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CONTENTS

EDITORIAL

This issue includes our usual rich mixture of science and technical knowhow, history, and art. Some science is supplied by John Davis, who has indicated what a wealth of information about a dial may be derived from the values and style of the EoT written on it. An aspect of technical information is presented by Patrick Powers who astonished me by indicating how comparatively recent is the use of the familiar 6-digit grid-reference system, for locating a spot on a map. John Foad on Hogben of Kent, and Tony Wood on Housman of Shropshire, provide some biographical interest. John Wall offers a piece of historical research: in the linking of Basel with a small Yorkshire village, he recalls the time when the whole of Europe was a single unit of scholarship, cemented by the Latin language. Those who went on last September's Sundial tour of Cornwall will enjoy re-living some of its best moments while reading Frank Evans' spirited account of our exploits.

THE EQUATION OF TIME AS SHOWN ON SUNDIALS

JOHN DAVIS

INTRODUCTION

The Equation of Time (EoT) has been a frequent subject for papers in the *Bulletin*[1-5] and elsewhere[23]. This paper will focus on the way in which it has been represented on sundials with particular emphasis on the period from the first publication of accurate tables in 1672 through to the end of the 19th century. There are two aspects to consider. The first is the actual values of EoT which are calculated by the astronomers and which form the source data for the dial-makers. The second is the format adopted to present the information in engraved bronze, stone, or other material.

The value of the EoT on any particular date can be calculated by a number of methods[6,7], to different degrees of accuracy. The underlying inputs to the calculation are the eccentricity of the Earth's orbit, the obliquity of the ecliptic, the solar longitude at perihelion and the solar longitude at the date in question. The general shape of the EoT, with its two primary and two secondary maxima/minima, is so well known to *Bulletin* readers that it will not be drawn here again. It is widely known[8] that the dates on which the EoT is zero can be used to date a table (and hence an English dial) to before or after the 1752 calendar reform when England finally relinquished the Julian calendar in favour of the Gregorian one. For convenience, the dates when the EoT is either zero or at its maxima/minima are shown in Table 1 for both calendar systems as an aid to dating dials.

The slight fluctuations in the EoT value on any particular day of the year due to the leap year cycle are also well known. It is less widely appreciated that the general shape of the curve changes over the millennia as the Earth's orbital parameters change, the main influence being the longitude of perihelion. Over a period of five centuries, these changes are most noticeable by small but significant changes in the values at the four maxima/minima and, as shown in Fig 1, these can be treated as varying linearly with time. The rates of change of the two maxima (-12.0 and 12.8 seconds per century for the February and July maxima respectively) are larger than those for the minima (9.4 and -5.4 seconds per century for May and October respectively). There are also changes in the dates of the maxima/minima and the date when the EoT has a zero value but these are less easy to document because of the leap year fluctuations which are superimposed on them. It might be thought that these values of the maxima/minima

could be used to date dials with EoT data precisely but two factors prevent a simple application of this theory. First, the values of the Earth's orbital parameters, and their variations with time, were not known accurately by 17th century astronomers. Secondly, the dial-makers did not always use up-to-date tables when engraving dials, as will be shown later. Nevertheless, EoT tables on dials can provide much information on the development of both astronomy and dial-making.

HISTORICAL EOT TABLES

The earliest published EoT tables, from John Flamsteed, Christiaan Huygens and other astronomers, presented their results in a number of different ways. To allow direct comparisons of the tables with each other and with those on dials, a spreadsheet has been compiled putting the data into a common format. (This spreadsheet table is far too large to be shown here but could be made available to other researchers.) This table has a line for each day of the year, using the Julian calendar as appropriate for the earliest English tables, with tables originally published in the Gregorian calendar being converted by subtracting 10 or 11 days, depending on whether the date is before or after 1700. The EoT value is expressed in seconds using the definition

EoT = mean solar time - local apparent time

as preferred by the BSS Glossary[7] and resulting in positive values of EoT in January and February. Transcribing the tables in this fashion makes it clear that there are often printer's errors in them, such as the number of seconds in excess of 60 or the values not increasing/decreasing monotonically. Wherever possible, these errors have been corrected.

It is worthwhile commenting on some of the earliest English EoT tables, in chronological order:

i) Christiaan Huygens' 1665 tables were originally printed in *Kort Ondewys...* (The Hague) and so used the Gregorian calendar. They were communicated to the Royal Society and reprinted in English in *Philosophical Transactions* in 1669. He did not fix the origin of his calculation at the perihelion but instead set the minimum value on 9/10 February to zero with a maximum value of 31m 55s from 30 Oct to 2 Nov (Gregorian). In order to fit this table into the common format, the published values have been
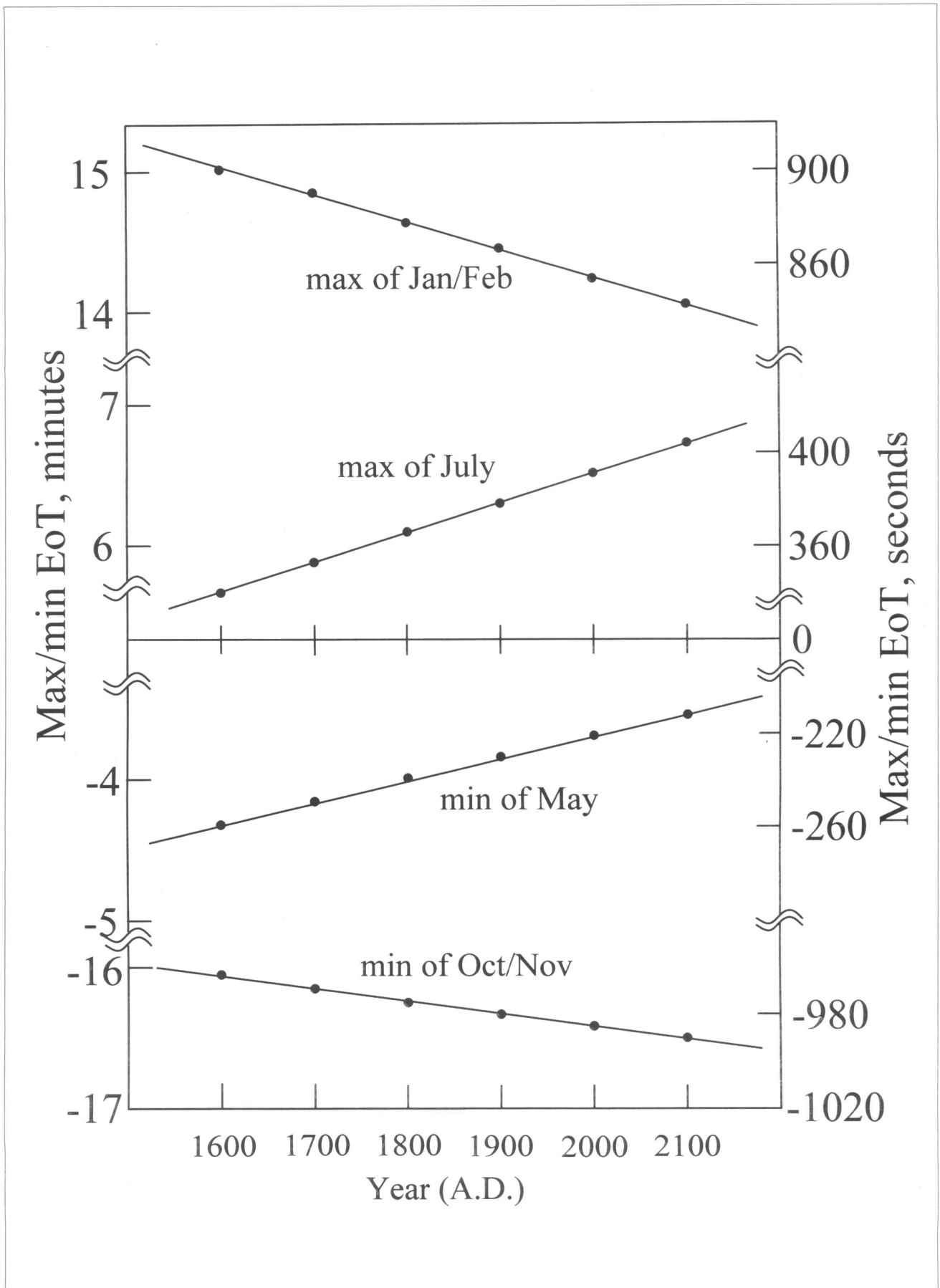
Figue 1: *Theoretical changes in the values of the four EoT maxima/minima over the period from 1600 AD to 2100. Calculated using the modern understanding of the Earth's orbital parameters, according to Meeus[6].*

subtracted from 902 seconds (a value chosen to optimise the fit to other tables) in the spreadsheet.

ii) John Flamsteed's 1672 tables are widely regarded as the first accurate tables of the true EoT and have been reprinted in the *Bulletin*[1]. Although they give the EoT in minutes and seconds, the table has 360 values, one for each degree of solar longitude. This is convenient for astronomers and it avoids the fluctuations of the leap year cycle but it is not easy to use on a sundial or for setting a longcase clock. Flamsteed was probably using Jeremiah Horrock's values for the Earth's orbital parameters at this time: these were more accurate than Huygens' but some way from perfect. Flamsteed's tables were also printed in Nicholas Stephenson's 1676 *The Royal Almanack...* This is believed[9] to use the early table that Flamsteed communicated to Sir Jonas Moore before his appointment as the Astronomer Royal, not the later one published by John Smart. Later, in 1680, Flamsteed published his *Doctrine of the Sphere* giving a detailed description of the motion of the earth and moon. It was republished the following year as part of Sir Jonas Moore's *A New Systeme of the Mathematicks....* Although the *Doctine* contains numerous tables it does not have a simple EoT laid out as a function of date so a dialmaker would have needed substantial help from an astronomer to use the data.

iii) John Smith, a clockmaker, published several pamphlets with EoT tables[9] (1678,1679, 1686, 1694). These used the Julian calendar and usually took the form of the number of seconds that each day varied from 24 hours; they thus represent the first derivative of the EoT. The version used for the spreadsheet comes from Smith's 1694 *Horological Disquisitions* but the values are actually the same as the earlier pamphlets. The arithmetic sum of the 365 values comes to just 1 second showing that there is no cumulative rounding error in the calculation. Assuming an EoT value of 532 seconds on 1 January, the values can be integrated to give a standard EoT table which proves to be identical to that of Huygens. It is assumed, therefore, that Smith derived his tables from the Huygens ones which had appeared in 1669. No sundial incorporating an EoT table based on the Smith/Huygens values has yet been identified. Smith also promoted a system of ten "rectifying days" at non-uniformly spaced dates throughout the year. At each of these a clock was to be set with a prescribed offset to solar time, with the result that the clock would remain accurate to within "a sixteenth part of an hour".

iv) Thomas Tompion (1683) printed a table of EoT to be pasted inside the door of his famous longcase clocks. He also used the table on his sundials (see below). It is believed that this table was originally supplied by the famous scientist Robert Hooke, who was the Royal Society's Curator of Experiments. Hooke[10] had invented a spring watch which he was having made by Tompion, and his diary for 13 December 1674 says[1] he "gave Tompion a description of Æquating of time for Sir J Moore's Clock". Although it seems likely that the table Hooke gave Tompion derived from Flamsteed's work, it has not so far been possible to locate the exact source.

v) William Molyneux FRS (1686) lived in Dublin where he was a member of the Irish Parliament and had other public offices, as well as being a respected amateur astronomer and mathematician. He is known to have had the elaborate dial with telescopic sights that he had invented made by Richard Whitehead, one of Henry Wynne's apprentices, so there was ample scope for his tables to have been used by the London mathematical instrument makers. His EoT table was published as part of *Sciothericum Telescopicum* and its values were close to those of Tompion's 1683 one although there are distinct differences.

vi) Thomas Tompion printed a second EoT table in 1690, this one in Latin and using the Gregorian calendar, presumably for his European customers as England was still using the Julian calendar at this time. This table, reprinted in the *Bulletin*[3], had some small but significant differences to his 1683 one, not accounted for by the change in calendar. Analysis has shown[27] that this table probably derives from the data in Flamsteed's 1680 *Doctrine of the Sphere*, although it is not known whether the necessary calculations were performed by Flamsteed himself or, for example, by Hooke. Certainly, in The *Mathematical Practitioners*, Taylor[9] says "the famous

EoT	Julian c.1700	Gregorian c.1785
Max	30-Jan	10-Feb
Min	04-May	15-May
Max	18-Jul	28-Jul
Min	22-Oct	02-Nov
Zero	04-Apr	15-Apr
Zero	06-Jun	15-Jun
Zero	20-Aug	31-Aug
Zero	13-Dec	24-Dec

Table 1. *The dates of zero and max/min EoT for both the Julian and Gregorian calendars. Note that the dates are for the 17th/18th centuries and may vary by ±1 day due to the leap year cycle.*

Tompion being supposed to follow Flamsteed".

vii) John Smart (1710) was Town Clerk of London and published a table which was derived from John Flamsteed's papers and is believed to be a re-print of his 1702 table[9]. Unlike Flamsteed's first table of 1672, this one was tabulated against dates rather than solar longitudes. The values also had distinct changes, showing the results of his major investigations into the Earth's orbit during the period 1689/90[11]. This table was widely copied in various publications over the next half-century: see, for example, the ornate but anonymous table published in the recent book by Christianson[12]. It was also used on many dials.

viii) George Neale (1733) was another clockmaker who had his own table printed for pasting inside his clocks, such as that illustrated in Ref 13. The values are the same as those published by Smart.

ix) James Atkinson Senior (1735) was a teacher of mathematics in Dublin and published an EoT table in the Supplement to his 1735 book *Epitome of the Art of Navigation*. Once again, his values are the same as Smart's although his printed version contains numerous obvious printers' errors.

x) Charles Leadbetter (1737) was a London mathematics teacher. The table which he published in his *Mechanick Dialling or the New Art of Shadows* was the first for some

years to show a significant recalculation of the basic orbital parameters. He republished the same table in 1739 in his book *The Young Mathematician's Companion....*

xi) Charles Leadbetter (1756). By the time *Mechanick Dialling or the New Art of Shadows* was re-issued in 1756, England had finally adopted the Gregorian calendar and so the dates of all the EoT maxima/minima values had changed by 11 days. Very small changes to the values of the maxima/minima show that Leadbetter had adjusted his parameters for the intervening 19 years.

xii) Society of Gentleman (1763). The second edition of the *Dictionary of Arts and Sciences....* contains an EoT table which is clearly the same as Leadbetter's 1756 one.

xiii) Roger Long FRS (1764) published a New Style (Gregorian) table in his Astronomy in Five Books. The values came from the French table for 1752 in Connaissance des Temps which are close to, but not the same as, contemporary English tables.

xiv) James Ferguson FRS (1785). By the time of the 7th edition of *Astronomy....* was published (including an account of the 1761 transit of Venus), the values of the orbital parameters were well defined and only minor updates to earlier EoT tables were necessary. The treatment here was comprehensive; four separate tables covered each year of the leap year cycle and the (mean) time of noon was

Author	Date	Equation of time at max/min				No. days GE	
		Jan/Feb	May	July	Oct/Nov	6m (Ju)	16m Oct
C Huygens	1665	15m 2s	4m 27s	5m 16s	16m 53s	-	24
J Flamsteed	1672	15m 3s	4m 4s	5m 41s	16m 16s	-	13
J Smith	1678-94	15m 2s	4m 27s	5m 16s	16m 53s	-	24
T Tompion	1683	14m 46s	4m 14s	5m 56s	16m 5s	-	8
W Molyneux	1686	14m 53s	4m 17s	5m 49s	16m 4s	-	6
T Tompion	1690	14m 49s	4m 13s	5m 46s	16m 1s	-	2
Smart (Flamsteed)	1702-1710	14m 49s	4m 13s	5m 46s	16m 1s	-	2
G Neale	1733	14m 49s	4m 12s	5m 46s	16m 0s	-	4
J Atkinson	1736	14m 49s	4m 13s	5m 46s	16m 1s	-	2
C Leadbetter	1737	14m 49s	4m 5s	5m 57s	16m 13s	-	11
C Leadbetter	1756	14m 49s	4m 5s	5m 55s	16m 13s	-	12
Soc of Gentlemen	1763	14m 49s	4m 5s	5m 55s	16m 13s	-	12
R Long	1764	14m 43s	4m 4s	5m 55s	16m 9s	-	10
J Ferguson	1785	14m 41s	4m 1s	6m 2s	16m 12s	5	11
E Dent	1875	14m 30s	3m 51s	6m 14s	16m 19s	14	14
Mre Gatty	1899	14m 27s	3m 48s	6m 17s	16m 20s	15	14

Table 2. *Key values from early published EoT tables. The signs of the EoT have been ignored. The table also gives the number of days that the EoT is greater than or equal to ("GE") a given number of minutes at the maxima. Note that the values of Huygens and J. Smith depend on the choice of an arbitrary constant. The values of Mrs Gatty and E. Dent come from the Nautical Almanac.*

given as well as the actual value of the EoT.

From this point, the number of published EoT tables proliferated and it becomes increasingly difficult to determine which were new calculations and which were merely derivative. The annual Nautical Almanac, first published in 1767 by Neville Maskelyne, the fifth Astronomer Royal, became the authoritative source of data. Mrs Gatty acknowledged the Nautical Almanac as the source of the tables in her famous books, as did Edward Dent for the tables which accompanied his dipleidoscopes at the end of the 19th century. There were also a number of simplified tables published, giving the EoT to the nearest minute, or just to one value per week. Because the differences in values between tables are small, it is difficult to identify sources with confidence although the format and choice of dates sometimes gives a clue.

IDENTIFYING SOURCES

Table 2 gives the maxima/minima values from the above tables. Where the EoT table on a dial allows these values to be read (or perhaps interpolated) to a second, these form by far the best means of identifying the source of the data. If this is not possible, the number of days around the October/November maxima when the EoT is equal or greater than 16m 0s is a very useful guide. After 1758 (conveniently close to the date of the calendar change), the July maximum exceeded 6 minutes and hence the day-count above 6m becomes useful. The method of day-counts can also be used on the two minima although it is less sensitive. When a dial gives the EoT in minutes only it is usually necessary to compare the table with possible sources individually.

PRESENTATION ON DIALS

Figue 2: *The 1675 Henry Wynne dial at Kinnaird Castle. Note the two engraving styles. Photo: The Earl of Southesk.*

The large stone polyhedral dial at Glamis Castle[14], Angus, has a simple EoT table carved on its pedestal. The dial is recorded as being erected in its present position by the 3rd Earl of Kinghorn between 1671 and 1680[26] so it is a contender for the earliest appearance of the EoT on a dial. The table consists of one value, in minutes only, for every seventh day of the year. It is spread over six sides of the octagonal pedestal and is now covered with lichen and difficult to read. Analysis of the values shows that although they follow the correct form there are significant discrepancies between the values of the maxima and minima, and the dates of the zero values, when compared to any of the tables which would have been available at this early date. There also appears to be a step of several minutes in the values between the 5th and 12th of March, i.e. at the time of the Julian equinox. Although the table might have been independently calculated by an unknown astronomer, it is also possible that it was engraved after the dial was installed using one of the approximate tables published during the 18th century. It has also been suggested[26] that the table may have been obtained experimentally, using sidereal time as a reference. This is certainly possible but any claim for this to be the earliest table on a dial must be viewed as unproven with some suspicion.

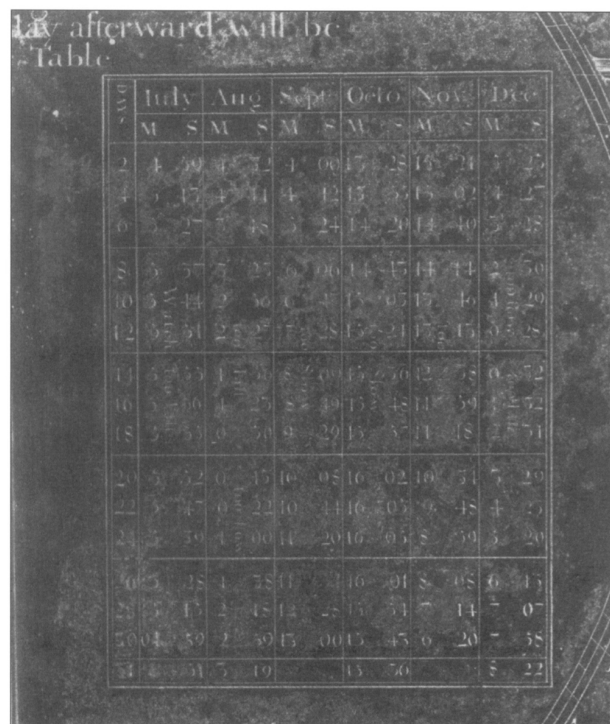The earliest dated dial with EoT data is the 1675 Henry

Figue 3: *Half of the EoT table as engraved on a dial by Thomas Tompion. Photo reprinted by courtesy of Sothebys.*

Wynne dial at Kinnaird Castle, Brechin*13*, shown in Fig 2. However, both the stylistic details and the actual values point to the EoT information being added about a century after Wynne made the original engraving. The data is in the form of a ring with the values unusually labelled "Sun fast(slow)", showing that clock time is now taking precedence over solar time. The months run anticlockwise and the engraving is oriented to be read from the outside whereas the rest of the dial, and Wynne's other dials, have the engraving oriented inwards. The style of the numerals (particularly the use of a flat-topped "8" and a very rounded "2") and the use of "J" rather than "I" for the initial letter of Jan, Jun and Jul, are not characteristic of Wynne. All of the minute marks for the EoT align exactly to a day marker, indicating that the information has been taken from a simplified table rather than by a proper interpolation of one in minutes and seconds. Finally, the values show that the table is using the Gregorian calendar (which Catholic Scotland adopted in 1599, well before the 1751 Act in England) with 12 days in October/November having values of over 16 minutes and 5 days in July having values over 6 minutes. Reference to Table 2 shows these values to point towards John Ferguson's 1785 table as the source although more detailed analysis shows an almost perfect match to a simplified table due to "Mr Smeaton" and included in Ferguson's *Astronomy*.

Another early table is on the Staunton Harold double horizontal dial by Wynne*15*, confidently dated to 1685. Here, the table is uniquely in the form of a long strip along the top edge of the gnomon. It has a scalar presentation of the EoT, divided and numbered in whole minutes, set against a months scale divided down into individual days. Although the scale is non-linear by the very nature of the EoT, it is possible to interpolate values down to, perhaps, a tenth of a minute or 6s. In addition, the number of excess seconds is actually engraved at the maxima/minima giving, for example, 16m 5s on 23 October. The need for adopting a sign convention for the EoT is neatly side-stepped by labelling the values, for example, "Watch goes to Fast" (sic). Thus all the features of the circular "Æquation of Natural Days" scales found on a large number of high-quality dials of the 18th century[16] are already present. Although it is possible that Wynne added the EoT table after the dial had been finished, this seems unlikely and so this is probably the earliest extant example of EoT data on a dial. The values that Wynne has used seem to be the same as on the Tompion 1683 printed table.

The most obvious way of presenting the EoT data, if not the most efficient or stylish, is to provide a table with a column for each month and 28/30/31 rows for the days. This was the layout adopted by the unknown maker of the "Bacon" double horizontal dial[17]. In that case, the values are only given to the nearest minute but because every day has a value it is possible to match this table with reasonable certainty to Tompion's 1683 table. A more clear-cut example is the Henry Wynne dial at Drumlanrig Castle[25] where the full table for each day of the year can definitely be assigned to the Tompion 1683 table. A dial by Tompion himself was sold at Sothebys[24] in 2002 (Fig 3) and it featured this tabular format, echoing the versions that he

Figure 4: Part of the "Æquation of Natural Days" scale on the Thomas Wright dial at Lacock Abbey (NT), Wiltshire. Note the dates increasing right to left and the maximum of 30 Jan in excess of 14_ minutes.
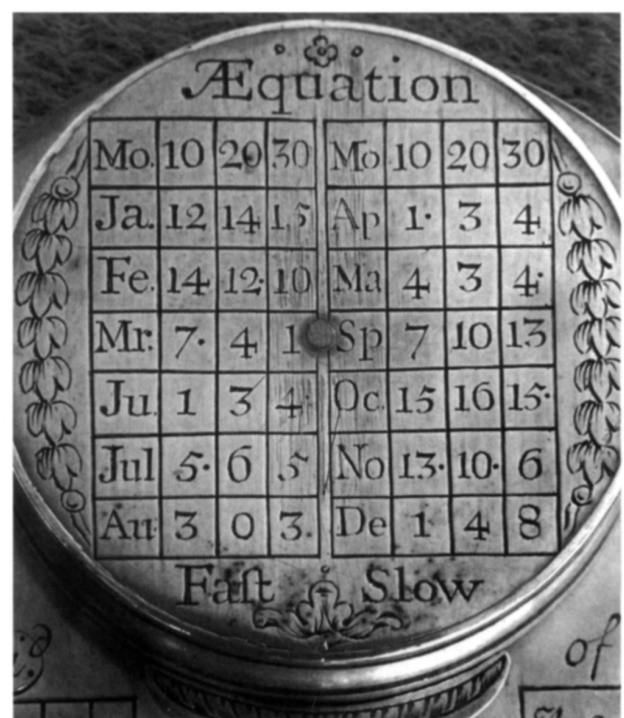

Figure 4 (b): "Æquation of Natural Days"

printed for his clocks. To save space, the values (in minutes and seconds) are given for every alternate day. Although the sale catalogue dates the dial as "circa 1705" it is easy to see that the values in this table are identical to the one he printed in 1683, rather than his improved 1690 version. Either the Sothebys' dating is a little out or Tompion has not bothered to convert his 1690 table back to the Julian calendar for this English dial.

Another example of the tabular format giving values in minutes and seconds is that at Cowham's Hospital, Stirling[18], dated 1727 and signed by Andr. Dickie. Andrew Dickie was a clockmaker in Stirling (w. 1723-39) and may also be the same man who was an official to the Board of Longitude in 1761-5. This dial was tragically re-engraved in 1910 to "freshen up" the appearance with the result that not all the values can be believed. Nevertheless, the values at the four maxima/minima are clear enough for the table to be identified as the Smart (Flamsteed) one.

In order to fit an EoT table on a portable dial, the data must be condensed significantly. An inventive method by John Rowley (Master of Mechanics to George I) is shown in Figure 4 where the table, on the back of the compass box of a Butterfield dial, has the months divided into two sets for "(watch) fast" and "(watch) slow". For August 30 (Julian), this results in the value having the wrong sign so Rowley has indicated this by use of a dot after the numeral. Some other numerals are also followed by dots; these stand in for half-minutes. The actual numbers of seconds for these values are between 25 and 38, rather than the 15 and 45 for a strict mathematical rounding. The extra resolution provided by this data allows the source to be identified as the Smart (Flamsteed) table of 1702, supporting a date of c.1705 for the dial. Rowley made a similar dial, now at the NMM, Greenwich, for the Earl of Orrery[20]. Subtle differences to which EoT values have dots show that for this dial Rowley was working from the 1683 Tompion table indicating, for the first time, that this dial probably predates that of Fig. 4.

One of the best extant examples of the Watch Faster/Slower or "Æquation of Natural Days" ring scales is that on the Thomas Wright dial at Lacock Abbey, Wiltshire (Fig 4). Here, the large size of the dial has allowed the scale to be divided to half-minutes so that, with care, it can be interpolated down to better than five seconds. This, together with the fact that it shows around 7 days in October with an EoT of 16m or more, allows the table to be identified as the early 1683 Tompion one. The dial is undated but Wright's working dates[19] of 1718-1747 show that he was using rather out-of-date data. Another, much later, Wright dial originally made for Haigh Hall, Wigan is now in a private collection. This, surprisingly, has an EoT scale in the Gregorian calendar which bears the added inscription "According to the New Style 1756 by Jno. Latham, Wigan". John Latham (w. 1730-1757) was a clockmaker in Wigan. The values of the EoT are difficult to read but, from the approximate 13 day separation of the two 16m marks in October/November, the values can be tentatively be attributed to Leadbetter's early Gregorian table.

Figure 5: *A slate dial made by Patrick Fox of Churchtown in Ireland, 1829. The letters in the corners of the dial spell out "EQUATION".*
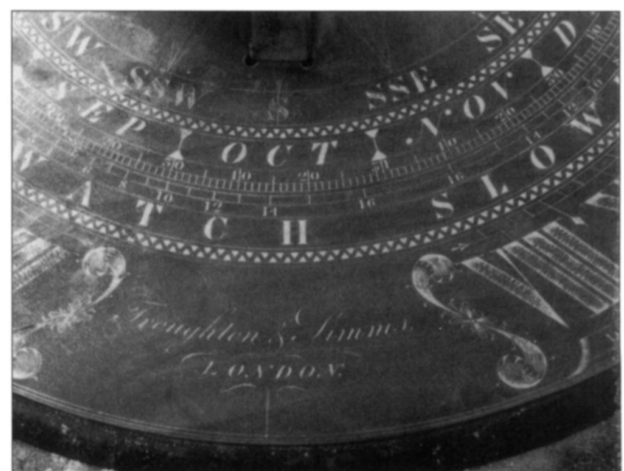

Figure 6: *Part of the EoT ring on a late 19th century dial by Troughton and Simms. The months are written anticlockwise so that the days increase left to right.*

Many dials, both garden and portable, made in the first half of the 18th century by London mathematical instrument makers used the 1710 Smart (Flamsteed) EoT table. For example, it seems that all the dials by the members of the Grocers' Guild used it. Some examples of garden horizontal dials by Benjamin Scott, Thomas Heath, Joseph Jackson and George Adams are illustrated in Ref 16. Other dials using this table include indoor inclining dials by John Sisson at the National Maritime Museum, illustrated in Ref 20, and one by Richard Glynne (another of Henry Wynne's apprentices) which was at the recent sale of items from The Time Museum[21].

Although the many examples of "Æquation of Natural Days" rings are superficially similar, there are a number of detailed differences which give clues to their dates and makers and are worth noting when recording a dial. In addition to the key values of the EoT, the questions of which answers provide clues includethe following:

• is the ring in a single arc or are there gaps at the north and south points?
• is the ring labelled "Æquation of Natural Days" or some similar title (later rings are usually unlabelled)?
• do the months lie on the inner rings with the EoT minutes on the outer ones, or vice versa?
• do the months run clockwise or anticlockwise? Note that if they are clockwise and oriented to be read from the outside, the days increase rather awkwardly from right to left.
• is the EoT labelled "Watch faster/slower" or "Clock faster/slower" or some similar expression?

The use of EoT data to date dials can sometimes produce anomolies. For example, a garden horizontal dial by Richard Glynne at the National Maritime Museum is said[20] to be dated 1753 but the reported values of its EoT maxima/minima are those of Tompion's long since replaced 1683 table. It is perhaps significant that Glynne is recorded[19] as having retired in 1730.

Although top-quality London dials continued to carry a full Æquation of Natural Days ring into the 19th century, provincial dials often only had a simplified table, if they showed the EoT at all. Fig 5 shows a beautifully engraved 1829 slate dial from Patrick Fox of Churchtown in Ireland. Fox is not otherwise known as a dial-maker. The EoT is shown as a large circular table round the outside of the dial with one segment per month and giving the dates for each integer number of minutes. It is worth noting that this method may not produce precisely the same table from the underlying data as giving the EoT to the nearest minute on pre-selected dates. This depends on the method adopted to round or truncate the data. Fox has clearly had difficulty in December where the rapidly-changing EoT has produced too many days for the available space so that he has had to erase one value and only show the even numbers of minutes. The data that Fox has used matches exactly that of the simplified table published by John Bonnycastle in his *Introduction to Astronomy* of 1796 although it is possible that there are other identical sources.

A very late example of a quality dial made by a mathematical instrument maker is one in Devon signed *Troughton & Simms*, shown in Fig 6. Edward Troughton's history can be traced back through several master instrument makers in the Grocers' Company to Benjamin Scott[16]. The engraving style on the dial shows that this influence has persisted although the design details and ornamentation have been simplified. Note in passing that the infill of the broad strokes of the main Roman numerals has been achieved by multiple short cuts from the edges, rather than the long parallel cuts that would have been used in the 18th century. The EoT scale on this dial clearly shows six days above 6m in July as well as the thirteen days above

Figure7: *The EoT graph on the 1921 dial in the Fellows' garden of Trinity College, Cambridge; possibly the earliest to use this format.*

16m in October/November. This would date the table, if not the dial itself, to the beginning of the 1826-1922 working period ascribed[19] to Troughton & Simms.

CLOSING REMARKS

Other presentation methods for the EoT are sometimes found on dials. For example, the analemma was engraved on a universal equatorial dial[20] by Johann Michael Vogler as early as the first quarter of the 18th century. A full study of analemmas on dials will be reserved for a future study. The use of an x-y (Cartesian) graph to show the EoT as a function of date seems to be a surprisingly modern feature. One of the earliest examples, shown in Fig. 7 and dating from 1921, was made by the Cambridge Instrument Company. It is in the Fellows' Garden of Trinity College, Cambridge[22]. The sign convention used in this graph is the same as that adopted in this paper (i.e., positive for the January maximim). A few other examples from the middle of the 20th century can be found in the BSS Sundial Register. In some more recent dials the correction graph also includes the local longitude correction but, strictly, this is not a true Equation of Time curve. Although the graphical format is easy to engrave and gives a fast appreciation of the correction, it does not give as good a resolution as a complete table or the scalar "Watch faster/slower" ring.

This paper has, I hope, shown that substantial historical information can be extracted from the EoT data on old dials. For modern designers of new dials, I suggest that the best data for the EoT is not that to be found printed in one of the standard mid-20th century texts (Waugh, Mayall & Mayall, Rohr etc.) or a modern computer-generated table for the year of manufacture. Instead, an averaged table for the projected life of the dial is proposed[7].

The author would be pleased to hear from readers who have other early examples of EoT tables from astronomy or navigation books, or pasted into longcase clocks.

REFERENCES AND NOTES

1. A. Kitto: "Richard Towneley and the Equation of Natural Days", BSS Bulletin, 13(ii), pp 60-65 (2001).
2. J Foad: "A Derivation of the Equation of Time", BSS Bulletin, 14(i), pp 17-19 (2002).
3. D.W. Hughes: 'An Introduction to the Equation of Time' BSS Bulletin, 93.3, pp 8-12 (1993).
4. R. Sagot: 'Equation of Time at Noon UT' BSS Bulletin, 91.2, pp 20-21 (1991).
5. R Vinck: 'The Equation of Time' (letter) BSS Bulletin, 94.2, pp 47-48 (1994).
6. J. Meeus: 'Astronomical Algorithms', Willmann-Bell, Richmond, Virginia, Second Edition (1998).
7. J. Davis (Ed.): 'BSS Sundial Glossary' (1999). The Second edition (2004) will include EoT data averaged for the period 2001-2047.
8. M. Cowham: 'Dating a Sundial by Calendar Change' BSS Bulletin, 13(ii), pp 79-82 (2001).
9. E.G.R. Taylor: 'The Mathematical Practitioners of Tudor & Stuart England' Cambridge University Press (1954).
10. S. Inwood: 'The Man Who Knew Too Much - The strange and inventive life of Robert Hooke 1635-1703' Macmillan, Basingstoke & Oxford (2002).
11. A. Chapman (Ed.): 'The Preface to John Flamsteed's Historia Coelestis Britannica' National Maritime Museum Monographs and Reports No. 52 (1982).
12. D. Christianson: 'Timepieces - masterpieces of chronometry" David & Charles, Newton Abbot, p117 (2002).
13. A.J. Turner: 'Essential Complementarity: the sundial and the clock' in 'Sundials at Greenwich ' by H Higton, OUP, Oxford, pp 15-23 (2002).
14. A. Somerville: 'The Ancient Sundials of Scotland' Rogers Turner, London (1994).
15. J.R. Davis and C.M. Lowne: 'Henry Wynne's Double Horizontal Dial at Staunton Harold', BSS Bulletin, 15(ii) pp 46-58 (2003).
16. J. Davis: 'Some 18th Century Dialmakers in the Grocers' Company' BSS Bulletin, 15(i), pp 6-14, (2003).
17. J.R. Davis & C.M. Lowne: 'The "Bacon" Double Horizontal Sundials' BSS Bulletin, 13(iv), pp 160-165 (2002).
18. This dial is SRNO 4014 and a colour photograph is in the BSS Sundial Register 2000, opposite page 364.
19. G. Clifton: 'Directory of British Scientific Instrument Makers 1550-1851' Zwemmer, London (1995).
20. H. Higton: 'Sundials at Greenwich' OUP, Oxford, pp 15-23 (2002). (The Rowley Butterfield dial is #69.)
21. Sotheby's: 'Treasures from the Time Museum Part Three', London (2002). See also Bull SIS, 78, pp. 28-29 (September 2003).
22. A Brookes and M Stanier: 'Cambridge Sundials' Pendragon Press, Cambridge (1991).
23. D. Petrie: 'The Basic Mechanics of the Equation of Time', NASS Compendium, 10(1), pp 24-30 (2003).
24. M Cowham: 'Dial Dealings 2002' BSS Bulletin, 15(i), pp 24-28, (2003).
25. G. Hendry: Private communication. The Drumlanrig Castle dial is SRNO 0897.
26. K. Mackay: Private communication. The Glamis Castle dial is SRNO 1489.
27. M. Lowne: Private communication.

Author's Address
Orchard View, Tye Lane, Flowton,
Ipswich IP8 4LD
john.davis@btinternet.com

THE DRUID

JOHN & BARRIE SINGLETON

I, Barrie Singleton, am writing this out of sheer admiration for my brother. It was not always like this; we are chalk and cheese.

John, who is five years older, is the academic and I am the artisan.

These attributes suited our roles of company secretary/accountant and process manager which we, until recently, played in our chemical products company.

But my subject here, is the Druid Sundial, devised and christened by John, developed jointly, and given form and structure by me.

John, who has a broad interest in the trappings of time (clocks, calendars, planners and sundials) had read a book describing a range of dial types. He plotted dial type against fault (non-linear, self-shading, latitude-specific etc) and found that none was "pure". He bent to the task of producing the fault-free device and the spiral-sealed Druid was conceived.

John shares that dialler's genius for the mock-up in household bits, so it was that when I called on him one day, he showed me a model in paper and wire (stuck in plasticine as I remember) of a helical sundial. I was hooked. Even at that size, its intrinsic elegance was signalled. By the following day I had cut a spiral from plastic pipe and mounted it with wire-nail spokes to a dowel gnomon mounted in a board base. I presented it proudly, only to learn that my thick gnomon would defeat accuracy. But the following day the story was quite different.

John had spotted that if he embodied a precise span of time in the shadow and used both leading and trailing edge for reference on the scale, a structurally dimensioned gnomon was feasible. The "Smart Shadow", read from both edges, had arrived. He later devised a form of "three bar numerals" which double as scale marks and offer tight time reading. By way of example: if the shadow is $\frac{1}{4}$ hour wide, a numeral bar is five minutes wide, and is easily read at the shadow edge to an accuracy two minutes. This begins to push the limits of constructional accuracy.

I struggled with dimensional and spatial ratios, the materials of construction and all those maddening factors which make this field so "rewarding". There are now embodiments from one foot to six feet high; three spoke (rigid spiral) and four spoke (wound in-situ spiral). I have used plastics, brass, stainless steel and even wood (100%!) the latter being made possible by a laceted scale; another bit of John Genius.

It is my contention that the "Smart Shadow" of the Druid dial is a quantum leap in the shadow dial. In ten-odd years, no one has challenged John's "prior art" in this. It leads to an elegance of functional members unmatched in my view. And the name "Druid"? That came later. In a fusion of ancient and modern, John came up with the "de rigeur" mnemonic: "Daytime Readout Universal Imaging Device
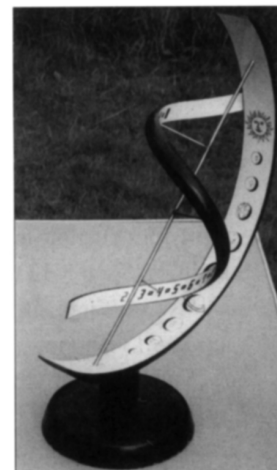
Thank you for your letter regarding attribution of the spiral dial. This was my first venture into dialling. Actually brother Barrie is the ideal partner, as he does the construction while I never get beyond the string-and-sealing-wax stage. So I suggest credit should go to the 'Singleton brothers'.

The dial dates from circa 1983, and emerged into the sunlight a few years later, just in time for the first meeting of the BSS. In more recent times, as you may recall, giant versions have appeared at David Pawley's famous meetings in Newbury.

From John Singleton
Old Coach House, Salcombe Road,
Newbury ,Berks

FINDING TRUE NORTH BY COMPASS IN 1927-40

P POWERS

Notes on Map Reading 1929 (reprinted with amendments, No's 1 to 4, 1939) HMSO 1940

In these days of computerised almanacks and satellite navigation it is easy to forget the difficulties experienced not all that long ago when trying to establish the bearing of an object on a map or even to establish true North. Since many of these problems – and also the techniques used then - are still with us when trying to align sundials, it can be both interesting and instructive to look back on such times.
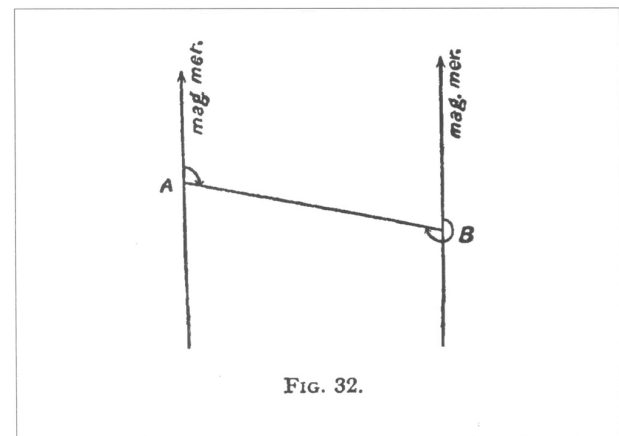

FIG. 32.

Figure 1

A book issued by the UK War Office in 1940 is a case in point. Notes on Map Reading 1929 (reprinted with Amendments (Nos 1 to 4) 1939), HMSO, 1940, makes fascinating reading. It is a reprint of a work first produced in 1927, the very year when the British System of Map Reference (dated 1919) was finally superseded by the Modified British System of Reference which is the one used today on Ordnance Survey Maps of the UK.

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68. *Compass Errors*

1. *Terrestrial Disturbances.*—The presence of iron always affects a compass, and great care should be taken to withdraw from any mass of iron when taking an observation. The following are minimum safe distances for visible masses of iron :—

Heavy gun	.. 60	yards
Field gun and telegraph wires	.. 40	,,
Barbed wire	.. 10	,,
Steel helmet	.. 3	,,
Cap badge	.. ½	,,
Box respirator	.. in " slung " position	

Electric cables and wires, dumps, railroads, tractors, corrugated iron hutments, steel or " rolled gold " spectacle frames and the like should be avoided.

Iron on the surface can be avoided, but when it lies below ground it presents a serious difficulty. Pipe lines below streets, or buried shells in battlefields, may be suspected, but in general there is no means of detecting masses of iron ore—the common cause of error—except by the behaviour of the compass itself.

If there is the least suspicion of disturbance the position of the compass should be shifted. The compass may then give a different reading, showing that there had been local disturbances, but, even if it does not alter, there remains the possibility of some widespread local magnetic field. The following test may be helpful although it is not conclusive.

Consider the forward (direct) and backward (reverse) bearings of the line AB in Fig. 32. The bearings AB at A and BA at B should differ by 180° ; if they do not, there is presumably disturbance at A or B, or both.

Every ordinary compass has its individual variation, which may differ from the mean. Compass users should not rely too much on the magnetic variation as charted (Plate VIII), but should test their compasses on lines of known true bearing, say, between trig. points ; and this should be done periodically. Bearings taken from a small scale map by a small protractor are barely good enough for this purpose a good circular protractor and large scale map (1/20,000) are necessary.

In addition the line of known bearing may not be free from magnetic disturbance ; hence comparisons at both extremities are desirable, and if possible a comparison should be made on two different lines.

To test the individual variation of the compass proceed as follows :—

1. Identify on the Map and Ground, the standpoint " A " and some distant object " B."

2. From map with protractor find Grid (or True) bearing of " B."

3. With compass, find compass bearing of " B."

4. From the Grid (or True) and Compass Bearings, find the compass variation.

5. Compare the compass variation with local magnetic variation.

    (*a*) If they coincide, the compass is correct.

    (*b*) If different the compass will have an individual variation of so many degrees East or West of Magnetic North.

Figure 2

FINDING TRUE NORTH FROM SUN OR STAR

1. *True North by Compass.*—True north is readily obtained from magnetic north if the variation of the compass is known. The compass, magnetic variation and the finding of true north in this way have already been explained in Chapter VI.

2. *True North by Watch and Sun.*—Lay the watch flat with the hour hand pointing to the sun. In the northern hemisphere the direction of true south is then midway between the hour hand and XII. In the southern hemisphere point XII to the sun ; then true north lies midway between XII and the hour hand.

Thus, in northern hemisphere, time 15.00 hrs. With watch set as described above, south lies in the direction midway between the figures 1 and 2 and north in the opposite direction.

This method is very rough. It is of no use in the tropics. The farther away from the equator the more accurate it becomes. Replacing the watch by a 24-hour dial drawn on the sketch does not make for much greater accuracy in the absence of a special device. If summer time is in force correct the watch before taking the observation.

3. *True North by the Sun.*—The method described below is one of " Equal Altitudes." Drop some sealing wax on a penny and press down thereon the flat end of a pencil, taking care that the latter is truly upright and central on the face of the coin. Place the " style " so formed on a table in the open, to which a square of white paper is pinned. Run a pencil point round the coin and find its centre O (Fig. 58). At about 10.00 note that the shadow of the pencil's point is at A. Mark A and join it to O and with OA as radius draw the circle C around O. Note that as the sun moves the shadow at the same time traces an arc (dotted, Fig. 58).

At about 13.45 examine the shadow again ; note that it is again approaching the circle. At about 14.00 the apex of the shadow again crosses the circle ; mark the point of crossing, B. Then ON, which bisects the angle AOB, is the direction of true north in the northern hemisphere, or true south in the southern hemisphere.

The reader can improve at will on this crude arrangement, and can experiment on the ground with the shadow of the corner of a roof suitably situated or with a pointed stake set at a slight angle in the ground. The centre of the circle C in these cases is vertically beneath the edge of the roof or the point of the stake ; in the latter case it may be obtained by aid of a weighted string or plumb-bob.

If the observer's position be not too near the poles, the apparatus be suitable and care be taken with the working, it

FIG. 58.   FIG. 59.
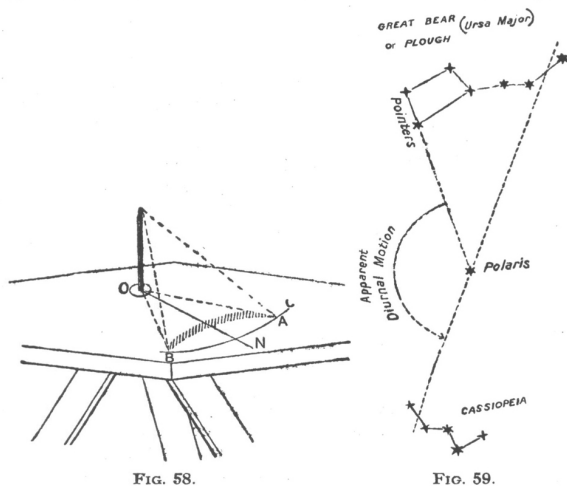
is possible to obtain true north with considerable accuracy by this method.

4. *True North by the Stars.*

1. Northern Hemisphere—The Pole Star (Polaris).—Everyone should be familiar with the Pole Star. It is the bright star indicated by the two " Pointers " of the Great Bear or Plough, Fig. 59.

Polaris gives an approximate line to true north. In latitudes less than 60° it is never more than $2\frac{1}{4}$° in bearing from the Pole. All stars revolve round the Pole and twice in the 24 hours Polaris is in the meridian, *i.e.* truly north. Midway between the times when it crosses the meridian, Polaris is approximately at its extreme distance, *i.e.* 2° about lat. 45°, east or west of true north.

There are two easy ways of knowing when Polaris is in the meridian : the first, by means of stars in the constellation of the Great Bear ; the second by stars in Cassiopeia, which is a conspicuous group, shaped like the letter W (Fig. 59) on the opposite side of the Pole Star from the Great Bear.

The Pole Star is exactly north when the point halfway between the two end stars of the tail of the Great Bear is vertically above or below it ; and the same is true for the point halfway between the two stars which form the first stroke in the W of Cassiopeia. Note this line of points, as pecked in Fig. 59, passing through Polaris.

As the height of the Pole, in other words the latitude, increases, Polaris becomes of increasingly less value as a means of finding true north.

2. Southern Hemisphere—The Southern Cross.—The Southern Cross may be used as follows : Consider the Cross as a kite ; prolong the greater axis $4\frac{1}{2}$ times in the direction of the tail, and the point reached will be approximately the South Pole. If a piece of paper be marked off along its edge by 12 dividing lines, spaced equally, and be held so that the first and third scale lines coincide with the head and tail stars respectively, the intersection of the 12th line with the edge of the paper will give, approximately, the southern Pole.

The southern Pole is more difficult to fix than the northern, as there is no bright star near it.

3. Southern Cross and Hydrus.—Continue the line above described for another two lengths of the greater axis of the Cross, *i.e.* to the 16th line of the scale ; we thus reach a star named β Hydri, which of the bright stars is the nearest to the South Pole.

When a Crucis, in the tail of the kite, and β Hydri are in the same vertical, they are nearly in the meridian and thus mark true south.

_____

Figure 3 cont...

The book is 'Crown Copyright Reserved, 1939' and I am indebted to the Controller of HMSO for permission to reproduce extracts from it here.

Within this work are sections dealing with the proper calibration and use of a compass and a section on finding True North. The extracts reproduced here may be of interest to any who today might still need to establish True North using a map and compass.

The discussion on compass errors (Figure 1) is particularly illuminating. Not only are tanks clearly to be avoided (!) but how many of us would think of needing to be some 10 yards away from barbed wire or, for that matter, of the need to establish the individual variation of our compass before relying on it? (Figures 1 & 2)

Although much of the content of the section on finding True North (Figure 3) will be familiar to diallists, the tips for knowing when Polaris is in the meridian or those for finding the Southern Pole may not be known to all.

Finally, it is salutary to realise that the formal definition of Magnetic Variation is the angle between the horizontal component of the Earth's magnetic field with True North, and that quoted on all Ordnance Survey maps – both then and now – is actually the angle made with Grid North. Diallists beware!
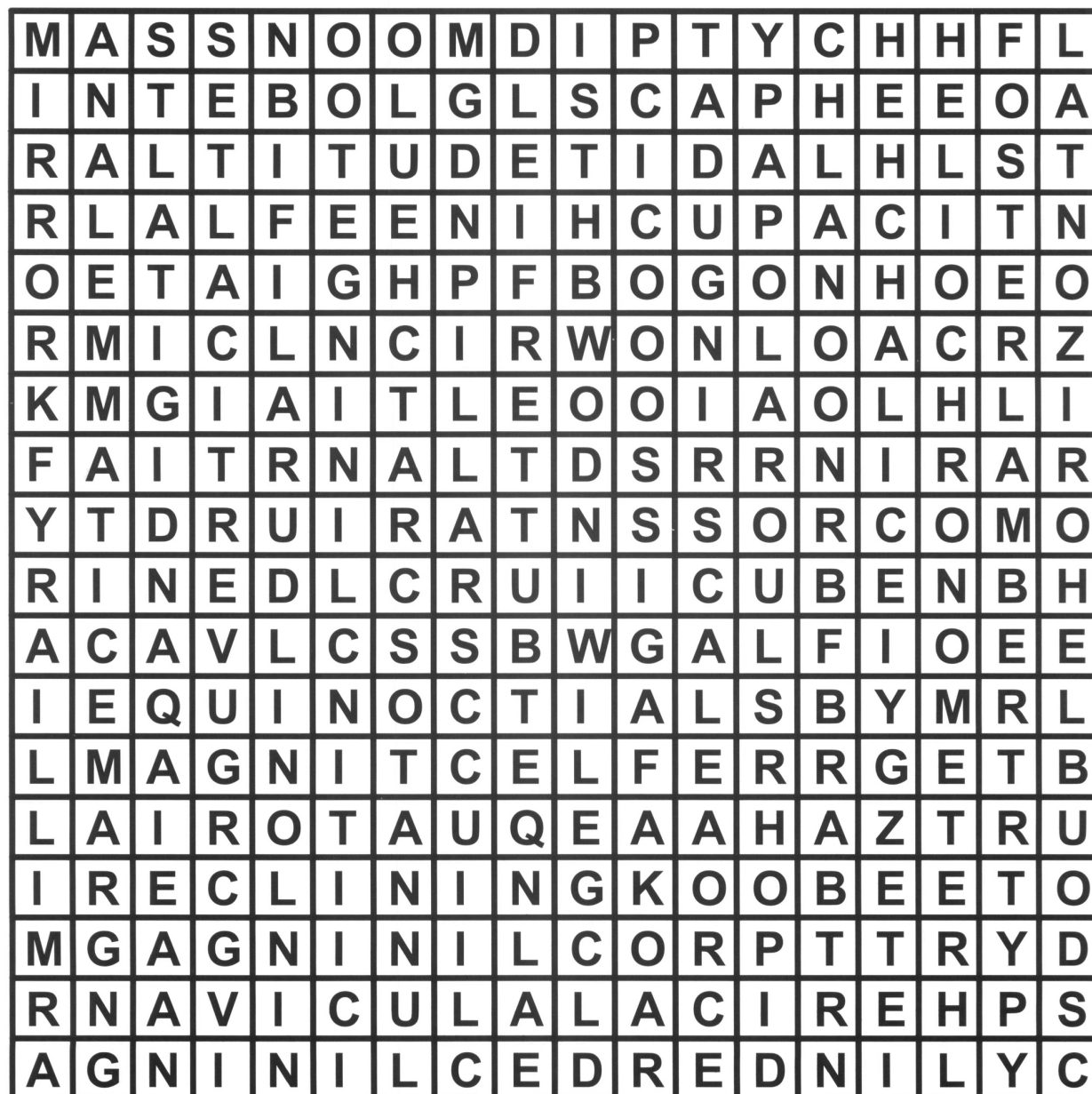
Authors address,
16 Moreton Avenue, Harpenden,
Herts, AL5 2ET

Figure 3

SUNDIAL WORDSEARCH

Hidden in this square are the names of 40 types of sundial. They may have been written horizontally or vertically and some may be written in reverse.

When all of these dial types have been found the remaining letters spell out a hidden message.

M	A	S	S	N	O	O	M	D	I	P	T	Y	C	H	H	F	L
I	N	T	E	B	O	L	G	L	S	C	A	P	H	E	E	O	A
R	A	L	T	I	T	U	D	E	T	I	D	A	L	H	L	S	T
R	L	A	L	F	E	E	N	I	H	C	U	P	A	C	I	T	N
O	E	T	A	I	G	H	P	F	B	O	G	O	N	H	O	E	O
R	M	I	C	L	N	C	I	R	W	O	N	L	O	A	C	R	Z
K	M	G	I	A	I	T	L	E	O	O	I	A	O	L	H	L	I
F	A	I	T	R	N	A	L	T	D	S	R	R	N	I	R	A	R
Y	T	D	R	U	I	R	A	T	N	S	S	O	R	C	O	M	O
R	I	N	E	D	L	C	R	U	I	I	C	U	B	E	N	B	H
A	C	A	V	L	C	S	S	B	W	G	A	L	F	I	O	E	E
I	E	Q	U	I	N	O	C	T	I	A	L	S	B	Y	M	R	L
L	M	A	G	N	I	T	C	E	L	F	E	R	R	G	E	T	B
L	A	I	R	O	T	A	U	Q	E	A	A	H	A	Z	T	R	U
I	R	E	C	L	I	N	I	N	G	K	O	O	B	E	E	T	O
M	G	A	G	N	I	N	I	L	C	O	R	P	T	T	R	Y	D
R	N	A	V	I	C	U	L	A	L	A	C	I	R	E	H	P	S
A	G	N	I	N	I	L	C	E	D	R	E	D	N	I	L	Y	C

From Mike Cowham
mike@eastlands99.freeserve.co.uk

THE GNOSALL DIAL

JOHN DAVIS

In his article "Marking Time in Gnosall"[1], Charles de Boer challenged readers to explain the unusual scales on the 1721 horizontal dial by Richard Boden. I agree with him, and with Noel Ta'Bois[2], that the scales are an attempt to give the times of sunrise and sunset. They do not rely on a shadow but act simply as a look-up table; the user has to imagine an index edge running radially from the centre of the semicircles. However, they are unusual in several aspects and are rather awkward to use. The first difficulty is that the scales are not fully labelled. The third of the five semicircular rings forms the basis of the scales and is clearly for the sun's declination. Assuming the Fig. 6 of the paper is an accurate representation of the dial, it is laid out in an equiangular fashion with the 180° of the scale representing the complete ±23.5° range of the declination. This has caused the other rings to be very non-linear (or non-equiangular) with the two outer rings, which represent the months, being significantly compressed at the solstices at either end.

Careful inspection of a photograph[3] of the original scales shows that the months are actually labelled with their initial letters; December to June in the outer (or fifth) ring and July to December in the fourth ring. Because the day numbers increase clockwise in both the outer and inner month rings, it has to be assumed that the declination scale has a variable sign convention rather than reading -23.5° at the left-hand end through to +23.5° at the right hand side. A more sensible arrangement of the dates would have been to have them running clockwise from the winter solstice to the summer solstice in the outer ring, and then back to the winter solstice anticlockwise in the inner ring, as is shown in the accompanying illustration. This arrangement would be very similar to that seen running around the horizon circle of a double horizontal dial.

The hour angles of sunrise and sunset are calculated from the sun's declination by[4]:

$$h_{sr,ss} = \mp \arccos(\tan \phi . \tan \delta)$$

where $h_{sr,ss}$ is the local hour angle at sunrise or sunset, ϕ is the latitude and δ is the sun's declination. These hour angles produce sunrise and sunset times which are symmetrical about noon and with the declination. Choice of which ring is for sunrise and which for sunset depends on which month ring is being used and is left for the user to

choose. When the latitude for Gnosall (52° 48' N, not 52° 45' as engraved on the dial) is used, the values shown in the accompanying illustration are obtained. These are similar to the values obtained from the inner two scales of the dial but there is some variation. The latest and earliest sunsets are calculated as 8.32 hours and 3.68 hours respectively, somewhat larger/smaller than the values on the dial. In fact, the dial values look to be more appropriate to London (latitude of 51.5°) so perhaps the maker has taken the values from a published table.
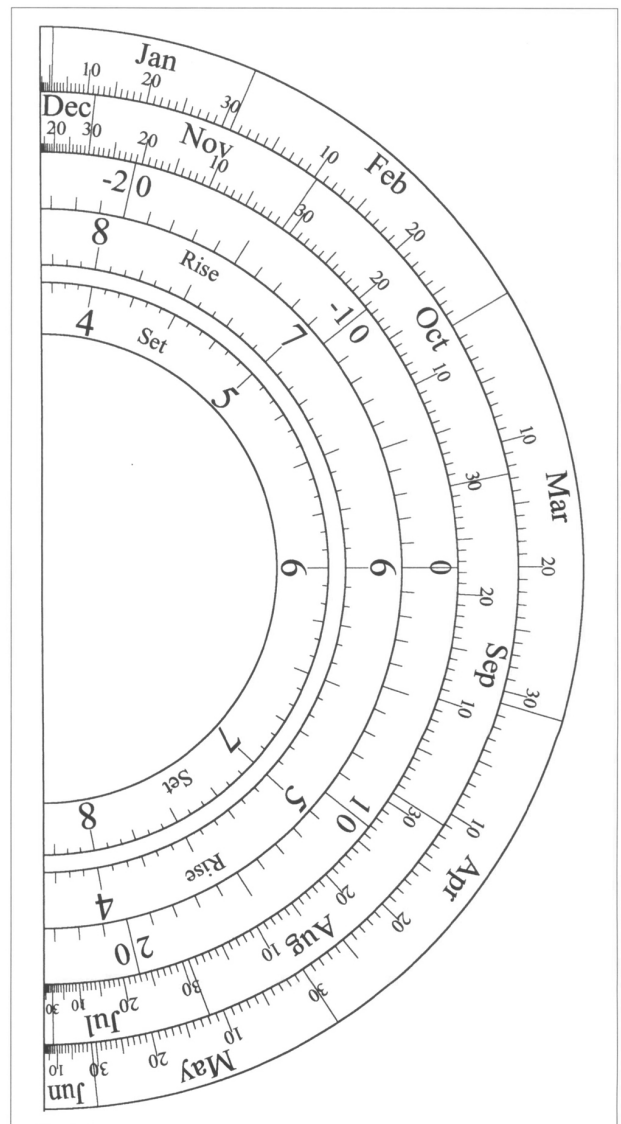
A modern version of the sunrise/sunset scales, calculated for the latitude of Gnosall (52° 48') using the Gregorian calendar and a declination table for the first half of the 21st century

A further complication with the dial scales is that the months actually occupy slightly more than a semicircle, extending just below the 6am-6pm hour line on both the east and west sides of the dial. At first I believed that this was an attempt to incorporate the slightly larger number of days in spring and summer compared to those in autumn and winter but this would be inconsistent with the 180° declination scale. Instead, it seems that the engraver just ran out of room for the closely spaced days at the solstices.

It can be concluded that the scales are a brave attempt by a country maker who did not have access to the best mathematicians!

References
1. C. de Boer: 'Marking Time in Gnosall', BSS Bull, 15(iii), pp.113-115, fig.6. (Sept. 2003).
2. N. Ta'Bois: 'A puzzling dial', The Sundial Page, Clocks (March 1988).
3. C. de Boer: Private communication.
4. J. Davis (Ed.): BSS Glossary (2000).

Author's address:
Orchard View
Tye Land
Flowton
Ipswith
IP8 4LD

NEWBURY 2003 – SING A SONG OF SUNDIAL

JOHN MOIR & PETER RANSOM

An otherwise cheery and sunny meeting was this year tinged with sadness. The day's proceedings began with a one minute silence in memory of Tony Baigent who had sadly passed away recently. Tony had become a good friend to many Newbury regulars and will be remembered especially for his amusing talks and his enthusiasm for teaching children (remember "Gregory" in Bull.BSS. 98.3, 27-29 (1998)?) Perhaps we should erect a sundial (using strictly recycled materials) in his memory.

Mike Shaw started off the talks with a witty account of his method of finding a wall's declination with the aid of a cheap laser spirit level, useful when there is no sun. The method involves finding the angular difference between the normal to the wall and a fix on a prominent landmark, then relating this to the landmark's bearing on the O.S map. He claims accuracy to $^1/_4$ degree. We were very impressed.

Next, Peter Ransom showed how, using Cabri2+ dynamic geometry software (see Newbury 2002 report in *Bull.BSS. 14(iv)*, 157-161 (2002)), he is trying to analyse the hour lines of a horizontal dial which is depicted on a Memento Mori painting in a chapel at Rug near Corwen in North Wales. With the use of Cabri2+ (demo disks available from Chartwell-Yorke Ltd, Tel 01204 811001 or www.chartwellyorke.com) perspective, both within the painting and that caused by a low camera angle can be resolved and an article on the findings will be submitted to the BSS Bulletin in due course.

More unresolved problems were discussed in the talk by Tony Wood, where "Cadrans Orientales" turn out to be not Chinese, but East facing, and a slate dial dug up near Dublin, with equiangular lines may have been a mass dial and not an equatorial, though it did have a strong resemblance to the Crowan dial (*Bull.BSS. 14(iv)*, 168-170 (2002)). As usual the members were not short of ideas/explanations!

Before breaking for lunch, Piers Nicholson gave us an update on his Spot-on dial project. He is developing a larger stainless steel version for the business/public market and also a plastic version of his garden dial intended for schools, and geared to sell at under £20. This looks a worthwhile endeavour and we wish it every success. One very impressed member took a prototype to place on his Stevenson screen at school since he reckoned it was the next best thing to a Campbell-Stokes sunshine recorder!

We then retired for lunch, chat and to watch the dials at work in the near equinoctial sunshine (amazing to see on Mike Shaw's Equatorial/clock combo how short a gnomon was needed.) Also how clear the shadow was on the shot-blasted stainless steel of Piers Nicholson's dial.

Back again inside and a surprise awaited us - a world premiere performance of "The Old Sundial" by David Brown accompanied by David Pawley on piano, the audience providing the chorus. Whoever unearthed this Victorian (?) masterpiece has a lot to answer for!

The Pawley-Brown duet lead the congregation in community singing

Ray Ashley's dials are admired

Returning to earth, as it were, Doug Bateman showed us a magnetic compass from a ship's binnacle purchased at a clock fair. Such a compass is a good option for laying out meridian lines on sunless days. Nowadays the magnetic survey stations can provide information on local variation to within 1 minute of arc. Doug will be writing it up for a future Bulletin.

The last "sit-down" event of the day was a video film showing David Pawley's work as a tower clock maker. Hard to believe he has been thus employed since 1970 but if exercise keeps you young he gets plenty of that. Apart from numerous craft skills the job requires a great deal of agility on ladders and working in confined spaces.

Doug Bateman then took the opportunity to thank, on behalf of the British Sundial Society, all those who helped to book and organise the smooth running of the Newbury meeting. Thanks go to Elspeth Smith of Rogers Turner Books for attending again with a large selection of sundial books (and for helping with the washing-up). This was an excellent opportunity for members to relieve themselves of the burden of any excess money.

Members' exhibits as usual provided a great deal of interest, as follows:-

Chris Lusby Taylor
A dial of Purbeck stone and slate, the shadow of the former on the latter giving the date rather than the time. To quote Alice (from Wonderland) "What a funny watch it is – it tells the date of the month." Also a loo roll perpetual calendar and prototype of an extremely accurate helical dial using plastic strips from window blinds

David Brown
A vertical dial of Welsh blue-black slate with a matt surface.

Ray Ashley
A 'flower power' dial, declination finder, noon cannon, CD dial, millennium dome box dial, azimuth dial (CD) and a free EoT on laminated card.

John Davis
A dial with a 57.75° gnomon – his furthest north. The dial includes declination lines for family birthdays. Also a resin cast of a double horizontal by Elias Allen

Picture 1: 47 people signed in at Newbury. You should be able to see a maximum of 46 in this picture taken after lunch

Ben Jones and his retirement dial

Peter's table of dialling novelties

Bill Hitching
A Homan dial from c.1910 exhibiting how you line up the spot of light on the analemma then read off the date.

Maurice Kenn
Shepherd's dial (Pringles canister) and a percolator (coffee time) dial that works for London or Sydney and is self-draining!

Mike Shaw
Pilkington sol chronometer and a Gibbs heliochronometer. He also displayed a dial based on Chris Lusby Taylor's design of a drainpipe dial with split gnomon for BST and GMT.

Heiner Thiessen
Equatorial dial for use around the clock (using sun, moon and stars) see
Bull.BSS. 15(ii), 63-68 (2003).

Ben Jones
A slate retirement dial with a motto that circles round without end: Time to thank you for your Time to thank you for your … Ben wonders if there is a time related similar palindrome. The best Colin Davis came up with was "Sex at noon taxes." – a good one to go on a meridian line for a retiring tax(wo)man!

Margaret Stanier demonstrates her clepsydra

Sue Manston
Photos of NE and NW facing dials, painted on wood with declination and wedding lines. Just the dial to appreciate when leaving for and returning from work! We considered this an ambitious and most successful first project.

Margaret Stanier
Delightful working model of a Clepsydra, a constant head device with a duration of 4 hours. Stretching a plastic tube provided the requisite narrow bore to provide the appropriate rate of flow.

John Moir
Models of Armillary Octahedron and bi-filar dials, one with and one without E.O.T adjustment. Photos of dials re-installed at the Horniman Museum, plus a new Analemmatic dial near Leighton Buzzard.

Peter Ransom
The usual treasure trove of dial novelties and ephemera including crested china miniature dials, shepherd's dial, cross stitch dial pictures, glass encased polyhedral dial, ring dials and books, some for sale - all of interest!

Tony Wood
Progress to date on the Dials in Museums Survey. A high percentage of replies are now in, covering mainly the South and County and smaller museums. Several interesting dials have come to light, and Tony hopes to publish a more detailed account in either the Bulletin or Newsletter.

Harriet James and Dave Pawley
Both displayed a range of photos showing their work

Martin Jenkins
Gave a "lap-top" show of dials found in the region north of Menton which he explored on motorcycle, The town of Coaraze is renowned for its dials and includes the famous Lizard sundial by Jean Cocteau. Many of the dials are painted or made with tiles.

Our most grateful thanks go to David Pawley for again organising the venue and arranging such superb weather. We are also indebted to Wendy Turnham who delayed a holiday in Portugal so she could assist with setting up on Friday afternoon, as well as helping with refreshments and signing in on the day.

We offer our humble apologies for any errors or omissions - we have now written about the Newbury meeting for 6 consecutive years and wish to make this our last report.

Volunteers to comment on Newbury 2004 (25 September) are most welcome!

John Moir, Wanstead, London
Peter Ransom, Rownhams, Southampton

Photographs by Michael Isaacs,
John Moir and Peter
Ransom

A.F. (TONY) BAIGENT

We record with regret the death in August 2003 of our member Tony Baigent of Goring-on-Thames. Tony Baigent was an enthusiastic maker of sundials, and regularly attended the Newbury BSS meetings, where he always had something original and amusing on offer. His occasional contributions to the BSS Bulletin had touches of humour, and his fellow-members of the Society found him good company.

Tony's daughters Susan Baigent and Sarah Ball have written: "He made many different dials for his garden, doing all the calculations, casting, shaping and engraving himself, with the utmost accuracy.... At the last count, there was at least ten dials, on walls or pedestals in the garden.... He wrote a small booklet 'My Garden Dials'

which was received with great interest at the BSS Newbury meeting... During September and October 2002, despite commencing a course of chemotherapy, Tony made an analemmatic sundial embedded in the grass of the Millennium Green at East Ilsley"

Photographs of Tony Baigent and of his last sundial are printed here.
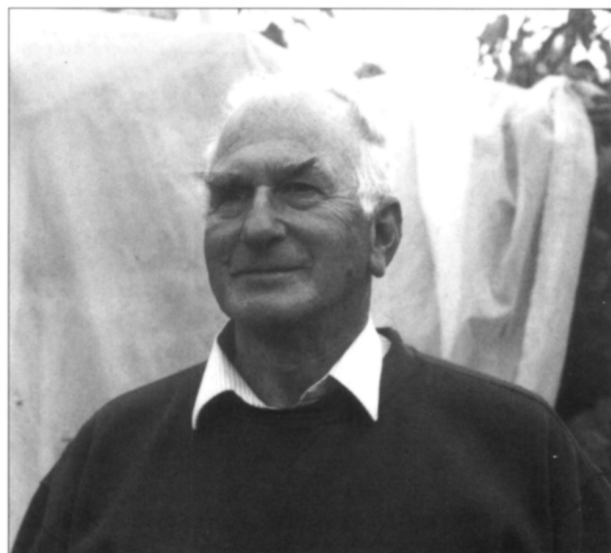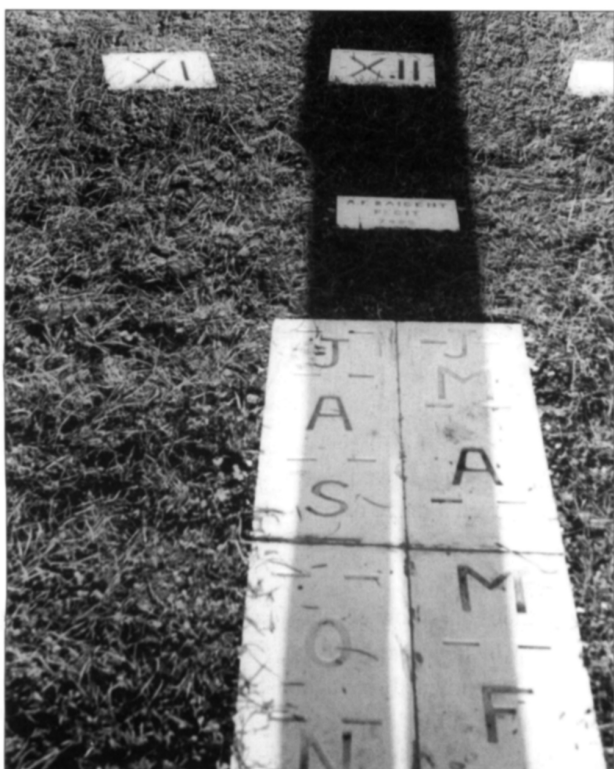
THOMAS HOGBEN

JOHN FOAD

Introduction

Thomas Hogben is widely acknowledged as one of the most distinguished and prolific of the map-makers working in Kent in the eighteenth century[1]. It is less well known that he also designed many sundials for private owners and churches in the locality. The church dials, and those for the smaller private houses, are simple affairs, attractive and well made, but remarkable for their number, rather than for any particular features. Those that he designed for large local landowners were of a different quality altogether, "geographical" dials of ornate and precise design, that were made in London to his specification. I will refer to these below as his "London" dials.

Before describing Hogben's three known "London" dials and what I may call his "Country" dials, perhaps it would be useful to fill in some of the background of the world he lived in, and his own family life and career. Much of it is speculative, and I ask your patience when I keep saying "probably" and "may well have" in what follows; but all that remains in the written record are the bare bones of Parish records of baptisms and burials; wills, letters, inventories and manuscript maps in the Archive offices; and the sundials themselves. Around these bones we can build a persuasive likeness, but it will never be confirmed in all its details.

Background

By trade, Hogben was a Land Surveyor, following the occupation of his father, and growing as I have said to become a most distinguished map maker. He lived in Smarden, and mapped the estates of land owners in the Weald, and the waterings governed by the Lords of the Romney Marshes. Over seventy of his maps can still be seen in the Centre for Kentish Studies at Maidstone, and he made many more in the fifty years of his working life. Thomas was the youngest son of his surveyor father, and in turn passed on his skills to his own youngest son, with whom he worked in partnership towards the end of his life. The middle of the eighteenth century was the Golden Age of the chain surveyor. Small areas could be mapped with no more equipment than a Gunter's Chain and pegs. A chain would cost only ten shillings or so, say £50 in today's money. More extensive properties would need the use of a plane table or circumferentor, or preferably a theodolite. The latter was a significant investment, costing around £10, about the same as the cost of a reasonable computer today;

but well worth the price when it came to the challenge of larger estates. A useful description of the surveying process can be found in Mason .

Thomas's father was born, I believe, in Aldington in 1672, son of Thomas and Mary. By the age of 19, he was living in the nearby town of Ashford, and had grown to be a well respected young man of some education. He became Clerk of the Accounts at St Mary's, the Ashford Parish Church, and married his wife Martha probably in 1693. She bore him six children between 1694 and 1702, though three died in infancy. He remained in his post at the church until his early death in the summer of 1703, less than a year after the birth of their last child. During those final years he practiced as a surveyor, describing himself on his maps as "Thomas Hogben of Ashford, Philomath".

His close links with St Mary's would have provided Martha with practical as well as spiritual support in her widowhood. The education of her two surviving sons would have been an important concern, and the clergy may well have helped in this. Thomas and his elder brother John probably attended the local Grammar School, founded by Sir Norton Knatchbull in 1635, and having always the vicar of St Mary's, and indeed the Rector of Aldington, as Visitors. To be accepted as a pupil, a child had to show that he understood the King's Grammar, and that he could read both the Old and the New Testament. Such early tuition may well have come from old colleagues of Martha's husband at St Mary's, if not from Martha herself.

Thomas

When the youngest child, our Thomas of the sundials, left school at the age of fourteen or fifteen, Martha encouraged him to take up his father's work, and he probably started by assisting a local surveyor. Even as a young lad he would be useful in setting out the poles and pegs, and helping with the chain. He would quickly absorb the skills of measurement and triangulation, and later the business of planning and recording, and eventually the arts of drawing, painting and embellishing the vellum or parchment maps that were the culmination of the process. It would not be many years before he could claim to be a fully qualified Surveyor himself.

One of the first maps to which he was able to put his own name was drawn in 1720, when he was only eighteen. It bears the legend

"Actually Survey'd Delineated and Admeasured by Thomas Hogben, Philomath", and goes on to advertise "Land Survey'd and Map't; Or land Divided &c For any Person, & according to Art performed. And Several Parts of the Mathematicks. Writing & Reading are faithfully Taught at reasonable rates by T. H of Ashford".

"Philomath" - a lover of learning of course, not just of mathematics! No doubt Thomas used the title proudly in memory of his father. It sounds strange to our ears, but it was a term employed by many surveyors at the time, and encompassed the varied activities that they advertised, often as in Thomas's case including the teaching of mathematics, and not infrequently referring to the making of sundials. Possibly even at this age Thomas was interested in gnomonics, although he does not mention the subject in his own advertisement. This early map was of Luddesdown, and was one of two of that location commissioned by an Ashford man, Matthew Rutton. Two other maps that he made in that first year were for the Commissioners of Sewers, and work connected with the drainage and sea defences of the Kentish Marshes was a subject he was to return to later in his life.

Thomas was still living with his mother at Ashford when in 1725 he married Susanna. That same year he was paid £1-12-6 "for writing of commandments" at his father's birthplace of Aldington. Boards painted with the Ten Commandments, the Lord's Prayer and the Creed were commonly erected in the churches of Romney Marsh and the bordering Weald. They were normally displayed on each side of the altar, for the instruction of the congregation. Those at Aldington have now disappeared, but similar boards may still be seen in many of the local churches.

Thomas, I believe, took his mother to stay with their relations at Aldington for a few days in the August of 1725, while he carried out his work in the church. Their hosts were a young cousin of Martha's husband, yet another Thomas Hogben, then aged 22, and his wife Mary. The cousin's father, possibly living in the same household, would have been about the same age as Martha's husband, had he survived. Martha, then in her early fifties, and widowed for twenty years, may still have been a lively and attractive woman. I think that she fell for the older man, and took the opportunity of her son's lengthy absences in the church, painting his Commandments, to break the seventh! She may have believed that she was too old to run

the risk of pregnancy, but events were to prove her wrong. Martha and her son returned to the family home in Ashford, where she and Susanna would now both be ready to give birth by the following Spring. Susanna duly delivered a daughter in April, but in May, Martha returned to Aldington to give birth there, away from the censorious chatter of the congregation of St Mary's. It may be that the young cousin and his wife in Aldington had agreed to take the child in and to bring it up as their own. But something went wrong. Perhaps Martha did not receive the care and comfort that would have attended a more conventional delivery, or perhaps it was her age. Whatever the cause, she did not survive the birth, and was buried - back at Ashford - some five days later. The child was christened Mary, and as far as I can find, she grew and flourished at Aldington, where she leaves our story.

Thomas and Susanna by now had a one-month old daughter of their own. With Thomas's parents both deceased, they sold the family home, and moved to the nearby village of Smarden, where they were to spend the rest of their lives, and raise a family of seven children.

Thomas's surveying and map making must have occupied most of his time, but as Mason[2] remarks, the measurement of land was not a road to riches. Other opportunities would not be turned down, and in 1733 he took another small signwriting job. Probably the Smarden churchwardens knew of his work at Aldington, because they paid him the sum of £2 "for drawing and writing the sentences in the church". This referred to eight oval boards, about two feet across, each holding the painted text of a single verse from the Bible. They were displayed above the pews in Smarden church, and again are a common feature in that part of the country. They were removed in 1869 but from their description[3] they would have been very similar to a set which still remain at the nearby church of Bilsington.

A few years later an additional source of income opened to him when he was appointed Master of the Free School at Smarden[4]. He held the position from 1742 at least until 1755, and remained living in the School House until his death. The school was a small charitable establishment, set up in 1720 with money from a bequest of Stephen Dadson, a bricklayer from the village of Bethersden, a few miles away. It thrived under the guidance of Thomas and subsequent Masters, and eventually evolved into what is now the local County Primary School. It is not clear how onerous his duties were, but they did not prevent him from continuing with his surveying work. Throughout the 1740's and 50's he mapped at least a few hundred acres a year. But from 1759 - 66, with his school responsibilities behind him, he was able to take more commissions, and when the Lords

of Romney Marsh decided to re-map the area, his output rose to some thousands of acres a year[5].

Despite this busy life, Thomas found time to study the delineation of sundials, and to manufacture them for several local churches, as well as for private owners. As we have seen, this was not an unusual sideline for surveyors, who would have the mathematical aptitude as well as the artistic skill to make a good job of it. An example can be found at Tenterden, where the dial on the porch of St Mildred's church (SR 0626) was made by the surveyor John Adams. Another such was the well known Kentish surveyor Robert Bottle of Harrietsham, who left the fine vertical dial that is still displayed on his house there, with the date 1788. Again, Henry Maxted, a surveyor from Canterbury, offered in an advertisement of 1738 both to make dials and to teach the art of dialling[6]. I look forward to the day when a dial of his, or of his partner Isaac Terry, may come to light. Humphrey Lilly of Appledore was another surveyor who offered "sundials drawn in any position, and beautified with gold figures, or without; also all sorts of church painting ..."[6].

But the making of sundials was always a secondary activity for Hogben. He found his fame and made his fortune, such as it was, in his surveying. When the re-mapping of Romney Marsh was planned, Hogben was already well known for his meticulous and beautiful work for many of the private land owners in central Kent, and he became a key figure in the operation. The detail he recorded was specified by his masters (boundaries, owners, acreage, bridges and so on) but the presentation was left to him. He enjoyed an elegant border, and a well presented table, and allowed these features to advertise his skill and ensure his continued popularity. An outstanding example is his map of Hoornes Waterings, dated 1762. Instead of a simple compass rose for orientation, it has a fine design of four concentric circles with "the Points or Winds according to the Ancients and Moderns". The innermost circle shows the eight winds according to Andronicus, builder of the Tower of the Winds at Athens. Next we have "the 12 principal winds" of Aristotle and Pliny. Outside that come the 24 points of Vitruvius, who in the first century BC described many types of sundial in his book "de Architectura"; and finally the 32 points "according to the modern sailors". It is painted in blue and green and yellow, all still fresh, and in what has now become a beautiful dusky rose red. The parchment map, some four feet square, shows the eastern sector of the Marshes at a scale of 24 rods to the inch, or about 13 inches to the mile. All his other maps that I have seen are signed, like his sundials, Tho Hogben or Thomas Hogben. But this map, which marks his sixtieth year, is shown rather grandly as by "Mr Hogben".

One feels that he enjoyed his work, and the respect which it brought.

The "London" Dials

Now as to his sundials. Three "London" dials of Thomas Hogben are known, all of them made for large land owners within twenty miles of his home in Smarden. I will call them H1, H2 and H3. This is for ease of reference only, and does not place them in chronological sequence. As mentioned above, these dials were designed by Hogben and bear his name, but they were manufactured to his specification by professional instrument makers in London. H1 is the dial at Leeds Castle, Kent (SR 0406), dated 1750. H2 is dated 1748, and H3 is undated, but was made between 1742 and 1752.

The dial H2 is a very fine piece of work. It was made for a family where the Hogbens, father and son, had a history of working as Land Surveyors since the turn of the century. The condition of H2 is almost perfect. The light blue-green oxidation in no way obscures the detail of the inscriptions, and the lettering and the furniture is as crisp and clear as on the day it was made. It features a most unusual and distinctive gnomon, cut from half-inch bronze, with four deep scallops in its lower side, and decorated with paired rolls at each cusp (fig 1). It has the Equation of Time in a full circle, with whole minute values to fractional day positions, and maxima and minima to the nearest second. It is a "geographical" dial, with seventeen locations from around the world, each with their time of noon.

Interestingly, the seventeen locations are exactly those used on the dial at Lacock Abbey by Thomas Wright, Instrument Maker to George II. Another of Wright's dials (SR 1710) is to be found at Chilham Castle, which happens to be only 15 miles from Hogben's home in Smarden. At first sight the duplicated list of locations would seem to confirm that H2 was made by Wright, or at least in his workshops. It may be so, but a number of features raise a question mark over this attribution. For example, the half-hour marks take the

Figue 1: *H2, the "London" dial of 1748*

form of three inward-pointing arrow heads, as against the traditional fleur-de-lys commonly used by Wright; and the font is not the one he normally employed[8].

Wright on his known dials used an italic font, where H2 has traditional Roman lower case. The distinction is not one of the size of the letters, or whether they are inclined; it is in the form of the characteristic letters a, e, f and g, which take a form similar to handwriting in the italic alphabet[14]. Even modern fonts such as the "Times" typeface used in the Bulletin, retain most of the distinction - compare lower case "a, e, f, g" with italic "a, e, f , g". (The unaltered "g" in the "Times" italic font is now common, but the traditional italic "g" has a simple tail as on the letter "y".)

The dial, dated 1748, was noted in an inventory of the following year, and was valued then at four guineas.

Thomas Hogben's most famous dial, the one I have called H1, is to be found at Leeds Castle and is dated two years after H2. Robert Fairfax, later the seventh Lord Fairfax, inherited the property in 1745, and immediately set about a series of alterations. He commissioned Hogben to survey and map the estate, and the work was completed in 1748, resulting in one of Thomas's finest maps. At the same time, Thomas designed the sundial, which now stands in a bay in the Western wall of the outer bailey. It is remarkably similar to H2, with exactly the same unusual scalloped gnomon. Unfortunately the dial has been "protected" with a coat of lacquer which is decomposing, and which we must hope will not have damaged the underlying detail. We can still see, however, that it carries an Equation of Time, and the Fairfax Coat of Arms. Like H2, it shows the noon times of seventeen places from Mexico to the far East.

Date	Designed For	Inscription and selected other furniture	Reference
1732	Rolvenden Church	"Thomas Hogben, Smarden, Fecit" plus a few cities	Welland[13]
1735	Ivychurch Church	"Thomas Hogben, Smarden Fecit" plus a few cities	SR 1043
1737	Cranbrook Church	Not Know	Tarbutt[9]
17xx	Ulcombe Church	"ULCOMB. T. HOGBEN FECIT" Not dated	SR 3119
17xx (H3)	Kent	"Thomas Hogben, Land Surveyor and Master of the Free School of Smarden Kent fecit" plus 29 cities, Coat of Arms, and EOT Not dated	SR 4241
1748	Wissenden House	"Wissenden, Tho Hogben, 1748"	Igglesden[10]
1748 (H2)	Kent	"Made by Thomas Hogben Master of the Free School of Smarden 1748" plus 17 cities, and EOT	J Ford
1750 (H1)	Leeds Castle	"Made by Thomas Hogben, Land Surveyor and Master of the Free School at Smarden-1750" plus 17 cities, Coat of Arms, and EOT	SR 0406
1754	Smarden Church	"Made by Thomas Hogben Land Surveyor and Master of the Free School of Smarden, 1754"	Haslewood[3]
1757	Orlestone Church	"Made by Thomas Hogben 1757"	Igglesden[10] Duncan[11]
1763	Headcorn Church	"Thomas Hogben Fecit 1763"	Duncan[11] Hogg[12]
1768	Kent	"Thomas Hogben Fecit 1768"	J Ford

Table 1: *The Horizontal Dials of Thomas Hogben. The undated "H2" and Ulcombe dials are inserted at their most probable period*

Most of the places are repeated from H2, only four being different. "Port Royal, Jamaica" has been replaced by "Belvoir, Virginia", the principal Fairfax seat in the New World. A sundial at Belvoir was said also to show the time of noon at Leeds Castle. I think it likely that Hogben designed both dials at the same time, and that the Belvoir one was shipped over; but no record of the American instrument survives. The Belvoir property was accidentally destroyed by fire in the 1780's, and the sundial has not been recorded since.

In the other three changes, Jerusalem, Moscow and Pekin on the H2 dial are replaced by Aleppo, Babylon and Siam respectively at Leeds. Again the natural conclusion is that H1 was made in the same workshop as H2, and most probably Wright's. Cleggett[7] has said that this dial, signed by Hogben and dated 1750, was actually manufactured to his specification in 1749 by one of the London dial makers; but unfortunately no more detail is available from the Fairfax archives.

The third "London" dial, H3, is in good condition, but I have not been able to observe it so closely. It is notable for the similarities with the other two dials, and may be from the same workshop. The positioning of the furniture is repeated, the EOT is shown to the same level of detail, the hours are subdivided to halves, quarters and eighths as on H1 and H2. Twenty-nine locations have been arranged around the dial, and over half of the places on H1 and H2 are carried forward to H3. The only significant differences in H3 in fact are i) the greater number of places, 29 against 17; and ii) the shape of the gnomon, which is traditional in H3. A comparison of the three "London" dials is shown at Table 2.

The "Country" Dials

Hogben's other sundials, the ones he manufactured himself, were not so directly linked to his survey operations in the area concerned, but he must have been widely known in the whole of mid Kent. He made at least two other sundials for private houses, and seven church dials.

Until recently, dials by Hogben could be seen in Ulcombe churchyard and at Ivychurch; both are recorded in the Register, but are now missing. Going further back, he made dials for the churchyards at Rolvenden, Cranbrook, Smarden, Orlestone and Headcorn, all long since gone, and he probably made others.

The dial for the churchyard of St Dunstan's at Cranbrook was one of a series. The first was made by the clocksmith E Ferrall in 1705. Thirty two years later the churchwardens paid Hogben £2-12-6 for a replacement, which in turn was succeeded in 1855 by a third and final dial. This last dial, made by a Mr Marshall for the grand sum of £20[9], can still be seen (SR 2970). It is listed by Mrs Gatty under its motto ("Dum Spectas Fugio"), and together with other furniture contains the Equation of Time in two tables on either side of the gnomon, and the Noon positions of seventeen locations around the world. (These bear no relation to the 17 places on H1 and H2.)

Hogben's Smarden dial was described by Haslewood[3] as being "of considerable merit". It was dated 1754, but went missing sometime in the following century, and was last seen in an antique shop in the 1870's[10]. Could it be that his dial at Cranbrook suffered a similar fate at the same time? It is noticeable that Marshall's replacement dial is unusually surrounded by high railings; though these seem to be designed more to support a shaky pedestal than to deter removal. But bronze dials do not wear out. So was it vandalism, or theft, that made the churchwardens decide to commission new dials, or just the wish to invest in instruments of increasing quality and complexity? If not theft, we may also wonder what happened to the redundant dials?

Figue 2: *H1, the Leeds Castle Dial of 1750*

Figue 3: *H3, the undated "London" dial*

Similanties

- A little ring for the EOT, thought with different wording in each case.

- The ring of EOT times, th the nearest minute.

- The days of the month, labelled at 10, 20, and (where observed) 28, 30 or 31 as appropriate.

- The months, 3-letter abbreviations.

- An inner and an outer ring of locations, followed (or occasionally precded) by XII with a central scribed noon time indicator.

- Half, quarter and eigth hour indicators

- The Chapter ring, using XII IIII, with the hour lines continued through the numeral. Half hours are marked by one or other form of fleur-de-lys rising from the base line, and s short spear descendong from the head line of the numerals.

- Finally a minute ring(s) indicationg to the nearest minute.
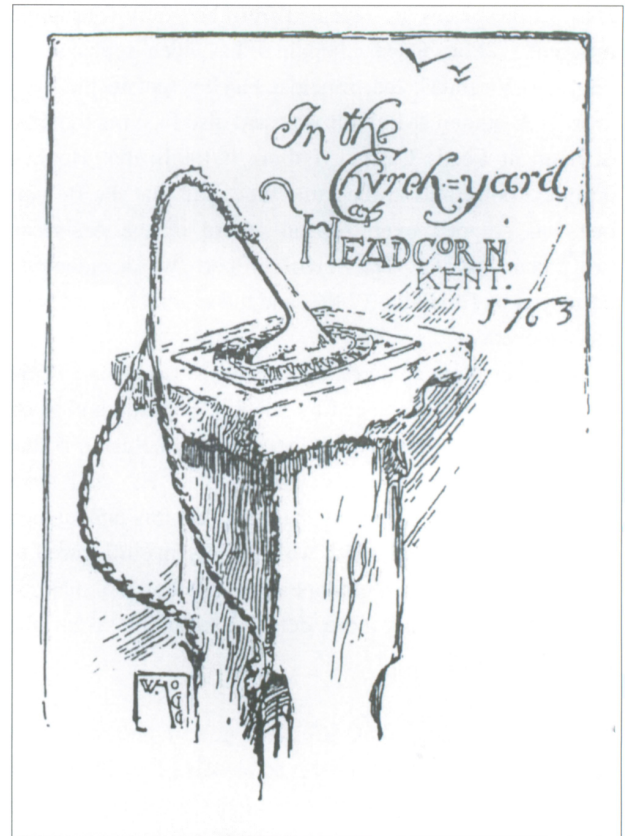
Figue 4: *The Headcorn Dial of 1763, as drawn by Warrington Hogg[12] in 1892*

The main differewnces can be summarised as follows:			
Dial	H1	H2	H3
Date	1750	1748	n. d.
Diameter	16.5"	16.5"	17"
Gnomon	Scalloped	Scalloped	Traditional
Ends of Gnomon fillets	Square-cut	Square-cut	Rounded
Coat of Arms	Yes	No	Yes
EOT title	A Regular of the Æquation of Natural Days	Æquation of Natural Days	Æquation of Natural Days
Direction of EOT	Counter clockwise	Counter clockwise	Clockwise
No of Locations	17	17	29
No on Thomas Wright's Lacock Abbey dial	13	17!	9
Half Hour Marker	Traditional Fleur-de-Lys	Slimmer "three-arrow" pattern	Traditional Fleur-de-Lys
Minute Ring(s)	1,3,5,7,....and 2,4,6,8	1,3,5,7,....and 2,4,6,8	1,2,3,4,....

Table 2: *A comparison of Hogben's "London" dials*

The sundial for Headcorn churchyard was made in 1763, and was recorded by both Duncan[11] and Hogg[12], but no trace of it now remains. From Hogg's illustration, it featured strange and unsightly ironwork supporting the tip of the gnomon, probably a later addition (fig 4). Of the Orlestone dial, nothing is left but the wooden pedestal on which it stood. It is extremely similar to the pedestal of the dial at Smeeth illustrated by Hogg[12], but with no maker recorded.

The Wissenden House dial is interesting. The hamlet of Wissenden, just outside Bethersden, was the home of Stephen Dadson, who bequeathed the money for the Free School at Smarden. It is possible that Hogben kept in touch with the Dadson family when he was appointed Master of the school, and made this dial for their house. The illustration in Igglesden[10], by the artist Xavier Willis, shows an elaborately pierced gnomon, which was not typical of Hogben's own work (fig 5). Willis, a well-known British painter of the day, made all the sketches for Igglesden's work, and there is no reason to doubt his accuracy. Might the dial, as a "Dadson memorial special", have been contracted out, once more, to a professional manufacturer? It was after all made in 1748, the same year as one of Hogben's "London" dials, and could perhaps have been a "side order" from the same workshop. This dial was known as recently as thirty years ago, when it was offered for sale to the then owners of Wissenden House. The offer was not taken up, and it has proved impossible to trace the dial since. If it ever comes to light, it will be interesting to study the engraving, which may answer the question of who made it.

By the age of 60 Thomas was showing no sign of winding down his activities as a surveyor. When the re-mapping of the Romney Marshes was completed in 1766, he took his youngest son Henry into partnership and they worked together for a few years until Henry set up on his own. Thomas then had more time on his hands, and in 1768 made
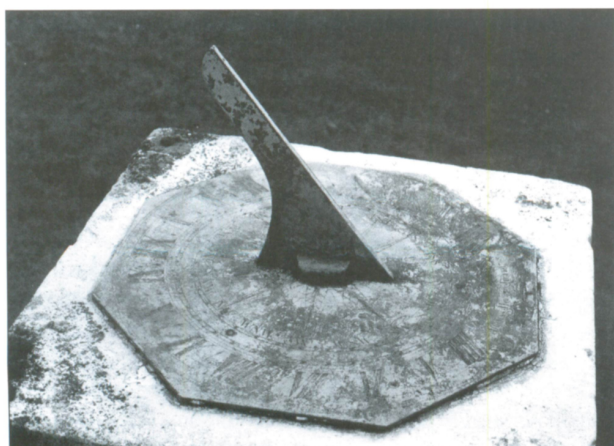
what was possibly his final dial, now in private ownership (fig 6). It is quite simple, and very similar to the one at Ulcombe Church, with none of the complexity of the "London" dials. These, as we have seen, were of an elaborate design, with an Equation of Time scale, noon times of foreign cities, and sometimes the family Coat of Arms. As far as we know he never gave an Equation of Time scale on his "Country" dials; he never used a motto or showed the names of Churchwardens. On his earliest dials, at Rolvenden and Ivychurch, he did include a few locations from abroad, giving Barbados, Naples, Jerusalem and possibly more at Rolvenden[13], and Mexico, Jerusalem, Surat and Pekin at Ivychurch. Later in life he dropped this practice for his simple dials. Possibly his client churches felt it was inappropriate. More likely it was just pressure of time, or his own style moving more towards an uncluttered and open design. The same trend towards simplicity is apparent in his maps.

We have seen here twelve of Hogben's dials, and more are probably waiting to be found. Even on the evidence of these few, it is clear that he was by far the most prolific of Kentish diallers. He is in fact the only early Kentish maker whom I can trace with more than a couple of dials known today. In addition to his well earned fame as a map maker, Thomas Hogben deserves to be more widely recognised as a skilful and productive craftsman, and the foremost Kentish designer and maker of sundials.

Figue 6: *Thomas Hogben's Last Dial*

Figue 5: *The Wissenden House Dial of 1748, sketched by Xavier Willis[10] in 1900*

References

1. F Hull (Ed): Catalogue of Estate Maps in the Kent County Archive Office, 1590 - 1840. Kent County Council, 1973

2. A Stuart Mason: Essex on the Map, the Eighteenth Century Land Surveyors of Essex. Essex Record Office, 1990

3. Rev Francis Haslewood: Memorials of Smarden. 1886

4. Rev Francis Haslewood: Antiquities of Smarden. 1866

5. Dr Sarah Bendall: The Faces of Nature in Enlightenment Europe.   Ed. Daston & Panata, Berliner Wissenschafts-Verlag, Berlin, 2003, pp 39-59

6. The Kentish Post. 5 August 1737/38 and 15 March 1739/40

7. David A H Cleggett: History of Leeds Castle and its Families. Leeds Castle Foundation, 1992

8. Dr J R Davis, private communication

9. W Tarbutt: Annals of Cranbrook Church (Vol II, p 9). 1870

10. Sir Charles Igglesden: A Saunter Through Kent. Kentish Express, Ashford, Vol 1, 1900 and Vol 6, 1909

11. Leland L Duncan: Memorial Inscriptions transcribed by the Kent Archaeological Society (www.kentarchaeology.org)

12. Warrington Hogg: Strand Magazine. Vol III (January - June 1892) [later re-published in The Book of Old Sundials. T N Foulis, 1914]

13. L G Welland: Bygone Kent. 1, 11 (November 1980)

14. Eric Gill: An Essay on Typography, 4th Edition, Dent, 1930

Author's address:
Greenfields,
Crumps Lane,
Ulcombe,
Kent,
ME17 1EX

FOREIGN JOURNALS

FRANCE

The Sundial Society of France is the 'Commission des Cadrans Solaires' or CCS. It is a section of the French Astronomical Society, SAF. It publishes a periodical named 'Cadran-Info' in May and October each year. Each issue consists of about 28 A4 pages stapled, the articles being illustrated with diagrams, B/W photos and line drawings.

Cadran-Info No.7, May 2003

Two Italian authors (M.Catamo & C. Lucarini, translated by D.Collin) wrote about 'Diffraction Sundials'. They were fascinated, as many of us have been, by the play of sunlight on compact-discs. They worked on the process of turning these discs into sundials, of the standard sundial forms: horizontal, equinoctial and vertical. This ingenious piece of work was presented as a lecture at a meeting in Italy in October 2000.

There is a report by P Gagnaire on a stone sundial found at Cluny (just north of Lyon) The excellent photographs accompanying the report show this to be a stone 'plate' mounted at an angle close to the plane of the equator, and carved in one piece with its plinth. The gothic lettering of the Latin inscription on the plinth translates on one face as: 'From mid-March to mid September' and on the other face 'From mid-September to mid-March'. Also on the plinth in a different type of lettering (probably later) are a series of letters and the date 1601. The dates of the equinoxes are given as 15-16 March and 15 September, which would not fit for the Julian calendar for this date; and the sundial is probably older than this: 'one of the most ancient of our inventory', says the author.

An article by A Gotteland describes a possible 'Calendar in Stone' at an archaeological site at Mnajdra on the island of Malta, dated 3600-2500 B.C. The article is introduced by photos of known astronomical megaliths, from Senegal, from Ireland(Newgrange), from Brittany, and from Stonehenge. The site at Mnajdra consists of a group of three ruined temples grouped in a half-circle with their entrances facing inwards towards the centre of the circle. Temple I

faces due east, Temple II faces south-east, and Temple III, the smallest and oldest, faces south-west. The historical and archaeological studies of all three temples have been extensive, but it was not until 1979 that astronomical significance was suggested. For Temple I, the narrow entrance door would admit sunlight at the equinoxes to fall directly onto a vertical stone on the far side of the temple. Similarly at the winter and summer solstices, sun rays through the doorway would fall on significant stones on the opposite wall.

In the museum at Chinon, near Tours in the Loire valley, there is a sun cannon, of which F. Pineau gives a vivid description and good clear photos. The cannon, together with a horizontal sundial, is mounted on a circular block of marble 28 cm in diameter. A lens mounted in a brass ring is held above the cannon on two arms, hinged at the base and movable against quadrant scales so that the angle of the lens can be adjusted for the date. The apparatus would have been aligned north-south, and when the sun is at its zenith its rays would be focussed by the lens onto a small pile of gunpowder, and the cannon fires. 'The sound can be heard all over the town, and everyone can adjust his watch , without stirring from home'! The article gives a short history of time-keeping and public clocks. We learn that Louis XIV ordered that 8 April 1641 should be the day when all the public clocks all over France should be regulated according to the movements of the sun. The Chinon sun cannon is dated from the early 19th century and the author has found several other examples of such cannons in his part of France, and continues to search. Photographs of a modern sun-cannon built by M G. Labrosse conclude the article.

A short article by D.Schneider based on a talk raises the question of who, precisely, would have used the scratch dials on small rural parish churches, beyond the immediate influence of cathedrals and abbeys. Another short article, by D.Savoie, tells us how to obtain both the orientation and the inclination of a plane surface from the shadow of a post fixed at a right-angle to the surface. There are short notices about four recently published books, including Higson's 'Sundials at Greenwich' and Burge's 'Cornish Church Sundials'.

AUSTRIA

The Sundial Group of the Austrian Astronomical Society is known as the Gnomonicae Societas Austriaca, or GSA. It publishes a journal (Rundschreiben) twice yearly in May and November. Each issue is of 12 pages, the articles being illustrated with diagrams, B/W photos and a few coloured photos which add much to the readers' pleasure. We have recently received two issues.

GSA Rundschreiben No.20, November 2000

In this issue the society celebrates its tenth year since its foundation. Dr. Helmut Sonderegger became its chairman and Dr. Ilse Fabian its editor. The issue included a very interesting article with coloured photos showing the restoration of a pair of ancient sundials dating from the mid sixteenth century, painted on the wall of the city apothecary's shop in Görlitz. These remarkable dials, called 'Arachne' and 'Solarium', include date-lines and hour-lines, planetary hours, zodiac symbols, dom lines and much other furniture; coloured photos in the article show impressive detail.

The restoration in the year 2000 by L.Pannier, author of the article, is the most recent of numerous repaintings over the centuries.
Another set of coloured photos show the winning entries of the Reutte 1998 International Sundial design competition. Especially delightful was a wall dial in which the spaces between the hour lines were filled with profile paintings of the main buildings of Reutte, so the dial-face resembled the city street.

GSA Rundschreiben No.25, May 2003

This issue starts with a celebration of the distinguished sundial maker Rafael Soler Gayá of Mallorca, and some of his famous dials, a few illustrated by colour photos. Then comes a contribution by Karlheinz Schaldach, an article with translation (Latin and German in parallel columns) of what is claimed to be the earliest text on the cylindrical dial. It is a manuscript from the library of the Abtei St. Peter in Salzburg. This thorough and scholarly work gives a couple of drawings from the manuscript showing quadrants of the dial-face. There is next an interesting speculation about a possible noon-mark on the wall of an ancient ruined church at Markgrafneusiedl in Lower Austria 20 km from Vienna. This might explain an otherwise mysterious circular aperture in the south wall. The issue concludes with a note on a large and colourful vertical corner-dial, a south face and adjoining west face, allowing time-telling from 8 am until 7 pm. Both faces have a background of rainbow colours, and the dial adorns the swimming pool of the sports centre of Thal in Osttirol. The motto on the dial-face is 'Das Leben ist Bewegung'--- Life is Movement.

M.S

From the Editor

The Editor would be glad to hear from any member who knows Italian, and would be willing to read and comment (in English) on Sundial Journals sent by the Italian Sundial Society; and perhaps also write short summaries of one or two articles from.

READERS' LETTERS

'Lines of Coincidence': A Further Comment

In the BSS Bulletin Volume 14(iv) there was a most delightful letter from one John Moir, saying that whilst he was considering the placement of a line of declination on his sundial to mark his wife's birthday on May 8th & he discovered, much to his surprise, that the same mark would do for his own birthday on August 6th - the Sun's declination being the same on both dates.

A great idea to mark such a coincidence, but I was a little saddened to read in the next Bulletin - Vol.15(i) - that there was some doubt being cast on the long-term stability of such a scheme. I quite expected to see this topic picked up in later Bulletins but so far, nothing. Alas, Positional Astronomy is a territory where Angels fear to tread, but someone must take the plunge - and as I am convinced that the original writer's scheme is perfectly sound I would like to comment.

Back to basics; and for a start let us imagine that the Earth is hollow with a translucent shell and we are situated at the centre. The Sun would then appear as a spot of light on the surface and this dot, known in navigating circles as the "Sub Solar Point", would, due to the rotation of the Earth, be moving in a westerly direction. It would also have a north-south component, spiralling upwards from the Equator until it reaches the Tropic of Cancer then all the way down to the Tropic of Capricorn - as marked on any school globe. The Sun's declination at any time is, of course, the angle between this spot of light and the Equator.

The moment that this sub solar point crosses the equator (heading north) it is taken to be the start of our "mean tropical year" which is equal to 365.24219 days: a figure that has not changed much for hundreds of years. A point to remember here is that it doesn't cross the equator at the same place each year: if it occurs over Nairobi one year, the next crossing in twelve months time will be somewhere over the Amazon in South America. Which is the reason for all our calendar troubles...

Seen from any point on the Earth's surface, the cyclic variation in the height of the Sun at noon associated with seasonal changes will strike anyone with even an elementary grasp of mathematics that here we have something approaching the Sine formula at work. We might therefore, make a start by drawing one. Take a sheet of A3 mm graph paper and draw a line across the middle, parallel with the long sides, Mark off the line in 15mm units, marking them 15, 30, 45.. etc up to 360. Then, with ones ever-helpful scientific calculator, enter "15", press "SIN",(0.2588), and multiply this by the constant "23.44" which is our assumed angle of tilt of the Earth. Plot the resulting "6.07" to a suitable scale above your first '15' mark, and then repeat the procedure every for tick all the way to 360. You should finish up with something like the drawing in Fig 1.

In my more whimsical moments I look upon this diagram as my "Troglodyte Calendar". Now in my fictional calendar, consider that the year starts at "A", consists of exactly 360 "Days" (Or "Trogs") and finishes at "B" - which is also, of course, the start of the next year. There are no "Leap" trogs and the distance between "A" and "B" is precisely a tropical year. From the diagram it is also obvious that for any point in the year the Sun's declination is exactly what it was the year before. So anyone with a birthday on, say Trog 46.5, (Or 133.5) would always be favoured - not that they could see it - with the Sun at declination 17.00 North.

Our problem arises when we attempt to overlay the present Gregorian calendar on this idealised troglodyte affair. If we assume that the March Equinox was precisely at 0 hours on March 21st our 365 days would not quite reach the end of the line and we would be well into the next March 21st before we reached "B". Let this run on for four years and we would be nearly into March 22nd - unless we slipped in another day (Feb 29th) to bring everything back under control. [I am sure that members of the UK SLIDE RULE CIRCLE could make a most excellent device to illustrate this point, with 360 degrees on the slide, 365.25 at scale A and 366.25 at D marked "Leap Year". How about it Gerald Stancey?]

I hope the above goes somewhere towards demonstrating that however it might appear from the various almanacs it is not the Sun's dec. which is dodging about but the shifting of the dates that makes it appear so. Birthdays and the like are not true anniversaries if one is considering just where into the year an event occurs. Which should give heart to those unfortunates born on February 29th: depending on the moment of the equinox your true birthday could just as well be on the day before or the day after.

When you look up the Sun's declination for a given date (let us say May 8th at 0 hours) on several successive years, you come up with something like this:

and it wouldn't be too difficult to guess at the declinations for the years 2006 and 2007!   Which well illustrates, I think, the jumping about of the calendar overlay on our sine wave - and incidentally the slow creep of the figures, only

1992	17°06'N
1993	17°02'N
1994	16°58'N
1995	16°54'N
1996	17°06'N
1997	17°02'N
1998	16°58'N
1999	16°54'N
2000	17°07'N
2001	17°03'N
2002	16°59'N
2003	16°55'N
2004	17°07'N
2005	17°03'N

stopped by dropping a day every 400 years.   (Year 2000 was an exception to this rule.)

It only remains to look in greater detail at possible astronomical variations which could affect the issue. Firstly the angle of the Earth's axis in relation to the ecliptic. This is gradually getting more upright but the change is very slow, having moved from about 24° five thousand years ago to a forecast 23° about three thousand five hundred years time. If we settle for 23.44° then we will not be far out for the next few generations.

There is, of course, the little matter of Nutation - the slight wobbling of the axis. This circular motion superimposed on the main axis has a period Of just over 18½ years and a cyclic amplitude of 9" of arc. (Source: "Explanatory Supplement to the Astronomical Almanac" page 13 in my copy.) which at most will change our nominal 23"26' 24" by ±4½" : all right for astronomers or surveyors, perhaps - but undetectable on a sundial.

The length of the Tropical Year is slightly variable - the mean figure of 365.24219 can alter by something of the order of a few minutes due to the attraction of the heavier planets and other factors - but the effect is small and can be ignored here.

All in all, our shadow-giving friend is, making allowances for our awkward calendar, a very steady mover and I venture to suggest that had a sundial been fixed to the rear face of the Great Pyramid (South reclining?), notwithstanding all the stars having changed their places, it would be as correct today as when it was first put up.   So go ahead John Moir, and mark your Line of Coincidence - but in view of our calendar, make the line a bit thick! (To make it stand out, of course...)

Micheal Maltin
Home Greenend,
Church Road
North Woudchester
Stroud, Glos
FL5 5PF
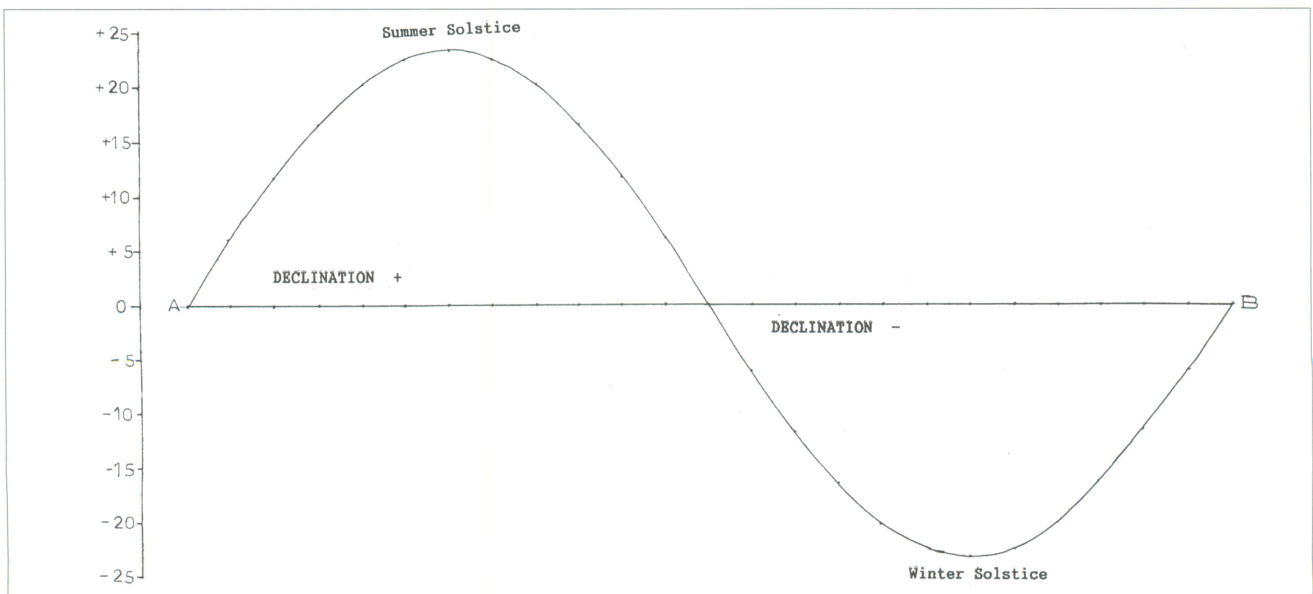
READERS' LETTERS
More pub dials

Before 'This correspondence is now closed' appears--- a further sundial for Mr. Norris.

At Aylburton in Gloucestershire, on 'The George' Inn, a modern dial from around 2000, brightly coloured and well carved. The gnomon has been borrowed from a unicorn; who designed this dial, I wonder?
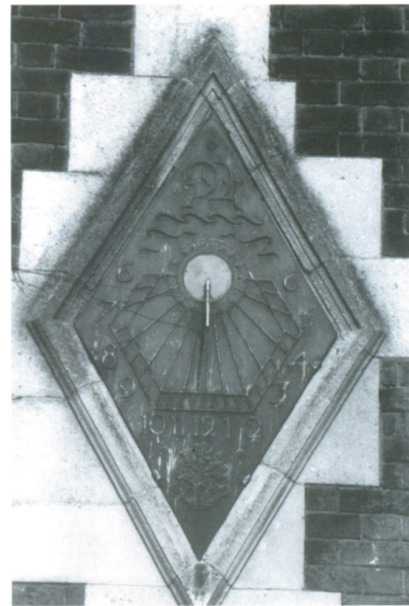
I trust a list of pubs will be published by Mr. Norris.

A.O.Wood
5 Leacey
Court, Churchdown
Gloucester, GL3 1LA

Here is my contribution to the subject of Pub Dials--- some sundials discovered during recent expeditions.

1. 'The Railway' at Pitsea, Basildon, Essex. The dial is of diamond shape, dated 1927, mounted on the chimney breast of the public house

2. 'The Pheasant', Ballinger Common, near Chesham, Bucks. The dial has a sun-face motif at the root of the gnomon , with a slender crescent moon face also featured. The face plate of the dial is formed on a slightly raised disc, rather like an ancient shield, or an inverted satellite dish. During the course of my searches for sundials I have also taken an interest in pub signs which feature astronomy, such as The Sun, Rising Sun, Full Moon, Half Moon.

Has anyone located a pub actually called 'The Sundial'?

I.R.Butson
60 Churnwood Road
Parsons Heath
Colchester
CO4 3EY

SUNDIAL TOUR OF CORNWALL

Saturday 27 September to Saturday 4 October 2003.

FRANK EVANS

As a base for the Cornwall tour our organisers, David and Lilli Young had made a fine discovery in the Whipsiderry Hotel, Newquay. They took it for our sole use during the week beyond the hotel's normal winter closing date; so we had it all to ourselves for our stay, all forty of us.

The hotel treated us royally, with excellent food and service. The views from its windows were dellghtfiil, down into pretty Porth Bay and across high country as far as the tower of St. Columb Minor church, scene later of a remarkable encounter between Society members and a bride in white. Our every wish was catered for, including the provision for each bedroom of a slim volume of bedtime stories. They turned out to be a sleep-inducing selection of Chris Daniel's "Sundial Page" articles from "Clocks".

Day1

On Sunday, our first touring day, we took our places in the coach according to infirmity, frailest at the front. During the week, though, our driver, John, helped us on and off indiscriminately. We set off for our first dial at the hilltop church of St. Issey, pronounced "Izzy" by the Cornish This was a slate dial of a type with which we were to become very familiar by the week's end. Slate is a fine material to take intricate carved work and many Cornish dials are most elaborately inscribed. From Issey we proceeded to Pencarrow House for coffee and a view of two dials by Thornas Heath (fi. 1720-50). (A sextant I bought new in 1946 was rnade by a London firm of this name, perhaps descended from the diallist.) Over coffee the aforesaid frail and infirm gathered for what one of them called "an organ recital". Happily we were to hear several real church organ

recitals by talented members of our group during the week. Over the week our investigations extended beyond the confines of dialling and we next visited the china clay museum at Wheal Martin where pasties and, for those who wished, "Tinner's Ale" awaited us, the twin Cornish industries of clay and tin extraction being thus embraced. The extraction of china clay, we learnt, starts with a sophisticated but brutal hosing of the clay cliff to extract the spoil. Until the introduction of modern methods Cornish rivers ran white with the residue.

Approaching home at the day's end some members left the coach to walk the last mile or so in order to visit the dial at St. Columb Minor but there, as noted above, they were surprised at the arrival of a stretch limousine, out of which stepped a radiant bride to be greeted by the vicar and escorted, attended by small bridesmaids, into the church. We whistled at the thought that a few moments later we might have been trapped inside the church as the celebration began.

Back at the hotel the social half~hour preceding dinner was much treasured, as it was throughout our stay and as it had been during all the earlier sundial tours, in order to make and renew friendships and to exchange news and views.

To our surprise and continuing joy we were able throughout our stay to view the nightly visit to the hotel of a family of badgers. They emerged around nine o'clock to feast on the kitchen scraps left in a box on the lawn. Many of us could never before have seen badgers so close, so clearly and for such long periods. It was unforgettable.

Day 2

Monday was sea day. We embarked for a voyage down the River Fal from Truro to Falmouth. Although in shekered waters with more pigeons than seagulls the river held many large vessels laid up and for sale. Their huge, rusting hulls made a sad contrast to the smartly painted boats that were our objective. For in Falmouth we came alongside at the pontoon of the National Maritime Museum Cornwall, a National Maritime Museum outstation housing the national small boat collection ~ This was in a new and imposing building with boats displayed at many levels. Interest within our party varied, the more enthusiastic being those who spotted boats they knew or even, in the case of the Famous "Mirror" dinghy, had built.

Back to dials and we proceeded to view a cube dial, probably eighteenth century, in the handsome private garden of Mrs. Patricia Choape followed by a splendid tea at the house at Mawnan Smith of our member, Carolyn Martin and her husband, Ian. (We loved her Welsh apple-cake.) Together they have assembled a most interesting array of dials, an analernmatic dial, an Armilliary and a pedestal dial of 1920 that had been discarded but was now so beautiflilly repaired that even the experienced Tony Moss could hardly spot the damage. Ian Martin had made a new gnomon for it that reflected the gnomon in the Rossetti painting of Beatrice.

This evening Mike Cowham produced his now traditional challenge, asking for words of three or more letters derived from the letters of the word "Cornwall". In the event the cornpetition was nobly won by a whisker on the last day by David and Pamela Gulland (55 words) but the margin would have been wider had the numerous Lallans words they artfully insinuated into their list been allowed. During the week Ian Wootton calculated the number of possible combinations under the rules, but including those not in the dictionary, as 67,314. He expounded on the subject one night after dinner, being careful to tell us that of course he had taken the interchangeabIlity of the double "1" in "Cornwall" into consideration. Much mirth ensued, almost none of it disbelieving.

Day 3

On Tuesday we set off west to the parish church of St. Uny, Lelant. This church like many others in the Duchy was named after a remote Cornish holyman ~ It was full of interest. Over the porch is a copper dial of unknown date. The gnomon carries a representation of Death holding a bone and, somewhat insultingly for a dial, an hour-glass. Someone said the fellow was just checking. Within, on the west wall, is a slate memorial to one Stephen Pawley, Gent., who died in 1635. Currently his descendant, David Pawley, Gent. of our party, was asked to blazon the arms of his ancestor but he did no more than have his photograph taken with them. Such modesty!

The east window of the church which is modern portrays several local saints and in a small corner a tiny outline of the benefactor and his dog out shooting. A small bell in silhouette in the opposite corner is probably indicative of the maker's name.

Having satisfactorily settled the identification of the holm oaks at the church gate our party continued on its way to the coast and the Levant tin mine, now in the care of the National Trust.

The engine house is drarnatically perched on the edge of the cliff, since the ore lay up to a mile out to sea and two
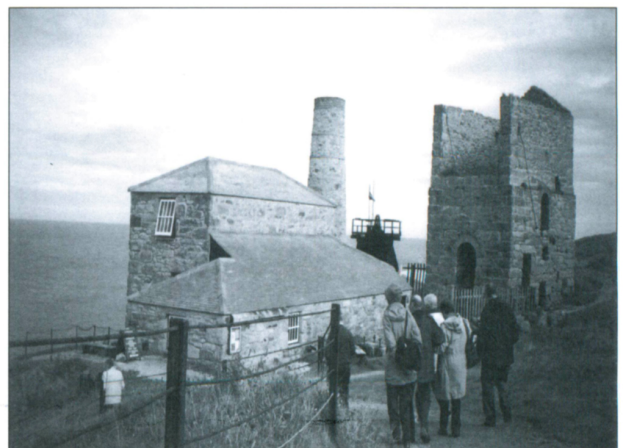
thousand feet down. The winding engine itself was all cylinders and oily shafts, driving a huge overhead beam It was started up for us by the engineman, drarnatically, in a cloud of steam. Some time during the week we learnt that Cornish tin mines produced mostly copper, followed by tin, lead and a little silver.

After Levant we proceeded to another tin mine, Geevor, for lunch then on to St. Ives where we had the opportunity to visit the Tate Modern Gallery and the Barbara Hepworth Sculpture Museum. St. Ives itself was all winding streets and little alleys and very crowded. At the harbour the marvellous light falling on the sand gave it a luminous appearance while offshore the sea faded from green to blue to grey, a dream and challenge for any artist. Returning to the hotel past Perranporth, Rosie and I saw once again the site of our camping holiday in 1952, when we were washed out by the same rainstorm that caused the disastrous floods that carried away the village of Lynmouth. Now much of the Cornish coast is pocked with concrete.

After dinner Len Burge described to us---together with recording tips---the equipment he carries for his comprehensive recording of dials; including such useful items as a camera, folding ruler and bearing compass.

Day 4

On Wednesday we made an early start and crossed the border into Devon. Aboard were our past Council members, Janet and Richard Thorne, whom we were delighted to see after a too-long interval. Richard became our tour guide, pointing out places of interest as we drove along. We went first to the village of Chagford and here our driver, John, earned a round of applause for his needle-threading skill in parking the coach in the narrow lanes of the town. The slate dial on the church porch was somewhat eroded but bore a family resemblance to the Cornish dials. Inside the church was a beautiful wall hanging illustrating Chagford life, made by the ladies of the WI over a ten year period. The incumbent was advertised as being a prebendary and by

chance the good man was present in person. On being questioned he described a prebendary as a canon with two humps. More seriously he explained that a prebendary is a canon of one of the older cathedrals, with a stall therein and a right to preach.

From Chagford we went on to Princetown, passing the grim prison walls to arrive at the welcoming "Plume of Feathers" for lunch. In the forecourt of the pub was a handsome pedestal dial made by Richard Thorne and engraved with a plume of feathers for the Lannton family, the proprietors. The three feathers of the Prince of Wales, Duke of Cornwall, are commonly to be seen locally. After lunch we proceeded to Janet and Richard's house at Mary Tavey. In the garden there were several of Richard's dials including a pleasing cube dial of coarse sandstone blocks faced with fine slate dial plates on three of its surfaces. Inside the house Richard displayed a cornucopia of dials of all types, most made by himself. They would have repaid a longer study had time allowed. Included was also a small plaque recording his twenty-five years of service with the Dartmoor Rescue Group. Janet, too, had something to show. She has now retired from her librarian's post (although retaining her HGV licence) and has taken up watercolours. Judging by the comments her work was of high quality and earned much praise today.

Some members went on to view an analemmatic dial situated at the village sports centre, conveyed nostalgically in Richard's fifty year old Ford Anglia. The ride was perhaps as memorable as the dial.

Home now, via the church of St. Ive or Ivo where the dial of 1695 bears above the hour marks a snake in a circle with each scale visible. It is said to symbolise eternity. There is a pretty rose replacing the number twelve for noon. The sky at this time darkened and it began to rain. From St. Ive we took back bleak and perhaps truer memories of the heights of Dartmoor, very different from our sunny morning. Passing once more through Tavistock we saw the small plot

on which it is planned to build "affordable houses" for such necessary people as postmen and dustmen. House prices in the locality are said to be very high.

Day 5

On Thursday we went to the Eden Project. We set off intending to be amazed and were not disappointed. The Eden Project is too well known for further description; suffice to say that it is very impressive, very large and sited in a huge worked-out china clay quarry. Similar quarry holes are to be seen in many parts of Cornwall, together with enormous white spoil heaps that recall the Rand gold fields in South Africa. Amidst the wildness of nature Cornwall's industrial past stands out clear and stark.

Having feasted on greenery and lunch we reassembled and set off for St. Neot's, pausing on the way at the forge of a blacksmith sundialist. St. Neot was a Celtic saint of the ninth century. His church was glorious in coloured glass and today rang out with the voluntaries offered by our organ-playing members, Brian Moss and David Pawley. In the churchyard was a very special dial created by S. B. Orylles, patron of the benefice of St. Neot's and at one time Chief Engineer of Rolls Royce. Contained within the dimensions of a six inch cube it is said to be of stainless steel but has the appearance of gunmetal. Either way, since

its installation in 1976 a part of its complex surface has been broken off. Although lacking hour lines it demonstrates the priniary classes of fixed dial, horizontal, vertical, polar and equnoctial and is a highly skilled production.

A second very special St. Neot's production was supplied in the old-fashioned teashop where we were provided with a true Cornish tea including a teapot with strainer, delicious scones, clotted cream and home-made strawberry jam, all appropriately served on fine china.

Day 6

Friday was our last dialling day (How the week has flown by) and we set out to the far west, almost to Land's End but calling first at the Royal Naval Air Station at Culdrose. At this naval establishment we were permitted only a few yards within the gate, where we were allowed to view a memorial dial newly re-sited from the Plymouth naval base. As we crowded round it we were overseen by a soldier with a gun cradled in his arm. This gentleman, who turned out to be friendly, was asked what a soldier was doing guarding a naval establishment. He replied: "Because we do it better!" On, then, to Helston and coffee and traditional saffron buns in the Methodist Church followed by a visit to the small but interesting Folk Museum displaying life in Helston in the past. There was a most convincing school classroom with desks and slates and a high teacher's chair. Some ladies of our party claimed their historical status by confessing that they had actually taught from such a chair. There were a couple of dials in the museum including a copper one of the eighteenth century.

We rattled down the A30 and lesser roads to Marizion, thence, the tide serving, by boat to St. Michael's Mount. At the top of the Mount, three hundred feet up, is a nice dial but the climb was too much for some of our party and others were delayed too long by the slow service in the National Trust cafe' to essay the accent. Further delays occurred on the mainland as we waited in the coach for the

arrival of a group of our members back from the Mount. They claimed that their places in the return boat had been captured by a party of giggling Japanese schoolgirls and they had had to wait for the next, a likely story indeed.

On then to St. Buryan, no more than six miles from Land's End. Here is a dial claimed in his book on Cornish church dials by Len Burge to be the most advanced in Cornwall. It dates from 1747 and is in good condition. On the dial plate are engraved, as well as the time lines, declinational lines and azimuth lines. But the small nodus in the form of a nick in the gnomon indicated by Burge could not be descried by any of our party. Without it only the time lines would be functionaL From St. Buryan it was back to the A30 and home.

Once at the hotel dinner was followed by the usual end-of-session entertainment upon which it has now become a firmly established tradition not to report. And on Saturday we all went home. It had been a wonderful week. We are grateful to all who contributed, especially the Martins and the Thornes and of course our organisers, David and Lilli Young who provided us with a wonderful potpourri and a real taste of Cornwall.

THE HOUSMAN TOMB AND SUNDIAL

A.O.WOOD

Alfred Edward Housman (Fig 1) is best known for his poetry, in particular 'A Shropshire Lad' – firmly in the English tradition of the early twentieth century, although it was first published in 1896. Many of the poems within 'A Shropshire Lad' have also found a place in our musical heritage, numerous composers having set his words to music; particularly George Butterworth, Ivor Gurney and Ralph Vaughan Williams. Such composers total over one hundred and fifty. (Appendix 1)

The Housman family tomb is at Smallcombe in the parish of Bathwick, a suburb of Bath. It consists essentially of a sundial (Fig 2), mounted on a large plinth carrying the names of those of the Housman family buried there.

Information about the tomb came from Gerald Symons[1] whose grandmother was Alfred's sister. This was in response to an appeal in 'Country Life' for information on dials and his letter also told me that the dial had been restored in 1998 with an appropriate ceremony of commemoration in 1999.

Figue 1: *Alfred Edward Housman*
(Drawing bt Francis Dodd, 1926)
(Card from the National Portrait Gallery)

Figue 2: *Housman Tomb and Sundial*

Figue 2a: *Housman Tomb and Sundial*

The dial dates from 1905 when a younger brother, Robert, who, after wading into a cold River Avon to take a photograph, was taken fatally ill, dying three days later. It may be that the sundial was Alfred's idea, chosen perhaps as an alternative to a cross, as he claimed to have become an atheist at the age of twenty one[2].

He and Robert were only a year apart and although following very different careers must have shared an enthusiasm for astronomy when young, Robert constructing a telescope and Alfred re-creating the solar system using his family as planets: 'To his early interest in astronomy I owe one of my childish memories --- an instance of how he found amusement in instructing others. One day he took two of us on to the lawn, and there placed us as astronomical characters. I was the sun, my brother Basil the earth, Alfred was the moon. My part in the game

Figue 3: *Memorial plaque at the base of sundial*

was to stay where I was and rotate on my own axis; Basil's was to go round me in a wide circle rotating as he went; Alfred performing the movements of the moon, skipped around him without rotation. And that is how I learned, and have ever since remembered, the primary relations of the sun, earth and the moon.

I have a vague idea that he placed other members of the family at a farther remove to represent the more distant planets, but I am not sure of this. In later years it was Robert, not Alfred, who gave most time to the study of the heavens, and devised for his own use a large telescope ingeniously made out of camera-lenses, which he filched from our father.' [2]

'A. E.' himself became a noted classicist, holding the Kennedy Chair of Latin at Cambridge (presumably the Kennedy of the Latin Primer, sixty years in print). He translated the astronomical and astrological writings of the Roman poet Manilius. It has been suggested that Alfred brought at least some astronomical knowledge to this work[3].

The dial is within my visiting distance so an expedition was mounted to add the dial to our records and Register. Gerald Symons had provided a map reminiscent of 'Treasure Island' but done in coloured pencil, and most useful it turned out to be.

Figure 4: *Restoration of The Housman Family tomb at Smallcomb cemetery, Bath, 12th May 1999.*
A.E.Housman's great-nephew Gerald Symons (dark suit): Jim Page, Chairman of Housman Society, (grey suit).

The cemetery is quite large but down a narrow road marked 'Private'. It has two chapels, one Anglican and one Roman Catholic. The tomb itself is on a slope overlooking a path and is now well shaded by trees, at least in summer.

The dial plate, in brass, is plain, circular and in good condition as is the gnomon. The numerals are Arabic, read from outside, and there is a split noon. The pedestal, mount stone and plinth are octagonal, a crucifix cross appearing on the east side of the column. Around the base are eight brass plates bearing the names of the children of Edward and Sarah Housman with Alfred Edward (1859 – 1936) appearing below the column face with the cross (Fig 3). The motto carved below the brass plates reads, in the usual cheerful tradition of sundials, ' OUR DAYS ON THE EARTH ARE AS A SHADOW AND THERE IS NONE ABIDING'

The Housman Society (Appendix 2) was responsible for the dial's refurbishment and clearance of the surrounding area; it is all in very good order.
Acknowledgements

I must thank Gerald Symons and Jim Page[4], Chairman of the Housman Society for their help in preparing this article. The extract is from the biography of A. E. Housman by Laurence Housman, a younger brother[2].

Appendix 1.
I cannot resist listing the composers quoted by Jim Page in reference 4.

Samuel Barber
Arnold Bax
Lennox Berkeley
Michael Berkeley
Arthur Bliss
Benjamin Burrows
George Butterworth
Ivor Gurney

Mervyn Horder
John Ireland
E. J, Moeran
C. W. Orr
Graham Peel
Arthur Somervell
Ralph Vaughan Williams

plus another 150 or so lesser known ones'.

Appendix 2.
There is a statue of Housman in Bromsgrove where he was born[5]. The address of the Housman Society is:
Chairman: Mr J Page, 80 New Road, Bromsgrove, Worcs. B60 2LA

References:
1. G. Symons: personal communication. 2003
2. Laurence Housman: A.E.H. published by Jonathan Cape – a biography of his elder brother.
3. M. W. Stanier: personal communication. 2003
4. J. M. Page: personal communication. 2003
5. Bromsgrove Museum and Tourist Information Centre: Bromsgrove & its Rural Surroundings. 1999

Authors address:
5 Leacey Court
Churchdown
Gloucester,
GL31LA

THE WAYFARER'S CLOCK

J.WALL

Some 38 Anglo-Saxon sundials have so far been identified in England, the majority (24) in the north. Of these no less than 14 are located in Yorkshire, and nine of them in the Ryedale District alone --- a remarkable proportion.[1] Again,

Fig 1: Anglo-Saxon sundial and inscription, St Gregory's Minster

of the important group of seven Anglo-Saxon sundials with inscriptions nation-wide, no less than four are located in Ryedale, the most important at St Gregory's Minster (Kirkdale) one-and-a-half miles south-west of Kirkbymoorside. It has the distinction of housing, immediately over the south door, what is acknowledged to be the finest Saxon sundial in England. It is also the largest of the important group of sundials with accompanying inscriptions (figure 1).

Just over two miles from Kirkdale as the crow flies to the south-east, the parish church of Great Edstone sits on its hilltop site. The nave of the church is of the 13th century but unlike St Gregory's Minster there is little in the fabric to betray the presence of a Saxon church on the site; except,

Fig 3: Central sectrion of St Gregory's Minster sundial, with Anglo-Saxon formula above

that is, for the striking 11th century Saxon sundial over the south door, the position it would no doubt have occupied in the original church before its rebuilding.

In contrast to the Anglo-Saxon inscription at St Gregory's Minster, that at Great Edstone is very short - LODHAN ME PROHTE A(..), that is 'Lothan wrought me a(nd)'. There are two features of note. First, short as it is, the wording and the lettering are almost identical to the similar 'speaking object' formula at St Gregory's: + HAPARD.ME. PROHTE. This suggests that they came from the same hand and that the inscribed stones originated in the same workshop. Apart from the common origin of the sundials, there is no other demonstrable connection between Kirkdale and Great Edstone.

The second feature is of crucial importance to our study, and it is common to the sundials at St Gregory's Minster and Great Edstone. Above the horizontal 6.00a.m.-6.00 p.m. line, the diameter of the semi-circle, there is inscribed a phrase that describes the function of a sundial. However, whereas the phrase at St Gregory's Minster is in Anglo-Saxon, that at Great Edstone is in Latin. The former reads + ÞIS IS DÆGES SOLMERCA + ÆT ILCUMTIDE + (Figures 2 and 3), that is: "This is (the) day's sun-marker at every tide". The latter reads: ORLOGIV(M) VIATORVM (where ORLOGIVM is a form of HOROLOGIVM), that is: "Wayfarer's Clock"[3] (Figures 3 and 4).

Whilst it is not usual for an Anglo-Saxon sundial to carry an inscription in Latin, it is not surprising; whereas Anglo-Saxon was the language of the common man, ecclesiastical Latin was the language of the Universal Church. HOROLOGIVM is customarily and rightly translated 'clock', but we must divest our minds of the modern concept of 'clock' as a mechanical instrument. The proper concept is any device for the measurement of time, since the word HOROLOGIVM came into use long before the invention of mechanical clocks.

HOROLOGIVM is an almost exact transliteration of the Greek, ὡρολόγιον that is in turn derived from ὥρη (Latin Hora) for 'hour'. Jesus remarks in John ch. 11 v.9 'Are there not 12 hours (ὥραι) in the day?'

(H)OR(O)LOGIVM VIATORVM at Great Edstone is therefore quite properly translated 'Wayfarer's Clock'. The superscription at St Gregory's Minster, but also, more pertinently, the superscription at Great Edstone, both of which describe the function of a sundial, are the most compelling evidence against the school of thought that
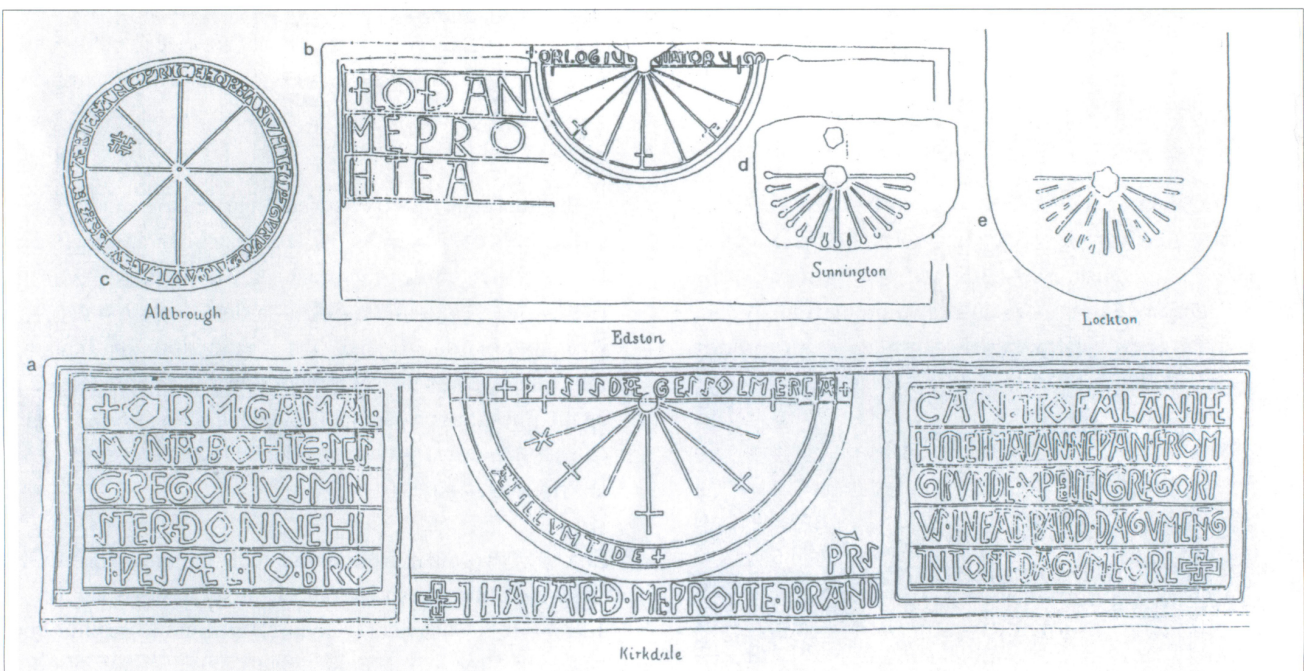
Fig 2: Wording of inscriptions at St Gregory's Minster and Great Edstone, after Haigh 1879[2]

maintains that Anglo-Saxon sundials with octaval divisions were not intended to be devices for the measurement of time, but merely to provide a rough-and-ready means of determining when the ritual worship of the seven monastic 'canonical hours' should begin during succeeding seasons of the year. To repeat, an HOROLOGIVM was originally a device for the measurement of time. Later, by association, it came to mean 'sundial', and elsewhere, 'water clock'.

It is sometimes objected that vertical sundials with a horizontal gnomon, in the nature of the case, cannot accurately measure hours of unequal length as the period of sunlight varies so markedly during successive seasons of the year. However, when considering the Anglo-Saxon sundial as a time-measuring device, this is somewhat of a red herring. The point is well put by Faith Wallis in her recent monumental work 'Bede: The Reckoning of Time'[4] - "(Bede's) chapter 3 discusses intervals of time smaller than the day, the basic unit of computus. These include the hour, defined in both its sundial sense and its astronomical sense. Ancient sundials were divided into twelve equal segments, so that the entire span of daylight, be it long or short, was divided into twelve hours. These were called "artificial" hours because they were defined by the artifice of the sundial. Of course, an "hour" in winter would be shorter than an "hour" in summer. "Natural" hours, or as Bede terms them, "equinoctial" hours, are of a constant length, namely 1/24 of a day. There are more equinoctial hours of sunlight in summer, fewer in winter.

Bede assumes that his reader is familiar with both kinds of hour. While monks may have used sundial hours for managing their daily round, the calendars in their computus manuscripts would have made them aware of equinoctial hours, for one of the conventional addenda to the monthly calendar page was a note on the number of equinoctial hours of daylight and night in that month.
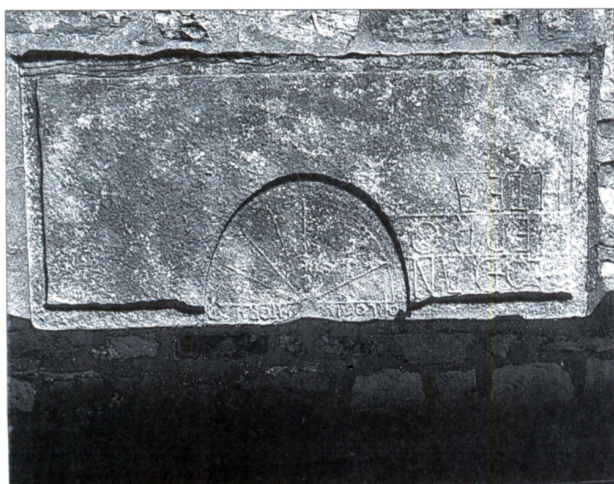
Fig 4: Great Edstone sundial with Latin formula above

The only other possible instance of the word HOROLOGIVM on an Anglo-Saxon sundial occurs at Orpington in Kent. This is an incomplete carved-stone round sundial on a square base, relocated on an internal pillar of All Saints parish church. Three incomplete texts appear on the visible face, two in Anglo-Saxon and one in Latin. It reads OR(....)VM, which has been taken to be a form of (H)OROLOGIVM, largely on the analogy of the wording at Great Edstone.[5]

We come now to the intriguing question 'What was the origin of the formula 'horologium viatorum'? First, we need to retrace our steps to the 6th/7th centuries AD, and in particular to the writings of the saint-bishop Isidore of Seville (c 560-636 AD.). Isidore was a remarkable genius, one whom we would nowadays describe as a 'polymath'. He was a man of immense learning and erudition, as his many works testify. '(They) became a storehouse of knowledge freely utilised by many medieval authors'. The most important of them, the Etymologiae, is an encyclopaedia of the knowledge of his time, containing information on such subjects as grammar, rhetoric, mathematics – (especially geometry), medicine and history, as well as books on the offices of the Church.

As with other authors among the early Fathers of the Church, no original contemporary manuscripts have survived. However, we are able to reconstruct them from copies that were made at a later date in the scriptoria of the principal monasteries. On a recent visit to the Library of the University of Basel in Switzerland I was privileged to handle, read and photograph perhaps the oldest extant MSS copy of part of the Etymologiae.[6] It is a precious relic, written on vellum and bound in calf-leather. In addition to the text it contains twelve pages of diagrams, illustrative of mathematical, geometrical and astronomical subjects and theories. The last page of diagrams on folio 23v (Figure 5) depicts in the upper half a semi-circular dial divided into twelve segments, one for each month, and containing figures corresponding to the length in feet of a standing
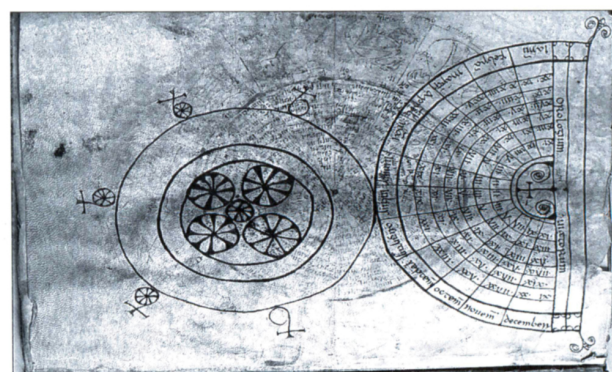

Fig 5: Sundial-analogue diagram in MSS at Basel University Library

man's shadow at two-hourly intervals (that is sundial or 'artificial' hours) during the day. The magic words (H)OROLOGIUM VIATORUM are inscribed above the diameter line of the semi-circular dial. The two words are set either side of a point marking the centre of this semi-circle from which springs a cross standing in the position of the gnomon of a sundial. Indeed the resemblance between this diagram and a sundial is no coincidence, since the one is an analogue of the other. From the information provided by the diagram it would have been possible to construct a sundial on the ground (of a kind that we would nowadays call an analemmatic dial), for which a man standing in the centre would serve as the gnomon. (Appropriately there is such a sundial set in the grounds of the Ryedale Open-Air Folk Museum at Hutton-le-Hole).

The Latin text of the Basel MSS is written in an Anglo-Saxon miniscule script. It has been attributed to an Anglo-Saxon centre on the continent, probably Fulda, north-east of Frankfurt in western Germany, and has been dated to c. 800 AD.

An almost identical dial-like diagram appears in MSS 422 of the Bibliotheque Municipale, Laon in northern France. The MSS is divided into three sections and is colloquiallyknown as 'The Book of Isidore' because the first section contains extracts from his De natura rerum.
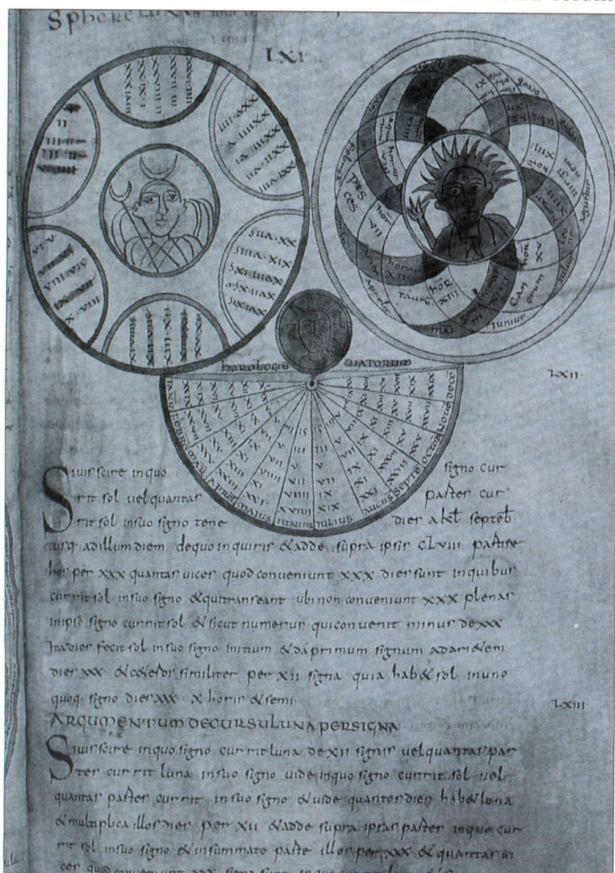
Fig 6: Sundial-analogue diagram in MSS at Municipal Library, Laon

The second section, in addition to works by the Venerable Bede, Cicero and others, contains extracts from Isidore's Etymologiae. There are three diagrams on folio 23v (Figure 6), one of the moon, another of the sun, and a third, the 'sundial' diagram. Once again the magic words HOROLOGIUM VIATORUM are written above the diameter of the semi-circle. Above the centre is a disc on which appears a stylised face with a halo of flames, to represent the sun.

On the evidence of the MSS's at Basel and Laon, the diagrams, with the superscript formula HOROLOGIUM VIATORUM, first appeared on the continent at least 200 years before it was inscribed in an analogous position above the Anglo-Saxon sundial at Great Edstone. How could it have been transmitted from the one to the other in the interval? We know that the Venerable Bede (c. 673-735) was greatly influenced by the works of Isidore of Seville, to the extent, for example, that he borrowed Isidore's title De natura rerum for his own work on the subject. Although, to the best of my knowledge, the formula HOROLOGIUM VIATORUM does not appear as such in any of Bede's works, it is quite conceivable that he was familiar with it from his reading of Isidore, and that it was transmitted in the first instance through the agency of one of his students/disciples at Jarrow. Such knowledge would be handed down through successive generations in the monastic communities that were heirs to the scholarship of Bede at Jarrow.

Received opinion now is that in the northern Province monasteries withered on the vine by about 820 AD, and that a parish structure was in place by the end of the 11th century. This would account for the appearance of a phrase that originated in a monastic milieu eventually finding its way to, and being applied at, a 'secular' parish church such as Great Edstone, dated c. 1060 AD.

The attribution of the Basel MSS to Fulda raises the intriguing possibility of a second, quite different source for the formula HOROLOGIUM VIATORUM that is, paradoxically, almost the reverse of the first. The Benedictine abbey of Fulda in Hesse Nassau Province was founded in 744 AD by St. Sturmius, a disciple of the Englishman St Boniface (680-754 AD), who had brought Christianity to the Anglo--Saxons of western Germany. We have already noted that the ecclesiastical Latin of the Basel MSS was written in an Anglo-Saxon miniscule script. It is quite possible therefore that the formula HOROLOGIUM VIATORUM and its accompanying diagram originated somewhere in England, for example the Benedictine monastery at Jarrow, home of the Venerable Bede, and was transmitted to Fulda in the course of that missionary

endeavour. It would be interesting to discover whether there are any 'Saxon' sundials with this inscription remaining in western Germany.

To sum up: The function of Anglo-Saxon sundials was expressed in two phrases that were inscribed above the diameter of two semi-circular vertical sundials in Ryedale, North Yorkshire - at St Gregory's Minster and the church at Great Edstone respectively. The formula at Great Edstone, ORLOGIUM (for HOROLOGIUM) VIATORUM, 'Wayfarer's Clock' is unique in England (with the possible exception of a highly conjectural reconstruction of an incomplete inscription on a fragmentary sundial from Orpington in Kent). It is succinct, apt, and appealing in its imagery. The formula probably had its origin in a MSS copy of the Etymologiae of St Isidore of Seville (c. 560-636 AD) that has been dated to c. 800 AD, now in the University Library at Basel in Switzerland. The diagram over which it there appears as a superscription is, to my knowledge, the earliest representation of a 'sundial' analogue in literature.

It is a far cry from the isolated church of Great Edstone in Yorkshire to the bustling, cosmopolitan city of Basel in Switzerland, and yet they are uniquely bound together through holding this treasure in common, 'The Traveller's Clock', than which there could surely be no better description of a Sundial.

REFERENCES

1. J.Wall "Anglo-Saxon Sundials in Yorkshire" Yorkshire Archaeological Journal, 69 (1997), 93-198.
2. Reproduced from Revd. D.H. Haigh "Yorkshire Dials" Yorkshire Archaeological Journal 5 (1879), 134-22. Figure on p.134. Although Haigh's text must be treated with some reserve, his illustrations may be taken as accurate reproductions of the sun dials as they appeared in 1879 since, for the most part, they were drawn from casts taken in situ. They are to be preferred to modern images on account of the erosion that has taken place in the interval, even though in the case of Kirkdale the sundial has been protected by the church porch.2
3. For example J.T. Lang (ed.) "Corpus of Anglo-Saxon Stone Sculpture, No.3 -York and East Yorkshire", British Academy (Oxford, 1991), 134.
4. Faith Wallis "Bede: The Reckoning of Time. Translation, introduction, notes and commentary" Liverpool University Press (1999), 267.
5. Elizabeth Okasha "Handlist of Anglo-Saxon Non-Runic Inscriptions" Oxford University Press (1971), No.99, and pl.,p. 105.
6. Basel, Universitatsbibliothek, F. III 15 a, fol. 23v.

Author's address:
7 Waydale Close,
Kirkbymoorside, North Yorkshire,
*YO62 2ET*

THE BENOY DIAL
PART 2

A.O.WOOD

After publication of the first part of 'The Benoy Dial' in the September 2003 Bulletin I received a letter from David McKendrick in Wetherby which brings us up to date with the story of the Gordon Benoy's dial.

Firstly, Gordon Benoy is still alive; I misinterpreted his omission from the Membership Register.

David McKendrick's letter explains that he obtained the intellectual property and production rights to the dial about ten years ago. The nature of the design and high cost of product liability insurance for this heavyweight dial has meant that he is not producing them commercially but 'one-offs' can still be made with proceeds going a cancer research charity.

Some technical details have emerged. The liquid in the jar 'took years of trial and error' to produce and is by no means a simple alcohol anti-freeze. The noon gap in the plastic rim which I imagined was a time mark feature may in fact be no more than a drain for rainwater.

As the face of the jar is in the correct plane for a CD dial to be installed, I gave it a try, arguing that the hour scale was already in place. The photograph (fig 1) shows that one has to view the arrangement from directly along the dial/CD axis to obtain a correct indication of the time. This is difficult to ensure without a sighting line so experiments will have to wait until the next summer.
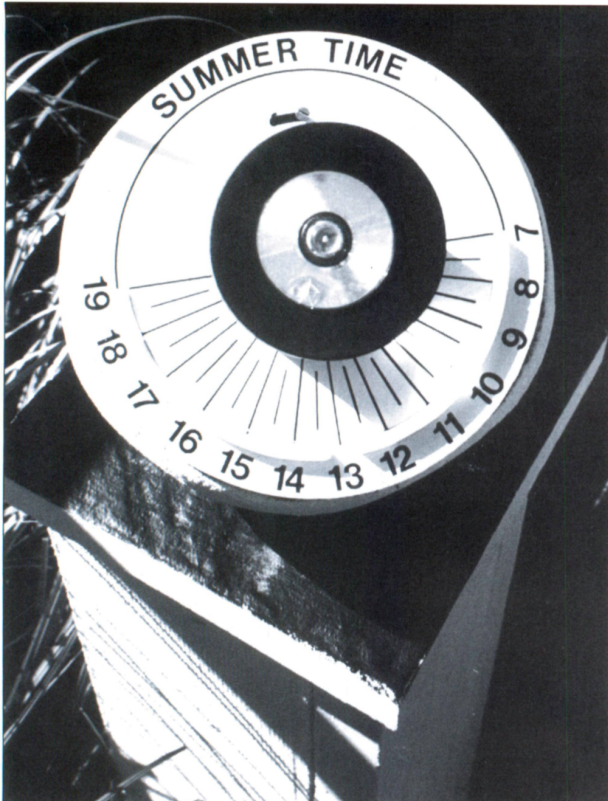
The letter from David McKendrick went on to say that the problem of 'Summer Only' use had been addressed. A version of the dial has been developed for production that can now operate all the year round.

As mentioned in Part 1 the dial can be read with remarkably high accuracy 'at a glance' justifying the change from using a shadow to using the sunlight directly itself, from all directions; an inventive step requiring original thought behind its apparent simplicity.

A.O.Wood

NOTES FROM EDITOR

The 'Druid' Dial'
1.This item comprises an apology from the Editor for the wrong attribution of the photo on the back cover of the September. Readers may remember seeing a picture of an interesting spiral/equitorial. This dial was and is in the possession of David Young: it was designed by John Singleton and the prototype built by his brother Barrie. The whole story is given in a short article in this issue: Druid Dial. My apologies have already been sent to David Young and the Singletons.

2. Tony Belk of Shrivenham, Swindon, offers this small correction to his article in the Dec. 2002 issue, about the Isaac Morris moon dial. The paragraph above Fig.4 in the article needs corrections.
"Select the lunar time cross the top *or bottom. Move diagonally up or* down to the age of the moon, read either from the left or the right hand side. From that point, follow the *vertical* line either up or down until it reaches the top *or bottom* of the diagram. That is the local apparent or true solar time."

The editor is grateful to the author and to Michael Lowne.

And to the watchful eyes of all readers who among them ensure that the Bulletin is as free from errors as is possible for any human institution.

3. Once again, we have been asked, by the National Maritime Museum and the Royal Greenwich Observatory, to draw the attention of members, especially of those living in or near London, to their excellent adult-education 'Open Museum' lecture series, on Maritime History and on Astronomy. Information available on their website: www.nmm.ac.uk/openmuseum.

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