Bulletin 00.3 English summary

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01 Account of the to Leiden and surroundings study trip — P. Louwman

On 24 June, we visited Leiden, The Hague, Rijswijk and Wassenaar. Although we knew this area from earlier trips, most of the sundials were new to us. Ton Bron and Dik de Groot, who organised this trip, surprised us with a 37-page well-researched booklet containing sundial descriptions and as many as 27 colour photographs.

Of particular interest was Leiden 11, built in 1976 by member H. Haasnoot. It has two semi-annual half-cylindrical dial plates carrying EOT half-curves for increasing and decreasing declination, respectively. The ends of two thin rods provide the shadows. "Zenith" for Sep 1986 featured a detailed description.

Note also the three motorised "sundial machines" by Ton Bron. They were described in this Bulletin earlier. Ton also owns a Bernhart dial [the model also seen in front of the Stuttgart Planetarium and in the Deutsches Museum (Munich) Sundial Garden].

04 Members — Secretariat

Two resignations, seven new members (one of which the Assen folk museum), two changes.

Qibla calculations. Martin Hugenholtz has available a DOS program that will calculate distances between points on earth, as well as the Qibla in each location.

The Sky and Telescope "Sun Pointer Amersfoort" feature is mentioned. So are two book reprints; the CD-ROM to "Faszination Sonnenuhr" contains over a hundred sundial photographs.

05 Japanese Sundial Society

Reinhold Kriegler of Germany sent us a photocopy of the first bulletin of the Japanese society [The sample shown is difficult enough for your summariser. 'Logomark no BOSHU' (or 'shita atsu'). BO could stand for yearning, and SHU for collection. Logomarks requested? Reading the katakana further down, we learn that they already have the Igilisu (English) logo, and those of kita (North) Amerika, Itaria, and Oranda].

At the celebration of 400 years of Dutch-Japanese relations, The Netherlands placed a sundial in a park in Kawatchi-Nagano. It is an armillosphere topped with a weathervane in the shape of the sailing vessel "De Liefde" ("Love") which was the first to arrive in Japan in 1600 [Jan Joosten of Lodenstein, later called Yanyosu - still later Yaesu].

06 (various notes)

The BSS Sundial Glossary is mentioned; see the text for details.

Lidi Schoorel found two gnomonically oriented assignments in the "Number and Geometry" series of schoolbooks. One is about the conversion between az/el and dec/RA co-ordinates and on sundials; the other on the Equation of Time.

07 Why Greenwich? — H.W. van de Wyck

The author explains how latitude can be found by observation of the sky alone, but for longitude a timepiece is needed, and that of sufficient accuracy. Christiaan Huygens invented the balance wheel in 1675, so solving the longitude problem in principle. Of the star tables produced for this purpose, the Greenwich tables of Astronomer Royal John Flamsteed became widely used. In 1884 the Greenwich meridian was elected as prime, over those proposed by France and Germany [we might add that the present "prime meridian" is already the third or so, subsequent Astronomers Royal defining the reference through their newer instruments, slightly beside the old].

08 The Green Meridian (from "Zonnetijdingen", nr. 41) — E. Daled, J. Lyssens

Historically speaking, the first scientifically established meridian was the noon line of the Paris observatory of 1667. Cassini I started using it in 1681. It remained the principle meridian for quite a while, especially for measurements on land, including the metric unit of length.

On mainland France, the meridian runs from Dunkerque in the north to Prats-de-Mollo-la-Preste in the south, spanning over 960 km (600 statute miles). It crosses 18 departments and 337 cities and municipalities.

On the occasion of the year 2000, architect Paul Chemetov wanted to visualise the meridian by lining it with trees. Obviously this was not possible everywhere, but in many places marked, or specially planted, trees indicate the meridian.

10 Ootmarsum-2000 Calendar B.P.U. Holman

The introduction is about the development of the calendar from the first megaliths to the Gregorian calendar. The author then describes the noon line on the church square of Ootmarsum. Local noon (which can be read on the sundial on City Hall opposite the church) is at approximately half past one DST. The shadow of the ball on the church tower falls on the noon line where subsequently the date can be read. There are markers for each entry into the next sign of the Zodiac, and smaller ones every ten days in between.

A line trough a special star-shaped marker and the weathercock on City Hall points to Polaris. To find more about all this, visit the Ootmarsum "Chronomium" Time Centre.

12 The gnomonic quality of Greek and Roman Sundials J. Kragten

The author is still investigating. In B99.3, he concluded that data on 75% of the *conical dials* answer to some mathematical concept. Of the other 25%, more measurements are needed. In B00.1, it was noted that none of the *cut spherical dial* data would fit any mathematical concept. The assumption of a shortened gnomon, in B00.2, did not help either. The BSS have been asked to perform measurements on four skaphes in the British Museum in London. Soon afterwards, it turned out that two of the four are different in that the front is almost at right angles to the top. Gibbs mentions nine dials of this kind. Gibb's p.18 is reproduced in the bulletin, with three remarks: -in fig.4, the gnomon tip shadow falls far outside the dial area, -one of the two in London was found in Egypt, -of the "best example", the front angle is given as 52,8°, far from 90°.

An alternative way of looking at these dials is given next. The author shows that in fig.6, the entire gnomon shadow could have been used, and the gnomon could have been shorter. This would preclude a date reading, but the date arcs were never convincing anyway; it may not have been deemed important at the time. For the equator, the time reading would be exact. For increasing latitudes, it would be exact at sunrise, noon, and sunset. Allowing a maximum error of half a (modern) hour, the maximum latitude for which such a dial would be usable would be 37°.

The author now looks at the data from these viewpoints. From his detailed analysis, he concludes that seven of the nine candidates could fit this concept reasonably, although more data are needed. If correct, the apparent design latitude of 0 to 35° could point to an Egyptian of Mesopotamian origin.

24 From the Rojas astrolabium to sundials F.J. de Vries

One of the most beautiful instruments of man is without doubt the astrolabium. Now the commonest type, which is based on the stereographic projection, was really made for a specific latitude. Although several plates for different latitudes could be used, it was never really universal.

Of the truly universal astrolabia, the Rojas type uses orthographic projection to make it latitude independent. The projection onto the north-south meridian plane transforms declination circles into straight lines, while hour circles become ellipses. On top of this there is a ruler or regula for azimuth, carrying at right angles to it another ruler, the cursor, for altitude. The divisions are sine or cosine.

Fig.1 shows settings for latitude 52° and date 0° Leo, or a sun declination of about 20°. With a measured altitude of 40° we find that the time is either 8:45am or 3:15pm.

Yvon Massé of France has built a sundial out of the Rojas astrolabe by replacing regula and cursor by a ruler fitted with an altitude-measuring device, as in fig.2. Set to latitude 52° as before, the altitude of the sun is measured. Let this be 40°; then the intersection of the plumb line with the date line of 0° Leo is at 8:45am or 3:15pm.

Noting that the hour line for a specific date shows $R \cos \delta \cos t$, and the date scale shows $R \sin \delta$, Yvon now derives a second type of sundial.

Fig. 3 shows the dial just described once more for clarity. The hour scale is date-dependent. If it were adjusted by a factor $1/\cos \delta$ then it would become date-independent. If the date scale is adjusted by the same factor and so becomes $R \tan \delta$ then the relation to the altitude of the sun is retained. Fig. 4 shows this.

The common base formula for these instruments is $\sin h = \sin \varphi \sin \delta + \cos \varphi \cos \delta \cos t$ and we see that φ and δ may be interchanged. This happens in fact in the Regiomontanus and Apian hour plates.

27 How to cope without a protractor J.A.F. de Rijk

Hans notes that one of the angles in the famous 3,4,5 triangle is 53,1°, which happens to be the latitude in the north of the Netherlands. Such a triangle is easily made and can be used to test if a pole style is correctly aimed.

28 From Ozanam sundials to Ozanam sundials F.J. de Vries

In Bulletin 85.3 of Sept 1985, René Rohr published an article on four universal horizontal dials designed by Jacques Ozanam in the 17th century. Based of their distinctive line patterns, Rohr called them elliptical, linear, parabolic and hyperbolic. They are all based on the relation $\tan z = \sin \varphi \tan t$ for horizontal dials, so that for every point x, y of the pattern the relation $x/y = \sin \varphi \tan t$. Different multiplications give different patterns, and the equations for the four original Ozanam dials are given. See also the figures on p29.

Fred Sawyer developed new patterns, of which four are shown in figs 1..4. Not all new patterns are easily read, as is shown in fig. 5. Here, $x = \sin(2\varphi)\sin^2 t$ and $y = \sin(2t)\cos\varphi$, so that again $x/y = \sin\varphi\tan t$.

32 Determining time from solar altitude — G. Strang van Hees

Starting from the well-known equation $\sin h = \sin\varphi\sin\delta + \cos\varphi\cos\delta\cos t$, the author starts with the special case of sunrise and sunset, for which $\sin h = 0$, so that $\cos t = -\tan\varphi\tan\delta$. Fig. 1 is the graphical representation of this relation. M is the centre of the semicircle through A and C. Use: measure off φ in A, find B, measure off δ in B, find D. Drop a perpendicular on the semicircle and read off angle t, which is the time of sunrise or -set. This can be extended to several latitudes as is shown in fig. 2, which could come in handy on vacations.
In fig. 3, the author finally solves for arbitrary t. B is found as in fig. 1, but C, on a scale at right angles to AB, is found by measuring off δ in A, as shown. Dropping down to D gives us the same point as in fig. 1; the extension of CD intersects the semicircle in sunrise or sunset. To use an arbitrary h, circle CA around C to get CE, with angle DCE equal to h, and CE=CA. Drop down from E to find G, which is the actual time t corresponding to h.
(To find altitude from time, the last procedure may be reversed, going up from G to intersect arc AE, then measuring h as the angle ECD.)
[the meaning of point F is not explained in the article]

37 "Everyday Science": Sunpicture; article from NRC newspaper of 3 June 2000 — K. Knip

In the afternoon of 13 May 2000, a fireworks factory in the city of Enschede exploded. The factory happened to be on an aerial photograph that the Topographical Service made in the morning of that very day. Author Knip wondered if the time the photo was made could be determined from it. In the sunny weather, the lampposts and trees had sharp, black shadows, which could serve as as many vertical gnomons.
The sundials of the Antiques used the shadow length of a vertical. In these low latitudes, this worked better than the direction, which was hard to determine because the shadow would at times be quite short, and also switch suddenly from west to east if the sun moved overhead. In higher latitudes, the direction was much more useful.
The author now discusses the shortcomings of the vertical gnomon and the development of the pole style.
From the photo and the known direction of the street (about 009°), the direction of the shadow is estimated at 320°, or 40° before local noon. The determination of local noon, using longitude and EOT, as well as Dst, comes next: 13:32 legal time. Part three of the solution concerns the speed at which the azimuth of the sun changes. On average, this is 15°/h of course, but it varies over the day. By experiment, the author finds it would have been around 23°/h. Which means the photo was taken one and three quarters of an hour before solar noon, or a quarter to twelve legal time.

38 A new book by Dees Verschuuren — Secretariat

The St. Aegten foundation is the keeper of the cultural and art-historical heritage of the Order of the Sacred Cross of St. Agatha monastery. The estate spans over six centuries and includes, among many other precious items, astronomical models and instruments. The book by Dees Verschuuren contains detailed descriptions and about forty photographs of sundials, orreries, balances, wigties, dividers and protractors. It should cost about $20. For information see the postal and e-mail addresses.

38 Sawyer Dialing Prize

The North American Sundial Society is very pleased to announce that it has awarded the first annual Sawyer Dialing Prize to Fer J. deVries of Eindhoven, Netherlands: In recognition of his many years of dedication to dialing, and in gratitude for his development of Zonwvlak and his always helpful encouragement and support of the global dialing community.
In addition to receiving a trophy sundial (by Tony Moss) and certificate, Fer will be able to direct a cash donation of $200 to a dialing project or non-profit organization of his choice. He has chosen to designate the money to benefit the Environmental Design course in the Architecture Department of UC-Berkeley. Each year this class teaches about 150 students about sundials and requires them all to design and build a dial.

39 Literature — A. vd. Hoeven, D. Verschuuren

1375: The Genk City Tourist Board has published a brilliant, modern brochure on the Sundial Park. Julien Lyssens was editor. The book contains a photo and description of all the dials as well as articles on layout and use of sundials, and on mottoes. 1376.1 (E. Daled): Official opening, on 19 May 2000, of the Genk Sundial Park. 1376.4 (M. Hugenholtz): The Moon Paradox. Yet another reason why the connection line between the cusps is not at right angles to the line between moon and sun. The "great-circle theory" is rejected. [W.L.Kennon, in 1948, has this to say about the problem: "Let us suppose that the cusps of the moon are connected by a straight line, and a perpendicular is drawn form the mid-point through the limb; this line will lie in the diurnal circle of the sun, and in a sense may be said to point toward the sun."]. 1378 (Rene Vinck): "Manual for the graphical design of horizontal and vertical sundials", 48pp text, 36pp tables. 1379.2: A plaque commemorating Georg Peuerbach carries an equation, as a riddle to passers-by. Quantity b is half the daylight arc.

A remark by A. vd. Hoeven: "The advance of the computer in gnomonics is clear: Internet addresses in articles, descriptions of software, artificial sundial configurations. What is disturbing is a possible loss of touch-and-feel, of insight, and of background".
Fer de Vries answers: "Granted, but a wealth of information is distributed through the Internet. As for the last part, we need our members' help. Let us know your gnomonic adventures and thoughts so we can publish them."