideas on time-measuring.

Now let us examine the pattern which shows six equal divisions only. A sundial from Edelzell, near Fulda in Hessen, (badly restored because of the incorrect gnomon), may be seen in Figure 5. This is not earlier than the 14th century. Although not known from ancient examples, these semicircles were understood by people in the Roman empire - because such dials based on double hours were known from ancient Babylonia and Greece, as well as from Egypt and China.[4]

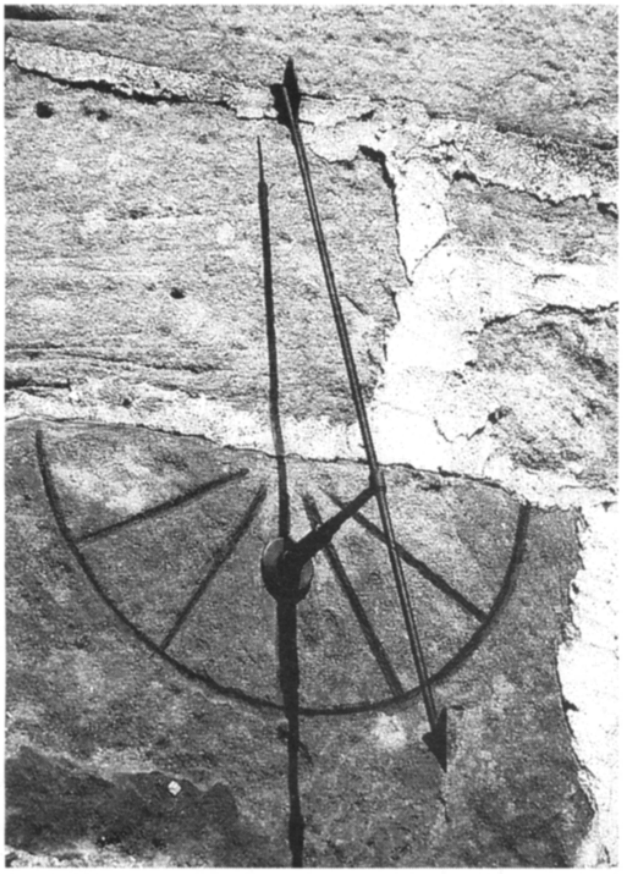


FIGURE 5: Edelzell, near Fulda, Hessen (incorrect gnomon)

THE OCTAVAL SYSTEM

This system was also known in Roman times for many Roman authors write of a four-part Roman day. One of these is Censorinus, who writes in his "De die natali liber", a discussion on astrology, and time divisions in the Roman Republic, circa AD 250, that night and day were each divided into four parts. The day was divided thus:

mane	- from sunrise to the end of the third hour
ad meridiem	- until the end of the sixth hour
de meridie	- until the end of the ninth hour
suprema	- until sunset

I wish to emphasize this because in some British articles, as well as in German articles, the octaval system is explained as if it was invented in the British Isles, or came from the Vikings. I cannot exclude this possibility, perhaps the octaval system indeed has roots that go back to the Vikings, or even the Celts; however I tend to the conclusion that the Anglo-Saxons inherited it from the Romans, as a result of oral or written tradition.

A German example of the four-division day is shown in Figure 6. It shows a shadow concept, a simple arithmetical pattern which provided reasonably close approximations of shadow lengths during the day throughout the year, already known from ancient Greece. The shadow scheme is outlined in a 9th century manuscript, probably written near Cologne.[5] It gives the shadow lengths for the 3rd, 6th, and 9th hours only. There is no hint here that these hours are determined by the hours of prayers. On the contrary, the hours of prayer or canonical hours are due to the Roman time system as expressed by Censorinus, or to the fact that the Roman guards were changed every three hours.

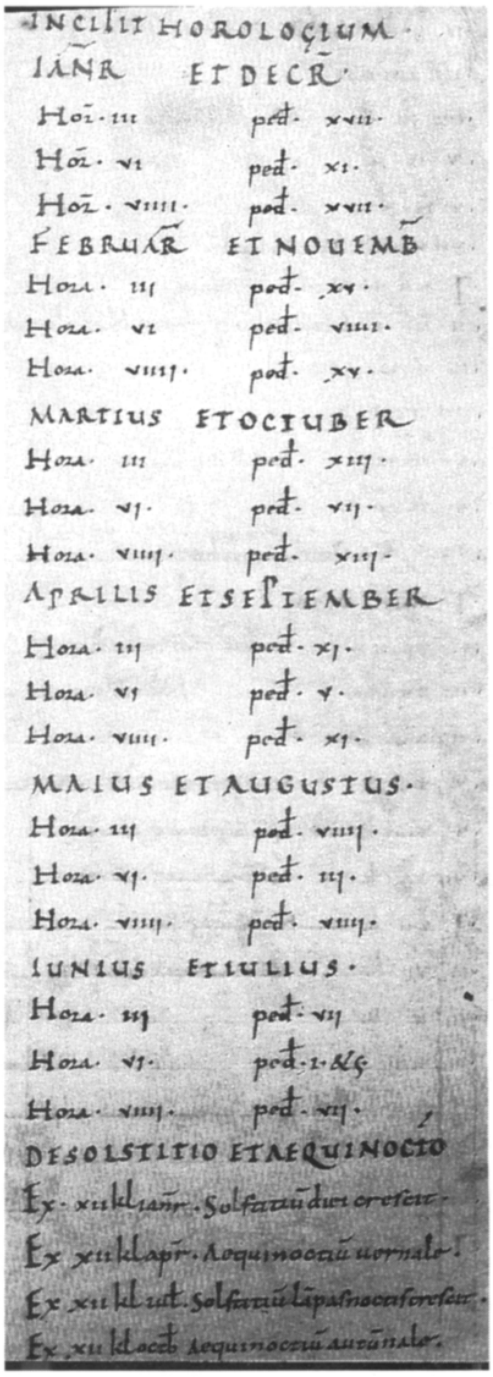


FIGURE 6: Table of shadow lengths for four-division day (German)

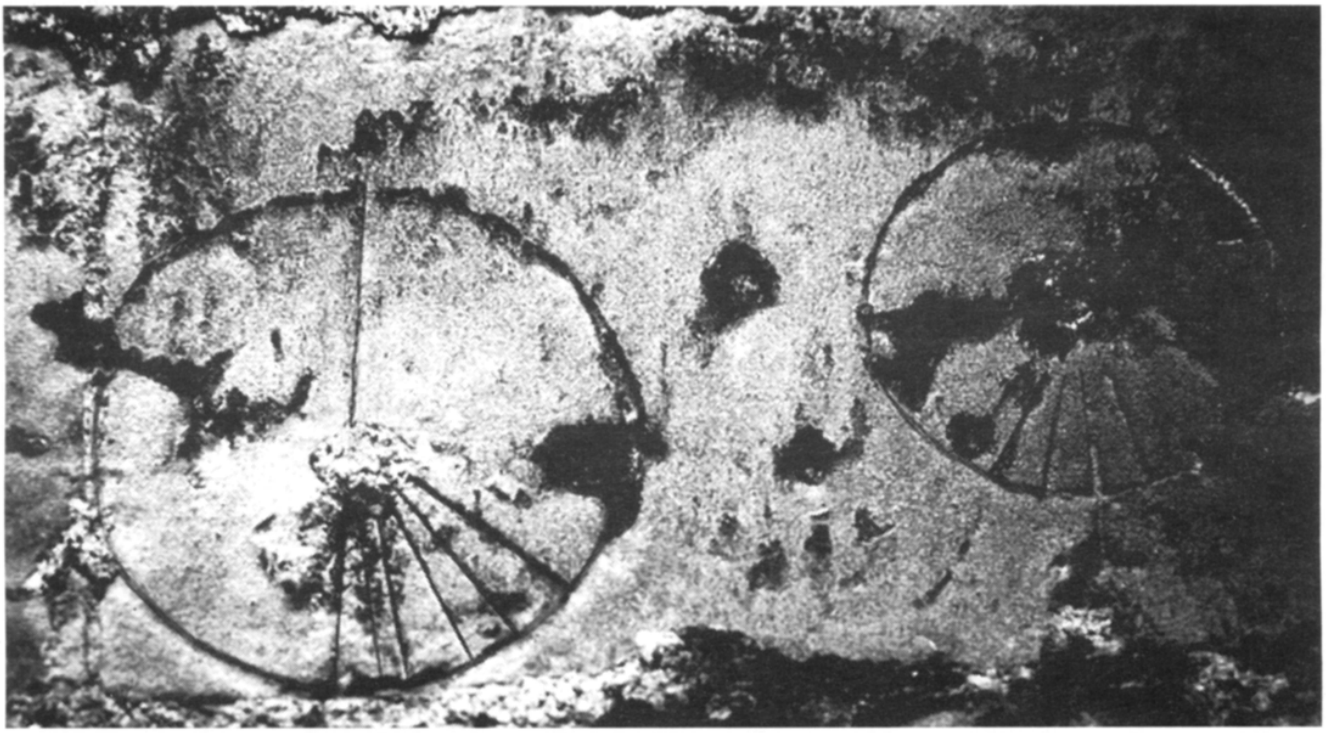


FIGURE 7: Benelen, Maastricht, Netherlands

IRREGULAR SCRATCH DIALS

What about the irregular scratch dials? Many of these are still extant in the British Isles, but some remain on the Continent. An example from Benelen near Maastricht, in the Netherlands is shown in Figure 7. The French author Jean G. Laviolette postulated that this irregular dial is a French import, probably arriving in England from across the Channel with the Norman invasion of England by William the Conqueror in 1066.[6] The German scholar Ernst Zinner, more uncertain about this, maintained that the first irregular dials were made about 1100 in the Celtic area.[7] Neither supposition was correct, because the sundial shown in Figure 8, excavated near Ancona, dates back to the 6th century.[8] It is not known what kind of events it is intended to indicate.

Nevertheless it demonstrates that the irregularly divided dial is no invention of the Normans, possibly a re-invention, but more likely learned from the Romans. And it shows another important fact, because in Roman times it seemed as a matter of course that only the tip of the gnomon shadow gave the hour. At least for the last centuries of the Western Roman empire, this statement is no longer true. There have been found some sundials of that era where it is obvious that only the direction of shadow indicated the hour, as it is the case with all the vertical medieval examples that have come down to us.

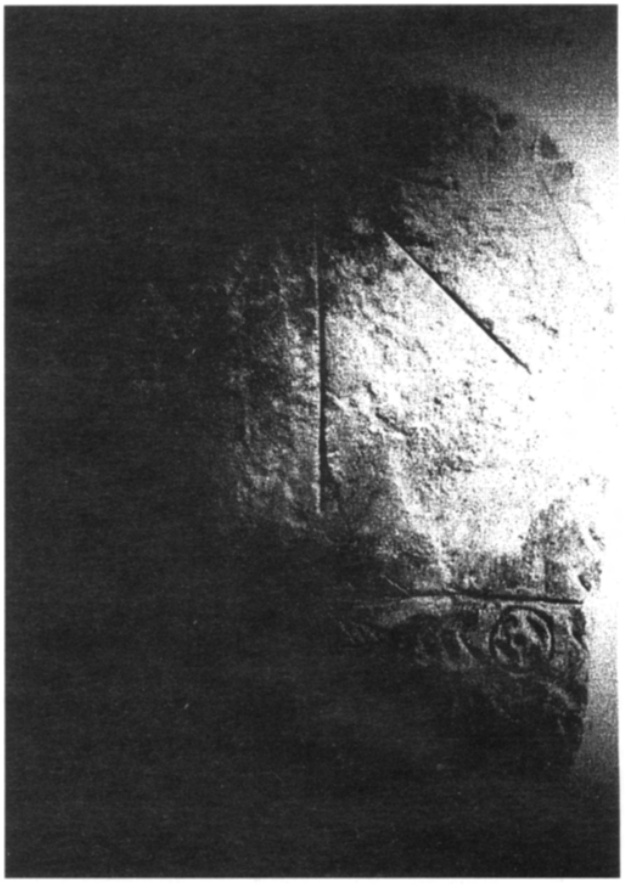


FIGURE 8: Exacavated near Ancona, 6th century

EIGHT-DIVISION SEMICIRCLE DIALS

I have not yet mentioned the type of dial in which the semicircle is divided into eight parts. Figure 9 shows one from Crock in Thuringia, immured in a church which was erected in the 15th century with stones taken from an older building. Most authors, in the writings which I have seen, explain this form by a special Nordic octaval system which is based upon azimuthal division. Anthony Turner has already challenged this assumption,[9] and on this I am sceptical too. Nevertheless there are some sources which can be interpreted that people in Scandinavia had such a system for dividing the day by the cardinal points, from which a division of the day into eight parts can be derived.[10]

But if there was such an octaval system in Northern countries, the problem remains. What was the thinking of people in central Europe when devising sundials, not with divisions of three, five or eleven radial lines, but by seven lines? What were the concepts and feelings by which they

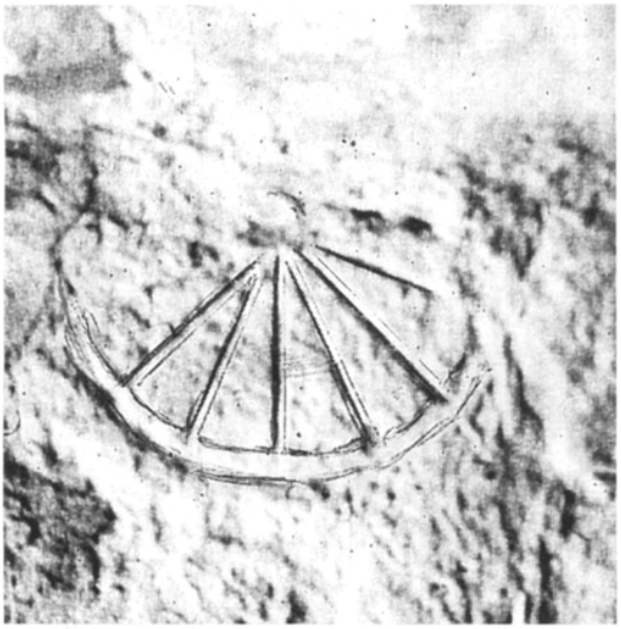


FIGURE 9: Crock, near Thuringia

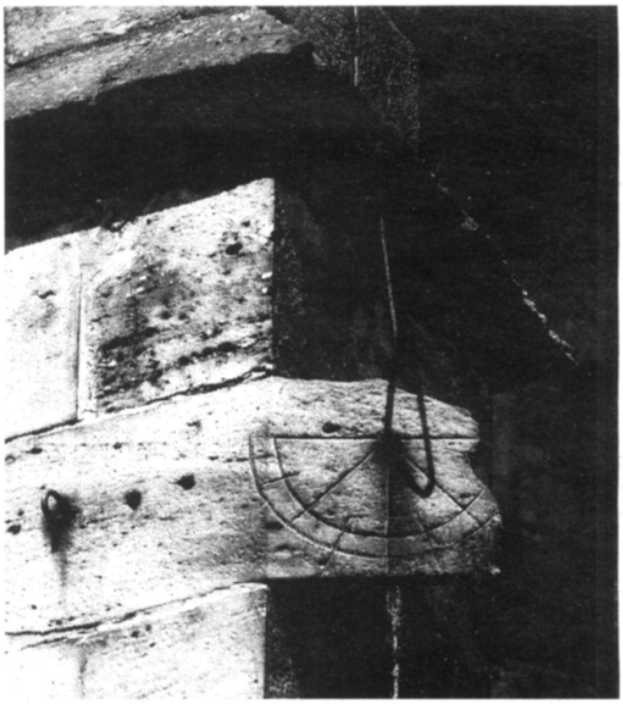


FIGURE 10: Alsfedl, Hessen

were moved? For in that area, no conquest by Vikings ever occurred, no one was there to force the semicircular sundial upon the community. It could be said that the eight-line division is a finer four-line division in order to read the time more exactly. This may be true but as an explanation I am not satisfied with it. And that is why I now come to my second thesis.

SECOND THESIS

The majority of sundials of the 12-14th centuries can only be understood by recognising that they are associated with a magic-astronomy. In using the word "magic", I especially mean religious cosmology and numeralogy, recognizing that in medieval life with its high degree of spirituality, instruments had to serve these beliefs rather than astronomical principles. So to engage oneself with medieval sundials also means entering this world of belief and pursuing art-historical researches, with the discussion of astronomical problems taking second place.

In support of this thesis, take as an example the sundial from Alsfeld in Hessen, shown in Figure 10. This dial is so small and mounted so high on the church that it is impossible to see all the details without the use of a telescope. Therefore I took a 400 mm objective to bring the dial closer to view. There are similar examples from the whole of the Continent. How can one make sense of such dials? All are on Gothic churches, and this is an important observation.

About 1100 a new faith is found in the minds of people. A new way of thinking arose where everything was based on the next world, to a new life after life, to a higher life after a life on earth. Pure dogma gave way to warm piety. Everything was bound in this spirit, boundless self-sacrifice and greater religious devotions were responses to the turbulence of the times. Whosoever built the new churches had to give voice to his feelings, including his search for the life hereafter. So the church stretched to the sky, or, as could be said with the same justification, to Heaven.

What did that mean in respect of sundials? The response was a revival all over Central Europe from the 12th to the 14th centuries, especially with the eight-divisioned type of sundial. Whilst there are many such examples in Germany, and there are many literary sources from that period, there are no references to an eight-divisioned day. Because, and this is my own conclusion, the people living in those days did not use such a day. But they had a special sense of the number eight, for eight is the number for the rising from the dead. For example, Christ's resurrection took place on the eighth day of the Passion, with its promise of future glory and eternal life to the believer.

In addition, the name of Jesus in Greek letters, IHESOYS, yields the numerical value of 888, a strengthening of the sacred 8. According to art historical studies, the connection with the eighth day, the day of circumcision and resurrection, is one reason for the octagonal shape of many Gothic churches; not to frighten men with demons any longer, as the early Christian church did, but to teach them the eight-fold way of the path that leads to Eternal Bliss. So every building-stone had to embody these ideas. Already for the Christian Church fathers of Roman times, circumcision, baptism, and resurrection were mysteriously connected, with all of them expressing an entrance into the life of future salvation. Sharon L. Gibbs, in her treatise[1], has listed many Roman sundials found in graveyards. These examples show that the connection between death, sundials, and eternity, is an old concept.

Let us return to medieval times again. Figure 11 show a sundial from Fulda in Hessen made in the same period as that from Alsfeld. This is recorded as a donation in a document of 1140, A sundial and a stone-lantern for the dead form an ensemble. Again there is this connection between a sundial and death. So my assumption is that with eight sectors on sundials, when a shadow fell on such a sundial, it was a reminder of coming death and eternity.

Another strange thing is the circle of the Fulda sundial. A circle, however, was the natural representation of temporal events during the Middle Ages. The most famous

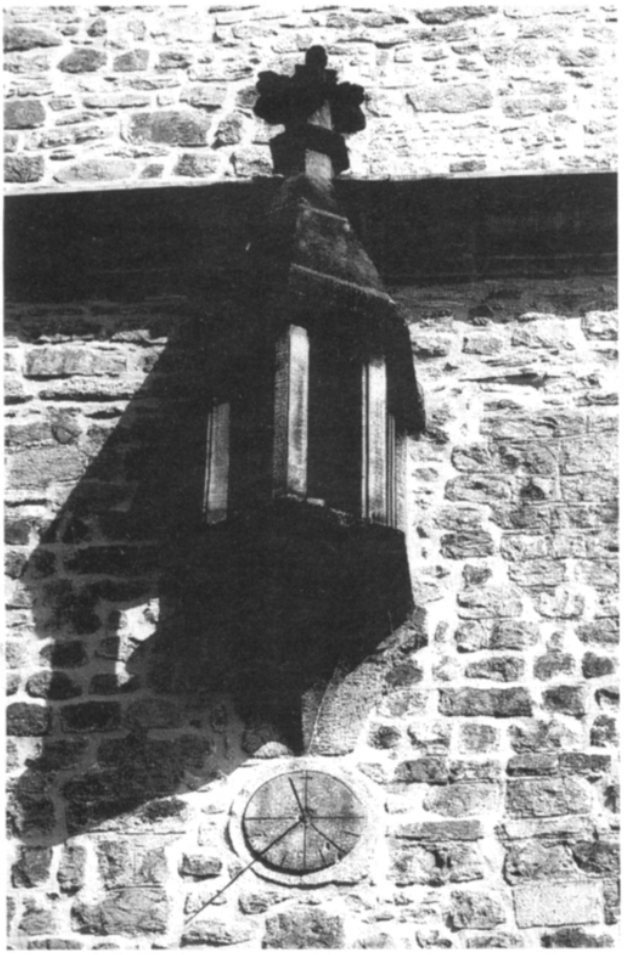


FIGURE 11: Fulda, Hessen, recorded in 1140

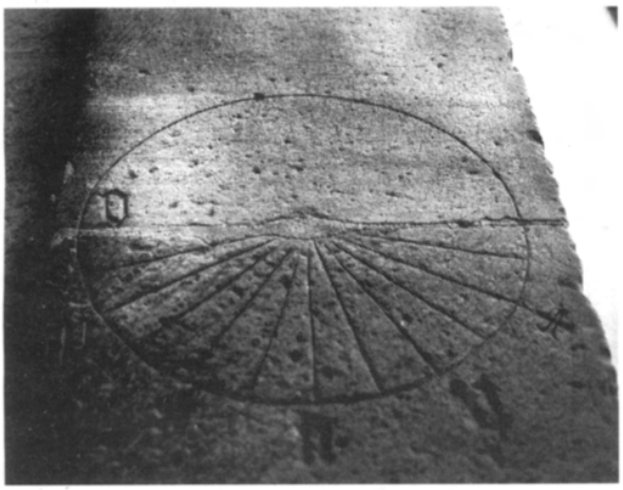


FIGURE 12: Hameln, Lower Saxony, midday marked by "N"

of these is the zodiac, but nearly every temporal process was figured by a circle. What implication does this have for sundials of this period? Many sundials carried a full circle by completing the upper half on the old conventional semi-circle, nonsense from a rational point of view since no shadow cast by the sun can ever reach this part.

The sundial from Hameln in Lower Saxony (Figure 12) is another example of this type and is of special interest, because here the midday line is marked by the letter N denoting the mass time "Non" that originally was celebrated at the ninth hour. In Germany the transfer of the Non to the sixth hour took place in the 13th century. A similar translation also took place in Great Britain, where

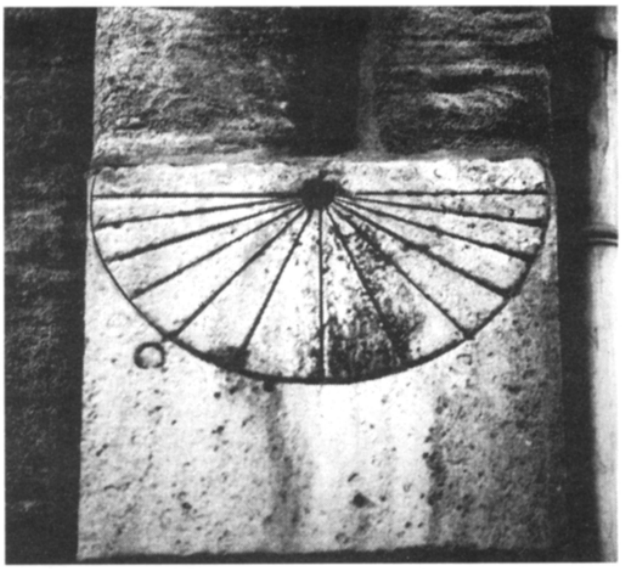


FIGURE 13: Brunswick, circa 1350

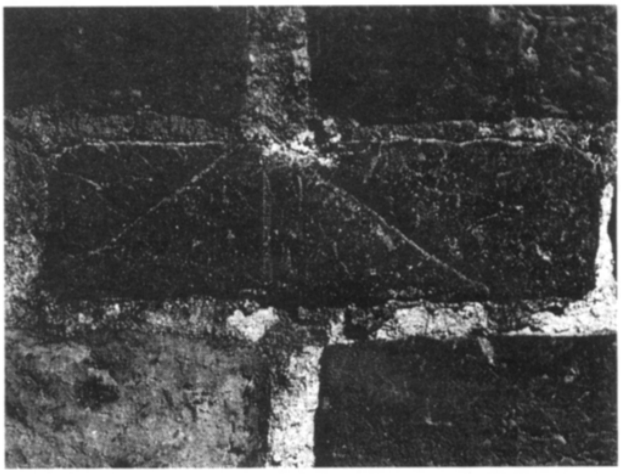


FIGURE 14: Greifswald, Mecklenburg-Vorpommern

even today "noon" is used instead of midday.

THIRD THESIS

With the economic and teaching developments of the 14th century, educated people became conscious that the equally divided semicircle does not provide even a rough indication either of unequal hours, nor of equal hours. This realization spread out from Erfurt.

In order to demonstrate this, my first example is a sundial in Brunswick circa 1350 (Figure 13). It is a sundial with divisions carefully made after a text that is known to exist in fifteen copies or more. The oldest one that is preserved was written in 1364, in which the text describes a rule to make a sundial for unequal hours. Another copy, London BM Addit. 15107, folio 203, shows not only the text, but gives a diagram, see Figure 18, that is identical to the sundial on the church in Brunswick[11]. Another two texts were copied in Rostock in 1414. They are identical with the Erfurt text although Rostock is further north, a circumstance that should have been reflected in the changed angles of the divisions of the sundial. But this was apparently of no concern to the copyists, who probably had no knowledge of dialling[12].

Who was the author of this description, and how did he calculate the angles? This remains an unsolved problem. In an article[13] I attempted to to provide answers, more or less taken from Ernst Zinner,[14] but, as I must confess, I am not

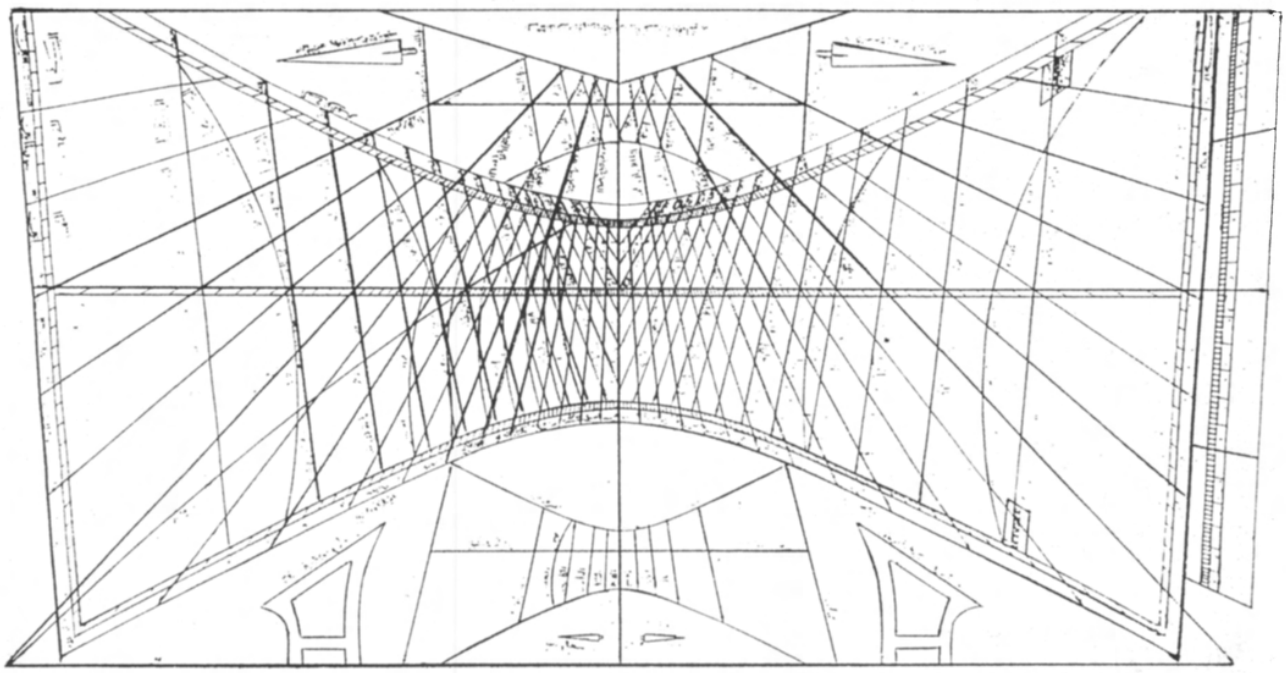


FIGURE 15: Islamic dial of 1371

very satisfied with these explanations. Further research is necessary to elucidate the matter.

In Germany there are some variants of this type. For example one with four divisions in Greifewald in Meklenburg-Vorpommern (Figure 14). They are all improvements compared with the 15 degree configuration. But these too do not give the seasonal hour exactly, as Drecker[15] and Mills[16] have pointed out. The first exact construction of this type in Middle Europe, south-facing position, plain wall, vertical style and seasonal hours was given in 1431 by Nicolaus de Heybech, who worked in Paris and Erfurt[17]. He writes that the study of al-Battani gave him the exact theory.

But in the 15th century, the century of Nicolaus de Heybech, unequal hours were no longer required, for the large clocks in towers were giving the new kind of time - equal hours. Therefore a method had to be found to obtain equal hours by the indications of sundials. We know the result of this search, the polar gnomon sundial. Was this derived from the Arabs? Not impossible because the earliest known Islamic example of this type dates from 1371 and is the culmination of a long tradition rather than a one-off production (Figure 15),[18] whereas the earliest European examples are known only from the 15th century onwards.

Nevertheless there are good reasons to suppose that the introduction of the polar gnomon in Middle Europe occurred independently to that of the Arabs. For example, Nicolaus de Heybech, who again was one of, or possibly even the first Latin author writing on the exact construction of equal-hours sundials, gives no hint that he obtained any ideas from Islamic contemporaries. And not to exaggerate, there are almost 100 scientific and other texts on sundials of the 14th and 15th centuries to prove that there was a great effort made towards understanding the principles of sundials, but none give the correct solution, the polar-gnomon sundial. Finally, there are some sundials of that period, or perhaps better expressed "sun-trials" for equal hours that show there must have been "trial and error" methods employed in Middle Europe until the polar gnomon was discovered, and I give two examples here.

The first one is on St Peter's church in Gelnhausen in Hessen, (Figure 16). The hours run from 6 to 6 but the divisions are equally divided. Is there a contradiction here? None if you agree that it is an palimgsest dial, first with an old circle dial with the divisions for seasonal hours. But in the 15th century it was attempted to convert the sundial to show equal hours, by adding some strange ciphers from 6 to 6. These ciphers are also known in six other sundials and from some old calendars, in which they are used to represent the Golden numbers. But in order to ensure that the sundial indicated the new hours correctly, the vertical gnomon was bent downwards a little. One can show that, with an angle of 90° minus half of the latitude, between the wall and south-facing pointer results in the sundial giving quite a reasonable approximation for equal hours.[19]

The second example is from the cathedral of Brunswick, made about 1360 (Fig 17). Although the sundial now has a polar gnomon, it is very questionable if it is in the original position, because the angles are not

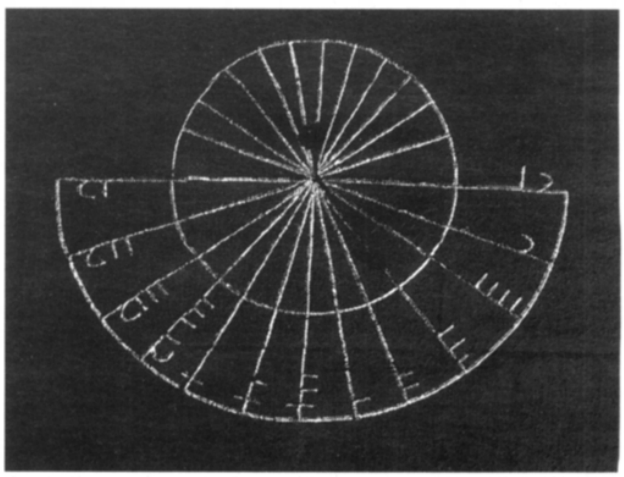


FIGURE 16: St. Peter's church, Gelnhaussen, Hessen

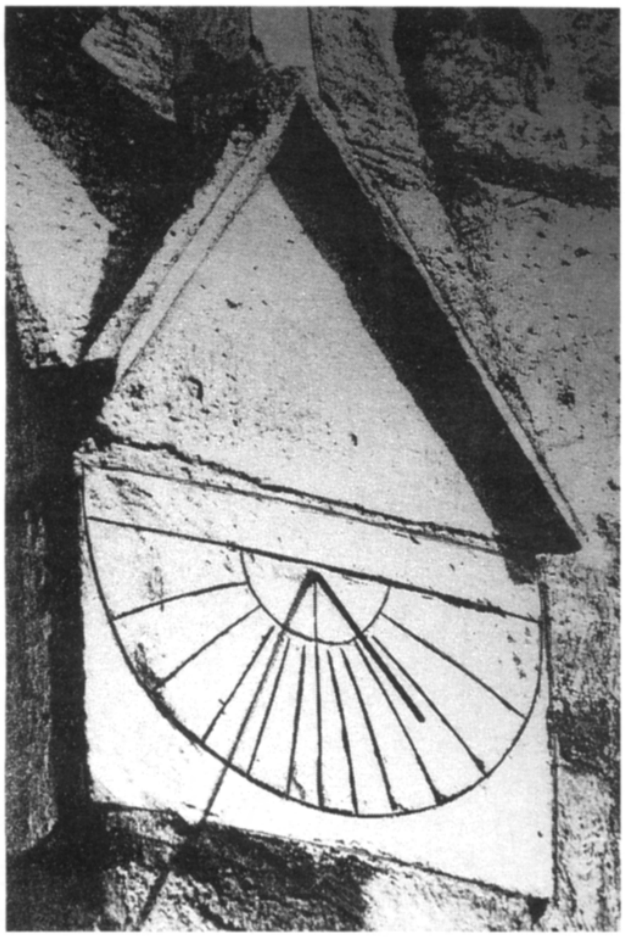


FIGURE 17: Brunswick cathedral, circa 1360

FIGURE 18: Part of folio 203, BM Addit 15107

correct. There is another example from Kothen in Sachsen-Anhalt with the same symmetrical arrangement but not exactly directed to the south. The inscription states: Anno domini 1401.

Although the polar gnomon was known from about 1440, and numerous scholars knew how to make a sundial for equal hours, it took over a hundred years before the necessary knowledge for marking the hour lines was universally known and diallists were able to construct such beautiful sundials as that shown in Figure 15, made in Syria by the astronomer Ibn al-Shatir.

ACKNOWLEDGEMENTS

This is a much shortened and revised version of a talk which I gave in July 1994 at the Summer meeting of the BSS. I should like to thank Edward Martin for the invitation to speak at the meeting, and who helped me formulate my ideas in English; also Erich Merkl, Reinhard, Präger and Herbert Rau, for their various personal contributions; and the Wissenschaftliche Allgmeinbibliothek, Erfurt, for providing me with the photograph of Figure 7.

NOTES AND REFERENCES

1. Sharon L. Gibbs, *Greek and Roman Sundials*, New Haven-London, 1976.
2. The opinion of N. Weyss, "Wo gab es die frühesten Fassadensonnenuhren?", in *Schriften der Freunde alter Uhren* 27, 1988, 89-103.
3. The monastery, situated near Istanbul, now destroyed, the illustration is taken from W. Meyer, "Istanbul 'daki Günes Saatleri", *Sandoz Kültür Yayinlari* 7, 1985, 18, who erroneously states the sundial is a Roman one from Nicodemia.
4. G. Bilfinger, "Die babylonische Dopplestunde", in *Programm des Eberhard-Ludwig-Gymnasiums* Stuttgart, 1888.
5. Efurt, 2°64, fol.96r., the best studies on shadow schemes are D. A. King, "A Survey of medieval Islamic schemes for simple time-reckoning", in *Oriens* 32, 1990, 191-249, and O. Neugebauer, *A History of Ancient Mathematical Astronomy II*, Berlin-New York, 1975, 736-746, where Neugebaeur mentions eight Latin schemes only, although there are at least sixty known.
6. Jean G. Laviolette (translated by C. K. Aked), "From the Clock of Solomon to the Canonical or Scratch Dials", in *Clocks* 8, 1985, 3, 23-28.
7. E. Zinner, *Alte Sonnenuhren an Europäischen Gebäuden*, Wiesbaden, 1964, 9.
8. I found this blurred photograph in an archaeological archive, signed "Acona". The sundial is described in I. Dall'Osso, *Guida Illustrat del Museo Nazionale di Ancona*, 1915.
9. A. J. Turner, "Anglo-Saxon Sundials and the 'Tidal' or 'Octaval' System of Time Measurement", *Antiquarian Horology* 15, 1984, 76f.
10. Some hints and considerations for this view are given in Zinner, 4.
11. London Addit. 15107 was written in Erfurt circa 1459.
12. Cf. K Schaldach, *Zwei Rostocker Handschriften und die Erfurter Regel*, not yet published.
13. H. Rau & K. Schaldach, "Vertikalsonnenuhren des 6-15 Jahrhunderts, in *Ad radices* (Hg. A v. Gotstedter), Stuttgart, 1994, 272-290.
14. E. Zinner, "Die ältesten Räderuhren und modernen Sonnenuhren", *XXVIII Bericht der naturforschenden Gesellschaft Bamberg*, 1939.
15. J. Drecker, "Sonnenuhren im Mittelalter", *Archiv für Geschichte der Mathematik, der Naturwissenschaft und der Technik* 10, 1927/28, 420-426.
16. A. A. Mills, "The Scratch Dial and its Function", *BSS Bulletin* 92.3, 5-8.
17. Lynn Thorndike, *Isis*, 39, 59f, 1948 "Nicolaus de Heybech". No one has written about Heybeck since this article.
18. D. A. King, "Science in the Service of Religion, the Case of Islam", *Impact of Science on Society*, No 159, vol 44.3, 1990.
19. H. Rau & K.Schaldach, "Vertikalsonnenuhren", 284 and Abb. 2a.

THE WEST DEAN COLLEGE CONFERENCE - 1996

CHARLES K. AKED

It was with some trepidation the writer set off in his car for the journey to West Dean College, see Figure 1, for it was his first journey over ten miles for six months. Although a journey often undertaken in the past, the roads had changed so much in the meantime that he missed the turning to Haslemere and continued to Hindshead where there was a real log jam of vehicles. Nevertheless the opening time of 16.00 was achieved and a welcoming cup of tea restored his spirits sufficiently to unload the car and survey the accommodation. There was enough time before dinner for a quick look at the prize winning sundial on the wall of the college, alas, although the sun was still shining brightly, high in the sky, none of its rays found its way to the sundial. And so on to view the exhibits already decorating the corridor and rooms leading to the lecture hall.

After an excellent dinner, the 1996 Conference commenced promptly at 20.15 with Christopher St. J. H. Daniel, in his office of Chairman, to give his welcoming speech to the assembled BSS members.

The first lecture was given by our excellent treasurer Mr. R. A. Nicholls about a previously little-known dial which was designed by Thomas Hardy (the well-known novelist) for his house at Dorchester, but which he never saw because he died before its construction was started. This is described fully elsewhere in BSS Bulletin 96.2, pages 49-51. Next was an unusual lecture on "Indian Timekeepers" by our American member Mrs. Jackie Holland. The series of strange illustrations of these Indian methods rather bemused the writer but it was an interesting lecture. Following this the members adjourned to the bar for a quick reviver before going to bed early to be ready for the demanding programme of the morrow.

SATURDAY

Starting at 9.30, Ian Wooton (the Society's Registrar) dealt with Declining Dials. His lecture will be the subject of a separate article in a future issue. Half an hour later, Mr. Roger Bowling regaled us with an account of figures he

FIGURE 1: West Dean College

BRITISH SUNDIAL SOCIETY
1996 CONFERENCE
AT WEST DEAN NEAR CHICHESTER
3rd to 6th May, 1996

KEY TO THE DELEGATES

Photograph taken on Sunday 5th May, 1996

1. Christopher Daniel, London
2. Terry Deignan, Ireland
3. Mary Wells, Leics
4. Mike Shaw, Merseyside
5. Jennifer Richar, Avon
6. Gillian Churchill, Berks.
7. Ray Ashley, London
8. Maurice Kenn, Kent
9. Anton Schmitz, Germany
10. Avraham Avitzour, Israel
11. David Young, London
12. Charles Aked, London
13. Lilli Young, London
14. Pamela Nicholls, Dorset
15. Glenda Bateman, Berkshire
16. Philip Adams, N. Ireland
17. John Churchill, Berkshire
18. Harriet Wynter, London
19. Margaret Stanier, Cambs.
20. Mrs. Schmitz, Germany
21. Anne Somerville, Cheshire
22. Peter Lamont, Worcs.
23. Jackie Holland, USA
24. Fred Sawyer III, USA
25. Nancy McVean, Gloucs.
26. Wilfrid Dukes, Suffolk
27. Liz Ogden, Ireland
28. Erich Pollaehne, Germany
29. Rosemary Kenn, Kent
30. James Richard, Avon
31. Tim Pollard, Somerset
32. Dorothy LeConte, Guernsey
33. David LeConte, Guernsey
34. David Pawley, Berkshire
35. Robert Sylvester, Cumbria
36. Mary Belk, Wiltshire
37. Tony Belk, Wiltshire
38. Sally Hersh, West Sussex
39. Tony Brooks, West Sussex
40. Jill Wilson, Gloucs.
41. Allan Mills, Leics.
42. Jane Walker, Surrey
43. Silas Higgon, Shropshire
44. Colin McVean, Gloucs.
45. Josephine Higgon, Salop
46. Andrew Ogden, Ireland
47. Mary Isaacs, Berkshire
48. Christine Maltin, Gloucs.
49. Michael Lowne, East Sussex
50. Piers Nicholson, Surrey
51. David Brown, Avon
52. Patrick Powers, Herts.
53. George Wyllie, Dumf & Gall
54. Geoff Parsons, Hampshire
55. John Ingram, Wiltshire
56. Peter Walker, Surrey
57. Alan Smith, Manchester
58. Roger Bowling, Cheshire
59. John Isaacs, Berkshire
60. David Cook, West Yorkshire
61. D. R. Rush, London
62. Diana Lowne, East Sussex
63. Dick Shackleton, Ireland
64. Graham Stapleton, London
65. John Davis, Suffolk
66. Nick Nicholls, Dorset
67. Veryan Wootton, Oxfordshire
68. Ian Wootton, Oxfordshire
69. Jim Holland, USA
70. Douglas Bateman, Berkshire
71. Owen Deignan, Ireland
72. Peter Mills, Devon
73. Richard Mallett, Bedfordshire
74. Klaus Eichholz, Germany
75. Michael Maltin, Gloucs.
76. John Hayden, London
77. Chris Taylor, Berkshire
78. Mike Groom, Kent
79. Nick Canfield, Gwynedd
80. James Swingler, Cornwall
81. Peter Fieldsend, W. Midlands
82. John Moir, London
83. Walter Wells, Leics.
84. Mike Cowham, Cambridgeshire

had located supporting sundials in a variety of ways. His lecture was entitled "The Grim Reaper" because one of the figures he went on to discuss was the figure of Death, clad in a black robe and carrying a scythe over his shoulder. It was a relief to have a cup of coffee after this grim reminder of the frailty of human life.

Mr. John Churchill continued with a lecture "Look at this Way" with a unique treatment of the majority of sundials which is difficult to express in a few words, and so hopefully will be the subject of a written explanation with examples in illustrated form. This brought the Conference to one of the focal points of the meeting, the BSS Sundial Competition Awards Presentation sponsored by Sun Alliance, with the prizes presented by the Earl of Perth who had journeyed to West Dean College for the occasion. He gave a fulsome speech on the attainments of those who entered the competition, mentioning his own collection of 9½ sundials and remarking on the coincidence that the winning sundial should be at the meeting place of the 1996 BSS Conference; followed by another speech by the new Principal of West Dean College, who said the College was appreciative of the honour. Sally Hersh received the first prize and a cheque for £250, see Figure 2. All the runner-ups were given a Certificate of Commendation in recognition of the art, design and craftsmanship shown. The writer collected the Certificate of Commendation awarded to Mr. John McCrindle for his horizontal sundial in the

FIGURE 2: The BSS Sundial Competition Award Ceremony. Sally Hersh has just received her first prize certificate from Lord Perth (Patron of the BSS, on the right) whilst the paternal figure of the BSS Chairman looks benignly on in the background.

public park, Bakewell, Derbyshire, whilst the assembled Conference showed their appreciation of the Patron of the BSS attending the prize-giving ceremony in the usual way.

After lunch, most of the members went off to visit the Weald and Downland Museum not far away. The writer, thought he heard the directions given as turning right at the entrance gate, but followed two cars out of the West Dean car park and was surprised when they turned left. No matter, they must know the way, a few minutes later one car turned into a public house car park, so he followed the remaining one. Several miles later, it was obvious that the Weald and Downland Museum was nowhere to be found in that direction, so a retreat was made back to the main road and a reversal of direction soon found the missing museum. It is quite a fascinating area with an assemblage of early

FIGURE 3: The Market Hall from Titchfield, Hampshire, in the main complex of buildings at the Weald and Downland Open Air Museum.

English houses, see Figure 3, and other things like carpenters' and plumbers' workshops, a water mill for grinding corn, and so on. A wonderful experience but very tiring, for the site covers many acres and some of the houses are quite a distance from each other. The writer was reminded of the distances later that night when trying to find a comfortable position for his aching legs.

THE AUCTION

Returning, with appetite keenly sharpened by the sheer volume of fresh air inhaled in the afternoon, it was a relief to sit down to an appetising Conference Dinner and build one's strength up for the evening's coming tussle, the AUCTION supervised by the Chairman, once unwisely rejected by Christies' as a potential auctioneer. Under his guidance, commonplace and readily available dialling items became the rarest treasurers and he beguiled many to spend far more than they had even dreaded parting with. If one word was over-worked on the Saturday night, it was the word "rare". [The real reason for the use of this word was only discovered ten days later and cannot be disclosed.]

With a mere table top of pamphlets and small books, photographs and the like, the Chairman extracted, with the greatest of ease, £500 from the wallets of the assembled members. The writer did not suspect that the whole assembly had that much anyway. He failed to sell just one item, which the writer later bought to preserve the auctioneer's previously unsullied auctioneering record and the dignity of the person who donated the item. Together with the sales of BSS items such as books etc, which raised another £500, the Society's funds were boosted by over a thousand pounds.

In passing it might be mentioned that the Chairman had only said a few words before opening the auction proper when the door behind the platform opened and the figure illustrated in Roger Bowling's lecture of the morning entered. Dressed entirely in black from head to front and carrying an ancient scythe over his shoulder, he entered slowly and shuffled towards the gathering. Conscious of the warnings from his medical advisers, the writer, for a brief moment thought he might have come for a personal

confrontation, but by the time the figure drew near, he had recovered his aplomb sufficiently to warn the figure that his scythe blade was dangerously near his rear (an euphemism).

A few days after the Conference, when the writer was at Christies' Auction Rooms, he realized that the professional auctioneer did not have a fraction of the verve and enthusiasm of the official BSS auctioneer, and strangely enough, he never mentioned the word "rare" once. Unique and scarce - yes; rare - definitely no!

SUNDAY

By dint of rising early a photograph was secured of the sundial on the parish church of West Dean which can be reached from the grounds of West Dean College, see Figure 4. The date inscribed at the root of the gnomon is 1729. It declines slightly to the east, and is in good condition.

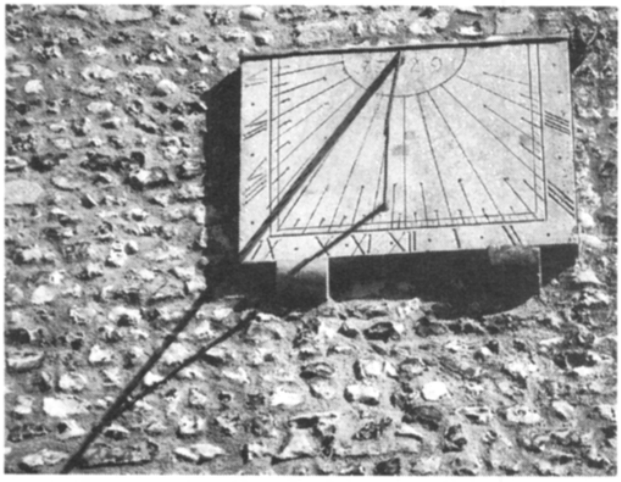


FIGURE 4: Sundial on West Dean Parish Church dated 1729. (Near the College.)

By some process not fully understood, the writer found himself in the Chair on Sunday morning to introduce the first speaker of the day, Dr. Allan Mills of Leicester University. As usual he gave a sparkling lecture with the confidence born of long practice. Slightly over-running his allotted time, he left none for the usual questions, for these meetings must be run with military precision with the timing if the programme is to keep on its designed course. Besides it was time for a coffee break and to peruse the dialling books brought to the College by Rogers and Turner.

At 11.15 the highlight of the Conference, the Andrew Somerville lecture was opened by Fred Sawyer III, who had come from the United States. It was excellently delivered by someone who knew his subject inside out. The Editor has already received a transcript of this lecture and it will be reported elsewhere in the next issue, so no further comment is necessary here. The Chairman had got his act together by now and there was a little time for questions after Mr. Sawyer's lecture.

Shortly afterwards, the Rogers and Turner bookstall was again besieged and quite a number of books were bought.

Following lunch, the Annual General Meeting got under way. The writer attended this on the premise that "what cannot be cured must be endured". To be honest he cannot remember anything of real significance apart for an appeal for an Editor from the Chairman, the result of which was a profound silence which fell upon the assembly. Modesty forbids the mention of the fulsome praises heaped on the present incumbent although these are deeply appreciated.

After the tea break the Conference members were given a rare treat, three hours to themselves but which was required to look at the many exhibits mounted by individual members. Merely to list these here would take a couple of pages, it will have to suffice to say that had these been presented together in a hall, the many themes would have made a complete exhibition in itself. These were by far the most ambitious staged yet.

In the evening David Young gave a very interesting account of how he developed a sun compass from first principles and a single piece of thick perspex. One needs a moderately accurate watch to be able to set the compass, the working principle being that an hour scale is covered by a shadow from a small dot on the top surface of the perspex disc, this shadow is set to local solar time by means of the watch (making the usual allowances, and with the help of an Equation of Time table thoughtfully pasted to the bottom of the sun compass). Thus there is no need in the future for small Boy Scouts to get lost as long as the sun is shining and they do not stray into the Southern Hemisphere. The writer was very impressed with the

FIGURE 5: The vertical declining sundial on the southwest corner buttress of Chichester Cathedral.

FIGURE 6: The rather crude gnomon of the Chichester Cathedral sundial.

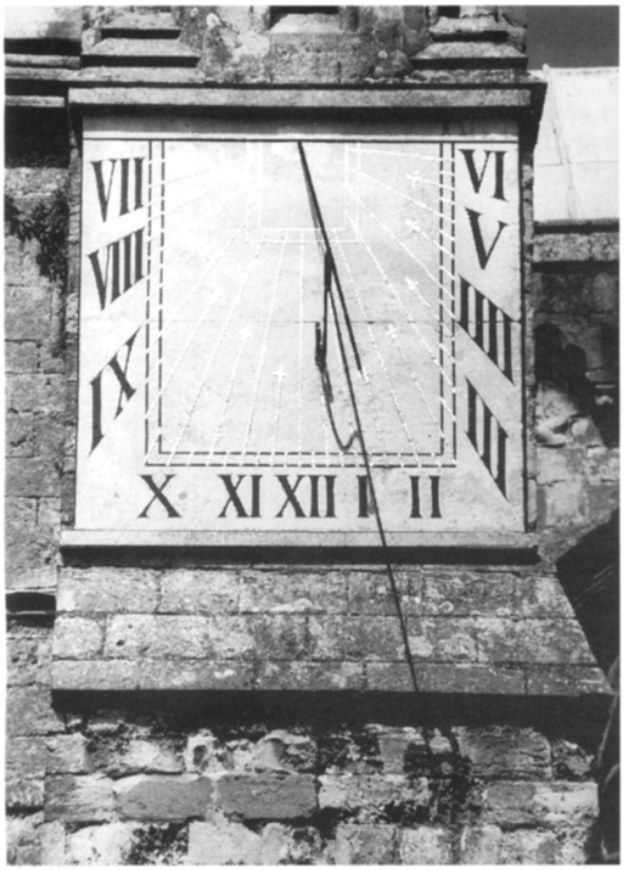


FIGURE 7: The vertical declining dial on the southeast buttress of Chichester Cathedral. Its gnomon is rather more elegantly formed.

FIGURE 8: The famous cross of Chichester standing at the junction of the four main thoroughfares of old - (North, East, West and South Streets).

research and the practical progression of the work.

Another short lecture was given by John Ingram on the Virgin and Child dial at Inglesham church, again a very interesting lecture and tackled in quite unusual ways, including flying over the site. My own impression was that it was a figure of the Virgin and Child on which someone had engraved a dial, rather than a Virgin and Child dial.

MONDAY

There was a choice of four options on Monday morning, although it was possible for a glutton to encompass Letter Carving in Stone, Portable Dials, Mass Dials, and Photography in the morning. The writer choose to go to the Fishbourne Roman Palace near Chichester and was not disappointed except for no sundials, and although the coach went within sight of Chichester Cathedral, a stop for the purpose of photographing the two sundials there was either not possible or not allowed. For those who have never been there, it is an eye-opener to see the remains of the huge and wonderful complex built there by the Romans in the early part of their occupation of Britain. Very well recommended and most interesting.

Returning to West Dean, the time before lunch was occupied in a tour of the West Dean grounds and enclosed kitchen gardens. The prolonged low temperatures of early 1996 was evident in the lateness of the flowers.

Following lunch there was an entertaining lecture on Stained Glass Sundials but the writer was not going to be denied his photographs of Chichester Cathedral whilst the sun was shining, his appetite being whetted by Robert Sylvester's glowing account of them, so off he went to Chichester by car. The last time these were seen, they were in a very shabby state. This time, in spite of Robert, the main one on the south-west corner of the cathedral was rather faded, see Figures 5 and 6. It is clear that a signwriter had been at work here because the classical presentation of the hour numerals has been ignored and the result is offensive to the eye. The sundial on the buttress near the south-east corner is fresher, see Figure 7, but carried out by the same hand and what would be a nice example of a standard sundial is spoilt by the out of proportion presentation of the hour numerals on the sides.

Somewhat annoyed by the sight of these, a short tour of Chichester followed, see Figure 8 for the famous Cross at the junction of all the main streets in Chichester. Once all the niches were filled with the figures of saints, possibly these were toppled out of their places by the Puritans. In the main, most vehicles are banned from the centre of Chichester, making the centre rather short of action, on mentioning this to an old native, he told me that as a young man, I should not be looking back into the mist of memories. Asked how old he was, "ninety-five years young" he replied!

Returning to West Dean College, and not wishing to cause a disturbance by entering the lecture room halfway through the lecture, a short tour of the exhibits was made, with a glance at the many treasures in West Dean College, including the fine rococo cartel clock shown in Figure 9. And finally, the first prize winner of the BSS Open Competition for Sundials, see Figure 10, actually taken the previous morning.

Getting into his car after his final cup of tea, the writer wondered where the time had gone, for it was only a few minutes ago that he had arrived there. Only a body weary from the exertions of the previous three days reminded him

FIGURE 9: A rather nice rococo cartel clock signed Colin Decka, in the main corridor of West Dean College.

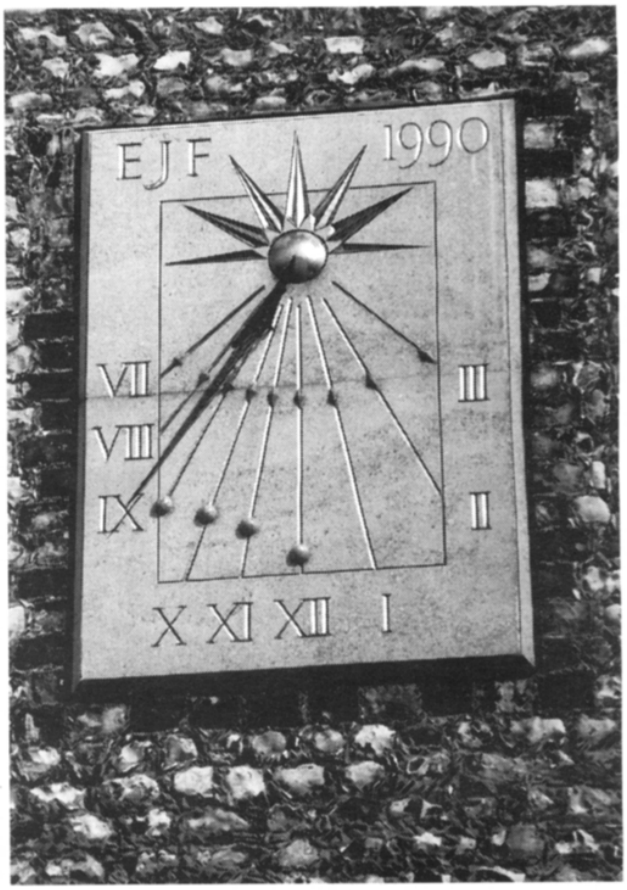


FIGURE 10: The BSS Sundial Competition Winning Sundial by Sally Hersh. (E.J.F. in the upper left corner is the abbreviation for Edward James Foundation. One day someone will attribute the sundial to the maker E.J.F.

that a lot of water had travelled under the bridge in the meantime, less than half an hour after leaving West Dean College, a tempting layby was seen and half an hour's nap became the order of the day.

Being a Yorkshireman (at heart), the writer preferred the Grantley Hall Conference of 1995, and although West Dean College has more palatial treasures, the standard of food was not as good, and there was no waiting at table for the Conference Dinner. Nor did the writer like being expected to have vacated his room before breakfast on the last day. But all in all, the BSS Conference was well up to its accustomed standard, thanks to the organising team headed by the BSS Secretary. So many thanks David. And thanks also those BSS members who took so much trouble to provide little vignettes of their own dialling interests, and in particular to Anne Somerville for a huge layout of BSS Bulletins, books, dialling lists, and other byproducts of the British Sundial Society. To sell over £500 of BSS material to about 90 members is no mean feat by any standard.

ACKNOWLEDGEMENTS

The Group Photograph was taken by our Membership Secretary Robert Sylvester, who climbed one of the world's highest stepladders to take this view of the assembled delegates on Sunday 5th May, 1996. A key to this photograph is included with this Bulletin as a separate A4 sheet.

West Dean College for permission to include photograph number 9.

EDITOR

If any member has suitable prints of the members' exhibits at West Dean College, I will be pleased to publish these in a future issue.

MISCELLANY

The 1996 Andrew Somerville Lecture, delivered by our learned American member Frederick Sawyer III, will appear in the next issue of the BSS Bulletin. It was hoped to include it in this issue but lack of space did not allow it. Another lecture from the 1996 Conference, by Roger Bowling will also be included. This deals with a little studied aspect of dialling, that of supporters for sundials.

Will other lecturers at the 1996 Conference please note that articles based on their lectures are particularly welcome to those members who are unable to attend Conference. Quite a number of lecturers promised the Editor that they would submit articles, many appear to have fallen by the wayside, or perhaps their material went astray in the post. If you do not receive an acknowledgement within a few days of sending your material, please contact the Editor.

If anyone proposing to attend the 1997 Conference would like to prepare a report of the proceedings for publication in the Bulletin, the Editor would be most pleased to hear from them.

SUNDIALS ON POSTCARDS

P.H. RANSOM

My daughters describe me as sad. To them 'sad' means pathetic, uninteresting, pitiable. To me it means sundial activity dedicated! I just cannot wait for the weekend to come when the National Gardens Scheme allows all of us access to people's gardens. They look at the plants, while I search for dials. Even during the winter I continue my search for dials. Then by looking for references in county magazines, mathematical books and topographical books. During the past few years I have found another source: postcards. These are cheap, attractive and collectable. They add interest to the exhibitions I produce to accompany sundial talks, and so far I have not seen a lot (Bulletin 94.1, p.45 mentions the postcards sold by the Museum of the History of Science) written about this branch of gnomonics. Hence this article, which may allow another category to be included in the membership interest codes.

FROM WHERE DO YOU COLLECT THEM?

My first few cards came from shops whilst on holiday. Looking for postcards to send to friends my eye was drawn to certain cards which inevitably featured a sundial. I'm now rather good at spotting sundials that are less than an eighth of an inch square on postcards. When visiting a new area the first thing on the itinerary is to scan the postcards. This then helps determine what must be visited on that holiday. At least three postcards have to be bought: one to keep, one to mount and one to send to a friend if I can ever part with it! Another source of cards is to let your friends know of your interest and ask them to send you a sundial postcard if they see one. I am fortunate in having colleagues who work abroad. They send interesting postcards from different countries. Another source is the collectors' fairs where there is usually a number of postcard stalls. Unfortunately few (if any) stall holders have a sundial category, so one is reduced to looking through all the county sections for buildings on which there may be a dial. If you are looking for dials in a particular county this does save time.

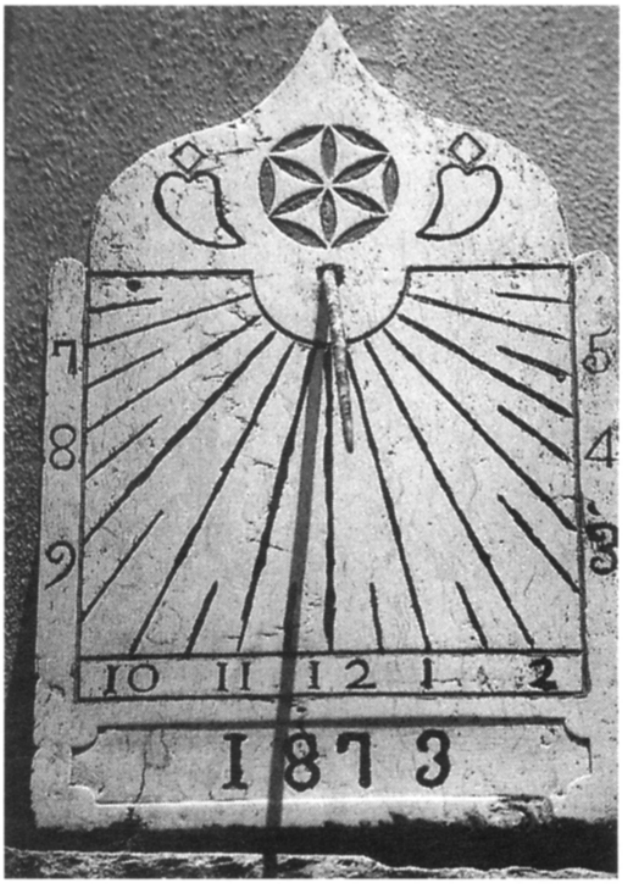
CATEGORISING THE POSTCARDS

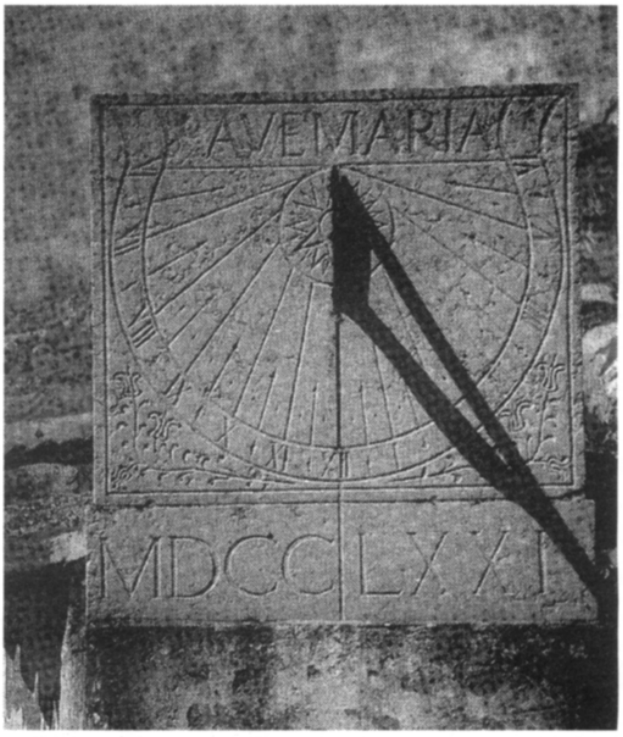
Sundials on postcards fall naturally into four types. These will be described with illustrations of each. Each type can be subdivided into old and new cards. My definition of new is Elizabethan II (i.e. after 1952).

CATEGORY 1: SETS OF SUNDIAL POSTCARDS

I have just one set of sundial specific postcards. This is a set of eighteen 6" by 4" cards from Portugal *'Relógios de Sol da Região Saloia'*. I believe they were photographed and published by mathematics teachers from Sintra, near Lisbon. These feature a dial that fills the card area. There are 14 vertical dials, 3 multiple block dials and 1 horizontal dial. The first card is a vertical south dial of a white stone with the detail painted in blue. It is located at Outeirinho, Mafra. The other one is at S. João das Lampas in Sintra.

Another set of which I am aware, although I do not have, is the one mentioned on page 20 of Bulletin 96.1. This is a French set of five postcards of dials that can be cut out and assembled. Perhaps the final card described in this article comes from this set.



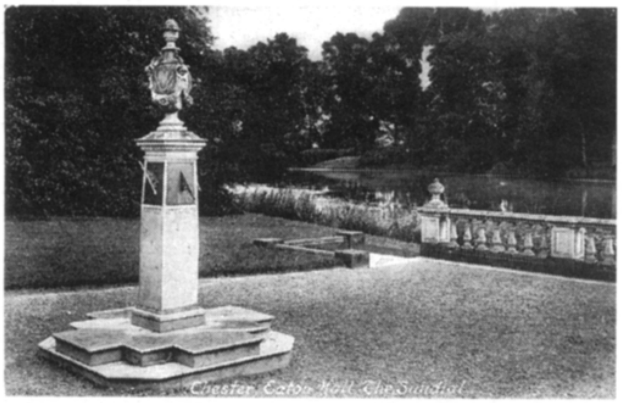


CATEGORY 2: INDIVIDUAL SUNDIAL POSTCARDS

These are very striking because those of fixed dials include some surrounding detail as well as the dial itself. The postcards that I have collected are listed here with details of where they are and references to the publisher.

Location	Dial type	Old/new	Publisher (+ address + reference)
Newton Kyme	Horiz	Old	P&R Leeds 241
Conway church	Horiz	Old (6/8/07)	Evans' series
Wroxton Abbey	Horiz	Old	Free with Shurrey's publications
Holyrood Palace	Multiple	Old	Ingle's, Carlton Hill Edinburgh
Eaton Hall, Chester	Multiple	Old	Frith & Co., Reigate no.67535
Sundial garden, Friar Park	Many types	Old	
Merton College, Oxford	Vertical	New	Thomas Photos, Oxford no. 144
All Soul's, Oxford	Vertical	New	Thomas Photos, Oxford no. 581
Eyam church dial	Vertical	New	English Life , Derby 16445E
Penshurst Palace	Demi-lune	New	ABC Historic Publications, Dunstable
Armada Sundial, Plymouth	Horiz	New	Dennis & Sons, Scarborough P.008112L 91
Armada Sundial, Plymouth	Horiz	New	John Hinde 2DC 1508
St Katherine's Dock, London	Equatorial	New	J Arthur Dixon PLO 01804
St Gregory's Minster, Kirkdale	Saxon	New	
Névache, France	Vertical	New	Pierre Putelat Molines
Reims, France	Sculpture	New	Estel, Blois A7608 W
Groningen, Netherlands	Vertical	New	Spanjersberg?
Kratzer dial, Oxford	Portable	New 1993	Museum of History of Science, 3rd series, no 3
Saxon dial, Canterbury	Portable	New 1982	Judges Ltd., Hastings C4133x CJ/IK

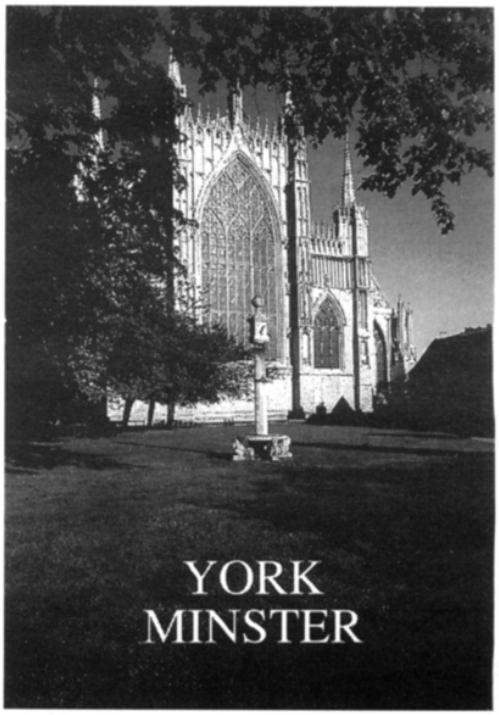
This column at Eaton Hall, Chester appears to have at least three vertical dials on it. Does it still exist? It is not in the Register.



The one of Sundial garden, Friar park intrigues me. I can make out many horizontal dials, multiple horizontal dials, globe and a cross dial. There is no information about the card publisher. It is postmarked from Henley in 1917. Does this garden still exist? If so, where is it, and has the British Sundial Society visited it? This seems a prime site for some fieldwork! The other card is the 'zonnewijzer' in Prinsenhoftuin, Groningen. This is a large vertical dial declining to the west of south.

CATEGORY 3: SUNDIALS AS A MINOR FEATURE

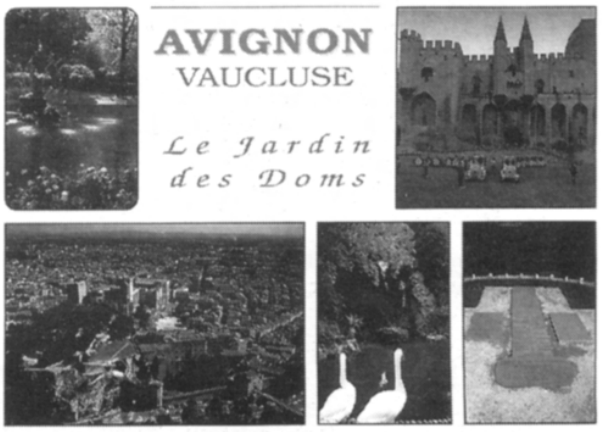
On these cards the sundial is incidental to the main picture. For example, this one of York Minster shows the multiple dial on a column in the foreground.



The Bargate at Southampton is a large monument on which there is a vertical sundial. However the dial is small in comparison with the rest of the edifice. I have sometimes found it useful to make an enlargement on a photocopier to see whether there is a sundial there or not, though none of the postcards listed here need that technique.

Location	Dial type	Old/new	Publisher (+ address + reference)
Magdalen Tower, Oxford	Horiz	Old	Levy sons & Co. Paris 9
Corpus Christi, Oxford	Multiple	Old	Levy sons & Co. Paris 15
Kilburn church, Yorks.	Vertical	New	Walter Scott, Bradford
St. Gregory's Minster, Kirkdale	Vertical	New	
York Minster	Multiple	New	Dennis & Sons, Scarborough Y002102L 92
St Mary's church, Whitby	Vertical	New	Dennis & Sons, Scarborough 34
St Leonard's church, Ingleton	Vertical	New	Judges Ltd., Hastings C6621X
Dial cottage, Killingworth	Vertical	New	North Tyneside libraries
Pockerley Farm, Beamish	Vertical	New	Lakefield Postcards, Brighouse 49
Escomb church, Co. Durham	Saxon & vert.	Old	Valentine's series 26651
Chillingham church, N'hum'land	Vertical	Old	Auty Series no. 1361
Berwick Upon Tweed church	Vertical	New	Dennis & Sons, Scarborough B.080006L 90
St Margaret's, Westminster	Vertical	New	Beric Tempest Colourcard TR26 3HT
Kingston Lacy, Wimborne	Armillary	New	Delpool KL-3
The Bargate, Southampton	Vertical	Old	F.G.O.Stuart 658
The Bargate, Southampton	Vertical	Old	35
The Bargate, Southampton	Vertical	New	J Arthur Dixon PHA 25768
The Bargate, Southampton	Vertical	New	J Arthur Dixon PHA 26397
The Bargate, Southampton	Vertical	New	John Hinde 2DH 347
The Bargate, Southampton	Vertical	New	Dennis & Sons, Scarborough S006022L
The Bargate, Southampton	Vertical	New	I. Salmon ltd. Sevenoaks 2-58-02-04
The Bargate, Southampton	Vertical	New	
The Bargate, Southampton	Vertical	New	G.G. pictures. Southampton series 1 no. 3
St. Cross Hospital, Winchester	Horizontal	Old (14/4/08)	Valentine's series 7339X
Winchester, Church of St Cross	Horizontal	Old	193 66053
St. Cross Beaufort's Tower, Hants	Vertical	Old (4/9/29)	Kingsway 5.17244
Boldre church	Vertical	New	Judges Ltd., Hastings C8778X
Breamore (4 views - 2 dials)	Vertical	New	Delpool NF-3
St Mary's church, Breamore	Vertical	New	Delpool SL-231
St Mary's church, Easton	Vertical	New	Beric Tempest Colourcard St Ives TR26 3HT
John Knox House, Edinburgh	Multi diptych		New Exclusive Card Co, Edinburgh E-10-V
Barfleur, France	Vertical	New	Editions Normandes Le Goubey, Caen
Saint-Cirq-Lapopie, France	Vertical	New	Editions Dubray 27190 Conches 12
Saint-Cirq-Lapopie, France	Vertical	New	Editions Cely, Castelsarrasin N.9432
Saint-Cirq-Lapopie, France	Vertical	New	Editions Cely, Castelsarrasin N.9434
Le beffroi, Amiens, France	Vertical	New	Editions d'art Yvon Arcueil 92
Le Peyrou, Montpellier, France	Analemma	New	Editions de la Palette, St-Clément-de-Rivière 170
Cathedrale, Montpellier, France	Vertical	New	Editions de la Palette, St-Clément-de-Rivière 173
Cathedrale, Montpellier, France	Vertical	New	Editions La Cigone, Toulouse 34
L'Eglise, Pontorson, France	Vertical	New	Artaud Freres, Carquefou-Nantes 1
L'Eglise, Malestroit, France	Vertical	New	Belles Editions de Bretagne, Quimper 56140/8
L'Eglise, Malestroit, France	Vertical	New	P Artaud & Cie, Conches 16
Le Jardin des Doms, Avignon	Analemma	New	As de Coeur, Marseille 84.7 157
La Tour de l'Horlogue, Anduze	Vertical	New	Editions SL Villeurbanne 607

The bottom right picture in this card shows an analemmatic dial in Le Jardin des Doms, which, like the one on Le Peyrou, Montpellier, relies on the observer to act as the gnomon.



CATEGORY 4: MISCELLANEOUS SUNDIAL FEATURES

On these cards the sundial appears as an unusual feature, in the sense that it is not quite what one expects. Since in listing these cards it is not easy to do them justice, they will be described individually.

The oldest sundial on a postcard that I have is that of the sundial featured on the Roman mosaic 'The Astronomer' in the Roman villa at Brading on the Isle of Wight. The dial is on a pillar next to the astronomer.

From the twenties and thirties I have five cards that were made for birthday cards and feature real sundials or drawings of dials. Unfortunately there is no indication of where these dials might have been. One of the cards has the message:

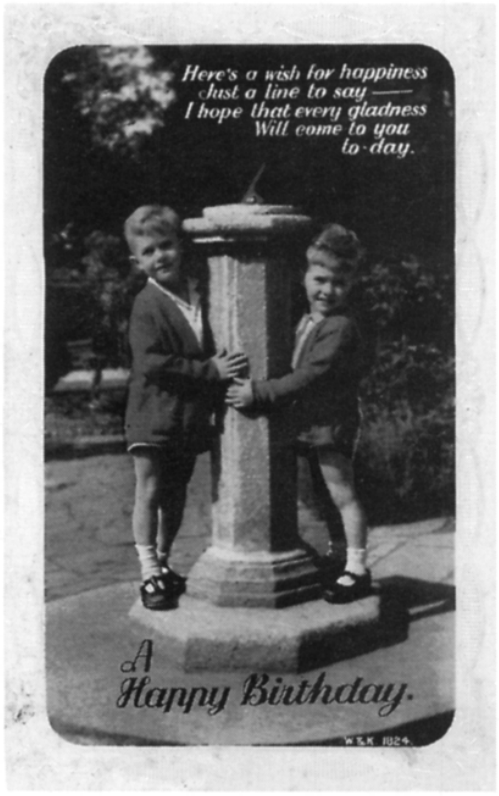
21st Birthday Congratulations
May you now you're twenty one,
Find good fortune watching o'er you,
Sweet reward for work well done,
And long happy years before you.
May your life be like a sundial in a pleasant garden set,
and telling no hours but the sunny hours.

The author of the verses is Clifton Bingham and the card was published by Beagles & Co. number 861 S. The

picture is a real photograph of an armillary sphere set in a walled garden. Another card by Beagles' (no 439 L) is a colour card of a horizontal dial in a garden. The message is similar to the last:

To greet you on your birthday
May your life be as a sundial
Which, amidst the fairest flowers,
And beneath the joyous sunshine
Tells of naught but sunny hours.

The card shown here features two little boys hugging a pedestal on which is a horizontal sundial. The card has W & K 1824 on it.



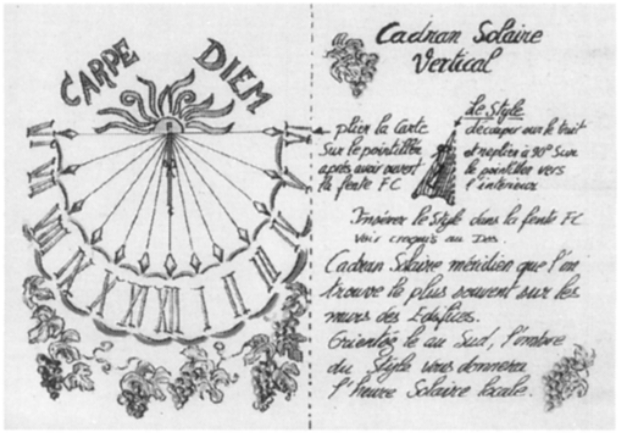
The other two sundial birthday cards have dials drawn on them. One, printed in Germany (series 2449), and shown above, has an incorrect vertical dial. The other has a drawing of an armillary sphere.

Postcard A16 by Mary Rose Trading shows the portable sundial found when the Mary Rose was excavated underwater in the last decade. It gives a selection of navigation equipment: dividers, protractor (actually a compass rose) and the sundial. An A3 drawing of this portable dial can be purchased from the Mary Rose museum at Portsmouth Historic Dockyard.

The Museum of the History of Science, Oxford, as well as selling the Kratzer dial, also have 'The Measurers' postcard (Third series, no. 2). This is a reproduction of the painting by Hendrik van Balen, c.1600. In the foreground there is an oddly shaped prism which appears to have gnomons on many faces. Next to this lies a quadrant.

The penultimate card is a net of the Martinitoren at Groningen. One cuts out the pieces, folds them up and sticks them together to make a 3-D model of the tower. At the bottom one can see the sundial. It is a pity that this is only drawn on, and not an extra element that would provide a working model!

The final card is one that folds into a working model of a vertical south dial. Published by Artissime of Nyons, France, the idea is to make a couple of cuts: one down the noon line, the other round the style and bottom of the gnomon. The card is then folded in half and the gnomon inserted through the back of the dial plate where the cut down the noon line has been made. This may well be one of the set of five cards mentioned in the 'sets' category.



I hope that this article will encourage the reader to look carefully at the postcards in a locality for evidence of sundials. As I am always interested in expanding my collection of sundial ephemera I would appreciate it if members would send me a card if they see one. I operate on the principle of a dial for a dial, and will reciprocate accordingly.

If members wish, I am prepared to draw up a list of those who wish to send sundial postcards to each other, and circulate it amongst those interested. This would operate on the understanding that those interested do their best to send cards on a one for one basis. Carpe diem!

COMPENDIUM

Volume 3, No. 2, issue for June 1996 contains a wide variety of dialling topics. The reviewer was pleased to find an article of his on a dial signed Elias Allen covering the first six pages. This has the unusual feature of a compass rose engraved 180° out of orientation with the dial itself.

Notice is given of the second Annual NASS Conference to be held at the University of Toronto, commencing on 26 September, 1996. In the same notice a plea is made for the submission of articles, for an examination of the contents listing shows that a few dedicated authors are providing most of the dialling material.

The main element of our dialling instruments indication is discussed by Don Petrie, a star located in the Milky Way galaxy and 8.3 light minutes from earth. It is hardly considered by most diallists.

Dialling on the Internet is a resumé of the sundial information on the Internet, there were at least eighteen contributing bodies in June 1996. It even includes the Sun Canon Club with the only functional sun-cannon dial in the world - compiled by Roderick Wall. A notice is included about Picture Archives in *Arbeitskreis Sonnenuhren,* the registrar Willy Bachmann has more than 20,000 photographs and slides! This huge collection is catalogued through a computer with several data bases.

Part IV of the series "Error Analysis of the Horizontal Sundial" by Lauroesch and Edinger continues with discussion of the source of time errors from a tilted gnomon. It is well illustrated.

"From the Tove's Nest" by Fred Sawyer gives eight items of topical interest, including the departure of Allan Pratt, the NASS Vice-President who has now moved to New Zealand. His office has been filled by George McDowell of Baltimore. Mention is made of the BSS Conference held at West Dean College in 1996, at which the NASS President Fred Sawyer delivered the prestigious Andrew Somerville Lecture.

Alan D. Pratt discusses a number of dialling topics in his article "The Analemma, Solar Declination, the Equation of Time . . .", followed by "The Sun's Inverted Rotation" by Erwin Overkamp, in which the possibility of the sun's azimuth reversing its rotation twice a day is discussed.

An article previously appearing in the BSS Bulletin - "Foster's Diametral Sundial" by Fred Sawyer, demonstrates his firm grasp of dialling principles and the astuteness of Samuel Foster. The next item is in the form of a mention of shareware package which was distributed in the Digital Compendium edition. (Price 3 dollars.)

Robert Terwilliger, in the Design and Construction Forum deals with "Mechanical Dialling and a Laser Trigon". The laser trigon is made from a transit and a pointing laser to simulate the sun's rays and is designed to mark out large sundials on irregular surfaces where calculations would be very tedious, if not impossible.

There is a quiz - "Photo Analysis" by George McDowell, from which with a small amount of data and a photograph, the longitude and latitude for which the dial was designed had to be found, and five other questions answered. The reviewer fears that he will not be able to claim the prize - a drink in Toronto.

Fred Sawyer also sets a quiz with an extract from Chaucer's *Canterbury Tales*, in which the reader has to determine the date of the year an observation was made that the pilgrim's shadow was eleven feet long. Those who can solve this problem may count themselves among the elite of diallists. There is a further addition "Canterbury Addendum" by Sawyer and McDowell dealing with the subtleties contained in Chaucer's words. The issue ends with an appeal for NASS Members to go out sundial hunting to expand the NASS Register of Dials. There is no doubt that young societies have a great deal of enthusiasm and vigour denied to long established bodies.

On the back inside cover is a three month table of Time and Solar Declination at Noon Eastern Standard Time.

Those dedicated to dialling are recommended to join the NASS, its *Compendium* complements the BSS Bulletin but being more orientated to the use of computers and mathematical aspects of dialling, will appeal to those who savour this approach. The Digital Compendium contains computer programs which are well worth acquiring. The technical level of the NASS Compendium compares favourably with any other published journal.

CHARLES K. AKED

HERMITAGE MUSEUM **(continued from page 51)**

Reference is made in Bulletin 96.1 to the earlier review in issue 95.3 of a translated catalogue of dials in the Hermitage in St. Petersburg, Russia. While working in the city this year I visited the museum eagerly anticipating the collection, only to be told that they had no sundials. Aware of the confusions which can arise when translations involved, I returned with a Russian colleague, who received the same response.

As a result, I would be very interested to read Patricia Atwood's translation of the article by Dr. Matveyev, and should be grateful if you would send me a copy. Enquiries at the Hermitage are ongoing and I will let you know if the mystery resolves.

E.J. Tyler refers in his review of *De Zonnewijzerkring* (Bulletin No. 96.1) to the use of a material called Snijfolie for marking dials. A British equivalent to this material is Lettraset which can be obtained in shops selling drawing instruments and materials. It is available in sheet and strip, plus characters with a range of fonts and sizes.

Reference is made in the same review to Rupelmonde, near Antwerp in Belgium, where an "Official Sundial Path" has been created. The village is close to the main Ostend/Antwerp motorway (A14/E17) and an essential detour for any passing member. Most of the dials were erected in 1994 and demonstrate the ingenuity and enthusiasm of the Belgian Society.

Members who construct dials may be interested in a plastic sandwich material available from sign making firms. The material comprises three layers, the middle of which has a colour contrasting with the outer two. Dial marking may be formed by routing, carving or engraving through the outer layer to reveal the contrasting layer beneath.

GORDON SCOTT

BOOK REVIEWS

FASZINATION SONNENUHR. Arnold Zenkert. 168 pages, 55 B & W photographs, 80 line diagrams, 17 tables. Published by Verlag Harri Deutsch, Frankfurt am Main, 1995. Thin card covers with four coloured illustrations. ISBN 3-8171-1386-2. German text. Price not known. This is a second edition of the work which first appeared in 1984.

One of the great regrets of the reviewer is that he was never able to master the various European languages, and yet this may be an advantage for it allows him to examine this book from the point of the average BSS member with no knowledge of German. Fortunately the languages of sundials and mathematics are universal, so the book is of interest even to someone who hardly knows a word of German.

There are eight main sections in the now traditional treatment of sundials, commencing, of course, with the history of dialling from Egypt onwards up to the present day. This is illustrated with many examples covering this long period. Section two deals with the mathematical and astronomical aspects in connection with dialling, ending with the Equation of Time, Middle Europe Time and Summer Time.

Section two and three are separated by a photograph of a T-shirt carrying a vertical sundial - complete with motto - *Carpe Diem* - "Seize the present moment", with the wearer actually closing his forefinger and thumb on the 2.20 shadow line to obtain his solis tempus on his solar plexis. Section three goes on to a workmanlike outline of the design and construction of sundials, this covers practically every conceivable type of dial. All the constructions are clearly laid out. In this section the reviewer found what he though was a thin blank card, however it opened to reveal two early sundial designs. This does not appear to belong to the book itself.

Section 4 deals mainly with the correction by analemmas to obtain clock time from local solar time, including the use of shaped gnomons. Section 5 is concerned with the furniture on dials such as declination lines, zodiacal signs, Babylonian, Italian and Planetary Hour lines. By the time the most complicated dial declineation is reached, the time indication seems to be of secondary importance.

Section 6 deals with practical hints for those making their own dials, including the use of a projector to simulate the sun. An illustration of an analemma with the last half of the year enclosed in the first part of the curve, leads to a much more compact design; this separates sections 6 and 7, the latter dealing with mottoes - "The Wisdom of Sundials" - and a very brief outline of chronograms which were most popular in the 18th century. These originated from the desire to establish priority of invention, and by placing a series of words in a sealed envelope to be held by a responsible body, a series of numerals would be given later in case of a dispute, these indicating the letters to be chosen, which was the key to deriving the correct claim. In the case of sundials, individual letters would be made larger and bolder, and on summating the value of these treated as Roman Numerals, a date would be revealed. There follows, in section eight, a brief outline of gnomonic practice, mainly in the form of equations to indicate the passage of the hour for the various types of sundials.

At this stage the treatment in the book goes on to round up the parts which make up the whole of dialling, namely a Lexicon of gnomonic terms, so essential to the newcomer to dialling; then a series of Tables such as Declination of the Sun, Latitudes of Cities (London not included), Longitudes, where London does appear since it is virtually on the Prime Meridian. There are a couple of nomograms for time differences and for determining solar declination throughout the year.

A two page listing of biographical works follows, mostly German, so Mrs. Gatty is excluded. A brief Subject Index is given, it seems entirely adequate for the purpose however; and a very brief Name Index, so short as to give the impression that very few have been employed in dialling.

On reading this book, it would give the impression that dialling from the Middle Ages onwards was mainly a German occupation, whereas we know that many European countries have made significant contributions, including Britain. But then how many British diallists are aware of the history of German gnomonics?

If the text was in English, the reviewer would have no hesitation in recommending "Fascinating Sundials" for purchase, it is an excellent treatise. Meanwhile he intends to buy a better German dictionary, for most of the words in the book which he attempted to translate, were not in his dictionary at all! However, such photographs as the last on the rear cover, of a rotund little man clutching a sundial to his navel, need no explanation. The complacent smirk on his face would brighten any garden.

CHARLES K. AKED

RELOJEROS DE ESPANA Y PORTUGAL, José Luis Basanta Campos, 261 pages. Museo de Pontevedra, 1995. ISBN 84-606-2679-2. Price 2000 pesetas (about £11 plus p & p.)

This little pocket book is a second edition of the bio-bibliography dictionary of clockmakers in Spain and Portugal and will not be reviewed here because most of the details are in connection with mechanical clocks. It receives mention in the BSS Bulletin because it also contains entries dealing with dialling manuscripts and books, with some illustrations of the title pages. Of course the majority of these works are little known in Britain.

Some of the title pages are illustrated in BSS Bulletin 95.1, pages 28-33. In the actual book, the details given are necessarily brief because of the large number of entries. It is a reference book, purely and simply. The contents are printed on white paper which seems rather less trying to the eyes than the original parchment tinted paper. Naturally the text is in Spanish, but a simple Spanish/English dictionary is sufficient to gain understanding.

READERS LETTERS

NORTH DECLINING SUNDIALS

I was very interested in Peter Meadows' recent article on "North Declining Sundials" and the responses to it. I performed my own calculation using the program I used to prepare the graphs in my article "Sundial Operating Limits" that appeared in Volume 3, Number 1 of the North American Sundial Society's Journal, the *Compendium*. The results are all for the summer solstice for which the sun's declination is 23·441 degrees.

Maximum operating limit:	3.47 am (sunrise)
AM maximum operating limit:	8.34 am
PM minimum operating limit:	6.04 pm
Maximum operating limit:	8.13 pm (sunset)

My results thus agree with both those of Colin Thorne and F. J. de Vries.

For reference, I transform the sun and style vectors from horizon coordinates to dial coordinates in which the X and Y coordinates are in the plane of the sundial and the Z coordinate is perpendicular to the plane forming a right hand coordinate system. Therefore, the operating limits, for any plane sundial, correspond to the times at which the Z component of the sun vector is zero.

HAROLD BRANDMAIER
(USA)

* * * * *

MOVABLE GNOMON

Sundial at Alençon, June 1996

On a recent visit to Alençon I saw the sundial illustrated here outside the Fine Arts and Lace Museum. I have not seen this type before and would be interested to know whether more experienced members have encountered similar ones elsewhere.

It appears to be an equatorial dial requiring action by the user in order to tell the time. A movable gnomon pivoted on the polar axis of the globe is turned until the narrowest shadow is cast on the equatorial hour band. A plaque on the wall at the back gives instructions for the use of the dial and carries a graph of the Equation of Time.

JOHN LESTER

* * * * *

MERIDIAN DIAL

Regarding the "semi-polar" dial (Bulletin 96.2 - "The Dials of Talmont Part II" Fig 1), I puzzled over this for several minutes. Why the figure 6 at "midday". Why, if it is a Polar dial, are "Matin" and "Apres Midi" printed upside down (for use in the Northern hemisphere)? Then it dawned on me, it is not a Polar dial, but a Meridian dial, designed to face either due East or due West.

To use the dial, it is stood on its edge like a wheel, with the observer's latitude, on the scale of degrees, at the contact point with the horizontal surface (table, wall etc) it is standing on. It is then pivoted on that point until if faces due East (am) or due West (pm). A small blob of plasticine or "blue tack" would be useful to fix it to the table. Obviously, in the morning you would stand the dial at the point of your latitude on the "Matin" 0-90° scale; and use the "après-midi" 0-90° scale in the afternoon. The times shown by the scale range for 14.00-11.15 (am - East) and 12.45-20.00 (pm - West). It also shows, as pointed out in the article, the sun's declination, and, therefore, an indication of the date. If two such dials were glued back-to-back, there would be no need to turn the dial at midday.

I hope my "mode d'emploi" is more easily understood than the original must have been!

Figure 3 in the same article is also incorrect, or at least carelessly drawn. The hour lines are not drawn at complementary angles (i.e. a true mirror image) either side of the noon line and the am hours are marked against the wrong lines, the 11 is placed on the 10.30 line, the 10 is placed on the 9.30 line and the 9 is off the scale.

I have not yet attempted to analyse the other three dials!

As usual, this issue of the Bulletin contains its happy mixture of the scientific, the historical and the "who cares - but it's fun". I think the above article falls into this latter category!

I once considered producing a postcard with a simple altitude dial on it for sale at garden centres etc, but then dismissed the idea. Latitude, longitude, the Equation of Time, etc; - I could never fit it all on a postcard. Dialling is a far too complicated and weighty matter for such a casual approach. Perhaps just as well, or we would all very quickly get bored with it.

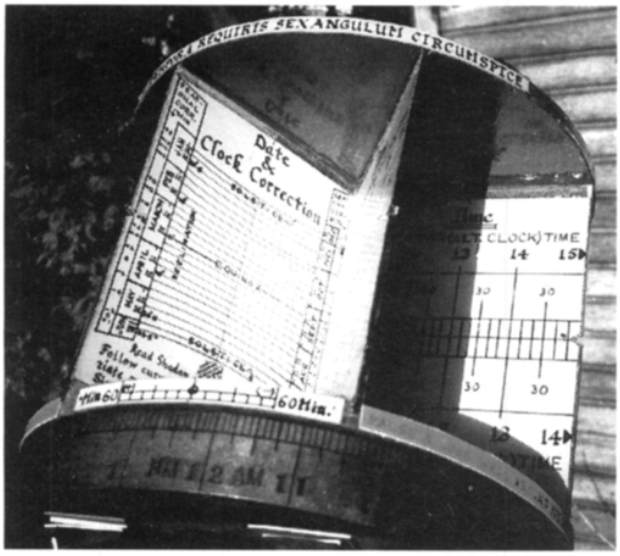
COLIN THORNE

* * * * *

OPEN BOOK AND MULTIPLE DIALS

Having a long-term attraction towards Multiple Gnomons and Dials, I was most interested in John Singleton's ingenious contribution to the BSS Bulletin 96.2 issue. A few years back I found this was a very convenient angle in constructing a Multiple Polar Dial when I ended up by encompassing the full 360 degree circle at 60 degree intervals.

The Sundial, (see accompanying photograph) comprised six identically designed dials each radiating 60 degrees from the central polar axis and each covering in succession a time range of four hours. The outer edge of each dial served as the gnomon for the previous dial, with each dial and associated gnomon forming an exact equilateral triangle, in which the gnomon faced the exact centre of the four hour ranges, resulting in symmetrical and closely even time scale divisions.



Hexagonal Dial, Bromsgrove, 1989
13.20 hours Summer Time

On the reverse of each dial I added a diagram for the declination and dates actuated by a Nodus on each Gnomon. Looking at the complete sundial now, whilst writing this letter, this additional information would equally conveniently have been included on the front of each dial. I must try a Mark 2 version one of these days.

Five only of the available six dials were actually marked out, the sixth coming in useful for a nodus and a Latin motto which - somewhat presumptuously - I borrowed and adapted from Sir Christopher Wren*:

"SI TEMPORA REQUIRIS SEXANGULUM
CIRCUMSPICE"

with an equivalent English translation:

"Should you require the fleeting hour to fix,
Pause and look well among my angles six"

PETER LAMONT

***EDITOR:** This refers to the wording on Sir Christopher Wren's tablet in St. Pauls Cathedral, London, - "If you would seek his Monument, look around you", i.e. at St. Pauls itself. Sir Christopher Wren was, of course, an able diallist in his own right.

MERIDIAN LINE AT RAMSGATE

I read the article about the Meridian Line at Ramsgate, in the BSS Bulletin 96.2, with interest. I correspond with the Secretary of the Madrid Society and see their Bulletin from time to time. By coincidence the latest edition contains an article about meridian lines in the Royal Palaces in Spain.

There are just three sites mentioned, the *Palacio de Aranjuez* where the meridian line is in the so-called King's Office, and dates from 1747. There are two meridian lines at the *Monasterio El Escorial*, in adjacent rooms, dating from 1755. There are records of another meridian line at the *Palacio del Buen Retiro* 1765 but this unfortunately no longer exists.

I hope you have a good response to your request for information about more meridian lines in Britain, I would be interested to hear the results.

MRS. CAROLYN MARTIN

* * * * *

TALMONT DIALS

I think you have made a useful addition to my text with your commentary upon the 'Artissime' sundial cards, but one point that has not come over is that it is possible to obtain the cards in London, and from a BSS member. You gave me this information in the interim between the publication of Talmont I and Talmont II, and I had a direct communication with the agent for these dials. You told me the matter of the dials could not be mentioned due to the prohibition on advertising in the BSS Bulletin.

I find this most surprising and I wonder if that prohibition is known by most members and whether it is their wish that it should continue. Virtually all journals relating to the varied aspects of timekeeping welcome advertising and perhaps the time has come to canvas members on their wished regarding advertising.

DAVID J. BOULLIN

EDITOR: The decision not to have advertisements in the BSS Bulletin was made by our first Chairman, Andrew Somerville. The Editor has not had a single request to place an advertisement in the Bulletin, it is not up to him to decide whether these shall be allowed or not, it is the prerogative of the BSS Council. So far, mention of the professional activities of BSS members has been confined to leaflets, newsletters, and separate listings outside the Bulletin. If advertising does go into the BSS Bulletin, it can only be at the expense of editorial text since it is almost as large as it can be in its present format without requiring a change of production method. No other sundial journal carries advertising, including *De Zonnewijzerkring*, the first in the field. This is a matter to be raised at an Annual General Meeting, not for the canvassing of members costing several hundreds of pounds. And who is going to do the work of preparing the canvas, and analysing the returns? Certainly not the present Editor who has had past experience of this, both from the preparation and analysis viewpoints.

The present approach to dialling in the Bulletin, unsullied by commercialism as envisaged by our first Chairman; with commercial matters on separate enclosures, seems as good an approach as any to the Editor.

continued on page 48

SUNDIALS THE EASY WAY

Lindisfarne Sundials have produced a pair of dialling scales (Latitude and Hour) so that sundials may be designed and delineated by means of the time-honoured simplest method ever devised. The latitude scale is about seven inches long, with 0-90° degree divisions on both edges, whilst the hour scale is drawn in 5 minute intervals to cover a twelve hour range and is almost ten inches long. The scales are precision etched into brushed stainless steel (to avoid danger of rusting in use).

The scale are clearly marked, backed by material to hold the scales in the desired position without the danger of slipping whilst marking out. An eight page booklet and four design examples on A4 sheets outline the way of designing your sundial in an easy way. The title of the booklet is actually "Designing (sic) a Sundial the Easy Way using Dialling Scales" but the booklet supplied was only a rough first draft of the final version.

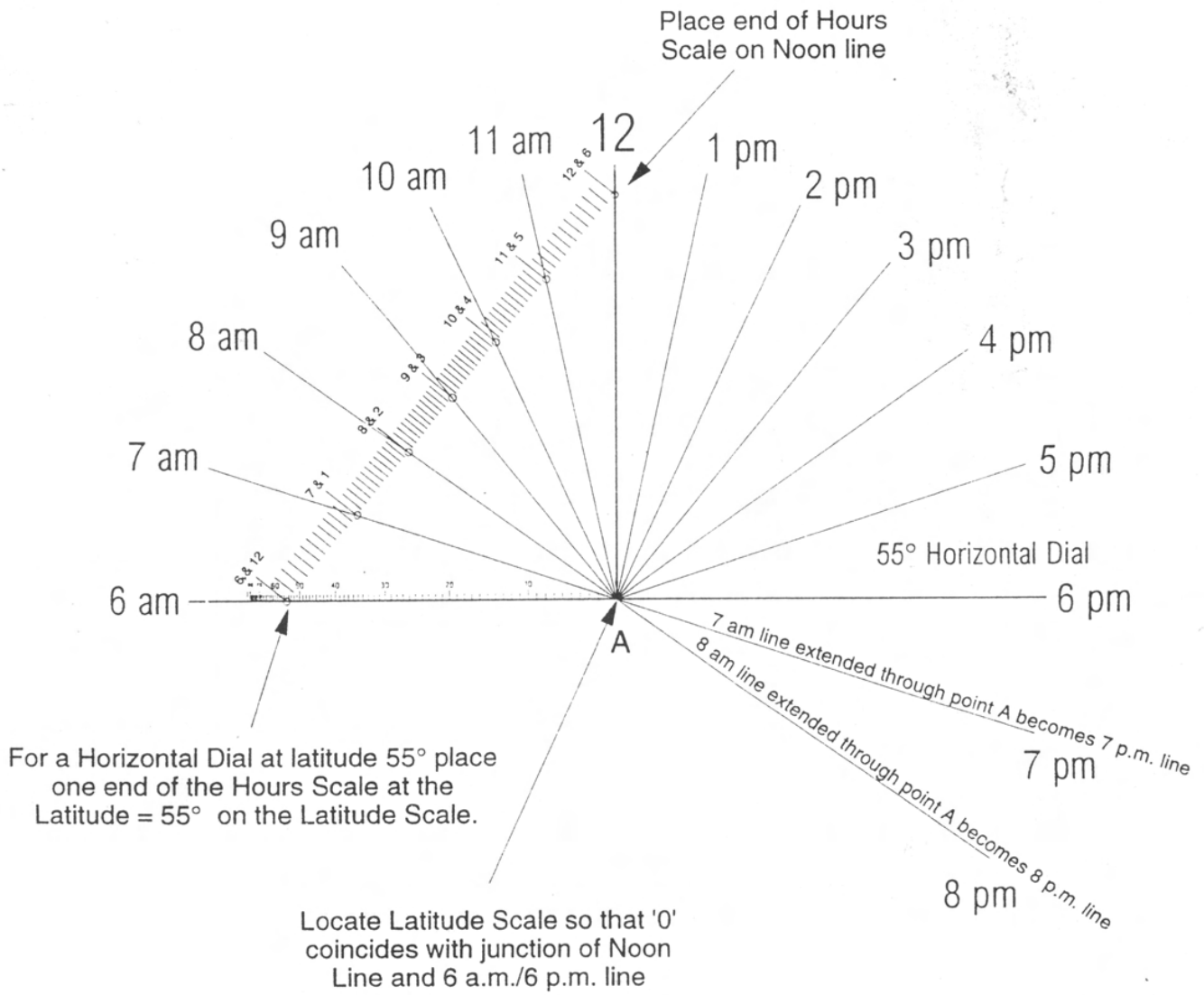
An example is shown in the accompanying illustration for a dial meant for use at the latitude of Newcastle, this clearly indicates how the greater coverage of hours for an horizontal dial may easily be obtained although the scale is for twelve hours only. Note that the dialling scales are only meant for use, in the case of vertical dial, when the dial plane is direct south-facing. If the wall is only a few degrees out of East-West orientation, the dial can be angled out to compensate.

On the last page of the booklet it refers to a diagram not to be found in any of the material sent for review, but its absence does not greatly matter since a Sundial Correction Table is given, covering every fifth day of the year, accurate enough to convert the indication given by most sundials to local clock time (plus longitude correction for Greenwich Mean Time).

In a covering letter Mr. Moss states that in addition to complete new dials without calculation, direct subdivision into five minute intervals can be accomplished without the need to measure very small angles, and also the determination of latitude for which an unknown dial plate was delineated.

Further information on these dialling scales may be obtained from Tony Moss (Lindisfarne Sundials), Tel: 01670 823232, or by writing to:

Lindisfarne, 43 Windsor Gardens, Bedlington, Northumberland, NE22 5SY, please mention you are a BSS member.



HONORARY OFFICIALS OF THE BRITISH SUNDIAL SOCIETY

PATRON: THE RT. HON. THE EARL OF PERTH P.C.
PRESIDENT: SIR FRANCIS GRAHAM-SMITH
VICE-PRESIDENT: M. RENÉ R.-J. ROHR (France)
VICE-PRESIDENT: MR. C. K. AKED

CHAIRMAN: MR. CHRISTOPHER ST. J.H. DANIEL
GENERAL SECRETARY: MR. DAVID YOUNG
FINANCE: MR. R. A. NICHOLLS
MEMBERSHIP: MR. ROBERT B. SYLVESTER
BULLETIN EDITOR: MR. CHARLES K. AKED

COUNCIL MEMBERS

Mr. Charles K. Aked
54 Swan Road
WEST DRAYTON
Middlesex UB7 7JZ
[Editor]
Tel: 01895 445332

Mr. Graham Aldred
4 Sheardhall Avenue
Disley
STOCKPORT
Cheshire SK12 2DE
[Council Member]

Mr. John Churchill
55 Rushington Avenue
MAIDENHEAD
Berkshire S16 1BY

Mr. C. St. J.H. Daniel
57 Gossage Road
PLUMSTEAD COMMON
London SE18 1NQ
[Chairman]
Tel: 0181 3178779

Wing Cdr. John Ingram
Polnish
40 Imber Road
WARMINSTER
Wiltshire BA12 0BN

Mr. E.R. Martin
West Lodge
Thicknall Lane
CLENT
Nr. Stourbridge
Worcs DY9 0HJ
[Mass Dials]
Tel: 01562 882709

Mr. R.A. Nicholls
45 Hound Street
SHERBORNE
Dorset DT9 3AB
[Treasurer]
Tel: 01935 812544

Mr. P. Nicholson
9 Lynwood Avenue
EPSOM
Surrey KT17 4LQ
[Sponsorship]
Tel: 0137 27 25742

Mr. Alan Smith
21 Parr Fold Avenue
WORSLEY
Manchester M28 7HD
[Northern Liaison]
Tel: 0161 790 3391

Mrs. Anne Somerville
Mendota
Middlewood Road
HIGHER POYNTON
Cheshire SK12 1TX
[Library, Archival Records & Sales]
Tel: 01625 872943

Mr. Robert B. Sylvester
Barncroft
Grizebeck
KIRKBY-IN-FURNESS
Cumbria LA17 7XJ
[Membership]
Tel: 01229 889716

Mrs. Jane Walker
55 Sevenacres
SOMERTON
Somerset TA11 6HG
[Education]

Miss R. J. Wilson
Hart Croft
14 Pear Tree Close
CHIPPING CAMPDEN
Gloucestershire GL55 6DB
[Sundial Makers]
Tel: 01386 841007

Dr. I.D.P. Wootton
Cariad Cottage
Cleeve Road
GORING-ON-THAMES
Oxon RG8 9BD
[Registrar]
Tel: 01491 873050

Mr. D.A. Young
Brook Cottage
112 Whitehall Road
CHINGFORD
London E4 6DW
[Secretary]
Tel: 0181 529 4880

Printed by: Stratford Repro, 42 Greenhill Street, Stratford-upon-Avon, Warwickshire. Tel: (01789) 269650